ACF11

DIAGNOSTIC

MD-11-DZAFA-C

EP-DZAFA-C-DL-A

FICHE 1 OF 1

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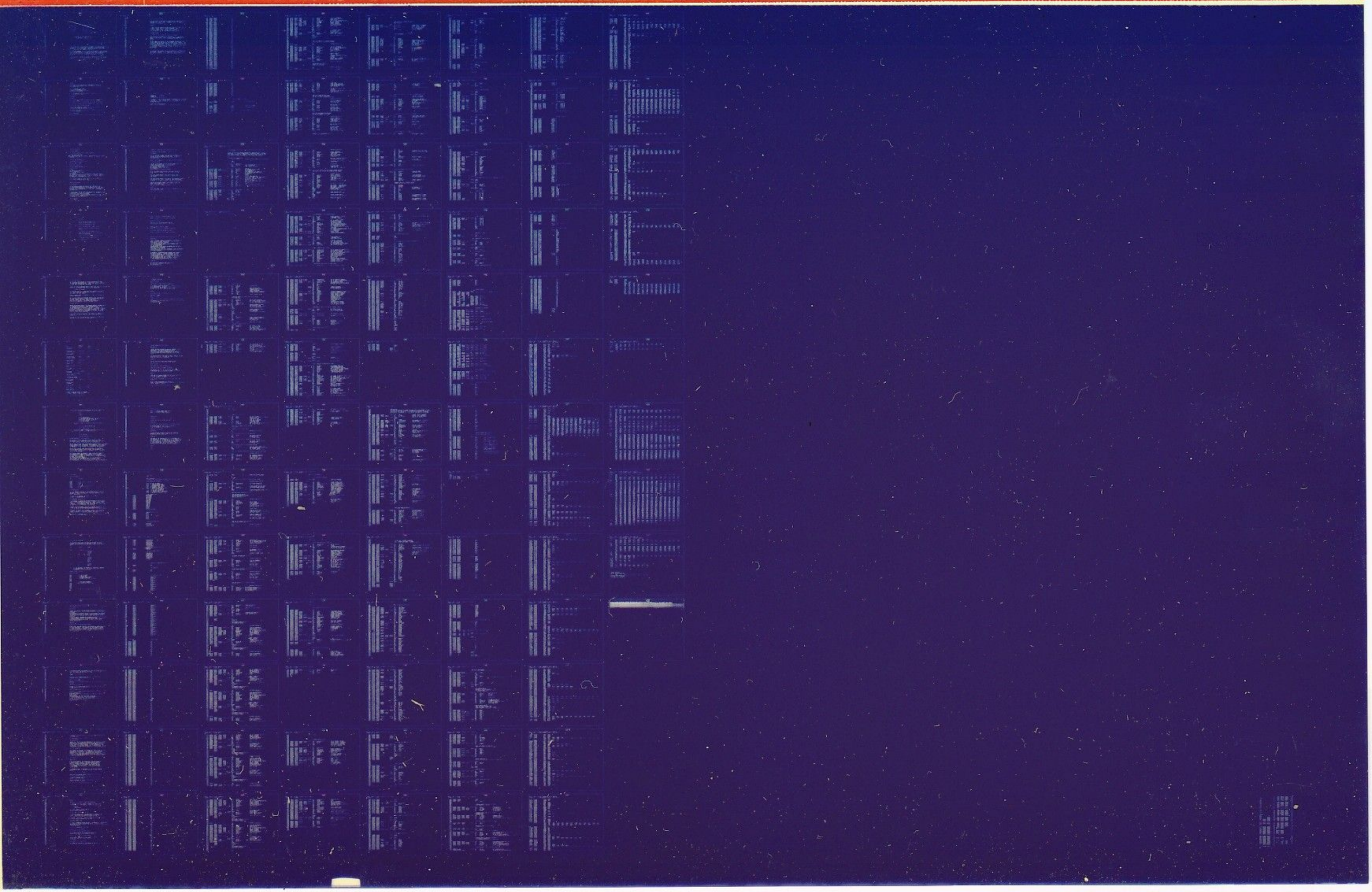
digital

MADE IN USA



IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZAFA-C-D

PRODUCT NAME: AFC11 DIAGNOSTIC

DATE REVISED: MAR. 1974

MAINTAINER: DIAGNOSTIC GROUP

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1.0 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 MVICS, OR EQUIVALENT.

OSCILLOSCOPE, TEKTRONIX 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-

E01

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" MXTIT". 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)
\	XXX=0-100 (DECIMAL) OR A

5.3.1.2 PROGRAM RESPONSE TO OPTION SELECTION

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

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

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

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

P ARE TYPED.

5.3.1.3 OPTION APPICABILITY

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

5.3.1.4 TEST RESELECTION

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

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

5.3.1.5 TEST PARAMETER MODIFICATION

IT IS POSSIBLE TO CHANGE ONE OR MORE PARAMETERS OF THE FOLLOWING TESTS WITHOUT COMPLETE REINITIAIZATION: "REPET","AMCAL","DATA", AND"[illegible] 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

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 CONVERTER 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 PROGRAM WILL TYPE "LOGIC" AND THEN RESTART BY EXECUTING THE FIRST TEST IN SEQUENCE.

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

                                6.1.2.1 OPERATION WITH SW15=1 (UP).


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

                                6.1.2.4 OPERATION WITH SW11=1 (UP)

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

                                6.1.2.5 OPERATION WITH SW10=1(UP)

                                        SAME AS 6.1.2.1.EXCEPT AFTER AN ERROR IS DETECTED, THE NEXT 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.
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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 [illegible] THE V KEYBOARD OPTION. AN ALTERNATIVE IS TO LET THE PROGRAM DO AUTOMATIC SCALING BY TYPING A AFTER THE V OPTION HAS BEEN SELECTED.

6.3.4 SIGNAL CONDITIONING MODULES
SEE 6.2.5 FOR INTERPRETATION OF VOLTAGES TYPED BY PROGRAM.

6.4 CALIBRATION, ADJUSTMENT, AND SCOPE LOOP ROUTINES

6.4.1 MULTIPLEXER TIMING ADJUSTMENT - MXTIM

6.4.1.1 DESCRIPTION

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

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

6.4.1.2 TIMING ADJUSTMENT

LOAD AND START PROGRAM (IF THIS HAS NOT ALREADY BEEN DONE).
CONNECT 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

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

                                        SELECT "MONOT"

                                        THE PROGRAM WILL BEGIN RUNNING IMMEDIATELY.

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


                                5.5.3   ERRORS

                                        IF AN ERROR OCCURS, THE PROGRAM WILL TYPE:

                                        MONOTONICITY ERROR
                                        1ST          2ND
                                        XXXXXX   YYYYYY

                                        WHERE XXXXXX AND YYYYYY ARE THE 2 CONVERSIONS BEING COMPARED.

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

6.6 CHANNEL 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

.END

```
                                .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
```

```
940             015506                  BINWRD=DIVIDL
941             015510                  DIGIT=DIVIDH
942             015506                  QUOT=DIVIDL
943             015510                  REMAND=DIVIDH
944             011614                  PRODH=MPYERL
945             011620                  PRODL=MPCND
946             016504                  ENDCOD=DATAB
947
948                                     ;CONTROL REGISTER BIT FUNCTIONS
949             000100                  ENABLE=100
950             000200                  DONE=200
951
952                                     ;INSTRUCTION DEFINITIONS
953
954             005746                  PUSH1SP=5746
955             005726                  POP1SP=5726
956             010046                  PUSHR0=10046
957             012600                  POPR0=12600
958             024646                  PUSH2SP=24646
959             022626                  POP2SP=22626
960             000240                  NOP=240
961             000257                  CLCVNZ=257
962
963
964
965                                             ;REFERANCE NUMBER DEFINITION
966
967             000000                  N=0
968             000000                  XN=N
969
970                                     ;EMT GENERATOR
971
972             000000                  X=0
973             000001                  M=1
974             000001                  XM=M
975
976
977
978                                     ;EMT DEFINITION TABLE
979
980             104000                  ERRORC=EMT+X
981             000001                  X=X+1
982             104001                  SCOPE=EMT+X
983             000002                  X=X+1
984             104002                  SCOPEF=EMT+X
985             000003                  X=X+1
986             104003                  TYPE=EMT+X
987             000004                  X=X+1
988             104004                  SAVOSP=EMT+X
989             000005                  X=X+1
990             104005                  OCTASC=EMT+X
991             000006                  X=X+1
992             104006                  RESOS=EMT+X
993             000007                  X=X+1
994             104007                  EXTRACT=EMT+X
995             000010                  X=X+1
```

```
  996          104010                          ERROR=EMT+X
  997          000011                          X=X+1
  998          104011                          BCDASC=EMT+X
  999          000012                          X=X+1
 1000          104012                          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
```

B03


```
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
```

```
                                                HALT
                                                .+2
                                                HALT
                                                .+2
                                                HALT
                                                .+2
                                                HALT
                                                .+2
                                                HALT
                                                .+2
                                                HALT
                                                .+2
                                                HALT

                                                ;STANDARD INTERRUPT VECTORS

                        000014          .=14
000014  003524                          TRACES                  ;TRACE TRAP SERVICE
000016  000340                          340

                        000024          .=24
000024  012750                          PFAIL                   ;POWER FAIL HANDLER
000026  000340                          340
000030  014526                          EMTSRV                  ;EMT DISPATCH SERVICE
000032  000340                          340
                        000060          .=60
000060  001440                          KEYINT          ;KEYBOARD INTERRUPT SERVICE
000062  000340                          340
                        000200          .=200
000200  000167  001340                  JMP     START
```

```
                                ;*****************************************************************
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  INE 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  000045          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 MONITICR

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                      ;ENABLE KEYBOARD ENTERRUPTS
001414  012777  000100  014336          MOV     #100,@TKCSR             ;CLEAR SOFTWARE INTERRUPT FLAG
001422  005067  014364                  CLR     SINTFL                  ;GET NAME OF TEST
001426  104013                  MONIT1: INSTR                           ;TO BE EXECUTED
001430  013217                          MPER
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     #TO,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                          TO:                             ;REFERENCE DESIGNATION
        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 PRICRITY 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 INTERRJPTS
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
```

```
                                ADT16:  BIS     #340,PS                 ;LOCK OUT INTERRUPTS
                                        CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
                                        TSTB    @AFDBR                  ;RESET DONE BIT
                                        MOV     #ADT16B,@AFCINT         ;SET UP LOCAL INTERRUPT RETURN
                                        MOV     PS,@AFCPS               ;SET UPT INTERRUPT SERVICE LEVEL
                                        MOV     #100,@AFCSR             ;ENABLE INTERFACE
                                        BIC     #340,PS                 ;ENABLE INTERRUPTS
                                        BIS     #0,PS                   ;SET PROCESSOR PRIORITY TO 0
                                        MOV     #2000,@AFCMN            ;START A-D CONVERTER
                                ADT16A: TSTB    @AFCSR                  ;WAIT FOR DONE
                                        BPL     ADT16A
                                        NOP                             ;DELAY 1 CYCLE
                                        BIS     #340,PS
                                        ERROR                           ;NO INTERRUPT, ERROR
                                        BR      ADT16C                  ;GO TO LOOP CHECK
                                ADT16B: POP2SP                          ;RESTORE STACK
                                ADT16C: CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
                                        MOV     AFCPS,@AFCINT           ;RESTOR TRAP CATCHER
                                        CLR     @AFCPS
                                        SCOPE                           ;CHECK FOR ITERATIONS, LOOP
                                        STATUS=STATUS-40
                                        LVL=LVL-1
                                        X=X+1


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

                                        T20:                            ;REFERENCE DESIGNATION
                                        N=N+1
                                ADT20T1:
                                        BIS     #340,PS                 ;LOCK OUT INTERRUPTS
                                        MOV     #ADINTJ,@AFCINT         ;SET UP LOCAL INTERRUPT RETURN
                                        MOV     PS,@AFCPS               ;SET UP INTERRUPT SERVICE LEVEL
                                        BIC     #340,PS                 ;ALLOW INTERRUPTS
                                        MOV     #2000,@AFCMN            ;START A-D CONVERTER
                                ADT20A: TSTB    @AFCSR                  ;WAIT FOR DONE
                                        BPL     ADT20A
                                        MOV     #100,@AFCSR             ;ENABLE INTERFACE
                                        NOP                             ;DELAY 1 CYCLE
                                        BIS     #340,PS                 ;LOCK OUT INTERRUPTS
                                        ERROR                           ;INTERRUPT DID NOT OCCUR, ERROR
                                        BR      ADT20B                  ;CONTINUE
                                ADINTJ: POP2SP                          ;RESTORE STACK, INTERRUPT OCCURE
                                ADT20B: CLR     @AFCSR                  ;CLEAR CONTROL REGISTER
                                        MOV     AFCPS,@AFCINT           ;RESTORE TRAPCATCHER
                                        CLR     @AFCPS
                                        SCOPE                           ;CHECK FOR ITERATIONS, LOOP


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

                                        T21:                            ;REFERENCE DESIGNATION
                                        N=N+1
                                MXT1:   BIC     #340,PS                 ;LOCK OUT INTERRUPTS
```

```
:893  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     @AFDBR,@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
```

F04


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 2051  004616  016767  011120  011042          MOV     SAMTAB,POINT2           ;SET UP POINTER TO SAMPLES
 2052  004624  016767  011105  011326          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                          BCDASC
 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 CORE
 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
```

H04


```
 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
```

```
2183                                    .SBTTL  A-D CONVERTER CAL
2184
2185
2186                                            ;A-D CONVERTER CLAIBRATION
2187
2188  005422  104003                  ADCAL:  TYPE                            ;TYPE R TO INDICATE
2189  005424  013514                          MR                              ;THAT TEST IS RUNNING
2190
2191  005426  005067  010342                  CLR     CPFLG                   ;IGNORE CONTROL P AND
2192  005432  005067  010340                  CLR     CRFLG                   ;CONTROL R INTERRUPTS
2193  005436  012777  005522  010300          MOV     #ADCALI,@AFCINT         ;SET UP INTERRUPT VECTOR
2194  005444  005077  010276                  CLR     @AFCPS                  ;AND PROCESSOR STATUS
2195  005450  012777  000100  010302  ADCAL1: MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
2196  005456  012777  004000  010272          MOV     #4000,@AFCMN            ;INHIBIT MUX TIMING
2197  005464  012777  000100  010256          MOV     #100,@AFCSR             ;ENABLE AFC INTERRUPTS
2198  005472  005067  172300                  CLR     PS                      ;CLEAR PROCESSOR STATUS
2199  005476  012777  002000  010252          MOV     #2000,@AFCMN            ;START A-D CONVERTER
2200  005504  000001                          WAIT                            ;WAIT FOR INTERRUPT
2201  005506  032767  000001  172054          BIT     #1,SWR                  ;IF SW00=1, RETURN TO
2202  005514  001755                          BEQ     ADCAL1                  ;KEYBOARD CONTROL
2203  005516  000167  173660                  JMP     MONIT                   ;RETURN TO MONITOR
2204  005522  017700  010224          ADCALI: MOV     @AFCBR,R0               ;GET DATA
2205  005526  032767  000040  172034          BIT     #40,SWR                 ;DISPLAY OR TYPE OUT DATA
2206  005534  001002                          BNE     ADCALT
2207  005536  000005                          RESET                           ;DISPLAY DATA
2208  005540  000002                          RTI
2209  005542  010067  000010          ADCALT: MOV     R0,ADCALN               ;SET UP FOR TYPEOUT
2210  005546  104005                          OCTASC                          ;GOTO TYPEOUT ROUTINE
2211  005550  000001                          1                               ;WORD COUNT
2212  005552  005556                          ADCALN                          ;DATA TO BE TYPED
2213  005554  000002                          RTI                             ;RETURN
2214  005556  000000          ADCALN: 000000
2215
2216
2217
```

```
                                        .SBTTL  AMCAL


                                        ;SWITCH GAIN AMPLIFIER CALIBRATION

005560  012767  005600  010202  AMCAL:  MOV     #AMCALP,CPRET           ;SET UP CONTROL P
005566  012767  000001  010200          MOV     #1,CPFLG                ;RETURN
005574  005067  010176                  CLR     CRFLG                   ;INGNORE CONTROL R INTERRUPT
005600  104017                  AMCALP: SUAD                            ;GET ADDRESS OF AMPLIFIER
005602  104003                          TYPE                            ;TYPE "R  TO INDICATE THAT TEST IS RUNNING
005604  013514                          MR
005606  016767  010066  010036          MOV     SYSUNB,OUTCHN           ;GET ADDRESS OF AMPLIFIER
005614  012777  000100  010136          MOV     #100,@TKCSR             ;ENABLE KEYBOARD INTERRUPTS
005622  005077  010130                  CLR     @AFCMN                  ;ENABLE MUX TIMING
005626  005077  010116                  CLR     @AFCSR                  ;DISABLE MUX INTERRUPTS
005632  005067  010144                  CLR     GFLG                    ;CLEAR HIGH GAIN FLAG
005636  005067  172134                  CLR     PS                      ;ENABLE INTERRUPTS
005642  032767  000200  171720  AMPG0:  BIT     #200,SWR                ;IFSW10=1, DO GAINS OF
005650  001007                          BNE     AMPC2                   ;50 AND 1000
005652  012767  070000  010026  AMPC1:  MOV     #70000,LOGAIN           ;SETUP FOR GAINS OF
005660  012767  050000  010026          MOV     #50000,HIGAIN           ;1 AND 20
005666  000405                          BR      AMPG01                  ;SET GAIN AND ADDRESS AMPLIFIER
005670  012767  030000  010010  AMPC2:  MOV     #30000,LOGAIN           ;SET UP FOR GAINS OF
005676  005067  010012                  CLR     HIGAIN                  ;50 AND 1000
005702  005767  010074          AMPG01: TST     GFLG                    ;HAS HIGHER GAIN BEEN DONE
005706  001016                          BNE     HIOUT                   ;IF NOT, DO IT
005710  005267  010066                  INC     GFLG                    ;SET HIGH GAIN FLAG
005714  016705  007766                  MOV     LOGAIN,R5               ;SET UP TO DO LOW GAIN
005720  056705  007726                  BIS     OUTCHN,R5               ;SET CHANNEL
005724  010577  010024          AMPG02: MOV     R5,@AFCAR               ;ADDRESS AMPLIFIER
005730  012703  020000                  MOV     #20000,R3               ;WAIT FOR CHANNEL TO SETTLE
005734  005303                          DEC     R3
005736  001376                          BNE     .-2
                                        
005740  000167  177676                  JMP     AMPG0                   ;DO NEXT GAIN
005744  016705  007744          HIOUT:  MOV     HIGAIN,R5               ;DO HIGH GAIN
005750  056705  007676                  BIS     OUTCHN,R5
005754  005067  010022                  CLR     GFLG
005760  000761                          BR      AMPG02
```

```
                                        .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
005102  100001                        BPL     MONOT3                  ;GENERATE ABSOLUTE VALJE
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                                  ;OUTPJT 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,CNTRS
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  005267  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  104036                  DATAP:  DISPAT                          ;GO TO COMMAND DECODER
006620  014036                          DATLST                          ;LIST OF COMMANDS AND POINTERS
006622  000735                          BR      DATAP                   ;CONTINUE COMMAND IN PUT



                                        ;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
```

```
                                                ;COMPUTE AVERAGE OF DATA
006746  104021          AVREGG: AVRG
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     @AFCBR,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     @AFCBR,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  002403                          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          ADC     ADBIT,QUOT      ;CORRECT AVERAGE OF DATA
 2541  007306  046767  006422  006172          BIC     ADMSK,QUOT      ;FOR A-D RESOLUTION
 2542
 2543                                          ;GENERATE TABLE OF DIFFERENCES BETWEEN
 2544                                          ;AVERAGE AND INDIVIDUAL DATA POINTS
 2545
 2546  007314  012704  016504          HISTOB: MOV     #DATAB,R4
 2547  007320  016703  006356                  MOV     SAMPLE,R3
 2548  007324  016702  006156          HISTOC: MOV     QUOT,R2         ;GET AVERAGE OF DATA
 2549  007330  162402                          SUB     (R4)+,R2        ;SUBTRACT DATA
 2550  007332  005402                          NEG     R2              ;NEGATE DIFFERENCE
 2551  007334  016701  006370                  MOV     ADRES,R1
 2552  007340  006001                  HISTC1: ROR     R1
 2553  007342  103402                          BCS     HISTC2
 2554  007344  006202                          ASR     R2
 2555  007346  000774                          BR      HISTC1
 2556  007350  020227  000012          HISTC2: CMP     R2,#12          ;WILL DIFFERENCE FIT GRAPH
 2557  007354  003403                          BLE     HISTOD          ;DIFFERENCE IS NOT 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
```

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 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   12701  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  175156          MOV     ADRES,DATA1
 2662  010000  104022          HISTOT: CECBCC
 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
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```
  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              TEMP1:      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  104403                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
```

```
2795
2796                                        ;4 DIGIT BCD TO BINARY CONVERSION
2797                                        ;WILL CONVERT N BCD WORDS TO BINARY
2798                                        ;AND    STORE EACH WORD IN A SEPARATE LOCATION
2799
2800  010540  011605                BCDBNN: MOV     (SP),R5
2801  010542  012567  000162               MOV     (R5)+,BCDCNT            ;NUMBER OF WORDS TO BE CONVERTED
2802  010546  010516                        MOV     R5,(SP)
2803  010550  012704  014422        BCDBN1: MOV     #INBUF,R4               ;POINTER TO ASCII
2804  010554  012703  010724               MOV     #BCDTAB,R3              ;TABLE FOR STORAGE OF CONVERTED WORD
2805  010560  016767  000144  000144       MOV     BCDCNT,CNTR2
2806  010566  012767  000004  005054 BCDBN2: MOV     #4,CHRCNT               ;4 DIGITS PER WORD, AT MOST
2807  010574  005002                        CLR     R2
2808  010576  005001                        CLR     R1                      ;CLEAR MULTIPLICATION REGISTEPS
2809  010600  105714                BCDBN3: TSTB    (R4)                    ;END OF DTAT ?
2810  010602  001441                        BEQ     BCDEXT                  ;YES, EXIT
2811  010604  122714  000054               CMPB    #54,(R4)                ;IS CHARACTER ","?
2812  010610  001012                        BNE     BCDBN4                  ;NO
2813  010612  022767  000004  005030       CMP     #4,CHRCNT
2814  010620  001437                        BEQ     BCDERR
2815  010622  105724                        TSTB    (R4)+
2816  010624  001435                        BEQ     BCDERR
2817  010626  122714  000054               CMPB    #54,(R4)
2818  010632  001432                        BEQ     BCDERR
2819  010634  000424                        BR      BCDEXT
2820  010636  121427  000060        BCDBN4: CMPB    (R4),#60
2821  010642  002426                        BLT     BCDERR
2822  010644  121427  000071               CMPB    (R4),#71
2823  010650  003023                        BGT     BCDERR
2824  010652  14_.14  000060               BICB    #60,(R4)
2825  010656  005367  004766               DEC     CHRCNT
2826  010662  002416                        BLT     BCDERR
2827  010664  112400                        MOVB    (R4)+,R0
2828  010666  060201                        ADD     R2,R1
2829  010670  060100                        ADD     R1,R0
2830  010672  010001                        MOV     R0,R1
2831  010674  006301                        ASL     R1
2832  010676  010102                        MOV     R1,R2
2833  010700  006302                        ASL     R2
2834  010702  006302                        ASL     R2
2835  010704  000735                        BR      BCDBN3
2836  010706  010023                BCDEXT: MOV     R0,(R3)+
2837  010710  005367  000016               DEC     CNTR2
2838  010714  001324                        BNE     BCDBN2
2839  010716  000002                        RTI
2840  010720  104014                BCDERR: INSTER
2841  010722  000712                        BR      BCDBN1
2842  010724                        BCDTAB:
2843  010724  000000                BCDWD1: 0
2844  010726  000000                BCDWD2: 0
2845  010730  000000                BCDCNT: 0
2846  010732  000000                CNTR2:  0
2847
2848
2849
2850                                        ;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     DECO
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,PROD4
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  01:200          PARAM1: MOV     #PARL1,R0
012140  000402                  BR      PARAM
012142  012700  014244          PARAM2: MOV     #PARL2 R0
012146  012067  000010          PARAM:  MOV     (R0)+,MSG
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  001[illegible]                  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
 3139                                          ;INPUT 2 CHANNEL ADDRESSES
 3140
 3141  012346  104013                  CHAN2:  INSTR
 3142  012350  013334                          MCHANA
 3143  012352  000012                          12
 3144  012354  104015                  CHAN2A: BCDBN
 3145  012356  000002                          2
 3146  012360  026727  176340  001777          CMP     BCDWD1,#1023.
 3147  012366  003040                          BGT     CHAN2E
 3148  012370  026727  176332  001777          CMP     BCDWD2,#1023.
 3149  012376  003034                          BGT     CHAN2E
 3150  012400  016767  176320  003310          MOV     BCDWD1,LOCHAN
 3151  012406  016767  176314  003304          MOV     BCDWD2,HICHAN
 3152  012414  166767  176304  176304          SUB     BCDWD1,BCDWD2
 3153  012422  002422                          BLT     CHAN2E
 3154  012424  026767  176276  003270          CMP     BCDWD2,MAXCHN
 3155  012432  003016                          BGT     CHAN2E
 3156  012434  016767  176266  003274          MOV     BCDWD2,CHNCNT
 3157  012442  005267  003270                  INC     CHNCNT
 3158  012446  016767  003264  003266          MOV     CHNCNT,SAMTAB
 3159  012454  006367  003262                  ASL     SAMTAB
 3160  012460  062767  016504  003254          ADD     #DATAB,SAMTAB
 3161  012466  000002                          RTI
 3162  012470  104014                  CHAN2E: INSTER
 3163  012472  000730                          BR      CHAN2A
 3164
 3165
 3166
 3167                                          ;INPUT HISTOGRAM VERTICAL SCALE FACTOR
 3168
 3169  012474  104013                  VSFIN:  INSTR
 3170  012476  013520                          MVSFI
 3171  012500  000004                          4
 3172  012502  122767  000101  001712  VSFINA: CMPB    #101,INBUF
 3173  012510  001006                          BNE     VSFMAN
 3174  012512  005067  003266                  CLR     VSFFLG
 3175  012516  012767  000001  003200          MOV     #1,VSF
 3176  012524  000002                  VSFIN1: RTI
 3177  012526  104015                  VSFMAN: BCDBN
 3178  012530  000001                          1
 3179  012532  026727  176166  000144          CMP     BCDWD1,#100.
 3180  012540  003012                          BGT     VSFE
 3181  012542  005767  176156                  TST     BCDWD1
 3182  012546  001410                          BEQ     VSFE
 3183  012550  016767  176150  003146          MOV     BCDWD1,VSF
 3184  012556  012767  000001  003220          MOV     #1,VSFFLG
 3185  012564  000757                          BR      VSFIN1
 3186  012566  104014                  VSFE:   INSTER
 3187  012570  000744                          BR      VSFINA
 3188
```

```
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  001423                                  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     #PWFUP,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  013032  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                    SP_ST:  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  MSLOD:  .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  MCRANG: .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
  3400  013614  005015  047524  040524  MERROR: .ASCIZ  <15><12>/TOTAL ERRORS:/
  3401  013622  020124  051105  047522
  3402  013630  051522  000072
  3403
  3404                                  ;ERROR MESSAGES
  3405
  3406  013634  005015  047515  047516  EMONOT: .ASCII  <15><12>/MONOTONICITY FAILURE/
  3407  013642  047524  044516  044503
  3410  013650  051524  043040  044501
  3411  013656  052514  042522
  3412  013662  005015  051461  004524          .ASCIZ  <15><12>/1ST    2ND
  3413  013670  047062  000104
  3414  013674  005015  020130  040502  MXBAD:  .ASCIZ  <15><12>/X BAD/
  3415  013702  000104
  3416  013704  005015  020131  040502  MYBAD:  .ASCIZ  <15><12>/Y BAD/
  3417  013712  000104
  3420                                  .EVEN
  3421
  3422                                  ;LIST OF TESTS TO BE EXECUTED
  3423
  3424  013714  042101                  TSTLST: "AD
  3425  013716  040503                          "CA
  3426  013720  000114                          'L
  3427  013722  006422                          ECCAL
  3430  013724  044115                          "MX
  3431  013726  044524                          "TI
  3432  013730  000115                          'M
  3433  013732  006170                          MXTIM
  3434  013734  047516                          "NO
  3435  013736  047516                          "NO
  3436  013740  000124                          'T
  3437  013742  006170                          MONOT
  3440  013744  044515                          "EM
```

```
3411   013746  040503                          "CA
3412   013750  000114                          .L
3413   013752  005560                          AMCAL
3414   013754  042514                          "LO
3415   013756  044507                          "GI
3416   013760  000103                          .C
3417   013762  001532                          .OGIC1
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
```

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

```
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),RETJRN
3634  014666  012516                          MOV     (R5)+,(SP)
3635  014670  011567  000720                  MOV     (R5),ICOUNT
3636  014674  005067  001110                  CLR     ERRFLG
3637  014700  000002                          RTI
3638  014702  012767  000001  000704  LOOPL:  MOV     #1,ICOUNT
3639  014710  000751                          BR      LOOPER
3640
3641                                          ;CHECK FOR LOOPING WITH SAME DATA
3642                                          ;CHECK FOR ESCAPE TO NEXT TEST ON ERROR
3643
3644  014712  005767  001072          FREEZE: TST     ERRFLG
3645  014716  001413                          BEQ     FREEZX
3646  014720  032767  002000  162642          BIT     #SW10,SWR
3647  014726  001345                          BNE     LOOPX
3648  014730  032767  001000  162632          BIT     #SW09,SWR
3649  014736  001403                          BEQ     FREEZX
3650  014740  017616  000000                  MOV     @(SP),(SP)
3651  014744  000002                          RTI
3652  014746  062716  000002          FREEZX: ADD     #2,(SP)
3653  014752  000002                          RTI
3654
3655                                          ;GENERAL ERROR SERVICE
3656                                          ;ONLY PC OF FAILING TEST IS OUTPUT TO TELEPRINTER
3657
3658  014754  104004                  ERR:    SAVDSP
3659  014756  032767  020000  162624          BIT     #SW13,SWR
3660  014764  001003                          BNE     ERRORR
3661  014766  104005                          OCTASC
3662  014770  000001                          1
3663  014772  015620                          SAVPC
3664  014774  104006                  ERRORR: RESDS
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:SAVDSP
3680  015032  032767  020000  162530          BIT     #SW13,SWR
3681  015040  001355                          BNE     ERRORR
3682  015042  104005                          OCTASC
3683  015044  000003                          3
3684  015046  015620                          SAVPC
```

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

```
                                                BINAS1: MOV     @(R5)+,BINWRD
                                                        MOV     CHRCNT,R0
                                                        MOV     #TEMTAB,R1
                                                BINS1A: EXTRACT
                                                        ADD     #60,DIGIT
                                                        MOVB    DIGIT,(R1)+
                                                        DEC     R0
                                                        BNE     BINS1A
                                                        TST     (PC)+
                                                SUOFLG: 0
                                                        BEQ     BINAS3
                                                        MOV     CHRCNT,R0
                                                        MOV     R1,R2
                                                BINAS2: CMPB    #60,-(R2)
                                                        BNE     BINAS3
                                                        DEC     R0
                                                        BEQ     BINAS3
                                                        BR      BINAS2
                                                BINAS3: MOV     CHRCNT,R0
                                                BINS3A: MOVB    -(R1),(R4)+
                                                        DEC     R0
                                                        BNE     BINS3A
                                                        MOVB    #40,(R4)+
                                                        DEC     WRDCNT
                                                        BNE     BINAS1
                                                        MOVB    #0,-(R4)
                                                        MOV     R5,(SP)
                                                        TST     (PC)+
                                                CORFLG: 0
                                                        BNE     BINAS4
                                                        TYPE
                                                        MBCD
                                                        RTI
                                                BINAS4: TYPE
                                                        MBCD+2
                                                        RTI


                                                        ;SINGLE PRECISION UNSIGNED DIVIDE LOOP

                                                DIVI:   CLR     DIVIDH
                                                DIVIB:  CMP     DIVIDH,DIVIS
                                                        BHIS    DIVIB
                                                        MOV     #17.,DIVCNT
                                                        BR      DIVIC
                                                DIVIA:  CMP     DIVIDH,DIVIS
                                                        BLO     DIVIC
                                                        SUB     DIVIS,DIVIDH
                                                DIVIC:  ROL     DIVIDL
                                                        ROL     DIVIDH
                                                        DEC     (PC)+
                                                DIVCNT: 0
                                                        BNE     DIVIA
                                                        ROR     DIVIDH
                                                        COM     DIVIDL
                                                        RTI
```

```
 3797  015504  000000                  DIVIB:  HALT
 3798  015506  000000                  DIVIDL: 0
 3799  015510  000000                  DIVIDH: 0
 3800  015512  000000                  DIVIS:  0
 3801:
 3802:
 3803:
 3804:
 3805  015514  016667  000004  000076 SVOSP:  MOV     4(SP),SAVPC
 3806:
 3807:
 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:
 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
 3828
 3829
 3830
 3831
 3832
 3833
 3834
 3835  015606  000000                 MTFFLG: 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                 ERRCNT: 0
 3850  015644  000000                 DELAY:  0
 3851:
 3852:
```

;SAVE PC OF TEST THAT FAILED AND R0-R5

;SAVE R0-R5

;RESTORE R0-R5

;TELETYPE OUTPUT ROUTINE

;PROGRAM VARIABLES

D07


```
                                          ;VARIABLES

  015646  000000                   INCNT:  0
  015650  000000                   CHRCNT: 0
  015652  000000                   OUTCHN: 0
  015654  000000                   INCHAN: 0
  015656  000000                   CNTR1:  0
  015660  000000                   CNTR4:  0
  015662  000000                   CNTR5:  0
  015664  000000                   POINT1: 0
  015666  000000                   POINT2: 0
  015670  000000                   ECONT' 0
  015672  000000                   EC      0
  015674  000000                   P    .  0


                                          ;PROGRAM CONTROL PARAMETERS

  015676  000000                   SYSUN:  0
  015700  000000                   SYSUNB: 0
  015702  000001                   SAMPLE: 1
  015704  000000                   LOGGN:  0
  015706  000000                   LOGAIN: 0
  015710  000000                   LGAIND: 0
  015712  000000                   HGAIND: 0
  015714  000000                   HIGAIN: 0
  015716  000000                   LOCHAN: 0
  015720  000037                   HICHAN: 37
  015722  000000                   MAXCHN: 0
  015724  000001                   VSF:    1
  015726  000000                   ADRESD: 0
  015730  000001                   ADRES:  1
  015732  000000                   ADBIT:  0
  015734  000000                   ADMSK:  0
  015736  000037                   CHNCNT: 37
  015740  000000                   RERES:  0
  015742  000000                   SAMTAB: 0


                                          ;INDIRECT POINTERS

  015744  000134                   AFCINT: 134
  015746  000136                   AFCPS:  136
  015750  172570                   AFCSR:  172570
  015752  172572                   AFDBR:  172572
  015754  172574                   AFCAR:  172574
  015756  172576                   AFCMN:  172576
  015760  177560                   TKCSR:  177560
  015762  177562                   TKDBR:  177562
  015764  177564                   TPCSR:  177564
  015766  177566                   TPDBR:  177566
  015770  000000                   CPRET:  0
  015772  005040                   CRRET:  REPORT


                                          ;PROGRAM CONTROL FLAGS
```

```
016012  000000          SINTFL: 0
016014  005015          MBCD:   .ASCII  <15><12>::
        016116          .=.+100
                        .EVEN

                                ;EMT DISPATCH TABLE

016116  015030          EMTTAB: ERRC
016120  014570                  LOOP
016122  014712                  FREEZE
016124  001176                  TYPER
016126  015514                  SVOSP
016130  015162                  OCTASN
016132  015554                  RSOS
016134  015412                  DIVI
016136  014754                  ERR
016140  015210                  BCDACO
016142  015442                  ADBIN
016144  010050                  INSTRR
016146  010454                  INSTRE
016150  010540                  BCDBNN
016152  015416                  DIVIU
016154  010036                  SCRADD
016156  015430                  OCBBCO
016160  007166                  AVRGG
016162  015150                  DCBBCO
016164  015056                  BCDSCO
016166  015410                  DIVI
016170  006746                  AVREGG
016172  011624                  DISPT
016174  015036                  BCDSN
016176  011532                  MULTI
016200  000000          EMTLIM: 0
        016222          .=.+20
016222  001576          TSTTAB: T0
016224  000001                  1
016226  001632                  T1
016230  040000                  4000
016232  001672                  T2
016234  040000                  4000
016236  001730                  T3
016240  040000                  4000
016242  002004                  T4
016244  040000                  4000
016246  002062                  T5
016250  040000                  4000
```

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```
016252  002204                          T6
016254  004000                          4000
016256  002240                          T7
016260  004000                          4000
016262  002350                          T10
016264  004000                          4000
016266  002470                          T11
016270  004000                          4000
016272  002610                          T12
016274  004000                          4000
016276  002730                          T13
016300  004000                          4000
016302  003056                          T14
016304  004000                          4000
016306  003332                          T16
016310  004000                          4000
016312  003460                          T17
016314  000100                          100
016316  003606                          T20
016320  000100                          100
016322  003716                          T21
016324  000100                          100
016326  003770                          T22
016330  000100                          100
016332  004036                          T23
016334  000100                          100
016336  004114                          T24
016340  000100                          100
016342  004210                          T25
016344  000100                          100
016346  014450                          EOP
016350  000001                          1
016352  000000               TEMTAB:    0
        016430               .=.+54
016430  000000               4TAB:      0
        016504               .=.+52
016504  000000               DATAB:     0
        000001                          .END
```

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	005422	2188#	3401						
ADCALI	005522	2193	2204#						
ADCALN	005556	2209*	2212	2214#					
ADCALT	005542	2206	2209#						
[illegible]	005450	2195#	2202						
[illegible]	002316	1599	1609#						
[illegible]	003674	1859	1870#						
[illegible] =	104012	1000#	1405						
[illegible]	015734	2176	2541	3198*	3204*	3210*	3886#		
[illegible]RES	015730	2059	2298	2551	2661	3196*	3202*	3208*	3884#
[illegible]RESD	015726	3195*	3506	3526	3863#				
[illegible]	001732	1519#							
[illegible]A	001766	1523	1525#	1529					
[illegible]B	002004	1526	1530#						
[illegible]	002020	1532	1534#						
[illegible]C	002040	1536	1539#						
[illegible]	[illegible]	1655#							
[illegible]	002552	1664#	1665						
[illegible]	002564	1658	1668#						
[illegible]	[illegible]	1667	1670#						
[illegible]	[illegible]	1693#							
[illegible]A	[illegible]	1692#	1693						
[illegible]B	002704	1696	1696#						
[illegible]C	[illegible]	1695	1698#						
[illegible]12	[illegible]30	[illegible]#							
[illegible]	[illegible]	1720#	1721						
[illegible]	[illegible]	1714	1726#						
[illegible]	[illegible]	1725	1727#						
[illegible]	[illegible]	1740#							
[illegible]	[illegible]	1749#	1750						
[illegible]	[illegible]	1743	1755#						
[illegible]	[illegible]	1754	1756#						
[illegible]14	[illegible]	1769#							
[illegible]	[illegible]	1778#	1779						
[illegible]	[illegible]	1772	1784#						
[illegible]	[illegible]	1783	1785#						
[illegible]	[illegible]	1798#							
[illegible]	[illegible]	1807#	1808						
[illegible]	[illegible]	1801	1813#						
[illegible]	[illegible]	1812	1814#						
[illegible]	[illegible]	1827#							
[illegible]16A	003542	1836#	1837						
[illegible]16B	003564	1830	1842#						
[illegible]16C	003566	1841	1843#						
[illegible]	[illegible]	1546#							
[illegible]2A	[illegible]	1553#	1554						
[illegible]2B	[illegible]	1548	1558#						
[illegible]	[illegible]	1557	[illegible]#						
[illegible]	[illegible]	1863#	[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]#						
[illegible]	[illegible]	[illegible]#							
[illegible]	[illegible]	[illegible]#							

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DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

ADT3A	002174	1572	1574#	1575										
ADT4	002204	1583#												
ADT4A	002230	1586	1599#	1599										
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	1459	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*	1659*	1671*	1696*	1699*	1714*	1728*	1743*
		1757*	1772*	1796*	1801*	1815*	1830*	1844*	1859*	1872*	2133*	3894#		
AFCMN	015756	1475	1500*	1501	1504*	1505	1521*	1522	1534*	1535	1551*	1570*	1594*	1595
		1603*	1625*	1663*	1691*	1719*	1749*	1777*	1806*	1835*	1862*	1885*	1925	1930
		1945*	1950	1969*	2039*	2132*	2136*	2196*	2199*	2231*	2275*	2276*	2290*	2314*
		2344*	2346	2355	2366	2413*	2469*	2497*	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*	1796	1797*	1802*	1815
		1816*	1831*	1844	1845*	1860*	1872	1873*	2194*	3895#				
AFCSR	015750	1463	1494*	1485	1498*	1499	1525	1531	1550*	1553	1571	1574	1589	1602*
		1604	1609	1612*	1628*	1634*	1635	1642*	1656*	1662*	1664	[illegible]	[illegible]	[illegible]
		1692	1699*	1712*	1716*	1720	[illegible]	[illegible]	1745*	1749	1756*	[illegible]	[illegible]	[illegible]
		1785*	1799*	1803*	1807	1814*	1828*	1832*	1836	1843*	1853	1865*	1871*	1884*
		1887	1904	1907	1909	1922*	1928	1943*	1947	1955	1969*	[illegible]	[illegible]	[illegible]
		2135*	2147	2197*	2232*	2272*	2277	2281	2315*	2417*	2425	2468*	2474	2496*
		2493	2701*	2703	2706	3936#								
AFCBR	015752	1530	1547	1629	1657	1685	1713	1742	1771	1800	1829	1832	1912	1923
		1933	1958	1970	2042	2149	2204	2279	2283	2427	2476	2495	2705	3897#
ALTMOD	013070	3271#	3301											
ALTM01	013106	3274	3276#											
AMCAL	005560	2223#	3413											
AMCALP	005600	2223	2226#											
AMPC1	005652	2237#												
AMPC2	0056[illegible]	2236	2240#											
AMPG0	005642	2235#	2252											
AMPG01	0057[illegible]	2239	2242#											
AMPG02	005724	2247#	2256											
A.REG =	104025	1022#	2677											
AVREGG	006746	2452#	3451	3947										
A.RG =	104021	1014#	2452	2537										
AVPGG	007136	2505#	3943											
AVRG1	007152	2509#	2514											
AVRG2	007232	2523	2525#											
AVRG2A	007226	2520	2524#											
BCDACD	015210	3730#	3935											
BCDASC=	104011	998#	1400	2085	2376									
BCDASN=	104027	1026#	2107	2122	2589	2669	2674	2714	3096					
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#											

```
BCDCNT  010730          2901*   2805    2845#
BCDERR  010720          2814    2816    2818    2821    2923    2826    2840#
BCDEXT  010706          2810    2819    2836#
BCDFIN  011340          2927#   2945    2955
BCDFN1  011404          2935    2939#
BCDSCO  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    3109    3130    3132    3145    3149    3151    3177    3179    3181    3195    3200
                        3206    3212    3225    3227
BCDWD2  010726          2944#   3147    3150    3151*   3153    3155
BINASC  015240          3697    3706    3724    3734    3738#
BINAS1  015252          3741#   3755
BINAS2  015322          3754#   3758
BINAS3  015336          3751    3755    3757    3759#
BINAS4  015404          3770    3774#
BINS1A  015266          3744#   3748
BINS2A  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    3987#
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*   3178*   2364*   2394*   3360#
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     928     946    2050    2133    2143    2160    2161    2419    2439    2505    2533    2546
                        2612    3159    4001#
DATAF   006616          2405    2406#   2408    2480
DATA1   006156          2088*   2093    2279*   2284    2297    2300*   2303#   2366*   2367*   2369*   2369*   2372    2373
```

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                        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*   3943
DCBCD   015150          3715*   3944
DECBB1  010752          2857*   2931
DECBC   010734          2853*   3711    3717
DECBCA  011132          2885*   2899    2902
DECBC9  011234          2907*
DECBCC= 104022          1016*   2091    2456    2662
DECBCD= 104020          1012*   2442    2496
DECBC1  011036          2866    2870*
DECBC2  011124          2874    2877    2880    2894*
DECBC3  011214          2983    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*
DECODF  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
DIS_ST  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
DISP_2  007030          2474*   2475
DISPT   011624          2996*   3948
DIVCNT  015466          3784*   3792*
DIVI    015412          3781*   3933    3946
```

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DIVIA   015436           3786*   3793
DIVIB   015504           3793    3797*
DIVIC   015454           3785    3787    3789*
DIVIDE= 104024           1020*   2599
DIVIDH  015510            941     943    2164*   2516*   3781*   3782    3786    3798*   3790*   3794*   3733*
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           3659*   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
```

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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    01643C           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
LIST1   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
```

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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           3259    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
MRUBOJ  013247           3280    3325*
MSAMP   013302           3039    3334*   3503    3523
MSG     010270           2727*   2731*
MSPACE  013242           1361    3323*
MSJAD   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*   1955    1956*   1980    1881*   1900
                         1901*   1919    1920*   1940    1941*   1965    1966*
NCP   = 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    3063*   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*   3711    3713*
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AF211   MACY11 27(732)  09-SEP-76  15:44  PAGE 95
DZAFAC.P11      CROSS REFERENCE TABLE -- USER SYMBOLS

                              3962#
POINT2   015666               2051*   2055    2067*   2090    2695*   2696*   2702    3963#
POPRO =  012600                957#   3673
POP1SP=  005726                955#
POP2SP=  022626                959#   1559    1609    1640    1568    1596    1726    1755    1784    1913    1942    1970
PRODH =  011614                944#   2987    2990*   2895*   2900
PRODL =  011620                945#
PS    =  177776                937#   1356    1359    1376*   1390*   1409*   1519*   1546*   1549    1552*   1556*   1569*   1583*
                              1598*   1600    1601*   1627*   1631    1632*   1633*   1655*   1659    1660*   1661*   1693*   1697
                              1688*   1689*   1711*   1715    1717*   1718*   1723*   1740*   1744    1746*   1747*   1752*   1759*
                              1773    1775*   1776*   1791*   1799*   1802    1904*   1905*   1810*   1827*   1831    1933*   1934*
                              1939*   1859*   1960    1961*   1967*   1982*   1902*   1921*   1942*   1967*   2010    2138*   2234*
                              2274*   2317*   2342*   2699*   3009*   3247*
PUSHRO=  012746                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*   2539    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#
REPAV1   005170               2142#   2158
REPAV3   005350               2168    2171#
REPAV4   005354               2170    2172#
REPAVS   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
REPETF   004356               2001    2002#   2004    2125
REPETR   004442               2019#   3484
REPETS   004500               2026    2029#
REPET1   004576               2033#   2072
REPET2   004546               2039#   2046
REPET3   004554               2040#   2041
REPET4   00 540               2054#   2070
REPET5   004700               2066#   2095    2097    2100
REPET7   005720               2084    2096#
REPE4A   004656               2057    2059#
REPE4B   004662               2060#   2063
REPE4C   004672               2061    2064#
REPF      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#
REPPE    012730               3223#   3230
REPPEE   012754               3226    3229#
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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  013113          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*   2928*   2829    2830*   2831*
                        2832    3235    3254*   3580*   3583    3743*   3746*   3753    3760    3813    3820*
R2     =.000002          927*   2423*   2431*   2440*   2445*   2508*   2512*   2516    2548*   2549*   2550*   2554*   2556
                        2560    2564*   2565*   2566*   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*   3547*   2567*   2595*   2603*   2626*   2628    2649*   2651*   2654*   2656*   2733*
                        2735*   2739*   2755*   2804*   2836*   2855*   2856*   2910*   2914*   2915*   2921*   2927*   2938*
                        2933*   2942*   2943*   2944*   2952*   2957*   2960*   3004*   3005    3237    3252*   3811    3822*
R4     =.000004          929*   1391*   1392    1979*   1980    2054*   2055*   2056    2058*   2062*   2064    2133*   2137*
                        2138*   2143*   2152*   2153*   2160*   2163    2164    2419*   2427*   2470*   2471*   2473    2505*
                        2509    2531*   2532*   2533    2546*   2549    2574*   2576    2578    2590    2594*   2597    2606*
                        2607    2608    2610    2611    2612    2622*   2623*   2624*   2625*   2627*   2630*   2631*   2634*
                        2635    2637    2639*   2640*   2645*   2646*   2647*   2648*   2650*   2653*   2655*   2658*   2732*
                        2734*   2738*   2754*   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    3139*   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    2796    2797*
                        2788*   2789    2800*   2801    2802    2853*   2854    2957    2932    2997*   2933    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
SAMP_E  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          3696    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          2574    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
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SCOPEF= 104002          984*  1983  1989
SINTFL  016012         1410*  1432* 2742  2744* 3917*
SP    =:000006          931*  1331* 1332  1333* 1334* 1336  1337  1340  1342* 1344* 1350  1354  1355*
                       1356* 1359* 13*5* 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  3757* 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  = :04017         1010* 2226  2337
SUADD   011710         3018* 3941
SUAD1   011716         3021* 3026
SUAD2   011736         3024  3027*
SUCFLG  015310         3693* 3703* 3721* 3731* 3750*
SUDS    015522         3809*
SUOSP   015514         3805* 3930
SWR   = 177570          936* 2074  2201  2205  2235  2348  2352  2357  2361  2374  2380  2479  3619
                       3620  3622  3646  3648  3659  3668  3680
SW01  = 000002          925*
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*
TKDBF   015762         1418  1424  1429  2745  2747  2751  2752  2760  3901*
TPB     001242         1350* 1366*
TPCSR   015764         2749  3902*
TPDBR   015766         2751* 3903*
TPS     001240         1343  1365*
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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           996#    1398     1403     1446     2023     2076     2105     2110     2188     2227     2267     2292     2310
                         2338     2350     2359     2388     2415     2454     2465     2596     2641     2659     2665     2667     2672
                         2719     2730     2767     2936     2939     3084     3257     3265     3271     3279     3285     3293     3579
                         3771     3774
TYPER    001176          1354#    3929
TYPER1   001220          1354*    1358#
TYPFLG   016000          2269*    2290     2294*    3912#
T0       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          1739#    3977
T15      003204          1767#
T16      003332          1796#    3979
T17      003460          1825#    3981
T2       001672          1498#    3957
T20      003636          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*    3509     3832#
VSFE     012566          3178     3180     3194#
VSFFLG   016004          2572     3172*    3182*    3914#
VSFIN    012474          2167#    3462
VSFINA   012532          3170#    3185
VSFIN1   012524          3174#    3183
VSFMAN   012526          3171     3175#
WRCCNT   015642          2854*    2929*    3740*    3764*    3849#
X      = 000017           972#     980      981#     982      983#     984      985#     936      987#     989      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#    1619#
                         1621     1648#    1649     1676#    1677     1704#    1705     1733#    1734     1762#    1763     1791#    1792
                         1820#    1821     1849#
```
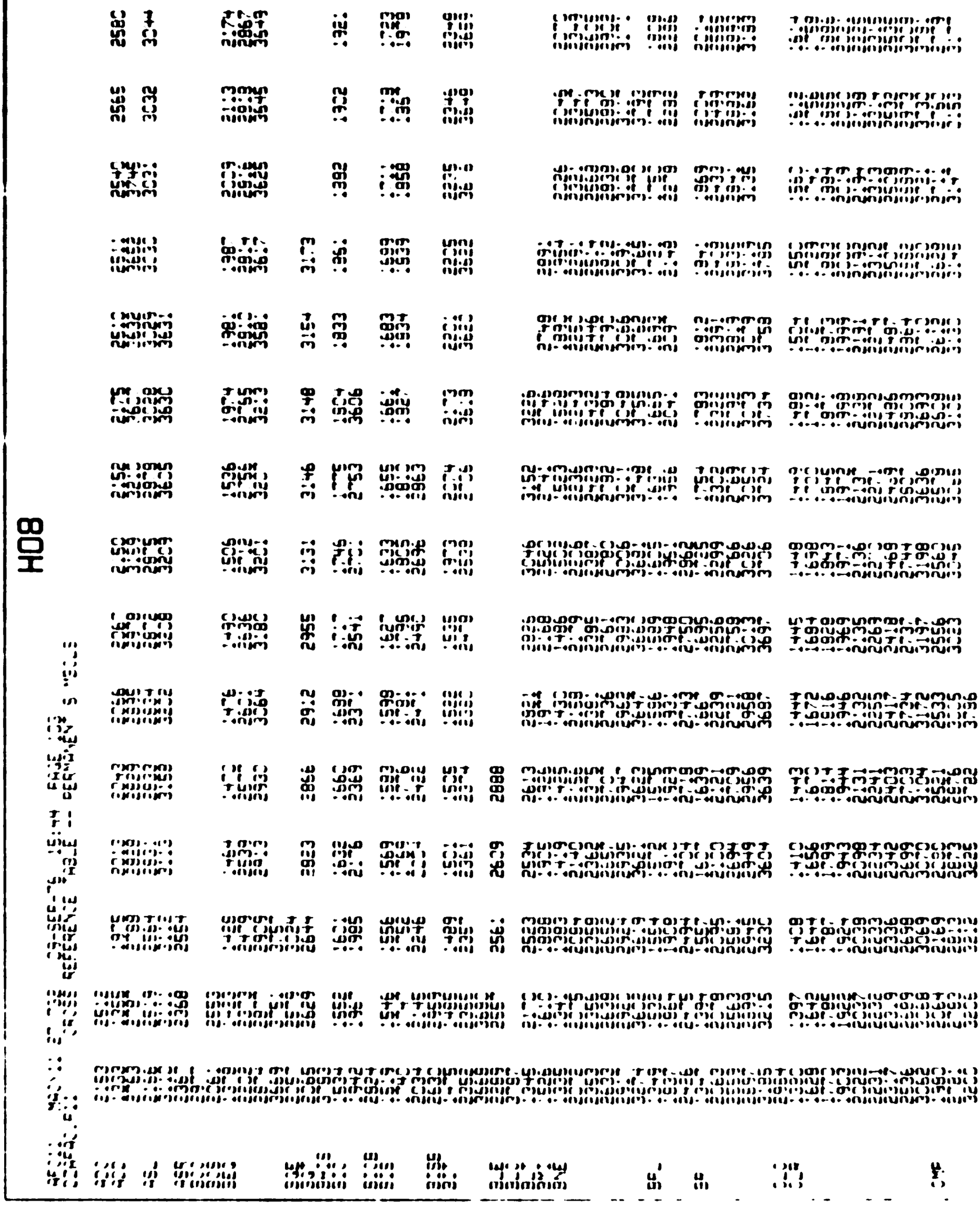

F08

```
RFC11   MACY11 27(732)  09-SEP-76  15:44  PAGE 99
DZRFAC.P11      CROSS REFERENCE TABLE -- USER SYMBOLS

XM     = 000001          974#
XN     = 000000          969#
$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#   3953#   3999#   4000#
```

EMTDEF	973#	990	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	1681	1709	1738	1767
	1796	1825	1855	1882	1900	1919	1940	1965							
.SCMTA	1#														
.SCMTB	1#														
.SCMTE	1#	1310													



CMPB	1340	1418	1424	1429	2372	2635	2637	2745	2747	2811	2817	2920	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
	2991	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	3737			
INC	1527	1899	1953	1991	2044	2069	2073	2096	2099	2154	2171	2244	2292	2524	2553
	2562	2566	2602	2614	2631	2639	2757	2869	2892	2896	2898	2916	2922	2948	3115
	3156	3203	3204	3576	3628										
[illegible]	1008	1379	1414	1421	1426	1431	2012	2125	2203	2252	2490	2762	2796	2931	3009
	3259	3267	3275	3276	3291	3299	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
	1594	1599	1600	1602	1603	1613	1630	1631	1634	1635	1643	1658	1659	1662	1663
	1671	1686	1687	1690	1691	1699	1714	1715	1716	1719	1729	1743	1744	1745	1749
	1757	1772	1773	1774	1777	1786	1801	1802	1803	1806	1815	1930	1931	1932	1935
	1844	1859	1860	1862	1865	1872	1945	1969	1979	1997	2001	2005	2006	2007	2010
	2011	2015	2028	2033	2035	2036	2039	2042	2050	2051	2052	2053	2054	2059	2088
	2090	2130	2133	2134	2141	2142	2143	2144	2146	2149	2159	2160	2161	2162	2163
	2164	[illegible]	2193	2195	2196	2197	2199	2204	2209	2223	2224	2229	2230	2237	2238
	2240	2245	2247	2248	2253	2273	2275	2276	2279	2280	2283	2284	2294	2300	2316
	2318	2334	2335	2341	2343	2344	2345	2354	2362	2364	2365	2366	2370	2390	[illegible]
	2405	2419	2420	2421	2423	2424	2427	2439	[illegible]	[illegible]	2453	[illegible]	[illegible]	[illegible]	[illegible]
	2488	2492	2495	2505	2506	2509	2515	2516	[illegible]	2531	2546	2547	2548	2551	2574
	2575	2594	2595	2596	2597	2598	2603	2606	[illegible]	[illegible]	[illegible]	2621	2622	[illegible]	2634
	2645	2649	2654	2661	2690	2691	2695	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	2729	2732	2733	2738	2739	2752	2759	[illegible]	2781	[illegible]	[illegible]	2801	2802	2833	[illegible]
	2905	2906	2830	2832	2836	2853	2854	2855	2857	2859	[illegible]	2891	2894	2895	[illegible]
	2918	2925	2932	2950	2953	2974	2975	2997	2998	2999	3003	3004	[illegible]	[illegible]	3033
	3043	3051	3067	3078	3080	3081	3092	3103	3107	3109	3132	3149	[illegible]	3155	[illegible]
	3173	3181	3192	3195	3196	3199	[illegible]	3234	3235	3236	[illegible]	3239	[illegible]	[illegible]	[illegible]
	3242	3247	3248	3249	3250	3251	3252	3253	3254	3255	3291	3295	3577	3580	3593
	3589	3598	3600	3608	3626	3629	3633	3634	3635	3639	3650	3671	3674	3694	3695
	3696	3702	3703	3704	3705	3716	3722	3723	3731	3732	3733	3738	3739	3740	3741
	3742	3743	3752	3753	3759	3767	3784	3805	3909	3910	3911	3912	3913	3914	3919
	3820	3821	3822	3823	3824										
MOVB	1334	1350	2623	2624	2625	2627	2640	2646	2647	2649	2650	2653	2655	2658	2751
	2754	2927	2956	2959	2960	2931	2934	2900	2910	2914	2915	2921	2927	2929	2933
	2942	2943	2944	2952	2957	2963	3745	3760	3763	3766					
NEG	2058	2287	2550	2868											
NOP	1400	1555	1638	1656	1694	1722	1751	1780	1809	1839	1866	2996	3534	3575	3536
RESET	3420	2207	2477	3256	3582										
ROL	3789	3790													

CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
ROR     2060  2062  2552  2976  2979  2980  2985  3794
RT      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
SCB     2055  2172  2295  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
        1723  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  2961  2913  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/SQL/CRF/DS:ERF2/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   007172   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   013314   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
```