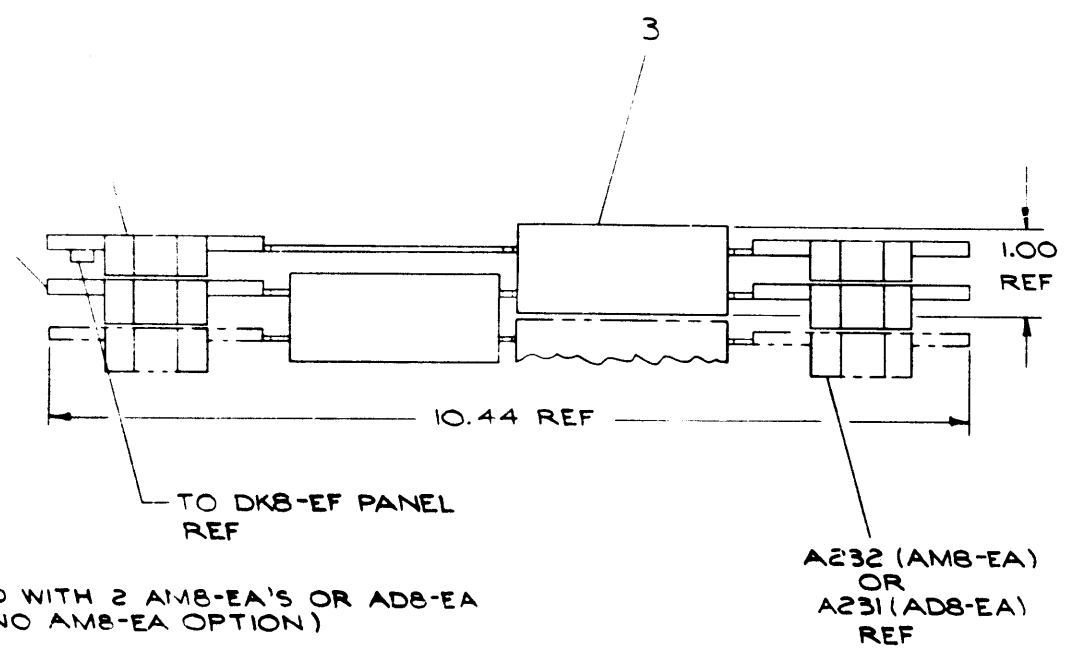


DK8-EP
programmable
real time clock
engineering drawings

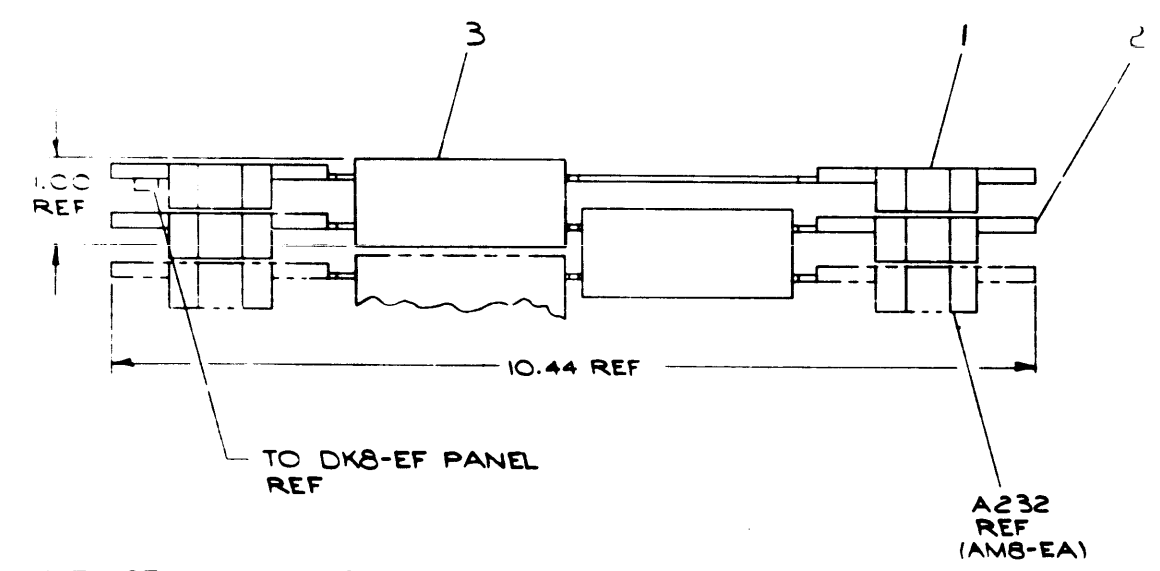
digital equipment corporation · maynard, massachusetts



NOTES:
 1. ITEM NO.1 AND NO.2 MUST ALWAYS BE FACING FRONT OF MACHINE AS SHOWN.



(IF USED WITH 2 AMB-EA'S OR ADS-EA WITH NO AMB-EA OPTION)



(IF USED WITH 1 AMB-EA OPTION)

REV. 1	DATE	BY
REV. 2	DATE	BY
REV. 3	DATE	BY
REV. 4	DATE	BY

FIRST USED ON OPTION/MODEL LAB8-E	UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES TOLERANCES DECIMALS FRACTIONS ANGLES ± .005 ± 1/64 ± 90° FINISH REMOVE BURRS AND BREAK SHARP EDGES	DATE 12-29-71 DATE 1-28-71 DATE 1-28-71 DATE 1-28-71 DATE 1-28-71	DATE 1-28-71 DATE 1-28-71 DATE 1-28-71 DATE 1-28-71	DATE 1-28-71 DATE 1-28-71 DATE 1-28-71 DATE 1-28-71
MATERIAL		NEXT HIGHER ASSY		DATE 1-28-71
FINISH		D-UA-DK8-ES-0		DATE 1-28-71
SCALE 1/1		DUA DK8-EP-0		DATE 1-28-71
SHEET 1 OF 1		REV. A		DATE 1-28-71

REV. A
 NUMBER DUA-DK8-EP-0
 SIZE CODE

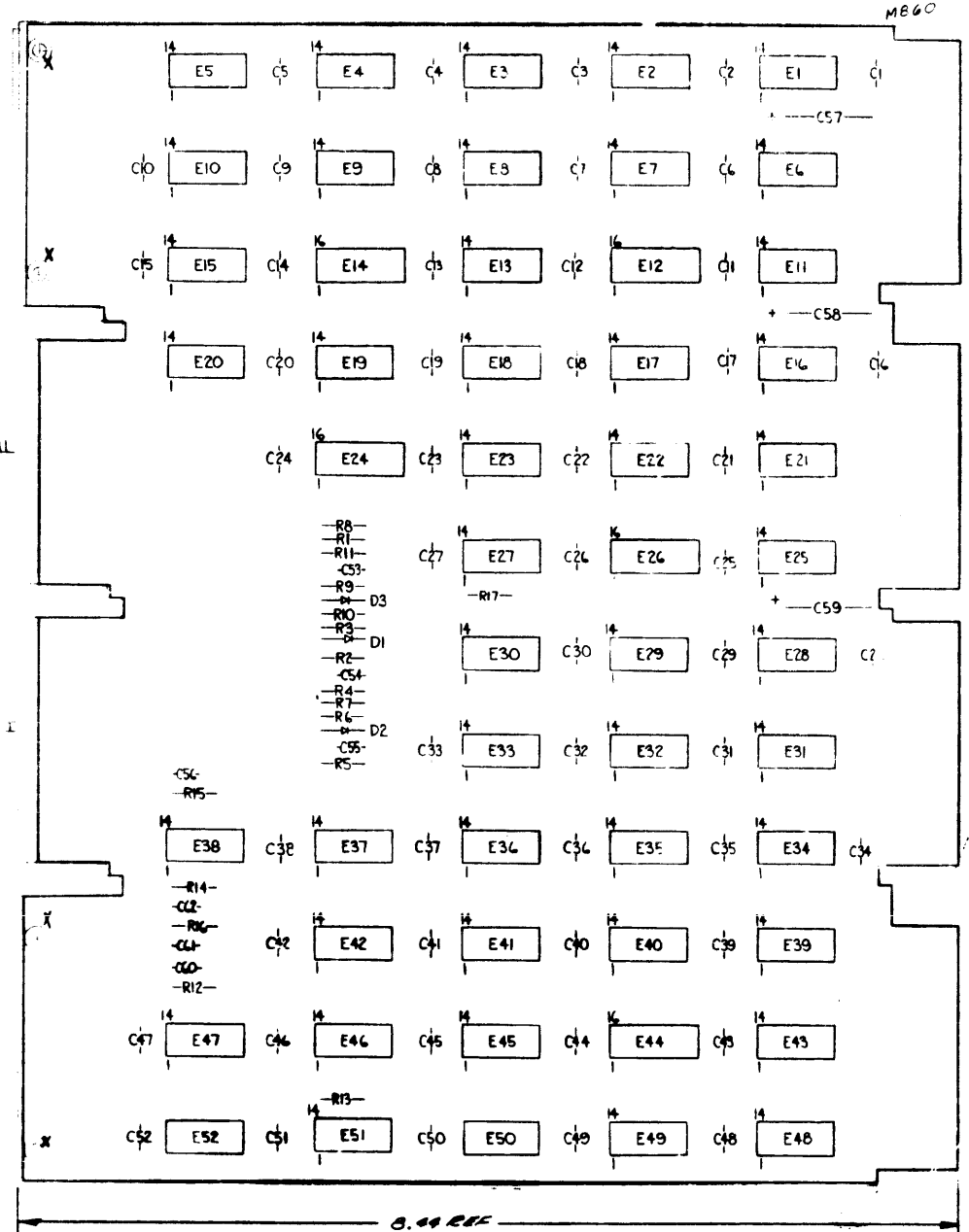
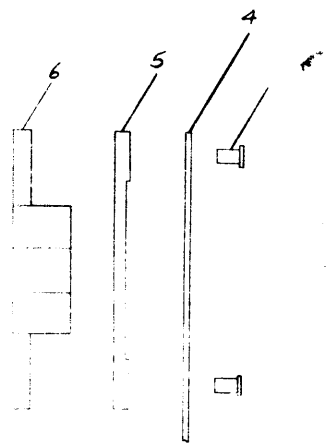
QTY. DESCRIPTION PART NO. ITEM NO.

PARTS LIST		EQUIPMENT CORPORATION METHUEN, MASSACHUSETTS	
TITLE		PROGRAMABLE R.T. CLOCK	
REV. A	NUMBER DUA DK8-EP-0	REV. A	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

UNLESS OTHERWISE NOTED:
 CAPACITORS ARE .01UF 100V 20%
 DIODES ARE D66A
 IC'S ARE DEC 7400
 RESISTORS ARE 1/4W 5%

AA2, BA2, CA2 +EV
 AC2, AF1, AF2, AN1, AN2, AT1
 AT2, BC1, BC2, BF1, BF2, BN1
 BN2, BT1, BT2, CC1, CC2, CF1
 CF2, CN1, CN2, CT1, CT2, DC1
 DC2, DF1, DF2, DN1, DN2, DT1, DT2



QTY	REF DESIGNATION	DESCRIPTION	REF. NO.
1	CW	CAP 470PF 100V 5%	1000024
1	E1	RES 220 1/4W 5%	1300271
1	E2	RES 100 1/4W 5%	1300273
1	E3	RES 22K 1/4W 5%	1301908
1	E4	RES 10K 1/4W 5%	1300439
3	E5, E10, E15	RES 3.3K 1/4W 5%	1300439
3	E6, E7, E8	RES 1.5K 1/4W 5%	1300371
7	E9, E11, E12, E13, E14, E16, E17, E18, E19	RES 470 1/4W 5%	1300376
1	E20	CAP 220PF 100V 5% DM	1000019
1	E21	CAP 100PF 100V 20% DM	1000019
3	E22, E23, E24	CAP 2.2UF 35V 5% DM	1000027
3	E25, E26, E27	CAP 220PF 100V 5% DM	1000021
1	E28, E29	CAP 82PF 100V 5% DM	1000016
1	E30	CAP 220PF 100V 5% DM	1000016
3	E31, E32, E33	DIODE D66A	1100114
3	E34, E35, E36	IC DEC 74797	190035
1	E37	IC DEC 74751	1909794
1	E38	IC DEC 74751	1909794
4	E39, E40, E41, E42	IC DEC 630	1905771
3	E43, E44, E45	IC DEC 324	1909738
6	E46, E47, E48, E49, E50, E51	IC DEC 5081	1909705
2	E52	IC DEC 7404	1909236
2	E53, E54	IC DEC 324	1909738
2	E55, E56	IC DEC 9601	1909733
1	E57	IC DEC 7475	1909236
2	E58, E59	IC DEC 7402	1909236
2	E60, E61	IC DEC 7440	1905771
1	E62	IC DEC 7400	1905771
1	E63	IC DEC 7410	1905576
8	E64, E65, E66, E67, E68, E69, E70, E71	IC DEC 7400	1905575
1	E72	IC DEC 7414	1905547
2	E73, E74	EMULET 654-11 STAMPSON	9004750
2	E75, E76	HANDLE-PIED SHIMMERS	100437-08
2	E77, E78	9540 CABLE CLAMP	1909701
2	E79, E80	CONDUCTIVE CONTACT	1909773
2	E81, E82	RESISTOR MOUNTING	1909773
2	E83, E84	RESISTOR MOUNTING	1909773
2	E85, E86	RESISTOR MOUNTING	1909773
2	E87, E88	RESISTOR MOUNTING	1909773
2	E89, E90	RESISTOR MOUNTING	1909773
2	E91, E92	RESISTOR MOUNTING	1909773
2	E93, E94	RESISTOR MOUNTING	1909773
2	E95, E96	RESISTOR MOUNTING	1909773
2	E97, E98	RESISTOR MOUNTING	1909773
2	E99, E100	RESISTOR MOUNTING	1909773

ITEM NO.	QTY	REV	DATE	BY	CHKD
DEC 584	1	B			
DEC 7475	11	4			
DEC 630	8	16			
DEC 630	1	8			
DEC 630	1	8			
DEC 630	8	16			

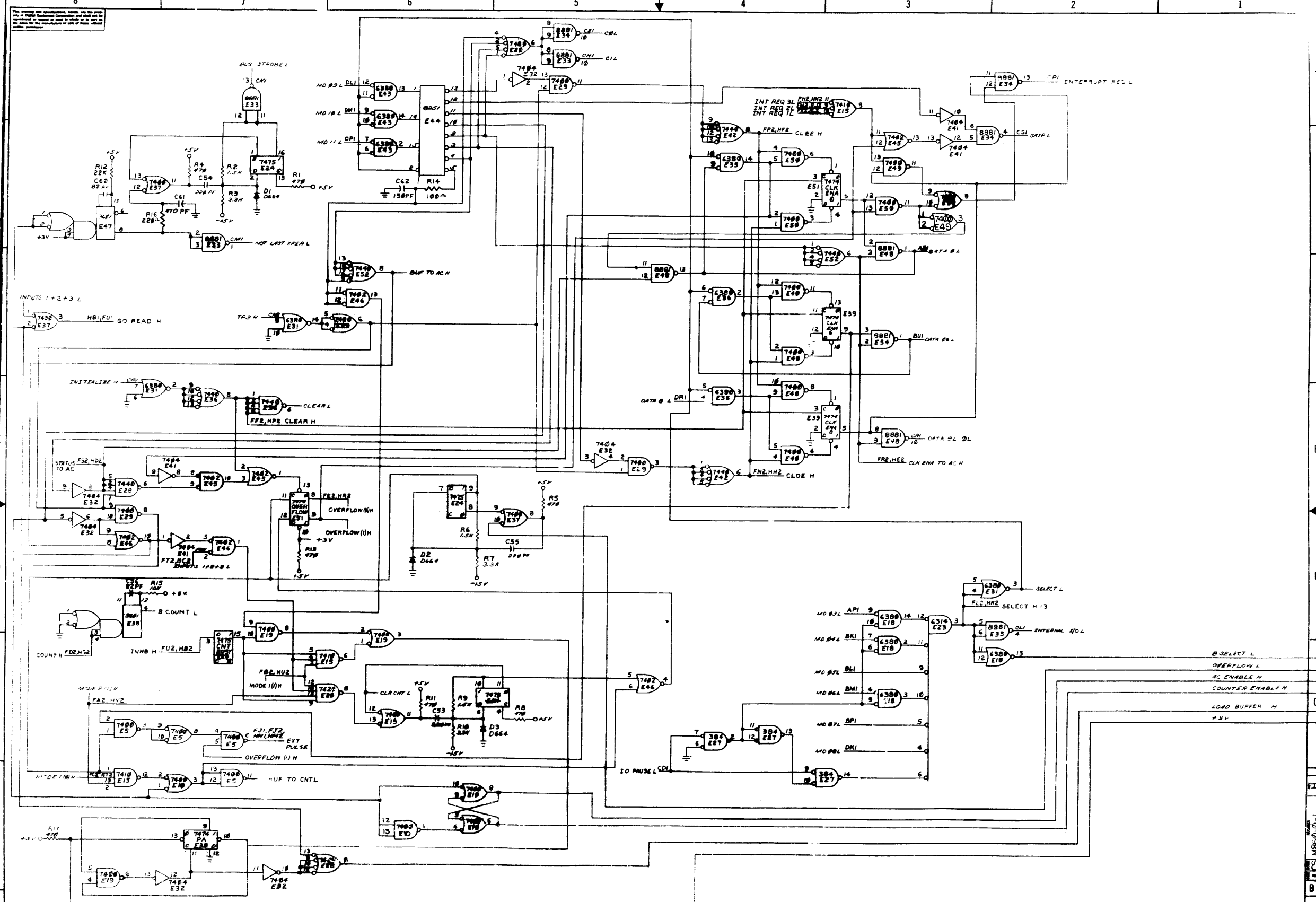
ETCH BOARD REV F

DATE: DEC 1964

DESIGNER: D-MA-DIB-EP-9

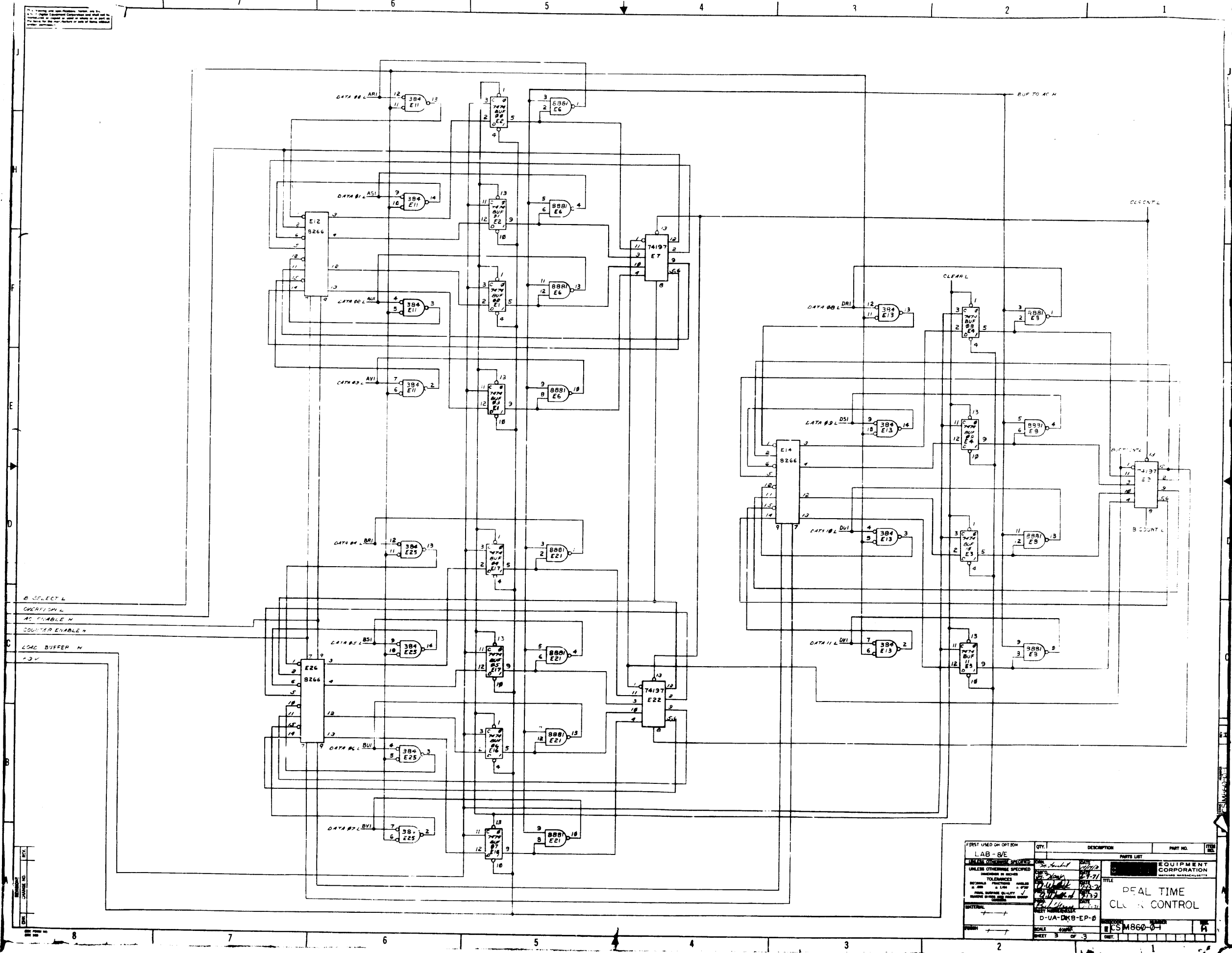
EQUIPMENT DESIGNATION: REAL TIME CONTROL

1-58664-1-1

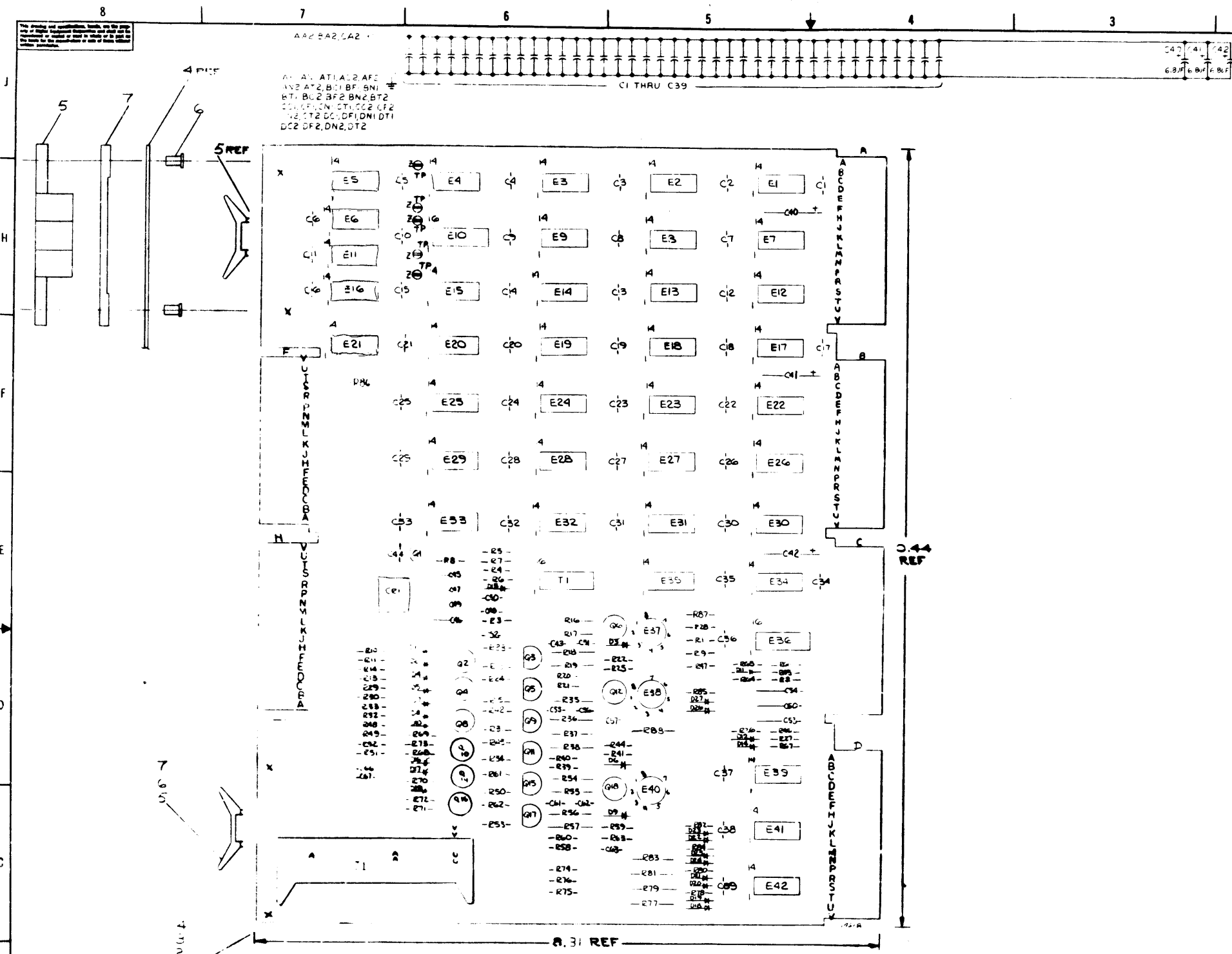


QTY.	DESCRIPTION	PART NO.	REV.
1	LAB - QE		
EQUIPMENT CORPORATION			
TITLE: I. L. TIME CLOCK CONTROL			
D-1A-DNS-EP-8			
CSM66-0-1			

1. This drawing is the property of the U.S. Government and is loaned to you for your information only. It and its contents are not to be distributed outside your organization.



QTY.	DESCRIPTION	PART NO.	ITEM NO.
	LAB - 8VE		
UNLESS OTHERWISE SPECIFIED			
TOLERANCES			
DIMENSIONS IN PARENTHESES ARE MINIMUM			
MATERIALS TO BE USED			
FINISH SURFACE QUALITY			
MATERIALS TO BE USED			
DATE			
D-UA-DK(8-EP-0			
CSM860-01			
SHEET 3 OF 3			



NOTES:

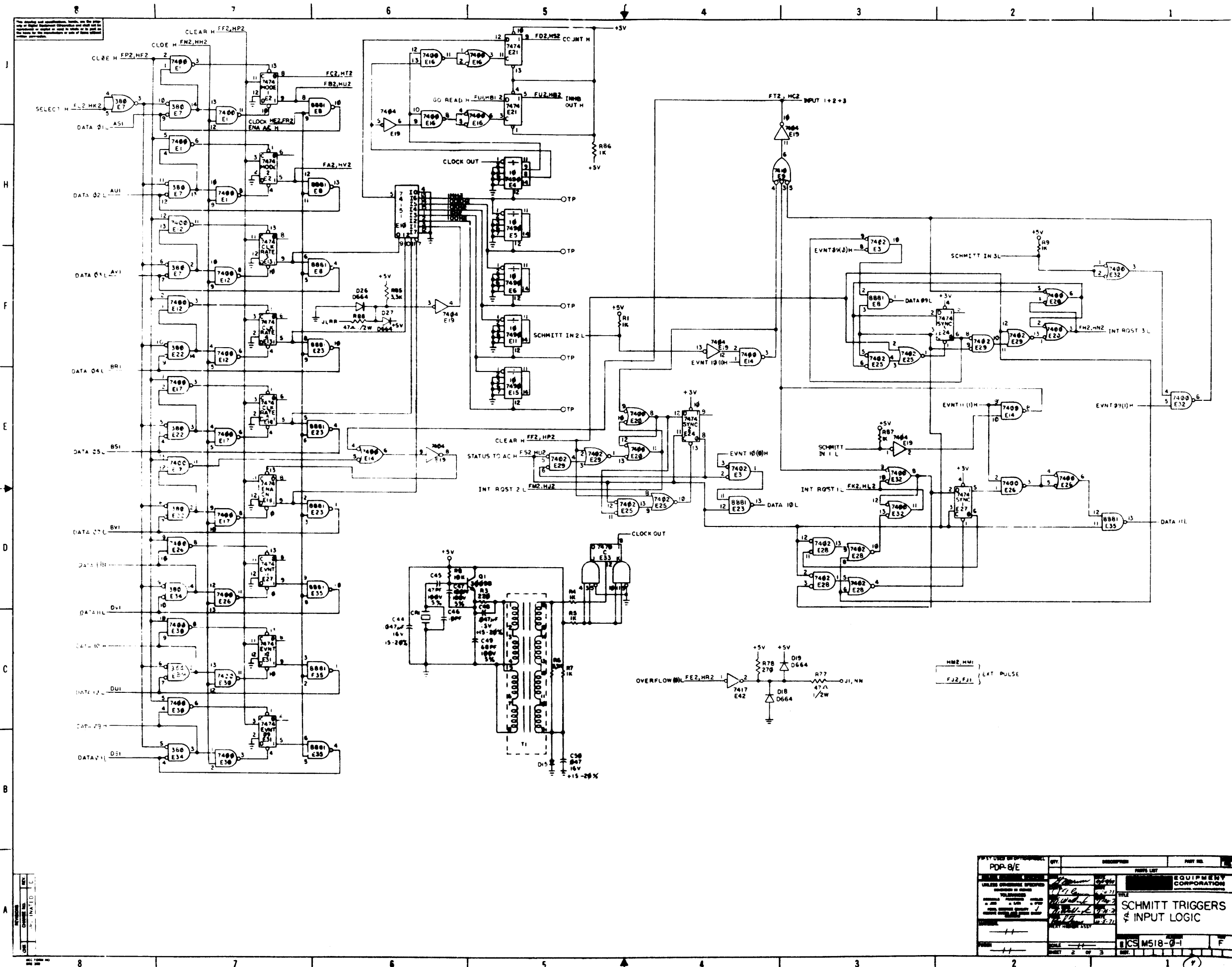
QTY	REF DESIGNATION	DESCRIPTION	PART NO.
3	R2, R46, R66	RES 4.7K 1/4W 5%	1300447
3	C53, C54, C60	CAP 100PF 100V 5% MKA	1000042
5		LUG SPLIT	9006735
1	CR1	CRYSTAL 20MC	1809880
1	HT	RIGHT ANGLE HEADER 4" P/N	123941
1	TF	TRANSFORMER	1609651
1	Q2, Q10, Q14, Q16	TRANSISTOR 2N4255	1303142
7	Q3, Q5, Q9, Q15, Q21	TRANSISTOR GE 3009B	1303100
3	Q6, Q12, Q18	TRANSISTOR DEC 8	1302992-01
1	Q7	CAP 100PF 100V 5% DM	1302216
1	Q46	CAP 10PF 100V 5% DM	1000226
1	Q48	CAP 47PF 20V 5% DM	1005211
1	Q49	CAP 68PF 100V 5% DM	1000014
50	C1, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39	CAP 0.1UF 100V 20% DM	1005160
3	C4, C37, C61, C63, C66, C67, C68, C69	CAP 6 BU5 35V 237 STAN	1000067
3	C44, C48, C50	CAP 0.47UF 16V 45-23% CER	1003678
5	DI1, DI5, DI8, DI2	DIODE D664	1002114
2	DI6, DI7	DIODE INT52A	1002808
2	R16, R19, R35, R36, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100	RES 34 9K 1/8W 1% MF	1303156
2	R7, R75, R81, R83, R85	RES 47K 1/2W 5%	1301695
4	R5, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100	RES 270K 1/4W 10%	1303110
5	R2, R3, R4, R6, R8, R9, R10, R11, R12, R13, R14, R15, R17, R18, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100	RES 470K 1/4W 5%	1303116
15	R14, R15, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100	RES 1K	1300365
4	R6, R10, R12, R25, R29, R32, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100	RES 3.3K	1301410
4	R3, R7, R8, R9, R11, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R26, R27, R28, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100	RES 220	1300271
4	R18, R30, R32, R34, R36, R38, R40, R42, R44, R46, R48, R50, R52, R54, R56, R58, R60, R62, R64, R66, R68, R70, R72, R74, R76, R78, R80, R82, R84, R86, R88, R90, R92, R94, R96, R98, R100	RES 270K	1301912
4	R11, R13, R15, R17, R19, R21, R23, R25, R27, R29, R31, R33, R35, R37, R39, R41, R43, R45, R47, R49, R51, R53, R55, R57, R59, R61, R63, R65, R67, R69, R71, R73, R75, R77, R79, R81, R83, R85, R87, R89, R91, R93, R95, R97, R99, R100	RES 47K	1302171
1	R26, R64, R65	RES 1.5K	1300391
3	R22, R41, R59	RES 2.2K	1300417
6	R23, R24, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100	RES 8K	1302465
3	R20, R39, R58	RES 62K	1304840
2	R69, R72	RES 150K	1301401
1	R36	RES 10K	1301317
1	R8	RES 10K 1/4W 5%	1300479
3	E1, E2, E3, E4	IC DEC 382	1309485
2	E19, E41	IC DEC 7404	1309686
3	E8, E23, E35	IC DEC 888	1309705
1	E10	IC DEC 7451	1309936
1	E42	IC DEC 7417	1309929
10	E1, E2, E4, E14, E16, E17, E20, E26, E30, E32, E33	IC DEC 7400	1305575
7	E2, E13, E18, E21, E24, E27, E31	IC DEC 7474	1305547
4	E3, E25, E28, E29	IC DEC 7402	1309004
5	E4, E5, E6, E11, E15	IC DEC 7490	1309051
1	E9	IC DEC 7410	1305576
1	E36	IC DEC 7475	1309050
1	E33	IC DEC 7470	1305589
3	E37, E38, E40	IC DEC 7437	1309344
2		SPACER (CABLE CLAMP)	1308704
4		WIRE TIE	1300670
2		HANDLE FLIP CHIP - MAGENTA	9008337-06
1		ETCHED CIRCUIT BOARD	9009630
1		MODULAR HISTORY DWG	3-MH-M518-B-6
1		ASSY DRILLING HOLE LAYOUT	3-MH-M518-B-5
1		XY COORDINATE HOLE LOC	3-MH-M518-B-4

REV	DATE	BY	CHKD	DESCRIPTION
DEC 380				
DEC 7415				
DEC 7495				
DEC 7415				

DEC NO.	EIA NO.	DEC NO.	EIA NO.
2N4250			
DEC 68			
DEC 3009B	2N3009		
IN752A	SAME		
D664	IN3606		

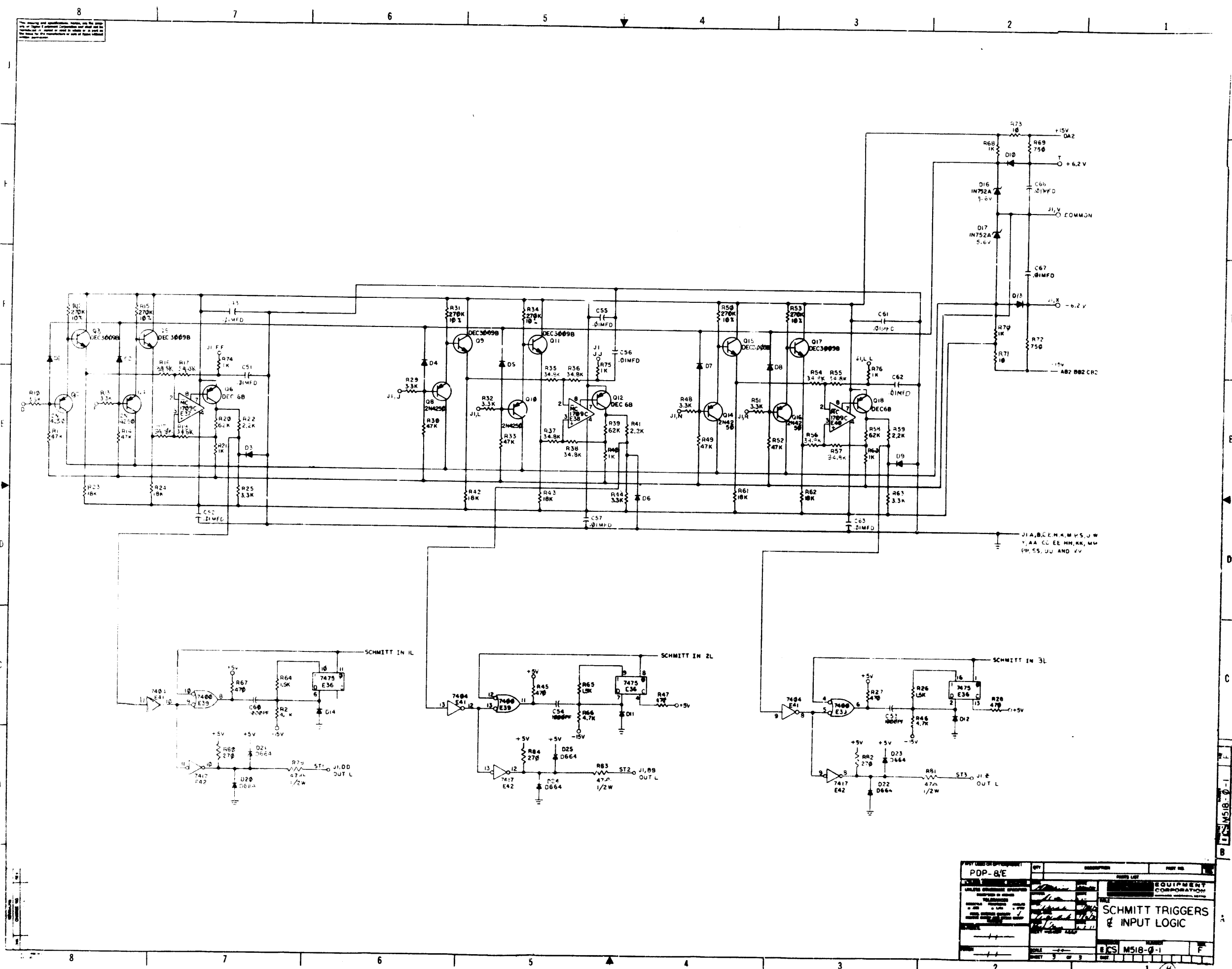
SCHMITT TRIGGERS & INPUT LOGIC

ECS M518-0-1



QTY.	DESCRIPTION	PART NO.	PAGE LIST
1	IC 7414	7414	1
1	IC 7400	7400	1
1	IC 8881	8881	1
1	IC 7402	7402	1
1	IC 380	380	1
1	IC 7474	7474	1
1	IC 7475	7475	1
1	IC 7476	7476	1
1	IC 7477	7477	1
1	IC 7478	7478	1
1	IC 7479	7479	1
1	IC 7480	7480	1
1	IC 7481	7481	1
1	IC 7482	7482	1
1	IC 7483	7483	1
1	IC 7484	7484	1
1	IC 7485	7485	1
1	IC 7486	7486	1
1	IC 7487	7487	1
1	IC 7488	7488	1
1	IC 7489	7489	1
1	IC 7490	7490	1
1	IC 7491	7491	1
1	IC 7492	7492	1
1	IC 7493	7493	1
1	IC 7494	7494	1
1	IC 7495	7495	1
1	IC 7496	7496	1
1	IC 7497	7497	1
1	IC 7498	7498	1
1	IC 7499	7499	1
1	IC 7500	7500	1
1	IC 7501	7501	1
1	IC 7502	7502	1
1	IC 7503	7503	1
1	IC 7504	7504	1
1	IC 7505	7505	1
1	IC 7506	7506	1
1	IC 7507	7507	1
1	IC 7508	7508	1
1	IC 7509	7509	1
1	IC 7510	7510	1
1	IC 7511	7511	1
1	IC 7512	7512	1
1	IC 7513	7513	1
1	IC 7514	7514	1
1	IC 7515	7515	1
1	IC 7516	7516	1
1	IC 7517	7517	1
1	IC 7518	7518	1
1	IC 7519	7519	1
1	IC 7520	7520	1
1	IC 7521	7521	1
1	IC 7522	7522	1
1	IC 7523	7523	1
1	IC 7524	7524	1
1	IC 7525	7525	1
1	IC 7526	7526	1
1	IC 7527	7527	1
1	IC 7528	7528	1
1	IC 7529	7529	1
1	IC 7530	7530	1
1	IC 7531	7531	1
1	IC 7532	7532	1
1	IC 7533	7533	1
1	IC 7534	7534	1
1	IC 7535	7535	1
1	IC 7536	7536	1
1	IC 7537	7537	1
1	IC 7538	7538	1
1	IC 7539	7539	1
1	IC 7540	7540	1
1	IC 7541	7541	1
1	IC 7542	7542	1
1	IC 7543	7543	1
1	IC 7544	7544	1
1	IC 7545	7545	1
1	IC 7546	7546	1
1	IC 7547	7547	1
1	IC 7548	7548	1
1	IC 7549	7549	1
1	IC 7550	7550	1
1	IC 7551	7551	1
1	IC 7552	7552	1
1	IC 7553	7553	1
1	IC 7554	7554	1
1	IC 7555	7555	1
1	IC 7556	7556	1
1	IC 7557	7557	1
1	IC 7558	7558	1
1	IC 7559	7559	1
1	IC 7560	7560	1
1	IC 7561	7561	1
1	IC 7562	7562	1
1	IC 7563	7563	1
1	IC 7564	7564	1
1	IC 7565	7565	1
1	IC 7566	7566	1
1	IC 7567	7567	1
1	IC 7568	7568	1
1	IC 7569	7569	1
1	IC 7570	7570	1
1	IC 7571	7571	1
1	IC 7572	7572	1
1	IC 7573	7573	1
1	IC 7574	7574	1
1	IC 7575	7575	1
1	IC 7576	7576	1
1	IC 7577	7577	1
1	IC 7578	7578	1
1	IC 7579	7579	1
1	IC 7580	7580	1
1	IC 7581	7581	1
1	IC 7582	7582	1
1	IC 7583	7583	1
1	IC 7584	7584	1
1	IC 7585	7585	1
1	IC 7586	7586	1
1	IC 7587	7587	1
1	IC 7588	7588	1
1	IC 7589	7589	1
1	IC 7590	7590	1
1	IC 7591	7591	1
1	IC 7592	7592	1
1	IC 7593	7593	1
1	IC 7594	7594	1
1	IC 7595	7595	1
1	IC 7596	7596	1
1	IC 7597	7597	1
1	IC 7598	7598	1
1	IC 7599	7599	1
1	IC 7600	7600	1

1-1-58 MS18-0-1



The drawing and specifications herein, and the use of any of the components, parts, and materials shown, are the property of Digital Equipment Corporation and shall not be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of Digital Equipment Corporation.

REV. LEVEL OR SUPPLEMENT	QTY	DESCRIPTION	PART NO.
PDP-8/E			
EQUIPMENT CORPORATION			
SCHMITT TRIGGERS & INPUT LOGIC			
ECS M518-0-1			

This drawing and specifications herein are the property of Digital Equipment Corporation and shall not be reproduced or copied or used in whole or in part as the basis for the manufacture or sale of items without written permission.

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS		DATE 7 24/71	
ENGINEERING SPECIFICATION			
TITLE REAL TIME CLOCK, DK8-EP		REV A	
REV	DESCRIPTION	CHG NO	DATE
A	ECO CHANGE	000013	1-6-71
		APPR	DATE
		AWRANCE	1-6-71
		APPD BY	DATE
			2-7-71

REV	NUMBER	SIZE	CODE	SP	REV
A	DK8-EP-1	A			A

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION

Real Time Clock, DK8-EP

7 24/71

ECO CHANGE

000013

1-6-71

APPR

DATE

1-6-71

AWRANCE

APPD BY

DATE

2-7-71

REV A

NUMBER DK8-EP-1

SIZE CODE SP

REV A

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE Real Time Clock, DK8-EP		REV A	
f) Ext start pulse			
g) Inhibit Clock pulses			
This register is under the control of 3 IOT's			
a) 6130: Zeroes to the clock enable register			
b) 6132: Ones to the clock enable register			
c) 6134: Clock enable register to the AC.			
2.5.2 Clock Buffer			
The clock buffer stores data being transferred from the AC to the clock counter or from the clock counter to the AC.			
2.5.3 Clock Counter			
The clock counter is a 12 bit binary up counter using MSI circuits with overflow which is sent off the board via the edge connector. The contents of the clock counter maybe transferred to the clock buffer or the clock counter maybe preset by the clock buffer. When overflow occurs, the clock buffer is automatically loaded into the clock counter when in certain modes.			
2.5.4 Programmable Time Base			
The program selectable time base provides pulses to the clock counter according to the rate set in the clock enable register. Rates range from 1 M Hz. to 100 Hz., in powers of ten, plus an external input. The clock pulses may be inhibited by setting bit 7 in the clock enable register.			
2.5.5 External Input Channels			
The three external input channels with Schmitt triggers may provide for three separate input events which can actuate the clock, cause an interrupt or skip pulse or cause the contents of the clock counter to be transferred to the clock buffer. These functions are controlled by the clock enable register.			

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION

Real Time Clock, DK8-EP

REV A

NUMBER DK8-EP-1

SIZE CODE SP

REV A

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE Real Time Clock, DK8-EP		REV A	
1. Overall Description			
The DK8-EP is an option, to the PDP-8/E computer, that may be used to measure or count intervals of time in a large variety of ways. Major features include: a 12 bit counter and overflow logic utilizing MSI circuits; a 12 bit clock buffer register; 5, program selectable, count rates plus provisions for an external clock source; crystal controlled clock for accuracy and stability and 3 external input circuits that feature variable threshold Schmitt triggers. The Schmitt Triggers are a feature only used with the DK8-ES option.			
2. General Specifications			
2.1 The basic system includes: the 12 bit counter plus overflow; 12 bit clock buffer register; the crystal controlled clock and frequency dividers; the I/O and control logic and the external sync logic.			
2.2 Option jumpers on the M518 module connect in the Schmitt triggers to the external sync logic.			
2.3 All control functions, IOT decoding and registers are contained on 1 8 1/2 inch Quad board numbered M860. The input logic and Schmitt triggers are contained on another Quad board, number M518. The modules are connected together with a top connector type H851 that connects the boards together on the top fingers of the boards.			
2.4 Operating Conditions are:			
Temperature: 30 F to 130 F			
Relative humidity: 10 to 90%, non-condensing			
Power Required: M518-430ma at +5 volts			
120ma at +15 volts			
120ma at -15 volts			
M860-900ma at +5 volts			
2.5 Logically the DK8-EP contains the following features:			
2.5.1 Clock Enable Register			
The clock enable register provides for:			
a) Clock rate selection			
b) Mode control			
c) Interrupt enable			
d) External event enable			
e) Overflow to Interrupt			

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION

Real Time Clock, DK8-EP

REV A

NUMBER DK8-EP-1

SIZE CODE SP

REV A

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE Real Time Clock, DK8-EP		REV A	
2.5.6 Crystal Clock			
The crystal clock is an extremely simple clock operating at 20 M Hz. and requires no adjustments. MSI circuit decade counters are used to divide the base clock frequency down to:			
a) 1 M Hz.			
b) 100 K Hz.			
c) 10 K Hz.			
d) 1 K Hz.			
e) .1 K Hz.			
2.5.7 Schmitt Triggers			
The Schmitt triggers on the M518 module are threshold detectors that can accept pulse or continuously varying analog inputs. Inputs to the Schmitt triggers may be cabled directly to the M518 or may be brought through the optional front panel, DK8-EP. TTL signals may be brought onto the M518 via the edge connector to actuate the input sync logic. The signal must transition to 0 volts from a nominal +3 volts for a minimum duration of 100 ns. The Schmitt triggers have the following characteristics:			
Nominal Input Voltage Range +5 Volts			
Input Type Differential			
Input Impedance 50K Ohms			
Minimum Input Pulse Width 2 u sec.			
Maximum Input Voltage +50 Volts			
Hysteresis 0.3 Volts			
Common Mode Rejection 35 db.			
Propagation Delay 600 ns.			
When connected to the Laboratory Peripheral Panel, DRB-EP:			
Input Threshold - Variable between +5 Volts			
Slope - + & -, Switch selectable			
Output Voltages - A) 0 to 5V (falling edge denotes firing of schmitt and resets on recrossing the threshold voltage for OUT 1, 2, and 3.			
B) Clock in and Overflow Out - 0 to 5 V			

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION

Real Time Clock, DK8-EP

REV A

NUMBER DK8-EP-1

SIZE CODE SP

REV A

DEC FORM NO 14-1022
DWA 100

ENGINEERING SPECIFICATION		CONTINUATION SHEET
TITLE Real Time Clock, DK8-EP		
<p>2.5.8 Input Synchronism Logic The major features of the input synchronism are:</p> <p>2.5.8.1 Input Channels There are three input channels which are used to convert asynchronous external events into synchronized control and status signals for the clock control logic. The three inputs may be driven from the Schmitt triggers or directly with an external TTL signal.</p> <p>2.5.8.2 Input Enable Flip-Flop This flip-flop, if set to a one, enables the pulse from the sync logic to reach the control gating. It is set and cleared under program control.</p> <p>2.5.8.3 Input Flip-Flop The input flip-flop is set by an external signal from either the Schmitt triggers or external TTL signal. The input flip-flop provides synchronization between asynchronous external events and internal clock timing.</p> <p>2.5.8.4 Sync Flip-Flop The sync flip-flop is loaded with the input flip-flop on the next status to AC IOT and continues to remain set during succeeding status to AC IOT's. When the sync flip-flop is loaded, the input flip-flop is cleared.</p> <p>2.5.8.5 Enable Event Interrupt This flip-flop connects the sync flip-flop to the interrupt request line on the Omnibus. It is set and cleared via bit 8 in the clock enable register.</p>		
DEC FORM NO 16-1022 ORA 10A	SIZE CODE A SP	NUMBER DK8-EP-1
	REV A	REV A

SHEET 5 OF 11

ENGINEERING SPECIFICATION		CONTINUATION SHEET
TITLE Real Time Clock, DK8-EP		
<p>Clock Enable Registers Function</p> <p>AC Bit β</p> <p>Functions Enable clock overflow to set bit β of the status register.</p> <p>1 & 2 Mode Control $\beta\beta$ Counter runs at selected rate. Overflow occurs every 4096 counts. Overflow remains set until cleared by the IOT 6135. $\beta 1$ Counter runs at selected rate. Overflow causes the clock buffer to be transferred to the clock counter which continues to run. Overflow remains set until cleared with IOT 6135. $\beta 0$ Counter runs at selected rate. When an enabled event occurs, the clock counter is transferred to the clock buffer and the counter continues.</p> <p>3, 4 & 5 Count Rate $\beta\beta\beta$ Stop $\beta\beta 1$ External clock source $\beta 1\beta$ $\beta.1$ K Hz. $\beta 11$ 1 K Hz. $1\beta\beta$ 1β K Hz. $1\beta 1$ $1\beta\beta$ K Hz. 11β 1 M Hz. 111 Stop</p> <p>6 When set to 1, overflow causes an EXT start pulse.</p> <p>7 When set to a 1, the crystal clock circuit is inhibited from generating clock pulses that increment counter.</p> <p>8 Enabled events in channels 1, 2 or 3 or an enabled overflow (bit β) cause an interrupt request when bit 8 is set to a one.</p>		
DEC FORM NO 16-1022 ORA 10A	SIZE CODE A SP	NUMBER DK8-EP-1
	REV A	REV A

SHEET 7 OF 11

ENGINEERING SPECIFICATION		CONTINUATION SHEET																		
TITLE Real Time Clock, DK8-EP																				
<p>3. Specification of Vendor Supplied Equipment See applicable Purchase Specifications for board components.</p> <p>4. Programming</p> <p>4.1 The IOT instructions are:</p> <table border="1"> <thead> <tr> <th>Mnemonic</th> <th>Octal Code</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>CLZE</td> <td>6130</td> <td>β's to the Clock Enable register corresponding to those bits set to a 1 in the AC. The AC is not cleared.</td> </tr> <tr> <td>CLSK</td> <td>6131</td> <td>Skip on clock interrupt. Interrupt conditions are: a) Overflow status set to a 1. b) Any of the 3 sync flip-flops set to a 1 in the status register.</td> </tr> <tr> <td>CLOE</td> <td>6132</td> <td>Ones to the Clock Enable register corresponding to those bits set to a 1 in the AC. The AC is not cleared.</td> </tr> <tr> <td>CLAB</td> <td>6133</td> <td>Contents of the AC are loaded into the clock then to the buffer and counter. The AC is not cleared.</td> </tr> <tr> <td>CLEN</td> <td>6134</td> <td>Contents of the clock enable register are loaded into the AC. Previous contents of the AC are lost.</td> </tr> </tbody> </table>			Mnemonic	Octal Code	Function	CLZE	6130	β 's to the Clock Enable register corresponding to those bits set to a 1 in the AC. The AC is not cleared.	CLSK	6131	Skip on clock interrupt. Interrupt conditions are: a) Overflow status set to a 1. b) Any of the 3 sync flip-flops set to a 1 in the status register.	CLOE	6132	Ones to the Clock Enable register corresponding to those bits set to a 1 in the AC. The AC is not cleared.	CLAB	6133	Contents of the AC are loaded into the clock then to the buffer and counter. The AC is not cleared.	CLEN	6134	Contents of the clock enable register are loaded into the AC. Previous contents of the AC are lost.
Mnemonic	Octal Code	Function																		
CLZE	6130	β 's to the Clock Enable register corresponding to those bits set to a 1 in the AC. The AC is not cleared.																		
CLSK	6131	Skip on clock interrupt. Interrupt conditions are: a) Overflow status set to a 1. b) Any of the 3 sync flip-flops set to a 1 in the status register.																		
CLOE	6132	Ones to the Clock Enable register corresponding to those bits set to a 1 in the AC. The AC is not cleared.																		
CLAB	6133	Contents of the AC are loaded into the clock then to the buffer and counter. The AC is not cleared.																		
CLEN	6134	Contents of the clock enable register are loaded into the AC. Previous contents of the AC are lost.																		
DEC FORM NO 16-1022 ORA 10A	SIZE CODE A SP	NUMBER DK8-EP-1																		
	REV A	REV A																		

SHEET 6 OF 11

ENGINEERING SPECIFICATION		CONTINUATION SHEET																								
TITLE Real Time Clock, DK8-EP																										
<table border="1"> <thead> <tr> <th>AC bit</th> <th>Functions</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>9, 10 & 11</td> <td>Enable events 9 - input 1 10 - input 2 11 - input 3</td> <td>The contents of the clock status register is loaded into the AC and then cleared in the status register. This prevents status information from being lost during the interrogation of the status register.</td> </tr> </tbody> </table> <p>Clock Status Register.</p> <table border="1"> <thead> <tr> <th>AC bit</th> <th>Status Condition</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>β</td> <td>Overflow 1 thru 8 9 1β 11</td> <td>input 1 input 2 input 3</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Mnemonic</th> <th>Octal Code</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>CLSA</td> <td>6135</td> <td>The contents of the clock status register is loaded into the AC and then cleared in the status register. This prevents status information from being lost during the interrogation of the status register.</td> </tr> <tr> <td>CLBA</td> <td>6136</td> <td>The contents of the clock buffer are loaded into the AC. Old value of the AC is lost.</td> </tr> <tr> <td>CLCA</td> <td>6137</td> <td>The contents of the clock counter are transferred into the clock buffer and then the contents of the clock buffer are loaded into the AC. The old value of the AC is lost.</td> </tr> </tbody> </table>			AC bit	Functions	Function	9, 10 & 11	Enable events 9 - input 1 10 - input 2 11 - input 3	The contents of the clock status register is loaded into the AC and then cleared in the status register. This prevents status information from being lost during the interrogation of the status register.	AC bit	Status Condition	Function	β	Overflow 1 thru 8 9 1β 11	input 1 input 2 input 3	Mnemonic	Octal Code	Function	CLSA	6135	The contents of the clock status register is loaded into the AC and then cleared in the status register. This prevents status information from being lost during the interrogation of the status register.	CLBA	6136	The contents of the clock buffer are loaded into the AC. Old value of the AC is lost.	CLCA	6137	The contents of the clock counter are transferred into the clock buffer and then the contents of the clock buffer are loaded into the AC. The old value of the AC is lost.
AC bit	Functions	Function																								
9, 10 & 11	Enable events 9 - input 1 10 - input 2 11 - input 3	The contents of the clock status register is loaded into the AC and then cleared in the status register. This prevents status information from being lost during the interrogation of the status register.																								
AC bit	Status Condition	Function																								
β	Overflow 1 thru 8 9 1β 11	input 1 input 2 input 3																								
Mnemonic	Octal Code	Function																								
CLSA	6135	The contents of the clock status register is loaded into the AC and then cleared in the status register. This prevents status information from being lost during the interrogation of the status register.																								
CLBA	6136	The contents of the clock buffer are loaded into the AC. Old value of the AC is lost.																								
CLCA	6137	The contents of the clock counter are transferred into the clock buffer and then the contents of the clock buffer are loaded into the AC. The old value of the AC is lost.																								
DEC FORM NO 16-1022 ORA 10A	SIZE CODE A SP	NUMBER DK8-EP-1																								
	REV A	REV A																								

SHEET 8 OF 11

ENGINEERING SPECIFICATION

CONTINUATION SHEET

TITLE Real Time Clock, DK8-EP

NOTE:

The clock counter may be read while it is counting. Gating in the clock control prevents data from being strobed out of the counter after a specified time after a clock pulse. This specified time, approximately 500 ns., allows the data to "settle" in the counter. This feature allows the counter to be read any number of times without introducing timing errors, in counting the amount of time between intervals and also eliminates false counts that are the result of reading the counter as one or more bits are in transition from one state to another.

4.2 There are no maintenance instructions.

4.3 Data format is 12 parallel bits to and from counter and to and from buffer. The clock counter may be incremented in a binary count sequence.

4.4 There are no operator controls.

5. Interface Specifications

All signals to and from the DK8-EP to the computer conform to the constraints of the 8/E bus.

SIZE	CODE	NUMBER	REV
A	SP	DK8-EP-1	A

DEC FORM NO 16-1022
DRA 108
SHEET 9 OF 11

ENGINEERING SPECIFICATION

CONTINUATION SHEET

TITLE Real Time Clock, DK8-EP

INSTALLATION PROCEDURES DK8EP/DK8ES

1. Verification of Parts

- A. 1 ea. M518 module
 - B. 1 ea. M860 module
 - C. 1 ea. H851 top block connector (2 if AD8-E is installed)
For DK8ES option add
 - D. 1 ea. 7008492 diagnostic jumper cable
 - E. DK8EF front panel assy
 - F. 5-BNC Connectors
 - G. Three (3) standard 3 conductor phone plugs #12-#943#.
2. Installation (DK8EP)
- A. Install M860 and M518 modules as per D-MU-LAB8-E-4.
 - B. Install top block connector as specified in D-MU-LAB8-E-4 (connector may be installed on either side of the module)

3. Installation (DK8ES)

- A. Install DK8EF front panel assy in H945 option box.
- B. Install M860 module as per D-MU-LAB8-E-4.
- C. Attach DK8EF panel cable to M518 module after routing it through the H945 option box.
- D. Install M518 and M851 as per D-MU-LAB8-E-4.
- E. Check if AD8-E or M8-E option are installed. If yes, then attach another H851 as specified in the MUL to these options.

4. Refer to acceptance and checkout procedures and Maindec for checkout and shipping software.

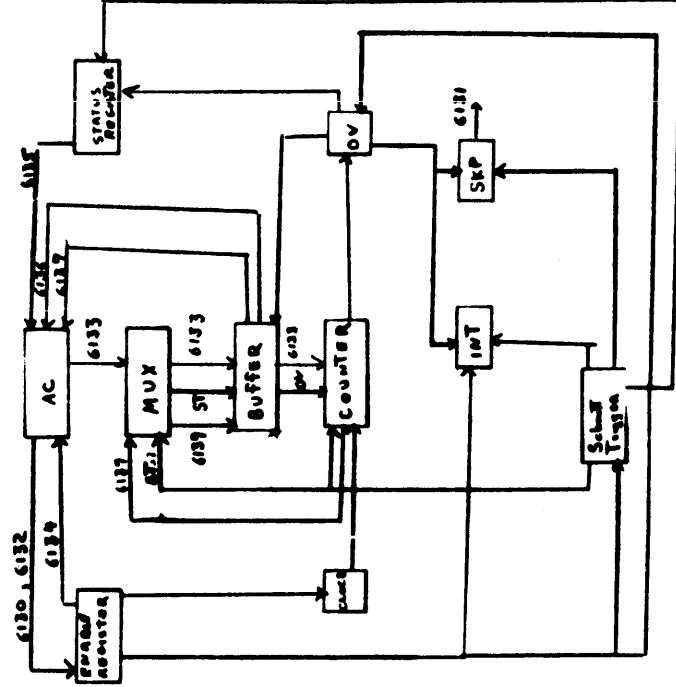
SIZE	CODE	NUMBER	REV
A	SP	DK8-EP-1	A

DEC FORM NO 16-1022
DRA 108
SHEET 11 OF 11

ENGINEERING SPECIFICATION

CONTINUATION SHEET

TITLE Real Time Clock, DK8-EP



ENGINEERING SPECIFICATION

CONTINUATION SHEET

TITLE Real Time Clock, DK8-EP

SIZE	CODE	NUMBER	REV
A	SP	DK8-EP-1	A

DEC FORM NO 16-1022
DRA 108
SHEET 10 OF 11

DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS				DATE 09/15/71	
ENGINEERING SPECIFICATION					
TITLE DK8-EP/DK8-ES ACCEPTANCE PROCEDURES					
REVISIONS					
REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY
A	ECO CHANGE		LAWRENCE	1-6-72	11/11/72
		0003			

EMG <i>Divided</i>	APPD <i>DDM</i>	ORIG <i>Modell</i>	SIZE CODE A	SP	NUMBER DK8-EP-2	REV A
DEC FORM NO. DRA 107						SHEET 1 OF 5

This drawing and specifications, herein, are the property of Digital Equipment Corporation and shall not be reproduced or copied or used in whole or in part as the basis for the manufacture or sale of items without written permission.

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE DK8-EP/DK8-ES ACCEPTANCE PROCEDURES			
IV. ACCEPTANCE TESTS			
A. 1. DK8-EP/ES Register Test			
a. Load Maindec-8E-DBAB-PB as per its document.			
b. Load 0200 into the switch register.			
c. Ingress Addr Load then clear the switch register.			
1. Set bit 00 to a "1".			
d. Depress Clear Key then the Continue Key.			
e. Observe printout - DK8E CLOCKS DIAGNOSTIC.			
f. After each pass the program will printout DK8E PASS COMPLETE.			
g. Allow the test to run for five (5) passes.			
1. Each pass takes approximately 3.5 minutes			
h. Pass - five (5) passes without an error printout.			
NOTE: If the clock option is a DK8-ES proceed to section IV.B.			
2. External Pulse Test			
a. Load 0200 into the switch register.			
1. Depress Addr Load			
b. Set switch register to 0020			
1. Depress Clear Key, then the Continue Key			
c. Observe printout - DK8E CLOCKS DIAGNOSTIC			
d. With the oscilloscope observe a 40 microsecond pulse rate at pins FJ2, FJ1, HMI, and HM2 on the edge connectors which connect the M860 and the M518 modules.			
NOTE: Set TIME/DIV to 10 microseconds to observe this signal. Scope synchronization may be difficult. The waveform is aperiodic.			
This concludes the DK8-EP Acceptance Testing.			
DEC FORM NO. DRA 108			
SHEET 3 OF 5			

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE DK8-EP/DK8-ES ACCEPTANCE PROCEDURES			
SCOPE: The purpose of this procedure is to establish the minimum requirements for DK8-EP and DK8-ES acceptance testing.			
I. SHIPPING HARDWARE			
A. DK8-EP			
1. M860 - Control Module			
2. M518 - Schmitt Triggers and Logic Module			
3. M851 - Edge connector			
B. DK8-ES			
1. DK8-EP			
2. DK8-EP - Front Panel Assembly			
3. Diagnostic Jumper Cable - #70-08492			
4. Five (5) BNC Connectors #12-01455			
5. Three (3) standard 3 conductor phone plugs- #12-09430			
II. SHIPPING DOCUMENTATION AND SOFTWARE			
A. Print Sets			
1. A-AL-DK8-EP			
2. A-ML-DK8-ES			
B. Diagnostic Software			
1. Maindec-8E-DBAC-PB			
2. Maindec-8E-DBAC-D-(D)			
C. Manuals			
1. Lab-8E Maintenance Manual			
2. Lab-8E Users Guide			
3. Lab-8E Programming Card			
III. TEST HARDWARE			
A. DK8EP			
1. Oscilloscope			
B. DK8-ES			
1. Oscilloscope - Model 453 or equivalent.			
2. Two (2) scope probes.			
IV. ACCEPTANCE TESTS			
A. DK8-EP - this section is to be completed for DK8-EP and DK8-ES options.			
NOTE: See A-AL-DK8-EP-3; A-AL-DK8-ES-1; A-AL-DK8-EP-1 for a detailed shipping list.			
DEC FORM NO. DRA 108			
SHEET 2 OF 5			

ENGINEERING SPECIFICATION		CONTINUATION SHEET	
TITLE DK8-EP/DK8-ES ACCEPTANCE PROCEDURES			
IV. ACCEPTANCE TESTS			
B. DK8-ES			
1. External Pulse Test			
a. Load 0200 into the switch register then depress the Addr Load Key.			
b. Set switch register to 0020, then depress the Clear Key and the Continue Key.			
c. Observe printout - DK8E CLOCKS DIAGNOSTIC			
d. With the oscilloscope observe a 40 microsecond pulse rate at pins FJ2, FJ1, HMI and HM2 on the edge connectors which connect the M860 and M518 modules.			
NOTE: Set TIME/DIV to 10 microseconds to observe this signal. Scope synchronization may be difficult. The waveform is aperiodic.			
e. Place the scope probe on the connector, on the front panel, which is labeled OVERFLOW.			
1. Observe a signal whose pulse rate is 40 microseconds.			
2. External Clock Test			
a. Load 0200 into the switch register, then depress Addr. Load.			
b. Set the switch register to 0014.			
c. Depress Clear Key then the Continue Key.			
d. Observe printout - DK8E CLOCKS DIAGNOSTIC.			
e. On the front panel, DK8-EP, ground the input CLOCK IN.			
1. The TTY bell should ring			
3. DK8-EP Front Panel Check			
a. Turn off computer power.			
b. Plug the test cable #70-08492 into the 28 VAC RECEPTACLE J5 on the processor, and plug the three phone jacks into the front panel inputs marked In 1, In 2, and In 4.			
Turn computer power on.			
1. Place scope 1, 2, and 3 switches to the + position.			
NOTE: Never install or remove the 7008492 Diagnostic cable with power on. Serious damage to the H724 Transformer may result as plugs are inserted into panel on a live machine.			
DEC FORM NO. DRA 108			
SHEET 4 OF 5			

ENGINEERING SPECIFICATION

CONTINUATION SHEET

TITLE DK8-EP DK8-ES ACCEPTANCE PROCEDURES

- IV. ACCEPTANCE TESTS
- B. 3. c. Place a scope probe on out 1.
1. Observe a 60 hz square wave.
 2. Check OUT 2 and OUT 4 for the same square wave.
- d. Place a probe on OUT 1 and a second probe on OUT 2.
1. Place SLOPE 2 to the - position.
 2. OUT 2 signal should be 180° out of phase with OUT 1.
- e. Place the second probe from OUT 2 to OUT 4.
1. Place SLOPE 4 to the - position.
 2. OUT 4 signal should be 180° out of phase with OUT 1.
 3. Place SLOPE 1 to the - position
 4. OUT 1 and OUT 4 should be in phase.
 - a. Place the three SLOPE switches to the + position.
- f. While monitoring OUT 1 on the scope, rotate the appropriate THRESHOLD pot.
1. There should be a noticeable movement of the waveform in both directions.
 - a. The square wave may cut out at either or both ends of the THRESHOLD pot movement.
 2. Repeat for OUT 2 and OUT 4.
 - a. Leave the THRESHOLD pots at mid-travel.
4. Schmitt Trigger Input Logic Test
- a. Load 0200 into the switch register.
 1. Depress Addr Load
 2. Set switch register to 2000.
 3. Depress Clear Key then the Continue Key.
 - b. Observe printout - DK8E CLOCKS DIAGNOSTIC
 - c. After each pass the program will printout DK8E PASS COMPLETE
- NOTE: Random errors may be caused by noisy 60Hz power. This can be verified by using a signal generator set to 60 Hz as the input to the Schmitt triggers.
- d. Allow the program to make five (5) passes.
 1. Each pass takes approximately two (2) minutes.
 - e. Pass - five (5) passes without an error printout.

This concludes the DK8-ES Acceptance Testing.

SIZE	CODE	NUMBER	REV
A	SP	DK8-EP-2	A

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ACCESSORY LIST

0 DOCUMENT
 DN DOCUMENT CHANGE
 NOTICE
 PA PAPER TAPE ASCII
 PE PAPER TAPE BINARY
 PM PAPER TAPE
 READ-IN-MODE

QUANTITY VARIATION

DATE 12-17-71
 DATE 12/17/71
 DATE 1/4/72

ITEM NO	DWG NO. / PART NO.	DESCRIPTION	QUANTITY VARIATION										KIT CHECK	BY	INSTALLATION	BY	DATE	
			1	2	3	4	5	6	7	8	9	10						
1	M518	Schmitt Trigger Module	1															
2	M860	Real Time Clock Control Module	1															
3	M861	Edge Connector	1															
4	DK8-EP	DK8-EP Print Set	1															
5	LAB-8E	Lab-8/e Print Set	1															
6	MAINDEC 8E-D8AB-PB	DK8-EP Diagnostic - Binary Tape	1															
7	MAINDEC 8E-D8AB-DL	DK8-EP Diagnostic - Document	1															
8	DEC-LB-HRZA-D	Lab-8/e User's Handbook	1															
9	DEC-LB-HXZA-D	Lab-8/e Maintenance Manual	1															
10		Lab-8/e Programming Card	1															
		NOTE: When item 8 or 9 is temporarily waived, ship the following:																
	A-SP-DK8EP-1	DK8EP Engineering Specification	1															
	A-SP-DK8EP-2	DK8EP Acceptance Procedure	1															

TITLE: DK8-EP Accessory List ASSY. NO. SIZE CODE: A AL NUMBER: DK8-EP-3 REV: CO NO:

SHEET OF

