

# KW11-P

REAL TIME CLOCK TEST  
CZKWBIO

AH-8878I-MC

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IDENTIFICATION  
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PRODUCT CODE: AC-8877I-MC  
PRODUCT NAME: CZKWBIC KW11-P RT CLK TST  
PRODUCT DATE: 02-FEBRUARY-1978  
MAINTAINER: DIAGNOSTIC ENGINEERING  
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W. SCHLITZKUS FEB. 02, 1978

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## 1.0 ABSTRACT

THIS PROGRAM TESTS THE KW11-P REAL TIME CLOCK. IT CONTAINS A SERIES OF INCREMENTAL ROUTINES THAT TEST THE CONTROL AND STATUS REGISTER, COUNT SET BUFFER, COUNTER, AND INTERRUPT VECTOR ADDRESS USING 100KHZ, 10KHZ, LINE AND EXTERNAL FREQUENCIES.

2.0 REQUIREMENTS  
2.1 EQUIPMENT

PDP-11 WITH KW11-P

## 2.2 STORAGE

THIS PROGRAM OCCUPIES MEMORY FROM 0 TO 11636.

3.0 LOADING PROCEDURE  
3.1 METHOD

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED

1. ABSOLUTE LOADER MUST BE IN MEMORY.
2. PLACE BINARY TAPE IN READER.
3. LOAD ADDRESS \*7500 (\* DETERMINED BY LOCATION OF LOADER).
4. PRESS "START" (PROGRAM WILL LOAD).

4.0 STARTING PROCEDURE  
4.1 CONTROL SWITCH SETTINGS

SET SW0=1 TO SUPPRESS TESTS USING EXTERNAL FREQUENCY.  
SET SW2=1 TO INCLUDE REPEATABILITY TEST T25 & T26 IF COW IS PRESENT

## 4.2 STARTING ADDRESSES

200 BASIC TEST  
204 RESTART ADDRESS-PRIMARYLY USED BY XOR TESTER  
210 TIMING TEST  
214 DOUBLE OR SINGLE REAL TIME CLOCK TEST. 100KHZ.  
220 DOUBLE OR SINGLE REAL TIME CLOCK TEST. 10KHZ.  
224 DOUBLE OR SINGLE REAL TIME CLOCK TEST. 60HZ.  
230 DOUBLE OR SINGLE REAL TIME CLOCK TEST 50HZ

## 4.3 PROGRAM AND/OR OPERATOR ACTION

\*\*NOTE: IF NO HARDWARE SWITCH REGISTER IS AVAILABLE THE PROGRAM WILL AUTOMATICALLY USE THE CONTENTS OF LOC. 176 AS THE SOFTWARE SWITCH REGISTER. THE USER SHOULD SET UP THIS LOC. BEFORE STARTING THE PROGRAM.

LOAD PROGRAM INTO MEMORY  
SET SWITCH REGISTER TO STARTING ADDRESS  
LOAD ADDRESS.  
IF DESIRED TO SUPPRESS EXTERNAL FREQUENCY TESTS SET SW0=1.  
PRESS START  
PROGRAM WILL BEGIN TESTING

## 5. OPERATING PROCEDURE

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5.1 OPERATIONAL SWITCH SETTINGS  
5.1.1 BASIC TEST

WITH SWITCHES 12 THRU 15=0 (DOWN) THE PROGRAM WILL PRINT OUT  
ON ERRORS AND CONTINUE IN TEST. BELL WILL RING AT COMPLETION  
OF A PASS.

SWITCH SETTINGS ARE:

SW15=1 OR UP...HALT ON ERROR  
SW14=1 OR UP...SCOPE LOOP  
SW13=1 OR UP...INHIBIT PRINTOUT  
SW11=1 OR UP...SINGLE ITERATIONS ONLY  
SW4 =1 OR UP...ENABLE SYNCHRONIZATION TESTS  
SW3 =1 OR UP...ADJUSTS DELAYS FOR 11/60, 11/70 OR 11/45 WITH MOS OR BIPOLAR MEMO  
SW2 =1 OR UP...CLK2 PRESENT-EXECUTE REPEATABILITY TESTS

5.2 SUBROUTINE ABSTRACTS

5.2.1 SCOPE

THIS SUBROUTINE CALL IS PLACED BETWEEN EACH SUB-TEST IN THE  
BASIC TEST SECTION. IT RECORDS THE STARTING ADDRESS OF EACH  
SUB-TEST AS IT IS BEING ENTERED. IF A SCOPE LOOP IS REQUESTED,  
IT WILL JUMP TO THE START OF THE SUB-TEST INDICATED BY "SCOPE".

5.2.2 HLT

THIS SUBROUTINE CALL PRINTS THE ADDRESS THAT TAGS THE FAILING  
SUB-TEST AND THE CONTENTS OF THE CONTROL AND STATUS REGISTER,  
COUNTER, AND "TEMP".

6. ERRORS

6.1 ERROR PRINTOUT FORMAT

WITH SW13=0 (OR DOWN) THE FOLLOWING PRINTOUT WILL APPEAR ON  
AN ERROR:

PC STATUS COUNTER TEMP  
XXXXXX XXXXX XXXXXX XXXXXX

PC = ADDRESS OF TEST WHERE ERROR OCCURRED  
STATUS = CONTENTS OF COMMAND AND STATUS REGISTER AT TIME OF ERROR  
COUNTER = CONTENTS OF COUNTER AT TIME OF ERROR  
TEMP = CONTENTS OF ADDRESS "TEMP" USED BY SOME TESTS.

NOTE: NOT ALL OF THE INFORMATION PRINTED IS INTENDED  
TO BE USEFUL FOR EVERY TYPE OF ERROR. THIS IS SIMPLY  
A STANDARD ERROR REPORT FOR ALL ERRORS. THE OPERATOR  
MUST REFER TO THE PROGRAM LISTING AT THE ADDRESS OR  
THE ERROR FOR A DESCRIPTION OF THE CAUSE OF THE ERROR.

6.2 ERROR RECOVERY

WITH SWITCH 15=1 (OR UP) THE PROGRAM WILL HALT ON AN ERROR.  
DEPRESS "CONTINUE" TO RESUME TESTING.

## 7. RESTRICTIONS

## 7.1 OPERATIONAL RESTRICTIONS

FOR PURPOSES OF TESTING THE EXTERNAL FREQUENCY SELECTION IT IS NECESSARY TO SUPPLY A KNOWN FREQUENCY TO THE EXTERNAL FREQUENCY INPUT. THIS PROGRAM USES THE INTERNAL 60HZ FOR ITS SOURCE. TO DO THIS IT IS REQUIRED THAT A JUMPER WIRE BE CONNECTED BETWEEN PINS CF1 AND DA1 OF THE SLOT IN WHICH THE CLOCK MODULE IS INSERTED. IF THIS IS NOT DONE, THEN THE PROGRAM MUST ALWAYS BE RUN WITH SWO=1 TO SUPPRESS THE EXTERNAL TESTS.  
\* IF A SECOND P CLOCK IS BEING USED FOR TEST PURPOSES, SET THE SWITCH REG = 000004 TO ENABLE TESTS T25 AND T26, DURING THE BASE TEST

## 8. MISCELLANEOUS

## 8.1 EXECUTION TIME

BASIC TEST REQUIRES 11 SECONDS PER PASS W/O ITERATIONS 66 WITH. TIMING TEST REQUIRES 4 MINUTES PER PASS.  
DOUBLE OR SINGLE REAL TIME CLOCK TEST-DETERMINED BY OPERATOR  
SUGGESTED EXECUTION TIMES ARE:  
1. IF THE SINGLE CLOCK TEST IS RUN WITHOUT BEING FOLLOWED BY THE DUAL CLOCK TEST: 17 MINUTES FOR EACH FREQUENCY (100KHZ, 10KHZ, 60KHZ)  
2. IF THE SINGLE CLOCK TEST IS FOLLOWED BY THE DUAL TEST  
RUN SINGLE CLOCK TEST FOR ONE MINUTE (FOR EACH FREQUENCY)  
RUN DUAL CLOCK TEST FOR FIFTY SECONDS (10 PRINTOUTS) (FOR EACH FREQUENCY)

NOTE: THIS TIME NOMINAL TIME FOR PDP-11/05  
OTHER C.P.U.'S THE TIME WILL VARY

## 9. PROGRAM DESCRIPTION

THE PROGRAM CONSISTS OF THREE SECTIONS: THE BASIC TEST THE TIMING TEST AND THE REAL TIME CLOCK TEST. THE BASIC TEST CHECKS EACH OF THE INDIVIDUAL BITS IN THE CONTROL AND STATUS REGISTER, COUNT SET BUFFER, AND COUNTER ALONG WITH PROPER OPERATION UNDER INTERRUPT CONTROL (SINGLE OR REPEATED INTERRUPTS) COUNT UP OR COUNT DOWN, AND REPEATABILITY. THE TIMING TEST USES ALL CLOCK FREQUENCIES TO RING THE TELETYPE BELL AT 10 SECOND INTERVALS. THE CLOCK TEST PROVIDES A REAL TIME CLOCK WHOSE ACCURACY CAN BE MEASURED AGAINST AN ACCURATE EXTERNAL SOURCE.

## 9.1 BASIC TEST

| TEST       | DESCRIPTION                                                              |
|------------|--------------------------------------------------------------------------|
| T0 THRU T9 | TEST THAT CSR, COUNT SET BUFFER AND COUNTER BITS MAY BE SET AND CLEARED. |

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T10 THRU T11 TEST FIX(BITS) TO SINGLE CLOCK COUNTER.  
T12 THRU T15 TEST CLOCK TO COUNT UP.  
T16 THRU T19 TEST CLOCK TO COUNT DOWN.  
T20 THRU T24 TEST INTERRUPT MODES.  
T25 THRU T26 TEST REPEATABILITY BY CHECKING THAT THE COUNTER  
CONTAINS THE SAME NUMBER OF COUNTS OVER TWO  
EQUAL PERIODS OF TIME.

9.2 TIMING TEST

THIS TEST USES THE REPEATED INTERRUPT MODE TO RING THE TELETYPE  
BELL AT 10 SECOND INTERVALS. FIRST THE BELL IS RUNG AT 10 SE-  
COND INTERVALS FOR 1 MINUTE USING 100HZ, FOLLOWED BY 1 MINUTE  
AT 10KHZ FOLLOWED BY 1 MINUTE AT LINE FREQ.(60HZ OR 50HZ) AND  
(IF SWD=0) 1 MINUTE AT LINE FREQ. USING EXTERNAL FREQUENCY  
INPUT.

9.3 DOUBLE OR SINGLE REAL TIME CLOCK TEST

9.3.1 SINGLE CLOCK REAL TIME TEST

THE 24 HOUR CYCLE:  
THIS TEST TRANSFORMS YOUR COMPUTER INTO AN  
ACCURATE DIGITAL "WALL CLOCK." A NORMAL  
CLOCK'S 12 HOUR CYCLE HAS BEEN REPLACED BY  
A 24 HOUR CYCLE.

EXAMPLES OF THE 24 HOUR CYCLE FOLLOW:

| ACTUAL TIME | PRINTOUT |      |      |                           |
|-------------|----------|------|------|---------------------------|
| -----       | HRS      | MINS | SECS | TENTHS+HUNDRETHS OF SECS. |
| MIDNIGHT    | 00       | : 00 | : 00 | : 00                      |
| 8:32 AM     | 08       | : 32 | : 00 | : 00                      |
| 12 NOON     | 12       | : 00 | : 00 | : 00                      |
| 2:15 PM     | 14       | : 15 | : 00 | : 00                      |
| 11:30 PM    | 23       | : 30 | : 00 | : 00                      |

9.3.1.1 ENTERING THE TIME

THE CLOCK CAN BE UPDATED BY HOLDING THE CTRL KEY DOWN  
AND TAPPING THE I KEY. THE CTRL KEY IS THEN RELEASED,  
AND THE STARTING TIME IS ENTERED.

THE MOST SIGNIFICANT HOUR DIGIT IS ENTERED FIRST.  
THIS DIGIT MUST BE A ZERO, A ONE OR A TWO.  
THE LEAST SIGNIFICANT HOURS DIGIT IS ENTERED NEXT FOLLOWED BY  
THE TWO MINUTES DIGIT, FOLLOWED BY THE TWO SECONDS DIGIT.  
THE FRACTION OF A SECOND DIGITS ARE NOT ENTERED. THE  
USER WILL ENTER A TOTAL OF SIX DIGITS WITH NO SPACES, COLONS,  
OR ANY OTHER CHARACTERS BETWEEN DIGITS. THE USER MUST

ENTER A TIME THAT WILL OCCUR A HALF MINUTE OR MORE IN THE FUTURE, TO ALLOW ENOUGH TIME TO ENTER THE REQUIRED INFORMATION. AFTER THE INFORMATION HAS BEEN ENTERED, THE USER MONITORS THE TIME STANDARD. WHEN THAT STANDARD REACHES THE TIME ENTERED VIA THE KEYBOARD, THE USER HITS THE CARRAGE RETURN (CR) KEY TO START THE CLOCK. NOTE THAT THE CHARACTERS WILL NOT BE PRINTED OUT AS THE TIME IS BEING ENTERED.

## 9.3.1.2 READING THE TIME

TO PRINT THE TIME, DEPRESS THE CTRL KEY. WHILE HOLDING THE CTRL KEY DOWN, SMARTLY TAP THE T KEY. THE TIME WHICH CORRESPONDS TO THE INSTANT THAT THE T KEY WAS DOWN, WILL BE PRINTED OUT. THE FORMAT OF THE PRINTOUT WILL BE SIMILAR TO THAT SHOWN IN THE 24 HOUR TIME EXAMPLE. THE ONLY DIFFERENCE WILL BE THE ABSENCE OF SPACES.

## 9.3.1.3 TIME REFERENCES

SINCE THE SYSTEM CLOCK IS MORE ACCURATE THAN MANY WRIST WATCHES, IT IS A GOOD IDEA TO USE AN ACCURATE TIME STANDARD. MANY TELEPHONE COMPANIES PROVIDE A NUMBER WHERE THE TIME, SYNCHRONIZED TO THE NATIONAL BUREAU OF STANDARDS RADIO STATION (WWV), IS AVAILABLE. CONSULT WITH YOUR LOCAL TELEPHONE COMPANY TO SEE IF THIS SERVICE IS AVAILABLE IN YOUR AREA.

## 9.3.1.4 PROCEDURE FOR SINGLE CLOCK REAL TIME TEST.

1. PERFORM THE BASIC TEST, PRIOR TO THE PERFORMANCE OF THIS TEST. PROCEED ONLY IF THE BASIC TEST HAS PASSED.
2. LOAD ADDRESS 214 VIA THE SWITCH REGISTER, (100KHZ TEST)
3. PLACE ALL ZEROS IN SWITCH REG., DEPRESS START
4. EXAMINE YOUR TIME REFERENCE, AND SELECT A TIME THAT WILL ALLOW YOU ENOUGH TIME TO ENTER THE TIME VIA THE KEYBOARD.
5. ENTER THE TIME, AS DESCRIBED PREVIOUSLY.
6. START THE CLOCK (HIT THE CR KEY) AT THE INSTANT THE TIME REFERENCE CORRELATES WITH THE TIME ENTERED.
7. MONITOR YOUR TIME REFERENCE, EXACTLY 1 MINUTE FROM THE TIME YOU STARTED THE CLOCK, READ THE PROGRAM CLOCK AS DESCRIBED PREVIOUSLY.
8. THE ONE MINUTE TIME ERROR SHOULD BE WITHIN ONE SECOND OF THE ACTUAL TIME.
9. IF THE RESULT OF STEP 8 IS NOT WITHIN ONE SECOND, ALLOW EXACTLY ONE MORE MINUTE TO PASS (FROM THE ORIGINAL START TIME). READ THE TIME AGAIN. IF THE TOTAL ERROR DOUBLED, THE BOARD IS DEFECTIVE. IF THE ERROR IS CONSTANT.

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RESTART THE TEST.

- 10.\* IF THE ONE MINUTE TEST WAS PASSED, ALLOW THE TEST TO RUN FOR EXACTLY 16 MINUTES MORE. AT THE EXACT END OF THE 16TH MINUTE INTERVAL, READ THE CLOCK. IT SHOULD BE WITHIN THREE SECONDS OF THE CORRECT TIME. IF IT IS NOT, THE BOARD IS DEFECTIVE. IN THE EVENT THAT THE DUAL CLOCK REAL TIME TEST IS GOING TO BE PERFORMED, THIS STEP CAN BE OMITTED.
  11. LOAD ADDRESS 220 VIA SWITCH REGISTER.  
DEPRESS START (10KHZ TEST)  
REPEAT STEPS 3-10
  12. LOAD ADDRESS 224 VIA SWITCH REGISTER.  
DEPRESS START (224 IF 60HZ, OR 230 IF 50HZ L.I.E TEST)  
REPEAT STEPS 3-10
- \* THE DURATION OF THIS TEST IS ARBITRARY. IT IS NOMINALLY A THOUSAND SECOND TEST. LONGER TESTS ARE PERMISSIBLE. THE RESULTS OF LONG TERM TESTS SHOULD BE WITHIN (PLUS OR MINUS 1 MINUTE FOR A 24 HR TEST.

NOTE THAT THE TIME CAN BE READ AT ANY POINT WITHIN THE TEST WITHOUT AFFECTING THE TEST.

#### 9.3.2 DUAL CLOCK REAL TIME CLOCK TEST

THE USE OF A TEMPORARY CLOCK (REFERED AS COW) REDUCES THE TIME REQUIRED FOR THE REAL TIME TEST. THE SECOND CLOCK INTERRUPTS THE FIRST CLOCK EVERY FIVE SECONDS. THE DURATION OF THE COMBINED REAL TIMES TESTS, WHEN THE DUAL CLOCK TEST IS USED IS 1 MIN : 50 SEC/FREQ VERSUS 17 MIN/FREQ FOR THE SINGLE CLOCK REAL TIME TEST ALONE.

THE DUAL CLOCK TEST REQUIRES THAT THE CLOCK BE STARTED AS IN THE SINGLE MODE. RAISING SWITCHES #0 AND #2 CAUSE THE PRINTOUT TO OCCUR AUTOMATICALLY.

THE COW MODULE SHOULD ONLY BE INSTALLED IN THE SYSTEM WHILE THIS DIAGNOSTIC IS BEING USED.

TO CONVERT A STANDARD F CLOCK TO A "COW" MODULE:

1. REMOVE JUMPER A4  
CSR=772560  
CSB=772562  
CTR=772564
2. ADD JUMPER V8  
VECTOR LOCATION IS 504  
PSW 506

NOTE: THIS VECTOR IS IN FLOATING VECTOR SPACE. CAUTION IS ADVISED WITH RESPECT TO ALLOWING VECTOR CONFLICTS.

#### 9.3.2.1 PROCEDURE FOR DUAL CLOCK REAL TIME CLOCK TEST

1. LOAD ADDRESS 214, DEPRESS START (100KHZ TEST)
2. ENTER THE TIME VIA THE TTY KEYBOARD AS DESCRIBED PREVIOUSLY
3. SET THE SWITCHES IN THE SWITCH REGISTER TO 000005. THE TTY WILL PRINT THE TIME AT 5 SECOND INTERVALS
4. CONSECUTIVE PRINTOUTS WILL BE WITHIN 5.00 PLUS OR MINUS .01 SECONDS OF EACH OTHER. ALLOW THE TEST TO RUN FOR AT LEAST TEN PRINTOUTS. IF THE TOLERANCE IS EXCEEDED, THE CLOCK IS DEFECTIVE.
5. LOAD ADDRESS 220, DEPRESS START (10KHZ TEST)
6. REPEAT STEPS 2-4
7. LOAD ADDRESS 224, IF 60HZ, OR 230 IF 50HZ DEPRESS START (LINE TEST)
8. REPEAT STEPS 2 & 3
9. CONSECUTIVE PRINTOUTS WILL BE WITHIN 5.00 PLUS OR MINUS .04 SECONDS OF EACH OTHER. TYPICALLY, AND 5.00 PLUS OR MINUS .2 SECONDS WORST CASE, DUE TO POSSIBLE AC LINE FREQUENCY VARIATIONS. ALLOW THE TEST TO RUN FOR AT LEAST TEN PRINTOUTS. IF THE TOLERANCE IS EXCEEDED, THE CLOCK IS DEFECTIVE.
10. THIS KW11-P DIAGNOSTIC WILL GO OUT & FIND IF THIS SHOULD RUN WITH CPU THAT HAS A SWITCH REG. OR WILL RUN WITH A PDP-11/04 THAT HAS NO SWITCH REGISTER. IF CPU HAS NO SWITCH REG. LOCATION 176 EQUALS SOFTWARE SWITCH REGISTER. IN THE ABOVE TEST TYPING !G(CONTROL-G) WILL ALLOW YOU TO ENTER/ALTER THE SOFTWARE SWITCH SETTINGS  
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429 .TITLE CZKWBHO KW11-P RT CLK TST
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431 .SBTTL BASIC TEST
432 ;COPYRIGHT 1971, 1978 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754
433 ;JOHN RODENHISER/JIM LACEY
434 .ENABL AMA,ABS
435
436 000000
437
438 000030 000030
439 000032 000340
440 000034 006150
441 000036 000340
442
443 000046 000046
444 005174
445 104000
446 177776
447 000240
448 104400
449 000176
450 000776
451 000200 000137 001046
452 000204 000137 001150
453 000210 000137 005210
454 000214 000137 006714
455 000220 000137 007000
456 000224 000137 007064
457 000230 000137 007150
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459 001000 001000
460 001000 172540
461 001002 172542
462 001004 172544
463 001006 000104
464 001010 000106
465 001012 177566
466 001014 177564
467 001016 000000
468 001020 000000
469 001022 000001
470 001024 177740
471 001026 177730
472 001030 160000
473 001032 160000
474 001034 177700
475
476 001036 177660
477 001040 140000
478 001042 140000
479 001044 177570
480
481
482
483
484 001046 012736 000776

;TRAP CATCHER 0-200
;=0
;=30
PRINT
340
SCOPEC
340
;=46
LOGICAL
HLT=EMT
CC=177776
NOP=240
SCOPE=TRAP
SOFTSR=176
BUFF=776
;=200
JMP @#BEGIN2
JMP @#BEGIN
JMP @#BEGIN1
JMP @#K100HZ
JMP @#K10HZ
JMP @#H60Z
JMP @#H50Z

;SOFTWARE SWITCH REGISTER
;START BASIC TEST
;RESTART BASIC TEST
;START TIMING TEST
;DOUBLE OR SINGAL CLK TEST. 100KHZ.
;DOUBLE OR SINGLE CLK TEST. 10KHZ.
;DOUBLE OR SINGLE CLK TEST. 60HZ.
;DOUBLE OR SINGLE CLK TEST. 50HZ

CSR: ;=1000
CSB: 172540
CTR: 172542
CKV: 104
CKVS: 106
TDBR: 177566
TCSR: 177564
TEMP1: 0
TEMP: 0
ICOUNT: 1
DEL1: -40
DEL2: -50
DEL3: -20000
DEL4: -20000
ADJ: -100

;CONTROL AND STATUS REGISTER
;COUNT SET BUFFER
;COUNTER
;CLOCK VECTOR ADDRESS

;DELAY ADJUSTMENT FOR 11/70
; & 11/45 WITH MOS MEM.
SR: 177570

BEGIN2: MOV @#BUFF,%6

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K01

CZKWBHD KW11-P RT CLK TST  
CZKWBH.P11 30-JAN-78 09:34MACY11 30A(1052) 30-JAN-78 09:35 PAGE 10  
BASIC TEST

SEQ 0010

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485 001052 023737 C00042 000046      CMP      2#42, 2#46      ;UNDER ACT ?
486 001060 001404      BEQ      1$              ;YES-SKIP TITLE PRINT OUT
487 001062 012702 006436      MOV      MSG3, %2      ;PRINT TITLE
488 001066 004737 006266      JSR      %7, SWADJ     ;HAS THIS CPU HAVE A SWITCH REG.?
489 001072 004737 011652      JSR      %7, DELADJ    ;IS ADJUSTMENT IN DELAY REQUIRED
490 001076 004737 011610      JSR      %7, DELADJ
491 001102 013746 000004      MOV      2#4, -(%6)
492 001106 012737 001230 000004      MOV      XOR, 2#4
493 001114 005737 177060      TST      2#177060
494 001120 012637 000004      MOV      (%6)+, 2#4
495 001124 012737 177777 006252      MOV      -1, 2#XORFLG
496 001132 012737 000001 001022      MOV      #1, 2#ICOUNT
497 001140 012702 006540      MOV      XORM, %2
498 001144 004737 006266      JSR      %7, TOP
499
500 001150 012706 000776      BEGIN: MOV      #BUFF, %6      ;SET UP STACK FOR SCOPE LOOPS
501 001154 004737 011652      JSR      %7, SWADJ     ;HAS THIS CPU HAVE A SWITCH REG.?
502 001160 004737 011610      JSR      %7, DELADJ    ;IS ADJUSTMENT IN DELAY REQUIRED
503 001164 012737 005572 000024      MOV      #PWRFL, 24    ;INIT POWER FAIL POINTER
504 001172 005077 005442      CLR      2#PSW        ;CLEAR PROC. STATUS REG.
505 001176 005037 001020      CLR      TEMP
506 001202 005037 006250      CLR      SCOPEF
507 001206 005037 001016      CLR      TEMP1        ;INIT. SCOPEF TAG
508 001212 012737 001254 006264      MOV      #TO, RETURN   ;SET UP RESET OF PROGRAM
509 001220 005037 005764      CLR      PRINT1       ;INITIALIZE ERROR PRINTOUT READING
510 001224 000137 001254      JMP      TO
511
512 001230 022626      XOR:   CMP      (%6)+, (%6)+
513 001232 012637 000004      MOV      (%6)+, 2#4
514 001236 012737 000005 001022      MOV      #5, 2#ICOUNT
515 001244 005037 006252      CLR      2#XORFLG
516 001250 000137 001150      JMP      2#BEGIN
517
518      ;TEST INIT TO CLEAR CONTROL AND STATUS REGISTER
519
520 001254 013746 000004      TO:    MOV      2#4, -(%6)
521 001260 012737 001312 000004      MOV      #CSRT, 2#4
522 001266 012777 100377 177504      MOV      #100377, 2#CSR
523 001274 000005      RESET
524 001276 032777 100377 177474      BIT      #100377, 2#CSR
525 001304 001413      BEQ      T1
526 001306 104000      HLT
527 001310 000411      BR      T1          ;ERROR, INIT FAILED TO CLEAR ALL BITS OF CSR.
528 001312 022626      CSRT:  CMP      (%6)+, (%6)+
529 001314 012637 000004      MOV      (%6)+, 2#4
530 001320 032777 040000 177516      BIT      #40000, 2#SR
531 001326 001352      BNE      TO
532 001330 000000      HALT
533 001332 000750      BR      TO          ;NO SSYN FROM DEVICE
534
535      ;TEST COUNT SET BUFFER
536      †1: MOV      (%6)+, 2#4
537 001334 012637 000004      MOV      SCOPE
538 001340 104400      MOV      #-1, 2#CSB
539 001342 012777 177777 177432      TST      2#CSB
540 001344 005777 177426      BEQ      .+4
541 001354 001401      HLT
542 001356 104000      MOV      #-1, 2#TEMP
543 001360 012737 177777 001020

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541 001366 012777 000000 177410      MOV      #0, @CTR
542 001374 023777 001020 177402      CMP      @TEMP, @CTR
543 001402 001401          BEQ      .+4
544 001404 104000          HLT
; CTR CHANGED WHEN WRITTEN TO
545          ; TEST COUNT SET BUFFER TO ACCEPT A COUNT PATTERN
546          ; TEST COUNTER TO CONTAIN COUNT SET BUFFER VALUE
547 001406 005037 001020          CLR      TEMP
548 001412 104400          SCOPE
549 001414 013777 001020 177360 T3:  MOV      TEMP, @CSB
550 001422 023777 001020 177354      CMP      TEMP, @CTR
551 001430 001401          BEQ      .+4
552 001432 104000          HLT
553 001434 005237 001020          INC      TEMP
; ERROR, CTR NOT=TEMP
; +1 TO COUNT PATTERN
554 001440 001365          BNE      T3
; REPEAT UNTIL COUNT OVERFLOWS
555          ; TEST THAT CTR REMAINS CONSTANT IF RUN CLEAR
556 001442 104400          T3A:  SCOPE
557 001444 005077 177330          CLR      @CSR
558 001450 012777 177777 177324      MOV      #-1, @CSB
559 001456 013737 001030 001020      MOV      @DEL3, @TEMP
560 001464 005237 001020          IS:  INC      @TEMP
561 001470 001375          BNE      IS
562 001472 022777 177777 177304      CM?     #-1, @CTR
563 001500 001401          BEQ      .+4
564 001502 104000          HLT
; CTR CHANGED ALTHOUGH RUN 0
565          ; TEST THAT CTR REMAINS CONSTANT WHEN CSR IS REF'D
566 001504 104400          T3B:  SCOPE
567 001506 005077 177266          CLR      @CSR
568 001512 012777 177777 177262      MOV      #-1, @CSB
569 001520 013737 001030 001020      MOV      @DEL3, @TEMP
570
571 001526 012777 177736 177244          IS:  MOV      #177736, @CSR
572 001534 017700 177240          MOV      @CSR, %0
573 001540 012777 000000 177232      MOV      #0, @CSR
574 001546 017700 177226          MOV      @CSR, %0
575 001552 005237 001020          INC      @TEMP
576 001556 001363          BNE      IS
577 001560 022777 177777 177216      CMP      #-1, @CTR
578 001566 001401          BEQ      .+4
579 001570 104000          HLT
; CTR CHANGED BY CSR REF
580          ; TEST INIT TO CLEAR COUNT SET BUFFER WHEN IT IS =-1
581 001572 104400          T4:  SCOPE
582 001574 012777 177777 177200      MOV      #-1, @CSB
583 001602 000005          RESET
584 001604 005777 177174          TST      @CTR
585 001610 001401          BEQ      .+4
586 001612 104000          HLT
; ERROR, INIT FAILED TO CLEAR CSB
587          ; TEST RATE SELECT (BIT,2) MAY BE SET AND CLEARED
588 001614 104400          T5:  SCOPE
589 001616 012777 000002 177154      MOV      #2, @CSR
590 001624 022777 000002 177146      CMP      #2, @CSR
591 001632 001401          BEQ      .+4
592 001634 104000          HLT
; ERROR, CSR NOT = 2
593 001636 012777 000004 177134      MOV      #4, @CSR
594 001644 022777 000004 177126      CMP      #4, @CSR
595 001652 001401          BEQ      .+4
596 001654 104000          HLT
; ERROR, CSR NOT = 4

```

|     |        |        |        |        |                                                       |            |                                              |
|-----|--------|--------|--------|--------|-------------------------------------------------------|------------|----------------------------------------------|
| 597 | 001656 | 012777 | 000006 | 177114 | MOV                                                   | #6, @CSR   |                                              |
| 598 | 001664 | 022777 | 000006 | 177106 | CMP                                                   | #6, @CSR   |                                              |
| 599 | 001672 | 001401 |        |        | BEQ                                                   | .+4        |                                              |
| 600 | 001674 | 104000 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 6                          |
| 601 | 001676 | 005077 | 177076 |        | CLR                                                   | @CSR       |                                              |
| 602 | 001702 | 005777 | 177072 |        | TST                                                   | @CSR       |                                              |
| 603 | 001706 | 001401 |        |        | BEQ                                                   | .+4        |                                              |
| 604 | 001710 | 104000 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 0                          |
| 605 |        |        |        |        | ;TEST MODE (BIT 3) CAN BE SET AND CLEARED             |            |                                              |
| 606 | 001712 | 104400 |        |        | T6:                                                   | SCOPE      |                                              |
| 607 | 001714 | 012777 | 000010 | 177056 | MOV                                                   | #10, @CSR  |                                              |
| 608 | 001722 | 022777 | 000010 | 177050 | CMP                                                   | #10, @CSR  |                                              |
| 609 | 001730 | 001401 |        |        | BEQ                                                   | .+4        |                                              |
| 610 | 001732 | 104000 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 10                         |
| 611 | 001734 | 005077 | 177040 |        | CLR                                                   | @CSR       |                                              |
| 612 | 001740 | 005777 | 177034 |        | TST                                                   | @CSR       |                                              |
| 613 | 001744 | 001401 |        |        | BEQ                                                   | .+4        |                                              |
| 614 | 001746 | 104000 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 0                          |
| 615 |        |        |        |        | ;TEST IUP/DN (BIT 4) CAN BE SET AND CLEARED           |            |                                              |
| 616 | 001750 | 104400 |        |        | T7:                                                   | SCOPE      |                                              |
| 617 | 001752 | 012777 | 000020 | 177020 | MOV                                                   | #20, @CSR  |                                              |
| 618 | 001760 | 022777 | 000020 | 177012 | CMP                                                   | #20, @CSR  |                                              |
| 619 | 001766 | 001401 |        |        | BEQ                                                   | .+4        |                                              |
| 620 | 001770 | 104000 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 20                         |
| 621 | 001772 | 005077 | 177002 |        | CLR                                                   | @CSR       |                                              |
| 622 | 001776 | 005777 | 176776 |        | TST                                                   | @CSR       |                                              |
| 623 | 002002 | 001401 |        |        | BEQ                                                   | .+4        |                                              |
| 624 | 002004 | 104000 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 0                          |
| 625 |        |        |        |        | ;TEST INTERRUPT ENABLE (BIT 6) CAN BE SET AND CLEARED |            |                                              |
| 626 |        |        |        |        | T9:                                                   | SCOPE      |                                              |
| 627 |        |        |        |        |                                                       |            |                                              |
| 628 | 002006 | 104400 |        |        | MOV                                                   | #340, CC   | ;SET PROCESSOR PRIORITY LEVEL 7              |
| 629 | 002010 | 012737 | 000340 | 177776 | MOV                                                   | #100, @CSR |                                              |
| 630 | 002016 | 012777 | 000100 | 176754 | CMP                                                   | #100, @CSR |                                              |
| 631 | 002024 | 022777 | 000100 | 176746 | BEQ                                                   | .+4        |                                              |
| 632 | 002032 | 001401 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 100                        |
| 633 | 002034 | 104000 |        |        | CLR                                                   | @CSR       |                                              |
| 634 | 002036 | 005077 | 176736 |        | TST                                                   | @CSR       |                                              |
| 635 | 002042 | 005777 | 176732 |        | BEQ                                                   | .+4        |                                              |
| 636 | 002046 | 001401 |        |        | HLT                                                   |            | ;ERROR, CSR NOT = 0                          |
| 637 | 002050 | 104000 |        |        | ;TEST RUN (BIT 0) CAN BE SET AND CLEARED              |            |                                              |
| 638 |        |        |        |        | T9A:                                                  | SCOPE      |                                              |
| 639 |        |        |        |        | CLR                                                   | @CSR       |                                              |
| 640 | 002052 | 104400 |        |        | CLR                                                   | TEMP       |                                              |
| 641 | 002054 | 005077 | 176720 |        | MOV                                                   | TEMP, @CSB | ;START AT ZERO                               |
| 642 | 002060 | 005037 | 001020 |        | MOV                                                   | #21, @CSR  | ;DISABLE INTERRUPT, COUNT UP, SET RUN        |
| 643 | 002064 | 013777 | 001020 | 176710 | BIT                                                   | #1, @CSR   | ;CHECK IF ZERO IS STILL SET                  |
| 644 | 002072 | 012777 | 000021 | 176700 | BNE                                                   | .+4        |                                              |
| 645 | 002100 | 032777 | 000001 | 176672 | HLT                                                   |            | ;CSR LOST BIT 0 AFTER BIT INSTRUCTION        |
| 646 | 072106 | 001001 |        |        | SCOPE                                                 |            |                                              |
| 647 | 002110 | 104000 |        |        | CLR                                                   | @CSR       |                                              |
| 648 | 002112 | 104400 |        |        | CLR                                                   | TEMP       |                                              |
| 649 | 002114 | 005077 | 176660 |        | MOV                                                   | TEMP, @CSB | ;START AT ZERO                               |
| 650 | 002120 | 005037 | 001020 |        | MOV                                                   | #20, @CSR  | ;DISABLE INTERRUPT, COUNT UP, DO NOT SET RUN |
| 651 | 002124 | 013777 | 001020 | 176650 |                                                       |            |                                              |
| 652 | 002132 | 012777 | 000020 | 176640 |                                                       |            |                                              |

NO1

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BASIC TEST

SEQ 0013

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653 002140 052777 000001 176632 BIS #1,ACSR ;SET RUN
654 002146 032777 000001 176624 BIT #1,ACSR ;CHECK IF BIT 0 IS SET
655 002154 001001 BNE .+4
656 002156 104000 HLT ;CSR LOST BIT 0 AFTER A BIS INSTRUCTION
657 002160 104400 SCOPE
658 002162 005077 176612 CLR ACSR
659 002166 005037 001020 CLR TEMP
660 002172 013777 001020 176602 MOV TEMP,ACSB ;START AT ZERO
661 002200 012777 000021 176572 MOV #21,ACSR ;DISABLE INTERRUPT, COUNT UP, SET RUN
662 002206 012777 000020 176564 MOV #20,ACSR ;LEAVE ALL SAME RESET RUN
663 002214 032777 000001 176556 BIT #1,ACSR ;CHECK BIT 0
664 002222 001401 BEQ .+4 ;BRANCH IF NOT SET
665 002224 104000 HLT ;CSR PICKED BIT 0 ON A MOV.
666
667
668 ; TEST FIX (BIT 5) TO SINGLE CLOCK COUNTER
669 ; SET UP/DN (BIT 4) =0 TO ENABLE COUNT DOWN
670 002226 104400 T10: SCOPE
671 002230 005077 176544 CLR ACSR
672 002234 012777 177777 176540 MOV #-1,ACSB
673 002242 012737 177776 001020 MOV #-2,TEMP
674 002250 012777 000040 176522 T10A: MOV #40,ACSR
675 002256 023777 001020 176520 CMP TEMP,ACTR
676 002264 001401 BEQ .+4
677 002266 104000 HLT ;ERROR, COUNTER NOT = TEMP, DIDN'T COUNT DOWN
678 002270 005337 001020 DEC TEMP ; -1 TO PATTERN COUNT
679 002274 023727 001020 000000 CMP TEMP,#0 ;DONE ALL COUNTS?
680 002302 001362 BNE T10A ;NO
681
682 ;TEST FIX (BIT 5) TO SINGLE CLOCK COUNTER
683 ;SET UP/DN (BIT 4)=1 TO ENABLE COUNT UP
684 002304 104400 T11: SCOPE
685 002306 005077 176466 CLR ACSR
686 002312 005077 176464 CLR ACSB
687 002316 012737 000001 001020 MOV #1,TEMP
688 002324 012777 000060 176446 T11A: MOV #60,ACSR
689 002332 023777 001020 176444 CMP TEMP,ACTR
690 002340 001401 BEQ .+4
691 002342 104000 HLT ;ERROR, COUNTER NOT = TEMP, FAILED TO COUNT UP.
692 002344 005237 001020 000000 INC TEMP ; +1 TO PATTERN COUNT
693 002350 023727 001020 000000 CMP TEMP,#0 ;DONE ALL COUNTS?
694 002356 001362 BNE T11A ;NO
695
696 ;TEST CLOCK TO COUNT DOWN AT ALL FREQUENCIES
697 ;100KHZ
698 002360 104400 T12: SCOPE
699 002362 005077 176412 CLR ACSR
700 002366 012777 000002 176406 MOV #2,ACSB ;COUNT SET BUFFER TO 2
701 002374 012777 000001 176376 MOV #1,ACSR ;DOWN COUNT , 100KHZ, GO
702 002402 013737 001024 001020 MOV #DEL1,TEMP
703 002410 105777 176364 T12A: TSTB ACSR
704 002414 100410 BMI T12B
705 002416 062737 000001 001020 ADD #1,TEMP
706 002424 001371 BNE T12A
707 002426 042777 000001 176344 BIC #1,ACSR
708 002434 104000 HLT ;ERROR, P INTR (BIT 7) NOT = 1.
709 002436 005777 176342 T12B: TST ACTR
710 002442 001401 BEQ .+4

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12KWBMC HW1.1-P AT CLR TEST  
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BASIC TEST

SEQ 0014

```

709 002444 104000 HLT ;ERROR, COUNTER DID NOT COUNT DOWN TO 0
710
711
712 002446 104400 ;10KHZ
713 002450 005077 176324 T13: SCOPE
714 002454 012777 000002 176320 CLR JCSR
715 002462 012777 000003 176310 MOV #2, JCSB
716 002470 013737 001026 001020 MOV #3, JCSR ;DOWN COUNT, 10KHZ, GO
717 002476 105777 176276 T13A: MOV JDEL2, JTEMP
718 002502 100410 T13A: TSTB JCSR
719 002504 062737 000001 001020 BMI T13B
720 002512 001371 ADD #1, JTEMP
721 002514 042777 000001 176256 BNE T13A
722 002522 104000 HLT #1, JCSR
723 002524 005777 176254 T13B: TST JCTR
724 002530 001401 BEQ .+4 ;ERROR, P INTR (BIT 7) NOT = 1.
725 002532 104000 HLT ;ERROR, COUNTER DID NOT COUNTDOWN TO 0
726
727 002534 104400 ;LINE FREQ.
728 002536 005737 006252 T14: SCOPE
729 002542 100432 TST JXORFLG
730 002544 005077 176230 BMI T15
731 002550 012777 000002 176224 CLR JCSR
732 002556 012777 000005 176214 MOV #2, JCSB
733 002564 013737 001030 001020 MOV #5, JCSR ;DOWN COUNT, LINE FREQ., GO
734 002572 105777 176202 T14A: MOV JDEL3, JTEMP
735 002576 100410 T14A: TSTB JCSR
736 002600 062737 000001 001020 BMI T14B
737 002606 001371 ADD #1, JTEMP
738 002610 042777 000001 176162 BNE T14A
739 002616 104000 HLT #1, JCSR
740 002620 005777 176160 T14B: TST JCTR
741 002624 001401 BEQ .+4 ;ERROR, P INTR (BIT 7) NOT=1
742 002626 104000 HLT ;ERROR, COUNTER DID NOT COUNT DOWN TO 0
743
744 002630 104400 ;EXT FREQ.
745 002632 032777 000001 176204 T15: SCOPE
746 002640 001032 BIT #1, JSR
747 002642 005077 176132 BNE T16
748 002646 012777 000002 176126 CLR JCSR
749 002654 012777 000007 176116 MOV #2, JCSB
750 002662 013737 001032 001020 MOV #7, JCSR ;DOWN COUNT, EXT., GO
751 002670 105777 176104 T15A: MOV JDEL4, JTEMP
752 002674 100410 T15A: TSTB JCSR
753 002676 062737 000001 001020 BMI T15B
754 002704 001371 ADD #1, JTEMP
755 002706 042777 000001 176064 BNE T15A
756 002714 104000 HLT #1, JCSR
757 002716 005777 176062 T15B: TST JCTR
758 002722 001401 BEQ .+4 ;ERROR, P INTR (BIT 7) NOT=1
759 002724 104000 HLT ;ERROR, COUNTER DID NOT COUNT DOWN TO 0
760
761 ;TEST CLOCK TO COUNT UP AT ALL FREQUENCIES
762 ;100 KHZ
763 002726 104400 T16: SCOPE
764 002730 005077 176044 CLR JCSR

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BASIC TEST

SEG 0015

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765 002734 012777 177776 176040      MOV      #-2, @CSB
766 002742 012777 000021 176030      MOV      #21, @CSR      ;UP COUNT, 100 KHZ, GO
767 002750 013737 001024 001020      MOV      @DEL1, @TEMP
768 002756 105777 176016      T16A:  TSTB    @CSR
769 002762 100410      BMI      T16B
770 002764 062737 000001 001020      ADD      #1, @TEMP
771 002772 001371      BNE      T16A
772 002774 042777 000001 175776      BIC      #1, @CSR
773 003002 104000      HLT
774 003004 005777 175774      T16B:  TST      @CTR
775 003010 001401      BEQ      .+4
776 003012 104000      HLT      ;ERROR
777      ;10 KHZ
778 003014 104400      T17:  SCOPE
779 003016 005077 175756      CLR      @CSR
780 003022 012777 177776 175752      MOV      #-2, @CSB
781 003030 012777 000023 175742      MOV      #23, @CSR      ;UP COUNT, 10 KHZ, GO
782 003036 013737 001026 001020      MOV      @DEL2, @TEMP
783 003044 105777 175730      T17A:  TSTB    @CSR
784 003050 100410      BMI      T17B
785 003052 062737 000001 001020      ADD      #1, @TEMP
786 003060 001371      BNE      T17A
787 003062 042777 000001 175710      BIC      #1, @CSR
788 003070 104000      HLT      ;ERROR
789 003072 005777 175706      T17B:  TST      @CTR
790 003076 001401      BEQ      .+4
791 003100 104000      HLT      ;ERROR
792      ;LINE FREQ.
793 003102 104400      T18:  SCOPE
794 003104 005737 006252      TST
795 003110 100432      BMI
796 003112 005077 175662      CLR      @CSR
797 003116 012777 177776 175656      MOV      #-2, @CSB
798 003124 012777 000025 175646      MOV      #25, @CSR      ;UP COUNT, LINE, GO
799 003132 013737 001030 001020      MOV      @DEL3, @TEMP
800 003140 105777 175634      T18A:  TSTB    @CSR
801 003144 100410      BMI      T18B
802 003146 062737 000001 001020      ADD      #1, @TEMP
803 003154 001371      BNE      T18A
804 003156 042777 000001 175614      BIC      #1, @CSR
805 003164 104000      HLT      ;ERROR
806 003166 005777 175612      T18B:  TST      @CTR
807 003172 001401      BEQ      .+4
808 003174 104000      HLT      ;ERROR
809
810      ;EXT FREQ.
811 003176 104400      T19:  SCOPE
812 003200 032777 000001 175636      BIT
813 003206 001033      BNE      T20
814 003210 005077 175564      CLR      @CSR
815 003214 012777 177776 175560      MOV      #-2, @CSB
816 003222 012777 000027 175550      MOV      #27, @CSR      ;UP COUNT, EXT FREQ, GO
817 003230 013737 001032 001020      MOV      @DEL4, @TEMP
818 003236 105777 175536      T19A:  TSTB    @CSR
819 003242 100411      BMI      T19B
820 003244 062737 000001 001020      ADD      #1, @TEMP

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821 003252 001371 BNE T19A
822 003254 042777 000001 175516 BIC #1,ACSR
823 003262 104000 HLT ;ERROR.
824 003264 000005 RESET
825 003266 005777 175512 T19B: TST ACIR
826 003272 001401 BEQ .+4
827 003274 104000 HLT ;ERROR
828 ;TEST THAT INTERRUPT OCCURS TO PROPER VECTOR WITH PROCESSOR PRIORITY 4
829 T20: SCOPE
830 003300 012737 000200 177776 MOV #200,CC ;SET PROCESSOR PRIORITY 4
831 003306 005077 175476 CLR ACIRV5 ;CLEAR INTERRUPT RETURN STATUS
832 003312 005077 175462 CLR ACIR
833 003316 012777 000002 175456 MOV #2,ACIR
834 003324 012777 003366 175454 MOV T20A,ACIRV ;SET UP INTERRUPT RETURN VECTOR
835 003332 012777 000101 175440 MOV #101,ACIR ;ENABLE INTERRUPT
836 003340 013737 001024 001020 MOV #DEL1,ACIRTEMP
837 003346 005237 001020 IS: INC ACIRTEMP
838 003352 001375 BNE IS
839 003354 042777 000001 175416 BIC #1,ACIR
840 003362 104000 HLT ;ERROR, INTERRUPT FAILED TO OCCUR.
841 003364 000420 BR T21
842 003366 017737 175406 001020 T20A: MOV ACIR,ACIRTEMP
843 003374 105737 001020 TSTB ACIRTEMP
844 003400 100401 BMI .+4
845 003402 104000 HLT ;DONE NOT SET ON INT.
846 003404 032737 000001 001020 BIT #1,ACIRTEMP
847 003412 001401 BEQ .+4
848 003414 104000 HLT ;RUN NOT CLEARED
849 003416 005077 175356 CLR ACIR
850 003422 012706 000776 MOV #BUFF,%6
851 ;TEST THAT INTERRUPT OCCURS WITH PROCESSOR PRIORITY 5
852 T21: SCOPE
853 003430 012737 000240 177776 MOV #240,CC ;SET PROCESSOR PRIORITY 5
854 003436 012777 003512 175342 MOV T21A,ACIRV ;SET UP INTERRUPT RETURN STATUS
855 003444 005077 175330 CLR ACIR
856 003450 012777 000002 175324 MOV #2,ACIR
857 003456 012777 000101 175314 MOV #101,ACIR ;ENABLE INTERRUPT
858 003464 013737 001024 001020 MOV #DEL1,ACIRTEMP
859 003472 005237 001020 IS: INC ACIRTEMP
860 003476 001375 BNE IS
861 003500 042777 000001 175272 BIC #1,ACIR
862 003506 104000 HLT ;ERROR, INTERRUPT FAILED TO OCCUR
863 003510 000404 BR T22
864 003512 005077 175262 T21A: CLR ACIR ;RETURN HERE AFTER INTERRUPT
865 003516 012706 000776 MOV #BUFF,%6
866 ;TEST THAT INTERRUPT IS INHIBITED WITH PROCESSOR PRIORITY 6
867 T22: SCOPE
868 003524 012737 000300 177776 MOV #300,CC ;SET PROCESSOR PRIORITY 6
869 003532 012777 003602 175246 MOV T22A,ACIRV ;SET UP INTERRUPT RETURN
870 003540 005077 175234 CLR ACIR
871 003544 012777 000002 175230 MOV #2,ACIR
872 003552 012777 000101 175220 MOV #101,ACIR ;INTERRUPT ENABLE
873 003560 013737 001024 001020 MOV #DEL1,ACIRTEMP
874 003566 005237 001020 IS: INC ACIRTEMP
875 003572 001375 BNE IS
876 003574 005077 175200 CLR ACIR

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877 003600 000406          BR      T23
878 003602 042777 000001 175170 T22A: BIC      #1,ACSR
879 003610 104000          HLT
880 003612 012706 000776          MOV      #BUFF,%6      ;ERROR, INT SHOULDN'T HAVE OCCURRED
881
882          ;TEST SINGLE INTERRUPT (MODE 0) ON OVERFLOW
883 003616 104400          T23:  SCOPE
884 003620 012737 000200 177776          MOV      #200,CL      ;SET PROCESSOR PRIORITY 4
885 003626 005077 175146          CLR      ACSR
886 003632 012777 177776 175142          MOV      #-2,ACSB
887 003640 012777 003702 175140          MOV      #T23A,ACKV      ;SET INTERRUPT RETURN
888 003646 012777 000121 175124          MOV      #121,ACSR      ;INTERRUPT ENABLE, UP COUNT, 100 KHZ, GO
889 003654 013737 001024 001020          MOV      #DEL1,ATEMP
890 003662 062737 000001 001020 T23AA: ADD      #1,ATEMP      ;WASTE TIME
891 003670 001374          BNE      T23AA
892 003672 042777 000001 175100          BIC      #1,ACSR
893 003700 104000          HLT
894 003702 005077 175072          T23A:  CLR      ACSR
895 003706 012706 000776          MOV      #BUFF,%6      ;ERROR, INTERRUPT FAILED TO OCCUP.
896          ;TEST REPEATED INTERRUPT (MODE 1).      ;RETURN HERE AFTER INTERRUPT.
897 003712 104400          T24:  SCOPE      ;RESET STACK
898 003714 012737 177700 001016          MOV      #-100,TEMP1      ;SET UP COUNTER FOR INTER
899 003722 012777 003774 175056          MOV      #T24B,ACKV      ;SET INTERRUPT RETURN
900 003730 012777 000010 175044          MOV      #10,ACSB      ;SET UP COUNT SET BUFFER
901 003736 012777 000111 175034          MOV      #111,ACSR      ;INTERRUPT ENABLE, REPEATED INTERRUPTS, 100 KHZ.
902 003744 013737 001024 001020 T24A:  MOV      #DEL1,ATEMP
903 003752 062737 000001 001020          ADD      #1,ATEMP
904 003760 001374          BNE      -6
905 003762 042777 000001 175010          BIC      #1,ACSR
906 003770 104000          HLT
907 003772 000406          BR      T24C
908 003774 022626          T24B:  CMP      (6)+,(6)+      ;POP STACK
909 003776 005237 001016          INC      TEMP1      ;DONE 100 INTERRUPTS?
910 004002 001360          BNE      T24A      ;NO
911 004004 005077 174770          CLR      ACSR      ;CLEAR CLOCK
912
913
914
915
916          ;SYNCHRONIZATION TEST
917          ;NO. 1 FOR
918          ;KW11-P BOARDS THAT
919          ;ARE REV F OR GREATER
920
921
922 004010 104400          T24C:  SCOPE
923 004012 005003          CLR      %3
924 004014 032777 000020 175022          BIT      #20,ASR
925 004022 001002          PHE      1$
926 004024 000137 004264          J P      T25
927 004030 012777 010000 174744 1$:  MOV      #10000,ACSB      ;LOAD COUNTER
928 004036 012777 000001 174734          MOV      #1,ACSR      ;GO COUNT DOWN, 100 KHZ
929 004044 017700 174734          MOV      ACR,%0      ;SAVE CTR
930 004050 020027 010000          CMP      %0,#10000      ;DID COUNT INCREASE?
931 004054 101404          BLOS     2$      ;BRANCH IF OK TO 1$
932 004056 010037 001020          MOV      %0,ATEMP

```

CZKWBHO KW11-P RT CLK TST  
CZKWBHI.P11 30-JAN-78 09:34

MACY11 30A(1052) 30-JAN-78 09:35 PAGE 18  
BASIC TEST

SEG 0010

```

933 004062 104000          HLT          : SYNC ERROR
934 004064 000404          BR          T240 : END TEST
935 004066 005077 174706 25: CLR        : CLR CSR
936 004072 005203          INC        %3  : NO OF TIMES THROUGH PROGRAM DETECTS 2(16)
937 004074 001355          BNE        15  : 2(16) YET, IF NOT GO BACK TO LOOP 1
938
939
940
941          : SYNCHRONIZATION TEST
942          : NO. 2 FOR KW11-P
943          : BOARDS THAT ARE
944          : REV F OR GREATER
945
946
947 004076 104400          T240: SCOPE
948 004100 017746 174702  MOV        : SAVE CLOCK VECTOR
949 004104 012777 000340 002526  MOV        #340, @PSW : PS=7 STOPS ALL INTRs
950 004112 005037 004246          CLR        TIKTIK : CLEAR CLOCK COUNTER
951 004116 005037 006632          CLR        CNT      : CLEAR ITERATION COUNT
952 004122 012777 004240 174656  MOV        @CLKSER, @CKV : SETUP INTR SERVICE RTN
953 004130 012777 000300 174652  MOV        #300, @CKVS : SETUP INTR PSW
954 004136 012777 000010 174636  MOV        #10, @CSB  : KW11 COUNT = 10
955 004144 012777 000111 174626  MOV        #111, @CSR : SET TO RUN @100KH
956                                     : INTR ENABLE & COUNT DOWN
957                                     : AND REPEAT INTR MODE
958
959 004152          LOOP:
960 004152 012777 000340 002460  MOV        #340, @PSW : PS=7 STOPS ALL INTRs
961 004160 004737 004250          JSR        PC, TYPE : 100MS DELAY @PR7
962 004164 005077 002450          CLR        @PSW   : PS=0 ALLOWS INTRs
963 004170 013701 004246          MOV        TIKTIK, R1 : GET CURRENT CLK COUNT
964 004174 004737 004250          JSR        PC, TYPE : 100MS DELAY @PR0
965 004200 023701 004246          CMP        TIKTIK, R1 : ANY INTRs DURING DELAY?
966 004204 001001          BNE        15  : IF YES, GO TO 15
967 004206 104000          HLT          : ELSE THERE WAS AN ERROR
968                                     : CHECK FOR JUMPERS ON THE
969                                     : KW11-P BOARD NEAR I.C.
970                                     : LOCATIONS E41 & E51 ON RE. F
971                                     : BOARD & GREATER ONLY
972
973 004210 005237 006632 15: INC        CNT
974 004214 022737 000170 006632  CMP        #120, CNT : 120 ITERATIONS?
975 004222 001353          BNE        LOOP : IF NOT, GO BACK TO LOOP
976 004224 012677 174556  MOV        (%6)+, @CKV : ELSE RESTORE THE VECTOR
977 004230 005077 174544  CLR        @CSR  : CLEAR CONTROL REG
978 004234 000137 004264  JMP        T25   : AND GO TO NEXT TEST
979
980 004240          CLKSER: INC        TIKTIK : INC CLK COUNTER
981 004244          CLKXIT: RTI          : ELSE EXIT RTN
982
983
984 004246 000000          TIKTIK: 0
985
986 004250 105777 174540          TYPE: TSTB   @TCSR : READY TO SEND
987 004254 100375          BPL        TYPE   : BR IF NOT
988 004256 110077 174530          MOVB    R0, @TDBR : SEND THEM A MESSAGE

```

```

989 004262 000207          RTS    PC
990
991
992
993
994
995          :TEST 100 KHZ REPEATABILITY
996 004264 104400          :T25:  SCOPE
997 004266 032777 000004 174550      BIT    #4,JSR          :ARE TWO CLK'S PRESENT
998 004274 001002          BNE     J5          :BRANCH IF SW#2 IS JP
999 004276 000137 004740      JMP     T27          :EXIT IF ONLY ONE CLK
1000 004302 005077 174472      3$:  CLR     @CSR          :SET CTR
1001 004306 012777 000000 174466      MOV     #0,@CSB          :COUNT UP 100KHZ GO
1002 004314 012777 000021 174456      MOV     #21,@CSR          :GO TO DELAY SUBROUTINE
1003 004322 004537 004416      JSR     R5,DELY          :TEST DONE BIT SET
1004 004326 105777 174446      TSTB    @CSR
1005 004332 100001          BPL     1$
1006 004334 104000          HLT
1007 004336 017737 174442 001020 1$:  MOV     @CTR,@TEMP          :DONE BIT SET TOO SOON
1008 004344 005077 174430          CLR     @CSR          :DONE NOT SET SO SAVE CTR
1009 004350 012777 000000 174424      MOV     #0,@CSB
1010 004356 012777 000021 174414      MOV     #21,@CSR
1011 004364 004537 004416      JSR     R5,DELY
1012 004370 105777 174404      TSTB    @CSR
1013 004374 100001          BPL     2$
1014 004376 104000          HLT
1015 004400 017737 174400 001016 2$:  MOV     @CTR,@TEMP1          :HERE WE ARE SAVING SEC CNT
1016 004406 004537 004446      JSR     R5,CACL          :GO DETERMINE ACCURACY OF CNT'S
1017 004412 104000          HLT
1018 004414 000432          BR      T25A
1019
1020 004416 005077 002154          DELY:  CLR     @CSR1          :DELAY SUBROUTINE
1021 004422 012777 001130 002144      MOV     #1130,@CSB1
1022 004430 012777 000021 002140      MOV     #21,@CSR1
1023 004436 105777 002134      1$:  TSTB    @CSR1          :WAIT 600 MIL.
1024 004442 100375          BPL     1$
1025 004444 000205          RTS     R5
1026
1027 004446 013700 001020          CACL:  MOV     @TEMP,R0          :COMPARE CTR1 WITH CTR2
1028 004452 013701 001016      MOV     @TEMP1,R1
1029 004456 160001          SUB     R0,R1
1030 004460 100001          BPL     1$
1031 004462 005401          R1
1032 004464 022701 000005      1$:  CMP     #5,R1          :DIFFERENCE MUST BE LESS THAN 5
1033 004470 002401          BLT     2$
1034 004472 005725          TST     (R5)+          :UPDATE RETURN
1035 004474 010137 001020      2$:  MOV     R1,TEMP          :DEFRENCE FOR PRINT OUT
1036 004500 000205          RTS     R5
1037
1038          :TEST 10 KHZ REPEATABILITY
1039          :THIS TEST IS THE SAME AS T25 EXCEPT IT IS
1040          :FOR 10KHZ.
1041 004502 104400          :T25A:  SCOPE
1042 004504 005077 174270          CLR     @CSR
1043 004510 012777 000000 174264      MOV     #0,@CSB
1044 004516 012777 000023 174254      MOV     #23,@CSR

```

H02

 CZKWBHO KW11-P RT CLK TST MAC111 30A(1052) 30-JAN-78 09:35 PAGE 20  
 CZKWBH.P11 30-JAN-78 09:34 BASIC TEST

SEG 0020

|      |        |        |        |        |      |      |               |
|------|--------|--------|--------|--------|------|------|---------------|
| 1045 | 004524 | 004537 | 004416 |        |      | JSR  | R5, DEL1      |
| 1046 | 004530 | 105777 | 174244 |        |      | TSTB | QCSR          |
| 1047 | 004534 | 100001 |        |        |      | BPL  | 1\$           |
| 1048 | 004536 | 104000 |        |        |      | HLT  |               |
| 1049 | 004540 | 017737 | 174240 | 001020 | 1\$: | MOV  | QCTR, Q#TEMP  |
| 1050 | 004546 | 005077 | 174226 |        |      | CLR  | QCSR          |
| 1051 | 004552 | 012777 | 000000 | 174222 |      | MOV  | #0, QCSB      |
| 1052 | 004560 | 012777 | 000023 | 174212 |      | MOV  | #23, QCSR     |
| 1053 | 004566 | 004537 | 004416 |        |      | JSR  | R5, DEL1      |
| 1054 | 004572 | 105777 | 174202 |        |      | TSTB | QCSR          |
| 1055 | 004576 | 100001 |        |        |      | BPL  | 2\$           |
| 1056 | 004600 | 104000 |        |        |      | HLT  |               |
| 1057 | 004602 | 017737 | 174176 | 001016 | 2\$: | MOV  | QCTR, Q#TEMP1 |
| 1058 | 004610 | 004537 | 004446 |        |      | JSR  | R5, CACL      |
| 1059 | 004614 | 104000 |        |        |      | HLT  |               |

: TEST LINE REPEATABILITY  
 : THIS TEST IS THE SAME AS T25 EXCEPT IT IS  
 : FOR LINE FREQ.

|      |        |        |        |        |      |      |               |
|------|--------|--------|--------|--------|------|------|---------------|
| 1064 | 004616 | 104400 |        |        |      | 126: | SCOPE         |
| 1065 | 004620 | 005737 | 006252 |        |      | TST  | Q#XORFLG      |
| 1066 | 004624 | 100445 |        |        |      | BMI  | T27           |
| 1067 | 004628 | 005077 | 174146 |        |      | CLR  | QCSR          |
| 1068 | 004632 | 012777 | 000000 | 174142 |      | MOV  | #0, QCSB      |
| 1069 | 004640 | 012777 | 000025 | 174132 |      | MOV  | #25, QCSR     |
| 1070 | 004646 | 004537 | 004416 |        |      | JSR  | R5, DEL1      |
| 1071 | 004652 | 105777 | 174122 |        |      | TSTB | QCSR          |
| 1072 | 004656 | 100001 |        |        |      | BPL  | 1\$           |
| 1073 | 004660 | 104000 |        |        |      | HLT  |               |
| 1074 | 004662 | 017737 | 174116 | 001020 | 1\$: | MOV  | QCTR, Q#TEMP  |
| 1075 | 004670 | 005077 | 174104 |        |      | CLR  | QCSR          |
| 1076 | 004674 | 012777 | 000000 | 174100 |      | MOV  | #0, QCSB      |
| 1077 | 004702 | 012777 | 000025 | 174070 |      | MOV  | #25, QCSR     |
| 1078 | 004710 | 004537 | 004416 |        |      | JSR  | R5, DEL1      |
| 1079 | 004714 | 105777 | 174060 |        |      | TSTB | QCSR          |
| 1080 | 004720 | 100001 |        |        |      | BPL  | 2\$           |
| 1081 | 004722 | 104000 |        |        |      | HLT  |               |
| 1082 | 004724 | 017737 | 174054 | 001016 | 2\$: | MOV  | QCTR, Q#TEMP1 |
| 1083 | 004732 | 004537 | 004446 |        |      | JSR  | R5, CACL      |
| 1084 | 004736 | 104000 |        |        |      | HLT  |               |

: TEST ERROR (BIT 15) TO SET WHEN INTERRUPT IS NOT SERVICED IN REPEAT MODE

|      |        |        |        |        |      |      |               |
|------|--------|--------|--------|--------|------|------|---------------|
| 1086 | 004740 | 104400 |        |        |      | 127: | SCOPE         |
| 1087 | 004742 | 005077 | 174032 |        |      | CLR  | QCSR          |
| 1088 | 004746 | 012737 | 000340 | 177776 |      | MOV  | #340, CC      |
| 1089 | 004754 | 012777 | 000002 | 174020 |      | MOV  | #2, QCSB      |
| 1090 | 004762 | 012777 | 000111 | 174010 |      | MOV  | #111, QCSR    |
| 1091 | 004770 | 013737 | 001024 | 001020 |      | MOV  | #DEL1, Q#TEMP |
| 1092 | 004776 | 062737 | 000001 | 001020 |      | ADD  | #1, Q#TEMP    |
| 1093 | 005004 | 001374 |        |        |      | BNE  | -6            |
| 1094 | 005006 | 005777 | 173766 |        |      | TST  | QCSR          |
| 1095 | 005012 | 100404 |        |        |      | BMI  | 1\$           |
| 1096 | 005014 | 042777 | 000001 | 173756 |      | BIC  | #1, QCSR      |
| 1097 | 005022 | 104000 |        |        |      | HLT  |               |
| 1098 | 005024 | 005077 | 173750 |        | 1\$: | CLR  | QCSR          |
| 1099 | 005030 | 005777 | 173744 |        |      | TST  | QCSR          |
| 1100 | 005034 | 100001 |        |        |      | BPL  | +.4           |

: SET PROCESSOR PRIORITY 7  
 : SET COUNTER FOR FAST INTERRUPTS  
 : INT EN, REPEATED INT, DOWN COUNT, 100 KHZ. GO

: ERROR, ERROR (BIT 15) NOT SET

CZKWBHO KW11-P RT CLK TST  
CZKWB1.P11 30-JAN-78 09:34

MACY11 30A(1052) 30-JAN-78 09:35 PAGE 21  
BASIC TEST

SEQ 0021

```

1101 005036 104000          HLT
1102          :TEST BIT 15 IS CLEARED BY INIT
1103          ↑27A: SCOPE
1104 005040 104400          MOV      #340,CC
1105 005042 012737 000340 177776      MOV      #2,ACSR
1106 005050 012777 000002 173724      MOV      #111,ACSR
1107 005056 012777 000111 173714      MOV      @DEL1,@TEMP
1108 005064 013737 001024 001020      MOV      @DEL1,@TEMP
1109 005072 062737 000001 001020      ADD      #1,@TEMP
1110 005100 001374          BNE      #-6
1111 005102 005777 173672          TST      ACSR
1112 005106 100404          BMI      15
1113 005110 042777 000001 173662          BIC      #1,ACSR
1114 005116 104000          HLT
1115 005120 000005          15: RESET
1116 005122 005777 173652          TST      ACSR
1117 005126 100001          BPL      .+4
1118 005130 104000          HLT
1119 005132 104400          SCOPE
1120          :BELL ON PASS COMPLETE
1121 005134 012777 000207 173650      ↑STEND: MOV      #207,@DDBR
1122 005142 105777 173646          TSTB     @TCR
1123 005146 100375          BPL      #-4
1124 005150 012777 000000 173634          MOV      #0,@DDBR
1125 005156 105777 173632          TSTB     @TCR
1126 005162 100375          BPL      #-4
1127 005164 013702 000042          MOV      @#42,%2
1128 005170 001405          BEQ      TRPA
1129 005172 000005          RESET
1130 005174 004712          LOGICAL: JSR      %7,(2)
1131 005176 000240          NOP
1132 005200 000240          NOP
1133 005202 000240          NOP
1134 005204 000137 001150      TRPA:  JMP      BEGIN

```

:ERR. FAILED TO CLEAR WHEN REF.

:BIT 15 NOT SET

:BIT 15 NOT CLEARED BY RESET

:SEND A NULL CHAR.

```

1135
1136
1137
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1142
1143 005210 012706 000776
1144 005214 004737 011652
1145 005220 013777 001010 173560
1146 005226 012777 000002 173554
1147 005234 012737 005602 000024
1148 005242 000005
1149
1150 005244 012777 141520 173530
1151 005252 012700 177772
1152 005256 012701 177754
1153 005262 012777 000111 173510
1154 005270 000001
1155 005272 005201
1156 005274 001375
1157 005276 105777 173512
1158 005302 100375
1159 005304 012777 000207 173500
1160 005312 005200
1161 005314 001360
1162 005316 042777 000101 173454
1163
1164 005324 012777 011610 173450
1165 005332 012701 177772
1166 005336 012701 177754
1167 005342 012777 000113 173430
1168 005350 000001
1169 005352 005201
1170 005354 001375
1171 005356 105777 173432
1172 005362 100375
1173 005364 012777 000207 173420
1174 005372 005200
1175 005374 001360
1176 005376 042777 000101 173374
1177
1178 005404 005737 006252
1179 005410 100677
1180 005412 012737 001130 005570
1181 005420 032777 000002 173416
1182 005426 001403
1183 005430 012737 000764 005570
1184
1185 005436 013777 005570 173336
1186 005444 012700 177772
1187 005450 012777 000115 173322
1188 005456 000001
1189 005460 105777 173330
1190 005464 100375

.SBTTL TIMING TEST
;RING TELETYPE BELL AT 10 SECOND INTERVALS USING REPEATED INTERRUPT MODE
;1ST MINUTE = 100 KHZ
;2ND MINUTE = 10 KHZ
;3RD MINUTE = LINE
;4TH MINUTE = EXTERNAL

BEGIN1: MOV #BUFF,%6
JSR %7,SWADJ ;HAS THIS CPU HAVE A SWITCH REG.?
MOV CKVS,%CKV
MOV #RTI,%CKVS
MOV #PWRP2,%24 ;INIT POWER FAIL POINTER
RESET

;100 KHZ
MOV #50000,%ACSB ;INIT COUNT SET BUFFER FOR .5 SECONDS
MOV #-6,%0 ;COUNT 6(10 SECOND) INTERVALS
T28: MOV #-20,%1 ;COUNT 20(.5 SECOND) INTERVALS
MOV #111,%ACSR ;100 KHZ, REPEATED INTERRUPTS, INTERRUPT ENABLE. GO
T28A: WAIT
INC %1 ;DONE 10 SECONDS?
BNE T28A ;NO
TSTB %TCSR
BPL -4
MOV #207,%TDBR
INC %0 ;DONE 6 TIMES?
BNE T28 ;NO
BIC #101,%ACSR ;YES DISABLE INTERRUPTS

;10 KHZ
MOV #5000,%ACSB ;INIT COUNT SET BUFFER FOR .5 SECONDS
MOV #-6,%0 ;COUNT 6(10SECOND) INTERVALS
T29: MOV #-20,%1 ;COUNT 20(.5 SECOND) INTERVALS
MOV #113,%ACSR ;10 KHZ, REPEATED INTERRUPTS, INTERRUPT ENABLE. GO
T29A: WAIT
INC %1 ;DONE 10 SECONDS?
BNE T29A ;NO
TSTB %TCSR ;YES, RING BELL
BPL -4
MOV #207,%TDBR
INC %0 ;DONE 6 TIMES?
BNE T29 ;NO
BIC #101,%ACSR ;YES, DISABLE INTERRUPTS

;SET UP FOR 10 SECONDS AT LINE FREQ.
TST %XORFLG
BMI BEGIN1
MOV #600,%LINE
BIT #2,%SR
BEQ +10
MOV #500,%LINE

;LINE
MOV LINE,%ACSB ;INITIALZE COUNT SET BUFFER FOR 10 SECONDS
MOV #-6,%0 ;COUNT 6 (10 SECOND) INTERVALS
T30: MOV #115,%ACSR ;LINE, REPEATED INTERRUPTS, INTERRUPT ENABLE. GO
WAIT
TSTB %TCSR
BPL -4

```

K02

CZKWBHO KW11-P RT CLK TEST  
CZKWB1.P11 30-JAN-78 09:34MACY11 30A(1052) 30-JAN-78 09:35 PAGE 23  
TIMING TEST

SEQ 0023

|      |        |        |        |        |                                  |              |                                                       |
|------|--------|--------|--------|--------|----------------------------------|--------------|-------------------------------------------------------|
| 1191 | 005466 | 012777 | 000207 | 173316 | MOV                              | #207, JTDDBR | :RING BELL                                            |
| 1192 | 005474 | 005200 |        |        | INC                              | %0           | :DONE 6 TIMES                                         |
| 1193 | 005476 | 001367 |        |        | BNE                              | T30          | :NO                                                   |
| 1194 | 005500 | 042777 | 000101 | 173272 | BIC                              | #101, JCSR   | :YES--DISABLE INTERRUPTS                              |
| 1195 | 005506 | 032777 | 000001 | 173330 | BIT                              | #1, JSR      | :                                                     |
| 1196 | 005514 | 001235 |        |        | BNE                              | BEGIN1       | :                                                     |
| 1197 |        |        |        |        | ;EXTERNAL (LINE FOR MAINTENANCE) |              |                                                       |
| 1198 | 005516 | 013777 | 005570 | 173256 | MOV                              | LINE, JCSB   | :INITIALZE COUNT SET BUFFER FOR 10 SECONDS            |
| 1199 | 005524 | 012700 | 177772 |        | MOV                              | #-6, %0      | :COUNT 6 (10 SECOND) INTERVALS                        |
| 1200 | 005530 | 012777 | 000117 | 173242 | MOV                              | #117, JCSR   | :EXT FREQ, REPEATED INTERRUPTS. INTERRUPT ENABLE . GO |
| 1201 | 005536 | 000001 |        |        | T31:                             | WAIT         |                                                       |
| 1202 | 005540 | 105777 | 173250 |        | TSTB                             | JTCSR        |                                                       |
| 1203 | 005544 | 100375 |        |        | BPL                              | .-4          |                                                       |
| 1204 | 005546 | 012777 | 000207 | 173236 | MOV                              | #207, JTDDBR | :RING BELL                                            |
| 1205 | 005554 | 005200 |        |        | INC                              | %0           | :DONE 6 TIMES                                         |
| 1206 | 005556 | 001367 |        |        | BNE                              | T31          | :NO                                                   |
| 1207 | 005560 | 042777 | 000100 | 173212 | BIC                              | #100, JCSB   | :YES, DISABLE INTERRUPTS                              |
| 1208 | 005566 | 000610 |        |        | BR                               | BEGIN1       | :REPEAT                                               |
| 1209 | 005570 | 001130 |        |        | LINE:                            | 600.         |                                                       |

|      |        |        |        |        |                                                                               |                 |                                 |
|------|--------|--------|--------|--------|-------------------------------------------------------------------------------|-----------------|---------------------------------|
| 1210 |        |        |        |        | .SBTTL                                                                        | SUBROUTINES     |                                 |
| 1211 |        |        |        |        | :POWER FAIL HANDLERS                                                          |                 |                                 |
| 1212 | 005572 | 012737 | 001150 | 005646 | PWRF1: MOV                                                                    | #BEGIN, FWRRTN  |                                 |
| 1213 | 005600 | 000403 |        |        | BR                                                                            | PWRDWN          |                                 |
| 1214 | 005602 | 012737 | 005210 | 005646 | PWRF2: MOV                                                                    | #BEGIN1, PWRRTN |                                 |
| 1215 | 005610 | 012737 | 005620 | 000024 | PWRDWN: MOV                                                                   | #PWRUP, 24      |                                 |
| 1216 | 005616 | 000000 |        |        | HALT                                                                          |                 |                                 |
| 1217 | 005620 | 012706 | 000776 |        | PWRUP: MOV                                                                    | #BUFF, %6       |                                 |
| 1218 | 005624 | 005000 |        |        | CLR                                                                           | %0              |                                 |
| 1219 | 005626 | 005200 |        |        | INC                                                                           | %0              |                                 |
| 1220 | 005630 | 001376 |        |        | BNE                                                                           | .-2             |                                 |
| 1221 | 005632 | 012702 | 006472 |        | MOV                                                                           | #MSGPWR, %2     |                                 |
| 1222 | 005636 | 004737 | 006266 |        | JSR                                                                           | %7, TOP         |                                 |
| 1223 | 005642 | 000177 | 000000 |        | JMP                                                                           | 2PWRRTN         |                                 |
| 1224 | 005646 | 001150 |        |        | PWRRTN: BEGIN                                                                 |                 |                                 |
| 1225 |        |        |        |        |                                                                               |                 |                                 |
| 1226 |        |        |        |        | :ENTERED WITH SYSTEM TRAP CALL (HLT)                                          |                 |                                 |
| 1227 |        |        |        |        | :PRINT PC STATUS REGISTER, COMAND REGISTER, BYTE COUNT, CURRENT ADDRESS, DATA |                 |                                 |
| 1228 | 005650 | 037727 | 173170 | 020000 | PRINT: BIT                                                                    | JSR, #20000     | :TEST FOR INHIBIT PRINT OUT     |
| 1229 | 005656 | 001401 |        |        | BEQ                                                                           | +.4             | :BRANCH TO PRINT                |
| 1230 | 005660 | 000002 |        |        | RTI                                                                           |                 | :INHIBIT, RETURN TO MAIN STREAM |
| 1231 | 005662 | 012702 | 006370 |        | MOV                                                                           | #MSG1, %2       |                                 |
| 1232 | 005666 | 005737 | 005764 |        | TST                                                                           | PRINT1          |                                 |
| 1233 | 005672 | 001402 |        |        | BEQ                                                                           | +.6             |                                 |
| 1234 | 005674 | 012702 | 006433 |        | MOV                                                                           | #MSG2, %2       |                                 |
| 1235 | 005700 | 004737 | 006266 |        | JSR                                                                           | %7, TOP         | :PRINT ERROR HEADING            |
| 1236 | 005704 | 005237 | 005764 |        | INC                                                                           | PRINT1          |                                 |
| 1237 | 005710 | 011602 |        |        | MOV                                                                           | (6), %2         |                                 |
| 1238 | 005712 | 162702 | 000002 |        | SUB                                                                           | #2, %2          |                                 |
| 1239 | 005716 | 004737 | 005766 |        | JSR                                                                           | %7, OCTPRT      | :PRINT PC                       |
| 1240 | 005722 | 017702 | 173052 |        | MOV                                                                           | 2CSR, %2        |                                 |
| 1241 | 005726 | 004737 | 005766 |        | JSR                                                                           | %7, OCTPRT      | :PRINT STATUS REGISTER          |
| 1242 | 005732 | 017702 | 173046 |        | MOV                                                                           | 2CTR, %2        |                                 |
| 1243 | 005736 | 004737 | 005766 |        | JSR                                                                           | %7, OCTPRT      | :PRINT COUNTER                  |
| 1244 | 005742 | 013702 | 001020 |        | MOV                                                                           | TEMP, %2        |                                 |
| 1245 | 005746 | 004737 | 005766 |        | JSR                                                                           | %7, OCTPRT      | :PRINT TEMP                     |
| 1246 | 005752 | 005777 | 173066 |        | TST                                                                           | 2SR             | :CHECK SR FOR HALT SWITCH       |
| 1247 | 005756 | 100001 |        |        | BPL                                                                           | +.4             |                                 |
| 1248 | 005760 | 000000 |        |        | HALT                                                                          |                 | :HALT ON ERROR UP               |
| 1249 | 005762 | 000002 |        |        | RTI                                                                           |                 | :RETURN TO MAINLINE             |
| 1250 | 005764 | 000000 |        |        | PRINT1: 0                                                                     |                 |                                 |
| 1251 |        |        |        |        | :PRINT OCTAL VALUE IN REGISTER2                                               |                 |                                 |
| 1252 | 005766 | 012737 | 000060 | 006100 | OCTPRT: MOV                                                                   | #'0, CHAR       | :INITIALIZE 1ST NUMBER AS 0     |
| 1253 | 005774 | 005702 |        |        | TST                                                                           | %2              | :IS VALUE POSITIVE              |
| 1254 | 005776 | 100003 |        |        | BPL                                                                           | OCT1            | :YES PRINT 0                    |
| 1255 | 006000 | 012737 | 000061 | 006100 | MOV                                                                           | #'1, CHAR       | :NO PRINT 1                     |
| 1256 | 006006 | 004737 | 006102 |        | OCT1: JSR                                                                     | %7, OCTP        |                                 |
| 1257 | 006012 | 006102 |        |        | ROL                                                                           | %2              |                                 |
| 1258 | 006014 | 006102 |        |        | ROL                                                                           | %2              |                                 |
| 1259 | 006016 | 012737 | 177773 | 006076 | MOV                                                                           | #-5, OCT        | :COUNT 5 DIGITS                 |
| 1260 | 006024 | 006102 |        |        | OCT2: ROL                                                                     | %2              |                                 |
| 1261 | 006026 | 006102 |        |        | ROL                                                                           | %2              |                                 |
| 1262 | 006030 | 006102 |        |        | ROL                                                                           | %2              |                                 |
| 1263 | 006032 | 010237 | 006100 |        | MOV                                                                           | %2, CHAR        | :SAVE DIGIT                     |
| 1264 | 006036 | 042737 | 177770 | 006100 | BIC                                                                           | #177770, CHAR   | :CLEAR OTHER BITS               |
| 1265 | 006044 | 052737 | 000060 | 006100 | BIS                                                                           | #60, CHAR       | :MAKE ASCII DIGIT               |

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SEQ 0025

|      |        |        |        |        |                                            |                |                                    |
|------|--------|--------|--------|--------|--------------------------------------------|----------------|------------------------------------|
| 1266 | 006052 | 006002 |        |        | ROR                                        | %2             |                                    |
| 1267 | 006054 | 004737 | 006102 |        | JSR                                        | %7, OCTP       | ;PRINT                             |
| 1268 | 006060 | 006102 |        |        | ROL                                        | %2             |                                    |
| 1269 | 006062 | 005237 | 006076 |        | INC                                        | OCT            | ;+1 TO DIGIT COUNT                 |
| 1270 | 006066 | 001356 |        |        | BNE                                        | OCT2           | ;NOT DONE                          |
| 1271 | 006070 | 004737 | 006120 |        | JSR                                        | %7, SP3        |                                    |
| 1272 | 006074 | 000207 |        |        | RTS                                        | %7             | ;EXIT                              |
| 1273 | 006076 | 000000 |        |        | OCT:                                       | 0              |                                    |
| 1274 | 006100 | 000000 |        |        | CHAR:                                      | 0              |                                    |
| 1275 | 006102 | 105777 | 172706 |        | OCTP:                                      | TSTB           | ATCSR                              |
| 1276 | 006106 | 100375 |        |        | BPL                                        | -4             | ;WAIT FOR READY                    |
| 1277 | 006110 | 013777 | 006100 | 172674 | MOV                                        | CHAR, ATDBR    | ;PRINT                             |
| 1278 | 006116 | 000207 |        |        | RTS                                        | %7             |                                    |
| 1279 |        |        |        |        | :TYPE 3                                    | SPACES         |                                    |
| 1280 | 006120 | 012702 | 006132 |        | SP3:                                       | MOV            | %SP3A, %2                          |
| 1281 | 006124 | 004737 | 006266 |        | JSR                                        | %7, TOP        |                                    |
| 1282 | 006130 | 000207 |        |        | RTS                                        | %7             |                                    |
| 1283 | 006132 | 020057 | 027440 |        | SP3A:                                      | .ASCII         | ; / / ;                            |
| 1284 |        |        |        |        | .EVEN                                      |                |                                    |
| 1285 |        |        |        |        |                                            |                |                                    |
| 1286 | 006136 | 022606 |        |        | SCOPEB:                                    | CMP            | (%)+, %6                           |
| 1287 | 006140 | 012637 | 177776 |        | MOV                                        | (%)+, CC       | ;REPOSITION THE STACK              |
| 1288 | 006144 | 000177 | 000114 |        | JMP                                        | RETURN         | ;SCOPE RETURN                      |
| 1289 |        |        |        |        |                                            |                |                                    |
| 1290 |        |        |        |        | :SCOPE OR/AND ITERATION LOOP FOR EACH TEST |                |                                    |
| 1291 | 006150 | 032777 | 040000 | 172666 | SCOPEC:                                    | BIT            | %40000, ASR                        |
| 1292 | 006156 | 001367 |        |        | BNE                                        | SCOPEB         | ;TEST SR FOR SCOPE                 |
| 1293 | 006160 | 005737 | 006252 |        | TST                                        | %XORFLG        | ;YES SCOPE                         |
| 1294 | 006164 | 100011 |        |        | BPL                                        | 1\$            |                                    |
| 1295 | 006166 | 013746 | 000004 |        | MOV                                        | %4, -(%6)      |                                    |
| 1296 | 006172 | 012737 | 006254 | 000004 | MOV                                        | %XORA, %4      |                                    |
| 1297 | 006200 | 005737 | 177060 |        | TST                                        | %177060        |                                    |
| 1298 | 006204 | 012637 | 000004 |        | MOV                                        | (%6)+, %4      | ;RESTORE STACK                     |
| 1299 | 006210 | 032777 | 004000 | 172626 | 1\$:                                       | BIT            | %4000, ASR                         |
| 1300 | 006216 | 001007 |        |        | BNE                                        | SCOPEB         | ;NO - TEST FOR ITERATION           |
| 1301 | 006220 | 023737 | 006250 | 001022 | CMP                                        | SCOPEF, ICOUNT | ;INHIBIT ITERATION                 |
| 1302 | 006226 | 001403 |        |        | BEQ                                        | SCOPEB         | ;EXIT - DONE                       |
| 1303 | 006230 | 005237 | 006250 |        | INC                                        | SCOPEF         | ;INCREMENT COUNT                   |
| 1304 | 006234 | 000740 |        |        | BR                                         | SCOPEB         | ;LOOP SOME MORE                    |
| 1305 | 006236 | 005037 | 006250 |        | SCOPEG:                                    | CLR            | SCOPEF                             |
| 1306 | 006242 | 011637 | 006264 |        | MOV                                        | %6, RETURN     | ;CLEAR COUNT                       |
| 1307 | 006246 | 000002 |        |        | RTI                                        |                | ;SAVE SCOPE RETURN POINTER         |
| 1308 | 006250 | 000000 |        |        | SCOPEF:                                    | 0              | ;RETURN INLINE-NEXT TEST           |
| 1309 | 006252 | 000000 |        |        | XORFLG:                                    | 0              | ;COUN LOCATION FOR INTERATION LOOP |
| 1310 | 006254 | 022626 |        |        | XORA:                                      | CMP            | (%6)+, (%6)+                       |
| 1311 | 006256 | 012637 | 000004 |        | MOV                                        | (%6)+, %4      |                                    |
| 1312 | 006262 | 000725 |        |        | BR                                         | SCOPEB         |                                    |
| 1313 | 006264 | 001150 |        |        | RETURN:                                    | BEGIN          | ;ADDRESS OF LAST TEST              |
| 1314 |        |        |        |        | :MOV ADDRESS OF MESSAGE TO REGISTER 2      |                |                                    |
| 1315 |        |        |        |        | :THEN JSR %7, TOP                          |                |                                    |
| 1316 | 006266 | 142777 | 000177 | 172520 | TOP:                                       | BICB           | %177, ATCSR                        |
| 1317 | 006274 | 112237 | 006366 |        | MOVB                                       | (2)+, EOMK     | ;CLR INT FLAG                      |
| 1318 | 006300 | 121237 | 006366 |        | CMPB                                       | %2, EOMK       | ;MOVE IN EOM MARKER                |
| 1319 | 006304 | 001001 |        |        | BNE                                        | +4             | ;COMPARE FOR EOM                   |
| 1320 | 006306 | 000207 |        |        | RTS                                        | %7             | ;NO                                |
| 1321 | 006310 | 121227 | 000100 |        | CMFB                                       | %2, %2         | ;YES, EXIT                         |

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SEQ 0026

|      |        |        |        |        |         |                                                |                       |
|------|--------|--------|--------|--------|---------|------------------------------------------------|-----------------------|
| 1322 | 006314 | 001406 |        |        | BEQ     | TOP2                                           |                       |
| 1323 | 006316 | 105777 | 172472 |        | TSTB    | ATCSR                                          | :CK TTY               |
| 1324 | 006322 | 100375 |        |        | BPL     | -4                                             | :WAIT FOR DONE        |
| 1325 | 006324 | 112277 | 172462 |        | MOVB    | (2)+,ATDBR                                     | :MOVE CHARACTER       |
| 1326 | 006330 | 000763 |        |        | BR      | TOP1                                           | :BRANCH BACK          |
| 1327 | 006332 | 105777 | 172456 | TOP2:  | TSTB    | ATCSR                                          |                       |
| 1328 | 006336 | 100375 |        |        | BPL     | -4                                             |                       |
| 1329 | 006340 | 112777 | 000215 | 172444 | MOVB    | #215,ATDBR                                     | :SEND CARRIAGE RETURN |
| 1330 | 006346 | 105777 | 172442 |        | TSTB    | ATCSR                                          |                       |
| 1331 | 006352 | 100375 |        |        | BPL     | -4                                             |                       |
| 1332 | 006354 | 112777 | 000212 | 172430 | MOVB    | #212,ATDBR                                     | :SEND LINE FEED       |
| 1333 | 006362 | 005202 |        |        | INC     | %2                                             | :INCRMTN R2           |
| 1334 | 006364 | 000745 |        |        | BR      | TOP1                                           | :NO EOM, SO LOOP      |
| 1335 | 006366 | 000    |        |        | EOMK:   | .BYTE 0                                        |                       |
| 1336 |        | 006370 |        |        |         | .EVEN                                          |                       |
| 1337 | 006370 | 040057 | 020040 | 041520 | MSG1:   | .ASCII ;/2 PC STATUS COUNTER TEMP2/;           |                       |
| 1338 | 006376 | 020040 | 020040 | 052123 |         |                                                |                       |
| 1339 | 006404 | 052101 | 051525 | 020040 |         |                                                |                       |
| 1340 | 006412 | 047503 | 047125 | 042524 |         |                                                |                       |
| 1341 | 006420 | 020122 | 052040 | 046505 |         |                                                |                       |
| 1342 | 006426 | 040120 | 057    |        |         |                                                |                       |
| 1343 |        | 006432 |        |        |         | .EVEN                                          |                       |
| 1344 | 006432 | 040057 | 057    |        | MSG2:   | .ASCII ;/2/;                                   |                       |
| 1345 |        | 006436 |        |        |         | .EVEN                                          |                       |
| 1346 | 006436 | 040057 | 055103 | 053513 | MSG3:   | .ASCII ;/2CZKWB1 KW11-P RT CLK TST2/;          |                       |
| 1347 | 006444 | 044502 | 045440 | 030527 |         |                                                |                       |
| 1348 | 006452 | 026461 | 020120 | 052122 |         |                                                |                       |
| 1349 | 006460 | 041440 | 045514 | 052040 |         |                                                |                       |
| 1350 | 006466 | 052123 | 027500 |        |         |                                                |                       |
| 1351 |        |        |        |        |         | .EVEN                                          |                       |
| 1352 | 006472 | 040057 | 042522 | 052123 | MSGPWR: | .ASCII ;/2RESTARTING AFTER A POWER FAILURE22/; |                       |
| 1353 | 006500 | 051101 | 044524 | 043516 |         |                                                |                       |
| 1354 | 006506 | 040440 | 052106 | 051105 |         |                                                |                       |
| 1355 | 006514 | 040440 | 050040 | 053517 |         |                                                |                       |
| 1356 | 006522 | 051105 | 043040 | 044501 |         |                                                |                       |
| 1357 | 006530 | 052514 | 042522 | 040100 |         |                                                |                       |
| 1358 | 006536 | 057    |        |        |         |                                                |                       |
| 1359 |        | 006540 |        |        |         | .EVEN                                          |                       |
| 1360 | 006540 | 040057 | 047531 | 020125 | XORM:   | .ASCII ;/2YOU ARE ON AN XOR TESTER2/;          |                       |
| 1361 | 006546 | 051101 | 020105 | 047117 |         |                                                |                       |
| 1362 | 006554 | 040440 | 020116 | 047530 |         |                                                |                       |
| 1363 | 006562 | 020122 | 042524 | 052123 |         |                                                |                       |
| 1364 | 006570 | 051105 | 027500 |        |         |                                                |                       |
| 1365 |        |        |        |        |         | .EVEN                                          |                       |
| 1366 |        |        |        |        |         | :TIMER FOR KW11-P CLOCK                        |                       |
| 1367 |        |        |        |        |         |                                                |                       |
| 1368 | 006574 | 172562 |        |        | CSB1:   | 172562                                         |                       |
| 1369 | 006576 | 172560 |        |        | CSR1:   | 172560                                         |                       |
| 1370 | 006600 | 172564 |        |        | CTR1:   | 172564                                         |                       |
| 1371 | 006602 | 000504 |        |        | CKV1:   | 504                                            |                       |
| 1372 | 006604 | 000506 |        |        | CKVS1:  | 506                                            |                       |
| 1373 | 006606 | 000000 |        |        | CLKFLG: | 0                                              |                       |
| 1374 | 006610 | 000000 |        |        | INTFLG: | 0                                              |                       |
| 1375 | 006612 | 177566 |        |        | PDBR:   | 177566                                         |                       |
| 1376 | 006614 | 177564 |        |        | PCSR:   | 177564                                         |                       |
| 1377 | 006616 | 000064 |        |        | PVEC:   | 64                                             |                       |

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1378 006620 000066 PVECS: 66
1379 006622 177562 KDBR: 177562
1380 006624 177560 KCSR: 177560
1381 006626 000060 KVEC: 60
1382 006630 000062 KVECS: 62
1383 006632 000000 CNT: 0
1384 006634 000000 CNT1: 0
1385 006636 000000 CNT8: 0
1386 000211 CTRL1=211
1387 000224 CTRLT=224
1388 006640 177776 PSW: 177776
1389 006642 000000 HRS1: 0
1390 006644 000000 HRS2: 0
1391 006646 000000 MIN1: 0
1392 006650 000000 MIN2: 0
1393 006652 000000 SEC1: 0
1394 006654 000000 SEC2: 0
1395 006656 000000 LST: 0
1396 006660 000000 MST: 0
1397 006662 000000 HRS1A: 0
1398 006664 000000 HRS2A: 0
1399 006666 000000 MIN1A: 0
1400 006670 000000 MIN2A: 0
1401 006672 000000 SEC1A: 0
1402 006674 000000 SEC2A: 0
1403 006676 000000 LSTA: 0
1404 006700 000000 MSTA: 0
1405 006702 000000 TMPSWR: 0
1406 006704 000 BYT1: .BYTE 0
1407 006705 000 BYT2: .BYTE 0
1408 006706 000 BYT3: .BYTE 0
1409 006707 000 BYT4: .BYTE 0
1410 006710 000 BYT5: .BYTE 0
1411 006711 000 BYT6: .BYTE 0
1412 006712 000 BYT7: .BYTE 0
1413 006714 .EVEN

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: TEMP LOC FOR SOFT-SWR CONTENTS
: LOC FOR 1ST * INPUT VIA TTY
: " " 2ND " " " "
: " " 3RD " " " "
: " " 4TH " " " "
: " " 5TH " " " "
: " " 6TH " " " "
: " " 7TH " " " "

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1418 006714 012706 000776 K100HZ: MOV #BUFF,%6
1419 006720 004737 011652 JSR %7,SWADJ ;HAS THIS CPU HAVE A SWITCH REG.?
1420 006724 005077 177710 CLR #PSW ;
1421 006730 012737 000000 007674 MOV #0,CLK+2 ;100KHZ
1422 006736 012737 000131 007702 MOV #131,CLK1+2
1423 006744 012700 010356 MOV #TABL,%0
1424 006750 012701 010376 MOV #TABL1,%1
1425 006754 004537 007234 JSR %5,#MOVE
1426 006760 012737 000043 010506 MOV #35,CLK3+2 ;LEAST VALUE
1427 006766 012737 001217 010536 MOV #655,CLK4+2 ;MOST VALUE
1428 006774 000137 007250 JMP #INIT
1429
1430 007000 012706 000776 K10HZ: MOV #BUFF,%6
1431 007004 004737 011652 JSR %7,SWADJ ;HAS THIS CPU HAVE A SWITCH REG.?
1432 007010 005077 177624 CLR #PSW ;
1433 007014 012737 164217 007674 MOV #-13561,CLK+2 ;10KHZ

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C03

CZKWBHD KW11-P RT CLK TST  
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SEQ 0028

|      |        |        |        |        |     |             |
|------|--------|--------|--------|--------|-----|-------------|
| 1434 | 007022 | 012737 | 000133 | 007702 | MOV | #133,CLK1+2 |
| 1435 | 007030 | 012700 | 010356 |        | MOV | #TABL,%0    |
| 1436 | 007034 | 012701 | 010416 |        | MOV | #TABL2,%1   |
| 1437 | 007040 | 004537 | 007234 |        | JSR | %5,%0#MOVE  |
| 1438 | 007044 | 012737 | 000000 | 010506 | MOV | #0,CLK3+2   |

D03

CZKWBHO KW11-P RT CLK TST  
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SEE 0029

|      |        |        |        |        |     |               |
|------|--------|--------|--------|--------|-----|---------------|
| 1439 | 007052 | 012737 | 001130 | C10536 | MOV | #600, CLK*4+2 |
| 1440 | 007060 | 000137 | 007250 |        | JMP | 2*INIT        |

E03

CZKWBHO KW11-P RT CLK TST  
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SEQ 0030

1441  
1442 007064 012706 000776  
1443 007070 004737 011652  
1444 007074 005077 177540

H602: MOV #BUFF,%6  
JSR %7,SWAD  
CLR @PSW

:HAS THIS CPU HAVE A SWITCH REG.  
:

F03

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SEG 0031

1445 007100 012737 177733 007674 MOV #45,CLK+2 :60HZ

G03

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SEQ 0032

1446 007106 012737 000135 007702 MOV #135,CLK1+2

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1447 007114 012700 010356      MOV      #TABL,%0
1448 007120 012701 010436      MOV      #TABL3,%1
1449 007124 004537 007234      JSR      %5,%#MOVE
1450 007130 012737 000000 010506  MOV      #00,CLK3+2
1451 007136 012737 001130 010536  MOV      #600,CLK4+2
1452 007144 000137 007250      JMP      @#INIT
1453
1454 007150 012706 000776      H502:  MOV      #BUFF,%6
1455 007154 004737 011652      JSR      %7,SWADJ      ;HAS THIS CPU HAVE A SWITCH REG.?
1456 007160 005077 177454      CLR      @PSW          ;50HZ
1457 007164 012737 177742 007674  MOV      #-36,CLK+2
1458 007172 012737 000135 007702  MOV      #135,CLK1+2
1459 007200 012700 010356      MOV      #TABL,%0
1460 007204 012701 010456      MOV      #TABL4,%1
1461 007210 004537 007234      JSR      %5,%#MOVE
1462 007214 012737 000000 010506  MOV      #0,CLK3+2
1463 007222 012737 001104 010536  MOV      #580,CLK4+2
1464 007230 000137 007250      JMP      @#INIT
1465
1466 007234 012702 177771      MOVE:  MOV      #-7,%2
1467 007240 012120 1S:      MOV      (%1)+,(%0)+
1468 007242 005202      INC      %2
1469 007244 001375      BNE      1S
1470 007246 000205      RTS      %5
1471
1472 007250 013737 005572 000024  INIT:  MOV      PWRFL,24
1473 007256 012706 000776      MOV      #BUFF,%6      ;INITIALIZE
1474 007262 005037 006656      CLR      @#LST
1475 007266 005037 006660      CLR      @#MST
1476 007272 012737 000060 006642  MOV      #60,@#HRS1
1477 007300 012737 000060 006644  MOV      #60,@#HRS2
1478 007306 012737 000060 006646  MOV      #60,@#MIN1
1479 007314 012737 000060 006650  MOV      #60,@#MIN2
1480 007322 012737 000060 006652  MOV      #60,@#SEC1
1481 007330 012737 000060 006654  MOV      #60,@#SEC2
1482 007336 012777 010476 171442  MOV      #CLKI,@CKV
1483 007344 012777 000340 171436  MOV      #340,@CKVS
1484 007352 012777 007560 177246  MOV      #KINT,@KVEC
1485 007360 012777 000200 177242  MOV      #200,@KVECS
1486 007366 012777 000200 177224  MOV      #200,@PVECS
1487 007374 012777 000100 177222  MOV      #100,@KCSR
1488 007402 005037 006606      CLR      @#CLKFLG
1489 007406 005037 006610      CLR      @#INTFLG
1490 007412 005077 171362      START: CLR      @CSR
1491 007416 005077 171360      CLR      @CSB
1492 007422 032777 000002 171414  WAITA: BIT      #2,@SR      ;WAIT LOOP, SW 1 CAUSE WAIT
1493 007430 001401      BEQ      CLKON
1494 007432 000001      WAITB: WAIT
1495 007434 032777 000001 171402  CLKON: BIT      #1,@SR      ;SW 0 TURNS ON CLK2
1496 007442 001432      BEQ      3S
1497 007444 032777 000004 171372  BIT      #4,@SR      ;SW 2 DETERMINES PRESENCE OF CLOCK 2
1498 007452 001426      BEQ      3S
1499 007454 005737 006606      TST      @#CLKFLG      ;CLKFLG ALLOW CLK 2 TO BE TURNED ON
1500 007460 001360      BNE      WAITA          ;ONLY ONCE
1501 007462 005077 177106      CLR      @CSB1
1502 007466 012777 007762 177106  MOV      #KOUT,@CKV1

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CZKWBHD KW11-P RT CLK \*ST  
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SEG 0034

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1503 007474 012777 000200 177102      MOV      #200, @CKVSI
1504 007502 012737 177777 006606      MOV      #-1, @CLKFLG
1505 007510 012777 141521 177056      MOV      #141521, @CSB1
1506 007516 012777 000113 177052      MOV      #113, @CSR1
1507 007524 000137 007432      JMP      WAITB      ;TURN ON CLK 2
1508 007530 005037 006606      CLR      @CLKFLG      ;CLEAR CLK 2 IF PRESENT
1509 007534 032777 000004 171302      BIT      #4, @SR
1510 007542 001404      BEQ      #5
1511 007544 005077 177026      CLR      @CSR1
1512 007550 005077 177020      CLR      @CSB1
1513 007554 000137 007422      JMP      WAITA      +5:
1514
1515 007560 017701 177036      KINTR:  MOV      @KDBR, %1      ;KEYBOARD INTERRUPT HANDLER
1516 007564 042701 177600      BIC      #177600, %1      ;STRIP JUNK
1517 007570 022701 000007      CMP      #7, %1      ;IS CHAR A ?G(CONTROL-G)?
1518 007574 001557      BEQ      CNCSWR      ;IF YES, GO TO CNCSWR
1519 007576 022701 000011      CMP      #11, %1      ;IS IT A CNTRL I ?
1520 007602 001404      BEQ      KIN
1521 007604 022701 000024      CMP      #24, %1      ;IS IT A CNTRL T ?
1522 007610 001464      BEQ      KOUT
1523 007612 000002      RTI
1524
1525
1526 007614 005077 171160      KIN:    CLR      @CSR      ;HANDLER FOR CTRL I
1527 007620 005077 171156      CLR      @CSB      ;SETUP TIME OF DAY
1528 007624 012737 177772 006632      MOV      #-6, @CNT
1529 007632 012737 006642 006634      MOV      #HRS1, @CNT1
1530 007640 005037 006656      CLR      LST      ;INPUT
1531 007644 005037 006660      CLR      MST
1532 007650 012777 007710 176750      MOV      #KINI, @KVEC
1533 007656 000002      RTI
1534
1535 007660 012777 007560 176740      KINI2:  MOV      #KINTR, @KVEC      ;AWAIT A CHAR TO START
1536 007666 017701 176730      MOV      @KDBR, %1
1537 007672 012777 000000 171102      CLK:    MOV      #0, @CSB      ;CLK 1
1538 007700 012777 000131 171072      CLK1:   MOV      #131, @CSR
1539 007706 000002      RTI
1540
1541 007710 013704 006634      KINI:   MOV      @CNT1, %4      ;STORE TIME OF DAY
1542 007714 017701 176702      MOV      @KDBR, %1
1543 007720 042701 000300      BIC      #300, %1
1544 007724 010124      MOV      %1, (%4)+
1545 007726 010437 006634      MOV      %4, @CNT1
1546 007732 005237 006632      INC      @CNT
1547 007736 001003      BNE      #5
1548 007740 012777 007660 176660      MOV      #KINI2, @KVEC
1549 007746 000002      RTI      15:
1550
1551 007750 017737 176646 007760      HOLDIT: MOV      @KDBR, @HOLD      ;DUMMY INTERRUPT SERVICE ROUTINE
1552 007756 000002      RTI
1553
1554 007760 000000      HOLD:   0
1555
1556 007762 005037 006610      KOUT:   CLR      @INTFLG      ;INPUT HANDLER FOR CTRL T
1557 007766 012777 007750 176632      MOV      #HOLDIT, @KVEC      ;SET DUMMY VECTOR
1558 007774 012700 006642      MOV      #HRS1, %0      ;GET TIME OF DAY INTO

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SEG 0035

|      |        |        |        |         |      |                 |  |                                          |
|------|--------|--------|--------|---------|------|-----------------|--|------------------------------------------|
| 1559 | 010000 | 012703 | 006662 |         | MOV  | #HRS1A,%3       |  | ;WORK AREA                               |
| 1560 | 010004 | 012704 | 177770 |         | MOV  | #-10,%4         |  |                                          |
| 1561 | 010010 | 012023 |        | 15:     | MOV  | (%0)+, (%3)+    |  |                                          |
| 1562 | 010012 | 005204 |        |         | INC  | %4              |  |                                          |
| 1563 | 010014 | 001375 |        |         | BNE  | 15              |  |                                          |
| 1564 | 010016 | 017701 | 170762 |         | MOV  | @CTR,%1         |  |                                          |
| 1565 | 010022 | 005737 | 006610 |         | TST  | @INTFLG         |  | ;SEE IF CLK HAS INTERRUPTED IN THIS TIME |
| 1566 | 010026 | 001355 |        |         | BNE  | KOUT            |  | ;CALC VALUE OF CTR                       |
| 1567 | 010030 | 005737 | 007674 |         | TST  | @CLK+2          |  | ;IS CLOCK RUNNING AT 100KHZ ?            |
| 1568 | 010034 | 001416 |        |         | BEQ  | 25              |  |                                          |
| 1569 | 010036 | 163701 | 007674 |         | SUB  | @CLK+2,%1       |  | ;SUB INIT VALUE                          |
| 1570 | 010042 | 006301 |        |         | ASL  | %1              |  |                                          |
| 1571 | 010044 | 006301 |        |         | ASL  | %1              |  |                                          |
| 1572 | 010046 | 023727 | 007674 | 164217  | CMP  | @CLK+2, #-13561 |  | ;IS CLOCK RUNNING AT 10KHZ ?             |
| 1573 | 010054 | 001405 |        |         | BEQ  | 35              |  |                                          |
| 1574 | 010056 | 000301 |        | 105:    | SWAB | %1              |  |                                          |
| 1575 | 010060 | 023727 | 007674 | 177742  | CMP  | @CLK+2, #-36    |  | ;IS CLOCK RUNNING AT 50KHZ ?             |
| 1576 | 010066 | 001001 |        |         | BNE  | 25              |  |                                          |
| 1577 | 010070 | 006301 |        | 35:     | ASL  | %1              |  |                                          |
| 1578 | 010072 | 005000 |        | 25:     | CLR  | %0              |  |                                          |
| 1579 | 010074 | 005003 |        |         | CLR  | %3              |  |                                          |
| 1580 | 010076 | 012704 | 010356 | 55:     | MOV  | #TABL,%4        |  |                                          |
| 1581 | 010102 | 005701 |        | 65:     | TST  | %1              |  |                                          |
| 1582 | 010104 | 100001 |        |         | BPL  | 45              |  |                                          |
| 1583 | 010106 | 061403 |        |         | ADD  | @%4,%3          |  |                                          |
| 1584 | 010110 | 006301 |        | 45:     | ASL  | %1              |  |                                          |
| 1585 | 010112 | 005724 |        |         | TST  | (%4)+           |  |                                          |
| 1586 | 010114 | 005200 |        |         | INC  | %0              |  |                                          |
| 1587 | 010116 | 022700 | 000007 |         | CMP  | #7,%0           |  |                                          |
| 1588 | 010122 | 001367 |        |         | BNE  | 65              |  |                                          |
| 1589 | 010124 | 060337 | 006700 |         | ADD  | %3, @MSTA       |  | ;ADD VALUE OF CTR TO MST                 |
| 1590 | 010130 | 000137 | 010772 |         | JMP  | @CLK2           |  |                                          |
| 1591 | 010134 |        |        | CNGSWR: |      |                 |  |                                          |
| 1592 | 010134 | 010246 |        |         | MOV  | %2, -(6)        |  | ;SAVE R2                                 |
| 1593 | 010136 | 010346 |        |         | MOV  | %3, -(6)        |  | ;SAVE R3                                 |
| 1594 | 010140 |        |        | SETBYT: |      |                 |  |                                          |
| 1595 | 010140 | 005037 | 006702 |         | CLR  | TMPSWR          |  | ;CLEAR TEMP SWR                          |
| 1596 | 010144 | 005003 |        |         | CLR  | %3              |  | ;CLEAR R3                                |
| 1597 | 010146 | 004737 | 010324 |         | JSR  | PC, CRLF        |  | ;PRINT <CR><LF>                          |
| 1598 | 010152 | 012702 | 006704 |         | MOV  | #BYT1,%2        |  | ;INIT R2 TO 1ST BYTE LOC                 |
| 1599 | 010156 |        |        | CKCSR:  |      |                 |  |                                          |
| 1600 | 010156 | 105777 | 176442 |         | TSTB | @KCSR           |  | ;IS CHAR TYPED?                          |
| 1601 | 010162 | 100375 |        |         | BPL  | CKCSR           |  | ;IF NOT WAIT                             |
| 1602 | 010164 | 017701 | 176432 |         | MOV  | @KDBR,%1        |  | ;ELSE MOVE THE CHAR TO R1                |
| 1603 | 010170 | 042701 | 177600 |         | BIC  | #177600,%1      |  | ;STRIP JUNK                              |
| 1604 | 010174 |        |        | 55:     |      |                 |  |                                          |
| 1605 | 010174 | 105777 | 176414 |         | TSTB | @PCSR           |  |                                          |
| 1606 | 010200 | 100375 |        |         | BPL  | 55              |  |                                          |
| 1607 | 010202 | 010177 | 176404 |         | MOV  | %1, @PDBR       |  |                                          |
| 1608 | 010206 | 122701 | 000025 |         | CMPB | #25,%1          |  | ;IS CHAR +U (CONTROL-U) ?                |
| 1609 | 010212 | 001752 |        |         | BEQ  | SETBYT          |  | ;IF YES START OVER                       |
| 1610 | 010214 | 122701 | 000015 |         | CMPB | #15,%1          |  | ;ELSE IS IT <CR> ?                       |
| 1611 | 010220 | 001412 |        |         | BEQ  | SWDONE          |  | ;IF EQUAL GO TO SWDONE                   |
| 1612 | 010222 | 122701 | 000012 |         | CMPB | #12,%1          |  | ;IS IT <LF> ?                            |
| 1613 | 010226 | 001407 |        |         | BEQ  | SWDONE          |  | ;IF EQUAL GO TO SWDONE                   |
| 1614 | 010230 | 005203 |        |         | INC  | %3              |  | ;INDICATE A CHAR INPUTTED                |

## K03

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SEG 0036

|      |        |        |        |         |      |             |                                    |
|------|--------|--------|--------|---------|------|-------------|------------------------------------|
| 1615 | 010232 | 042701 | 177770 |         | BIC  | #177770,%1  | ; LEAVE ONLY BINARY # IN R1        |
| 1616 | 010236 | 110122 |        |         | MOVB | %1,(2)+     | ; MOVE # TO PROPER BYTE LOC        |
| 1617 | 010240 | 022702 | 006712 |         | CMP  | #BYT7,%2    | ; IS R2 PAST BYTE ADDR?            |
| 1618 | 010244 | 001344 |        |         | BNE  | CKCSR       | ; IF NOT, GO BACK FOR ANOTHER CHAR |
| 1619 | 010246 |        |        | SWDONE: |      |             |                                    |
| 1620 | 010246 | 005703 |        |         | TST  | %3          | ; WAS A CHAR TYPED?                |
| 1621 | 010250 | 001420 |        |         | BEQ  | 30\$        | ; IF NOT, EXIT                     |
| 1622 | 010252 | 012703 | 006704 |         | MOV  | #BYT1,%3    | ; INIT R3 TO 1ST BYTE ADDR         |
| 1623 | 010256 |        |        | 10\$:   |      |             |                                    |
| 1624 | 010256 | 152337 | 006702 |         | BISB | (3)+,TMPSWR | ; SET LOW 3 BITS OF TMPSWR         |
| 1625 | 010262 | 020302 |        |         | CMP  | %3,%2       | ; IS R3 EQUAL BYTE ADDR IN R2?     |
| 1626 | 010264 | 001407 |        |         | BEQ  | 20\$        | ; IF YES, EXIT                     |
| 1627 | 010266 | 006137 | 006702 |         | ROL  | TMPSWR      | ; ELSE                             |
| 1628 | 010272 | 006137 | 006702 |         | ROL  | TMPSWR      | ; SHIFT                            |
| 1629 | 010276 | 006137 | 006702 |         | ROL  | TMPSWR      | ; NEXT 3 BITS UP                   |
| 1630 | 010302 | 000765 |        |         | BR   | 10\$        | ; AND GO GET ANOTHER #             |
| 1631 | 010304 |        |        | 20\$:   |      |             |                                    |
| 1632 | 010304 | 013777 | 006702 | 170532  | MOV  | TMPSWR,%SR  | ; SET UP NEW SWR                   |
| 1633 | 010312 |        |        | 30\$:   |      |             |                                    |
| 1634 | 010312 | 012603 |        |         | MOV  | (6)+,%3     | ; RESTORE R3                       |
| 1635 | 010314 | 012602 |        |         | MOV  | (6)+,%2     | ; RESTORE R2                       |
| 1636 | 010316 | 004737 | 010324 |         | JSR  | PC,CRLF     | ; PRINT <CR><LF>                   |
| 1637 | 010322 | 000002 |        |         | RTI  |             |                                    |
| 1638 |        |        |        |         |      |             |                                    |
| 1639 | 010324 |        |        | CRLF:   |      |             |                                    |
| 1640 | 010324 | 105777 | 176264 |         | TSTB | @PCSR       | ; IS TTY READY?                    |
| 1641 | 010330 | 100375 |        |         | BPL  | CRLF        | ; IF NOT, WAIT                     |
| 1642 | 010332 | 012777 | 000215 | 176252  | MOV  | #215,@PDBR  | ; ELSE TYPE <CR>                   |
| 1643 | 010340 |        |        | 10\$:   |      |             |                                    |
| 1644 | 010340 | 105777 | 176250 |         | TSTB | @PCSR       | ; IS TTY READY?                    |
| 1645 | 010344 | 100375 |        |         | BPL  | 10\$        | ; IF NOT, WAIT                     |
| 1646 | 010346 | 012777 | 000212 | 176236  | MOV  | #212,@PDBR  | ; ELSE TYPE <LF>                   |
| 1647 | 010354 | 000207 |        |         | RTS  | PC          |                                    |
| 1648 |        |        |        |         |      |             |                                    |
| 1649 | 010356 | 000510 |        | TABL:   | 328. |             | ; TABLE FOR WORK AREA              |
| 1650 | 010360 | 000244 |        |         | 164. |             |                                    |
| 1651 | 010362 | 000122 |        |         | 82.  |             |                                    |
| 1652 | 010364 | 000051 |        |         | 41.  |             |                                    |
| 1653 | 010366 | 000024 |        |         | 20.  |             |                                    |
| 1654 | 010370 | 000012 |        |         | 10.  |             |                                    |
| 1655 | 010372 | 000005 |        |         | 5.   |             |                                    |
| 1656 | 010374 | 000003 |        |         | 3.   |             |                                    |
| 1657 |        |        |        |         |      |             |                                    |
| 1658 | 010376 | 000510 |        | TABL1:  | 328. |             | ; 100KHZ TIME TABLE                |
| 1659 | 010400 | 000244 |        |         | 164. |             |                                    |
| 1660 | 010402 | 000122 |        |         | 82.  |             |                                    |
| 1661 | 010404 | 000051 |        |         | 41.  |             |                                    |
| 1662 | 010406 | 000024 |        |         | 20.  |             |                                    |
| 1663 | 010410 | 000012 |        |         | 10.  |             |                                    |
| 1664 | 010412 | 000005 |        |         | 5.   |             |                                    |
| 1665 | 010414 | 000003 |        |         | 3.   |             |                                    |
| 1666 |        |        |        |         |      |             |                                    |
| 1667 | 010416 | 000632 |        | TABL2:  | 410. |             | ; 10KHZ TIME TABLE                 |
| 1668 | 010420 | 000315 |        |         | 205. |             |                                    |
| 1669 | 010422 | 000146 |        |         | 102. |             |                                    |
| 1670 | 010424 | 000063 |        |         | 51.  |             |                                    |

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SEQ 0037

|      |        |        |             |
|------|--------|--------|-------------|
| 1671 | 010426 | 000032 | 26.         |
| 1672 | 010430 | 000015 | 13.         |
| 1673 | 010432 | 000006 | 6.          |
| 1674 | 010434 | 000003 | 3.          |
| 1675 |        |        |             |
| 1676 | 010436 | 001025 | TABL3: 533. |
| 1677 | 010440 | 000413 | 267.        |
| 1678 | 010442 | 000205 | 133.        |
| 1679 | 010444 | 000103 | 67.         |
| 1680 | 010446 | 000041 | 33.         |
| 1681 | 010450 | 000021 | 17.         |
| 1682 | 010452 | 000000 | 0.          |
| 1683 | 010454 | 000000 | 0.          |
| 1684 |        |        |             |
| 1685 | 010456 | 000500 | TABL4: 320. |
| 1686 | 010460 | 000240 | 160.        |
| 1687 | 010462 | 000120 | 80.         |
| 1688 | 010464 | 000050 | 40.         |
| 1689 | 010466 | 000024 | 20.         |
| 1690 | 010470 | 000000 | 0.          |
| 1691 | 010472 | 000000 | 0.          |
| 1692 | 010474 | 000000 | 0.          |
| 1693 |        |        |             |
| 1694 |        |        |             |
| 1695 |        |        |             |
| 1696 |        |        |             |

;60HZ TIME TABLE

;50HZ TIME TABLE

;THIS ROUTINE KEEPS THE 24 HOUR  
;TIME OF DAY

|      |        |        |        |        |       |     |              |
|------|--------|--------|--------|--------|-------|-----|--------------|
| 1697 | 010476 | 012737 | 177777 | 006610 | CLK1: | MOV | #-1, @INTFLG |
| 1698 | 010504 | 062737 | 000044 | 006656 | CLK3: | ADD | #36, @LST    |
| 1699 | 010512 | 022737 | 000144 | 006656 |       | CMP | #100, @LST   |
| 1700 | 010520 | 003005 |        |        |       | BGT | CLK4         |
| 1701 | 010522 | 162737 | 000144 | 006656 |       | SUB | #100, @LST   |
| 1702 | 010530 | 005237 | 006660 |        |       | INC | @MST         |
| 1703 | 010534 | 062737 | 001217 | 006660 | CLK4: | ADD | #655, @MST   |
| 1704 | 010542 | 022737 | 001750 | 006660 |       | CMP | #1000, @MST  |
| 1705 | 010550 | 003011 |        |        |       | BGT | 25           |
| 1706 | 010552 | 162737 | 001750 | 006660 |       | SUB | #1000, @MST  |
| 1707 | 010560 | 005237 | 006654 |        |       | INC | @SEC2        |
| 1708 | 010564 | 022737 | 000072 | 006654 |       | CMP | #72, @SEC2   |
| 1709 | 010572 | 001401 |        |        |       | BEQ | +.4          |
| 1710 | 010574 | 000002 |        |        | 25:   | RTI |              |
| 1711 | 010576 | 012737 | 000060 | 006654 |       | MOV | #60, @SEC2   |
| 1712 | 010604 | 005237 | 006652 |        |       | INC | @SEC1        |
| 1713 | 010610 | 022737 | 000066 | 006652 |       | CMP | #66, @SEC1   |
| 1714 | 010616 | 001401 |        |        |       | BEQ | +.4          |
| 1715 | 010620 | 000002 |        |        |       | RTI |              |
| 1716 | 010622 | 012737 | 000060 | 006652 |       | MOV | #60, @SEC1   |
| 1717 | 010630 | 005237 | 006650 |        |       | INC | @MIN2        |
| 1718 | 010634 | 022737 | 000072 | 006650 |       | CMP | #72, @MIN2   |
| 1719 | 010642 | 001401 |        |        |       | BEQ | +.4          |
| 1720 | 010644 | 000002 |        |        |       | RTI |              |
| 1721 | 010646 | 012737 | 000060 | 006650 |       | MOV | #60, @MIN2   |
| 1722 | 010654 | 005237 | 006646 |        |       | INC | @MIN1        |
| 1723 | 010660 | 022737 | 000066 | 006646 |       | CMP | #66, @MIN1   |
| 1724 | 010666 | 001401 |        |        |       | BEQ | +.4          |
| 1725 | 010670 | 000002 |        |        |       | RTI |              |
| 1726 | 010672 | 012737 | 000060 | 006646 |       | MOV | #60, @MIN1   |

;CLOCK INTERRUPT SERVICE ROUTINE  
;ADD LSB TO LST  
;DID IT OVER FLOW

;YES  
;INC MST  
;ADD MSB TO MST  
;DID IT OVER FLOW

;YES  
;INC SECOND  
;HAS 10 SECONDS ELAPSED

;YES  
;INC MSB OF SECOND  
;HAS 60 MIN ELAPSED

;YES  
;INC LSB OF MIN  
;HAS 10 MIN ELAPSED

;INC MSB OF MIN  
;HAS 60 MIN ELAPSED

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SEQ 0038

|      |        |        |        |        |           |                |                             |
|------|--------|--------|--------|--------|-----------|----------------|-----------------------------|
| 1727 | 010700 | 005237 | 006644 |        | INC       | 2#HRS2         | : INC LSB OF HOURS          |
| 1728 | 010704 | 022737 | 000064 | 006644 | CMP       | #64, 2#HRS2    | : IS LSB A 4                |
| 1729 | 010712 | 001014 |        |        | BNE       | NEWTM          |                             |
| 1730 | 010714 | 022737 | 000062 | 006642 | CMP       | #62, 2#HRS1    | : IF YES, IS MSB A 2        |
| 1731 | 010722 | 001401 |        |        | BEQ       | .+4            |                             |
| 1732 | 010724 | 000002 |        |        | RTI       |                |                             |
| 1733 | 010726 | 012737 | 000060 | 006642 | MOV       | #60, 2#HRS1    | : IF 24 HOURS RESET         |
| 1734 | 010734 | 012737 | 000060 | 006644 | MOV       | #60, 2#HRS2    | : LSB AND MSB OF HOURS      |
| 1735 | 010742 | 000002 |        |        | RTI       |                |                             |
| 1736 | 010744 | 022737 | 000072 | 006644 | CMP       | #72, 2#HRS2    | : IF NOT 4 IS IT 10 HOURS   |
| 1737 | 010752 | 001401 |        |        | BEQ       | .+4            |                             |
| 1738 | 010754 | 000002 |        |        | RTI       |                |                             |
| 1739 | 010756 | 005237 | 006642 |        | INC       | 2#HRS1         | : YES INC MSB OF HOURS      |
| 1740 | 010762 | 012737 | 000060 | 006644 | MOV       | #60, 2#HRS2    |                             |
| 1741 | 010770 | 000002 |        |        | RTI       |                |                             |
| 1742 |        |        |        |        |           |                |                             |
| 1743 |        |        |        |        |           |                |                             |
| 1744 |        |        |        |        |           |                |                             |
| 1745 |        |        |        |        |           |                |                             |
| 1746 | 010772 | 022737 | 001750 | 006700 | CLK2: CMP | #1000., 2#MSTA | : THIS ROUTINE IS THE WORK  |
| 1747 | 011000 | 003011 |        |        | BGT       | 2\$            |                             |
| 1748 | 011002 | 162737 | 001750 | 006700 | SUB       | #1000., 2#MSTA | : AREA ROUTINE AND IS THE   |
| 1749 | 011010 | 005237 | 006674 |        | INC       | 2#SEC2A        | : SAME AS INTERRUPT HANDLER |
| 1750 | 011014 | 022737 | 000072 | 006674 | CMP       | #72, 2#SEC2A   | : SERVICE ROUTINE           |
| 1751 | 011022 | 001401 |        |        | BEQ       | .+4            |                             |
| 1752 | 011024 | 000475 |        |        | BR        | END1A          |                             |
| 1753 | 011026 | 012737 | 000060 | 006674 | MOV       | #60, 2#SEC2A   |                             |
| 1754 | 011034 | 005237 | 006672 |        | INC       | 2#SEC1A        |                             |
| 1755 | 011040 | 022737 | 000066 | 006672 | CMP       | #66, 2#SEC1A   |                             |
| 1756 | 011046 | 001401 |        |        | BEQ       | .+4            |                             |
| 1757 | 011050 | 000463 |        |        | BR        | END1A          |                             |
| 1758 | 011052 | 012737 | 000060 | 006672 | MOV       | #60, 2#SEC1A   |                             |
| 1759 | 011060 | 005237 | 006670 |        | INC       | 2#MIN2A        |                             |
| 1760 | 011064 | 022737 | 000072 | 006670 | CMP       | #72, 2#MIN2A   |                             |
| 1761 | 011072 | 001401 |        |        | BEQ       | .+4            |                             |
| 1762 | 011074 | 000451 |        |        | BR        | END1A          |                             |
| 1763 | 011076 | 012737 | 000060 | 006670 | MOV       | #60, 2#MIN2A   |                             |
| 1764 | 011104 | 005237 | 006666 |        | INC       | 2#MIN1A        |                             |
| 1765 | 011110 | 022737 | 000066 | 006666 | CMP       | #66, 2#MIN1A   |                             |
| 1766 | 011116 | 001401 |        |        | BEQ       | .+4            |                             |
| 1767 | 011120 | 000437 |        |        | BR        | END1A          |                             |
| 1768 | 011122 | 012737 | 000060 | 006666 | MOV       | #60, 2#MIN1A   |                             |
| 1769 | 011130 | 005237 | 006664 |        | INC       | HRS2A          |                             |
| 1770 | 011134 | 022737 | 000064 | 006664 | CMP       | #64, 2#HRS2A   |                             |
| 1771 | 011142 | 001014 |        |        | BNE       | NEWT           |                             |
| 1772 | 011144 | 022737 | 000062 | 006662 | CMP       | #62, 2#HRS1A   |                             |
| 1773 | 011152 | 001401 |        |        | BEQ       | .+4            |                             |
| 1774 | 011154 | 000421 |        |        | BR        | END1A          |                             |
| 1775 | 011156 | 012737 | 000060 | 006662 | MOV       | #60, 2#HRS1A   |                             |
| 1776 | 011164 | 012737 | 000060 | 006664 | MOV       | #60, 2#HRS2A   |                             |
| 1777 | 011172 | 000412 |        |        | BR        | END1A          |                             |
| 1778 | 011174 | 022737 | 000072 | 006664 | CMP       | #72, 2#HRS2A   |                             |
| 1779 | 011202 | 001401 |        |        | BEQ       | .+4            |                             |
| 1780 | 011204 | 000405 |        |        | BR        | END1A          |                             |
| 1781 | 011206 | 005237 | 006662 |        | INC       | 2#HRS1A        |                             |
| 1782 | 011212 | 012737 | 000060 | 006664 | MOV       | #60, 2#HRS2A   |                             |

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1783 011220 012777 011266 175370 END1A: MOV      #CR,APVEC      ;SET UP FOR PRINTER OUTPUT
1784 011226 012737 177776 006636      MOV      #-2,APCNTB
1785 011234 012737 006662 006634      MOV      #HR51A,APCNT1
1786 011242 012737 177767 006632      MOV      #-11,APCNT
1787 011250 012777 000000 175334      MOV      #0,APDBR
1788 011256 012777 000100 175330      MOV      #100,APCSR
1789 011264 000002                RTI
1790
1791
1792 011266 012777 011304 175322 CR:      MOV      #LF,APVEC      ;OUTPUT CR
1793 011274 012777 000215 175310      MOV      #215,APDBR
1794 011302 000002                RTI
1795
1796 011304 012777 011322 175304 LF:      MOV      #PINTR,APVEC    ;OUTPUT LF
1797 011312 012777 000212 175272      MOV      #212,APDBR
1798 011320 000002                RTI
1799 011322 005237 006632      PINTR: INC      APCNT      ;PRINT TWO DIGITS FOLLOWED
1800 011326 001414      BEQ      DONE      ;BY COLON UNTIL TIME OF
1801 011330 005737 006636      TST      CNTB      ;DAY IS PRINTED
1802 011334 001420      BEQ      COLON
1803 011336 013704 006634      MOV      APCNT1,%4
1804 011342 012477 175244      MOV      (%4),APDBR
1805 011346 010437 006634      MOV      %4,APCNT1
1806 011352 005237 006636      INC      APCNTB
1807 011356 000002                RTI
1808 011360 012777 011414 175230 DONE:  MOV      #PER,APVEC    ;WHEN DONE PRINT "."
1809 011366 012777 000056 175216      MOV      #56,APDBR
1810 011374 000002                RTI
1811
1812 011376 012737 177776 006636 COLON: MOV      #-2,APCNTB
1813 011404 012777 000072 175200      MOV      #72,APDBR
1814 011412 000002                RTI
1815
1816 011414 005037 006636      PER:      CLR      APCNTB      ;PRINT MSB OF MILLISEC
1817 011420 000250      CLN
1818 011422 013737 006700 006634      MOV      #MSTA,APCNT1
1819 011430 012737 177767 006632      MOV      #-9,APCNT
1820 011436 162737 000144 006634 1$:  SUB      #100.,APCNT1
1821 011444 100406      BMI      2$
1822 011446 005237 006636      INC      APCNTB
1823 011452 005237 006632      INC      APCNT
1824 011456 001367      BNE      1$
1825 011460 000404      BR       3$
1826 011462 062737 000144 006634 2$:  ADD      #100.,APCNT1
1827 011470 000250      CLN
1828 011472 062737 000060 006636 3$:  ADD      #60,APCNTB
1829 011500 012777 011516 175110      MOV      #NUM1,APVEC
1830 011506 013777 006636 175076      MOV      APCNTB,APDBR
1831 011514 000002                RTI
1832
1833 011516 012777 011600 175072 NUM1:  MOV      #NUM2,APVEC    ;PRINT LSB OF MILLISEC
1834 011524 005037 006636      CLR      APCNTB
1835 011530 000250      CLN
1836 011532 012737 177767 006632      MOV      #-9,APCNT
1837 011540 162737 000012 006634 1$:  SUB      #10.,APCNT1
1838 011546 100405      BMI      3$

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1839 011550 005237 006636 INC 2#CNTB
1840 011554 005237 006632 INC 2#CNT
1841 011560 001367 BNE 1$
1842 011562 062737 000060 006636 3$: ADD 2#CNTB
1843 011570 013777 006636 175014 MOV 2#CNTB,2PDBR
1844 011576 000002 RTI
1845
1846 011600 012777 007560 175020 NUM2: MOV 2#KINTR,2#KVEC ;RESTORE KEYBOARD VECTOR
1847 011606 000002 RTI
1848
1849
1850
1851
1852
1853
1854 011610 032777 000010 167226 DELADJ: BIT 2#10,2SR ;TEST FOR SR3=1 WHICH INDICATES
1855 ;11/60 11/70 & 11/45 WITH MOS
1856 011616 001001 BNE 1$ ;ADJUST DELAY TIMES
1857 011620 000207 RTS %7 ;NO ADJUSTMENTS REQUIRED
1858 011622 012701 001034 1$: MOV 2#ADJ R1 ;GET START OF REG. FOR ADJUST
1859 011626 012700 001024 MOV 2#DEL1,R0 ;GET START OF REG. TO ADJUST
1860 011632 012702 001032 MOV 2#DEL4,R2 ;GET END TAG OF ADJUSTMENT
1861 011636 062702 000002 ADD 2#R2 ;UPDATE END CHECK
1862 011642 012120 2$: MOV (R1)+,(R0)+ ;UPDATE DELAY COUNTS
1863 011644 020200 CMP R2,R0 ;ARE WE DONE
1864 011646 001375 BNE 2$ ;NO CONTINUE UPDATE
1865 011650 000207 RTS %7 ;ADJUSTMENT MADE
1866
1867 011652 013746 000004 SWADJ: MOV 2#4,-(%6) ;SAVE CONTENT OF TRAP
1868 ;VECTOR
1869 011656 012737 011676 000004 MOV 2#SWADJ1,2#4 ;SET UP NEW TRAP VECTOR
1870 011664 005777 167154 TST 2SR ;TEST FOR SWITCH REG.
1871 011670 012637 000004 MOV (%6)+,2#4 ;RESTORE STACK NO
1872 ;TIME OUT ACCONED.
1873 011674 000207 RTS %7
1874
1875 011676 022626 SWADJ1: CMP (%6)+,(%6)+ ;UPDATE STACK
1876 011700 012637 000004 MOV (%6)+,2#4 ;RESTORE TRAP VECTOR
1877 011704 012737 000176 001044 MOV 2#SOFTSR,SR ;SET SWITCH REG.(SR) TO
1878 ;EQUAL SOFTSR
1879 011712 000207 RTS %7 ;RETURN TO CALLER
1880
1881
1882
1883 000001 .END

```

C04

CZKWBHD KW11-P RT CLK \*ST  
CZKWBH.P11 30-JAN-78 09:34MACY11 30A(1052) 30-JAN-78 09:35 PAGE 42  
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0041

|        |        |       |       |       |       |       |       |       |       |       |       |       |       |       |
|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| ADJ    | 001034 | 474*  | 1858  |       |       |       |       |       |       |       |       |       |       |       |
| BEGIN  | 001150 | 452   | 500*  | 516   | 1134  | 1212  | 1224  | 1313  |       |       |       |       |       |       |
| BEGIN1 | 005210 | 453   | 1143* | 1179  | 1196  | 1208  | 1214  |       |       |       |       |       |       |       |
| BEGIN2 | 001046 | 451   | 484*  |       |       |       |       |       |       |       |       |       |       |       |
| BUFF = | 000776 | 449*  | 484   | 500   | 850   | 865   | 880   | 895   | 1143  | 1217  | 1418  | 1430  | 1442  | 1454  |
|        |        | 1473  |       |       |       |       |       |       |       |       |       |       |       |       |
| BYT1   | 006704 | 1406* | 1598  | 1622  |       |       |       |       |       |       |       |       |       |       |
| BYT2   | 006705 | 1407* |       |       |       |       |       |       |       |       |       |       |       |       |
| BYT3   | 006706 | 1408* |       |       |       |       |       |       |       |       |       |       |       |       |
| BYT4   | 006707 | 1409* |       |       |       |       |       |       |       |       |       |       |       |       |
| BYT5   | 006710 | 1410* |       |       |       |       |       |       |       |       |       |       |       |       |
| BYT6   | 006711 | 1411* |       |       |       |       |       |       |       |       |       |       |       |       |
| BYT7   | 006712 | 1412* | 1617  |       |       |       |       |       |       |       |       |       |       |       |
| CACL   | 004446 | 1016  | 1027* | 1058  | 1083  |       |       |       |       |       |       |       |       |       |
| CC =   | 177776 | 445*  | 629*  | 830*  | 853*  | 868*  | 884*  | 1088* | 1104* | 1287* |       |       |       |       |
| CHAR   | 006100 | 1252* | 1255* | 1263* | 1264* | 1265* | 1274* | 1277  |       |       |       |       |       |       |
| CKCSR  | 010156 | 1599* | 1601  | 1618  |       |       |       |       |       |       |       |       |       |       |
| CKV    | 001006 | 463*  | 834*  | 854*  | 869*  | 887*  | 899*  | 948   | 952*  | 975*  | 1145* | 1482* |       |       |
| CKVS   | 001010 | 464*  | 831*  | 953*  | 1145  | 1146* | 1483* |       |       |       |       |       |       |       |
| CKVS1  | 006604 | 1372* | 1503* |       |       |       |       |       |       |       |       |       |       |       |
| CKV1   | 006602 | 1371* | 1502* |       |       |       |       |       |       |       |       |       |       |       |
| CLK    | 007672 | 1421* | 1433* | 1445* | 1457* | 1537* | 1567  | 1569  | 1572  | 1575  |       |       |       |       |
| CLKFLG | 006606 | 1373* | 1488* | 1499  | 1504* | 1508* |       |       |       |       |       |       |       |       |
| CLKI   | 010476 | 1482  | 1697* |       |       |       |       |       |       |       |       |       |       |       |
| CLKON  | 007434 | 1493  | 1495* |       |       |       |       |       |       |       |       |       |       |       |
| CLKSER | 004240 | 952   | 979*  |       |       |       |       |       |       |       |       |       |       |       |
| CLKXIT | 004244 | 981*  |       |       |       |       |       |       |       |       |       |       |       |       |
| CLK1   | 007700 | 1422* | 1434* | 1446* | 1458* | 1538* |       |       |       |       |       |       |       |       |
| CLK2   | 010772 | 1590  | 1746* |       |       |       |       |       |       |       |       |       |       |       |
| CLK3   | 010504 | 1426* | 1438* | 1450* | 1462* | 1698* |       |       |       |       |       |       |       |       |
| CLK4   | 010534 | 1427* | 1439* | 1451* | 1463* | 1700  | 1703* |       |       |       |       |       |       |       |
| CNGSWR | 010134 | 1518  | 1591* |       |       |       |       |       |       |       |       |       |       |       |
| CNT    | 006632 | 951*  | 972*  | 973   | 1383* | 1528* | 1546* | 1786* | 1799* | 1819* | 1823* | 1836* | 1840* |       |
| CNT8   | 006636 | 1385* | 1784* | 1801  | 1806* | 1812* | 1816* | 1822* | 1828* | 1830  | 1834* | 1839* | 1842* | 1843  |
| CNT1   | 006634 | 1384* | 1529* | 1541  | 1545* | 1785* | 1803  | 1805* | 1818* | 1820* | 1826* | 1837* |       |       |
| COLON  | 011376 | 1802  | 1812* |       |       |       |       |       |       |       |       |       |       |       |
| CR     | 011266 | 1783  | 1792* |       |       |       |       |       |       |       |       |       |       |       |
| CRLF   | 010324 | 1597  | 1636  | 1639* | 1641  |       |       |       |       |       |       |       |       |       |
| CSB    | 001002 | 461*  | 536*  | 537   | 549*  | 558*  | 568*  | 582*  | 643*  | 651*  | 660*  | 672*  | 685*  | 698*  |
|        |        | 714*  | 731*  | 748*  | 765*  | 780*  | 797*  | 815*  | 833*  | 856*  | 871*  | 886*  | 900*  | 927*  |
|        |        | 954*  | 1001* | 1009* | 1043* | 1051* | 1068* | 1076* | 1089* | 1105* | 1150* | 1164* | 1185* | 1198* |
|        |        | 1491* | 1527* | 1537* |       |       |       |       |       |       |       |       |       |       |
| CSB1   | 006574 | 1021* | 1368* | 1501* | 1505* | 1512* |       |       |       |       |       |       |       |       |
| CSR    | 001000 | 460*  | 521*  | 523   | 557*  | 567*  | 571*  | 572   | 573*  | 574   | 589*  | 590   | 593*  | 594   |
|        |        | 597*  | 598   | 601*  | 602   | 607*  | 608   | 611*  | 612   | 617*  | 618   | 621*  | 622   | 630*  |
|        |        | 631   | 634*  | 635   | 641*  | 644*  | 645   | 649*  | 652*  | 653*  | 654   | 658*  | 661*  | 662*  |
|        |        | 663   | 671*  | 674*  | 684*  | 687*  | 697*  | 699*  | 701   | 705*  | 713*  | 715*  | 717   | 721*  |
|        |        | 730*  | 732*  | 734   | 738*  | 747*  | 749*  | 751   | 755*  | 764*  | 766*  | 768   | 772*  | 779*  |
|        |        | 781*  | 783   | 787*  | 796*  | 798*  | 800   | 804*  | 814*  | 816*  | 818   | 822*  | 832*  | 835*  |
|        |        | 839*  | 842   | 849*  | 855*  | 857*  | 861*  | 864*  | 870*  | 872*  | 876*  | 878*  | 885*  | 888*  |
|        |        | 892*  | 894*  | 901*  | 905*  | 911*  | 928*  | 935*  | 955*  | 976*  | 1000* | 1002* | 1004  | 1008* |
|        |        | 1010* | 1012  | 1042* | 1044* | 1046  | 1050* | 1052* | 1054  | 1067* | 1069* | 1071  | 1075* | 1077* |
|        |        | 1079  | 1087* | 1090* | 1094  | 1096* | 1098* | 1099  | 1106* | 1110  | 1112* | 1115  | 1153* | 1162* |
|        |        | 1167* | 1176* | 1187* | 1194* | 1200* | 1207* | 1240  | 1490* | 1526* | 1538* |       |       |       |
| CSR*   | 001312 | 520   | 527*  |       |       |       |       |       |       |       |       |       |       |       |
| CSR1   | 006576 | 1020* | 1022* | 1023  | 1369* | 1506* | 1511* |       |       |       |       |       |       |       |



E04

CZKWBHO KW11-P RT CLK TST  
CZKWB1.P11 30-JAN-78 09:34MACY11 30A(1052) 30-JAN-78 09:35 PAGE 44  
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0043

|         |        |       |       |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
|---------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|--|--|--|--|
| MST     | 006660 | 1396* | 1475* | 1531* | 1702* | 1703* | 1704  | 1706* |       |       |       |       |       |      |  |  |  |  |
| MSTA    | 006700 | 1404* | 1589* | 1746  | 1748* | 1818  |       |       |       |       |       |       |       |      |  |  |  |  |
| NEWT    | 011174 | 1771  | 1778* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| NEWTM   | 010744 | 1729  | 1736* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| NOP =   | 000240 | 446*  |       |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| NUM1    | 011516 | 1829  | 1833* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| NUM2    | 011600 | 1833  | 1846* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| OCT     | 006076 | 1259* | 1269* | 1273* |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| OCTP    | 006102 | 1256  | 1267  | 1275* |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| OCTPRT  | 005766 | 1239  | 1241  | 1243  | 1245  | 1252* |       |       |       |       |       |       |       |      |  |  |  |  |
| OCT1    | 006006 | 1254  | 1256* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| OCT2    | 006024 | 1260* | 1270  |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PCSR    | 006614 | 1376* | 1605  | 1640  | 1644  | 1788* |       |       |       |       |       |       |       |      |  |  |  |  |
| POBR    | 006612 | 1375* | 1607* | 1642* | 1646* | 1787* | 1793* | 1797* | 1804* | 1809* | 1813* | 1830* | 1843* |      |  |  |  |  |
| PER     | 011414 | 1808  | 1816* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PINTR   | 011322 | 1796  | 1799* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PRINT   | 005650 | 438   | 1228* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PRINT1  | 005764 | 509*  | 1232  | 1236* | 1250* |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PSW     | 006640 | 504*  | 949*  | 959*  | 961*  | 1388* | 1420* | 1432* | 1444* | 1456* |       |       |       |      |  |  |  |  |
| PVEC    | 006616 | 1377* | 1783* | 1792* | 1796* | 1808* | 1829* | 1833* |       |       |       |       |       |      |  |  |  |  |
| PVECS   | 006620 | 1378* | 1486* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PWRDWN  | 005610 | 1213  | 1215* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PWRF1   | 005572 | 503   | 1212* | 1472  |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PWRF2   | 005602 | 1147  | 1214* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PWRRTN  | 005646 | 1212* | 1214* | 1223  | 1224* |       |       |       |       |       |       |       |       |      |  |  |  |  |
| PWRUP   | 005620 | 1215  | 1217* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| RETURN  | 006264 | 508*  | 1288  | 1306* | 1313* |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SCOPE = | 104400 | 447*  | 535   | 548   | 556   | 566   | 581   | 588   | 606   | 616   | 628   | 640   | 648   | 657  |  |  |  |  |
|         |        | 670   | 683   | 696   | 712   | 727   | 744   | 763   | 778   | 793   | 811   | 829   | 852   | 867  |  |  |  |  |
|         |        | 883   | 897   | 922   | 947   | 996   | 1041  | 1064  | 1086  | 1103  | 1118  |       |       |      |  |  |  |  |
| SCOPEB  | 006136 | 1286* | 1292  | 1304  | 1312  |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SCOPEC  | 006150 | 440   | 1291* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SCOPEF  | 006250 | 506*  | 1301  | 1303* | 1305* | 1308* |       |       |       |       |       |       |       |      |  |  |  |  |
| SCOPEG  | 006236 | 1300  | 1302  | 1305* |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SEC1    | 006652 | 1393* | 1480* | 1712* | 1713  | 1716* |       |       |       |       |       |       |       |      |  |  |  |  |
| SEC1A   | 006672 | 1401* | 1754* | 1755  | 1758* |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SEC2    | 006654 | 1394* | 1481* | 1707* | 1708  | 1711* |       |       |       |       |       |       |       |      |  |  |  |  |
| SEC2A   | 006674 | 1402* | 1749* | 1750  | 1753* |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SETBYT  | 010140 | 1594* | 1609  |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SOFTSR= | 000176 | 448*  | 1877  |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SP3     | 006120 | 1271  | 1280* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SP3A    | 006132 | 1280  | 1283* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SR      | 001044 | 479*  | 529   | 745   | 812   | 924   | 997   | 1181  | 1195  | 1228  | 1246  | 1291  | 1299  | 1432 |  |  |  |  |
|         |        | 1495  | 1497  | 1509  | 1632* | 1854  | 1870  | 1877* |       |       |       |       |       |      |  |  |  |  |
| START   | 007412 | 1490* |       |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SWADJ   | 011652 | 489   | 501   | 1144  | 1419  | 1431  | 1443  | 1455  | 1867* |       |       |       |       |      |  |  |  |  |
| SWADJ1  | 011676 | 1869  | 1875* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| SWDONE  | 010246 | 1611  | 1613  | 1619* |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| TABL    | 010356 | 1423  | 1435  | 1447  | 1459  | 1580  | 1649* |       |       |       |       |       |       |      |  |  |  |  |
| TABL1   | 010376 | 1424  | 1658* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| TABL2   | 010416 | 1436  | 1667* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| TABL3   | 010436 | 1448  | 1676* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| TABL4   | 010456 | 1460  | 1685* |       |       |       |       |       |       |       |       |       |       |      |  |  |  |  |
| TCSR    | 001014 | 466*  | 986   | 1122  | 1125  | 1157  | 1171  | 1189  | 1202  | 1275  | 1316* | 1323  | 1327  | 1330 |  |  |  |  |
| TDBR    | 001012 | 465*  | 988*  | 1121* | 1124* | 1159* | 1173* | 1191* | 1204* | 1277* | 1325* | 1329* | 1332* |      |  |  |  |  |
| TEMP    | 001020 | 468*  | 505*  | 540*  | 542   | 547*  | 549   | 550   | 553*  | 559*  | 560*  | 569*  | 575*  | 642* |  |  |  |  |

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SEP 0044

|        |        | 643   | 650   | 651   | 659*  | 660   | 673*  | 675   | 678*  | 679   | 686*  | 688   | 691*  | 692   |
|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|        |        | 700*  | 703*  | 716*  | 719*  | 733*  | 736*  | 750*  | 753*  | 767*  | 770*  | 782*  | 785*  | 799*  |
|        |        | 802*  | 817*  | 820*  | 836*  | 837*  | 842*  | 843   | 846   | 858*  | 859*  | 873*  | 874*  | 883*  |
|        |        | 890*  | 902*  | 903*  | 932*  | 1007* | 1027  | 1035* | 1049* | 1074* | 1091* | 1092* | 1107* | 1108* |
| TEMP1  | 001016 | 1244  |       |       |       |       |       |       |       |       |       |       |       |       |
| TIKTIK | 004246 | 467*  | 507*  | 898*  | 909*  | 1015* | 1028  | 1057* | 1082* |       |       |       |       |       |
| TMPSWR | 006702 | 950*  | 962   | 964   | 980*  | 964*  |       |       |       |       |       |       |       |       |
| TOP    | 006266 | 1405* | 1595* | 1624* | 1627* | 1628* | 1629* | 1632  |       |       |       |       |       |       |
| TOP1   | 006300 | 488   | 498   | 1222  | 1235  | 1281  | 1316* |       |       |       |       |       |       |       |
| TOP2   | 006332 | 1318* | 1326  | 1334  |       |       |       |       |       |       |       |       |       |       |
| TRPA   | 005204 | 1322  | 1327* |       |       |       |       |       |       |       |       |       |       |       |
| TSTENO | 005134 | 1128  | 1134* |       |       |       |       |       |       |       |       |       |       |       |
| TYPE   | 004250 | 1121* |       |       |       |       |       |       |       |       |       |       |       |       |
| T0     | 001254 | 960   | 963   | 986*  | 987   |       |       |       |       |       |       |       |       |       |
| T1     | 001334 | 508   | 510   | 519*  | 530   | 532   |       |       |       |       |       |       |       |       |
| T10    | 002226 | 524   | 526   | 534*  |       |       |       |       |       |       |       |       |       |       |
| T10A   | 002250 | 670*  |       |       |       |       |       |       |       |       |       |       |       |       |
| T11    | 002304 | 674*  | 680   |       |       |       |       |       |       |       |       |       |       |       |
| T11A   | 002324 | 683*  |       |       |       |       |       |       |       |       |       |       |       |       |
| T12    | 002360 | 687*  | 693   |       |       |       |       |       |       |       |       |       |       |       |
| T12A   | 002410 | 696*  |       |       |       |       |       |       |       |       |       |       |       |       |
| T12B   | 002436 | 701*  | 704   |       |       |       |       |       |       |       |       |       |       |       |
| T13    | 002446 | 702   | 707*  |       |       |       |       |       |       |       |       |       |       |       |
| T13A   | 002476 | 712*  |       |       |       |       |       |       |       |       |       |       |       |       |
| T13B   | 002524 | 717*  | 720   |       |       |       |       |       |       |       |       |       |       |       |
| T14    | 002534 | 718   | 723*  |       |       |       |       |       |       |       |       |       |       |       |
| T14A   | 002572 | 727*  |       |       |       |       |       |       |       |       |       |       |       |       |
| T14B   | 002620 | 734*  | 737   |       |       |       |       |       |       |       |       |       |       |       |
| T15    | 002630 | 735   | 740*  |       |       |       |       |       |       |       |       |       |       |       |
| T15A   | 002670 | 729   | 744*  |       |       |       |       |       |       |       |       |       |       |       |
| T15B   | 002716 | 751*  | 754   |       |       |       |       |       |       |       |       |       |       |       |
| T16    | 002726 | 752   | 757*  |       |       |       |       |       |       |       |       |       |       |       |
| T16A   | 002756 | 746   | 763*  |       |       |       |       |       |       |       |       |       |       |       |
| T16C   | 003004 | 768*  | 771   |       |       |       |       |       |       |       |       |       |       |       |
| T17    | 003014 | 769   | 774*  |       |       |       |       |       |       |       |       |       |       |       |
| T17A   | 003044 | 778*  |       |       |       |       |       |       |       |       |       |       |       |       |
| T17B   | 003072 | 783*  | 786   |       |       |       |       |       |       |       |       |       |       |       |
| T18    | 003102 | 784   | 789*  |       |       |       |       |       |       |       |       |       |       |       |
| T18A   | 003140 | 793*  |       |       |       |       |       |       |       |       |       |       |       |       |
| T18B   | 003166 | 800*  | 803   |       |       |       |       |       |       |       |       |       |       |       |
| T19    | 003176 | 801   | 805*  |       |       |       |       |       |       |       |       |       |       |       |
| T19A   | 003236 | 795   | 811*  |       |       |       |       |       |       |       |       |       |       |       |
| T19B   | 003266 | 813*  | 821   |       |       |       |       |       |       |       |       |       |       |       |
| T20    | 003276 | 819   | 825*  |       |       |       |       |       |       |       |       |       |       |       |
| T20A   | 003366 | 813   | 829*  |       |       |       |       |       |       |       |       |       |       |       |
| T21    | 003426 | 834   | 842*  |       |       |       |       |       |       |       |       |       |       |       |

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[illegible]

ERRORS DETECTED: 0

CZKWBI.BIN,CZKWBI.LST/CRF/SOL NL:TOC=CZKWBI.P11  
 RUN-TIME: 24.6 SECONDS  
 RUN-TIME RATIO: 210/7=27.6  
 CORE USED: 9% 17 PAGES.

H04