

KM11 Replica Documentation

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1.0 Introduction

The KM11 as originally created by DEC was two boards (W130 & W131) that plugged into each other. They were originally used on the 11/20 as a means of viewing and controlling the internal processor states not normally visible on the front panel. It was adapted (through the use of overlays) for other processors and some peripherals.

This design for this replica was based on and influenced by two previous designs. The original replica was done by Tony Duell (ard@p850ug1.demon.co.uk). A second design was done by Tom Uban based upon Tony's work.

The KM11 replica represented here uses a single wide double high board to contain all of the components. In order to be useful it must be plugged into a card extender which is then plugged into the appropriate location in the unit (CPU or device) to be debugged. This was done to keep the cost of the board down and most folks who would be using a KM11 seriously should already have a set of card extenders.

2.0 Parts Selection

Table 1 on page 2 lists the parts that are required. The physical constraints of the PCB have dictated certain component selections. In particular the selections for C3 and S1-S4 are critical in terms of physical dimensions. All of the components are available from the various component suppliers (Digikey, Mouser Electronics, etc).

TABLE 1.

KM11 Parts List

Part	Value	Description
C1, C2	10nf @ 50V	Ceramic disc capacitor 0.01 uf
C3	330uf @ 16V Xicon 140-XAL16V330	Axial lead electrolytic capacitor
IC1-IC4	ULN2803A	NPN darlington array
IC5	SN7400	Quad 2-input NAND gate
IC6	SN7406	Hex inverter with HV open collector outputs
LED1-LED28	Kingbrite W1503ID	5mm Red
R1-R28	330ohm @ 1/4 W	
R29-R33	1K ohm @ 1/8 W	
S1-S3	E-Switch 100SP1T1B1M2RE	SPDT ON-ON toggle switch
S4	E-Switch 100SP2T1B1M2QE	SPDT ON-ON momentary toggle switch

3.0 Board Assembly

Before starting assembly, clean the PCB with a no residue contact cleaner. That will remove any oils and residue that remain on the board after the manufacturing process. It also goes without saying to use good soldering techniques.

Figure 1 on page 4 shows the identifications and locations of the parts on the KM11 board.

Start by placing the resistors on the board. Make sure that the leads are bent cleanly and that they are tight against the board prior to soldering them.

Insert the LEDs (again make sure that they are tight against the board). The flat side on the silk screen indicates the cathode. Depending upon the specific LED chosen the cathod will be indicated either by a flat on the plastic part of the LED or a “short” lead (ie the anode will be longer). Make sure that this is correct prior to soldering or else the LED will not work!

Next insert and solder the ICs and then the capacitors. Again making sure that the parts are tight against the board. In particular, make sure that the correct ICs are placed into the correct locations with the correct orientaion. Pay attention to the polarity of C3! When soldering the ICs don’t use too much heat at once.

Finally insert and solder the switches. It is best to do one switch at a time and solder just one lead. Since the leads are what are physically holding the switch upright, it is at

this point where the alignment of the switch should be made (ie vertical). DO NOT force the switch if it is at an angle. Heat the joint and move it when it is at the correct angle let it cool (if it is moved while cooling a cold solder joint will result which can result in failures). Once the switch is correctly positioned, solder the remaining two leads.

For S1-S3 the position of the switch during installation is unimportant. However, because S4 is momentary, it is important that it be installed correctly. Using the E-switch specified in the parts list, this will be with the switch handle pointing towards the LEDs.

Finally, examine all of the solder joints to make sure that there is enough solder, the joints look clean/bright and that there are no solder bridges.

Once complete, clean the board with a good no residue flux cleaner to remove any solder flux from the board.

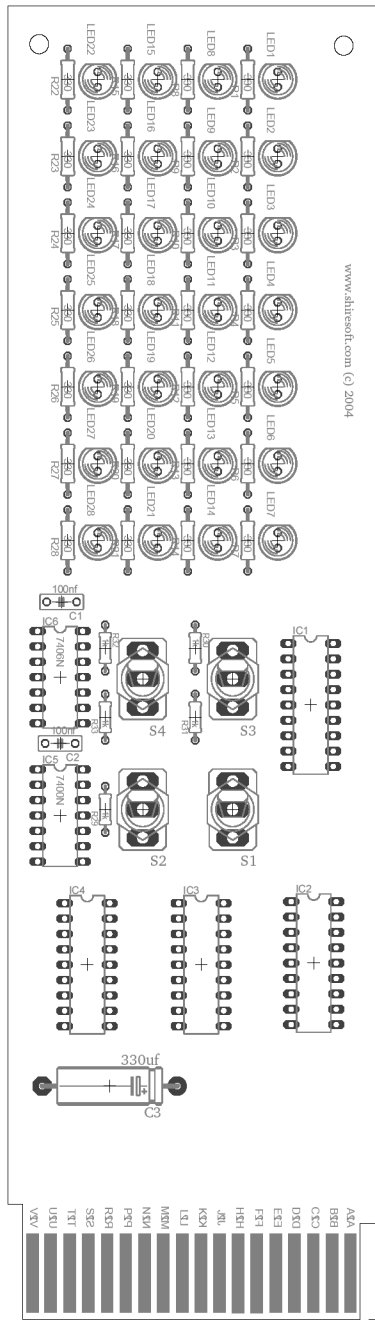
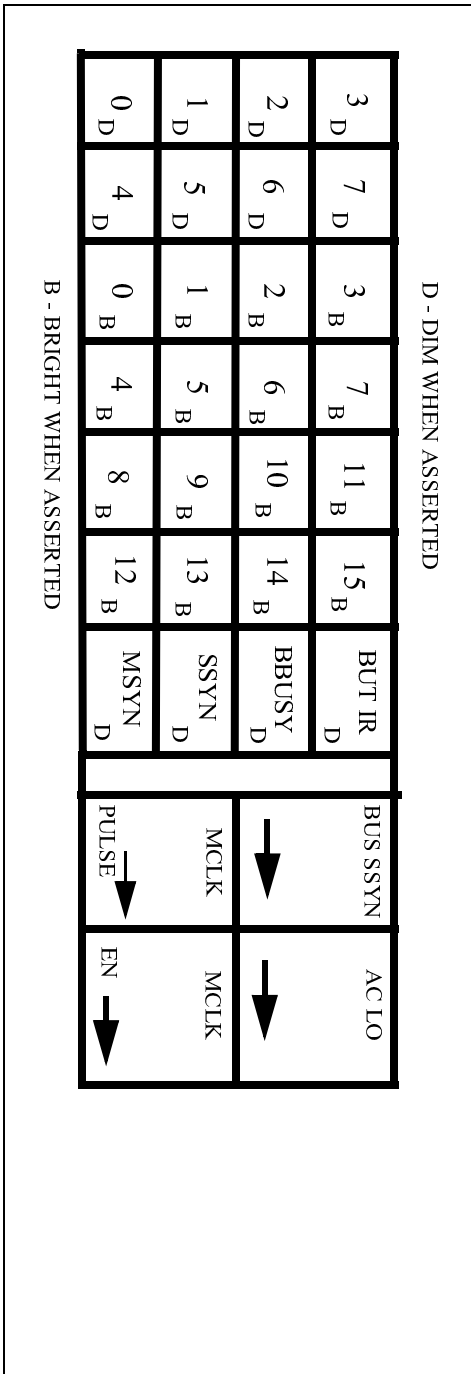
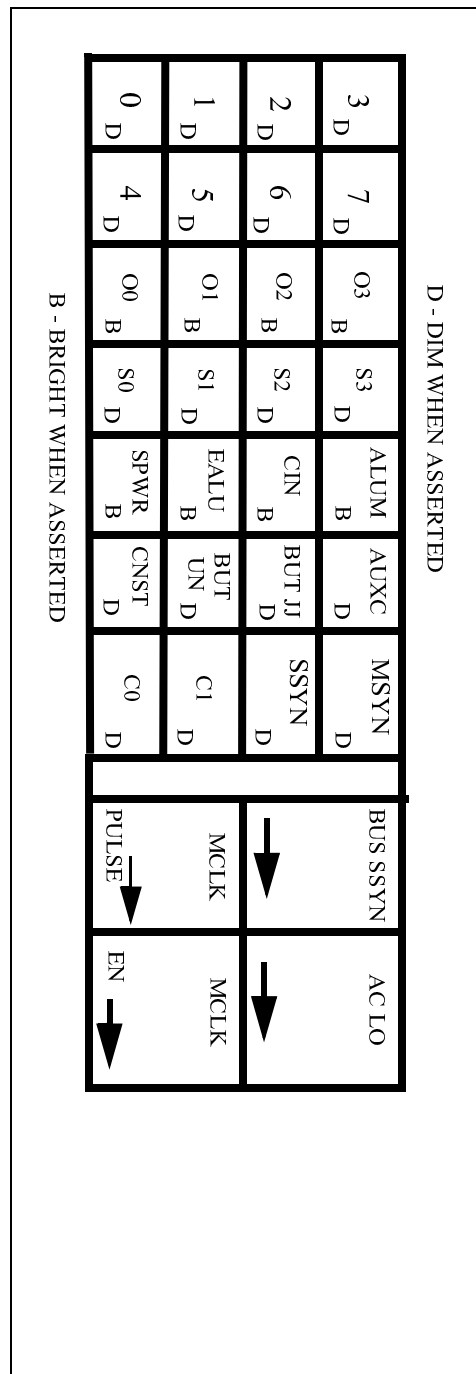


FIGURE 1.

KM11 Component Layout



11/05 KM-1



11/05 KM-2

TPH F	T1 F	T2 F	T3 F	T4 F	T5 F	BUST	CLK	S1	FUNC	S2	S1
MEM	CPFC1 FPEC1	EN T3 DLY	BBSY	MSSYN	SSYN	CNTL OK	XTAL RC	0	NORM Op	0	0
FP SYNC	FP REQ	FP ATTN	FP WAIT	REF REQ1	REF REQ2	AERF	MAINT	S2	uPB STOP	0	1
T	N F	Z F	V F	C F	PAR ERR	SERF	STPR →	0	ROM CYCL	1	0
								1	SING TP	1	1

KB11-A,D
FP11-B,C

R/W2	T	N	ISR15	ISR0	BSR15	BSR0	BUS	NO TIME
TST1	TRAPS	Z	ISR14	ISR1	BSR14	BSR1		
TST2	MSYN	V	ISR12	ISR3	BSR12	BSR3	MCLK	MCLK
ISR2	SSYN	C	ISR8	ISR12	BSR8	BSR7	TOGGLE	ENABLE

KA11 (11/20)

PUPP 6	PUPP 3	PUPP 0	BUPP 6	BUPP 3	BUPP 0	C		MSTOP
PUPP 7	PUPP 4	PUPP 1	BUPP 7	BUPP 4	BUPP 1	V		MCLK
PUPP 8	PUPP 5	PUPP 2	BUPP 8	BUPP 5	BUPP 2	Z	MCLK	MCLK
		TRAP	SSYN	MSYN	T	N		ENABLE

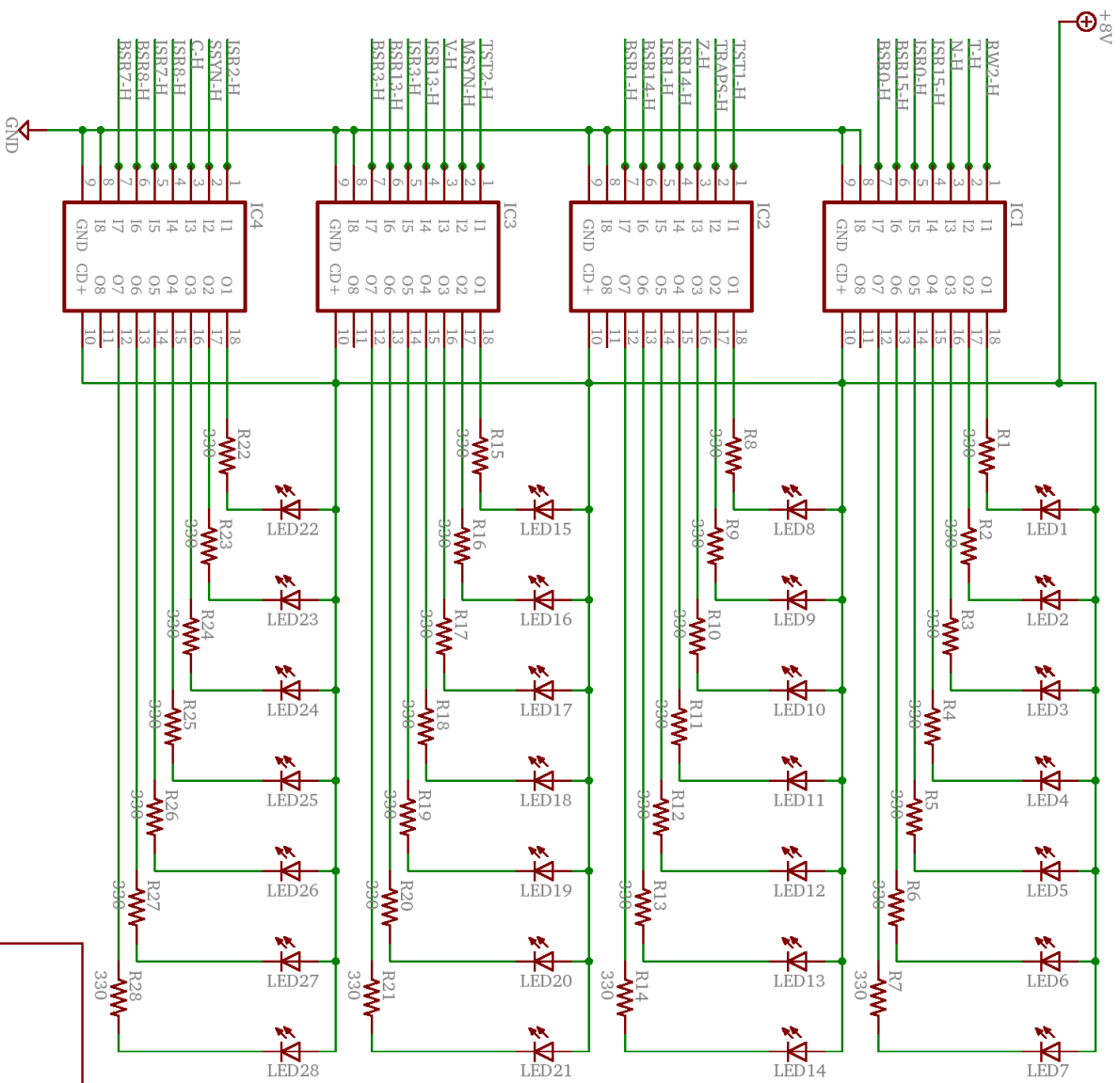
KD11A (11/40)

KT11-D				KE11-E,F			
PBA 15	PBA 12	PBA 09	PBA 06	B15	DR00	EPS (C)	
PBA 16	PBA 13	PBA 10	PBA 07	ECN 00	DR09	EPS (V)	
PBA 17	PBA 14	PBA 11	PBA 08	EXP UNFL	MSR 00	EPS (Z)	
ROM A	ROM B	ROM C	ROM D	EXP OVFL	MSR 01	EPS (N)	

KT11-D & KE11-E,F

RKDA 03	RKDA 07	RKDA 10	R1	WC OVF	SEEK RSET	CNTL RDY	A1	B2
RKDA 02	RKDA 06	RKDA 09	RKDA 12	WT GATE	RD RDCK	HE	OFF	OFF
RKDA 01	RKDA 05	RKDA 08	RKDA 11	RD GATE	WT WTCK	DATA	U1	V2
RKDA 00	RKDA 04	D1	FILE FULL	FILE EMPTY	IN BUF FULL	OUT BUF FULL	OFF	OFF

RK11-D



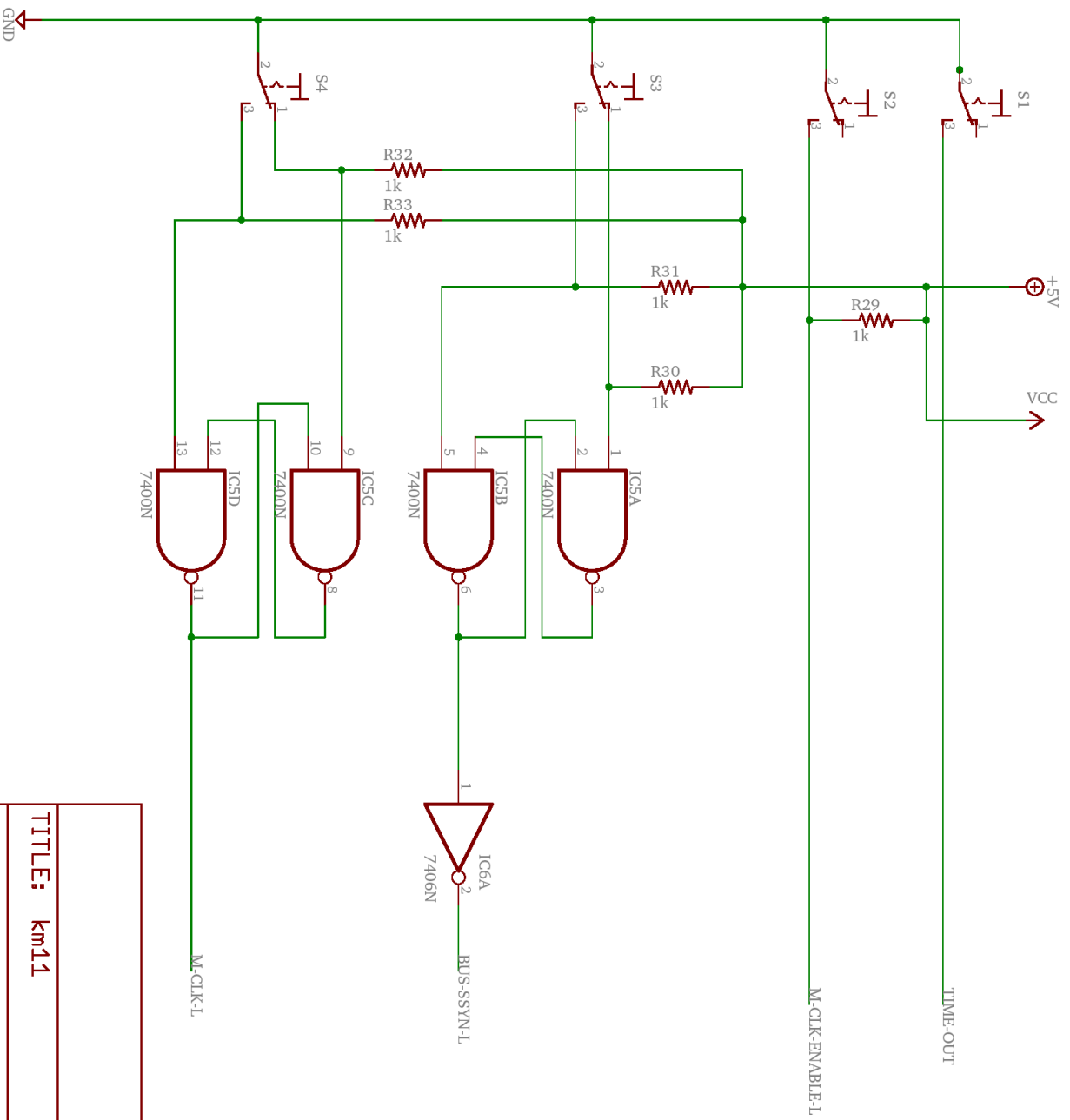
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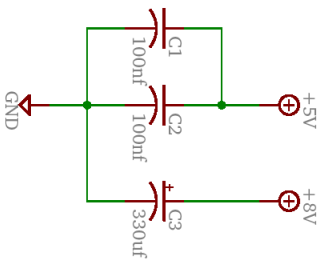
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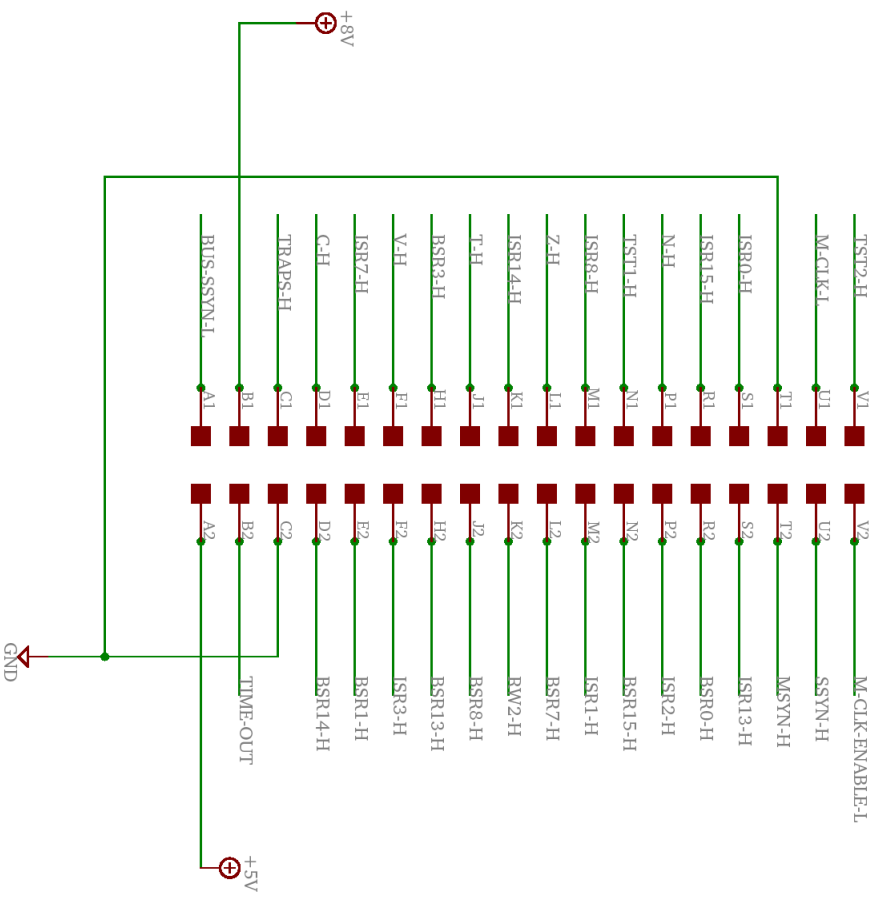
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