DK8-EC crystal real time clock engineering drawings

digital equipment corporation · maynard. massachusetts

MASTER DRAWING LIST

DWG. NO.	REV. LET.	NO. OF SHEETS	TITLE
A-PL-DK8-E-0	A	1	Real Time Clock (PARTS LIST)
A-SP-DK8-EC-4		5	Engineering Specs
A-SP-DK8-EC-5	A	5	Test Procedure
E-CS-M8830-0-1	#	2	REAL TIME CLOCK (CRYSTAL)
A-SP-7665123-0-0	A	2	ACCEPTANCE PROCEDURE
LIBKIT-8E-DK8E	REF		LIBRARY KIT
A-AL-DK8-EC-6		1	ACCESSORY LIST

REVISIONS			
REV.	DATE	CHG. NO.	APP'D.
A	032371	00001	A.D.
B	12/71	00005	a.D.
C	2/72	00006	a.D.
D	2/72	DK8E-00007	a.D.
E	8/73	DK8E-8	A.D.

DRN. Ken Zulick	DATE 2-25-71	digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS
CHK'D. Ken Zulick	DATE 2-25-71	
ENG. Al DeLuca	DATE 2-25-71	TITLE DK8-EC Real Time Clock (Crystal)
PROJ. ENG. Dave Vogelsang	DATE 2-25-71	
PROD.	DATE	
FIRST USED ON PDP8-E		SIZE A · CODE ML · NUMBER DK8-EC · REV. E
SCALE ##		
SHEET 1 OF 1		DIST.

DEC FORM NO. 16-1033
DRA 103

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY K. GULICK	CHECKED K. RUSS	SECTION
DATE 3/23/71	DATE 3/23/71	1
ENG Al DeJuneo	PROD Tracy Baylor	ISSUED SECT.
DATE 4/6/71	DATE 4/7/71	1

ITEM NO.	DWG NO./PART NO.	DESCRIPTION	QUANTITY/VARIATION DK8-EA	DK8-EC
1	E-CS-M882-0-1	REAL TIME CLOCK (LINE)	1	-
2	E-CS-M8830-0-1	REAL TIME CLOCK (CRYSTAL)	-	1
3	D-IA-7007128-0-0	28 VAC POWER CABLE	1	-

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.	ECO NO.
REAL TIME CLOCK DK8-E	SHEET 1 OF 1	A	PL	DK8-E-0	A	DK8E-00005
		DIST.				

DEC FORM NO.16-1031
DRA 110

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ENGINEERING SPECIFICATION DATE 10/13/71

TITLE Engineering Specifications for DK8-EC M8830 Real Time Clock (crystal

REVISIONS

REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE

ENG	APPD	SIZE	CODE	NUMBER	REV
A. DeLuca		A	SP	DK8-EC-4	

DEC FORM NO. DRA 107

ENGINEERING SPECIFICATION CONTINUATION SHEET

TITLE Engineering Specs for DK8-EC (M8830) Real Time Clock (crystal)

DK8-EC Real Time Clock (crystal)

1. General Description

1.1 The DK8-EC(M8830) counts intervals of time at any one of four different selectable rates 1 Hz. 50 Hz, 500 Hz and 5000 Hz These rates are selected by adding jumpers on the M8830 The M8830is shipped with a machine inserted jumper selecting the 1 Hz rate.

The DK8-EC plugs into the OMNIBUS of the PDP8-E processor. The frequency is determined by a 20 MHz crystal oscillator divided down through MSI decade counters.

1.1.1 The crystal oscillator, decade counter and the remaining logic is contained on one 8½ inch quad module. All three IOT's for the DK8-EC are decoded on this module and are listed below:

MNEMONIC	CODE	OPERATION
CLEI	6131	Set Interrupt
CLDI	6132	Clear Interrupt
CLSK	6133	Skip on clodk flag and clear flag

1.2 Operation

Refer to DK8-EC block diagram and timing diagram. 6132 or initialize will clear the interrupt request flag. The interrupt request line will be asserted if the slave clock flag is set from the master clock flag and will remain asserted until it is cleared by 6132, initialize or 6133. The master clock flag is set every time the frequency source goes high 1, 50, 500 or 5000 times a second.

	SIZE	CODE	NUMBER	REV
	A	SP	DK8-EC-4	

DEC FORM NO 16-1022 DRA 108

1.2 Operation (continued)

The skip line is pulled to ground, asserted, if the slave clock flag has been set and the IOT 6133 is issued. The skip line stays at ground for the duration of the IOT 6133. At the end of this IOT the master clock flag will be cleared. TP1 the start of any IOT will clear or set the slave flag depending upon the output state of the master flag. If the master flag has been cleared then the slave will be cleared. With both the master and slave cleared no skip can occur until the next clock pulse which will set the master flag and TP1 will set the slave.

It takes two IOT's to sync to the frequency source the first to clear the master clock flag and the second to skip the moment the master clock flag goes high which will be when the frequency source clock pulse goes high.

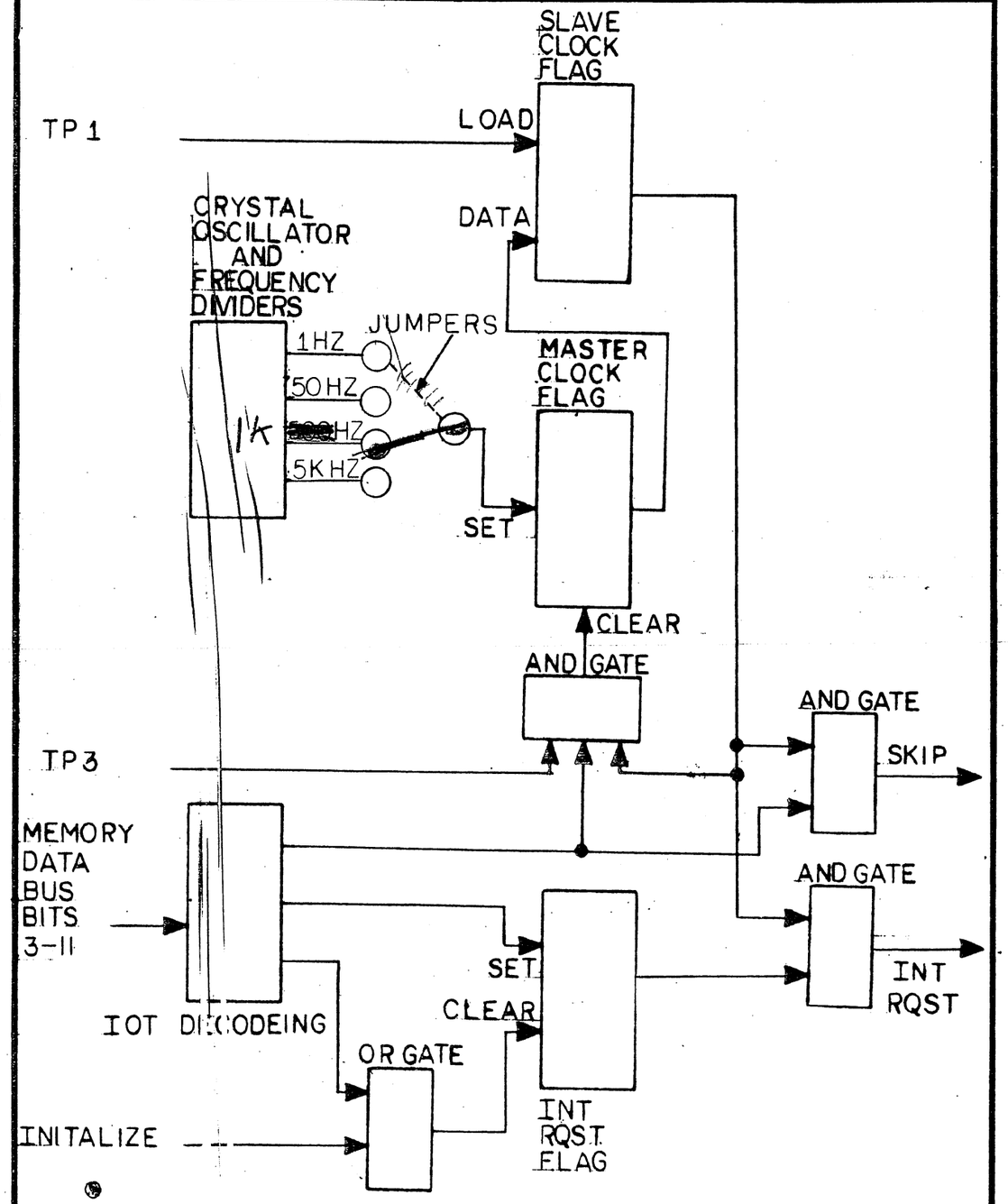
Sample Program:

```
6133
JMP.-1
6133
JMP.-1
```

2. Operating Conditions

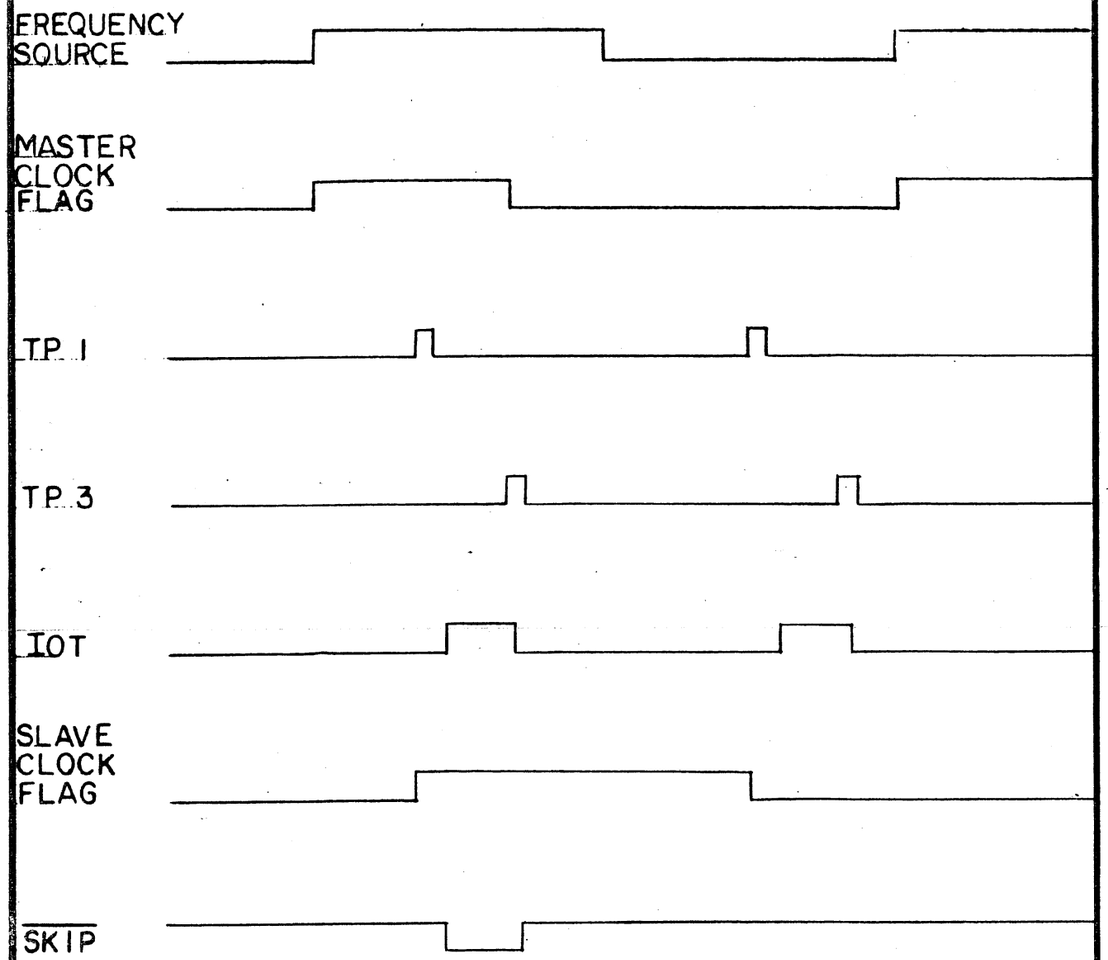
Temperature -30°F - 130° F
Humidity -10% - 90% non condensing
Power required +5 volts - 400 ma
Frequency stability = .01%

3. Software: MAINDEC-8E-D8AA-D-(D) Write Up
MAINDEC-8E-D8AA-PB Tape



ENGINEERING SPECIFICATION [redacted] **CONTINUATION SHEET**

TITLE DK8-EC TIMING DIAGRAM



	SIZE	CODE	NUMBER	REV
	A	SP	DK8-EC- 4	

DEC FORM NO 16-1022
DRA 108

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ENGINEERING SPECIFICATION DATE 3/17/71

TITLE DK8-EA, EC TEST PROCEDURE

REVISIONS

REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE
A	ECO CHANGE	DK8E-00007	MCCLUSKY	3/8/72	a.D	3/13/72

ENG	APPD	SIZE	CODE	NUMBER	REV
Al DeLuca	Al DeLuca	A	SP	DK8-EC-5	A

DEC FORM NO. DRA 107

ENGINEERING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE DK8-EA, EC TEST PROCEDURE

1.0 Equipment

1.1 PDP-8/e Standard

1.2 Heat Box

1.3 453 Scope and Voltage Probes

1.4 Teletype

1.5 Option module and cable required:
DK8-EA = M882 Module & 7007128 Cable
DK8-EC = M8830 Module

2.0 Test Station Set Up

2.1 Check paper work in the envelope, making sure it is complete as required by DEC Standard #101.

2.1.1 Test and Inspection Record.

2.1.2 Key Sheet and ECO Status Sheet will contain both CS and etch revision.

2.1.3 Quality Control Inspection Report

2.1.4 PDP-8/e Progress Report (inserted at this time).

2.2 Insert M882 or M8830 module in the Omnibus per Recommended Module Assignment List (ASP-PDP-8/e-0-4).

2.3 Connect the red wire from the 7007128 cable to the middle hole of the amp connector (J5, H724 power supply) and either white wire on each side of the red one. Insert the Mate-N-Lock end of the cable to the M882 module. The 7007128 cable can be daisy-chained.

2.4 Turn on PDP-8/e power

SIZE	CODE	NUMBER	REV
A	SP	DK8-EC-5	A

DEC FORM NO 16-1022

3.0 High Speed Dump Operating Procedure (USING MOTHER SYSTEM IF NOT USING MOTHER SYSTEM GO TO STEP 5.0)

3.1 Set test station "On Line" switch to "Off Line".

3.2 Toggle into 8/e memory.

3.2.1 Load address ØØØ1 through switch register.

3.2.2 Deposit ØØØ1/5ØØ1
ØØØ2/7777
ØØØ3/7777

3.2.3 Load address ØØØ1, hit clear and continue.

3.2.4 This initializes the memory; the address lights will indicate ØØØ1 and MD lights will indicate 5ØØ1.

3.3 Set "Auto/Manual" switch to manual.

3.3.1 High speed dump light will light on test panel.

3.4 Set "On Line" switch to "On Line".

3.4.1 On Line light will light.

3.5 Set test station switch register to octal number of program desired.

3.6 Depress and release initialized switch.

3.6.1 Initialize light will come on and stay there until mother recognizes stations service request, then initialize light goes out.

3.7 Program will be loaded and checked by mother computer; if load is completed, the 8/e will stop at location ØØØ1, MA-ØØØ2.

3.7.1 Initialize light is out and the loaded light goes out.

3.8 If an error, the following lights will/may be lit.

3.8.1 Receive - Data receive by mother not complete, go back to 3.1 and load again.

3.8.2 Transmit - Data transmitted by mother not complete; go to 3.1.

3.8.3 Load - Check sum error, go to 3.1.

3.8.4 Illegal Program - Program non-existant; go to 3.1.

3.8.5 Had load - If load is on, hit initialize key to clear; go back to 3.1.

3.8.6 If any of the above error lights light, the program under test will have to be loaded five successive times to insure the 8/E is not causing the error.

3.9 Start a program

3.9.1 In order to start a program, consult diagnostic write-up for starting address.

4.0 DK8 Checkout

4.1 For jumper configurations for different frequencies (DK8-EC) along with switch register settings required, consult diagnostic write-up.

4.2 The DK8-EC comes supplied with a machine inserted jumper selecting the 1 Hz . frequency. The diagnostic should be run with this configuration for five minutes. The split lugs on the M8830 module should be scoped and their correct frequency of 50 Hz, 500 Hz and 5000 Hz verified.

4.3 Execution times are as follows:

Options	Minutes/Pass	Run Time	Program Octal No.
DK8-EA	≈ 2.5	5 Minutes	36
DK8-EC	≈ 2.5	5 Minutes	36

5.0 System or Option Checkout with no Mother System

5.1 Manually load RIM loader into the PDP8/E memory.

5.2 Load Binary Loader into the 8/E memory via RIM Loader and the teletype.

5.3 Load Maindec-8E-D8AA-PB into the 8/E memory via Binary Loader and the teletype. Refer to the program document for starting procedure.

5.4 The DK8-E is considered to be accepted after running the Diagnostic for fifteen minutes.

6.0 Heat Test

6.1 Heat test is to be run after successful completion of all previously indicated tests.

6.2 Run the DK8-E clocks diagnostic for five minutes with the heat box down, ports closed and heat off.

6.3 Raise the heat switch on the test station panel and once the indicator light goes off, run the DK8-E clock's diagnostic for ten minutes.

6.4 Turn the heat switch off and open the two ports on the left side of the heat box.

6.5 Allow fifteen minutes for the machine to cool before removing the heat box.

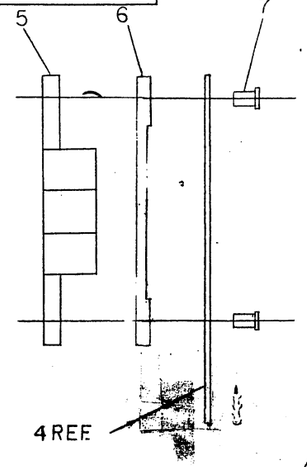
6.6 Terminate the test once the machine has run for five minutes at room temperature.

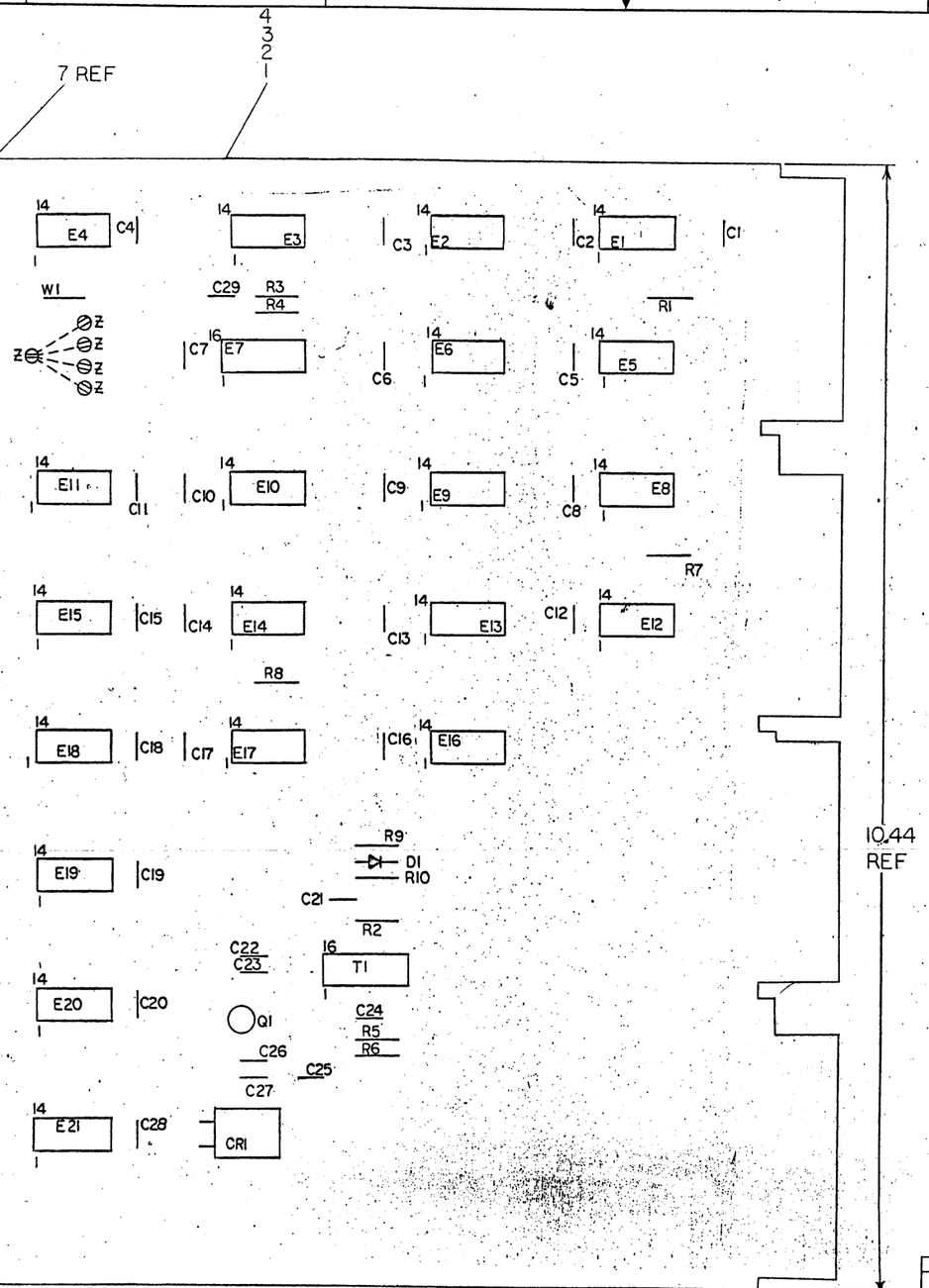
7.0 Final Operation and Inspection

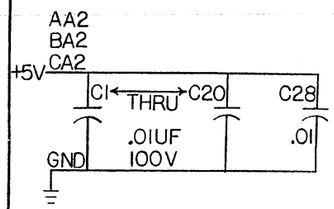
7.1 If shipping the DK8-EA or DK8-EC as an add on, disconnect the M882 or M8830 module from the 8/E and the cable from J5 (H724 power supply) if M882 module is used.

7.2 Check that the following paper work has been completed: Envelope, ECO Status Sheet, Q.C. Sheet, PDP8/E Progress Report.

NOTES:







ALL C, F, N, AND T PINS EXCEPT ACI ARE GROUNDED

DEC 7490	10	5
DEC 7475	12	5
DEC 314	1	8
DEC 380	1	8
IC TYPE	GND	+ 5V

GND AND 5V ARE USUALLY PIN 7 AND 14 RESPECTIVELY EXCEPTIONS ARE STATED ABOVE

IC PIN LOCATIONS

REF		DESCRIPTION	PART NO.	ITEM NO.
REF		X-Y COORDINATE HOLE LOC.	K-CO-M883Ø-Ø-4	1
REF		ASSY/DRILLING HOLE LAYOUT	D-AH-M883Ø-Ø-5	2
REF		MODULE HISTORY LIST	D-WH-M883Ø-Ø-6	3
1		ETCHED CIRCUIT BOARD	5009655	4
4		HANDLE FLIP CHIP-MAGENTA	9008337-06	5
4		SPACER (CABLE CLAMP)	1202704	6
8		EYELET #GS4-11 STIMPSON	9006750	7
5		SPLIT LUG	9006735	8
22	C1-C2Ø,C28,C29	CAP. .Ø1 UF 1ØØV 2Ø% DISC.	1001610	9
3	C21,C24,C25	CAP. .Ø47 UF 16V -15 + 2Ø% DISC	1009678	10
1	C22	CAP 68 PF 1ØØV 5% DM	1000014	11
1	C23	CAP 1ØØ PF 1ØØV 5% DM	1000016	12
1	C26	CAP 1Ø PF 1ØØV 5% DM	1000006	13
1	C27	CAP 47 PF 1ØØV 5% DM	1000011	14
1	D1	DIODE D664	1100114	15
3	E1,E12,E13	I.C. DEC 380	1909485	16
2	E2, E14	I.C. DEC 7402	1909004	17
2	E3, E9	I.C. DEC 7400	1905575	18
7	E4,E11,E15,E18-E21	I.C. DEC 7490	1909051	19
1	E5	I.C. DEC 314	1909704	20
1	E6	I.C. DEC 7410	1905576	21
1	E7	I.C. DEC 7475	1909050	22
1	E8	I.C. DEC 8881	1909705	23
1	E1Ø	I.C. DEC 7474	1905547	24
2	E16, E17	I.C. DEC 7470	1905589	25
2	R1, R7	RES. 470 1/4W 5%	1300316	26
1	R2	RES. 3.3K 1/4W 5%	1300439	27
1	R3	RES. 330 1/4W 5%	1300295	28
1	R4	RES. 750 1/4W 5%	1301401	29
1	R5	RES. 220 1/4W 5%	1300271	30
1	R6	RES. 22K 1/4W 5%	1301808	31
3	R8-10	RES. 1K 1/4W 5%	1300365	32
1	Q1	TRANSISTOR DEC 3009B	1503100	33
1	T1	PULSE TRANSFORMER	1609651	34
1	CR1	CRYSTAL	1809880	35
A/R	W1	WIRE #22 AWG SOLID BUS	9107560-01	36

QTY | REF DESIGNATION | DESCRIPTION | PART NO. | ITEM NO.

PARTS LIST

ETCH BOARD REV C

FIRST USED ON OPTION MODEL

REV	CHANGE NO.	ORIGINATED	CHK
B		M8830-0-1 3-21-71	
C		A. DELUCA 6-14-71	

REVISIONS

DEC NO. | EIA NO. | DEC NO. | EIA NO.

SEMICONDUCTOR CONVERSION CHART

DRN.	W. McCARTHY	DATE 8-10-71
CHK'D.	K. GULICK	DATE 8-13-71
ENG.	A. DELUCA	DATE 8-16-71
PROJ. ENG.	A. DELUCA	DATE 8-16-71
PROD.		DATE

NEXT HIGHER ASSY M8830

SCALE

SHEET 1 OF 2

digital EQUIPMENT CORPORATION MAYNARD MASSACHUSETTS

TITLE: REAL TIME CLOCK (CRYSTAL)

SIZE D | CODE CS | NUMBER M8830-0-1 | REV. C

DIST.

DEC FORM NO. DRD 135-B

MD Ø3 L — API — 38Ø E1
MD Ø4 L — BK1 — 38Ø E1
MD Ø6 L — BM1 — 38Ø E1
MD Ø5 L — BL1
MD Ø7 L — BP1
MD Ø8 L — BR1
314 E5
I/O PULSE L — CDI — R1 470 — +5V — 38Ø E1 — 8881 E8
R7 470 — +5V
E13 38Ø
MD Ø9 L — DL1 — 38Ø E13
MD 11 L — DP1 — 38Ø E13
MD 10 L — DM1 — 38Ø E13 — E14 7402
7400 E3 — 7402 E2
7402 E2 — 7400 E3
7400 E3 — 7402 E2
7402 E2 — 7400 E3
7402 E2

RG 22K — C27 47PF — CR1 — C26 10PF — C25 .047UF
Q1 3Ø9Ø8 — C23 100PF
R5 22Ø — C24 .047UF — C22 68PF
R8 1K — R9 1K — R10 1K — R2 33K
D1 DG64 — C21 .047 UF
+5V

TP1 H — CD2 — 38Ø E12 — 7400 E3
TP3 H — CN2 — 38Ø E12
7410 E6 — 7410 E6 — 7410 E6
G131 L — 38Ø E12
G132 L
G133 L — 7400 E9
INIT H — CR1 — 38Ø E12

7474 E16 — 10 MHZ
7474 E17 — 5 MHZ
7490 E21 — 5ØKHZ
7490 E20 — 5ØKHZ
7490 E19 — 5KHZ
7490 E18 — 1KHZ
7490 E15 — 100HZ
7490 E14 — 10HZ
7490 E5 — 5HZ
5K HZ
W1 — A — B — 2KHZ — 100HZ — 1KHZ
7475 E7
7474 E16
7474 E16
7410 E6
8881 E8 — CS1 — SKIP L
8881 E8 — CP1 — INT RQST L
8881 E8 — CL1 — INTERNAL I/O L
R3 33Ø — +5V
C29 .1
R4 75Ø

Clock set at 100 Hz (281)

— Delete
— Add

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
		PARTS LIST		

DIMENSIONAL TOLERANCE
DIMENSIONS ARE MILLIMETERS / INCHES
UNLESS OTHERWISE SPECIFIED

MILLIMETERS	INCHES	ANGLES
X.XX ±0.10 X.X ±0.5 X ±2.	.XXX ±.005 .XX ±.02 .X ±.1	±0° 30'

THIRD ANGLE PROJECTION
REMOVE BURRS AND BREAK SHARP CORNERS SURFACE QUALITY ✓
MATERIAL
FINISH

	NAME	DATE
DRN.	NORM CUPEAU	8-6-71
CHK'D.	KEN GULICK	8-13-71
ENG.	A. DELUCA	8-16-71
PROJ. ENG.	A. DELUCA	8-16-71
PROD.		DATE

NEXT HIGHER ASSY.
SCALE NONE
SHEET 2 OF 2

digital

TITLE: REAL TIME CLOCK (CRYSTAL)

SIZE	CODE	NUMBER	REV.
D	CS	M8830-0-1	C

DIST.

DEC FORM NO. DRD 102-C

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ENGINEERING SPECIFICATION

DATE 4/1/71

TITLE DK8-EC ACCEPTANCE PROCEDURE

REVISIONS

REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE
A	CHANGE MODULE NUMBER	00005	DE LUCA	12/71	Al DeLuca	12/23/71

ENG	APPD	SIZE	CODE	NUMBER	REV
R E Dunker	Dave Chartham	A	SP	7665123-0-0	A

DEC FORM NO. DRA 107

ENGINEERING SPECIFICATION [redacted] CONTINUATION SHEET

TITLE DK8-EC ACCEPTANCE PROCEDURE

1.0 SET-UP

1.1 Inspect M8830(DK8-EC) module to insure conformance to "Final Inspection Procedure for Flip-Chip Modules" (A-SP-7665039-0-0) and "Module Rework Standard" (A-SP-7605845-0-0).

1.2 Check the M8830(DK8-EC) module for a legible three character numerical date code.

1.3 Check the M8830module to insure the circuit and etch revisions are up to current ECO levels and the correct clock frequency jumper is installed.

1.4 Make sure the power to the PDP8-E is turned off.

1.5 Insert the M8830(DK8-EC) module into the omnibus. Be sure you adhere to the "Recommended Omnibus Assignment List" (A-SP-PDP8-E-0-4).

2.0 ELECTRICAL TEST

2.1 Turn on power to the PDP8-E.

2.2 Follow the loading procedure for the DK8-EC diagnostic (MAINDEC-8E-D8AA).

2.3 Run the DK8-EC diagnostic following the instructions in the program write-up, this test must run error free for a minimum of 15 minutes.

3.0 FAILURE CLASSIFICATION

3.1 Mechanical failure.

3.1.1 Any M8830(DK8-EC) module that does not meet the criterion outlined in 1.1, 1.2, and 1.3 will be classified as a failure.

3.1.2 The acceptance supervisor has the option of either waivering the failure (using DEC form 12-1026) or returning the M883 module to production for repair.

3.2 Electrical failure.

3.2.1 Any M8830which while performing 2.3, halts, generates error printouts, garble, or runs other than continuous and as specified in the diagnostic write-up will be classified defective and returned to production for repair.

SIZE	CODE	NUMBER	REV
A	SP	7665123-0-0	A

DEC FORM NO 16-1022 DRA 108