ACF11

DIAGNOSTIC

MD-11-DZAFA-C

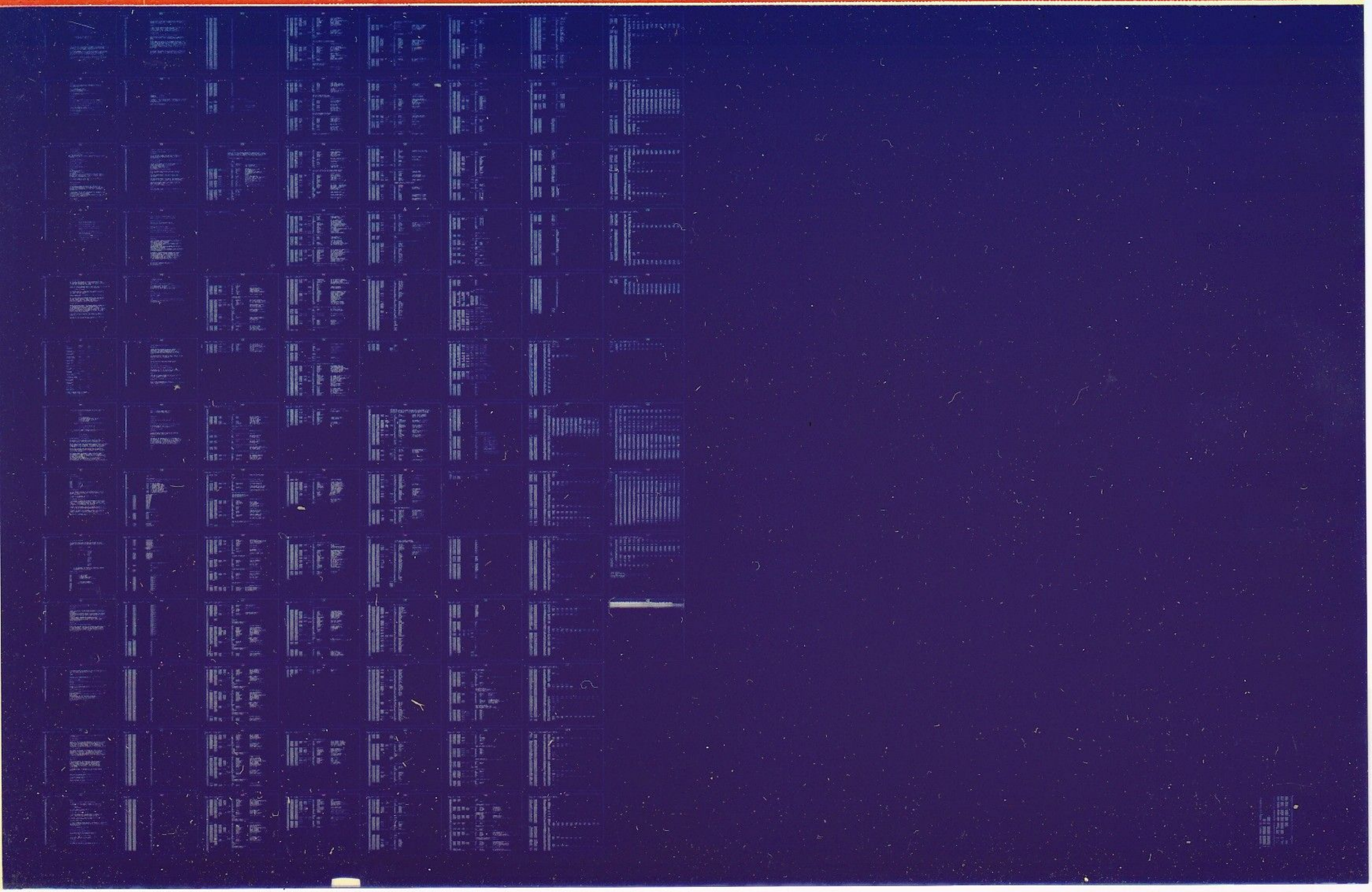
EP-DZAFA-C-DL-A

FICHE 1 OF 1

NOV 1976

digital

MADE IN USA



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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZAFA-C-D
PRODUCT NAME:	AFC11 DIAGNOSTIC
DATE REVISED:	MAR. 1974
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	M. DAVIS/E. ROUSE/E. BADGER

FIRST PRINTING, MARCH 1970

1. 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

PDP-11 STANDARD COMPUTER WITH ASR-33 TELETYPE (OR EQUIVALENT).

ADJUSTABLE PRECISION VOLTAGE SOURCE, EDC MV1C5, 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. STARTING PROCEDURE

4.1 STARTING ADDRESS

THE STARTING ADDRESS FOR ALL TESTS IS 000200.

4.2 INITIAL SWITCH SETTINGS
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 OPERATOR AND PROGRAM ACTION

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 SEQUENTIALLY BY THE DATA REPEATABILITY TEST.

5. OPERATING PROCEDURES

5.1 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 CR 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-

SCRIPTION OF EACH TEST.

TABLE 1

TEST	FUNCTION
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
MXTIM	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
DECOD	MULTIPLEXER CHANNEL ADDRESSING TEST
OLOAD	AFC OVERSCALE TEST

5.3 TEST INITIALIZATION

THE FOLLOWING TESTS REQUIRE NO FUTHER KEYBOARD INPUTS AFTER THEY HAVE BEEN SELECTED:"ADCAL", "MONOT" AND" MXTIM". 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	NONE	NONE
D-DISPLAY CHANNEL IN DATA LIGHTS	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 FOR "REPET"	
L-LIST ALL DATA POINTS INDIVIDUALLY	NONE	NONE
LC-CONTINUOUSLY SAMPLE AND LIST ONE CHANNEL	NONE	NONE
N-SELECT NUMBER OF SAMPLES	*SAMPLES:	XXXX(CR)
P-TYPE ALL TEST PARAMETERS		
ST-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.

TABLE 3

OPTION	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)
V	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 IDICATE 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 REINITIAIZATION: "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.

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 FORMAL FOR THE SPECIFIC TEST.

TEST	OPTION	FORMAT
REPET	I (SEE NOTE) OR	
	C	XXXX,YYYY(CR)
	G	XXXX(CR)
	N	XXXX(CR)
	ER	XX(CR)
	EM	X(CR)
	ST	NONE
DATA	C	XXXX(CR)
	G	XXXX(CR)
	N	XXXX(CR)
	T	NONE
	V	XXX(CR) OR A
	A,D,H,L,L,C	NONE
OLOAD	C	XXXX(CR)
	G	XXXX(CR)
	ST	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,SUPRESS END OF PASS TYPEOUT
SR05	
SR04	
SR03	
SR02	
SR01	
SR00	=1,RETURN TO KEYBOARD CONTROL

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                                6.0     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 CON-
                                        VERTER CONTROL LOGIC.  THE FOLLOWING SEQUENCE OF TESTS IS EXECUTED
                                        EACH PASS:
                                        ALL REGISTERS IN INTERFACE (EXECPT 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 ITEROTED A NUMBER
                                        OF TIMES (DETERMINED BY PROGRAM) AND THEN THE NEXT SUBTEST WILL
                                        BE EXECUTED.  WHEN ALL SUBTESTS HAVE BEEN COMPLETED, THE PRO-
                                        GRAM 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 SEQ-UENTIAL SUBTEST WILL BE EXECUTED

6.1.2.6 OPERATION WITH SW06=1 (UP)

SAME AS 6.1.2.1 EXCEPT NO END OF PASS TYPEOUT 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 TYPEOUT
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 REPEATABLILTY 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 PARAMTERS SELECTION. (SEE 5.3.2).
IF THE "I" OPTION HAS BEEN SELECTED, NO FURTHER ACTION IS REQUIRED.
IF INDIVIDUAL PARAMTERS 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 YYYY ZZZZ

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

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

ZZZZ 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

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PASSES:
TOTAL ERRORS:
*
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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

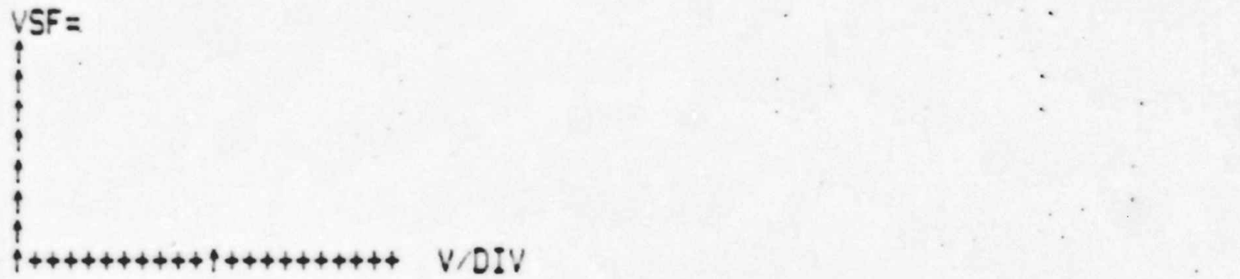
THE FORMAT OF THE HISTOGRAM IS SHOWN IN FIGURE 1.

EACH DATA POINT IS PRESENTED BY AN ASTERISK (*). VSF IS THE VERTICAL SCALE FACTOR. WITH A VSF OR 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 U.. 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 INTERPRETAION 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 OCILLOSCOPE PROBE (X1) TO AM11-E04F2
CONNECT OSCILLOSCOPE GROUND TO AM11-E04C2
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-E04) FOR A 2 MS WIDE PULSE.

MOVE OSCILLOSCOPE PROBE TO AM11-E03T2. ADJUST LOWER POTENTIOMETER ON M3020 (LOCATED AT AM11-E03) FOR A 3 MS WIDE PULSE.

MOVE OSCILLOSCOPE PROBE TO AM11-E04T2. SET HORIZONTAL DISPLAY ON OSCILLOSCOPE FOR 1 US/CM. ADJUST THE LOWER POTENTIOMETER ON THE M3020 (LOCATED AT AM11-E04) FOR A 1/2 US WIDE PULSE.

MOVE THE OSCILLOSCOPE PROBE TO AM11-E03F2. ADJUST THE UPPER POTENTIOMETER ON THE M3020 (LOCATED AT AM11-E03) 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 SELCTED, 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 SW5=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 OT 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 ASAVES 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.


                                6.5.3   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 ADDRESSSING 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
```

```
                                .TITLE  AFC11
                                .ABS

                                ;AFC11 DIAGNOSTIC
                                ;COPYRIGHT 1971,1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.

                                ;SWITCH REGISTER FUNCTIONS

                                ;SW15   =1,HALT ON ERROR
                                ;SW14   =1,LOOP ON CURRENT TEST
                                ;SW13   =1,SUPPRESS ERROR TYPEOUT
                                ;SW12   =1,SUPPRESS TRACE TRAPPING
                                ;SW11   =1,SUPPRESS ITTERATIONS
                                ;SW10   =1,ESCAPE TO NEXT TEST ON ERROR
                                ;SW07   =1,HIGH GAIN CALIBRATION
                                        ;=0,LOW GAIN CALIBRATION
                                ;SW05   =1, TYPE OUT DATA IN ADCAL TEST
                                ;SW06   =1,SUPPRESS END OF PASS TYPEOUT
                                ;SW00   =1,RETURN TO KEYBOARD CONTROL

                                ;SYMBOL DEFINITIONS
100000                          SW15=100000
040000                          SW14=40000
020000                          SW13=20000
010000                          SW12=10000
004000                          SW11=4000
002000                          SW10=2000
001000                          SW09=1000
000400                          SW08=400
000200                          SW07=200
000100                          SW06=100
000040                          SW05=40
000020                          SW04=20
000010                          SW03=10
000004                          SW02=4
000002                          SW01=2
000135                          MAX4K=16776-DATAB/2


                                ;REGISTER DEFINITIONS
000000                          R0=%0
000001                          R1=%1
000002                          R2=%2
000003                          R3=%3
000004                          R4=%4
000005                          R5=%5
000006                          SP=%6
000007                          PC=%7

                                ;LOCATION EQUIVALENCIES

177570                          SWR=177570
177776                          PS=177776
016704                          STACK=DATAB+200
015512                          RADIX=DIVIS
```

```
                015506          BINWRD=DIVIDL
                015510          DIGIT=DIVIDH
                015506          QUOT=DIVIDL
                015510          REMAND=DIVIDH
                011614          PRODH=MPYERL
                011620          PRODL=MPCND
                016504          ENDCOD=DATAB

                                ;CONTROL REGISTER BIT FUNCTIONS
                000100          ENABLE=100
                000200          DONE=200

                                ;INSTRUCTION DEFINITIONS

                005746          PUSH1SP=5746
                005726          POP1SP=5726
                010046          PUSHR0=10046
                012600          POPR0=12600
                024646          PUSH2SP=24646
                022626          POP2SP=22626
                000240          NOP=240
                000257          CLCVNZ=257



                                        ;REFERANCE NUMBER DEFINITION

                000000                  N=0
                000000                  XN=N

                                        ;EMT GENERATOR

                000000                  X=0
                000001                  M=1
                000001                  XM=M


                                        ;EMT DEFINITION TABLE

                104000                  ERRORC=EMT+X
                000001                  X=X+1
                104001                  SCOPE=EMT+X
                000002                  X=X+1
                104002                  SCOPEF=EMT+X
                000003                  X=X+1
                104003                  TYPE=EMT+X
                000004                  X=X+1
                104004                  SAVOSP=EMT+X
                000005                  X=X+1
                104005                  OCTASC=EMT+X
                000006                  X=X+1
                104006                  RESOS=EMT+X
                000007                  X=X+1
                104007                  EXTRACT=EMT+X
                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                          ADLNGTH=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                          DECBCD=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
 1028          104030                          MULTPY=EMT+X
 1029          000031                          X=X+1
 1030
 1031
 1032
 1033                                          ;TRAP CATCHER
 1034          000000                  .=0
 1035  000000  000002                          .+2
 1036  000002  000000                          HALT
 1037  000004  000006                          .+2
 1038  000006  000000                          HALT
 1039  000010  000012                          .+2
 1040  000012  000000                          HALT
 1041  000014  000016                          .+2
 1042  000016  000000                          HALT
 1043  000020  000022                          .+2
 1044  000022  000000                          HALT
 1045  000024  000026                          .+2
 1046  000026  000000                          HALT
 1047  000030  000032                          .+2
 1048  000032  000000                          HALT
 1049  000034  000036                          .+2
 1050  000036  000000                          HALT
 1051  000040  000042                          .+2
```

```
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
```

```
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
```

```
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
```

```
1220  000562  000000                    HALT
1221  000564  000566                    .+2
1222  000566  000000                    HALT
1223  000570  000572                    .+2
1224  000572  000000                    HALT
1225  000574  000576                    .+2
1226  000576  000000                    HALT
1227  000600  000602                    .+2
1228  000602  000000                    HALT
1229  000604  000606                    .+2
1230  000606  000000                    HALT
1231  000610  000612                    .+2
1232  000612  000000                    HALT
1233  000614  000616                    .+2
1234  000616  000000                    HALT
1235  000620  000622                    .+2
1236  000622  000000                    HALT
1237  000624  000626                    .+2
1238  000626  000000                    HALT
1239  000630  000632                    .+2
1240  000632  000000                    HALT
1241  000634  000636                    .+2
1242  000636  000000                    HALT
1243  000640  000642                    .+2
1244  000642  000000                    HALT
1245  000644  000646                    .+2
1246  000646  000000                    HALT
1247  000650  000652                    .+2
1248  000652  000000                    HALT
1249  000654  000656                    .+2
1250  000656  000000                    HALT
1251  000660  000662                    .+2
1252  000662  000000                    HALT
1253  000664  000666                    .+2
1254  000666  000000                    HALT
1255  000670  000672                    .+2
1256  000672  000000                    HALT
1257  000674  000676                    .+2
1258  000676  000000                    HALT
1259  000700  000702                    .+2
1260  000702  000000                    HALT
1261  000704  000706                    .+2
1262  000706  000000                    HALT
1263  000710  000712                    .+2
1264  000712  000000                    HALT
1265  000714  000716                    .+2
1266  000716  000000                    HALT
1267  000720  000722                    .+2
1268  000722  000000                    HALT
1269  000724  000726                    .+2
1270  000726  000000                    HALT
1271  000730  000732                    .+2
1272  000732  000000                    HALT
1273  000734  000736                    .+2
1274  000736  000000                    HALT
1275  000740  000742                    .+2
```

```
1276   000742  000000                          HALT
1277   000744  000746                          .+2
1278   000746  000000                          HALT
1279   000750  000752                          .+2
1280   000752  000000                          HALT
1281   000754  000756                          .+2
1282   000756  000000                          HALT
1283   000760  000762                          .+2
1284   000762  000000                          HALT
1285   000764  000766                          .+2
1286   000766  000000                          HALT
1287   000770  000772                          .+2
1288   000772  000000                          HALT
1289   000774  000776                          .+2
1290   000776  000000                          HALT
1291
1292
1293                                           ;STANDARD INTERRUPT VECTORS
1294
1295           000014                  .=14
1296   000014  014524                  TRACES                  ;TRACE TRAP SERVICE
1297   000016  000340                  340
1298
1299           000024                  .=24
1300   000024  012760                  PFAIL                   ;POWER FAIL HANDLER
1301   000026  000340                  340
1302   000030  014526                  EMTSRV                  ;EMT DISPATCH SERVICE
1303   000032  000340                  340
1304           000060                  .=60
1305   000060  001440                  KEYINT          ;KEYBOARD INTERRUPT SERVICE
1306   000062  000340                  340
1307           000200                  .=200
1308   000200  000167  001040          JMP     START
1309
```

```
                                ;*******************************************************************************
001100                                  .=1100

                                ;ROUTINE TO TYPE ASCII MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;NOTE1: $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;NOTE2: $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.

                                ;CALL:
                                ;1) USING A TRAP INSTRUCTION
                                ;       TYPE    ,MESADR         ;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;OR
                                ;       TYPE
                                ;       MESADR

                                ;2) USING A JSR INSTRUCTION
                                ;       MOV     PSW,-(SP)       ;PUSH PROCESSOR STATUS WORD ON THE STACK
                                ;       JSR     PC,$TYPE        ;CALL TYPE ROUTINE
                                ;       MESADDR                 ;FIRST ADRESS OF MESSAGE

001100  010046                 $TYPE:  MOV     R0,-(SP)        ;SAVE R0
001102  017600  000002                  MOV     @2(SP),R0       ;GET ADDRESS OF ASCIZ STRING
001106  062766  000002  000002          ADD     #2,2(SP)        ;ADJUST RETURN PC
001114  112046                 1$:     MOVB    (R0)+,-(SP)     ;PUSH CHARACTER TO BE TYPED ONTO STACK
001116  001003                          BNE     2$              ;BR IF IT ISN'T THE TERMINATOR
001120  005726                          TST     (SP)+           ;IF TERMINATOR POP IT OFF THE STACK
001122  012600                          MOV     (SP)+,R0        ;RESTORE R0
001124  000002                          RTI                     ;RETURN
001126  004767  000026          2$:     JSR     PC,5$           ;GO TYPE THIS CHARACTER
001132  122726  000012          3$:     CMPB    #12,(SP)+       ;CHECK IF THE CHAR. TYPED WAS A  LINE FEED
001136  001366                          BNE     1$              ;GO GET NEXT CHAR. IF NOT LINE FEED
001140  016746  000072                  MOV     $NULL,-(SP)     ;GET # OF FILLER CHARS. NEEDED
                                                                ;AND THE NULL CHAR.
001144  105366  000001          4$:     DECB    1(SP)           ;DOES A NULL NEED TO BE TYPED?
001150  002770                          BLT     3$              ;BR IF NO--GO POP THE NULL OFF OF STACK
001152  004767  000002                  JSR     PC,5$           ;GO TYPE A NULL
001156  000772                          BR      4$              ;LOOP
001160  105777  000054          5$:     TSTB    @TPS            ;WAIT UNTIL PRINTER IS READY
001164  100375                          BPL     5$
001166  116677  000002  000046          MOVB    2(SP),@TPB      ;LOAD CHAR TO BE TYPED INTO DATA REG.
001174  000207                          RTS     PC


001176  017667  000000  000014  TYPER:  MOV     @(SP),TYPER1
001204  062716  000002                  ADD     #2,(SP)
001210  016746  176562                  MOV     PS,-(SP)
001214  004767  177660                  JSR     PC,$TYPE
001220  000000                  TYPER1: 000000
001222  016746  176550                  MOV     PS,-(SP)
001226  004767  177646                  JSR     PC,$TYPE
001232  013242                          MSPACE
001234  000002                          RTI
001236     000          $NULL:  .BYTE   0
001237     002          $FILLS: .BYTE   2
001240  177564          TPS:    177564
```

```
  1366  001242  177566                    TPB:    177566
  1367
```

```
                                        .SBTTL  MONITOR
                                                ;PROGRAM MONITIOR
001244  012706  001000          START:  MOV     #1000,SP        ;POSITION STACK
001250  012767  000340  176520          MOV     #340,PS
001256  005737  000042                  TST     @#42            ;TEST FOR AUTO LOAD
001262  001402                          BEQ     .+6             ;BRANCH IF NORMAL LOAD
001264  000167  000242                  JMP     LOGIC1          ;OTHERWISE RUN LOGIC TEST
001270  005067  176502                  CLR     PS              ;ENABLE INTERRUPTS
001274  012777  000100  014456          MOV     #100,@TKCSR     ;ENABLE KEYBOARD INTERRUPTS
001302  005767  014300                  TST     MTRFLG          ;INHIBIT RETYPING ON RESTART
001306  001035                          BNE     MONIT
001310  012767  000001  014270          MOV     #1,MTRFLG       ;INHIBIT HEADER TYPE OUT.

                                                ;DETERMINE NUMBER OF CHANNELS THAT CAN BE TESTED
                                                ;SIMULTANEOUSLY
001316  012767  001342  176460          MOV     #START1,4       ;SET UP TIME OUT RETURN
001324  012704  020000                  MOV     #20000,R4       ;TEST FIRST LOCATION OF SECOND
001330  005714                          TST     (R4)            ;4K.  IF TRAP OCCURS, ONLY 4K
001332  012767  002000  014362          MOV     #1024.,MAXCHN   ;NO TRAP, 1024 CHANNELS CAN BE TESTED
001340  000403                          BR      START2
001342  012767  000135  014352  START1: MOV     #MAX4K,MAXCHN   ;=MAXIMUM NUMBER OF CHANNELS
001350  012767  000006  176426  START2: MOV     #6,4            ;RESTORE TIMEOUT TRAP
001356  005067  176424                  CLR     6               ;SET UP TO HALT AFTER TIMEOUT
001362  104003                          TYPE                    ;TYPE "AFC11 DIAGNOSTIC"
001364  013171                          MTITLE
001366  104011                          BCDASC                  ;CONVERT NUMBER OF CHANNELS TO
001370  000001                          1                       ;ASCII AND OUTPUT
001372  015722                          MAXCHN                  ;TO TELEPRINTER
001374  104003                          TYPE                    ;TYPE "CHANNELS CAN BE TESTED"
001376  013371                          MMAXCH
001400  104012                          ADLNGTH
001402  012706  001000          MONIT:  MOV     #1000,SP        ;POSITION STACK
001406  000240                          NOP
001410  005067  176362                  CLR     PS
001414  012777  000100  014336          MOV     #100,@TKCSR     ;ENABLE KEYBOARD ENTERRUPTS
001422  005067  014364                  CLR     SINTFL          ;CLEAR SOFTWARE INTERRUPT FLAG
001426  104013                  MONIT1: INSTR                   ;GET NAME OF TEST
001430  013217                          MPER                    ;TO BE EXECUTED
001432  000006                          6
001434  000167  007024                  JMP     TSTNAM          ;CHECK FOR VALID NAME

                                                ;KEYBOARD INTERRUPT SERVICE
001440  127727  014316  000203  KEYINT: CMPB    @TKDBR,#203     ;WAS CONTROL C TYPED
001446  001003                          BNE     KEYINP          ;NO, LOOK FOR CONTROL P
001450  000005                          RESET                   ;YES, RESET SYSTEM
001452  000167  011402                  JMP     CONTC           ;TYPE ↑C AND RETURN TO MONITOR
001456  005767  014312          KEYINP: TST     CPFLG           ;ARE CONTROL P INTERRUPTS VALID
001462  001406                          BEQ     KEYINR          ;NO, CHECK FOR CONTROL R
```

```
 1424  001464  127727  014272  000220          CMPB    @TKDBR,#220             ;YES, WAS CONTROL P TYPED
 1425  001472  001002                          BNE     KEYINR                  ;NO, LOOK FOR CONTROL R
 1426  001474  000167  011422                  JMP     CONTP                   ;TYPE ↑P, 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,@TKDBR             ;YES, WAS CONTROL R TYPED
 1430  001514  001002                          BNE     KEYEX                   ;NO, EXIT
 1431  001516  000167  011414                  JMP     CONTR                   ;TYPE ↑R, REPORT ERRORS
 1432  001522  012767  177777  014262  KEYEX:  MOV     #-1,SINTFL              ;SET SOFTWARE INTERRUPT FLAG
 1433  001530  000002                          RTI
 1434
```

```
                                .SBTTL  LOGIC TEST
                                
                                
                                
                                
                                
                                
                                        ;ENTRANCE TO LOGIC TEST
                                
001532  005067  014236          LOGIC1: CLR     CPFLG                   ;SET UP TO IGNORE
001536  005067  014234                  CLR     CRFLG                   ;CONTROL R AND CONTROL P INTERRUPTS
001542  005067  014242                  CLR     ERRFLG                  ;CLEAR ERROR FLAG
001546  104003                          TYPE                            ;TYPE 'R' TO INDICATE
001550  013514                          MR                              ;THAT TEST IS RUNNING
001552  005067  014040                  CLR     TSTNO                   ;CLEAR TEST NUMBER
001556  005067  014026                  CLR     PASCNT                  ;CLEAR PASS COUNT
001562  012767  001576  014022          MOV     #T0,RETURN              ;SET UP SCOPE RETURN FOR FIRST TEST
001570  012767  000001  014016          MOV     #1,ICOUNT               ;SET UP FOR 1 ITERATION
                                
                                        ;AFC-11 A-D CONVERTER AND MULTIPLEXER
                                        ;LOGIC TEST
                                
                                        ;INTERFACE INITIALIZATION CHECKS
                                
001576                                  T0:                             ;REFERENCE DE IGNATION
        000001                          N=N+1
                                
                                        ;DID INITIALIZE CLEAR AFC CONTROL REGISTER
                                
001576  005777  014146          INIT1:  TST     @AFCSR                  ;WAS CONTROL REGISTER
001602  001401                          BEQ     .+4                     ;CLEARED BY INIT
001604  104010                          ERROR                           ;NOT CLEARED, ERROR
                                
                                        ;DID INITIALIZE CLEAR AFC CHANNEL SELECTION REGISTER
                                
001606  005777  014142          INIT2:  TST     @AFCAR                  ;WAS CHANNEL ADDRESS REGISTER
001612  001401                          BEQ     .+4                     ;CLEARED BY INIT
001614  104010                          ERROR                           ;NOT CLEARED, ERROR
                                
                                        ;DID INITIALIZE CLEAR AFC MAINTENANCE REGISTER
                                
001616  032777  177774  014132  INIT3:  BIT     #-4,@AFCMN              ;CHECK ALL BITS EXCEPT 0 AND 1
001624  001401                          BEQ     .+4                     ;WAS MAINTENANCE REGISTER CLEARED BY INIT
001626  104010                          ERROR                           ;NOT CLEARED, ERROR
001630  104001                          SCOPE                           ;CHECK FOR ITERATIONS, LOOP
                                
                                        ;TEST THAT INTERFACE ENABLE BIT OF AFCSR CAN BE SET AND CLEARED
                                
001632                                  T1:                             ;REFERENCE DESIGNATION
        000002                          N=N+1
001632  012777  000100  014110  INIT4:  MOV     #100,@AFCSR             ;SET INTERFACE ENABLE BIT
001640  032777  000100  014102          BIT     #100,@AFCSR             ;WAS INTERFACE ENABLE SET
001646  001001                          BNE     .+4                     ;YES, ENABLE SET
001650  104010                          ERROR                           ;ENABLE NOT SET, ERROR
001652  005077  014072          INIT5:  CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
001656  032777  000100  014064          BIT     #100,@AFCSR             ;WAS ENABLE CLEARED
001664  001401                          BEQ     .+4
```

```
1491  001666  104010                          ERROR                           ;ENABLE NOT CLEARED, ERROR
1492  001670  104001                          SCOPE                           ;CHECK FOR LOOP, ITERATIONS
1493
1494
1495
1496                                          ;TEST THAT TIMING INHIBIT BIT CAN BE SET AND CLEARED
1497
1498  001672                                  T2:                             ;REFERENCE DESIGNATION
1499          000003                          N=N+1
1500  001672  012777  004000  014056  INIT7:  MOV     #4000,@AFCMN            ;SET TIMING INHIBIT BIT
1501  001700  032777  004000  014050          BIT     #4000,@AFCMN            ;WAS TIMING INHIBIT SET
1502  001706  001001                          BNE     .+4
1503  001710  104010                          ERROR                           ;TIMING INHIBIT NOT SET, ERROR
1504  001712  005077  014040          INIT8:  CLR     @AFCMN                  ;CLEAR MAINTENANCE REGISTER
1505  001716  032777  004000  014032          BIT     #4000,@AFCMN            ;WAS TIMING INHIBIT CLEARED
1506  001724  001401                          BEQ     .+4
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
1520  001740  012767  177600  013676          MOV     #-200,DELAY             ;SET UP TIMER
1521  001746  012777  002000  014002          MOV     #2000,@AFCMN            ;START CONVERSION
1522  001754  032777  002000  013774          BIT     #2000,@AFCMN            ;TEST MAINTENANCE REGISTER
1523  001762  001001                          BNE     ADT1A                   ;A-D START BIT
1524  001764  104010                          ERROR                           ;START BIT NOT SET, ERROR
1525  001766  105777  013756          ADT1A:  TSTB    @AFCSR                  ;WAIT FOR DONE BIT
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     @AFDBR                  ;CLEAR DONE BY READING A-D BUFFER
1531  002010  105777  013734                  TSTB    @AFCSR                  ;WAS DONE CLEARED
1532  002014  100001                          BPL     ADT1C
1533  002016  104010                          ERROR                           ;DONE NOT CLEARED, ERROR
1534  002020  042777  002000  013730  ADT1C:  BIC     #2000,@AFCMN            ;CLEAR A-D START BIT
1535  002026  032777  002000  013722          BIT     #2000,@AFCMN            ;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
```

```
1547  002050  005777  013676                        TST     @AFDBR                  ;CLEAR DONE BIT
1548  002054  012777  002130  013662                MOV     #ADT2B,@AFCINT          ;SET UP LOCAL INTERRUPT RETURN
1549  002062  016777  175710  013656                MOV     PS,@AFCPS               ;SET UP INTERRUPT SERVICE LEVEL
1550  002070  005077  013654                        CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
1551  002074  012777  002000  013654                MOV     #2000,@AFCMN            ;START A-D CONVERTER
1552  002102  042767  000340  175666                BIC     #340,PS
1553  002110  105777  013634          ADT2A:        TSTB    @AFCSR                  ;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,@AFCINT           ;RESTOR TRAP CATCHER
1560  002140  005077  013602                        CLR     @AFCPS
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,@AFCMN            ;START A-D CONVERTER
1571  002164  005777  013560                        TST     @AFCSR                  ;IS BUSY SET
1572  002170  100001                                BPL     ADT3A
1573  002172  104010                                ERROR                           ;BUSY SET, ERROR
1574  002174  105777  013550          ADT3A:        TSTB    @AFCSR                  ;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 INTERUPTS
1584  002212  012777  002000  013536                MOV     #2000,@AFCMN            ;START A-D CONVERTER
1585  002220  005777  013532                        TST     @AFCMN                  ;IS BUSY SET
1586  002224  100001                                BPL     ADT4A
1587  002226  104010                                ERROR                           ;BUSY SET, ERROR
1588  002230  105777  013514          ADT4A:        TSTB    @AFCSR                  ;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,@AFCINT ;SET UP LOCAL INTERRUPT RETURN
1600  002254  016777  175516  013464                MOV     PS,@AFCPS       ;AND PROCESSOR PRIORITY
1601  002262  042767  000340  175506                BIC     #340,PS         ;SET PROCESSOR PRIORITY=0
1602  002270  012777  000100  013452                MOV     #100,@AFCSR     ;ENABLE INTERRUPT
```

```
1603  002276  012777  002000  013452          MOV     #2000,@AFCMN    ;START A-D CONVERTER
1604  002304  105777  013440          ADT6A:  TSTB    @AFCSR          ;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    @AFCSR
1610  002324  100401                         BMI     ADT6B
1611  002326  104010                         ERROR                   ;INTERRUPT WITH DONE NOT SET
1612  002330  005077  013414          ADT6B:  CLR     @AFCSR          ;CLEAR INTERRUPT ENABLE
1613  002334  016777  013406  013402         MOV     AFCPS,@AFCINT   ;RESET TRAPCATCHER
1614  002342  005077  013400                 CLR     @AFCPS
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          000011                         N=N+1
1627  002350  052767  000340  175420  ADT7:  BIS     #340,PS                 ;LOCK OUT INTERRUPTS
1628  002356  005077  013366                 CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
1629  002362  105777  013364                 TSTB    @AFDBR                  ;RESET DONE BIT
1630  002366  012777  002444  013350         MOV     #ADT7B,@AFCINT          ;SET UP LOCAL INTERRUPT RETURN
1631  002374  016777  175376  013344         MOV     PS,@AFCPS               ;SET UP INTERRUPT SERVIE 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,@AFCSR             ;ENABLE INTERFACE
1635  002424  012777  002000  013324         MOV     #2000,@AFCMN            ;START A-D CONVERTER
1636  002432  105777  013312          ADT7A: TSTB    @AFCSR          ;WAIT FOR DONE
1637  002436  100375                         BPL     ADT7A
1638  002440  000240                         NOP                             ;DELAY 1 MORE CYCLE
1639  002442  000402                         BR      ADT7C           ;NO INTERRUPT, CONTINUE
1640  002444  022626                  ADT7B: POP2SP                          ;RESTORE STACK
1641  002446  104010                         ERROR                           ;INTERRUPT OCCURED, ERROR
1642  002450  005077  013274          ADT7C: CLR     @AFCSR                  ;CLEAR ENABLE
1643  002454  016777  013266  013262         MOV     AFCPS,@AFCINT           ;RESTORE TRAP CATCHER
1644  002462  005077  013260                 CLR     @AFCPS
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          000012                         N=N+1
1655  002470  052767  000340  175300  ADT10: BIS     #340,PS                 ;LOCK OUT INTERRUPTS
1656  002476  005077  013246                 CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
1657  002502  105777  013244                 TSTB    @AFDBR                  ;RESET DONE BIT
1658  002506  012777  002564  013230         MOV     #ADT10B,@AFCINT         ;SET UP LOCAL INTERRUPT RETURN
```

```
 1659  002514  016777  175256  013224          MOV     PS,@AFCPS               ;SET UP INTERRUPT SERVIE 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,@AFCSR             ;ENABLE INTERFACE
 1663  002544  012777  002000  013204          MOV     #2000,@AFCMN            ;START A-D CONVERTER
 1664  002552  105777  013172          ADT10A: TSTB    @AFCSR          ;WAIT FOR DONE
 1665  002556  100375                  BPL     ADT10A
 1666  002560  000240                  NOP                             ;DELAY 1 MORE CYCLE
 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     @AFCSR                  ;CLEAR ENABLE
 1671  002574  016777  013146  013142  MOV     AFCPS,@AFCINT           ;RESTORE TRAP CATCHER
 1672  002602  005077  013140          CLR     @AFCPS
 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     @AFCSR                  ;CLEAR CONTROL REGISTER
 1685  002622  105777  013124          TSTB    @AFDBR                  ;RESET DONE BIT
 1686  002626  012777  002704  013110  MOV     #ADT11B,@AFCINT         ;SET UP LOCAL INTERRUPT RETURN
 1687  002634  016777  175136  013104  MOV     PS,@AFCPS               ;SET UP INTERRUPT SERVIE 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,@AFCSR             ;ENABLE INTERFACE
 1691  002664  012777  002000  013064  MOV     #2000,@AFCMN            ;START A-D CONVERTER
 1692  002672  105777  013052  ADT11A: TSTB    @AFCSR          ;WAIT FOR DONE
 1693  002676  100375                  BPL     ADT11A
 1694  002700  000240                  NOP                             ;DELAY 1 MORE CYCLE
 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     @AFCSR                  ;CLEAR ENABLE
 1699  002714  016777  013026  013022  MOV     AFCPS,@AFCINT           ;RESTORE TRAP CATCHER
 1700  002722  005077  013020          CLR     @AFCPS
 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     @AFCSR                  ;CLEAR CONTROL REGISTER
 1713  002742  105777  013004          TSTB    @AFDBR                  ;RESET DONE BIT
 1714  002746  012777  003034  012770  MOV     #ADT12B,@AFCINT         ;SET UP LOCAL INTERRUPT RETURN
```

```
1715  002754  016777  175016  012764          MOV     PS,@AFCPS               ;SET UPT INTERRUPT SERVICE LEVEL
1716  002762  012777  000100  012760          MOV     #100,@AFCSR             ;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    @AFCSR                  ;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     @AFCSR                  ;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     @AFCSR                  ;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,@AFCSR             ;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    @AFCSR                  ;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     @AFCSR                  ;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     @AFCSR                  ;CLEAR CONTROL REGISTER
```

```
 1771  003216  105777  012530                    TSTB    @AFDBR                  ;RESET DONE BIT
 1772  003222  012777  003310  012514            MOV     #ADT14B,@AFCINT         ;SET UP LOCAL INTERRUPT RETURN
 1773  003230  016777  174542  012510            MOV     PS,@AFCPS               ;SET UPT INTERRUPT SERVICE LEVEL
 1774  003236  012777  000100  012504            MOV     #100,@AFCSR             ;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,@AFCMN            ;START A-D CONVERTER
 1778  003266  105777  012456          ADT14A:   TSTB    @AFCSR                  ;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     @AFCSR                  ;CLEAR CONTROL REGISTER
 1786  003316  016777  012424  012420            MOV     AFCPS,@AFCINT           ;RESTOR TRAP CATCHER
 1787  003324  005077  012416                    CLR     @AFCPS
 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     @AFCSR                  ;CLEAR CONTROL REGISTER
 1800  003344  105777  012402                    TSTB    @AFDBR                  ;RESET DONE BIT
 1801  003350  012777  003436  012366            MOV     #ADT15B,@AFCINT         ;SET UP LOCAL INTERRUPT RETURN
 1802  003356  016777  174414  012362            MOV     PS,@AFCPS               ;SET UPT INTERRUPT SERVICE LEVEL
 1803  003364  012777  000100  012356            MOV     #100,@AFCSR             ;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,@AFCMN            ;START A-D CONVERTER
 1807  003414  105777  012330          ADT15A:   TSTB    @AFCSR                  ;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     @AFCSR                  ;CLEAR CONTROL REGISTER
 1815  003444  016777  012276  012272            MOV     AFCPS,@AFCINT           ;RESTOR TRAP CATCHER
 1816  003452  005077  012270                    CLR     @AFCPS
 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
```

```
 1827  003460  052767  000340  174310  ADT16:  BIS     #340,PS          ;LOCK OUT INTERRUPTS
 1828  003466  005077  012256                  CLR     @AFCSR           ;CLEAR CONTROL REGISTER
 1829  003472  105777  012254                  TSTB    @AFDBR           ;RESET DONE BIT
 1830  003476  012777  003564  012240          MOV     #ADT16B,@AFCINT  ;SET UP LOCAL INTERRUPT RETURN
 1831  003504  016777  174266  012234          MOV     PS,@AFCPS        ;SET UPT INTERRUPT SERVICE LEVEL
 1832  003512  012777  000100  012230          MOV     #100,@AFCSR      ;ENABLE INTERFACE
 1833  003520  042767  000340  174250          BIC     #340,PS          ;ENABLE INTERRUPTS
 1834  003526  052767  000000  174242          BIS     #0,PS            ;SET PROCESSOR PRIORITY TO 0
 1835  003534  012777  002000  012214          MOV     #2000,@AFCMN     ;START A-D CONVERTER
 1836  003542  105777  012202          ADT16A: TSTB    @AFCSR           ;WAIT FOR DONE
 1837  003546  100375                          BPL     ADT16A
 1838  003550  000240                          NOP                      ;DELAY 1 CYCLE
 1839  003552  052767  000340  174216          BIS     #340,PS
 1840  003560  104010                          ERROR                    ;NO INTERRUPT, ERROR
 1841  003562  000401                          BR      ADT16C           ;GO TO LOOP CHECK
 1842  003564  022626                  ADT16B: POP2SP                   ;RESTORE STACK
 1843  003566  005077  012156          ADT16C: CLR     @AFCSR           ;CLEAR CONTROL REGISTER
 1844  003572  016777  012150  012144          MOV     AFCPS,@AFCINT    ;RESTOR TRAP CATCHER
 1845  003600  005077  012142                  CLR     @AFCPS
 1846  003604  104001                          SCOPE                    ;CHECK FOR ITERATIONS, LOOP
 1847          177740                          STATUS=STATUS-40
 1848          177777                          LVL=LVL-1
 1849          000017                          X=X+1
 1850
 1851
 1852                                          ;TEST FOR INTERRUPT ON INTERRUPT ENABLED
 1853                                          ;AFTER DONE SET AND PROCESSOR PRIORITY=0
 1854
 1855  003606                          T20:                             ;REFERENCE DESIGNATION
 1856          000021                  N=N+1
 1857  003606                  ADT20T1:
 1858  003606  052767  000340  174162          BIS     #340,PS          ;LOCK OUT INTERRUPTS
 1859  003614  012777  003674  012122          MOV     #ADINTJ,@AFCINT  ;SET UP LOCAL INTERRUPT RETURN
 1860  003622  016777  174150  012116          MOV     PS,@AFCPS        ;SET UP INTERRUPT SERVICE LEVEL
 1861  003630  042767  000340  174140          BIC     #340,PS          ;ALLOW INTERRUPTS
 1862  003636  012777  002000  012112          MOV     #2000,@AFCMN     ;START A-D CONVERTER
 1863  003644  105777  012100          ADT20A: TSTB    @AFCSR           ;WAIT FOR DONE
 1864  003650  100375                          BPL     ADT20A
 1865  003652  012777  000100  012070          MOV     #100,@AFCSR      ;ENABLE INTERFACE
 1866  003660  000240                          NOP                      ;DELAY 1 CYCLE
 1867  003662  052767  000340  174106          BIS     #340,PS          ;LOCK OUT INTERRUPTS
 1868  003670  104010                          ERROR                    ;INTERRUPT DID NOT OCCUR, ERROR
 1869  003672  000401                          BR      ADT20B           ;CONTINUE
 1870  003674  022626                  ADINTJ: POP2SP                   ;RESTORE STACK, INTERRUPT OCCURE
 1871  003676  005077  012046          ADT20B: CLR     @AFCSR           ;CLEAR CONTROL REGISTER
 1872  003702  016777  012040  012034          MOV     AFCPS,@AFCINT    ;RESTORE TRAPCATCHER
 1873  003710  005077  012032                  CLR     @AFCPS
 1874  003714  104001                          SCOPE                    ;CHECK FOR ITERATIONS, LOOP
 1875
 1876                                          ;MULTIPLEXER LOGIC TESTS
 1877                                          ;VERIFY A-D DONE IS SET BY
 1878                                          ;STARTING MULTIPLEXER
 1879
 1880  003716                          T21:                             ;REFERENCE DESIGNATION
 1881          000022                  N=N+1
 1882  003716  042767  000340  174052  MXT1:   BIC     #340,PS          ;LOCK OUT INTERRUPTS
```

```
 1883  003724  005067  011714                CLR     DELAY           ;CLEAR TIMER
 1884  003730  005077  012014                CLR     @AFCSR          ;CLEAR CONTROL REGISTER
 1885  003734  005077  012016                CLR     @AFCMN          ;CLEAR MAINTENANCE REGISTER
 1886  003740  005077  012010                CLR     @AFCAR          ;START MULTIPLEXER TIMING
 1887  003744  105777  012000        MXT1A:  TSTB    @AFCSR          ;WAIT FOR DONE
 1888  003750  100404                        BMI     MXT1B
 1889  003752  005267  011666                INC     DELAY           ;DONE NOT SET, UPDATE TIMER
 1890  003756  001372                        BNE     MXT1A           ;CONTINUE
 1891  003760  104010                        ERROR                   ;DONE DID NOT SET BEFORE TIME OUT, ERROR
 1892  003762  005777  011764        MXT1B:  TST     @AFDBR          ;CLEAR DONE BIT
 1893  003766  104001                        SCOPE                   ;CHECK FOR ITERATIONS, LOOP
 1894
 1895
 1896                                        ;TEST FOR CONTROL REGISTER BUSY
 1897                                        ;BIT SET BY STARTING MULTIPLEXER
 1898                                        ;AND FOR BUSY BEING CLEARED BY A-D DONE
 1899
 1900  003770                                T22:                    ;REFERENCE DESIGNATION
 1901          000023                        N=N+1
 1902  003770  042767  000340  174000  MXT2:   BIC     #340,PS         ;LOCK OUT INTERRUPTS
 1903  003776  005077  011752                CLR     @AFCAR          ;START MULTIPLEXER
 1904  004002  005777  011742                TST     @AFCSR          ;IS BUSY BIT SET
 1905  004006  100401                        BMI     MXT2A
 1906  004010  104010                        ERROR                   ;BUSY NOT SET, ERROR
 1907  004012  105777  011732        MXT2A:  TSTB    @AFCSR          ;WAIT FOR DONE
 1908  004016  100375                        BPL     MXT2A
 1909  004020  005777  011724                TST     @AFCSR          ;DID BUSY CLEAR
 1910  004024  100001                        BPL     MXT2B           ;WHEN DONE WAS SET
 1911  004026  104010                        ERROR                   ;BUSY STILL SET, ERROR
 1912  004030  005777  011716        MXT2B:  TST     @AFDBR          ;CLEAR DONE BIT
 1913  004034  104001                        SCOPE                   ;TEST FOR ITERATIONS, LOOP
 1914
 1915                                        ;TEST FOR MAINTENANCE REGISTER BUSY
 1916                                        ;BIT SET BY STARTING MULTIPLEXER
 1917                                        ;AND FOR BUSY RESET BY A-D DONE
 1918
 1919  004036                                T23:                    ;REFERENCE DESIGNATION
 1920          000024                        N=N+1
 1921  004036  042767  000340  173732  MXT3:   BIC     #340,PS         ;ENABLE INTERRUPTS
 1922  004044  005077  011700                CLR     @AFCSR          ;CLEAR CONTROL REGISTER
 1923  004050  005777  011676                TST     @AFDBR          ;CLEAR DONE BIT
 1924  004054  005077  011674                CLR     @AFCAR          ;START MULTIPLEXER
 1925  004060  005777  011672                TST     @AFCMN          ;IS BUSY SET
 1926  004064  100401                        BMI     MXT3A
 1927  004066  104010                        ERROR                   ;BUSY NOT SET, ERROR
 1928  004070  105777  011654        MXT3A:  TSTB    @AFCSR          ;WAIT FOR DONE
 1929  004074  100375                        BPL     MXT3A
 1930  004076  005777  011654                TST     @AFCMN          ;WAS BUSY CLEARED
 1931  004102  100001                        BPL     MXT3B           ;WHEN DONE SET
 1932  004104  104010                        ERROR                   ;BUSY STILL SET, ERROR
 1933  004106  005777  011640        MXT3B:  TST     @AFDBR          ;CLEAR DONE BIT
 1934  004112  104001                        SCOPE                   ;CHECK FOR ITERATIONS, LOOP
 1935
 1936
 1937                                        ;DOES BIT 11 OF MAINTENANCE REGISTER
 1938                                        ;INHIBIT MULTIPLEXER TIMING
```

```
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     @AFCSR              ;CLEAR CONTROL REGISTER
1944  004126  005067  011512                  CLR     DELAY               ;CLEAR TIMER
1945  004132  012777  004000  011616          MOV     #4000,@AFCMN        ;SET TIMING INHIBIT
1946  004140  005077  011610                  CLR     @AFCAR              ;START MULTIPLEXER
1947  004144  005777  011600                  TST     @AFCSR              ;IS BUSY SET
1948  004150  100001                          BPL     MXT4A
1949  004152  104010                          ERROR                       ;BUSY SET, TIMING NOT INHIBITED
1950  004154  005777  011576          MXT4A:  TST     @AFCMN              ;IS MAINTENANCE BUSY SET
1951  004160  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    @AFCSR              ;IS DONE SET
1956  004176  100003                          BPL     MXT4C
1957  004200  104010                          ERROR                       ;DONE SET, ERROR
1958  004202  005777  011544                  TST     @AFDBR              ;CLEAR DONE BIT
1959  004206  104001                  MXT4C:  SCOPE                       ;CHECK FOR LOOP, ITERATIONS
1960
1961
1962                                          ;RUN A COUNT PATTERN THRU THE CHANNEL ADDRESS REGISTER
1963                                          ;AND VERIFY THAT ALL PATTERNS CAN BE SET AND CLEARED
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,@AFCMN        ;SET TIMING INHIBIT
1969  004224  005077  011520                  CLR     @AFCSR              ;CLEAR CONTROL REGISTER
1970  004230  005777  011516                  TST     @AFDBR              ;CLEAR DONE
1971  004234  005005                          CLR     R5                  ;CLEAR EXPECTED RESULT
1972  004236  005077  011512                  CLR     @AFCAR              ;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  050577  011470          CAT2L:  BIS     R5,@AFCAR           ;SET CHANNEL ADDRESS REGISTER
1979  004264  017704  011464                  MOV     @AFCAR,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 ADDRSS
1983  004276  104002                          SCOPEF                      ;CHECK FOR LOOP ON SAME DATA
1984  004300  004260                          CAT2L
1985  004302  040577  011446          CAT2C:  BIC     R5,@AFCAR           ;CLEAR SELECTED BITS
1986  004306  005777  011442                  TST     @AFCAR              ;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                  CAT2D:  INC     R5                  ;UPDATE DATA PATTERN
1992  004324  104001                  CAT2E:  SCOPE                       ;CHECK FOR ITERATIONS, LOOP
1993
1994
```

```
 1995                                           ;DATA REPEATABILITY TEST PARAMETER SETUP
 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 COMAND
 2003  004360  014110                          REPLST                        ;POINTER TO COMMAND LIST
 2004  004362  000775                          BR      REPETP                ;GET ANOTHER COMMAND
 2005  004364  012777  000100  011366  REPETA: MOV     #100,@TKCSR           ;ENABLE KEYBOARD INTERRUPTS
 2006  004372  012767  014162  011264          MOV     #REPPAR,POINT1        ;GET INITIALIZATION PARAMETERS
 2007  004400  016700  011260          REPETC: MOV     POINT1,R0             ;GET PARAMETER TO BE INPUT
 2008  004404  005710                          TST     (R0)                  ;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     @(R0)                 ;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,@TKCSR           ;ENABLE KEYBOARD INTERRUPTS
 2016
 2017                                           ;DATA REPEATABILITY TEST
 2018
 2019  004442  005067  011340          REPETR: CLR     REPFLG                ;CLEAR AVERAGE FLAG
 2020  004446  005067  011222                  CLR     PASSC                 ;CLEAR PASS COUNT
 2021  004452  005067  011212                  CLR     ECONTL                ;CLEAR ERROR COUNTERS
 2022  004456  005067  011210                  CLR     ECONTH
 2023  004462  104003                          TYPE                          ;TYPE "R" TO INDICATE
 2024  004464  013514                          MR                            ;THAT TEST HAS STARTED
 2025  004466  005767  011314          REPET:  TST     REPFLG                ;HAS AVERAGE BEEN TAKEN
 2026  004472  001002                          BNE     REPETS                ;NO, GET AVERAGE FOR EACH CHANNEL
 2027  004474  004767  000414                  JSR     PC,REPAVG             ;GET AVERAGES FOR EACH CHANNEL
 2028  004500  012767  000144  011154  REPETS: MOV     #100.,CNTR5           ;SET UP FOR 100 PASSES
 2029
 2030
 2031                                           ;INPUT 1 SAMPLE ON EACH CHANNEL
 2032
 2033  004506  016767  011204  011136  REPET1: MOV     LOCHAN,OUTCHN         ;SET UP ADDRESS AND GAIN SELECTION
 2034  004514  056767  011166  011130          BIS     LOGAIN,OUTCHN         ;WORD FOR FIRST CHANNEL
 2035  004522  016767  011210  011130          MOV     CHNCNT,CNTR4          ;GET COUNT OF CHANNELS TO BE TESTED
 2036  004530  016767  011206  011126          MOV     SAMTAB,POINT1         ;SET UP POINTER FOR STORAGE OF INDIVIDUAL SAMPLE
 2037  004536  005077  011206                  CLR     @AFCSR                ;CLEAR CONTROL REGISTER
 2038  004542  005077  011210                  CLR     @AFCMN                ;CLEAR MAINTENANCE REGISTER
 2039  004546  016777  011100  011200  REPET2: MOV     OUTCHN,@AFCAR         ;SELECT FIRST CHANNEL
 2040  004554  105777  011170          REPET3: TSTB    @AFCSR                ;WAIT FOR DONE FLAG
 2041  004560  100375                          BPL     REPET3                ;DONE NOT SET
 2042  004562  017777  011164  011074          MOV     @AFCDBR,@POINT1       ;READ A-D BUFFER, STORE DATA
 2043  004570  062767  000002  011066          ADD     #2,POINT1             ;INCREMENT STORAGE POINTER
 2044  004576  005267  011050                  INC     OUTCHN                ;INCREMENT CHANNEL TO BE SAMPLED
 2045  004602  005367  011052                  DEC     CNTR4                 ;DECREMENT CHANNEL COUNT
 2046  004606  001357                          BNE     REPET2                ;CONTINUE IF NOT DONE
 2047
 2048                                           ;COMPARE SAMPLE AND AVERAGE FOR SAME CHANNEL
 2049
 2050  004610  012767  016504  011046          MOV     #DATAB,POINT1         ;SET UP POINTER TO AVERAGES
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 2051  004616  016767  011120  011042          MOV     SAMTAB,POINT2           ;SET UP POINTER TO SAMPLES
 2052  004624  016767  011106  011026          MOV     CHNCNT,CNTR4            ;SET UP COUNT OF COMPARISIONS
 2053  004632  016767  011060  011012          MOV     LOCHAN,OUTCHN           ;SET UP CHANNEL NUMBER FOR ERROR REPORT
 2054  004640  017704  011020          REPET4: MOV     @POINT1,R4              ;GET AVERAGE OF CHANNEL
 2055  004644  167704  011016                  SUB     @POINT2,R4              ;SUMBTRACT SAMPLE FOR THAT CHANNEL
 2056  004650  005704                          TST     R4                      ;GET ABSOLUTE VALUE OF DIFFERENCE
 2057  004652  002001                          BGE     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  REPET5: 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                   ;DECREMENTTEST COUNT
 2072  004732  001265                          BNE     REPET1                  ;TAKE ANOTHER SET OF SAMPLES IF NOTO
 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                            ;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                                          ;REPEATABILITY ERROR, TYPE CHANNEL, AVERAGE, SAMPLE
 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                          1
 2087  004770  015652                          OUTCHN
 2088  004772  017767  010666  001156          MOV     @POINT1,DATA1           ;GET AVERAGE FOR CHANNEL
 2089
 2090  005000  017767  010662  001152          MOV     @POINT2,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      REPET5                  ;CONTINUE
 2096  005020  005267  010644          REPET7: INC     ECONTL                  ;UPDATE ERROR COUNTER
 2097  005024  100325                          BPL     REPET5                  ;CONTINUE
 2098  005026  005067  010636                  CLR     ECONTL                  ;CLEAR LOW COUNT
 2099  005032  005267  010634                  INC     ECONTH                  ;UPDATE HIGH COUNT
 2100  005036  000720                          BR      REPET5                  ;CONTINUE
 2101
 2102
 2103                                          ;REPORT ERRORS AFTER CONTROL R
 2104
 2105  005040  104003          REPORT: TYPE                                    ;TYPE "PASSES"
 2106  005042  013602                          MPASS
```

```
2107  005044  104027                          BCDASN                          ;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 HIG COUNT 0
2113  005062  001407                          BEQ     REPOR1
2114  005064  104023                          BCDASO                          ;CONVERT LOW AND HIGH COUNTS
2115
2116  005066  000001                          1                               ;AND OUTPUT
2117  005070  015672                          ECONTH
2118  005072  104023                          BCDASO
2119  005074  000001                          1
2120  005076  015670                          ECONTL
2121  005100  000403                          BR      REPOR2                  ;CONTINUE
2122  005102  104027                  REPOR1: BCDASN                          ;OUTPUT LOW COUNT
2123  005104  000001                          1
2124  005106  015670                          ECONTL
2125  005110  000167  177242          REPOR2: JMP     REPETP                  ;GET NEW COMMAND
2126
2127
2128                                          ;INPUT AVERAGES FOR REPEATABILITY TEST
2129
2130  005114  012767  000001  010664  REPAVG: MOV     #1,REPFLG               ;SET AVERAGE TAKEN FLAG
2131  005122  005077  010622                  CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
2132  005126  005077  010624                  CLR     @AFCMN                  ;CLEAR MAINTENANCE REGISTER
2133  005132  012704  016504                  MOV     #DATAB,R4               ;SET UP POINTER TO STORE AVERAGES
2134  005136  016703  010574                  MOV     CHNCNT,R3               ;GET NUMBER OF AVERAGES TO BE TAKE
2135  005142  005077  010602                  CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
2136  005146  005077  010604                  CLR     @AFCMN                  ;CLEAR MAINTENANCE REGISTER
2137  005152  005024                  REPAVA: CLR     (R4)+                   ;CLEAR AVERAGE TABLE
2138  005154  005024                          CLR     (R4)+
2139  005156  005303                          DEC     R3
2140  005160  001374                          BNE     REPAVA
2141  005162  016767  010514  010472          MOV     SAMPLE,CNTR5            ;GET NUMBER OF SAMPLES FOR EACH CHANNEL
2142  005170  016767  010542  010462  REPAV1: MOV     CHNCNT,CNTR4            ;GET CHANNEL COUNT
2143  005176  012704  016504                  MOV     #DATAB,R4               ;SET UP POINTER FOR AVERAGE STORAGE
2144  005202  016767  010510  010442          MOV     LOCHAN,OUTCHN           ;GET ADDRESS OF FIRST CHANNEL
2145  005210  056767  010472  010434          BIS     LOGAIN,OUTCHN           ;GET GAIN  FOR SAMPLING
2146  005216  016777  010430  010530  REPAVB: MOV     OUTCHN,@AFCAR           ;SAMPLE THE CHANNEL
2147  005224  105777  010520          REPAVC: TSTB    @AFCSR                  ;WAIT FOR MULTIPLEXER
2148  005230  100375                          BPL     REPAVC                  ;TO FINISH
2149  005232  017703  010514                  MOV     @AFDBR,R3               ;READ A-D CONVERTER BUFFER
2150  005236  062703  020000                  ADD     #20000,R3               ;SCALE UP TO COREE
2151  005242  000257                          CLCVNZ                          ;FOR NEGATIVE VALUES
2152  005244  060324                          ADD     R3,(R4)+                ;FORM PARTIAL SUM
2153  005246  005524                          ADC     (R4)+
2154  005250  005267  010372                  INC     OUTCHN                  ;GO TO NEXT CHANNEL
2155  005254  005367  010400                  DEC     CNTR4                   ;ALL CHANNELS DONE
2156  005260  001356                          BNE     REPAVB                  ;NO, SAMPLE NEXT CHANNEL
2157  005262  005367  010374                  DEC     CNTR5                   ;ARE ALL SAMPLES TAKEN
2158  005266  001340                          BNE     REPAV1                  ;NO, GET MORE
2159  005270  016767  010442  010362          MOV     CHNCNT,CNTR4            ;ALL SAMPLES DONE,GET CHANNEL COUNT
2160  005276  012704  016504                  MOV     #DATAB,R4               ;GET POINTER TO TATALS
2161  005302  012703  016504                  MOV     #DATAB,R3
2162  005306  016767  010370  010176  REPAVD: MOV     SAMPLE,DIVIS            ;SET UP TO GENERATE AVERAGES
```

```
 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          REPAV3: INC     QUOT
 2172  005354  162767  020000  010124  REPAV4: SUB     #20000,QUOT             ;CORRECT SIGN OF RESULT
 2173  005362  036767  010344  010116          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                          BNE     REPAVD                  ;IF NOT, CONTINUE
 2180  005420  000207                          RTS     PC                      ;RETURN
 2181
 2182
```

```
                                        .SBTTL  A-D CONVERTER CAL


                                                ;A-D CONVERTER CLAIBRATION

005422  104003                  ADCAL:  TYPE                            ;TYPE R TO INDICATE
005424  013514                          MR                              ;THAT TEST IS RUNNING

005426  005067  010342                 CLR     CPFLG                   ;IGNORE CONTROL P AND
005432  005067  010340                 CLR     CRFLG                   ;CONTROL R INTERRUPTS
005436  012777  005522  010300         MOV     #ADCALI,@AFCINT         ;SET UP INTERRUPT VECTOR
005444  005077  010276                 CLR     @AFCPS                  ;AND PROCESSOR STATUS
005450  012777  000100  010302  ADCAL1: MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
005456  012777  004000  010272         MOV     #4000,@AFCMN            ;INHIBIT MUX TIMING
005464  012777  000100  010256         MOV     #100,@AFCSR             ;ENABLE AFC INTERRUPTS
005472  005067  172300                 CLR     PS                      ;CLEAR PROCESSOR STATUS
005476  012777  002000  010252         MOV     #2000,@AFCMN            ;START A-D CONVERTER
005504  000001                         WAIT                            ;WAIT FOR INTERRUPT
005506  032767  000001  172054         BIT     #1,SWR                  ;IF SW00=1, RETURN TO
005514  001755                         BEQ     ADCAL1                  ;KEYBOARD CONTROL
005516  000167  173660                 JMP     MONIT                   ;RETURN TO MONITOR
005522  017700  010224  ADCALI: MOV     @AFDBR,R0               ;GET DATA
005526  032767  000040  172034         BIT     #40,SWR                 ;DISPLAY OR TYPE OUT DATA
005534  001002                         BNE     ADCALT
005536  000005                         RESET                           ;DISPLAY DATA
005540  000002                         RTI
005542  010067  000010          ADCALT: MOV     %0,ADCALN               ;SET UP FOR TYPEOUT
005546  104005                         OCTASC                          ;GOTO TYPEOUT ROUTINE
005550  000001                         1                               ;WORD COUNT
005552  005556                         ADCALN                          ;DATA TO BE TYPED
005554  000002                         RTI                             ;RETURN
005556  000000                  ADCALN:000000
```

```
2218                                    .SBTTL  AMCAL
2219
2220
2221                                            ;SWITCH GAIN AMPLIFIER CALIBRATION
2222
2223  005560  012767  005600  010202  AMCAL:  MOV     #AMCALP,CPRET           ;SET UP CONTROL P
2224  005566  012767  000001  010200          MOV     #1,CPFLG                ;RETURN
2225  005574  005067  010176                  CLR     CRFLG                   ;INGNORE CONTROL R INTERRUPT
2226  005600  104017                  AMCALP: SUAD                            ;GET ADDRESS OF AMPLIFIER
2227  005602  104003                          TYPE                            ;TYPE "R" TO INDICATE THAT TEST IS RUNNING
2228  005604  013514                          MR
2229  005606  016767  010066  010036          MOV     SYSUNB,OUTCHN           ;GET ADDRESS OF AMPLIFIER
2230  005614  012777  000100  010136          MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
2231  005622  005077  010130                  CLR     @AFCMN                  ;ENABLE MUX TIMING
2232  005626  005077  010116                  CLR     @AFCSR                  ;DISABLE MUX INTERRUPTS
2233  005632  005067  010144                  CLR     GFLG                    ;CLEAR HIGH GAIN FLAG
2234  005636  005067  172134                  CLR     PS                      ;ENABLE INTERRUPTS
2235  005642  032767  000200  171720  AMPGO:  BIT     #200,SWR                ;IFSW10=1, DO GAINS OF
2236  005650  001007                          BNE     AMPC2                   ;50 AND 1000
2237  005652  012767  070000  010026  AMPC1:  MOV     #70000,LOGAIN           ;SETUP FOR GAINS OF
2238  005660  012767  050000  010026          MOV     #50000,HIGAIN           ;1 AND 20
2239  005666  000405                          BR      AMPGO1                  ;SET GAIN AND ADDRESS AMPLIFIER
2240  005670  012767  030000  010010  AMPC2:  MOV     #30000,LOGAIN           ;SET UP FOR GAINS OF
2241  005676  005067  010012                  CLR     HIGAIN                  ;50 AND 1000
2242  005702  005767  010074          AMPGO1: TST     GFLG                    ;HAS HIGHER GAIN BEEN DONE
2243  005706  001016                          BNE     HIOUT                   ;IF NOT, DO IT
2244  005710  005267  010066                  INC     GFLG                    ;SET HIGH GAIN FLAG
2245  005714  016705  007766                  MOV     LOGAIN,R5               ;SET UP TO DO LOW GAIN
2246  005720  056705  007726                  BIS     OUTCHN,R5               ;SET CHANNEL
2247  005724  010577  010024          AMPGO2: MOV     R5,@AFCAR               ;ADDRESS AMPLIFIER
2248  005730  012703  020000                  MOV     #20000,R3               ;WAIT FOR CHANNEL TO SETTLE
2249  005734  005303                          DEC     R3
2250  005736  001376                          BNE     .-2
2251
2252  005740  000167  177676                  JMP     AMPGO                   ;DO NEXT GAIN
2253  005744  016705  007744          HIOUT:  MOV     HIGAIN,R5               ;DO HIGH GAIN
2254  005750  056705  007676                  BIS     OUTCHN,R5
2255  005754  005067  010022                  CLR     GFLG
2256  005760  000761                          BR      AMPGO2
2257
2258
2259
2260
2261
```

```
                                        .SBTTL  MONOT

                                        ;A-D CONVERTER MONOTONICITY TEST

005762  104003                MONOT:  TYPE
005764  013514                        MR
005766  005067  010006                CLR     TYPFLG                  ;CLEAR ERROR MESSAGE FLAG
005772  005067  007776                CLR     CPFLG                   ;IGNORE CONTROL P AND
005776  005067  007774                CLR     CRFLG                   ;CONTROL R INTERRUPTS
006002  005077  007742                CLR     @AFCSR                  ;DISABLE AFC INTERRUPT
006006  012777  000100  007744        MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
006014  005067  171756                CLR     PS                      ;ENABLE INTERRUPTS
006020  012777  004000  007730        MOV     #4000,@AFCMN            ;DISABLE MUX TIMING
006026  012777  002000  007722  MONOT1: MOV     #2000,@AFCMN            ;START A-D CONVERTER
006034  105777  007710        MONOTA: TSTB    @AFCSR                  ;WAIT FOR DONE
006040  100375                BPL     MONOTA
006042  017767  007704  000106        MOV     @AFDBR,DATA1            ;SAVE FIRST CONVERSION
006050  012777  002000  007700  MONOT2: MOV     #2000,@AFCMN            ;START A-D CONVERTER
006056  105777  007666        MONOTC: TSTB    @AFCSR                  ;WAIT FOR DONE
006062  100375                BPL     MONOTC
006064  017767  007662  000066        MOV     @AFDBR,DATA2            ;SAVE SECOND CONVERSION
006072  016701  000060                MOV     DATA1,R1
006076  166701  000056                SUB     DATA2,R1                ;COMPARE CONVERSIONS
006102  100001                        BPL     MONOT3                  ;GENERATE ABSOLUTE VALUE
006104  005401                        NEG     R1                      ;OF DIFFERENCE
006106  020167  007616        MONOT3: CMP     R1,ADRES                ;IS DIFFERENCE>+OR
006112  003415                        BLE     MONOTO                  ;-1LSB
006114  005767  007660                TST     TYPFLG                  ;YES, ERROR
006120  001005                        BNE     MONOT4
006122  104003                        TYPE
006124  013634                        EMONOT
006126  012767  000001  007644        MOV     #1,TYPFLG
006134  104005                MONOT4: OCTASC                          ;OUTPUT VALUES OF SAMPLES
006136  000002                        2
006140  006156                        DATA1
006142  006160                        DATA2
006144  000730                        BR      MONOT1                  ;RESTART AND RESYNC
006146  016767  000006  000002  MONOTO: MOV     DATA2,DATA1             ;NO ERROR, SET UP FOR NEXT SAMPLE

006154  000735                        BR      MONOT2                  ;CONTINUE
006156  000000                DATA1:  0
006160  000000                DATA2:  0


                                        ;MULTIPLEXER TIMING ADJUSTMENT

006162  104003                MXTIM:  TYPE
006164  013514                        MR
006166  005067  007602                CLR     CPFLG                   ;IGNOR CONTROL R
006172  005067  007600                CLR     CRFLG                   ;CONTROL P INTERRUPTS
006176  005077  007554                CLR     @AFCMN                  ;ENABLE MUX TIMING
006202  005077  007542                CLR     @AFCSR                  ;DISABLE MUX INTERRUPTS
006206  012777  000100  007544        MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
006214  005067  171556                CLR     PS                      ;CLEAR PROCESSOR STATUS
```

```
 2318  006220  016705  000012          MXTIM1: MOV     DELAY1,R5               ;SET UP TIMER
 2319  006224  005077  007524                  CLR     @AFCAR                  ;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
```

```
                                .SBTTL  DECODE
                                ;ADDRESSS DECODING TEST
006240  012767  006260  007522  DECOD:  MOV     #DECODP,CPRET           ;SET UP CONTROL P RETURN
006246  012767  000001  007520           MOV     #1,CPFLG                ;ACCEPT CONTROL P INTERRUPTS
006254  005067  007516                   CLR     CRFLG                   ;IGNORE CONTROL R INTERRUPTS
006260  104017                   DECODP: SUAD                            ;GET SYSTEM UNIT ADDRESS
006262  104003                           TYPE                            ;TYPE "R" TO INDICATE
006264  013514                           MR                              ;THAT TEST IS RUNNING

006266  012767  004000  007366           MOV     #4000,CNTR5
006274  005067  171476                   CLR     PS                      ;ENABLE INTERRUPTS
006300  012777  000100  007452           MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
006306  012777  004000  007442           MOV     #4000,@AFCMN            ;DISABLE AFC TIMING
006314  016777  007360  007432  DECODA:  MOV     SYSUNB,@AFCAR           ;SELECT SYSTEM UNIT
006322  032777  000001  007426           BIT     #1,@AFCMN               ;TEST "Y" BIT
006330  001012                           BNE     DECODB                  ;"Y" BIT =1, CONTINUE
006332  032767  020000  171230           BIT     #20000,SWR              ;TYPE ERROR MESSAGE ?
006340  001002                           BNE     DECOA1                  ;NO, CHECK FOR LOOP
006342  104003                           TYPE                            ;TYPE "X BAD"
006344  013704                           MYBAD
006346  032767  040000  171214  DECOA1:  BIT     #40000,SWR              ;CHECK FOR LOOP
006354  001357                           BNE     DECODA                  ;LOOP
006356  016777  007316  007370  DECODB:  MOV     SYSUNB,@AFCAR           ;SELECT SYSTEM UNIT
006364  032777  000002  007364           BIT     #2,@AFCMN               ;CHECK X BIT
006372  001012                           BNE     DECODC                  ;"X"=1, CONTINUE
006374  032767  020000  171166           BIT     #20000,SWR              ;TYPE ERROR MESSAGE ?
006402  001002                           BNE     DECOB1                  ;NO, CHECK FOR LOOP
006404  104003                           TYPE                            ;TYPE "X" BAD
006406  013674                           MXBAD
```

```
2361  006410  032767  040000  171152  DECOB1:  BIT     #40000,SWR              ;CHECK FOR LOOP
2362  006416  001357                           BNE     DECODB                  ;LOOP
2363  006420  016767  007254  007224  DECODC:  MOV     SYSUNB,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,@AFCAR           ;ADDRESS A CHANNEL
2366  006442  017767  007310  177506           MOV     @AFCMN,DATA1            ;READ BACK MAINTENANCE REGISTER
2367  006450  006267  177502                    ASR     DATA1                   ;REPOSITION DATA
2368  006454  006267  177476                    ASR     DATA1
2369  006460  042767  177740  177470           BIC     #177740,DATA1           ;CLEAR UNWANTED BITS
2370  006466  016767  007160  177464           MOV     OUTCHN,DATA2            ;SET UP FOR COMPARE
2371  006474  042767  177740  177456           BIC     #177740,DATA2
2372  006502  126767  177450  177450           CMPB    DATA1,DATA2             ;COMPARE EXPECTED AND RECEIVED DATA
2373  006510  001414                           BEQ     DECODD
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  DECODE:  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 "DECOD"
2389  006564  013504                           MDECOD
2390  006566  012767  004000  007066           MOV     #4000,CNTR5
2391  006574  000647                           BR      DECODA
2392
2393
2394
```

```
                                        .SBTTL  MAIN


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

006576  005067  007174               DATA:   CLR     CRFLG                   ;IGNORE CONTROL R INTERRUPT
006602  012767  000001  007164       MOV     #1,CPFLG                        ;ACCEPT CONTROL P INTERRUPT
006610  012767  006616  007152       MOV     #DATAP,CPRET                    ;SET UP CONTROL P RETURN
006616  104026                       DATAP:  DISPAT                          ;GO TO COMMAND DECODER
006620  014026                               DATLST                          ;LIST OF COMMANDS AN  POINTERS
006622  000775                               BR      DATAP                   ;CONTINUE COMMAND IN   T


                                        ;INPUT "N" SAMPLES ON A GIVE CHANNEL
                                        ; AT A FIXED GAIN

006624  104003                       TAKEN:  TYPE
006626  013514                               MR
006630  005077  007114                       CLR     @AFCSR
006634  005077  007116                       CLR     @AFCMN
006640  012704  016504                       MOV     #DATAB,R4               ;TABLE FOR DATA STORAGE
006644  016701  007032                       MOV     SAMPLE,R1               ;NUMBER OF SAMPLES TO BE INPUT
006650  016703  007042                       MOV     LOCHAN,R3               ;CHANNEL TO BE SAMPLED
006654  056703  007026                       BIS     LOGAIN,R3               ;SET GAIN BITS
006660  012702  020000               TAKEN1: MOV     #20000,R2               ;DELAY BETWEEN CONVERSIONS
006664  010377  007064                       MOV     R3,@AFCAR               ;START MULTIPLEXER
006670  105777  007054               TAKEN2: TSTB    @AFCSR                  ;WAIT FOR DONE
006674  100375                               BPL     TAKEN2
006676  017724  007050                       MOV     @AFDBR,(R4)+            ;SAVE DATA SAMPLE
006702  005301                               DEC     R1                      ;ALL SAMPLES IN
006704  001001                               BNE     TAKEN3                  ;NO, GET ANOTHER
006706  000002                               RTI                             ;YES, EXIT
006710  005302                       TAKEN3: DEC     R2                      ;STALL
006712  001376                               BNE     TAKEN3
006714  000761                               BR      TAKEN1


                                        ;LIST "N" SAMPLES OF DATA

006716  012701  016504               LIST:   MOV     #DATAB,R1               ;GET POINTER TO STORED DATA
006722  016702  006754                       MOV     SAMPLE,R2               ;GET NUMBER OF SAMPLES TO BE LISTED
006726  012167  177224               LIST1:  MOV     (R1)+,DATA1             ;GET DATA
006732  104020                               DECBCD                          ;CONVERT DATA TO DECIMAL
006734  000001                               1
006736  006156                               DATA1
006740  005302                               DEC     R2
006742  001371                               BNE     LIST1
006744  000002                               RTI


                                        ;COMPUTE AVERAGE OF "N"SAMPLES, OUTPUT TO TTY
```

```
006746 104021                   AVREGG: AVRG                    ;COMPUTE AVERAGE OF DATA
006750 016767 006532 177200             MOV     QUOT,DATA1      ;GET AVERAGE
006756 104003                           TYPE                    ;TYPE "AVERAGE="
006760 013255                           MAVRG
006762 104022                           DECBCC                  ;CONVERT TO DECIMAL AND OUTPUT
006764 000001                           1
006766 006156                           DATA1
006770 000002                           RTI

                                        ;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     @AFCSR          ;CLEAR CONTROL REGISTER
007002 005077 006750                    CLR     @AFCMN          ;CLEAR MAINTENANCE REGISTER
007006 016704 006704                    MOV     LOCHAN,R4       ;GET ADDRESS OF CHANNEL TO BE DISPLAYED
007012 056704 006670                    BIS     LOGAIN,R4       ;GET GAIN
007016 012777 000100 006734     DISPL1: MOV     #100,@TKCSR     ;ENABLE KEYBOARD INTERRUPTS
007024 010477 006724                    MOV     R4,@AFCAR       ;START MULTIPLEXER
007030 105777 006714            DISPL2: TSTB    @AFCSR          ;WAIT FOR DONE
007034 100375                           BPL     DISPL2
007036 017700 006710                    MOV     @AFDBR,R0       ;READ A-D BUFFER
007042 000005                           RESET                   ;DISPLAY DATA
007044 032767 000001 170516             BIT     #1,SWR          ;IF SW00=1, RETURN TO KEYBOARD CONTROL
007052 001761                           BEQ     DISPL1
007054 000167 177536                    JMP     DATAP

                                        ;CONTINUOUSLY SAMPLE AND LIST ONE CHANNEL

007060 005077 006664            LISTC:  CLR     @AFCSR          ;CLEAR CONTROL REGISTER
007064 005077 006666                    CLR     @AFCMN          ;CLEAR MAINTENANCE REGISTER
007070 016767 006622 006554             MOV     LOCHAN,OUTCHN   ;GET ADDRESS OF CHANNEL

007076 056767 006604 006546             BIS     LOGAIN,OUTCHN   ;GET GAIN

007104 016777 006542 006642     LISTC1: MOV     OUTCHN,@AFCAR   ;SELECT CHANNEL
007112 105777 006632            LISTC3: TSTB    @AFCSR          ;WAIT FOR DONE
007116 100375                           BPL     LISTC3
007120 017767 006626 177030             MOV     @AFDBR,DATA1    ;GET DATA
007126 104020                           DECBCD                  ;CONVERT TO DECIMAL AND OUTPUT
007130 000001                           1
007132 006156                           DATA1
007134 000763                           BR      LISTC1

                                        ;COMPUTE AVERAGE OF "N" DATA POINTS

007136 012704 016504            AVRGG:  MOV     #DATAB,R4       ;GET POINTER TO TABLE OF DATA
007142 016703 006534                    MOV     SAMPLE,R3       ;GET NUMBER OF SAMPLES
```

```
2507  007146  005001                          CLR     R1
2508  007150  005002                          CLR     R2
2509  007152  012400                  AVRG1:  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     REMAND                  ;ROUND OF AVERAGE
2520  007214  100404                          BMI     AVRG2A
2521  007216  026767  006266  006456          CMP     REMAND,SAMPLE
2522
2523  007224  002402                          BLT     AVRG2
2524  007226  005267  006254          AVRG2A: INC     QUOT
2525  007232  162767  020000  006246  AVRG2:  SUB     #20000,QUOT             ;CORRECT SIGN OF RESULT
2526  007240  000002                          RTI
2527
2528
2529                                          ;TELETYPE HISTOGRAM OUTPUT ROUTINE
2530
2531  007242  012704  016352          HISTO:  MOV     #TEMTAB,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          ADD     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 TO LARGE
2558  007356  005267  000460                  INC     ORANGE                  ;DIFFERENCE IS TOO LARGE
2559  007362  000412                          BR      HISTOF
2560  007364  022702  177766          HISTOD: CMP     #-12,R2                 ;WILL DIFFERENCE FIT GRAPH
2561  007370  003403                          BLE     HISTOE                  ;DIFFERENCE IS NOT TOO SMALL
2562  007372  005267  000446                  INC     URANGE                  ;DIFFERENCE IS TOO NEGATIVE
```

```
2563  007376  000404                          BR      HISTOF
2564  007400  006302                HISTOE:   ASL     R2
2565  007402  066702  000442                  ADD     HTABA,R2              ;PUT A POINT IN DIFFERENCE TABLE
2566  007406  005212                          INC     (R2)
2567  007410  005303                HISTOF:   DEC     R3
2568  007412  001344                          BNE     HISTOC
2569
2570                                          ;SET UP VERTICAL SCALE FACTOR
2571
2572  007414  005767  006364                  TST     VSFFLG                ;HAS VERTICAL SCALE FACTOR BEEN SET UP
2573  007420  001015                          BNE     HISTOG                ;MANUALLY
2574  007422  012704  014344                  MOV     #SCLTAB,R4            ;NO, GET TABLE OF SCALE FACTORS
2575  007426  012767  000001  006270          MOV     #1,VSF                ;START WITH VSF=1
2576  007434  005714                HISTVA:   TST     (R4)                  ;ARE WEE AT END OF TABLE
2577  007436  001406                          BEQ     HISTOG
2578  007440  022467  006236                  CMP     (R4)+,SAMPLE          ;IS VSF TOO SMALL
2579  007444  002003                          BGE     HISTOG
2580  007446  062467  006252                  ADD     (R4)+,VSF             ;YES, INCREASE VSF
2581  007452  000770                          BR      HISTVA
2582
2583
2584                                          ;TYPE VERTICAL SCALE FACTOR
2585
2586  007454  104003                HISTOG:   TYPE
2587  007456  013422                          MVSF
2588  007460  104027                          BCDASN
2589  007462  000001                          1
2590  007464  015724                          VSF
2591
2592                                          ;FIND LARGEST ENTRY IN TABLE OF DIFFERENCES
2593
2594  007466  012704  016430                  MOV     #HTAB,R4
2595  007472  012703  016430                  MOV     #HTAB,R3
2596  007476  012702  000025                  MOV     #21.,R2
2597  007502  012467  006000        HISTG1:   MOV     (R4)+,DIVIDL
2598  007506  016767  006212  005776          MOV     VSF,DIVIS
2599  007514  104024                          DIVIDE
2600  007516  005767  005766                  TST     REMAND
2601  007522  001402                          BEQ     HISTG2
2602  007524  005267  005756                  INC     QUOT
2603  007530  016723  005752        HISTG2:   MOV     QUOT,(R3)+
2604  007534  005302                          DEC     R2
2605  007536  001361                          BNE     HISTG1
2606  007540  012704  016430                  MOV     #HTAB,R4
2607  007544  011402                          MOV     (R4),R2
2608  007546  022402                HISTOH:   CMP     (R4)+,R2
2609  007550  003402                          BLE     HISTOI
2610  007552  014402                          MOV     -(R4),R2
2611  007554  005724                          TST     (R4)+
2612  007556  020427  016504        HISTOI:   CMP     R4,#DATAB
2613  007562  002771                          BLT     HISTOH
2614  007564  005202                          INC     R2
2615  007566  010267  000254                  MOV     R2,TEMP1
2616
2617
2618                                          ;SET UP 1 LINE OF
```

```
 2619                                                ;TELETYPE OUTPUT AT A TIME
 2620
 2621  007572  012701  000025          HISTOK: MOV     #21.,R1
 2622  007576  012704  016352                  MOV     #TEMTAB,R4
 2623  007602  112724  000015                  MOVB    #15,(R4)+
 2624  007606  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     #TEMTAB+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                          TEMTAB
 2643  007700  005367  000142                  DEC     TEMP1
 2644  007704  003332                          BGT     HISTOK
 2645  007706  012704  016352                  MOV     #TEMTAB,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                          TEMTAB
 2661  007772  016767  005732  176156          MOV     ADRES,DATA1
 2662  010000  104022                  HISTOT: DECBCC
 2663  010002  000001                          1
 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                          1
 2671  010022  010044                          URANGE
 2672  010024  104003                          TYPE
 2673  010026  013436                          MORANG
 2674  010030  104027                          BCDASN
```

```
  2675  010032  000001                          1
  2676  010034  010042                          ORANGE
  2677  010036  104025                          AVREG
  2678  010040  000002                          RTI
  2679  010042  000000              ORANGE:     0
  2680  010044  000000              URANGE:     0
  2681  010046  000000              TEMPI:      0
  2682  010050  016454              HTABA:      HTAB+24
```

```
                                        ;OVERLOAD TEST
                                        ;THIS TEST WILL WAIT FOR A CHANNEL AND GAIN INPUT TO BE ENTERED VIA THE
                                        ;TELETYPE AND THEN TAKE CONTINUOUS CONVERSIONS ON THE SELECTED CH. TESTING
                                        ;THE STATE OF THE OVERLOAD BIT.  THE STATE OF THE OVERLOAD IS REPORTED VIA
                                        ;THE TELETYPE BY PRINTING A '1' IS THE BIT IS SET AND A '0' IF CLEARED.

010052  005067  005720          OLOAD:  CLR     CRFLG                   ;INHIBIT 'CNTR R' REQUESTS
010056  012767  000001  005710          MOV     #1,CPFLG                ;ENABLE 'CNTR P' REQUESTS
010064  012767  010052  005676          MOV     #OLOAD,CPRET            ;SET UP 'P' RETURN ADDRESS
010072  104026                  OLOADP: DISPAT                          ;GET THE CH. AND GAIN
010074  014226                          OLOLST
010076  000775                          BR      OLOADP
010100  016767  005612  005560  OLOADT: MOV     LOCHAN,POINT2           ;GET ADDRESS CHA. TO BE TESTED
010106  056767  005574  005552          BIS     LOGAIN,POINT2           ;ADD THE GAIN
010114  012777  000100  005636          MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
010122  005067  167650                  CLR     PS
010126  005067  005532                  CLR     POINT1
010132  012767  000106  005454  OLOAD1: MOV     #106,ICOUNT             ;SET UP TO TYPE "70" DIGITS PER LINE
010140  042777  020000  005602  OLOAD2: BIC     #20000,@AFCSR           ;CLR THE OLOAD BIT
010146  016777  005514  005600          MOV     POINT2,@AFCAR           ;START THE CONVERSIONS
010154  105777  005570                  TSTB    @AFCSR                  ;WAIT FOR DONE
010160  100375                          BPL     .-4
010162  005777  005564                  TST     @AFDBR                  ;CLR DONE
010166  032777  020000  005554          BIT     #20000,@AFCSR           ;TEST IF THE OVERLOAD BIT SET
010174  001003                          BNE     OLOAD3                  ;BRANCH IF SET
010176  005067  005444                  CLR     INCNT                   ;OTHERWISE CLR TEMP
010202  000403                          BR      OLOAD4
010204  012767  000001  005434  OLOAD3: MOV     #1,INCNT                ;TYPE '1' IF SET
010212  026767  005446  005426  OLOAD4: CMP     POINT1,INCNT            ;HAS FLAG CHANGED STATES?
010220  001747                          BEQ     OLOAD2                  ;NO, RETEST CH.
010222  016767  005420  005434          MOV     INCNT,POINT1            ;YES, UPDATE POINTER
010230  104027                          BCDAS'
010232  000001                          1
010234  015646                          INCNT
010236  005367  005352                  DEC     ICOUNT
010242  100336                          BPL     OLOAD2
010244  104003                          TYPE
010246  013244                          MCRLF
010250  000730                          BR      OLOAD1


                                        ;INPUT  ASCII CHARACTER STRING

010252  011605                  INSTRR: MOV     (SP),R5                 ;GET PC OF MESSAGE POINTER
010254  012567  000010                  MOV     (R5)+,MSG               ;GET MESSAGE POINTER
010260  012567  005362                  MOV     (R5)+,INCNT             ;GET EXPECTED CHARACTER COUNT
010264  010516                          MOV     R5,(SP)                 ;SET UP RETURN
010266  104003                  INSTR1: TYPE                            ;TYPE MESSAGE
010270  000000                  MSG:    0
010272  012704  014422          INSTR2: MOV     #INBUF,R4
010276  016703  005344                  MOV     INCNT,R3
010302  005024                  INSTRA: CLR     (R4)+                   ;CLEAR INPUT BUFFER
010304  005303                          DEC     R3
010306  001375                          BNE     INSTRA
010310  005067  005334                  CLR     CHRCNT                  ;CLEAR RECEIVED CHARACTER COUNT
010314  012704  014422                  MOV     #INBUF,R4               ;SET UP TO RECEIVE
```

```
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  000240      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                      BEQ     INSTRE          ;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)            ;LOOK FOR END OF LIST
2765  010450  001725                      BEQ     INSTRB
2766  010452  000766                      BR      SPCHRA
2767  010454  104003      INSTRE: TYPE                            ;INPUT STRING ERROR
2768  010456  013225              MQMARK                          ;TYPE "?"
2769  010460  000702                      BR      INSTR1          ;TRY AGAIN
2770  010462  000002      INSTEX: 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                      INSTER                  ;INVALID NAME
2792  010536  000752                      BR      TSTNAM
2793
2794
```

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

010540  011605          BCDBNN: MOV     (SP),R5
010542  012567  000162          MOV     (R5)+,BCDCNT        ;NUMBER OF WORDS TO BE CONVERTED
010546  010516                  MOV     R5,(SP)
010550  012704  014422  BCDBN1: MOV     #INBUF,R4           ;POINTER TO ASCII
010554  012703  010724          MOV     #BCDTAB,R3          ;TABLE FOR STORAGE OF CONVERTED WORD
010560  016767  000144  000144  MOV     BCDCNT,CNTR2
010566  012767  000004  005054  BCDBN2: MOV     #4,CHRCNT           ;4 DIGITS PER WORD, AT MOST
010574  005002                  CLR     R2
010576  005001                  CLR     R1                  ;CLEAR MULTIPLICATION REGISTERS
010600  105714          BCDBN3: TSTB    (R4)                ;END OF DTAT ?
010602  001441                  BEQ     BCDEXT              ;YES, EXIT
010604  122714  000054          CMPB    #54,(R4)            ;IS CHARACTER ","?
010610  001012                  BNE     BCDBN4              ;NO
010612  022767  000004  005030  CMP     #4,CHRCNT
010620  001437                  BEQ     BCDERR
010622  105724                  TSTB    (R4)+
010624  001435                  BEQ     BCDERR
010626  122714  000054          CMPB    #54,(R4)
010632  001432                  BEQ     BCDERR
010634  000424                  BR      BCDEXT
010636  121427  000060  BCDBN4: CMPB    (R4),#60
010642  002426                  BLT     BCDERR
010644  121427  000071          CMPB    (R4),#71
010650  003023                  BGT     BCDERR
010652  142714  000060          BICB    #60,(R4)
010656  005367  004766          DEC     CHRCNT
010662  002416                  BLT     BCDERR
010664  112400                  MOVB    (R4)+,R0
010666  060201                  ADD     R2,R1
010670  060100                  ADD     R1,R0
010672  010001                  MOV     R0,R1
010674  006301                  ASL     R1
010676  010102                  MOV     R1,R2
010700  006302                  ASL     R2
010702  006302                  ASL     R2
010704  000735                  BR      BCDBN3
010706  010023          BCDEXT: MOV     R0,(R3)+
010710  005367  000016          DEC     CNTR2
010714  001324                  BNE     BCDBN2
010716  000002                  RTI
010720  104014          BCDERR: INSTER
010722  000712                  BR      BCDBN1
010724                  BCDTAB:
010724  000000          BCDWD1: 0
010726  000000          BCDWD2: 0
010730  000000          BCDCNT: 0
010732  000000          CNTR2:  0


                                        ;CONVERT DECIMAL FRACTION TO ASCII BCD
```

```
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                           MOVB    #40,(R3)+
2857   010752  013567  004530                 DECBB1:   MOV     @(R5)+,BINWRD
2858   010756  016700  004722                           MOV     LOGGN,R0
2859   010762  116067  014324  000540                   MOVB    GNEXP(0),DECEXP
2860   010770  116067  014334  000530                   MOVB    GNSCL(0),SCALEF
2861   010776  105767  000526                           TSTB    DECEXP
2862   011002  100003                                   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     DECBC1
2867   011024  001572                                   BEQ     DECD
2868   011026  005467  004454                           NEG     BINWRD
2869   011032  005267  000466                           INC     DECSGN
2870   011036  012704  016352                 DECBC1:   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     DECBC2
2875   011064  006367  004416                           ASL     BINWRD
2876   011070  026727  000432  000001                   CMP     SCALEF,#1
2877   011076  001412                                   BEQ     DECBC2
2878   011100  006367  004402                           ASL     BINWRD
2879   011104  005767  004376                           TST     BINWRD
2880   011110  001005                                   BNE     DECBC2
2881   011112  112724  000002                           MOVB    #2,(R4)+
2882   011116  005067  000476                           CLR     MPCND
2883   011122  000434                                   BR      DECBC3
2884   011124  016767  004356  000466  DECBC2:  MOV     BINWRD,MPCND
2885   011132  012767  000012  000456  DECBCA:  MOV     #12,MPYERH
2886   011140  104030                           MULTPY
2887   011142  126727  000446  000011           CMPB    PRODH,#11
2888   011150  003424                           BLE     DECBC4
2889   011152  005067  176670                   CLR     TEMP1
2890   011156  162767  000012  000430  DIGEXT:  SUB     #12,PRODH
2891   011164  100403                           BMI     DIGDON
2892   011166  005267  176654                   INC     TEMP1
2893   011172  000771                           BR      DIGEXT
2894   011174  116724  176646          DIGDON:  MOVB    TEMP1,(R4)+
2895   011200  062767  000012  000406           ADD     #12,PRODH
2896   011206  005267  000316                   INC     DECEXP
2897   011212  000403                           BR      DECBC4
2898   011214  005267  000310          DECBC3:  INC     DECEXP
2899   011220  000744                           BR      DECBCA
2900   011222  116724  000366          DECBC4:  MOVB    PRODH,(R4)+
2901   011226  005367  004416                   DEC     CHRCNT
2902   011232  001337                           BNE     DECBCA
2903
2904
2905                                                    ;INSERT SIGN AND DECIMAL POINT
2906
```

```
 2907  011234  012704  016352          DECBCB: MOV     #TEMTAB,R4
 2908  011240  005767  000260                  TST     DECSGN
 2909  011244  001402                          BEQ     DECEX
 2910  011246  112723  000055                  MOVB    #55,(R3)+
 2911  011252  005767  000252          DECEX:  TST     DECEXP
 2912  011256  003064                          BGT     DECEG
 2913  011260  001506                          BEQ     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     DECBB1
 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  000676                          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
```

```
2963  011520  000207                          RTS     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                                          ;SINGLE PRECISION UNSIGNED MULTIPLY
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                                          ;COMMAND DECODE AND DISPATCH
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,@TKCSR
3008  011666  005067  166104                  CLR     PS
3009  011672  000174  000000                  JMP     @(R4)
3010  011676  005714              DISPA3:     TST     (R4)
3011  011700  001365                          BNE     DISPA2
3012  011702  104014                          INSTER
3013  011704  000757                          BR      DISPA1
3014  011706  000000              DISLST:     0
3015
3016                                          ;INPUT  SYSTEM UNIT ADDRESS
3017
3018  011710  104013              SUADD:      INSTR
```

```
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  011760  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,R0
3044  012016  006300                          ASL     R0
3045  012020  020067  176700                  CMP     R0,BCDWD1
3046  012024  002403                          BLT     SAMPEL
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
3055                                          ;INPUT ERROR REPORT MODE
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     EMODER
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
```

```
                                                ;TYPE PARAMETERS OF TEST IN PROGRESS

012134  012700  014200          PARAM1: MOV     #PARL1,R0
012140  000402                          BR      PARAM
012142  012700  014244          PARAM2: MOV     #PARL2,R0
012146  012067  000010          PARAM:  MOV     (R0)+,PMSG
012152  012067  000012                  MOV     (R0)+,PDATA
012156  104004                          SAVOSP
012160  104003                          TYPE
012162  000000                  PMSG:   0
012164  104027                          BCDASN
012166  000001                          1
012170  000000                  PDATA:  0
012172  104006                          RESOS
012174  005710                          TST     (R0)
012176  001363                          BNE     PARAM
012200  000002                          RTI


                                                ;INPUT 1 GAIN

012202  104013                  GAIN1:  INSTR
012204  013270                          MGAIN
012206  000005                          5
012210  104015                  GAIN1A: BCDBN
012212  000001                          1
012214  012704  014302                  MOV     #GNLST,R4
012220  005067  003462                  CLR     LOGAIN
012224  026724  176474          GAIN1B: CMP     BCDWD1,(R4)+
012230  001021                          BNE     GAIN1C
012232  016767  003450  003444          MOV     LOGAIN,LOGGN
012240  016767  176460  003442          MOV     BCDWD1,LGAIND
012246  000367  003434                  SWAB    LOGAIN
012252  006367  003430                  ASL     LOGAIN
012256  006367  003424                  ASL     LOGAIN
012262  006367  003420                  ASL     LOGAIN
012266  006367  003414                  ASL     LOGAIN
012272  000002                          RTI
012274  005267  003406          GAIN1C: INC     LOGAIN
012300  005714                          TST     (R4)
012302  001350                          BNE     GAIN1B
012304  104014                          INSTER
012306  000740                          BR      GAIN1A


                                                ;INPUT 1 CHANNEL ADDRESS

012310  104013                  CHAN1:  INSTR
012312  013334                          MCHANA
012314  000005                          5
012316  104015                  CHAN1A: BCDBN
012320  000001                          1
012322  026727  176376  001777          CMP     BCDWD1,#1023.
```

```
3131  012330  003004                        BGT     CHAN1E
3132  012332  016767  176366  003356        MOV     BCDWD1,LOCHAN
3133  012340  000002                        RTI
3134  012342  104014              CHAN1E:   INSTER
3135  012344  000764                        BR      CHAN1A
3136
3137
3138                                        ;INPUT 2 CHANNEL ADDRESSES
3139
3140  012346  104013              CHAN2:    INSTR
3141  012350  013334                        MCHANA
3142  012352  000012                        12
3143  012354  104015              CHAN2A:   BCDBN
3144  012356  000002                        2
3145  012360  026727  176340  001777        CMP     BCDWD1,#1023.
3146  012366  003040                        BGT     CHAN2E
3147  012370  026727  176332  001777        CMP     BCDWD2,#1023.
3148  012376  003034                        BGT     CHAN2E
3149  012400  016767  176320  003310        MOV     BCDWD1,LOCHAN
3150  012406  016767  176314  003304        MOV     BCDWD2,HICHAN
3151  012414  166767  176304  176304        SUB     BCDWD1,BCDWD2
3152  012422  002422                        BLT     CHAN2E
3153  012424  026767  176276  003270        CMP     BCDWD2,MAXCHN
3154  012432  003016                        BGT     CHAN2E
3155  012434  016767  176266  003274        MOV     BCDWD2,CHNCNT
3156  012442  005267  003270                INC     CHNCNT
3157  012446  016767  003264  003266        MOV     CHNCNT,SAMTAB
3158  012454  006367  003262                ASL     SAMTAB
3159  012460  062767  016504  003254        ADD     #DATAB,SAMTAB
3160  012466  000002                        RTI
3161  012470  104014              CHAN2E:   INSTER
3162  012472  000730                        BR      CHAN2A
3163
3164
3165                                        ;INPUT HISTOGRAM VERTICAL SCALE FACTOR
3166
3167  012474  104013              VSFIN:    INSTR
3168  012476  013520                        MVSFI
3169  012500  000004                        4
3170  012502  122767  000101  001712  VSFINA:  CMPB    #101,INBUF
3171  012510  001006                        BNE     VSFMAN
3172  012512  005067  003266                CLR     VSFFLG
3173  012516  012767  000001  003200        MOV     #1,VSF
3174  012524  000002              VSFIN1:   RTI
3175  012526  104015              VSFMAN:   BCDBN
3176  012530  000001                        1
3177  012532  026727  176166  000144        CMP     BCDWD1,#100.
3178  012540  003012                        BGT     VSFE
3179  012542  005767  176156                TST     BCDWD1
3180  012546  00140                         BEQ     VSFE
3181  012550  016767  176150  003146        MOV     BCDWD1,VSF
3182  012556  012767  000001  003220        MOV     #1,VSFFLG
3183  012564  000757                        BR      VSFIN1
3184  012566  104014              VSFE:     INSTER
3185  012570  000744                        BR      VSFINA
3186
```

```
3187
3188                                        ;INPUT A-D CONVERTER RESOLUTION
3189
3190  012572  104013            ADBIN:    INSTR
3191  012574  013530                      MADRES
3192  012576  000003                      3
3193  012600  104015            ADBINA:   BCDBN
3194  012602  000001                      1
3195  012604  016767  176114  003114      MOV     BCDWD1,ADRESD
3196  012612  012767  000001  003110      MOV     #1,ADRES
3197  012620  005067  003106              CLR     ADBIT
3198  012624  005067  003104              CLR     ADMSK
3199  012630  012704  000015              MOV     #13.,R4
3200  012634  026704  176064              CMP     BCDWD1,R4
3201  012640  001427                      BEQ     ADBINB
3202  012642  006367  003062              ASL     ADRES
3203  012646  005267  003060              INC     ADBIT
3204  012652  005267  003056              INC     ADMSK
3205  012656  005304                      DEC     R4
3206  012660  020467  176040              CMP     R4,BCDWD1
3207  012664  001415                      BEQ     ADBINB
3208  012666  006367  003036              ASL     ADRES
3209  012672  006367  003034              ASL     ADBIT
3210  012676  062767  000002  003030      ADD     #2,ADMSK
3211  012704  005304                      DEC     R4
3212  012706  020467  176012              CMP     R4,BCDWD1
3213  012712  001402                      BEQ     ADBINB
3214  012714  104014                      INSTER
3215  012716  000730                      BR      ADBINA
3216  012720  000002            ADBINB:   RTI
3217
3218                                        ;INPUT ERROR DETECTION LIMITS FOR REPEATABILITY TEST
3219
3220  012722  104013            REPRES:   INSTR
3221  012724  013547                      MREPRE
3222  012726  000003                      3
3223  012730  104015            REPREA:   BCDBN
3224  012732  000001                      1
3225  012734  022767  000050  175762      CMP     #40.,BCDWD1
3226  012742  002404                      BLT     REPREE
3227  012744  016767  175754  002766      MOV     BCDWD1,RERES
3228  012752  000002                      RTI
3229  012754  104014            REPREE:   INSTER
3230  012756  000764                      BR      REPREA
3231
3232                                        ;POWER FAIL HANDLER
3233
3234  012760  010046            PFAIL:    MOV     R0,-(SP)
3235  012762  010146                      MOV     R1,-(SP)
3236  012764  010246                      MOV     R2,-(SP)
3237  012766  010346                      MOV     R3,-(SP)
3238  012770  010446                      MOV     R4,-(SP)
3239  012772  010546                      MOV     R5,-(SP)
3240  012774  016746  165024              MOV     24,-(SP)
3241  013000  010667  002620              MOV     SP,SAVSP
3242  013004  012767  013014  165012      MOV     #PWRUP,24
```

```
 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  013[illegible]  012605                  MOV     (SP)+,R5
 3251  013034  012604                          MOV     (SP)+,R4
 3252  013036  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  013052  013351                          MPFAIL
 3259  013054  000167  166322                  JMP     MONIT
 3260
 3261
 3262
 3263                                          ;RESPONSE TO CONTROL C
 3264
 3265  013060  104003                  CONTC:  TYPE
 3266  013062  013231                          MCONTC
 3267  013064  000167  166312                  JMP     MONIT
 3268
 3269                                          ;RESPONSE TO CARRIAGE RETURN
 3270
 3271  013070  104003                  ALTMOD: TYPE
 3272  013072  013244                          MCRLF
 3273  013074  005767  002550                  TST     CHRCNT
 3274  013100  001002                          BNE     ALTMO1
 3275  013102  000167  175346                  JMP     INSTRE
 3276  013106  000167  175350          ALTMO1: JMP     INSTEX
 3277
 3278                                          ;RESPONSE TO RUBOUT
 3279  013112  104003                  RUBOUT: TYPE
 3280  013114  013247                          MRUBOU
 3281  013116  000167  175150                  JMP     INSTR2
 3282
 3283                                          ;RESPONSE TO CONTROL P
 3284
 3285  013122  104003                  CONTP:  TYPE
 3286  013124  013234                          MCONTP
 3287  013126  012706  001000                  MOV     #1000,SP
 3288  013132  000177  002632                  JMP     @CPRET
 3289
 3290
 3291                                          ;RESPONSE TO CONTROL R
 3292
 3293  013136  104003                  CONTR:  TYPE
 3294  013140  013237                          MCONTR
 3295  013142  012706  001000                  MOV     #1000,SP
 3296  013146  000177  002620                  JMP     @CRRET
 3297
 3298                                          ;SPECIAL CHARACTER DECODE LIST
```

```
3299
3300  013152  000215                    SPLST:  215
3301  013154  013070                            ALTMOD
3302  013156  000203                            203
3303  013160  013060                            CONTC
3304  013162  000377                            377
3305  013164  013112                            RUBOUT
3306  013166  000000                            0
3307
3308
3309
3310                                            ;GENERAL MESSAGES
3311
3312  013170     000                  .BYTE
3313  013171     015  040412  041506  MTITLE: .ASCIZ  <15><12>/AFC-11 DIAGNOSTIC/<15><12>
3314  013176  030455  020061  044504
3315  013204  043501  047516  052123
3316  013212  041511  005015     000
3317  013217     015  027012     000  MPER:   .ASCIZ  <15><12>/./
3318  013223     054     000          MCOMMA: .ASCIZ  / /
3319  013225     015  037412     000  MQMARK: .ASCIZ  <15><12>/?/
3320  013231     136  000103          MCONTC: .ASCIZ  /↑C/
3321  013234  050136     000          MCONTP: .ASCIZ  /↑P/
3322  013237     136  000122          MCONTR: .ASCIZ  /↑R/
3323  013242  000040                  MSPACE: .ASCIZ  / /
3324  013244  005015     000          MCRLF:  .ASCIZ  <15><12>//
3325  013247     057     000          MRUBOU: .ASCIZ  !/!
3326  013251     015  025012     000  MASTER: .ASCIZ  <15><12>/*/
3327  013255     015  040412  042526  MAVRG:  .ASCIZ  <15><12>/AVERAGE=/
3328  013262  040522  042507  000075
3329
3330                                            ;PARAMETER INPUT MESSAGES
3331
3332  013270  043452  044501  024116  MGAIN:  .ASCIZ  /*GAIN(S):/
3333  013276  024523  000072
3334  013302  051452  046501  046120  MSAMP:  .ASCIZ  /*SAMPLES:/
3335  013310  051505  000072
3336  013314  005015  051452  051531  MSUAD:  .ASCIZ  <15><12>/*SYSTEM UNIT:/
3337  013322  042524  020115  047125
3338  013330  052111  000072
3339  013334  041452  040510  047116  MCHANA: .ASCIZ  /*CHANNEL(S):/
3340  013342  046105  051450  035051
3341  013350     000
3342  013351     015  050012  053517  MPFAIL: .ASCIZ  <15><12>/POWER FAILURE/
3343  013356  051105  043040  044501
3344  013364  052514  042522     000
3345  013371     040  041440  040510  MMAXCH: .ASCIZ  /  CHANNELS CAN BE TESTED/
3346  013376  047116  046105  020123
3347  013404  040503  020116  042502
3348  013412  052040  051505  042524
3349  013420  000104
3350  013422  005015  051526  036506  MVSF:   .ASCIZ  <15><12>/VSF=/
3351  013430     000
3352  013431     055  044504  000126  MVDIV:  .ASCIZ  /-DIV/
3353  013436  020040  020040  020040  MORANG: .ASCIZ  /       OVER  /
3354  013444  053117  051105  020040
```

```
3355  013452  000
3356  013453  015  052412  042116  MURANG: .ASCIZ  <15><12>/UNDER /
3357  013460  051105  000040
3358  013464  005015  042522  042520  MREPET: .ASCIZ  <15><12>/REPET/
3359  013472  000124
3360  013474  005015  047514  044507  MLOGIC: .ASCIZ  <15><12>/LOGIC/
3361  013502  000103
3362  013504  005015  042504  047503  MDECOD: .ASCIZ  <15><12>/DECOD/
3363  013512  000104
3364  013514  005015  000122          MR:     .ASCIZ  <15><12>/R/
3365  013520  005015  053052  043123  MVSFI:  .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  013554  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  013602  005015  040520  051523  MPASS:  .ASCIZ  <15><12>/PASSES:/
3377  013610  051505  000072
3378  013614  005015  047524  040524  MERROR: .ASCIZ  <15><12>/TOTAL ERRORS:/
3379  013622  020114  051105  047522
3380  013630  051522  000072
3381
3382                                  ;ERROR MESSAGES
3383
3384  013634  005015  047515  047516  EMONOT: .ASCII  <15><12>/MONOTONICITY FAILURE/
3385  013642  047524  044516  044503
3386  013650  054524  043040  044501
3387  013656  052514  042522
3388  013662  005015  051461  004524          .ASCIZ  <15><12>/1ST    2ND/
3389  013670  047062  000104
3390  013674  005015  020130  040502  MXBAD:  .ASCIZ  <15><12>/X BAD/
3391  013702  000104
3392  013704  005015  020131  040502  MYBAD:  .ASCIZ  <15><12>/Y BAD/
3393  013712  000104
3394                                  .EVEN
3395
3396                                  ;LIST OF TESTS TO BE EXECUTED
3397
3398  013714  042101                  TSTLST: "AD
3399  013716  040503                          "CA
3400  013720  000114                          'L
3401  013722  005422                          ADCAL
3402  013724  054115                          "MX
3403  013726  044524                          "TI
3404  013730  000115                          'M
3405  013732  006162                          MXTIM
3406  013734  047515                          "MO
3407  013736  047516                          "NO
3408  013740  000124                          'T
3409  013742  005762                          MONOT
3410  013744  046501                          "AM
```

```
3411   013746   040503                          "CA
3412   013750   000114                          'L
3413   013752   005560                          AMCAL
3414   013754   047514                          "LO
3415   013756   044507                          "GI
3416   013760   000103                          'C
3417   013762   001532                          LOGIC1
3418   013764   040504                          "DA
3419   013766   040524                          "TA
3420   013770   000000                          0
3421   013772   006576                          DATA
3422   013774   042522                          "RE
3423   013776   042520                          "PE
3424   014000   000124                          'T
3425   014002   004326                          REPETE
3426   014004   042504                          "DE
3427   014006   047503                          "CO
3428   014010   000104                          'D
3429   014012   006240                          DECOD
3430   014014   046117                          "OL
3431   014016   040517                          "OA
3432   014020   000104                          'D
3433   014022   010052                          OLOAD
3434   014024   000000                          0
3435
3436                                            ;COMMAND DECODER DISPATCH LISTS
3437
3438                                            ;DATA ROUTINES COMMAND LIST
3439
3440   014026   000103   DATLST:  'C
3441   014030   012310            CHAN1          ;INPUT CHANNEL ADDRESS
3442   014032   000107            'G
3443   014034   012202            GAIN1          ;INPUT GAIN
3444   014036   000116            'N
3445   014040   012000            SAMPL          ;INPUT NUMBER OF SAMPLES
3446   014042   000124            'T
3447   014044   006624            TAKEN          ;GET "N" DATA POINTS
3448   014046   000114            'L
3449   014050   006716            LIST           ;LIST "N" SAMPLES OF DATA
3450   014052   000101            'A
3451   014054   006746            AVREGG         ;AVERAGE "N" SAMPLES
3452   014056   000104            'D
3453   014060   006772            DISPLY         ;DISPLAY SINGLE CHANNEL
3454                                             ;IN DATA LIGHTS
3455   014062   041514            "LC
3456   014064   007060            LISTC          ;CONTINUOUS SAMPLE AND TYPEOUT
3457   014066   000110            'H
3458   014070   007242            HISTO          ;TYPE HISTOGRAM ON TELETYPE
3459   014072   042101            "AD
3460   014074   012572            ADBIN
3461   014076   000126            'V
3462   014100   012474            VSFIN
3463   014102   000120            'P
3464   014104   012134            PARAM1
3465   014106   000000            0
3466
```

```
  3467                                          ;REPEATABILITY TEST COMMAND LIST
  3468
  3469  014110  000111                  REPLST: 'I
  3470  014112  004364                          REPETA
  3471  014114  000103                          'C
  3472  014116  012346                          CHAN2
```

```
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
3491  014162  012346              REPPAR:     CHAN2
3492  014164  012202                          GAIN1
3493  014166  012000                          SAMPL
3494  014170  012722                          REPRES
3495  014172  012050                          EMODE
3496  014174  004434                          REPETB
3497  014176  000000                          0
3498
3499  014200  013334              PARL1:      MCHANA
3500  014202  015716                          LOCHAN
3501  014204  013270                          MGAIN
3502  014206  015710                          LGAIND
3503  014210  013302                          MSAMP
3504  014212  015702                          SAMPLE
3505  014214  013530                          MADRES
3506  014216  015726                          ADRESD
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
```

```
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                            ADRESD
3527  014270  013547                            MREPRE
3528  014272  015740                            RERES
3529  014274  013565                            MEMODE
3530  014276  015776                            CRFLG
3531  014300  000000                            0
3532
3533                                            ;GAIN CONVERSION TUMBLE LIST
3534
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      377      377  GNEXP:  .BYTE   -2,-1,-1,-1,0,0,1,1
3545  014327     377      000      000
3546  014332     001      001
3547                                    .EVEN
3548  014334     001      002      001  GNSCL:  .BYTE   1,2,1,5,1,2,2,1
3549  014337     005      001      002
3550  014342     002      001
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.
3570
3571                                            ;END OF PASS
3572                                            ;UPDATE PASS COUNT
```

```
                                        ;TYPE END OF PASS MESSAGE
                                        ;CHECK FOR TRACE TRAPPONG ON NEXT PASS
                                        
014450  005267  001134          EOP:    INC     PASCNT
014454  012767  000001  001134          MOV     #1,TSTNO
014462  104003                          TYPE
014464  013474                          MLOGIC
014466  013701  000042                  MOV     @#42,R1
014472  001405                          BEQ     TRAC                    ;BRANCH IF NOT AUTO LOAD
014474  000005                          RESET
014476  004711                          JSR     PC,(R1)
014500  000240                          NOP
014502  000240                          NOP
014504  000240                          NOP
014506  012706  016704          TRAC:   MOV     #STACK,SP
014512  012716  000340                  MOV     #340,(SP)
014516  005746                  TRACOF: PUSH1SP
014520  000167  000122                  JMP     TSTENT
014524  000002                  TRACES: RTI
                                        
                                        ;EMT DISPATCH SERVICE
                                        ;ARGUMENT OF EMT IS EXTRACTED
                                        ;AND USED AS OFFSET TO OBTAIN POINTER
                                        ;TO SELECTED SUBROUTINE
                                        
014526  011646                  EMTSRV: MOV     (SP),-(SP)      ;GET PC OF RETURN
014530  162716  000002                  SUB     #2,(SP)         ;=PC OF EMT
014534  017616  000000                  MOV     @(SP),(SP)      ;GET EMT
014540  005716                          TST     (SP)            ;IS EMT VALID
014542  001002                          BNE     EMTOK
014544  000000                          HALT                    ;INVALID EMT
014546  000776                          BR      .-2
014550  006316                  EMTOK:  ASL     (SP)            ;MULTIPLY EMT ARG BY 2
014552  042716  177001                  BIC     #177001,(SP)    ;CLEAR UNWANTED BITS
014556  062716  016116                  ADD     #EMTTAB,(SP)    ;POINTER TO SUBROUTINE ADDRESS
014562  017616  000000                  MOV     @(SP),(SP)      ;SUBROUTINE ADDRESS
014566  000136                          JMP     @(SP)+          ;GO TO SUBROUTINE
                                        
                                        ;END OF SUBTEST SERVICE
                                        ;CHECK FOR LOOP ON CURRENT TEST
                                        ;CHECK FOR ESCAPE TO NEXT TEST ON ERROR
                                        ;UPDATE ITERATION COUNT AND EXIT TO NEXT TEST IF 0
                                        
014570  005767  001214          LOOP:   TST     ERRFLG
014574  001404                          BEQ     LOOPS
014576  032767  002000  162764          BIT     #SW10,SWR
014604  001016                          BNE     LOOPX
014606  032767  040000  162754  LOOPS:  BIT     #SW14,SWR
014614  001032                          BNE     LOOPL
014616  032767  004000  162744          BIT     #SW11,SWR
014624  001006                          BNE     LOOPX
014626  005367  000762                  DEC     ICOUNT
014632  001403                          BEQ     LOOPX
014634  016716  000752          LOOPER: MOV     RETURN,(SP)
014640  000002                          RTI
014642  005267  000750          LOOPX:  INC     TSTNO
```

```
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:    SAVOSP
3659  014756  032767  020000  162604          BIT     #SW13,SWR
3660  014764  001003                          BNE     ERRORR
3661  014766  104005                          OCTASC
3662  014770  000001                          1
3663  014772  015620                          SAVPC
3664  014774  104006                  ERRORR: RESOS
3665
3666                                          ;ERROR HALT SERVICE
3667
3668  014776  032767  100000  162564  ERRORH: BIT     #SW15,SWR
3669  015004  001405                          BEQ     ERRORX
3670  015006  010046                          PUSHRO
3671  015010  016700  000604                  MOV     SAVPC,RO
3672  015014  000000                          HALT
3673  015016  012600                          POPRO
3674  015020  012767  000001  000762  ERRORX: MOV     #1,ERRFLG
3675  015026  000002                          RTI
3676
3677                                          ;CHANNEL ADDRESS ERROR SERVICE
3678
3679  015030  104004                  ERRC:SAVOSP
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
```

```
3685  015050  015626                          SAVR5
3686  015052  015630                          SAVR4
3687  015054  000747                          BR      ERRORR
3688
3689
3690                                          ;INTERGER BINARY TO BCD ASCII CONVERSION
3691                                          ;TYPE LEADING 0S, NO CR-LF
3692
3693  015056  005067  000226          BCDSCD: CLR     SUOFLG                  ;TYPE LEADING 0S
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 0S
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 0S
3704  015122  012767  000012  000362          MOV     #10.,RADIX              ;SET UP FOR BCD
3705  015130  012767  000005  000512          MOV     #5,CHRCNT               ;SET UPT 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  DCBCD:  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 0S
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          BCDACD: CLR     CCRFLG                  ;TYPE CARRIAGE RETURN AND LINE FEED
3731  015214  012767  000001  000066          MOV     #1,SUOFLG               ;SUPPRESS LEADING 0S
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 COVERSION 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)+,WRDCNT            ;GET NUMBER OF WORDS TO BE CONVERTED
```

```
 3741  015252  013567  000230          BINAS1: MOV     @(R5)+,BINWRD
 3742  015256  016700  000366                  MOV     CHRCNT,R0
 3743  015262  012701  016352                  MOV     #TEMTAB,R1
 3744  015266  104007                  BINS1A: EXTRACT
 3745  015270  062767  000060  000212          ADD     #60,DIGIT
 3746  015276  116721  000206                  MOVB    DIGIT,(R1)+
 3747  015302  005300                          DEC     R0
 3748  015304  001370                          BNE     BINS1A
 3749  015306  005727                          TST     (PC)+
 3750  015310  000000                  SUOFLG: 0
 3751  015312  001411                          BEQ     BINAS3
 3752  015314  016700  000330                  MOV     CHRCNT,R0
 3753  015320  010102                          MOV     R1,R2
 3754  015322  122742  000060          BINAS2: CMPB    #60,-(R2)
 3755  015326  001003                          BNE     BINAS3
 3756  015330  005300                          DEC     R0
 3757  015332  001401                          BEQ     BINAS3
 3758  015334  000772                          BR      BINAS2
 3759  015336  016700  000306          BINAS3: MOV     CHRCNT,R0
 3760  015342  114124                  BINS3A: MOVB    -(R1),(R4)+
 3761  015344  005300                          DEC     R0
 3762  015346  001375                          BNE     BINS3A
 3763  015350  112724  000040                  MOVB    #40,(R4)+
 3764  015354  005367  000262                  DEC     WRDCNT
 3765  015360  001334                          BNE     BINAS1
 3766  015362  112744  000000                  MOVB    #0,-(R4)
 3767  015366  010516                          MOV     R5,(SP)
 3768  015370  005727                          TST     (PC)+
 3769  015372  000000                  CORFLG: 0
 3770  015374  001003                          BNE     BINAS4
 3771  015376  104003                          TYPE
 3772  015400  016014                          MBCD
 3773  015402  000002                          RTI
 3774  015404  104003                  BINAS4: TYPE
 3775  015406  016016                          MBCD+2
 3776  015410  000002                          RTI
 3777
 3778
 3779                                          ;SINGLE PRECISION UNSIGNED DIVIDE LOOP
 3780
 3781  015412  005067  000072          DIVI:   CLR     DIVIDH
 3782  015416  026767  000066  000066  DIVIU:  CMP     DIVIDH,DIVIS
 3783  015424  103027                          BHIS    DIVIB
 3784  015426  012767  000021  000032          MOV     #17.,DIVCNT
 3785  015434  000407                          BR      DIVIC
 3786  015436  026767  000046  000046  DIVIA:  CMP     DIVIDH,DIVIS
 3787  015444  103403                          BLO     DIVIC
 3788  015446  166767  000040  000034          SUB     DIVIS,DIVIDH
 3789  015454  006167  000026          DIVIC:  ROL     DIVIDL
 3790  015460  006167  000024                  ROL     DIVIDH
 3791  015464  005327                          DEC     (PC)+
 3792  015466  000000                  DIVCNT: 0
 3793  015470  001362                          BNE     DIVIA
 3794  015472  006067  000012                  ROR     DIVIDH
 3795  015476  005167  000004                  COM     DIVIDL
 3796  015502  000002                          RTI
```

```
 3797  015504  000000                    DIVIB:  HALT
 3798  015506  000000                    DIVIDL: 0
 3799  015510  000000                    DIVIDH: 0
 3800  015512  000000                    DIVIS:  0
 3801
 3802
 3803                                    ;SAVE PC OF TEST THAT FAILED AND R0-R5
 3804
 3805  015514  016667  000004  000076    SVOSP:  MOV     4(SP),SAVPC
 3806
 3807                                    ;SAVE R0-R5
 3808
 3809  015522  010567  000100            SVOS:   MOV     R5,SAVR5
 3810  015526  010467  000076                    MOV     R4,SAVR4
 3811  015532  010367  000074                    MOV     R3,SAVR3
 3812  015536  010267  000072                    MOV     R2,SAVR2
 3813  015542  010167  000070                    MOV     R1,SAVR1
 3814  015546  010067  000066                    MOV     R0,SAVR0
 3815  015552  000002                            RTI
 3816
 3817                                    ;RESTORE R0-R5
 3818
 3819  015554  016700  000060            RSOS:   MOV     SAVR0,R0
 3820  015560  016701  000052                    MOV     SAVR1,R1
 3821  015564  016702  000044                    MOV     SAVR2,R2
 3822  015570  016703  000036                    MOV     SAVR3,R3
 3823  015574  016704  000030                    MOV     SAVR4,R4
 3824  015600  016705  000022                    MOV     SAVR5,R5
 3825  015604  000002                            RTI
 3826
 3827                                    ;TELETYPE OUTPUT ROUTINE
 3828
 3829
 3830
 3831
 3832
 3833                                    ;PROGRAM VARIABLES
 3834
 3835  015606  000000                    MTRFLG: 0
 3836  015610  000000                    PASCNT: 0
 3837  015612  000000                    RETURN: 0
 3838  015614  000000                    ICOUNT: 0
 3839  015616  000000                    TSTNO:  0
 3840  015620  000000                    SAVPC:  0
 3841  015622  000000                    SAVPS:  0
 3842  015624  000000                    SAVSP:  0
 3843  015626  000000                    SAVR5:  0
 3844  015630  000000                    SAVR4:  0
 3845  015632  000000                    SAVR3:  0
 3846  015634  000000                    SAVR2:  0
 3847  015636  000000                    SAVR1:  0
 3848  015640  000000                    SAVR0:  0
 3849  015642  000000                    WRDCNT: 0
 3850  015644  000000                    DELAY:  0
 3851
 3852
```

```
3853                                        ;VARIABLES
3854
3855  015646  000000                INCNT:  0
3856  015650  000000                CHRCNT: 0
3857  015652  000000                OUTCHN: 0
3858  015654  000000                INCHAN: 0
3859  015656  000000                CNTR1:  0
3860  015660  000000                CNTR4:  0
3861  015662  000000                CNTR5:  0
3862  015664  000000                POINT1: 0
3863  015666  000000                POINT2: 0
3864  015670  000000                ECONT1: 0
3865  015672  000000                EC      0
3866  015674  000000                P       0
3867
3868
3869                                        ;PROGRAM CONTROL PARAMETERS
3870
3871  015676  000000                SYSUN:  0
3872  015700  000000                SYSUNB: 0
3873  015702  000001                SAMPLE: 1
3874  015704  000000                LOGGN:  0
3875  015706  000000                LOGAIN: 0
3876  015710  000000                LGAIND: 0
3877  015712  000000                HGAIND: 0
3878  015714  000000                HIGAIN: 0
3879  015716  000000                LOCHAN: 0
3880  015720  000037                HICHAN: 37
3881  015722  000000                MAXCHN: 0
3882  015724  000001                VSF:    1
3883  015726  000000                ADRESD: 0
3884  015730  000001                ADRES:  1
3885  015732  000000                ADBIT:  0
3886  015734  000000                ADMSK:  0
3887  015736  000037                CHNCNT: 37
3888  015740  000000                RERES:  0
3889  015742  000000                SAMTAB: 0
3890
3891
3892                                        ;INDIRECT POINTERS
3893
3894  015744  000134                AFCINT: 134
3895  015746  000136                AFCPS:  136
3896  015750  172570                AFCSR:  172570
3897  015752  172572                AFDBR:  172572
3898  015754  172574                AFCAR:  172574
3899  015756  172576                AFCMN:  172576
3900  015760  177560                TKCSR:  177560
3901  015762  177562                TKDBR:  177562
3902  015764  177564                TPCSR:  177564
3903  015766  177566                TPDBR:  177566
3904  015770  000000                CPRET:  0
3905  015772  005040                CRRET:  REPORT
3906
3907
3908                                        ;PROGRAM CONTROL FLAGS
```

```
3909
3910  015774  000000                    CPFLG:  0
3911  015776  000000                    CRFLG:  0
3912  016000  000000                    TYPFLG: 0
3913  016002  000000                    GFLG:   0
3914  016004  000000                    VSFFLG: 0
3915  016006  000000                    REPFLG: 0
3916  016010  000000                    ERRFLG: 0
3917  016012  000000                    SINTFL: 0
3918
3919  016014  005015                    MBCD:   .ASCII  <15><12>;;
3920          016116                    .=.+100
3921                                    .EVEN
3922
3923
3924                                            ;EMT DISPATCH TABLE
3925
3926  016116  015030                    EMTTAB: ERRC
3927  016120  014570                            LOOP
3928  016122  014712                            FREEZE
3929  016124  001176                            TYPER
3930  016126  015514                            SVOSP
3931  016130  015162                            OCTASN
3932  016132  015554                            RSOS
3933  016134  015412                            DIVI
3934  016136  014754                            ERR
3935  016140  015210                            BCDACO
3936  016142  012572                            ADBIN
3937  016144  010252                            INSTRR
3938  016146  010454                            INSTRE
3939  016150  010540                            BCDBNN
3940  016152  015416                            DIVIU
3941  016154  011710                            SUADD
3942  016156  015140                            DCBCC
3943  016160  007136                            AVRGG
3944  016162  015150                            DCBCO
3945  016164  015056                            BCDSCO
3946  016166  015412                            DIVI
3947  016170  006746                            AVREGG
3948  016172  011624                            DISPT
3949  016174  015106                            BCDSN
3950  016176  011532                            MULTI
3951  016200  000000                    EMTLIM: 0
3952          016222                    .=.+20
3953  016222  001576                    TSTTAB: T0
3954  016224  000001                            1
3955  016226  001632                            T1
3956  016230  004000                            4000
3957  016232  001672                            T2
3958  016234  004000                            4000
3959  016236  001732                            T3
3960  016240  004000                            4000
3961  016242  002042                            T4
3962  016244  004000                            4000
3963  016246  002150                            T5
3964  016250  004000                            4000
```

```
3965  016252  002204                          T6
3966  016254  004000                          4000
3967  016256  002240                          T7
3968  016260  004000                          4000
3969  016262  002350                          T10
3970  016264  004000                          4000
3971  016266  002470                          T11
3972  016270  004000                          4000
3973  016272  002610                          T12
3974  016274  004000                          4000
3975  016276  002730                          T13
3976  016300  004000                          4000
3977  016302  003056                          T14
3978  016304  004000                          4000
3979  016306  003332                          T16
3980  016310  004000                          4000
3981  016312  003460                          T17
3982  016314  000100                          100
3983  016316  003606                          T20
3984  016320  000100                          100
3985  016322  003716                          T21
3986  016324  000100                          100
3987  016326  003770                          T22
3989  016330  000100                          100
3989  016332  004036                          T23
3990  016334  000100                          100
3991  016336  004114                          T24
3992  016340  000100                          100
3993  016342  004210                          T25
3994  016344  000100                          100
3995  016346  014450                          EOP
3996  016350  000001                          1
3997  016352  000000          TEMTAB:  0
3998          016430                .=.+54
3999  016430  000000          HTAB:    0
4000          016504                .=.+52
4001  016504  000000          DATAB:   0
4002          000001                .END
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
ADBIN   012572          3190*   3460    3478    3936
ADBINA  012600          3193*   3215
ADBINB  012720          3201    3207    3213    3216*
ADBIT   015732          2173    2175    2538    2540    3197*   3203*   3209*   3885*
ADCAL   005425          2188*   3401
ADCALI  005522          2193    2204*
ADCALN  005556          2209*   2212    2214*
ADCALT  005542          2206    2209*
ADCALI  005450          2195*   2202
ADINTA  002316          1599    1608*
ADINTJ  003674          1859    1870*
ADLNGT= 104012          1000*   1405
ADMSK   015734          2176    2541    3198*   3204*   3210*   3886*
ADRES   015730          2059    2298    2551    2661    3196*   3202*   3208*   3884*
ADRESD  015726          3195*   3506    3526    3883*
ADT1    001732          1519*
ADT1A   001766          1523    1525*   1528
ADT1B   002004          1526    1530*
ADT1C   002020          1532    1534*
ADT1D   002040          1536    1538*
ADT1O   002470          1655*
ADT1OA  002552          1664*   1665
ADT1OB  002564          1658    1668*
ADT1OC  002570          1667    1670*
ADT11   002610          1683*
ADT11A  002672          1692*   1693
ADT11B  002704          1686    1696*
ADT11C  002710          1695    1698*
ADT12   002730          1711*
ADT12A  003012          1720*   1721
ADT12B  003034          1714    1726*
ADT12C  003036          1725    1727*
ADT13   003056          1740*
ADT13A  003140          1749*   1750
ADT13B  003162          1743    1755*
ADT13C  003164          1754    1756*
ADT14   003204          1769*
ADT14A  003266          1778*   1779
ADT14B  003310          1772    1784*
ADT14C  003312          1783    1785*
ADT15   003336          1798*
ADT15A  003414          1807*   1808
ADT15B  003436          1801    1813*
ADT15C  003440          1812    1814*
ADT16   003460          1827*
ADT16A  003542          1836*   1837
ADT16B  003564          1830    1842*
ADT16C  003566          1841    1843*
ADT2    002042          1546*
ADT2A   002110          1553*   1554
ADT2B   002130          1548    1558*
ADT2C   002146          1557    1562*
ADT2OA  003644          1863*   1864
ADT2OB  003676          1869    1871*
ADT2OT  003606          1857*
ADT3    002150          1569*
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
ADT3A   002174          1572    1574#   1575
ADT4    002204          1583#
ADT4A   002230          1586    1598#   1589
ADT6    002240          1598#
ADT6A   002304          1604#   1605
ADT6B   002330          1607    1610    1612#
ADT7    002350          1627#
ADT7A   002432          1636#   1637
ADT7B   002444          1630    1640#
ADT7C   002450          1639    1642#
AFCAR   015754          1469    1886*   1903*   1924*   1946*   1972*   1978*   1979    1985*   1986    2039*   2146*   2247*
                        2319*   2345*   2354*   2365*   2424*   2473*   2492*   2702*   3898#
AFCINT  015744          1548*   1559*   1599*   1613*   1630*   1643*   1658*   1671*   1686*   1699*   1714*   1728*   1743*
                        1757*   1772*   1786*   1801*   1815*   1830*   1844*   1859*   1872*   2193*   3894#
AFCMN   015756          1475    1500*   1501    1504*   1505    1521*   1522    1534*   1535    1551*   1570*   1584*   1585
                        1603*   1635*   1663*   1691*   1719*   1749*   1777*   1806*   1835*   1862*   1885*   1925    1930
                        1945*   1950    1968*   2038*   2132*   2136*   2196*   2199*   2231*   2275*   2276*   2280*   2314*
                        2344*   2346    2355    2366    2418*   2469*   2487*   3899#
AFCPS   015746          1549*   1559    1560*   1600*   1613    1614*   1631*   1643    1644*   1659*   1671    1672*   1687*
                        1699    1700*   1715*   1728    1729*   1744*   1757    1758*   1773*   1786    1787*   1802*   1815
                        1816*   1831*   1844    1945*   1860*   1872    1873*   2194*   3895#
AFCSR   015750          1463    1484*   1485    1488*   1489    1525    1531    1550*   1553    1571    1574    1588    1602*
                        1604    1609    1612*   1628*   1634*   1636    1642*   1656*   1662*   1664    1670*   1684*   1690*
                        1692    1698*   1712*   1716*   1720    1727*   1741*   1745*   1749    1756*   1770*   1774*   1778
                        1785*   1799*   1803*   1807    1814*   1828*   1832*   1836    1843*   1863    1865*   1871*   1884*
                        1887    1904    1907    1909    1922*   1928    1943*   1947    1955    1969*   2037*   2040    2131*
                        2135*   2147    2197*   2232*   2272*   2277    2281    2315*   2417*   2425    2468*   2474    2486*
                        2493    2701*   2703    2706    3896#
AFDBR   015752          1530    1547    1629    1657    1685    1713    1742    1771    1800    1929    1892    1912    1923
                        1933    1958    1970    2042    2149    2204    2279    2283    2427    2476    2495    2705    3897#
ALTMOD  013070          3271#   3301
ALTMO1  013106          3274    3276#
AMCAL   005560          2223#   3413
AMCALP  005600          2223    2226#
AMPC1   005652          2237#
AMPC2   005670          2236    2240#
AMPGO   005642          2235#   2252
AMPGO1  005702          2239    2242#
AMPGO2  005724          2247#   2256
AVREG =  104025         1022#   2677
AVREGG  006746          2452#   3451    3947
AVRG  =  104021         1014#   2452    2537
AVRGG   007136          2505#   3943
AVRG1   007152          2509#   2514
AVRG2   007232          2523    2525#
AVRG2A  007226          2520    2524#
BCDACO  015210          3730#   3935
BCDASC=  104011          998#   1400    2085    2376
BCDASN=  104027         1026#   2107    2122    2588    2669    2674    2714    3086
BCDASO=  104023         1018#   2114    2118
BCDBN =  104015         1006#   3021    3041    3060    3101    3128    3143    3175    3193    3223
BCDBNN  010540          2800#   3939
BCDBN1  010550          2803#   2841
BCDBN2  010566          2806#   2838
BCDBN3  010600          2809#   2835
BCDBN4  010636          2812    2820#
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
BCDCNT  010730          2801* 2805  2845#
BCDERR  010720          2814  2816  2818  2821  2823  2826  2840#
BCDEXT  010706          2810  2819  2836#
BCDFIN  011340          2927* 2945  2956
BCDFN1  011404          2935  2939#
BCDSCD  015056          3693# 3945
BCDSN   015106          3702# 3949
BCDTAB  010724          2804  2842#
BCDWD1  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
BCDWD2  010726          2844# 3147  3150  3151* 3153  3155
BINASC  015240          3697  3706  3724  3734  3738#
BINAS1  015252          3741# 3765
BINAS2  015322          3754# 3758
BINAS3  015336          3751  3755  3757  3759#
BINAS4  015404          3770  3774#
BINS1A  015266          3744# 3748
BINS3A  015342          3760# 3762
BINWRD= 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  2134  2142  2159  3155* 3156* 3157  3887#
CHRCNT  015650          2737* 2757* 2806* 2813  2825* 2871* 2901* 3273  3696* 3705* 3723* 3733* 3742
                        3752  3759  3856#
CLCVNZ= 000257           961# 2151
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* 2159* 2178* 2364* 2384* 3860#
CNTR5   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* 2689* 3062* 3067* 3530
                        3911#
CRRET   015772          3296  3905#
DATA    006576          2403# 3421
DATAB   016504           921   938   946  2050  2133  2143  2160  2161  2419  2439  2505  2533  2546
                        2612  3159  4001#
DATAP   006616          2405  2406# 2408  2480
DATA1   006156          2088* 2093  2279* 2284  2297  2300* 2303# 2366* 2367* 2368* 2369* 2372  2379
```

```
                    2441*   2444    2453*   2458    2495*   2498    2661*   2664
DATA2   006160      2090*   2094    2283*   2285    2298    2300    2304*   2370*   2371*   2372    2378
DATLST  014026      2407    3440#
DCBCC   015140      3710#   3942
DCBCO   015150      3716#   3944
DECBB1  010752      2857#   2931
DECBC   010734      2853#   3711    3717
DECBCA  011132      2885#   2899    2902
DECBCB  011234      2907#
DECBCC= 104022      1016#   2091    2456    2662
DECBCD= 104020      1012#   2442    2496
DECBC1  011036      2866    2870#
DECBC2  011124      2874    2877    2880    2884#
DECBC3  011214      2883    2898#
DECBC4  011222      2888    2897    2900#
DECB1   011012      2862    2864#
DECEDN  011326      2920    2925#
DECED1  011334      2926#   2955
DECEG   011430      2912    2946#
DECEGA  011440      2947    2950#
DECEG1  011446      2951#
DECEG2  011476      2913    2949    2957#
DECEN   011266      2915#   2917
DECEX   011252      2909    2911#
DECEXP  011530      2859*   2861    2863*   2896*   2898*   2911    2916*   2950    2954    2967#
DECEO   011300      2918#   2958
DECEO1  011306      2919#   2924
DECMOV  011504      2926    2951    2959#   2962
DECOA1  006346      2349    2352#
DECOB1  006410      2358    2361#
DECOD   006240      2334#   3429
DECODA  006314      2345#   2353    2387    2391
DECODB  006356      2347    2354#   2362
DECODC  006420      2356    2363#
DECODD  006542      2373    2382#
DECODE  006532      2375    2380#
DECODP  006260      2334    2337#
DECOD1  006434      2365#   2381    2385
DECSGN  011524      2864*   2869*   2908    2965#
DECO    011412      2867    2942#
DELAY   015644      1520*   1527*   1883*   1889*   1944*   1953*   3850#
DELAY1  006236      2318    2323#
DIGDON  011174      2891    2894#
DIGEXT  011156      2890#   2893
DIGIT =  015510      941#   3745*   3746
DISLST  011706      2998*   3003    3014#
DISPAT= 104026      1024#   2002    2406    2692
DISPA1  011644      3003#   3013
DISPA2  011654      3005#   3011
DISPA3  011676      3006    3010#
DISPLY  006772      2465#   3453
DISPL1  007016      2472#   2479
DISPL2  007030      2474#   2475
DISPT   011624      2996#   3948
DIVCNT  015466      3784*   3792#
DIVI    015412      3781#   3933    3946
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
DIVIA   015436          3786*   3793
DIVIB   015504          3783    3797*
DIVIC   015454          3785    3787    3789*
DIVIDE= 104024          1020*   2599
DIVIDH  015510           941     943    2164*   2516*   3781*   3782    3786    3788*   3790*   3794*   3799*
DIVIDL  015506           940     942    2163*   2517*   2597*   3789*   3795*   3798*
DIVIDU= 104016          1008*   2165    2518
DIVIS   015512           939    2162*   2515*   2598*   3782    3786    3788    3800*
DIVIU   015416          3782*   3940
DONE  = 000200           950*
ECONTH  015672          2000*   2022*   2099*   2112    2117    3070*   3865*
ECONTL  015670          1999*   2021*   2096*   2098*   2120    2124    3069*   3864*
EMODE   012050          3057*   3486    3495
EMODER  012130          3066    3072*
EMODE1  012056          3060*   3073
EMODE2  012112          3064    3068*
EMONOT  013634          2293    3384*
EMTLIM  016200          3951*
EMTOK   014550          3602    3605*
EMTSRV  014526          1302    3598*
EMTTAB  016116          3607    3926*
ENABLE= 000100           949*
ENDCOD= 016504           946*
EOP     014450          3576*   3995
ERR     014754          3658*   3934
ERRC    015030          3679*   3926
ERRFLG  016010          1445*   3616    3636*   3644    3674*   3916*
ERROR = 104010           996*   1465    1471    1477    1487    1491    1503    1507    1524    1529    1533    1537    1561
                        1573    1587    1606    1611    1641    1669    1697    1724    1753    1782    1811    1840    1868
                        1891    1906    1911    1927    1932    1949    1952    1957    1988
ERRORC= 104000           980*   1982
ERRORH  014776          3668*
ERRORR  014774          3660    3664*   3681    3687
ERRORX  015020          3669    3674*
EXTRAC= 104007           994*   3744
FREEZE  014712          3644*   3928
FREEZX  014746          3645    3649    3652*
GAIN1   012202          3098*   3443    3474    3492    3513
GAIN1A  012210          3101*   3119
GAIN1B  012224          3105*   3117
GAIN1C  012274          3106    3115*
GFLG    016002          2233*   2242    2244*   2255*   3913*
GNEXP   014324          2859    3544*
GNLST   014302          3103    3535*
GNSCL   014334          2860    3548*
HGAIND  015712          3877*
HICHAN  015720          3150*   3520    3880*
HIGAIN  015714          2238*   2241*   2253    3878*
HIOUT   005744          2243    2253*
HISTC1  007340          2552*   2555
HISTC2  007350          2553    2556*
HISTG1  007502          2597*   2605
HISTG2  007530          2601    2603*
HISTN1  007652          2635*   2638
HISTO   007242          2531*   3458
HISTOA  007246          2532*   2534
```

```
HISTOB  007314          2539    2546#
HISTOC  007324          2548#   2568
HISTOD  007364          2557    2560#
HISTOE  007400          2561    2564#
HISTOF  007410          2559    2563    2567#
HISTOG  007454          2573    2577    2579    2586#
HISTOH  007546          2608#   2613
HISTOI  007556          2609    2612#
HISTOK  007572          2621#   2644
HISTOM  007622          2627#   2633
HISTON  007640          2629    2631#
HISTOP  007666          2636    2639#
HISTOR  007732          2650#   2652
HISTOS  007752          2655#   2657
HISTOT  010000          2662#
HISTVA  007434          2576#   2581
HTAB    016430          2594    2595    2606    2626    2682    3999#
HTABA   010050          2565    2682#
ICOUNT  015614          1451*   2700*   2717*   3624*   3635*   3638*   3838#
INBUF   014422          2732    2738    2778    2803    3004    3170    3568#
INCHAN  015654          3858#
INCNT   015646          2708*   2710*   2711    2713    2716    2728*   2733    2739    3855#
INIT1   001576          1463#
INIT2   001606          1469#
INIT3   001616          1475#
INIT4   001632          1484#
INIT5   001652          1488#
INIT7   001672          1500#
INIT8   001712          1504#
INSTER= 104014          1004#   2791    2840    3012    3025    3049    3072    3118    3134    3161    3184    3214    3229
INSTEX  010462          2770#   3276
INSTR = 104013          1002#   1411    3000    3018    3038    3057    3098    3125    3140    3167    3190    3220
INSTRA  010302          2734#   2736
INSTRB  010324          2740#   2743    2758    2765
INSTRC  010364          2749#   2750
INSTRE  010454          2756    2767#   3275    3938
INSTRR  010252          2726#   3937
INSTR1  010266          2730#   2769
INSTR2  010272          2732#   3281
INSTR3  010340          2741    2744#
KEYEX   001522          1428    1430    1432#
KEYINP  001456          1419    1422#
KEYINR  001500          1423    1425    1427#
KEYINT  001440          1305    1418#
LGAIND  015710          3108*   3502    3522    3876#
LIST    006716          2439#   3449
LISTC   007060          2486#   3456
LISTC1  007104          2492#   2499
LISTC3  007112          2493#   2494
LISTI   006726          2441#   2446
LOCHAN  015716          2033    2053    2144    2421    2470    2488    2695    3132*   3149*   3500    3518    3879#
LOGAIN  015706          2034    2145    2237*   2240*   2245    2422    2471    2490    2696    3104*   3107    3109*   3110*
                        3111*   3112*   3113*   3115*   3875#
LOGGN   015704          2858    3107*   3874#
LOGIC1  001532          1379    1443#   3417
LOOP    014570          3616#   3927
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
LOOPER  014634          3626#   3639
LOOPL   014702          3621    3638#
LOOPS   014606          3617    3620#
LOOPX   014642          3619    3623    3625    3628#   3647
LVL   = 177777          1620#   1621    1647#   1649    1675#   1677    1703#   1705    1732#   1734    1761#   1763    1790#
                        1792    1819#   1821    1848#
M     = 000001           973#    974
MADRES  013530          3191    3367#   3505    3525
MASTER  013251          3001    3326#
MAVRG   013255          2455    3327#
MAXCHN  015722          1393*   1395*   1402    3043    3153    3881#
MAX4K = 000135           921#   1395
MBCD    016014          2855    2937    2940    3739    3772    3775    3919#
MCHANA  013334          3126    3141    3339#   3499    3517
MCNT    011600          2974*   2982#
MCOMMA  013223          3318#   3519
MCONTC  013231          3266    3320#
MCONTP  013234          3286    3321#
MCONTR  013237          3294    3322#
MCRLF   013244          2720    3272    3324#
MDECOD  013504          2389    3362#
MEMODE  013565          3058    3373#   3529
MERROR  013614          2111    3378#
MGAIN   013270          3099    3332#   3501    3521
MLOGIC  013474          3360#   3579
MMAXCH  013371          1404    3345#
MMPC    011622          2975*   2978    2990#
MONIT   001402          1383    1406#   2203    3259    3267
MONIT1  001426          1411#
MONOT   005762          2267#   3409
MONOTA  006034          2277#   2278
MONOTC  006056          2281#   2282
MONOTO  006146          2289    2300#
MONOT1  006026          2276#   2299
MONOT2  006050          2280#   2302
MONOT3  006106          2286    2288#
MONOT4  006134          2291    2295#
MORANG  013436          2673    3353#
MPASS   013602          2106    3376#
MPCND   011620           945    2882*   2884*   2975    2980*   2985*   2989#
MPER    013217          1412    3317#
MPFAIL  013351          3258    3342#
MPYERH  011616          2885*   2976*   2988#
MPYERL  011614           944    2973*   2978*   2979*   2987#
MQMARK  013225          2768    3319#
MR      013514          1447    2024    2189    2228    2268    2311    2339    2416    2466    3364#
MREPET  013464          2077    3358#
MREPRE  013547          3221    3370#   3527
MRUBOU  013247          3280    3325#
MSAMP   013302          3039    3334#   3503    3523
MSG     010270          2727*   2731#
MSPACE  013242          1361    3323#
MSUAD   013314          3019    3336#
MTITLE  013171          1399    3313#
MTRFLG  015606          1382    1384*   3835#
MULTA   011552          2976#   2983
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
MULTI   011532            2973#   3950
MULTPY= 104030            1028#   2886
MULTU   011536            2974#
MURANG  013453            2668    3356#
MVDIV   013431            2666    3352#
MVSF    013422            2587    3350#
MVSFI   013520            3168    3365#   3507
MXBAD   013674            2360    3390#
MXTIM   006162            2310#   3405
MXTIMA  006230            2320#   2321
MXTIM1  006220            2318#   2322
MXT1    003716            1882#
MXT1A   003744            1887#   1890
MXT1B   003762            1888    1892#
MXT2    003770            1902#
MXT2A   004012            1905    1907#   1908
MXT2B   004030            1910    1912#
MXT3    004036            1921#
MXT3A   004070            1926    1928#   1929
MXT3B   004106            1931    1933#
MXT4    004114            1942#
MXT4A   004154            1948    1950#
MXT4B   004164            1951    1953#   1954
MXT4C   004206            1956    1959#
MYBAD   013704            2351    3392#
N     = 000026             967#    968    1458   1459#  1482   1483#  1498   1499#  1517   1518#  1544   1545#  1567
                          1568#   1581   1582#  1596   1597#  1625   1626#  1653   1654#  1681   1682#  1709   1710#
                          1738    1739#  1767   1768#  1796   1797#  1825   1826#  1855   1856#  1880   1881#  1900
                          1901#   1919   1920#  1940   1941#  1965   1966#
NOP   = 000240             960#
OCTASC= 104005             990#   2210   2295   3661   3682
OCTASN  015162            3720#   3931
OLOAD   010052            2689#   2691   3433
OLOADP  010072            2692#   2694
OLOADT  010100            2695#   3515
OLOAD1  010132            2700#   2721
OLOAD2  010140            2701#   2712   2718
OLOAD3  010204            2707    2710#
OLOAD4  010212            2709    2711#
OLOLST  014226            2693    3510#
ORANGE  010042            2535*   2558*  2676   2679#
OUTCHN  015652            2033*   2034*  2039   2044*  2053*  2068*  2087   2144*  2145*  2146   2154*  2229*  2246
                          2254    2363*  2365   2370   2382*  2488*  2490*  2492   3857#
PARAM   012146            3079    3081#  3091
PARAM1  012134            3078#   3464
PARAM2  012142            3080#   3488
PARL1   014200            3078    3499#
PARL2   014244            3080    3517#
PASCNT  015610            1449*   3576*  3836#
PASSC   015674            1998*   2020*  2073*  2109   3068*  3866#
PC    =%000007             932#   1339*  1346*  1351*  1357*  1360*  2027*  2180*  2926*  2951*  2963*  2981*  3583*
                          3749    3768   3791#
PDATA   012170            3082*   3088#
PFAIL   012760            1300    3234#
PMSG    012162            3081*   3085#
POINT1  015664            2006*   2007   2013*  2036*  2042*  2043*  2050*  2054   2066*  2088   2699*  2711   2713*
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
                    3862#
POINT2  015666      2051*   2055    2067*   2090    2695*   2696*   2702    3863#
POPRO  = 012600      957#   3673
POP1SP= 005726       955#
POP2SP= 022626       959#   1558    1608    1640    1668    1696    1726    1755    1784    1813    1842    1870
PRODH  = 011614      944#   2887    2890*   2895*   2900
PRODL  = 011620      945#
PS     = 177776      937#   1356    1359    1376*   1380*   1408*   1519*   1546*   1549    1552*   1556*   1569*   1583*
                    1598*   1600    1601*   1627*   1631    1632*   1633*   1655*   1659    1660*   1661*   1683*   1687
                    1688*   1689*   1711*   1715    1717*   1718*   1723*   1740*   1744    1746*   1747*   1752*   1769*
                    1773    1775*   1776*   1781*   1798*   1802    1804*   1805*   1810*   1827*   1831    1833*   1834*
                    1939*   1958*   1960    1961*   1967*   1982*   1902*   1921*   1942*   1967*   2010    2198*   2234*
                    2274*   2317*   2342*   2698*   3008*   3247*
PUSHRO= 010346       956#   3670
PUSH1S= 005746       954#   3589
PUSH2S= 024646       958#
PWRUP   013014      3242    3247#
QUOT   = 015506      942#   2171*   2172*   2173    2175*   2176*   2177    2453    2524*   2525*   2538    2540*   2541*
                    2548    2602*   2603
RADIX  = 015512      939#   3695*   3704*   3722*   3732*
REMAND= 015510       943#   2166*   2167    2169    2519*   2521    2600
REPAVA  005152      2137#   2140
REPAVB  005216      2146#   2156
REPAVC  005224      2147#   2148
REPAVD  005306      2162#   2179
REPAVG  005114      2027    2130#
REPAVI  005170      2142#   2158
REPAV3  005350      2168    2171#
REPAV4  005354      2170    2172#
REPAV5  005406      2174    2177#
REPERR  004756      2065    2083#
REPET   004466      2025#   2075    2078    3482
REPETA  004364      2005#   3470
REPETB  004434      2009    2015#   3496
REPETC  004400      2007#   2014
REPETE  004326      1997#   3425
REPETP  004356      2001    2002#   2004    2125
REPETR  004442      2019#   3484
REPETS  004500      2026    2028#
REPETI  004506      2033#   2072
REPET2  004546      2039#   2046
REPET3  004554      2040#   2041
REPET4  004640      2054#   2070
REPET5  004700      2066#   2095    2097    2100
REPET7  005020      2084    2096#
REPE4A  004656      2057    2059#
REPE4B  004662      2060#   2063
REPE4C  004672      2061    2064#
REPFLG  016006      2019*   2025    2130*   3915#
REPLST  014110      2003    3469#
REPORT  005040      2105#   3905
REPOR1  005102      2113    2122#
REPOR2  005110      2121    2125#
REPPAR  014162      2006    3491#
REPREA  012730      3223#   3230
REPREE  012754      3226    3229#
```

```
REPRES  012722          3220#   3480    3494
REPTRN  004424          2011    2013#
RERES   015740          2064    3227*   3528    3888#
RESOS = 104006           992#   3089    3664
RETURN  015612          1450*   3626    3633*   3837#
RSOS    015554          3819#   3932
RUBOUT  013112          3279#   3305
R0     =%000000          925#   1331    1332*   1334    1337*   2007*   2008    2012    2204*   2476*   2509*   2510*   2511
                        2827*   2829*   2830    2836    2858*   3043*   3044*   3045    3078*   3080*   3081    3082    3090
                        3234    3255*   3671*   3742*   3747*   3752*   3756*   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*   3583    3743*   3746*   3753    3760    3813    3820*
R2     =%000002          927#   2423*   2431*   2 40*   2445*   2508*   2512*   2516    2548*   2549*   2550*   2554*   2556
                        2560    2564*   2565*   2.06*   2596*   2604*   2607*   2608    2610*   2614*   2615    2759*   2760
                        2762    2763*   2764    2807*   2828    2832*   2833*   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*   2733*
                        2735*   2739*   2755*   2804*   2836*   2855*   2856*   2910*   2914*   2915*   2921*   2927*   2928*
                        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    2580    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*   2778*   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    3199*   3200    3205*   3206    3211*
                        3212    3238    3251*   3739*   3760*   3763*   3766*   3810    3823*
RS     =%000005          930#   1971*   1973    1975*   1976    1978    1980    1985    1991*   2245*   2246*   2247    2253*
                        2254*   2318*   2320*   2726*   2727    2728    2729    2777*   2779    2781    2793    2786    2787*
                        2788*   2789    2800*   2801    2802    2853*   2854    2857    2932    2997*   2998    2999    3239
                        3250*   3629*   3630*   3631*   3632*   3633    3634    3635    3738*   3740    3741    3767    3809
                        3824*
SAMPEL  012034          3046    3049#
SAMPL   012000          3038#   3445    3476    3493
SAMPLE  015702          2141    2162    2169    2420    2440    2506    2515    2521    2547    2578    3051*   3504    3524
                        3873#
SAMPL1  012006          3041#   3050
SAMPL2  012040          3048    3051#
SAMTAB  015742          2036    2051    3157*   3158*   3159*   3889#
SAVPC   015620          3663    3671    3684    3805*   3840#
SAVPS   015622          3841#
SAVR0   015640          3814*   3819    3848#
SAVR1   015636          3813*   3820    3847#
SAVR2   015634          3812*   3821    3846#
SAVR3   015632          3811*   3822    3845#
SAVR4   015630          3686    3810*   3823    3844#
SAVR5   015626          3685    3809*   3824    3843#
SAVSP   015624          3241*   3248    3842#
SAVOSP= 104004           988#   3083    3658    3679
SCALEF  011526          2860*   2873    2876    2966#
SCLTAB  014344          2674    3552#
SCOPE = 104001           982#   1478    1492    1508    1538    1562    1576    1590    1615    1645    1673    1701    1730
                        1759    1788    1817    1846    1874    1893    1913    1934    1959    1992
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
SCOPEF= 104002          984*   1983   1989
SINTFL  016012         1410*   1432*  2742   2744*  3917#
SP    =X000006          931#   1331*  1332   1333*  1334*  1336   1337   1340   1342*  1344*  1350   1354   1355*
                       1356*  1359*  1375*  1406*  2010*  2011*  2726   2729*  2785*  2800   2802*  2853   2932*
                       2997   2999*  3234*  3235*  3236*  3237*  3238*  3239*  3240*  3241   3248*  3249   3250
                       3251   3252   3253   3254   3255   3287*  3295*  3587*  3588*  3598*  3599*  3600*  3601
                       3605*  3606*  3607*  3608*  3609   3626*  3634*  3650*  3652*  3738   3767*  3805
SPCHR   010424         2746   2748   2759#
SPCHRA  010430         2760#  2766
SPCHR1  010442         2761   2763#
SPLST   013152         2759   3300#
STACK = 016704          938#   3587
START   001244         1308   1375#
START1  001342         1390   1395#
START2  001350         1394   1396#
STATUS= 177740         1619#  1621   1646#  1649   1674#  1677   1702#  1705   1731#  1734   1760#  1763   1789#
                       1792   1818#  1821   1847#
SUAD  = 104017         1010#  2226   2337
SUADD   011710         3018#  3941
SUAD1   011716         3021#  3026
SUAD2   011736         3024   3027#
SUOFLG  015310         3693*  3703*  3721*  3731*  3750#
SVDS    015522         3809#
SVOSP   015514         3805#  3930
SWR   = 177570          936#  2074   2201   2205   2235   2348   2352   2357   2361   2374   2380   2478   3619
                       3620   3622   3646   3648   3659   3668   3680
SW01  = 000002          920#
SW02  = 000004          919#
SW03  = 000010          918#
SW04  = 000020          917#
SW05  = 000040          916#
SW06  = 000100          915#
SW07  = 000200          914#
SW08  = 000400          913#
SW09  = 001000          912#   3648
SW10  = 002000          911#   3618   3646
SW11  = 004000          910#   3622
SW12  = 010000          909#
SW13  = 020000          908#   3659   3680
SW14  = 040000          907#   3620
SW15  = 100000          906#   3668
SYSUN   015676         3027*  3871#
SYSUNB  015700         2229   2345   2354   2363   3033*  3872#
TAKEN   006624         2415#  3447
TAKEN1  006660         2423#  2433
TAKEN2  006670         2425#  2426
TAKEN3  006710         2429   2431#  2432
TEMP1   010046         2615*  2628   2643*  2681#  2889*  2892*  2894
TEMTAB  016352         2531   2622   2634   2642   2645   2660   2870   2907   3743   3997#
TKCSR   015760         1381*  1409*  2005*  2015*  2195*  2230*  2273*  2316*  2343*  2472*  2697*  2740   3007*
                       3900#
TKDBR   015762         1418   1424   1429   2745   2747   2751   2752   2760   3901#
TPB     001242         1350*  1366#
TPCSR   015764         2749   3902#
TPDBR   015766         2751*  3903#
TPS     001240         1348   1365#
```

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

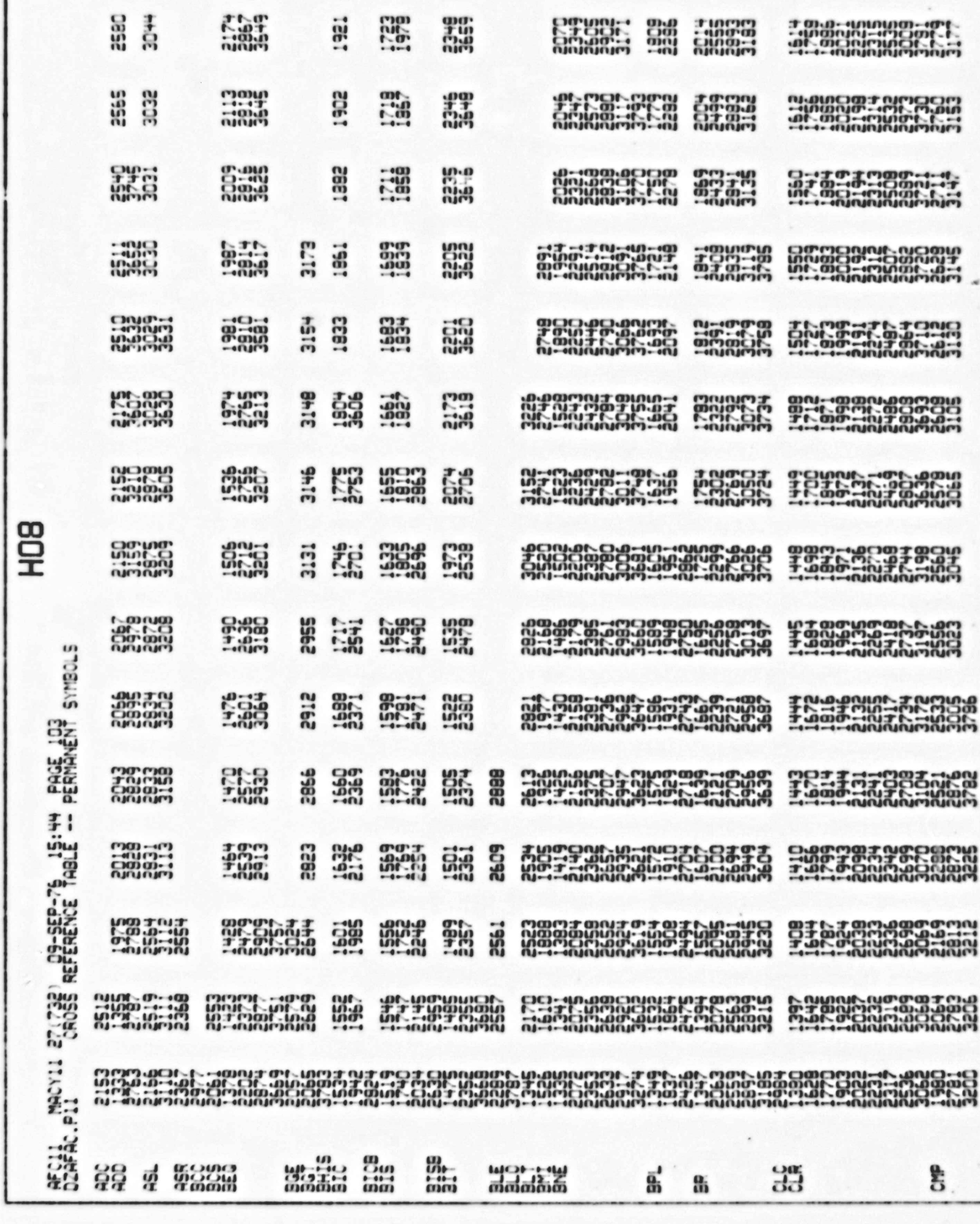
```
TRAC    014506          3581    3587#
TRACES  014524          1296    3591#
TRACOF  014516          3589#
TSTENT  014646          3590    3629#
TSTLST  013714          2777    3398#
TSTNAA  010470          2778#   2790
TSTNAM  010464          1414    2777#   2792
TSTNA1  010520          2780    2787#
TSTNA2  010524          2782    2788#
TSTNA3  010530          2784    2789#
TSTNO   015616          1448*   3577*   3628*   3629    3839#
TSTTAB  016222          3632    3953#
TYPE  = 104003           986#   1398    1403    1446    2023    2076    2105    2110    2188    2227    2267    2292    2310
                        2338    2350    2359    2388    2415    2454    2465    2586    2641    2659    2665    2667    2672
                        2719    2730    2767    2936    2939    3084    3257    3265    3271    3279    3285    3293    3578
                        3771    3774
TYPER   001176          1354#   3929
TYPER1  001220          1354*   1358#
TYPFLG  016000          2269*   2290    2294*   3912#
TO      001576          1450    1458#   3953
T1      001632          1482#   3955
T10     002350          1625#   3969
T11     002470          1653#   3971
T12     002610          1681#   3973
T13     002730          1709#   3975
T14     003056          1738#   3977
T15     003204          1767#
T16     003332          1796#   3979
T17     003460          1825#   3981
T2      001672          1498#   3957
T20     003606          1855#   3983
T21     003716          1880#   3985
T22     003770          1900#   3987
T23     004036          1919#   3989
T24     004114          1940#   3991
T25     004210          1965#   3993
T3      001732          1517#   3959
T4      002042          1544#   3961
T5      002150          1567#   3963
T6      002204          1581#   3965
T7      002240          1596#   3967
URANGE  010044          2536*   2562*   2671    2680#
VSF     015724          2575*   2580*   2590    2598    3173*   3181*   3508    3832#
VSFE    012566          3178    3180    3184#
VSFFLG  016004          2572    3172*   3182*   3914#
VSFIN   012474          3167#   3462
VSFINA  012502          3170#   3185
VSFIN1  012524          3174#   3183
VSFMAN  012526          3171    3175#
WRDCNT  015642          2854*   2929*   3740*   3764*   3849#
X     = 000017           972#    980     981#    982     983#    984     985#    986     987#    988     989#    990     991#
                         992     993#    994     995#    996     997#    998     999#   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#   1618#
                        1621    1648#   1649    1676#   1677    1704#   1705    1733#   1734    1762#   1763    1791#   1792
                        1820#   1821    1849#
```

F08

DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
XM      = 000001            974#
XN      = 000000            968#
$FILLS    001237           1364#
$NULL     001236           1342    1363#
$TYPE     001100           1331#   1357    1360
.       = 016506           1034#   1035    1037    1039    1041    1043    1045    1047    1049    1051    1053    1055    1057
                           1059    1061    1063    1065    1067    1069    1071    1073    1075    1077    1079    1081    1083
                           1085    1087    1089    1091    1093    1095    1097    1099    1101    1103    1105    1107    1109
                           1111    1113    1115    1117    1119    1121    1123    1125    1127    1129    1131    1133    1135
                           1137    1139    1141    1143    1145    1147    1149    1151    1153    1155    1157    1159    1161
                           1163    1165    1167    1169    1171    1173    1175    1177    1179    1181    1183    1185    1187
                           1189    1191    1193    1195    1197    1199    1201    1203    1205    1207    1209    1211    1213
                           1215    1217    1219    1221    1223    1225    1227    1229    1231    1233    1235    1237    1239
                           1241    1243    1245    1247    1249    1251    1253    1255    1257    1259    1261    1263    1265
                           1267    1269    1271    1273    1275    1277    1279    1281    1283    1285    1287    1289    1295#
                           1299#   1304#   1307#   1312#   1378    1464    1470    1476    1486    1490    1502    1506    2250
                           2704    2930    2977    3567#   3569#   3604    3920#   3952#   3998#   4000#
```

```
EMTDEF   973#    980    982    984    986    988    990    992    994    996    998   1000   1002   1004   1006
        1008   1010   1012   1014   1016   1018   1020   1022   1024   1026   1028
INT1     976#   1621   1649   1677
INT2     977#   1705   1734   1763   1792   1821
TM       975#
TS       969#   1458   1482   1498   1517   1544   1567   1581   1596   1625   1653   1691   1709   1738   1767
        1796   1825   1855   1880   1900   1919   1940   1965
.$CMTA     1#
.$CTYP     1#
.$TYPE     1#   1310
```



DZAFAC.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
CMPB    1340  1418  1424  1429  2372  2635  2637  2745  2747  2811  2817  2820  2822  2887  3170
        3754
COM     3795
DEC     2045  2069  2071  2139  2155  2157  2178  2249  2320  2384  2386  2428  2431  2445  2513
        2567  2604  2632  2643  2651  2656  2717  2735  2755  2825  2837  2901  2923  2929  2961
        2981  3205  3211  3624  3747  3756  3761  3764  3791
DECB    1344
EMT      980   982   984   986   988   990   992   994   996   998  1000  1002  1004  1006  1008
        1010  1012  1014  1016  1018  1020  1022  1024  1026  1028
HALT    1036  1038  1040  1042  1044  1046  1048  1050  1052  1054  1056  1058  1060  1062  1064
        1066  1068  1070  1072  1074  1076  1078  1080  1082  1084  1086  1088  1090  1092  1094
        1096  1098  1100  1102  1104  1106  1108  1110  1112  1114  1116  1118  1120  1122  1124
        1126  1128  1130  1132  1134  1136  1138  1140  1142  1144  1146  1148  1150  1152  1154
        1156  1158  1160  1162  1164  1166  1168  1170  1172  1174  1176  1178  1180  1182  1184
        1186  1188  1190  1192  1194  1196  1198  1200  1202  1204  1206  1208  1210  1212  1214
        1216  1218  1220  1222  1224  1226  1228  1230  1232  1234  1236  1238  1240  1242  1244
        1246  1248  1250  1252  1254  1256  1258  1260  1262  1264  1266  1268  1270  1272  1274
        1276  1278  1280  1282  1284  1286  1288  1290  3243  3603  3672  3797
INC     1527  1889  1953  1991  2044  2068  2073  2096  2099  2154  2171  2244  2382  2524  2558
        2562  2566  2602  2614  2631  2639  2757  2869  2892  2896  2898  2916  2922  2948  3115
        3156  3203  3204  3576  3628
JMP     1308  1379  1414  1421  1426  1431  2012  2125  2203  2252  2480  2762  2786  2931  3009
        3259  3267  3275  3276  3281  3288  3296  3590  3609  3711  3717
JSR     1339  1346  1357  1360  2027  2926  2951  3583
MOV     1331  1332  1337  1342  1354  1356  1359  1375  1376  1381  1384  1390  1391  1393  1395
        1396  1406  1409  1432  1450  1451  1484  1500  1520  1521  1548  1549  1551  1559  1570
        1584  1599  1600  1602  1603  1613  1630  1631  1634  1635  1643  1658  1659  1662  1663
        1671  1686  1687  1690  1691  1699  1714  1715  1716  1719  1728  1743  1744  1745  1748
        1757  1772  1773  1774  1777  1786  1801  1802  1803  1806  1815  1830  1831  1832  1835
        1844  1859  1860  1862  1865  1872  1945  1968  1979  1997  2001  2005  2006  2007  2010
        2011  2015  2028  2033  2035  2036  2039  2042  2050  2051  2052  2053  2054  2058  2088
        2090  2130  2133  2134  2141  2142  2143  2144  2146  2149  2159  2160  2161  2162  2163
        2164  2177  2193  2195  2196  2197  2199  2204  2209  2223  2224  2229  2230  2237  2238
        2240  2245  2247  2248  2253  2273  2275  2276  2279  2280  2283  2294  2300  2310  2406
        2318  2334  2335  2341  2343  2344  2345  2354  2363  2364  2365  2366  2370  2390  2404
        2405  2419  2420  2421  2423  2424  2427  2439  2440  2441  2453  2470  2472  2473  2476
        2488  2492  2496  2505  2506  2509  2515  2516  2517  2531  2546  2547  2548  2551  2574
        2575  2594  2595  2596  2597  2598  2603  2606  2607  2610  2621  2622  2626  2630  2634
        2645  2649  2654  2661  2690  2691  2695  2697  2700  2702  2710  2713  2726  2727  2728
        2729  2732  2733  2738  2739  2752  2759  2777  2778  2785  2800  2801  2802  2803  2804
        2805  2806  2830  2832  2836  2853  2854  2855  2857  2858  2870  2871  2889  2895  2907
        2918  2925  2932  2950  2953  2974  2975  2997  2998  2999  3003  3004  3007  3027  3033
        3043  3051  3067  3078  3080  3081  3082  3103  3107  3108  3132  3149  3150  3155  3157
        3173  3181  3182  3195  3196  3199  3227  3234  3235  3236  3237  3238  3239  3240  3241
        3242  3247  3248  3249  3250  3251  3252  3253  3254  3255  3287  3295  3377  3380  3387
        3588  3598  3600  3608  3626  3629  3633  3634  3635  3638  3650  3671  3674  3694  3695
        3696  3702  3703  3704  3705  3716  3722  3723  3731  3732  3733  3738  3739  3740  3741
        3742  3743  3752  3753  3758  3767  3784  3805  3809  3810  3811  3812  3813  3814  3819
        3820  3821  3822  3823  3824
MOVB    1334  1350  2623  2624  2625  2627  2640  2646  2647  2648  2650  2653  2655  2658  2751
        2754  2827  2856  2859  2860  2881  2894  2900  2910  2914  2915  2921  2927  2928  2933
        2942  2943  2944  2952  2957  2960  3745  3760  3763  3766
NEG     2058  2287  2550  2868
NOP     1407  1555  1638  1666  1694  1722  1751  1780  1809  1838  1866  2996  3584  3595  3596
RESET   1420  2207  2477  3256  3582
ROL     3789  3790
```

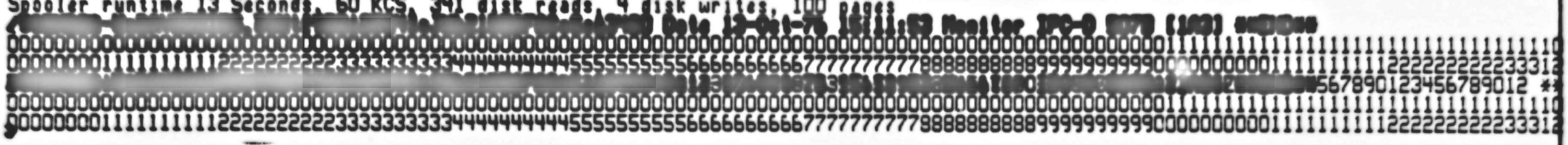
DZAFAC.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
ROR      2060    2062    2552    2976    2979    2980    2985    3794
RTI      1338    1362    1433    2208    2213    2430    2447    2459    2526    2678    2770    2839    2938    2941    2986
         3034    3052    3071    3092    3114    3133    3160    3174    3216    3228    3591    3627    3637    3651    3653
         3675    3773    3776    3796    3815    3825
RTS      1351    2180    2963
SUB      2055    2172    2285    2525    2549    2890    2954    3151    3599    3788
SWAB     3109
TST      1336    1377    1382    1392    1422    1427    1463    1469    1530    1547    1571    1585    1892    1904    1909
         1912    1923    1925    1930    1933    1947    1950    1958    1970    1976    1986    2008    2025    2056    2083
         2112    2167    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
TSTB     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    1955    2040
         2147    2277    2281    2425    2474    2493    2703    2740    2749    2809    2815    2861    2919    2946
WAIT     2200
.ABS      886
.ASCII   3384    3919
.ASCIZ   3313    3317    3318    3319    3320    3321    3322    3323    3324    3325    3326    3327    3332    3334    3336
         3339    3342    3345    3350    3352    3353    3356    3358    3360    3362    3364    3365    3367    3370    3373
         3376    3378    3388    3390    3392
.BYTE    1363    1364    3312    3544    3546
.END     4002
.EVEN    3394    3547    3551    3921
.LIST       1       2     884    1310
.MACR     969     973     975     976     977
.MACRO      1
.NLIST      1     884    1310
.PAGE    1310    1368    1435    2183    2218    2262    2327    2395
.REPT       2    1035    1621    1705    3028    3110
.SBTTL   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
 CORE USED:  15K  (29 PAGES)
```

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



```
  11                        ...B1    2404  006602  012767   ...B5
  59                        ...C1    2460  006770  000002   ...C5
  95                        ...D1    2516  007176  010267   ...D5
 151                        ...E1    2572  007414  005767   ...E5
 180                        ...F1    2628  007626  026723   ...F5
 224                        ...G1                           ...G5
 280                        ...H1    2692  010072  104026   ...H5
 336                        ...I1    2748  010362  100420   ...I5
 381                        ...J1    2804  010554  012703   ...J5
 437                        ...K1    2860  010770  116067   ...K5
 468                        ...L1    2916  011272  005267   ...L5
 503                        ...M1    2972                    ...M5
 557                        ...N1    3028  011744  006367   ...N5

 607                        ...B2    3084  012160  104003   ...B6
 648                        ...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    3482  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
1433  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  .$TYPE      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
                            ...L4
2336  006254      005067    ...M4
2370  006466      016767    ...N4
```