

KW11-P

REAL TIME CLOCK TEST
CZKWBIO

AH-8878I-MC

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IDENTIFICATION

PRODUCT CODE:	AC-8877I-MC										
PRODUCT NAME:	CZKWBIC KW11-P RT CLK TST										
PRODUCT DATE:	02-FEBRUARY-1978										
MAINTAINER:	DIAGNOSTIC ENGINEERING										
AUTHOR:	JOHN RODENHISER/JIM LACEY										
REVISED BY:	<table border="0"> <tr> <td>W.F. KELLICKER</td> <td>AUG 30, 1974</td> </tr> <tr> <td>A.J. COSSETTE</td> <td>NOV. 21, 1975</td> </tr> <tr> <td>M. SOARES</td> <td>NOV. 21, 1975</td> </tr> <tr> <td>B. SUSSMAN</td> <td>JAN. 02, 1978</td> </tr> <tr> <td>W. SCHLITZKUS</td> <td>FEB. 02, 1978</td> </tr> </table>	W.F. KELLICKER	AUG 30, 1974	A.J. COSSETTE	NOV. 21, 1975	M. SOARES	NOV. 21, 1975	B. SUSSMAN	JAN. 02, 1978	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 FOLLOWIG PRINTOUT WILL APPEAR ON AN ERROR:

PC	STATUS	COUNTER	TEMP
XXXXXX	XXXXXX	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
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TO 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,

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 LINE 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
.ENDR

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429 .TITLE CZKWBHO KW11-P RT CLK TST
430 .SBTTL BASIC TEST
431 :COPYRIGHT 1971, 1978 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754
432 :JOHN RODENHISER/JIM LACEY
433 .ENABL AMA,ABS
434 .=0
435 000000
436 ;TRAP CATCHER 0-200
437 .=30
438 000030 005650 PRINT
439 000032 000340 340
440 000034 006150 SCOPEC
441 000036 000340 340
442 .=46
443 000046 005174 LOGICAL
444 104000 HLT=EMT
445 177776 CC=177776
446 000240 NOP=240
447 104400 SCOPE=TRAP
448 000176 SOFTSR=176
449 000776 BUFF=776
450 000200 .=200
451 000200 000137 001046 JMP @#BEGIN2 ;START BASIC TEST
452 000204 000137 001150 JMP @#BEGIN ;RESTART BASIC TEST
453 000210 000137 005210 JMP @#BEGIN1 ;START TIMING TEST
454 000214 000137 006714 JMP @#K100HZ ;DOUBLE OR SINGAL CLK TEST. 100KHZ.
455 000220 000137 007000 JMP @#K10HZ ;DOUBLE OR SINGLE CLK TEST. 10KHZ.
456 000224 000137 007064 JMP @#H60Z ;DOUBLE OR SINGLE CLK TEST. 60HZ.
457 000230 000137 007150 JMP @#H50Z ;DOUBLE OR SINGLE CLK TEST. 50HZ
458
459 001000 001000 .=1000
460 001000 172540 CSR: 172540 ;CONTROL AND STATUS REGISTER
461 001002 172542 CSB: 172542 ;COUNT SET BUFFER
462 001004 172544 CTR: 172544 ;COUNTER
463 001006 000104 CKV: 104 ;CLOCK VECTOR ADDRESS
464 001010 000106 CKVS: 106
465 001012 177566 TDBR: 177566
466 001014 177564 TCSR: 177564
467 001016 000000 TEMP1: 0
468 001020 000000 TEMP: 0
469 001022 000001 ICOUNT: 1
470 001024 177740 DEL1: -40
471 001026 177730 DEL2: -50
472 001030 160000 DEL3: -20000
473 001032 160000 DEL4: -20000
474 001034 177700 ADJ: -100
475
476 001036 177660 -120
477 001040 140000 -40000
478 001042 140000 -40000
479 001044 177570 SR: 177570
480
481
482
483
484 001046 012706 000776 BEGIN2: MOV #BUFF,%6

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;SOFTWARE SWITCH REGISTER

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;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

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

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

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K01

CZKWBHO KW11-P RT CLK TST
CZKWB1.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 000042 000046      CMP      @#42, @#46      ;UNDER ACT ?
486 001060 001404          BEQ      1$              ;YES-SKIP TITLE PRINT OUT
487 001062 012702 006436          MOV      MSG3, %2
488 001066 004737 006266          JSR      %7, TOP          ;PRINT TITLE
489 001072 004737 011652          JSR      %7, SWADJ        ;HAS THIS CPU HAVE A SWITCH REG.?
490 001076 004737 011610          JSR      %7, DELADJ       ;IS ADJUSTMENT IN DELAY REQUIRED
491 001102 013746 000004          MOV      @#4, -(%6)
492 001106 012737 001230 000004      MOV      @XOR, @#4
493 001114 005737 177060          TST      @#177060
494 001120 012637 000004          MOV      (%6)+, @#4
495 001124 012737 177777 006252      MOV      #-1, @XORFLG
496 001132 012737 000001 001022      MOV      #1, @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      @PWR1, 24      ;INIT POWER FAIL POINTER
504 001172 005077 005442          CLR      @PSW          ;CLEAR PROC. STATUS REG.
505 001176 005037 001020          CLR      TEMP
506 001202 005037 006250          CLR      SCOPEF        ;INIT. SCOPEF TAG
507 001206 005037 001016          CLR      TEMP1
508 001212 012737 001254 006264      MOV      #TO, RETURN    ;SET UP RESTART 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)+, @#4
514 001236 012737 000005 001022      MOV      #5, @ICOUNT
515 001244 005037 006252          CLR      @XORFLG
516 001250 000137 001150          JMP      @#BEGIN
517
518          ;TEST INIT TO CLEAR CONTROL AND STATUS REGISTER
519
520 001254 013746 000004          TO:    MOV      @#4, -(%6)
521 001260 012737 001312 000004      MOV      @CSAT, @#4
522 001266 012777 100377 177504      MOV      #100377, @CSR
523 001274 000005          RESET
524 001276 032777 100377 177474      BIT      #100377, @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)+, @#4
530 001320 032777 040000 177516      BIT      #40000, @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)+, @#4
537 001334 012637 000004          MOV      SCOPE
538 001340 104400          MOV      #-1, @CSB
539 001342 012777 177777 177432      TST      @CSB
540 001344 005777 177426          BEQ      .+4
541 001354 001401          HLT
542 001356 104000          MOV      #-1, @TEMP
543 001360 012737 177777 001020

```

SEQ 0011

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	
545						; CTR CHANGED WHEN WRITTEN TO
546						; TEST COUNT SET BUFFER TO ACCEPT A COUNT PATTERN
547						; TEST COUNTER TO CONTAIN COUNT SET BUFFER VALUE
548	001406	005037	001020		CLR	TEMP
549	001412	104400			SCOPE	
550	001414	013777	001020	177360	T3:	MOV TEMP, @CSB
551	001422	023777	001020	177354	CMP	TEMP, @CTR
552	001430	001401			BEQ	.+4
553	001432	104000			HLT	
554	001434	005237	001020		INC	TEMP
555	001440	001365			BNE	T3
556						; ERROR, CTR NOT=TEMP
557						; +1 TO COUNT PATTERN
558						; REPEAT UNTIL COUNT OVERFLOWS
559	001442	104400				; TEST THAT CTR REMAINS CONSTANT IF RUN CLEAR
560	001444	005077	177330		T3A:	SCOPE
561	001450	012777	177777	177324	CLR	@CSR
562	001456	013737	001030	001020	MOV	#-1, @CSB
563	001464	005237	001020		MOV	@DEL3, @TEMP
564	001470	001375			INC	@TEMP
565	001472	022777	177777	177304	BNE	IS
566	001500	001401			CM?	#-1, @CTR
567	001502	104000			BEQ	.+4
568					HLT	
569						; CTR CHANGED ALTHOUGH RUN 0
570	001504	104400				; TEST THAT CTR REMAINS CONSTANT WHEN CSR IS REF'D
571	001506	005077	177266		T3B:	SCOPE
572	001512	012777	177777	177262	CLR	@CSR
573	001520	013737	001030	001020	MOV	#-1, @CSB
574					MOV	@DEL3, @TEMP
575	001526	012777	177736	177244	IS:	MOV #177736, @CSR
576	001534	017700	177240		MOV	@CSR, %0
577	001540	012777	000000	177232	MOV	#0, @CSR
578	001546	017700	177226		MOV	@CSR, %0
579	001552	005237	001020		INC	@TEMP
580	001556	001363			BNE	IS
581	001560	022777	177777	177216	CMP	#-1, @CTR
582	001566	001401			BEQ	.+4
583	001570	104000			HLT	
584						; CTR CHANGED BY CSR REF
585	001572	104400				; TEST INIT TO CLEAR COUNT SET BUFFER WHEN IT IS = -1
586	001574	012777	177777	177200	T4:	SCOPE
587	001602	000005			MOV	#-1, @CSB
588	001604	005777	177174		RESET	
589	001610	001401			TST	@CTR
590	001612	104000			BEQ	.+4
591					HLT	
592						; ERROR, INIT FAILED TO CLEAR CSB
593	001614	104400				; TEST RATE SELECT (BIT,2) MAY BE SET AND CLEARED
594	001616	012777	000002	177154	T5:	SCOPE
595	001624	022777	000002	177146	MOV	#2, @CSR
596	001632	001401			CMP	#2, @CSR
597	001634	104000			BEQ	.+4
598	001636	012777	000004	177134	HLT	
599	001644	022777	000004	177126	MOV	#4, @CSR
600	001652	001401			CMP	#4, @CSR
601	001654	104000			BEQ	.+4
602					HLT	
603						; ERROR, CSR NOT = 2
604						; ERROR, CSR NOT = 4

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SEQ 0012

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 LIP/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							
626							
627					;TEST INTERRUPT ENABLE (BIT 6) CAN BE SET AND CLEARED		
628	002006	104400			T9:	SCOPE	
629	002010	012737	000340	177776	MOV	#340, CC	;SET PROCESSOR PRIORITY LEVEL 7
630	002016	012777	000100	176754	MOV	#100, @CSR	
631	002024	022777	000100	176746	CMP	#100, @CSR	
632	002032	001401			BEQ	.+4	
633	002034	104000			HLT		;ERROR, CSR NOT = 100
634	002036	005077	176736		CLR	@CSR	
635	002042	005777	176732		TST	@CSR	
636	002046	001401			BEQ	.+4	
637	002050	104000			HLT		;ERROR, CSR NOT = 0
638					;TEST RUN (BIT 0) CAN BE SET AND CLEARED		
639					T9A:	SCOPE	
640	002052	104400			CLR	@CSR	
641	002054	005077	176720		CLR	TEMP	
642	002060	005037	001020		MOV	TEMP, @CSB	;START AT ZERO
643	002064	013777	001020	176710	MOV	#21, @CSR	;DISABLE INTERRUPT, COUNT UP, SET RUN
644	002072	012777	000021	176700	MOV	#1, @CSR	;CHECK IF ZERO IS STILL SET
645	002100	032777	000001	176672	BIT	#1, @CSR	
646	002106	001001			BNE	.+4	
647	002110	104000			HLT		;CSR LOST BIT 0 AFTER BIT INSTRUCTION
648	002112	104400			SCOPE		
649	002114	005077	176660		CLR	@CSR	
650	002120	005037	001020		CLR	TEMP	
651	002124	013777	001020	176650	MOV	TEMP, @CSB	;START AT ZERO
652	002132	012777	000020	176640	MOV	#20, @CSR	;DISABLE INTERRUPT, COUNT UP, DO NOT SET RUN

NO1

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SEQ 0013

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653 002140 052777 000001 176632 BIS #1, @CSR ;SET RUN
654 002146 032777 000001 176624 BIT #1, @CSR ;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 @CSR
659 002166 005037 001020 CLR TEMP
660 002172 013777 001020 176602 MOV TEMP, @CSB ;START AT ZERO
661 002200 012777 000021 176572 MOV #21, @CSR ;DISABLE INTERRUPT, COUNT UP, SET RUN
662 002206 012777 000020 176564 MOV #20, @CSR ;LEAVE ALL SAME RESET RUN
663 002214 032777 000001 176556 BIT #1, @CSR ;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 @CSR
672 002234 012777 177777 176540 MOV #-1, @CSB
673 002242 012737 177776 001020 MOV #-2, TEMP
674 002250 012777 000040 176522 T10A: MOV #40, @CSR
675 002256 023777 001020 176520 CMP TEMP, @CTR
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 @CSR
686 002312 005077 176464 CLR @CSB
687 002316 012737 000001 001020 MOV #1, TEMP
688 002324 012777 000060 176446 T11A: MOV #60, @CSR
689 002332 023777 001020 176444 CMP TEMP, @CTR
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 @CSR
700 002366 012777 000002 176406 MOV #2, @CSB ;COUNT SET BUFFER TO 2
701 002374 012777 000001 176376 MOV #1, @CSR ;DOWN COUNT , 100KHZ, GO
702 002402 013737 001024 001020 MOV @DEL1, @TEMP
703 002410 105777 176364 T12A: TSTB @CSR
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, @CSR
708 002434 104000 HLT ;ERROR, P INTR (BIT 7) NOT = 1.
709 002436 005777 176342 T12B: TST @CTR
710 002442 001401 BEQ .+4

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709 002444 104000 HLT ;ERROR, COUNTER DID NOT COUNT DOWN TO 0
710
711 ;10KHZ
712 002446 104400 T13: SCOPE
713 002450 005077 176324 CLR @CSR
714 002454 012777 000002 176320 MOV @2,@CSB
715 002462 012777 000003 176310 MOV @3,@CSR
716 002470 013737 001026 001020 MOV @DEL2,@TEMP ;DOWN COUNT, 10KHZ, GO
717 002476 105777 176276 T13A: TSTB @CSR
718 002502 100410 BMI T13B
719 002504 062737 000001 001020 ADD @1,@TEMP
720 002512 001371 BNE T13A
721 002514 042777 000001 176256 BIC @1,@CSR
722 002522 104000 HLT ;ERROR, P INTR (BIT 7) NOT = 1.
723 002524 005777 176254 T13B: TST @CTR
724 002530 001401 BEQ .+4
725 002532 104000 HLT ;ERROR, COUNTER DID NOT COUNTDOWN TO 0
726 ;LINE FREQ.
727 002534 104400 T14: SCOPE
728 002536 005737 006252 TST @XORFLG
729 002542 100432 BMI T15
730 002544 005077 176230 CLR @CSR
731 002550 012777 000002 176224 MOV @2,@CSB
732 002556 012777 000005 176214 MOV @5,@CSR
733 002564 013737 001030 001020 MOV @DEL3,@TEMP ;DOWN COUNT, LINE FREQ., GO
734 002572 105777 176202 T14A: TSTB @CSR
735 002576 100410 BMI T14B
736 002600 062737 000001 001020 ADD @1,@TEMP
737 002606 001371 BNE T14A
738 002610 042777 000001 176162 BIC @1,@CSR
739 002616 104000 HLT ;ERROR, P INTR (BIT 7) NOT=1
740 002620 005777 176160 T14B: TST @CTR
741 002624 001401 BEQ .+4
742 002626 104000 HLT ;ERROR, COUNTER DID NOT COUNT DOWN TO 0
743 ;EXT FREQ.
744 002630 104400 T15: SCOPE
745 002632 032777 000001 176204 BIT @1,@SR
746 002640 001032 BNE T16
747 002642 005077 176132 CLR @CSR
748 002646 012777 000002 176126 MOV @2,@CSB
749 002654 012777 000007 176116 MOV @7,@CSR
750 002662 013737 001032 001020 MOV @DEL4,@TEMP ;DOWN COUNT, EXT., GO
751 002670 105777 176104 T15A: TSTB @CSR
752 002674 100410 BMI T15B
753 002676 062737 000001 001020 ADD @1,@TEMP
754 002704 001371 BNE T15A
755 002706 042777 000001 176064 BIC @1,@CSR
756 002714 104000 HLT ;ERROR, P INTR (BIT 7) NOT=1
757 002716 005777 176062 T15B: TST @CTR
758 002722 001401 BEQ .+4
759 002724 104000 HLT ;ERROR, COUNTER DID NOT COUNT DOWN TO 0
760 ;TEST CLOCK TO COUNT UP AT ALL FREQUENCIES
761 ;100 KHZ
762 T16: SCOPE
763 002726 104400 CLR @CSR
764 002730 005077 176044

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SEQ 0015

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	T16H	
772	002774	042777	000001	175776	BIC	#1, @CSR	
773	003002	104000			HLT		;ERROR
774	003004	005777	175774		T16B: TST	@CTR	
775	003010	001401			BEQ	.+4	;ERROR
776	003012	104000			HLT		
777							
778	003014	104400			: 10 KHZ		
779	003016	005077	175756		T17: SCOPE		
780	003022	012777	177776	175752	CLR	@CSR	
781	003030	012777	000023	175742	MOV	#-2, @CSB	
782	003036	013737	001026	001020	MOV	#23, @CSR	;UP COUNT, 10 KHZ, GO
783	003044	105777	175730		MOV	@DEL2, @TEMP	
784	003050	100410			T17A: TSTB	@CSR	
785	003052	062737	000001	001020	BMI	T17B	
786	003060	001371			ADD	#1, @TEMP	
787	003062	042777	000001	175710	BNE	T17A	
788	003070	104000			BIC	#1, @CSR	
789	003072	005777	175706		HLT		;ERROR
790	003076	001401			T17B: TST	@CTR	
791	003100	104000			BEQ	.+4	;ERROR
792					HLT		
793	003102	104400			: LINE FREQ.		
794	003104	005737	006252		T18: SCOPE		
795	003110	100432			TST	@XORFLG	
796	003112	005077	175662		BMI	T19	
797	003116	012777	177776	175656	CLR	@CSR	
798	003124	012777	000025	175646	MOV	#-2, @CSB	
799	003132	013737	001030	001020	MOV	#25, @CSR	;UP COUNT, LINE, GO
800	003140	105777	175634		MOV	@DEL3, @TEMP	
801	003144	100410			T18A: TSTB	@CSR	
802	003146	062737	000001	001020	BMI	T18B	
803	003154	001371			ADD	#1, @TEMP	
804	003156	042777	000001	175614	BNE	T18A	
805	003164	104000			BIC	#1, @CSR	
806	003166	005777	175612		HLT		;ERROR
807	003172	001401			T18B: TST	@CTR	
808	003174	104000			BEQ	.+4	;ERROR
809					HLT		
810							
811	003176	104400			: EXT FREQ.		
812	003200	032777	000001	175636	T19: SCOPE		
813	003206	001033			BIT	#1, @SR	
814	003210	005077	175564		BNE	T20	
815	003214	012777	177776	175560	CLR	@CSR	
816	003222	012777	000027	175550	MOV	#-2, @CSB	
817	003230	013737	001032	001020	MOV	#27, @CSR	;UP COUNT, EXT FREQ, GO
818	003236	105777	175536		MOV	@DEL4, @TEMP	
819	003242	100411			T19A: TSTB	@CSR	
820	003244	062737	000001	001020	BMI	T19B	
					ADD	#1, @TEMP	


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821 003252 001371      BNE      T19A
822 003254 042777 000001 175516 BIC      #1,ACSR
823 003262 104000      HLT
824 003264 000005      RESET      ;ERROR.
825 003266 005777 175512 T19B: TST      ACSR
826 003272 001401      BEQ      .+4
827 003274 104000      HLT
828      ;TEST THAT INTERRUPT OCCURS TO PROPER VECTOR WITH PROCESSOR PRIORITY 4
829 003276 104400      ;T20: SCOPE
830 003300 012737 000200 177776 MOV      #200,CC      ;SET PROCESSOR PRIORITY 4
831 003306 005077 175476 CLR      ACSR      ;CLEAR INTERRUPT RETURN STATUS
832 003312 005077 175462 CLR      ACSR
833 003316 012777 000002 175456 MOV      #2,ACSB
834 003324 012777 003366 175454 MOV      #T20A,ACKV      ;SET UP INTERRUPT RETURN VECTOR
835 003332 012777 000101 175440 MOV      #101,ACSR      ;ENABLE INTERRUPT
836 003340 013737 001024 001020 MOV      A#DEL1,A#TEMP
837 003346 005237 001020 IS: INC      A#TEMP
838 003352 001375      BNE      IS
839 003354 042777 000001 175416 BIC      #1,ACSR
840 003362 104000      HLT      ;ERROR, INTERRUPT FAILED TO OCCUR.
841 003364 000420      BR
842 003366 017737 175406 001020 T20A: MOV      ACSR,A#TEMP
843 003374 105737 001020 TSTB      A#TEMP
844 003400 100401      BMI      .+4
845 003402 104000      HLT
846 003404 032737 000001 001020 BIT      #1,A#TEMP
847 003412 001401      BEQ      .+4
848 003414 104000      HLT      ;DONE NOT SET ON INT.
849 003416 005077 175356 CLR      ACSR
850 003422 012706 000776 MOV      #BUFF,%6      ;RUN NOT CLEARED
851      ;TEST THAT INTERRUPT OCCURS WITH PROCESSOR PRIORITY 5
852 003426 104400      ;T21: SCOPE
853 003430 012737 000240 177776 MOV      #240,CC      ;SET PROCESSOR PRIORITY 5
854 003436 012777 003512 175342 MOV      #T21A,ACKV      ;SET UP INTERRUPT RETURN STATUS
855 003444 005077 175330 CLR      ACSR
856 003450 012777 000002 175324 MOV      #2,ACSB
857 003456 012777 000101 175314 MOV      #101,ACSR
858 003464 013737 001024 001020 MOV      A#DEL1,A#TEMP
859 003472 005237 001020 IS: INC      A#TEMP
860 003476 001375      BNE      IS
861 003500 042777 000001 175272 BIC      #1,ACSR
862 003506 104000      HLT      ;ERROR, INTERRUPT FAILED TO OCCUR
863 003510 000404      BR
864 003512 005077 175262 T21A: CLR      ACSR
865 003516 012706 000776 MOV      #BUFF,%6      ;RETURN HERE AFTER INTERRUPT
866      ;TEST THAT INTERRUPT IS INHIBITED WITH PROCESSOR PRIORITY 6
867 003522 104400      ;T22: SCOPE
868 003524 012737 000300 177776 MOV      #300,CC      ;SET PROCESSOR PRIORITY 6
869 003532 012777 003602 175246 MOV      #T22A,ACKV      ;SET UP INTERRUPT RETURN
870 003540 005077 175234 CLR      ACSR
871 003544 012777 000002 175230 MOV      #2,ACSB
872 003552 012777 000101 175220 MOV      #101,ACSR
873 003560 013737 001024 001020 MOV      A#DEL1,A#TEMP
874 003566 005237 001020 IS: INC      A#TEMP
875 003572 001375      BNE      IS
876 003574 005077 175200 CLR      ACSR

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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,CC      ;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 OCCUR.
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)+      ;ERROR, INTERRUPT FAILED TO OCCUR
909 003776 005237 001016          INC      TEMP1      ;POP STACK
910 004002 001360          BNE      T24A      ;DONE 100 INTERRUPTS?
911 004004 005077 174770          CLR      ACSR      ;NO
912          ;CLEAR CLOCK
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          BNE      1$
926 004024 000137 004264          JMP      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
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BASIC TEST

SEQ 0018

```

933 004062 104000          HLT          : SYNC ERROR
934 004064 000404          BR          T24D    : END TEST
935 004066 005077 174706 2$: CLR          : CLR CSR
936 004072 005203          INC          %3    : NO OF TIMES THROUGH PROGRAM DETECTS 2(16)
937 004074 001355          BNE          1$    : 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          T24D: 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          : CLEAR CLOCK COUNTER
951 004116 005037 006632  CLR          : 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
957          : INTR ENABLE & COUNT DOWN
958          : AND REPEAT INTR MODE
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          : PS=0 ALLOWS INTRs
963 004170 013701 004246  MOV      TIKTIK, R1 : GET CURRENT CLK COUNT
964 004174 004737 004250  JSR          PC, TYPE : 100MS DELAY @PRO
965 004200 023701 004246  CMP          TIKTIK, R1 : ANY INTRs DURING DELAY?
966 004204 001001          BNE          1$    : IF YES, GO TO 1$
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 REV F
971          : BOARD & GREATER ONLY
972 004210 005237 006632 1$: INC          CNT
973 004214 022737 000170 006632 CMP      #120, CNT : 120 ITERATIONS?
974 004222 001353          BNE          LOOP : IF NOT, GO BACK TO LOOP
975 004224 012677 174556  MOV      (%6)+, @CKV : ELSE RESTORE THE VECTOR
976 004230 005077 174544  CLR          : CLEAR CONTROL REG
977 004234 000137 004264  JMP          T2$    : AND GO TO NEXT TEST
978
979 004240          CLKSER:
980 004240 005237 004246  CLKXIT: INC      TIKTIK : INC CLK COUNTER
981 004244          RTI          : ELSE EXIT RTN
982 004244 000002
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  MOV      RO, @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, @SR          :ARE TWO CLK'S PRESENT
998 004274 001002          BNE     3$          :BRANCH IF SW#2 IS UP
999 004276 000137 004740  JMP     T27          :EXIT IF ONLY ONE CLK
1000 004302 005077 174472 3$:  CLR     @CSR          :SET CTR
1001 004306 012777 000000 174466  MOV     #0, @CSB          :COUNT UP 100KHZ GO
1002 004314 012777 000021 174456  MOV     #21, @CSR          :GO TO DELAY SUBROUTINE
1003 004322 004537 004416  JSR     RS, DELY          :TEST DONE BIT SET
1004 004326 105777 174446  TSTB    @CSR
1005 004332 100001          BPL     1$
1006 004334 104000          HLT
1007 004336 017737 174442 001020 1$:  MOV     @CTR, @TEMP          :DONE BIT SET TOO SOON
1008 004344 005077 174430          CLR     @CSR          :DONE NOT SET SO SAVE CTR
1009 004350 012777 000000 174424  MOV     #0, @CSB
1010 004356 012777 000021 174414  MOV     #21, @CSR
1011 004364 004537 004416  JSR     RS, DELY
1012 004370 105777 174404  TSTB    @CSR
1013 004374 100001          BPL     2$
1014 004376 104000          HLT
1015 004400 017737 174400 001016 2$:  MOV     @CTR, @TEMP1          :HERE WE ARE SAVING SEC CNT
1016 004406 004537 004446  JSR     RS, CACL          :GO DETERMINE ACCURACY OF CNT'S
1017 004412 104000          HLT
1018 004414 000432          BR      T25A
1019
1020 004416 005077 002154          DELY:  CLR     @CSR1          :DELAY SUBROUTINE
1021 004422 012777 001130 002144  MOV     #1130, @CSB1
1022 004430 012777 000021 002140  MOV     #21, @CSR1
1023 004436 105777 002134 1$:  TSTB    @CSR1          :WAIT 600 MIL.
1024 004442 100375          BPL     1$
1025 004444 000205          RTS     RS
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          NEG     R1
1032 004464 022701 000005 1$:  CMP     #5, R1          :DIFFERENCE MUST BE LESS THAN 5
1033 004470 002401          BLT     2$
1034 004472 005725          TST     (RS)+          :UPDATE RETURN
1035 004474 010137 001020 2$:  MOV     R1, TEMP          :DEFERENCE FOR PRINT OUT
1036 004500 000205          RTS     RS
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

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BASIC TEST

SEQ 0020

1045	004524	004537	004416				JSR	R5, DELY
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, DELY
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.

1060								
1061								
1062								
1063								
1064	004616	104400						
1065	004620	005737	006252					
1066	004624	100445						
1067	004626	005077	174146					
1068	004632	012777	000000	174142				
1069	004640	012777	000025	174132				
1070	004646	004537	004416					
1071	004652	105777	174122					
1072	004656	100001						
1073	004660	104000						
1074	004662	017737	174116	001020	1\$:			
1075	004670	005077	174104					
1076	004674	012777	000000	174100				
1077	004702	012777	000025	174070				
1078	004710	004537	004416					
1079	004714	105777	174060					
1080	004720	100001						
1081	004722	104000						
1082	004724	017737	174054	001016	2\$:			
1083	004732	004537	004446					
1084	004736	104000						

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

1085								
1086	004740	104400						
1087	004742	005077	174032					
1088	004746	012737	000340	177776				
1089	004754	012777	000002	174020				
1090	004762	012777	000111	174010				
1091	004770	013737	001024	001020				
1092	004776	062737	000001	001020				
1093	005004	001374						
1094	005006	005777	173766					
1095	005012	100404						
1096	005014	042777	000001	173756				
1097	005022	104000						
1098	005024	005077	173750					
1099	005030	005777	173744		1\$:			
1100	005034	100001						

:27: SCOPE

CLR	QCSR
MOV	#340, CC
MOV	#2, QCSB
MOV	#111, QCSR
MOV	Q#DEL1, Q#TEMP
ADD	#1, Q#TEMP
BNE	-6
TST	QCSR
BMI	1\$
BIC	#1, QCSR
HLT	
CLR	QCSR
TST	QCSR
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

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BASIC TEST

SEQ 0021

1101	005036	104000			HLT				
1102					:TEST BIT 15 IS CLEARED BY INIT				:ERR. FAILED TO CLEAR WHEN REF.
1103	005040	104400			↑27A: SCOPE				
1104	005042	012737	000340	177776	MOV	#340,CC			
1105	005050	012777	000002	173724	MOV	#2,ACSR			
1106	005056	012777	000111	173714	MOV	#111,ACSR			
1107	005064	013737	001024	001020	MOV	DEL1,TEMP			
1108	005072	062737	000001	001020	ADD	#1,TEMP			
1109	005100	001374			BNE	-6			
1110	005102	005777	173672		TST	ACSR			
1111	005106	100404			BMI	15			
1112	005110	042777	000001	173662	BIC	#1,ACSR			:BIT 15 NOT SET
1113	005116	104000			HLT				
1114	005120	000005			15: RESET				
1115	005122	005777	173652		TST	ACSR			
1116	005126	100001			BPL	+4			:BIT 15 NOT CLEARED BY RESET
1117	005130	104000			HLT				
1118	005132	104400			SCOPE				
1119									
1120					:BELL ON PASS COMPLETE				
1121	005134	012777	000207	173650	↑STEND: MOV	#207,TDDBR			
1122	005142	105777	173646		TSTB	ACSR			
1123	005146	100375			BPL	-4			
1124	005150	012777	000000	173634	MOV	#0,TDDBR			:SEND A NULL CHAR.
1125	005156	105777	173632		TSTB	ACSR			
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			

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BASIC TEST

SEQ 0022

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1135
1136
1137
1138
1139
1140
1141
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 012700 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 #PWR2,%24 ;INIT POWER FAIL POINTER
        RESET

;100 KHZ
        MOV #50000,%CSB ;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,%CSR ;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,%CSR ;YES DISABLE INTERRUPTS

;10 KHZ
        MOV #5000,%CSB ;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,%CSR ;10 KHZ, REPEATED INTERRUPTS, INTERRUPT ENABLE, GO
T29A: WAIT
      INC %1 ;DONE 10 SECONDS?
      BNE T29A ;NO
      TSTB %TCSR
      BPL -4
      MOV #207,%TDBR
      INC %0 ;DONE 6 TIMES?
      BNE T29 ;NO
      BIC #101,%CSR ;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,%CSB ;INITIALZE COUNT SET BUFFER FOR 10 SECONDS
        MOV #-6,%0 ;COUNT 6 (10 SECOND) INTERVALS
T30: MOV #115,%CSR ;LINE, REPEATED INTERRUPTS, INTERRUPT ENABLE, GO
      WAIT
      TSTB %TCSR
      BPL -4

```

K02

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TIMING TEST

SEQ 0023

1191	005466	012777	000207	173316	MOV	#207, @TDBR	:RING BELL
1192	005474	005200			INC	%0	:DONE 6 TIMES
1193	005476	001367			BNE	T30	:NO
1194	005500	042777	000101	173272	BIC	#101, @CSR	:YES--DISABLE INTERRUPTS
1195	005506	032777	000001	173330	BIT	#1, @SR	:
1196	005514	001235			BNE	BEGIN1	:
1197					;EXTERNAL (LINE FOR MAINTENANCE)		
1198	005516	013777	005570	173256	MOV	LINE, @CSB	: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, @CSR	:EXT FREQ, REPEATED INTERRUPTS, INTERRUPT ENABLE . GO
1201	005536	000001			T31:	WAIT	
1202	005540	105777		173250	TSTB	@TCSR	
1203	005544	100375			BPL	.-4	
1204	005546	012777	000207	173236	MOV	#207, @TDBR	:RING BELL
1205	005554	005200			INC	%0	:DONE 6 TIMES
1206	005556	001367			BNE	T31	:NO
1207	005560	042777	000100	173212	BIC	#100, @CSR	:YES, DISABLE INTERRUPTS
1208	005566	000610			BR	BEGIN1	:REPEAT
1209	005570	001130			LINE:	600.	


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1210 .SBTTL SUBROUTINES
1211 :POWER FAIL HANDLERS
1212 005572 012737 001150 005646 PWRF1: MOV #BEGIN,PWRRTN
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 @PWRRTN
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 006432 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 @CSR,%2 ;PRINT STATUS REGISTER
1241 005726 004737 005766 JSR %7,OCTPRT
1242 005732 017702 173046 MOV @CTR,%2 ;PRINT COUNTER
1243 005736 004737 005766 JSR %7,OCTPRT
1244 005742 013702 001020 MOV TEMP,%2 ;PRINT TEMP
1245 005746 004737 005766 JSR %7,OCTPRT ;CHECK SR FOR HALT SWITCH
1246 005752 005777 173066 TST @SR
1247 005756 100001 BPL .+4 ;HALT ON ERROR UP
1248 005760 000000 HALT ;RETURN TO MAINLINE
1249 005762 000002 RTI
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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SUBROUTINES

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	15	
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	15:	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	
1303	006230	005237	006250		INC	SCOPEF	;EXIT - DONE
1304	006234	000740			BR	SCOPEB	;INCREMENT COUNT
1305	006236	005037	006250		SCOPEG:	CLR	SCOPEF
1306	006242	011637	006264		MOV	#%6, RETURN	;LOOP SOME MORE
1307	006246	000002			RTI		;CLEAR COUNT
1308	006250	000000			SCOPEF:	0	;SAVE SCOPE RETURN POINTER
1309	006252	000000			XORFLG:	0	;RETURN INLINE-NEXT TEST
1310	006254	022626			XORA:	CMP	(%6)+, (%6)+
1311	006256	012637	000004		MOV	(%6)+, #4	;COUNT LOCATION FOR ITERATION LOOP
1312	006262	000725			BR	SCOPEB	
1313	006264	001150			RETURN:	BEGIN	
1314					:MOV ADDRESS OF MESSAGE TO REGISTER 2		;ADDRESS OF LAST TEST
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		CMPB	#2, #2	;YES, EXIT

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

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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	;/@ PC	STATUS COUNTER TEMP@/;
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	;/@/;	
1345		006436				.EVEN		
1346	006436	040057	055103	053513	MSG3:	.ASCII	;/@CZKWB1 KW11-P RT CLK TST@/;	
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	;/@RESTARTING AFTER A POWER FAILURE@/;	
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	;/@YOU ARE ON AN XOR TESTER@/;	
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		

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	

```

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

```

1418	006714	012706	000776	K100HZ:	MOV	#BUFF,%6	
1419	006720	004737	011652		JSR	%7,SWADJ	
1420	006724	005077	177710		CLR	APSW	;HAS THIS CPU HAVE A SWITCH REG.?
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	#TABL,%1	
1425	006754	004537	007234		JSR	%5,APMOVE	
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	APINIT	
1429							
1430	007000	012706	000776	K10HZ:	MOV	#BUFF,%6	
1431	007004	004737	011652		JSR	%7,SWADJ	
1432	007010	005077	177624		CLR	APSW	;HAS THIS CPU HAVE A SWITCH REG.?
1433	007014	012737	164217	007674	MOV	#-13561,CLK+2	:10KHZ

C03

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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,%#MOVE
1438	007044	012737	000000	010506	MOV	#0,CLK3+2

003

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SUBROUTINES

SEQ 0029

1439 007052 012737 001130 010536
1440 007060 000137 007250

MOV #600, CLK4+2
JMP @INIT

E03

CZKWBHO KW11-P RT CLK TST
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SUBROUTINES

SEQ 0030

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

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

:HAS THIS CPU HAVE A SWITCH REG.?
:

F03

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SEQ 0031

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

G03

CZKWBMO KW11-P RT CLK TST
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SUBROUTINES

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      #500,CLK4+2
1452 007144 000137 007250      JMP      @#INIT
1453
1454 007150 012706 000776      H50Z:  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      IS:    MOV      (%1)+, (%0)+
1468 007242 005202      INC      %2
1469 007244 001375      BNE      1$
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      3$
1497 007444 032777 000004 171372  BIT      #4,@SR      ;SW 2 DETERMINES PRESENCE OF CLOCK 2
1498 007452 001426      BEQ      3$
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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CZKWBHO KW11-P RT CLK TST
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SEQ 0034

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1503 007474 012777 000200 177102      MOV      #200, @CKVS1
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
1508 007530 005037 006606      3$:      CLR      @CLKFLG
1509 007534 032777 000004 171302      BIT      #4, @SR
1510 007542 001404      BEQ      4$
1511 007544 005077 177026      CLR      @CSR1
1512 007550 005077 177020      CLR      @CSB1
1513 007554 000137 007422      4$:      JMP      WAITA
1514
1515 007560 017701 177036      KINTR:  MOV      @KDBR, %1
1516 007564 042701 177600      BIC      #177600, %1
1517 007570 022701 000007      CMP      #7, %1
1518 007574 001557      BEQ      CNCSWR
1519 007576 022701 000011      CMP      #11, %1
1520 007602 001404      BEQ      KIN
1521 007604 022701 000024      CMP      #24, %1
1522 007610 001464      BEQ      KOUT
1523 007612 000002      RTI
1524
1525
1526 007614 005077 171160      KIN:      CLR      @CSR
1527 007620 005077 171156      CLR      @CSB
1528 007624 012737 177772 006632      MOV      #-6, @CNT
1529 007632 012737 006642 006634      MOV      #HRS1, @CNT1
1530 007640 005037 006656      CLR      LST
1531 007644 005037 006660      CLR      MST
1532 007650 012777 007710 176750      MOV      #KINI, @KVEC
1533 007656 000002      RTI
1534
1535 007660 012777 007560 176740      KINI2:  MOV      #KINTR, @KVEC
1536 007666 017701 176730      MOV      @KDBR, %1
1537 007672 012777 000000 171102      CLK:      MOV      #0, @CSB
1538 007700 012777 000131 171072      CLK1:     MOV      #131, @CSR
1539 007706 000002      RTI
1540
1541 007710 013704 006634      KINI:      MOV      @CNT1, %4
1542 007714 017701 176702      MOV      @KDBR, %1
1543 007720 042701 000300      BIC      #300, %1
1544 007724 010124      MOV      %1, (%4)+
1545 007726 010437 006634      MOV      %4, @CNT1
1546 007732 005237 006632      INC      @CNT
1547 007736 001003      BNE      1$
1548 007740 012777 007660 176660      MOV      #KINI2, @KVEC
1549 007746 000002      1$:      RTI
1550
1551 007750 017737 176646 007760      HOLDIT: MOV      @KDBR, @HOLD
1552 007756 000002      RTI
1553
1554 007760 000000      HOLD:      0
1555
1556 007762 005037 006610      KOUT:     CLR      @INTFLG
1557 007766 012777 007750 176632      MOV      #HOLDIT, @KVEC
1558 007774 012700 006642      MOV      #HRS1, %0

```

;TURN ON CLK 2
;CLEAR CLK 2 IF PRESENT

;KEYBOARD INTERRUPT HANDLER
;STRIP JUNK
;IS CHAR A ?G(CONTROL-G)?
;IF YES, GO TO CNCSWR
;IS IT A CNTRL I ?
;IS IT A CNTRL T ?

;HANDLER FOR CTRL I
;SETUP TIME OF DAY

;INPUT

;AWAIT A CHAR TO START

;CLK 1

;STORE TIME OF DAY

;DUMMY INTERRUPT SERVICE ROUTINE

;INPUT HANDLER FOR CTRL T
;SET DUMMY VECTOR
;GET TIME OF DAY INTO

```

1559 010000 012703 006662      MOV      #HRS1A,%3      ;WORK AREA
1560 010004 012704 177770      MOV      #-10,%4
1561 010010 012023      1$:    MOV      (%0)+,(%3)+
1562 010012 005204      INC      %4
1563 010014 001375      BNE     1$
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     2$
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     3$
1574 010056 000301      10$:   SWAB      %1
1575 010060 023727 007674 177742  CMP      @CLK+2,#-36      ;IS CLOCK RUNNING AT 50KHZ ?
1576 010066 001001      BNE     2$
1577 010070 006301      3$:    ASL      %1
1578 010072 005000      2$:    CLR      %0
1579 010074 005003      CLR      %3
1580 010076 012704 010356      5$:    MOV      #TABL,%4
1581 010102 005701      6$:    TST      %1
1582 010104 100001      BPL     4$
1583 010106 061403      ADD      @%4,%3
1584 010110 006301      4$:    ASL      %1
1585 010112 005724      TST      (%4)+
1586 010114 005200      INC      %0
1587 010116 022700 000007      CMP      #7,%0
1588 010122 001367      BNE     6$
1589 010124 060337 006700      ADD      %3,@MSTA      ;ADD VALUE OF CTR TO MST
1590 010130 000137 010772      JMP      @CLK2
1591 010134      CNGSWR:  MOV      %2,-(6)      ;SAVE R2
1592 010134 010246      MOV      %3,-(6)      ;SAVE R3
1593 010136 010346
1594 010140      SETBYT:  CLR      TMP SWR      ;CLEAR TEMP SWR
1595 010140 005037 006702      CLR      %3      ;CLEAR R3
1596 010144 005003      JSR      PC,CRLF      ;PRINT <CR><LF>
1597 010146 004737 010324      MOV      #BYT1,%2      ;INIT R2 TO 1ST BYTE LOC
1598 010152 012702 006704
1599 010156      CKCSR:   TSTB     @KCSR      ;IS CHAR TYPED?
1600 010156 105777 176442      BPL     CKCSR      ;IF NOT WAIT
1601 010162 100375      MOV      @KDBR,%1      ;ELSE MOVE THE CHAR TO R1
1602 010164 017701 176432      BIC     #177600,%1      ;STRIP JUNK
1603 010170 042701 177600
1604 010174      5$:    TSTB     @PCSR
1605 010174 105777 176414      BPL     5$
1606 010200 100375      MOV      %1,@PDBR
1607 010202 010177 176404      CMPB    #25,%1      ;IS CHAR ^U (CONTROL-U)?
1608 010206 122701 000025      BEQ     SETBYT      ;IF YES START OVER
1609 010212 001752      CMPB    #15,%1      ;ELSE IS IT <CR>?
1610 010214 122701 000015      BEQ     SWDONE      ;IF EQUAL GO TO SWDONE
1611 010220 001412      CMPB    #12,%1      ;IS IT <LF>?
1612 010222 122701 000012      BEQ     SWDONE      ;IF EQUAL GO TO SWDONE
1613 010226 001407
1614 010230 005203      INC     %3      ;INDICATE A CHAR INPUTTED

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

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1671 010426 000032
1672 010430 000015
1673 010432 000006
1674 010434 000003
1675
1676 010436 001025
1677 010440 000413
1678 010442 000205
1679 010444 000103
1680 010446 000041
1681 010450 000021
1682 010452 000000
1683 010454 000000
1684
1685 010456 000500
1686 010460 000240
1687 010462 000120
1688 010464 000050
1689 010466 000024
1690 010470 000000
1691 010472 000000
1692 010474 000000
1693
1694
1695
1696

TABL3: 533.
267.
133.
67.
33.
17.
0.
0.

;60HZ TIME TABLE

TABL4: 320.
160.
80.
40.
20.
0.
0.
0.

;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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SUBROUTINES

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	NEWTM: 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	25	
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	NEWT: 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      #HRS1A,APCNT1
1786 011242 012737 177767 006632      MOV      #-11,APCNT
1787 011250 012777 000000 175334      MOV      #0,APDDBR
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,APDDBR
1794 011302 000002                      RTI
1795
1796 011304 012777 011322 175304 LF:      MOV      #PINTR,APVEC    ;OUTPUT LF
1797 011312 012777 000212 175272      MOV      #212,APDDBR
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),APDDBR
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,APDDBR
1810 011374 000002                      RTI
1811
1812 011376 012737 177776 006636 COLON:  MOV      #-2,APCNTB
1813 011404 012777 000072 175200      MOV      #72,APDDBR
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,APDDBR
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 3#CNTB
1840 011554 005237 006632 INC 3#CNT
1841 011560 001367 BNE 1$
1842 011562 062737 000060 006636 3$: ADD 3#CNTB
1843 011570 013777 006636 175014 MOV 3#CNTB,3PDBR
1844 011576 000002 RTI
1845
1846 011600 012777 007560 175020 NUM2: MOV #KINTR,3KVEC ;RESTORE KEYBOARD VECTOR
1847 011606 000002 RTI
1848
1849
1850
1851
1852
1853
1854 011610 032777 000010 167226 DELADJ: BIT #10,3SR ;TEST FOR SR3=1 WHICH INCL.CATES
1855 ;11/60, 11/70 & 11/45 WITH MOS
1856 011616 001001 BNE 1$ ;ADJUST DELAY TIMES
1857 011620 000207 RTS %7 ;NO ADJUSTMENTS REQUIRED
1858 011622 012701 001034 1$: MOV 3ADJ,R1 ;GET START OF REG. FOR ADJUST
1859 011626 012700 001024 MOV 3DEL1,R0 ;GET START OF REG. TO ADJUST
1860 011632 012702 001032 MOV 3DEL4,R2 ;GET END TAG OF ADJUSTMENT
1861 011636 062702 000002 ADD 3R2 ;UPDATE END CHECK
1862 011642 012120 2$: 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 3#4,-(%6) ;SAVE CONTENT OF TRAP
1868 ;VECTOR
1869 011656 012737 011676 000004 MOV 3SWADJ1,3#4 ;SET UP NEW TRAP VECTOR
1870 011664 005777 167154 TST 3SR ;TEST FOR SWITCH REG.
1871 011670 012637 000004 MOV (%6)+,3#4 ;RESTORE STACK NO
1872 ;TIME OUT ACCONEG.
1873 011674 000207 RTS %7
1874
1875 011676 022626 SWADJ1: CMP (%6)+,(%6)+ ;UPDATE STACK
1876 011700 012637 000004 MOV (%6)+,3#4 ;RESTORE TRAP VECTOR
1877 011704 012737 000176 001044 MOV 3SOFTSR,SR ;SET SWITCH REG.(SR) TO
1878 ;EQUAL SOFTSR
1879 011712 000207 RTS %7 ;RETURN TO CALLER
1880
1881
1882
1883 000001 .END

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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#

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CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0042

CTR	001004	462# 774	541* 789	542 806	550 825	562 929	577 1007	584 1015	675 1049	688 1057	707 1074	723 1082	740 1242	757 1564
CTRLI =	000211	1386#												
CTRLT =	000224	1387#												
CTR1	006600	1370#												
DELADJ	011610	490	502	1854#										
DELY	004416	1003	1011	1020#	1045	1053	1070	1078						
DEL1	001024	470#	700	767	836	858	873	889	902	1091	1107	1859		
DEL2	001026	471#	716	782										
DEL3	001030	472#	559	569	733	799								
DEL4	001032	473#	750	817	1860									
DONE	011360	1800	1808#											
END1A	011220	1752	1757	1762	1767	1774	1777	1780	1783#					
EOMK	006366	1317*	1318	1335#										
HLT =	104000	444#	525	539	544	552	564	579	586	592	596	600	604	610
		614	620	624	633	637	647	656	665	677	690	706	709	722#
		725	739	742	756	759	773	776	788	791	805	808	823	827
		840	845	848	862	879	893	906	933	966	1006	1014	1017	1048
		1056	1059	1073	1081	1084	1097	1101	1113	1117				
HOLD	007760	1551*	1551#											
HOLDIT	007750	1551#	1557											
HRS1	006642	1389#	1476*	1529	1558	1730	1733*	1739*						
HRS1A	006662	1397#	1559	1772	1775*	1781*	1785							
HRS2	006644	1390#	1477*	1727*	1728	1734*	1736	1740*						
HRS2A	006664	1398#	1769*	1770	1776*	1778	1782*							
H5OZ	00715U	457	1454#											
H6OZ	007064	456	1442#											
ICOUNT	001022	469#	496*	514*	1301									
INIT	007250	1428	1440	1452	1464	1472#								
INTFLG	006610	1374#	1489*	1556*	1565	1697*								
KCSR	006624	1380#	1487*	1600										
KDBR	006622	1379#	1515	1536	1542	1551	1602							
KIN	007614	1520	1526#											
KINI	007710	1532	1541#											
KINI2	007660	1535#	1548											
KINTR	007560	1484	1515#	1535	1846									
KOUT	007762	1502	1522	1556#	1566									
KVEC	006626	1381#	1484*	1532*	1535*	1548*	1557*	1846*						
KVECS	006630	1382#	1485*											
K10HZ	007000	455	1430#											
K100HZ	006714	454	1418#											
LF	011304	1792	1796#											
LINE	005570	1180#	1183*	1185	1198	1209#								
LOGICA	005174	443	1130#											
LOOP	004152	958#	974											
LST	006656	1395#	1474*	1530*	1698*	1699	1701*							
LSTA	006676	1403#												
MIN1	006646	1391#	1478*	1722*	1723	1726*								
MIN1A	006666	1399#	1764*	1765	1768*									
MIN2	006650	1392#	1479*	1717*	1718	1721*								
MIN2A	006670	1400#	1759*	1760	1763*									
MOVE	007234	1425	1437	1449	1461	1466#								
MSGPWR	006472	1221	1352#											
MSG1	006370	1231	1337#											
MSG2	006432	1234	1344#											
MSG3	006436	487	1346#											

E04

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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*												
PDBR	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#															
PWRTN	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	1492				
		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*				

CZKWBHD KW11-P RT CLK TST
CZKWBH.P11 30-JAN-78 09:34

MACY11 30A(1052) 30-JAN-78 09:35 PAGE 45
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0044

[illegible]

G04

CZKWBHO KW11-P RT CLK TST
CZKWBI.P11 30-JAN-78 09:34MACY11 30A(1052) 30-JAN-78 09:35 PAGE 46
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0045

T24C	004010	907	922#																	
T24D	004076	934	947#																	
T25	004264	926	977	996#																
T25A	004502	1018	1041#																	
T26	004616	1064#																		
T27	004740	999	1066	1086#																
T27A	005040	1103#																		
T28	005256	1152#	1161																	
T28A	005270	1154#	1156																	
T29	005336	1166#	1175																	
T29A	005350	1168#	1170																	
T3	001414	549#	554																	
T3A	001442	556#																		
T3B	001504	566#																		
T30	005456	1188#	1193																	
T31	005536	1201#	1206																	
T4	001572	581#																		
T5	001614	588#																		
T6	001712	606#																		
T7	001750	616#																		
T9	002006	628#																		
T9A	002052	640#																		
WAITA	007422	1492#	1500	1513																
WAITB	007432	1494#	1507																	
XOR	001230	492	512#																	
XORA	006254	1296	1310#																	
XORFLG	006252	495*	515*	728	794	1065	1178	1293	1309#											
XORM	006540	497	1360#																	
.	= 011714	435#	437#	442#	450#	459#	538	543	551	563	578	585	591	595						
		599	603	609	613	619	623	632	636	646	655	664	676	689						
		708	724	741	758	775	790	807	826	844	847	904	1093	1100						
		1109	1116	1123	1126	1158	1172	1182	1190	1203	1220	1229	1233	1247						
		1276	1319	1324	1328	1331	1336#	1343#	1345#	1359#	1413#	1709	1714	1719						
		1724	1731	1737	1751	1756	1761	1766	1773	1779										

. ABS. 011714 000

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: 9K (17 PAGES)

H04