ADF11

CONVERSION RATE TEST

MD-11-DZADF-A

EP-DZADF-A-DL

FICHE 1 OF 1

MAY 1978

digital

MADE IN USA

IDENTIFICATION

PRODUCT CODE:	MD-11-DZADF-A-D
PRODUCT NAME:	ADF11 CONVERSION RATE TEST
DATE CREATED:	FEB. 1976
MAINTAINER:	IPGCP
AUTHOR:	RAY BALDWIN

ADF11 CONVERTION RATE TIMING TEST

REQUIREMENTS:
PDP11, KW11L OR KW11P REAL TIME OPTION,ADF11
,ASR33 OR EQUIVELENT.

MEMORY STORAGE:
4K OCTAL MEMORY UPPER 2K IS READ/WRITE.

LOADING PROCEDURE:
PAPER TAPE SUPPLIED ,LOADED USING NORMAL
BINARY PROCEDURE.

STARTING PROCEDURE:

STARTING ADDRESS 200:
ADDRESS 000200 ENTERS THE PROGRAM HEADER ROUTINE
WHICH WILL ASK ,VIA TELETYPE THE FOLLOWING QUESTIONS.

1. TYPE(L) FOR LINE OR (P) FOR PROG. CLK.

THE OPERATOR MUST RESPOND BY TYPING AN "L" IF USING
THE KW11L OR A "P" IF THE KW11P REAL TIME
CLOCKS FOR THE TIME BASE.

IF AN "L" IS TYPED THE NEXT QUESTION IS

2.TYPE (5) FOR 50 OR (6) FOR 60 HZ.

TO WHICH THE OPERATOR MUST TYPE A "5" IF THE POWER
REFERENCE IS 50 CPS. OR A "6" IF THE POWER REFERENCE
IS 60 CPS..

IF A "P" IS TYPED THE NEXT QUESTION IS

2. TYPE (L) FOR 10 KHZ. (H) FOR 100KHZ.

TO WHICH THE OPERATOR MUST TYPE AN "L" IF
USING THE 10KHZ CRYSTAL OR (H) IF USING THE 120KHZ
CRYSTAL.

THE PROGRAM WILL THEN LIST THE 4 MODES
OF CONVERTION TO WHICH THE OPERATOR MUST TYPE THE
DESIGNATED LETTER OF ENTRY.

P=PROGRAM CONTROL
S=SINGLECHANNEL
Q=SEQUENTIAL
R=RANDOM

AFTER ENTERING ONE OF THE PROGRAMING MODES
LISTED ABOVE THE PROGRAM WILL REPORT THE MODE
SELECTED ON THE TELETYPE.

CONVERTIONS ARE TAKEN FOR 10 SECONDS (TIMED
BY KW11W OR KW11P) AND ARE REPORTED ON THE TELETYPE
AS KILO-HERTZ.

SYSTEM STATUS ERROR REPORTS

SHOULD A SYSTEM STATUS ERROR BE REPORTED FROM THE
REAL TIME CLOCK OR THE ADF11, THE PROGRAM WILL REPORT.

CLOCK STATUS ERROR (KW11L OR KW11P ERROR)

ADF11 STATUS ERROR (ADF11 STATUS ERROR)

EITHER STATUS ERROR WILL CAUSE A HALT AND
MUST BE RECOVERED BY THE OPERATOR.
MODE CHANGEING:

TO CHANGE THE MODE OF CONVERTION THE "CONTROL C"
FUNTION IS USED,THE KEYBOARD (ASR33 OR EQUIVALENT)
IS SCENSED AFTER EVERY DATA OUTPUT.
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                        ;
                        ; ADF11 CONVERTION RATE TIMING TEST
                        ;
                        ; DIGITAL EQUIPMENT CORPORATION
                        ; INDUSTRIAL PRODUCTS GROUP (COUSTON SYSTEMS)
                        ; AUTHOR:  RAY, BALDWIN
                        ; MAINTAINER:  IPG
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                        ;
                        ;
                        ; THIS TEST WILL TAKE CONVERTIONS IN THREE DIFFERENT MODES
                        ; AS SELECTED BY THE OPERATOR FROM THE TELETYPE KEYBOARD.
                        ; THE PROGRAM WILL OBTAIN ITS TIME BASE FROM EITHER THE KW111
                        ; OR KW11P REAL TIME CLOCK.
                        ; THE CONVERTION RATE WILL BE INCREMENTS OF 1000, EXPRESSED IN KILO-HERTZ,
                        ; PER SECOND.
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;
                        ; EQUALITIES
                        ;
                        ;
177776                  PS      =177776
177570                  SR      =177570
177560                  TKS     =177560         ;TELETYPE READER STATUS
177562                  TKB     =177562         ;TELETYPE READER BUFFER
177564                  TPS     =177564         ;TELETYPE PRINTER STATUS
177566                  TPB     =177566         ;TELETYPE PRINTER BUFFER
172540                  KWPS    =172540         ;KW11P REAL TIME CLOCK STATUS
172542                  KWPB    =172542         ;KW11P REAL TIME CLOCK COUNT SET BUF.
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                172540                  KWPC    =172540         ;KW11P REAL TIME CLOCK COUNTER REG.
                172546                  KWPXX   =172546         ;KW11P ALL
                177546                  LKS     =177546         ;KW11L STATUS REGISTER
                000240                  NOP     =240
                000000                  HLT     =0
                000000                  R0      =%0
                000001                  R1      =%1
                000002                  R2      =%2
                000003                  R3      =%3
                000004                  R4      =%4
                000005                  R5      =%5
                000006                  SP      =%6
                000007                  PC      =%7
                                        ; ADF11
                164000                  SWAR    =164000         ;ADF11-STATUS WORD ADDRESS REG.
                164002                  ADW     =164002         ;DATA WORD ADDRESS REG.
                164004                  WCR     =164004         ;WORD COUNT REGISTER
                164006                  CR      =164006         ;CONTROL REGISTER
                164010                  CSR     =164010         ;CONTROL AND STATUS REGISTER
                164012                  DR      =164012         ;DATA REGISTER
                164014                  BDW     =164014         ;DATA WORD ADDRESS REG. B
                164016                  IOR     =164016         ;INCREMENT MEMORY OFF SET
                                        ;
                                        ;BUSSS ERROR TIME OUT
                                        ;
                000004                  .=4
000004  003376                          BERR
000006  000340                          340
                                        ;
                                        ; KW11L TRAP VECTOR
                000100                  .=100
000100  002332                          TIMA                    ;LINE TIME CLOCK
000102  000340                          340
                000104                  .=104
000104  002404                          TIMB                    ;PROGRAMABLE TIME CLOCK
000106  000340                          340
                000200                  .=200
000200  000167  000574                  JMP     PRIME
                                        ; ADF11
                000274                  .=274
000274  003176                  SURV:   ADCRT                   ;ADF11 CONVERTION RATE ROUTINE
000276  000340                          340
                000600                  .=600
000600  000000                  STACK:  0
                001000                  .=1000
                                        ; INITIATE PROGRAM HEADER
001000  012706  000600          PRIME:  MOV     #STACK,SP               ;INIT STACK
001004  012767  000340  176764          MOV     #340,PS
001012  005067  001364                  CLR     CLKRET          ;CLR CLOCK RETURN LOC
001016  005067  000170                  CLR     PGCLK
001022  005067  000162                  CLR     LECLK
001026  012704  003415                  MOV     #TEXT,R4        ;PRINT HEADER AND ASK INITIAL QUESTIONS
001032  004367  002044                  JSR     R3,PRINT        ;ASK TYPE OF CLOCK
001036  004267  001452                  JSR     R2,REC          ;RECEIVE A CHARATER
001042  004367  001466                  JSR     R3,ECHO         ;ECHO CHARACTER
```

E1

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001046  022767  000314  001456          CMP     #314,HOLD       ;WAS CLOCK KW11L
001054  001412                          BEQ     SETLNE          ;BRANCH TO SET LINE CLOCK ROUTINE
001056  022767  000320  001446          CMP     #320,HOLD       ;WAS CLOCK KW11P
001064  001453                          BEQ     SETPRG          ;BRANCH TO SET PROGRAM CLOCK ROUTINE
001066  012704  003413                  MOV     #QU,R4          ;PRINT?
001072  004367  002004                  JSR     R3,PRINT        ;
001076  000167  177676                  JMP     PRIME           ;RECYCLE
                                        ;
                                        ; SET LINE CLOCK CONSTANTS
001102  012704  003467          SETLNE: MOV     #ASK50,R4       ;ASK FOR 50 OR 60 CPS?
001106  004367  001770                  JSR     R3,PRINT
001112  004267  001376                  JSR     R2,REC          ;RECEIVE A 5 OR A 6
001116  004367  001412                  JSR     R3,ECHO         ;ECHO CHAR.
001122  022767  000265  001402          CMP     #265,HOLD
001130  001412                          BEQ     SET5            ;SET 50 CYCLE RATE
001132  022767  000266  001372          CMP     #266,HOLD
001140  001412                          BEQ     SET6
001142  012704  003413                  MOV     #QU,R4          ;RECYCLE QUESTION
001146  004367  001730                  JSR     R3,PRINT
001152  000167  177724                  JMP     SETLNE
001156  012767  000764  000022  SET5:   MOV     #764,COUNT      ;SET 50 CYCLE K FOR 10 SEC
001164  000403                          BR      .+10
001166  012767  001130  000012  SET6:   MOV     #1130,COUNT     ;SET 60 CYCLE K FOR 10 SEC
001174  012767  177777  000006          MOV     #-1,LECLK       ;SET LOC. KW11L FOR FURTHUR REF.
001202  000167  000114                  JMP     MODE            ;
001206  000000                  COUNT:  0                       ;K FOR LINE CLOCK
001210  000000                  LECLK:  0                       ;LINE CLOCK INDICATOR
001212  000000                  PGCLK:  0                       ;PROGRAM CLOCK INDICATOR
                                        ; SET PROGRAMABLE CRYSTAL CONTROL CLOCK VARIABLES
                                        ;
001214  012704  003643          SETPRG: MOV     #ASK12,R4       ;ASK IF 10KC OR 100KC
001220  004367  001656                  JSR     R3,PRINT
001224  004267  001264                  JSR     R2,REC          ;RECIEVE ONE CHARACTER
001230  004367  001300                  JSR     R3,ECHO
001234  022767  000310  001270          CMP     #310,HOLD       ;WAS CHARACTER H FOR 100KC
001242  001412                          BEQ     SETHI           ;SET HIGH FREQUENCY K
001244  022767  000314  001260          CMP     #314,HOLD       ;WAS CHARACTER L FOR 10KC
001252  001412                          BEQ     SETLO           ;SET LOW FREQUENCY K
001254  012704  003413                  MOV     #QU,R4          ;PRINT A?
001260  004367  001616                  JSR     R3,PRINT
001264  000167  177724                  JMP     SETPRG          ;RECYCLE?
001270  012767  141520  000022  SETHI:  MOV     #141520,SEC     ;SET .5 SEC AT 100KC
001276  000403                          BR      .+10
001300  012767  011610  000012  SETLO:  MOV     #011610,SEC     ;SET .5 SEC AT 10KC
001306  012767  177777  177676          MOV     #-1,PGCLK
001314  000167  000002                  JMP     MODE
001320  000000                  SEC:    0
                                        ;
                                        ; ASK FOR MODE OF CONVERTION
                                        ;
001322  012704  003535          MODE:   MOV     #ASK11,R4
001326  004367  001550                  JSR     R3,PRINT        ;ASK FOR MODE OF CONVERTION
001332  004267  001156                  JSR     R2,REC
001336  004367  001172                  JSR     R3,ECHO
001342  022767  000320  001162          CMP     #320,HOLD       ;WAS MODE PROGRAM CONTROL "P"
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001350  001423                          BEQ     PRGCNT
001352  022767  000323  001152          CMP     #323,MOLD       ;WAS MODE SINGLE CHANNEL "S"
001360  001515                          BEQ     SINCH
001362  022767  000321  001142          CMP     #321,MOLD       ;WAS MODE SEQUENTIAL "Q"
001370  001571                          BEQ     SEQ
001372  022767  000322  001132          CMP     #322,MOLD       ;WAS MODE RANDOM "R"
001400  001405                          BEQ     S
001402  012704  003413                  MOV     #QU,R4          ;TYPE A?
001406  004367  001470                  JSR     R3,PRINT
001412  000743                          BR      MODE
001414  000167  000474          S:      JMP     RAN
                                        ;
                                        ;
                                        ; PROGRAM CONTROL MODE
                                        ;
001420  012704  003735          PRGCNT: MOV     #PCM,R4         ;PC G=1
001424  004367  001452                  JSR     R3,PRINT        ;PRINT PROGRAM CONTROL MODE
001430  012767  177777  000744          MOV     #-1,CLKRET      ;SET FOR CLOCK RETURN.
001436  005067  000150          PRNT:   CLR     INCC            ;CLEAR BLOCK COUNTER
001442  005067  001610                  CLR     CNT             ;CLEAR INC COUNTER
001446  012767  020000  162334          MOV     #20000,CSR              ;SET CONTROL & STATUS REGISTER.
001454  000240                          NOP
001456  005767  177526                  TST     LECLK           ;WHAT CLK?
001462  100404                          BMI     .+12
001464  004367  000604                  JSR     R3,PCT          ;START PROGRAMABLE CLK, 10 SEC
001470  000167  000002                  JMP     .+6
001474  004367  000556                  JSR     R3,LCT          ;START LINE CLK, 10 SEC
001500  042767  000340  176270          BIC     #340,PS
001506  000240                          NOP
001510  012767  000000  162270  LOP:    MOV     #0,CR           ;START A-D CONVERTION
001516  005267  000070                  INC     INCC            ;+1 TO INCREMENT COUNTER
001522  022767  001750  000062          CMP     #1750,INCC      ;HAVE WE REACHED 1000
001530  001407                          BEQ     .+20
001532  105767  162252                  TSTB    CSR             ;WAIT FOR A DONE
001536  100375                          BPL     .-4
001540  016767  162246  000042          MOV     DR,HEX          ;CLR FLAG
001546  000760                          BR      LOP             ;RECYCLE CONVERTIONS
001550  105767  162234                  TSTB    CSR             ;WAIT FOR LAST OF 1000
001554  100375                          BPL     .-4             ;WAIT FOR LAST IN BLOCK
001556  005267  001474                  INC     CNT             ;+1 TO GROUP COUNTER
001562  005067  000024                  CLR     INCC            ;CLEAR INCREMENT COUNTER
001566  000167  177716                  JMP     LOP
001572  016767  162214  000010  LOPA:   MOV     DR,HEX          ;CLEAR A-D FLAG
001600  004167  000746                  JSR     R1,CHECK
001604  000167  177626                  JMP     PRNT            ;RECYCLE TEST
001610  000000                  HEX:    0                       ;READ DATA IN HERE
001612  000000                  INCC:   0
                                        ;
                                        ;
                                        ; INITIATE SINGLE CHANNEL MODE-DMA-
                                        ;
001614  012767  003176  176452  SINCH:  MOV     #ADCRT,SURV     ;SET UP SERVICE FOR S. CH. MODE
001622  012704  003706                  MOV     #SINC,R4        ;PRINT SINGLE CHANNEL MODE
001626  004367  001250                  JSR     R3,PRINT
001632  012767  020000  162150          MOV     #20000,CSR
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001640  005067  001412          SINCMA: CLR     CNT
001644  005767  177340                  TST     LECLK           ;WHICH CLOCK?
001650  100404                          BMI     .+12
001652  004367  000416                  JSR     R3,PCT          ;START PROGRAMABLE CLOCK FOR 10 SEC.
001656  000167  000002                  JMP     .+6
001662  004367  000370                  JSR     R3,LCT          ;START LINE CLOCK FOR 10 SEC.
001666  000240                          NOP
001670  012767  013550  162104          MOV     #DBF,ADW        ;LOAD THE ADDRESS OF DATA BUFFER INTO
001676  000240                          NOP                     ;DATA WORD ADDRESS REG. A
001700  012767  176030  162076          MOV     #176030,WCR     ;SET WORD COUNT REGISTER TO 1000
001706  012767  001000  162072          MOV     #001000,CR      ;LOAD FINAL ADDRESS
001714  012767  110000  162064          MOV     #110000,CR      ;LOAD INITIAL, DMA, AND START CONVERT
001722  052767  000100  162060          BIS     #100,CSR        ;ENABLE W.C. INT.
001730  042767  000340  176040          BIC     #340,PS
001736  000001                          WAIT
001740  000776                          BR      .-2             ;WAIT FOR W.C. INTERRUPT
001742  000240                          NOP
001744  004167  000602                  JSR     R1,CHECK
001750  000167  177664                  JMP     SINCMA          ;
                                        ; THE WORD COUNT REGISTER WILL BE RELOADED IN THE A-D
                                        ; INTERRUPT SERVICE ROUTINE
                                        ;
                                        ;
                                        ;
                                        ;
                                        ; INITIATE SEQUENTIAL CHANNEL MODE -DMA-
001754  012767  003176  176312  SEQ:    MOV     #ADCRT,SURV     ;SERVICE FOR SEQ. MODE
001762  012704  003765                  MOV     #SCM,R4         ;PRINT SEQUENTIAL CHANNEL MODE
001766  004367  001110                  JSR     R3,PRINT
001772  012767  020000  162010          MOV     #20000,CSR
002000  005067  001252          SEQA:   CLR     CNT             ;CLEAR BLOCK COUNTER (# OF 1000'S)
002004  005767  177200                  TST     LECLK           ;WHICH CLOCK
002010  100404                          BMI     .+12
002012  004367  000256                  JSR     R3,PCT          ;START PROGRAMABLE CLOCK FOR 10 SEC.
002016  000167  000002                  JMP     .+6
002022  004367  000230                  JSR     R3,LCT          ;START LINE CLOCK FOR 10 SEC.
002026  000240                          NOP
002030  012767  013550  161744          MOV     #DBF,ADW        ;LOAD THE ADDRESS OF DATA BUFFER
002036  000240                          NOP                     ;INTO DATA WORD ADDRESS REG. A
002040  012767  176030  161736          MOV     #176030,WCR     ;SET W.C. REG. TO 1000
002046  012767  001010  161732          MOV     #001010,CR      ;LOAD FINAL ADDRESS
002054  012767  110000  161724          MOV     #110020,CR      ;LOAD INITIAL, DMA, & START CONVERT
002062  052767  000100  161720          BIS     #100,CSR
002070  042767  000340  175700          BIC     #340,PS
002076  000001                          WAIT
002100  000776                          BR      .-2             ;WAIT FOR CLOCK INTERRUPTS
002102  000240                          NOP
002104  004167  000442                  JSR     R1,CHECK
002110  000167  177664                  JMP     SEQA
                                        ; THE WORD COUNT REGISTER WILL BE RELOADED IN THE
                                        ; CLOCK INTERRUPT SERVICE ROUTINES
                                        ;
                                        ;
                                        ;
                                        ; INITIATE RANDOM CHANNEL & GAIN MODE -DMA-
```

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002114  012767  003272  176152  RAN:    MOV     #SERVIR,SURV    ;SET SERVICE ROUTINE FOR RANDOM
002122  012704  004020                  MOV     #RCH,R4         ;MODE
002126  004367  000750                  JSR     R3,PRINT        ;PRINT RANDOM CHANNEL MODE
002132  012767  020000  161650          MOV     #20000,CSR
002140  004167  001212                  JSR     R1,WRITP        ;WRIGHT 1000 STATUS WORDS
002144  005067  001106          RAND:   CLR     CNT             ;CLEAR BLOCK COUNTER
002150  012767  013550  161624          MOV     #DBF,ADW        ;LOAD ADDRESS OF DATA BUFFER
002156  012767  007626  161614          MOV     #STA,SWAR       ;LOAD ADDRESS OF STATUS WORDS
002164  005767  177020                  TST     LECLK
002170  100404                          BMI     .+12
002172  004367  000076                  JSR     R3,PCT          ;START PROGRAMABLE CLOCK FOR 10 SEC.
002176  000167  000002                  JMP     .+6
002202  004367  000050                  JSR     R3,LCT          ;START LINE CLOCK FOR 10 SEC.
002206  000240                          NOP
002210  012767  176030  161566          MOV     #176030,WCR     ;SET W.C. FOR 1000 DEC.
002216  012767  010000  161562          MOV     #010000,CR      ;SET FOR RANDOM MODE
002224  052767  000100  161556          BIS     #100,CSR
002232  042767  000340  175536          BIC     #340,PS
002240  000001                          WAIT
002242  000776                          BR      .-2
002244  000240                          NOP
002246  004167  000300                  JSR     R1,CHECK
002252  000167  177666                  JMP     RAND            ;RECYCLE TEST
                                        ;
                                        ;
                                        ;
                                        ;
                                        ; START LINE FREQUENCY REAL TIME CLOCK
                                        ;
002256  016767  176724  000114  LCT:    MOV     COUNT,LCNT      ;SET LINE CLOCK FOR 10 SEC.
002264  012767  000100  175254          MOV     #100,LKS        ;ENABLE INT.
002272  000203                          RTS     R3
                                        ;
                                        ; START PROGRAMABLE REAL TIME CLOCK (MODE 1)
002274  016767  177020  170240  PCT:    MOV     SEC,KWPR        ;SET PRECOUNT IN BUFFER
002302  100404                          BMI     .+12            ;SET HIGH SPEED
002304  012767  000113  170226          MOV     #000113,KWPS    ;10KHZ DOWN COUNT & RUN TO STATUS
002312  000403                          BR      .+10
002314  012767  000111  170216          MOV     #000111,KWPS    ;100KHZ, INT. EN, DOWN & RUN TO STATUS
002322  012767  000024  000130          MOV     #24,PCNT        ;SET FOR 20 TRIPS @ .5 SEC EACH
002330  000203                          RTS     R3
                                        ; SERVICE LINE FREQUENCY CLOCK INTTERRUPTS
                                        ;
002332  005367  000042          TIMA:   DEC     LCNT            ;CHECK FOR LAST CLOCK TICK
002336  001401                          BEQ     .+4
002340  000002                          RTI
002342  004567  000126                  JSR     R5,REPT
002346  012767  020000  161434          MOV     #20000,CSR      ;CLR LAST W.C.
002354  005767  000022                  TST     CLKRET          ;CHECK FOR P.C. MODE ON LAST TICK
002360  100403                          BMI     .+10
002362  062716  000004                  ADD     #4,@SP
002366  000002                          RTI
002370  012706  000600                  MOV     #STACK,SP       ;REINITIAL THE STACK
002374  000167  177172                  JMP     LOPA            ;RETURN TO P.C. TEST
002400  000000          LCNT:   0
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002402  000000                  CLKRET: 0
                                        ;
                                        ; SERVICE PROGRAMABLE REAL TIME CLOCK INTERRUPTS
002404  005767  170130          TIMB:   TST     KWPS            ;TEST STATUS OF CLOCK INT.
002410  100424                          BMI     ERR             ;REINITIALIZE TEST
002412  005367  000042                  DEC     PCNT            ;20 TRIPS
002416  001401                          BEQ     .+4             ;BRANCH WHEN DONE
002420  000002                          RTI
002422  004567  000046                  JSR     R5,REPT         ;REPORT FINDINGS
002426  012767  020000  161354          MOV     #2000*,CSR      ;CLR LAST W.
002434  005767  177742                  TST     CLKRET          ;TEST FOR PROGRAM CONTROL MODE
002440  100407                          BMI     .+20
002442  062716  000004                  ADD     #4,@SP
002446  000002                          RTI                     ;RECYCLE TEST
002450  012706  000600                  MOV     #STACK,SP       ;REINITIALIZE THE STACK
002454  000167  177112                  JMP     LOPA            ;RETURN TO P.C. TEST
002460  000000          PCNT:   0
                                        ;
                                        ; REPORT CLOCK STATUS ERROR
002462  012704  004047          ERR:    MOV     #CLKST,R4
002466  004367  000410                  JSR     R3,PRINT
002472  000000                          HLT                     ;REAL TIME CLOCK STATUS SHOWS ERROR
                                        ;
                                        ;
                                        ;
                                        ; REPORT RESULTS OF CONVERTIONS TAKEN IN 10 SEC.
                                        ; AND SCALE FOR RESULTS OF ONE SEC.
                                        ;
                                        ;
002474  012767  000340  175274  REPT:   MOV     #340,PS
002502  004267  000100                  JSR     R2,OCTDEC       ;CONVERT OCTAL VALUE CONV. TO DEC.
002506  004267  000264                  JSR     R2,OUTCOD       ;PRINT
002512  000205                          RTS     R5
                                        ;
                                        ; RECEIVE ONE CHARACTER FROM KEYBOARD AND
                                        ; STORE IN LOCATION HOLD
                                        ;
002514  105767  175040          REC:    TSTB    TKS             ;WAIT FOR KEYBOARD
002520  100375                          BPL     .-4
002522  016767  175034  000002          MOV     TKB,HOLD
002530  000202                          RTS     R2
002532  000000          HOLD:   0
                                        ; ECHO CHARACTER IN TELETYPE BUFFER REGISTER
002534  016767  175022  175024  ECHO:   MOV     TKB,TPB         ;READER BUFFER TO PRINTER BUFFER
002542  105767  175016                  TSTB    TPS
002546  100375                          BPL     .-4
002550  000203                          RTS     R3
                                        ;
                                        ;
002552  105767  175002          CHECK:  TSTB    TKS
002556  100401                          BMI     .+4
002560  000201                          RTS     R1
002562  022767  000203  174772          CMP     #203,TKB
002570  001401                          BEQ     .+4
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```
002572  000201                          RTS     R1
002574  052767  020000  161206          BIS     #20000,CSR
002602  000167  176172                  JMP     PRIME
                                        ;
                                        ;
                                        ; CONVERT VALUE IN LOCATION "CNT" TO DECIMAL AND
                                        ; STORE RESULTS IN ASCII CODE FOR OUTPUT
                                        ;
002606  005767  000444          OCTDEC: TST     CNT
002612  001001                          BNE     .+4
002614  000000                          HLT                     ;NO VALUE TO CONVERT
002616  012700  002746                  MOV     #NEG,R0         ;R0 POINTS TO NEG, #5 FOR SUB,
002622  012701  002762                  MOV     #DEC,R1         ;R1 POINTS TO LOCS FOR DEC, VALUES
002626  012767  000260  000126                  MOV     #260,DEC                ;LOAD ASCII BASE VALUES
002634  012767  000260  000122          MOV     #260,DEC+2
002642  012767  000260  000116          MOV     #260,DEC+4
002650  012767  000260  000112          MOV     #260,DEC+6
002656  012767  000260  000106          MOV     #260,DEC+10
002664  016767  000366  000050          MOV     CNT,SAVE
002672  016767  000044  000044          MOV     SAVE,SUMS
002700  061067  000040          BIDE:   ADD     (R0),SUMS       ;SUBTRACT DECIMAL EQUIVALENTS
002704  100004                          BPL     .+12
002706  005720                          TST     (R0)+           ;UPDATE SUB,VALUE
002710  005721                          TST     (R1)+           ;UPDATE DEC, LOCATOR
002712  000167  177754                  JMP     BIDE-6
002716  016767  000022  000016          MOV     SUMS,SAVE       ;SAVE REMAINDER FOR WHEN #GOES, NEG,
002724  005211                          INC     (R1)            ;PLUS 1 TO ASCII VALUE
002726  005767  000012                  TST     SUMS
002732  001402                          BEQ     .+6
002734  000167  177740                  JMP     BIDE
002740  000202                          RTS     R2              ;RETURN WHEN DONE
                                        ;
002742  000000          SAVE:   0
002744  000000          SUMS:   0
002746  154360          NEG:    154360                  ;010000 OCT-
002750  176030                  176030                  ;001000 OCT-
002752  177634                  177634                  ;000100 OCT-
002754  177766                  177766                  ;000010 OCT-
002756  177777                  177777                  ;000001 OCT-
                                        ;
002760  000000                  0
002762  000000          DEC:    0
002764  000000                  0
002766  000000                  0
002770  000000                  0
002772  000000                  0
002774  177777                  177777
                                        ;
                                        ;
                                        ; PRINT CONVERTED VALUE OF KHZ,
                                        ;
                                        ;
002776  012700  002762          OUTCOD: MOV     #DEC,R0
003002  022710  000260                  CMP     #260,@R0        ;CHECK FOR FIRST NON-ZERO CHAR,
003006  001007                          BNE     .+20            ;PRINT
```

```
003010  005720                          TST     (R0)+           ;SKIP OVER LEADING ZERO'S
003012  012704  004074                  MOV     #SPACE,R4       ;PRINT A SPACE
003016  004367  000060                  JSR     R3,PRINT
003022  000167  177754                  JMP     OUTCOD+4
003026  112067  174534                  MOVB    (R0)+,TPB
003032  105767  174526                  TSTB    TPS
003036  100375                          BPL     .-4
003040  022700  002772                  CMP     #DEC+10,R0
003044  001370                          BNE     .-16
003046  012704  004076                  MOV     #PT,R4          ;PRINT.
003052  004367  000024                  JSR     R3,PRINT
003056  011067  174504                  MOV     (R0),TPB
003062  105767  174476                  TSTB    TPS
003066  100375                          BPL     .-4
003070  012704  004100                  MOV     #KHZ,R4
003074  004367  000002                  JSR     R3,PRINT        ;PRINT "KHZ."
003100  000282                          RTS     R2              ;ALL DONE
                                        ;
                                        ;
                                        ;
                                        ;PRINT DATA SPECIFIED BY REGISTER 4 UNTIL TERMINATED BY
                                        ; (0)
003102  112467  000066          PRINT:  MOVB    (R4)+,DBUF
003106  122767  000100  000060          CMPB    #100,DBUF
003114  001426                          BEQ     DONE
003116  122767  000045  000050          CMPB    #45,DBUF
003124  001010                          BNE     OUT
003126  112767  000015  000040          MOVB    #15,DBUF
003134  004567  000014                  JSR     R5,PRT
003140  112767  000012  000026          MOVB    #12,DBUF
003146  004567  000002          OUT:    JSR     R5,PRT
003152  000753                          BR      PRINT
                                        ;
003154  116767  000014  174404  PRT:    MOVB    DBUF,TPB
003162  105767  174376                  TSTB    TPS
003166  100375                          BPL     .-4
003170  000205                          RTS     R5
003172  000203                  DONE:   RTS     R3
003174  000000                  DBUF:   0
                                        ;
                                        ; SERVICE THE A-D CONVERTER ON EVERY WORD COUNT
                                        ; OVER FLOW AND CHECK FOR ANY ERROR CONDITIONS
                                        ; THIS ROUTINE USED FOR SINGLE CHANNEL & SEQUENTIAL MODE
                                        ;
003176  005767  160606          ADCRT:  TST     CSR             ;TEST FOR INT. FROM ERROR
003202  100002                          BPL     .+6
003204  000167  000050                  JMP     SERR            ;REPORT A STATUS ERROR
003210  000240                          NOP
003212  042767  000200  160570          BIC     #200,CSR        ;CLEAR THE READY BIT
003220  005267  000032                  INC     CNT             ;PLUS 1 TO BLOCK COUNTER
003224  062716  177740                  ADD     #177740,@SP             ;SUBTRACT 40 FROM STACK
003230  005726                          TST     (SP)+
003232  012716  000340                  MOV     #340,@SP
003236  005746                          TST     -(SP)
003240  052767  020000  160542          BIS     #20000,CSR
```

```
003246  012767  013550  160526          MOV     #DBF,ADW
003254  000002                          RTI
003256  000000          CNT:    0                       ;GROUPS OF 1000'S
                        ; REPORT STATUS ERROR
003260  012704  004107  SERR:   MOV     #STATUS,R4
003264  004367  177612          JSR     R3,PRINT
003270  000000                  HLT                     ;STATUS REG. CONTAINS ERROR
                        ;
                        ;
                        ;
                        ;
                        ;
                        ; SERVICE WORD COUNT OVERFLOW & ERROR INTERRUPTS
                        ; FROM THE RANDOM MODE
                        ;
003272  005767  160512  SERVIR:  TST     CSR             ;TEST FOR ERRORS
003276  100002                  BPL     .+6
003300  000167  177754          JMP     SERR            ;REPORT A STATUS ERROR
003304  052767  020000  160476  BIS     #20000,CSR
003312  012767  013550  160462  MOV     #DBF,ADW        ;LOAD DATA WORD ADDRESS REG. A.
003320* 012767  007626  160452  MOV     #STA,SWAR       ;LOAD STATUS WORD ADDRESS REG A
003326  042767  000200  160454  BIC     #200,CSR        ;CLEAR THE READY BIT
003334  005267  177716          INC     CNT             ;+1 TO BLOCK COUNTER
003340  062716  177746          ADD     #177746,@SP     ;SUBTRACT 32 FROM STACK
003344  005726                  TST     (SP)+
003346  012716  000340          MOV     #340,@SP
003352  005746                  TST     -(SP)
003354  000002                  RTI
                        ;
                        ; WRITE 1000 STATUS WORDS FOR RANDON MODE
                        ;
003356  012705  007626  WRITE:  MOV     #STA,R5
003362  012725  010000          MOV     #10000,(R5)+
003366  020527  013550          CMP     R5,#DBF
003372  001373                  BNE     .-10
003374  000201                  RTS     R1
                        ;
                        ;
                        ;BUSS TIME OUT ERROR HANDLER
                        ;
                        ;
003376  012704  004134  BERR:   MOV     #BUSE,R4                ;REPORT BUS ERROR
003402  004367  177474          JSR     R3,PRINT
003406  000167  175366          JMP     PRIME
                        ;
                        ;
                        ; MESSAGES
003412      000                 .BYTE
003413      077         QU:     .ASCII  /?@/
003414      100


003415      045         TEXT:   .ASCII  /% TYPE (L) FOR LINE OR (P) FOR PROG. CLK @/
003416      040
```

```
003417      124
003420      131
003421      120
003422      105
003423      040
003424      050
003425      114
003426      051
003427      040
003430      106
003431      117
003432      122
003433      040
003434      114
003435      111
003436      116
003437      105
003440      040
003441      117
003442      122
003443      040
003444      050
003445      120
003446      051
003447      040
003450      106
003451      117
003452      122
003453      040
003454      120
003455      122
003456      117
003457      107
003460      056
003461      040
003462      103
003463      114
003464      113
003465      040
003466      100

003467      045                 ASK56:  .ASCII  /% TYPE (5) FOR 50 OR (6) FOR 60 HZ.  0/
003470      040
003471      124
003472      131
003473      120
003474      105
003475      040
003476      050
003477      065
003500      051
003501      040
003502      106
003503      117
```

```
003504      122
003505      040
003506      065
003507      060
003510      040
003511      117
003512      122
003513      040
003514      050
003515      066
003516      051
003517      040
003520      106
003521      117
003522      122
003523      040
003524      066
003525      060
003526      040
003527      110
003530      132
003531      056
003532      040
003533      040
003534      100


003535      045                 ASK11:  .ASCII  /%(P)=PROGRAM CONTROL %(S)=SINGLE CHANNEL%/
003536      050
003537      120
003540      051
003541      075
003542      120
003543      122
003544      117
003545      107
003546      122
003547      101
003550      115
003551      040
003552      103
003553      117
003554      116
003555      124
003556      122
003557      117
003560      114
003561      040
003562      045
003563      050
003564      123
003565      051
003566      075
003567      123
003570      111
```

```
003571      116
003572      107
003573      114
003574      105
003575      040
003576      103
003577      110
003600      101
003601      116
003602      116
003603      105
003604      114
003605      045

003606      050                     .ASCII  /(Q)=SEQUENTIAL %(R)=RANDON %0/
003607      121
003610      051
003611      075
003612      123
003613      105
003614      121
003615      125
003616      105
003617      116
003620      124
003621      111
003622      101
003623      114
003624      040
003625      045
003626      050
003627      122
003630      051
003631      075
003632      122
003633      101
003634      116
003635      104
003636      117
003637      116
003640      040
003641      045
003642      100

003643      045             ASK12:  .ASCII  /%TYPE(L)FOR 10KHZ,(H)FOR 100KHZ,  0/
003644      124
003645      131
003646      120
003647      105
003650      050
003651      114
003652      051
003653      106
```

C2

```
003654      117
003655      122
003656      040
003657      061
003660      060
003661      113
003662      110
003663      132
003664      056
003665      050
003666      110
003667      051
003670      106
003671      117
003672      122
003673      040
003674      061
003675      060
003676      060
003677      113
003700      110
003701      132
003702      056
003703      040
003704      040
003705      100

003706      045                 SINC:   .ASCII  /%SINGLE CHANNEL MODE%%0/
003707      123
003710      111
003711      116
003712      107
003713      114
003714      105
003715      040
003716      103
003717      110
003720      101
003721      116
003722      116
003723      105
003724      114
003725      040
003726      115
003727      117
003730      104
003731      105
003732      045
003733      045
003734      100

003735      045                 PCM:    .ASCII  /%PROGRAM CONTROL MODE%%0/
003736      120
```

```
003737      122
003740      117
003741      107
003742      122
003743      101
003744      115
003745      040
003746      103
003747      117
003750      116
003751      124
003752      122
003753      117
003754      114
003755      040
003756      115
003757      117
003760      104
003761      105
003762      045
003763      045
003764      100

003765      045                 SCM:    .ASCII  /%SEQUENTIAL CHANNEL MODE%%0/
003766      123
003767      105
003770      121
003771      125
003772      105
003773      116
003774      124
003775      111
003776      101
003777      114
004000      040
004001      103
004002      110
004003      101
004004      116
004005      116
004006      105
004007      114
004010      040
004011      115
004012      117
004013      104
004014      105
004015      045
004016      045
004017      100

004020      045                 RCM:    .ASCII  /%RANDOM CHANNEL MODE%%0/
004021      122
```

```
004022      101
004023      116
004024      104
004025      117
004026      116
004027      040
004030      103
004031      110
004032      101
004033      116
004034      116
004035      105
004036      114
004037      040
004040      115
004041      117
004042      104
004043      105
004044      045
004045      045
004046      100

004047      045                 CLKST:  .ASCII  /%CLOCK STATUS ERROR @/
004050      103
004051      114
004052      117
004053      103
004054      113
004055      040
004056      123
004057      124
004060      101
004061      124
004062      125
004063      123
004064      040
004065      105
004066      122
004067      122
004070      117
004071      122
004072      040
004073      100

004074      040                 SPACE:  .ASCII  / @/
004075      100

004076      056                 PT:     .ASCII  /.@/
004077      100

004100      040                 KMZ:    .ASCII  / KMZ.%@/
```

```
004101      113
004102      110
004103      132
004104      056
004105      045
004106      100

004107      045                 STATUS: .ASCII  /%ADF11 STATUS ERROR%0/
004110      101
004111      104
004112      106
004113      061
004114      061
004115      040
004116      123
004117      124
004120      101
004121      124
004122      125
004123      123
004124      040
004125      105
004126      122
004127      122
004130      117
004131      122
004132      045
004133      100

004134      102                 BUSER:  .ASCII  /BUS TIME OUT ERROR%0/
004135      125
004136      123
004137      040
004140      124
004141      111
004142      115
004143      105
004144      040
004145      117
004146      125
004147      124
004150      040
004151      105
004152      122
004153      122
004154      117
004155      122
004156      045
004157      100


            004160              .EVEN
            007626              .=7626
```

```
007626  000000          STA:  0                 ;BEGIN 1000 WORD STATUS BUF.
        013550                .=13550
013550  000000          DBF:  0                 ;BEGIN 1000 WORD DATA BUF.
        000001                .END
```

ADCRT	003176	PRINT	003102
ADW	164002	PRNT	001436
ASK11	003535	PRT	003154
ASK12	003643	PS	177776
ASK56	003467	PT	004076
BDW	164014	QU	003413
BERR	003376	R0	000000R
BIDE	002700	R1	000001R
BUSER	004134	R2	000002R
CHECK	002552	R3	000003R
CLKRET	002402	R4	000004R
CLKST	004047	R5	000005R
CNT	003256	RAN	002114
COUNT	001206	RAND	002144
CR	164006	RCM	004020
CSR	164010	REC	002514
DBF	013550	REPT	002474
DBUF	003174	SAVE	002742
DEC	002762	SCM	003765
DONE	003172	SEC	001320
DR	164012	SEQ	001754
ECHO	002534	SEQA	002000
ERR	002462	SERR	003260
HEX	001610	SERVIR	003272
HLT	000000	SET5	001156
HOLD	002532	SET6	001166
INCC	001612	SETHI	001270
IOR	164016	SETLNE	001102
KHZ	004100	SETLO	001300
KWPB	172542	SETPRG	001214
KWPC	172544	SINC	003706
KWPS	172540	SINCH	001614
KWPXX	172546	SINCHA	001640
LCNT	002400	SP	000006R
LCT	002256	SPACE	004074
LECLK	001210	SR	177570
LKS	177546	STA	007626
LOP	001510	STACK	000600
LOPA	001572	STATUS	004107
MODE	001322	SUMS	002744
NEG	002746	SURV	000274
NOP	000240	SWAR	164000
OCTDEC	002606	TEXT	003415
OUT	003146	TIMA	002332
OUTCOD	002776	TIMB	002404
PC	000007R	TKB	177562
PCM	003735	TKS	177560
PCNT	002460	TPB	177566
PCT	002274	TPS	177564
PGCLK	001212	WCR	164004
PRGCNT	001420	WRITE	003356
PRIME	001000	$	001414

ERRORS DETECTED: 0

RUN-TIME: 3 SECONDS

5K CORE USED