



**DR-216**  
**INSTALLATION GUIDE**

**P/N 06510 REV K**

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**REVISIONS**

REV	SHEET	DESCRIPTION	APPROVED	DATE
A	A11	Release to Production	BC	1-28-85
B	6	ECN 3894	C. Lynch	2-21-85
C	7,3	ECN 3946	C. Lynch	4-12-85
D	3	ECN 3999	Q.E.Q.	26 Jun 85
E	6	ECN 4006	JAN	7/16/85
F	ALL	ECN 4057	JAN	10/15/85
G	7,8	ECN 4136	JAN	1/29/86
H	ADDENDUM	ECN 4454	JAN	2/21/87
J	P. 8,9	ECN 4703	JAN	6/2/88
K	PGS.9-11	ECN 4933	JAN	7/12/89

**APPROVALS**

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## ADDENDUM TO DR-216 INSTALLATION GUIDE

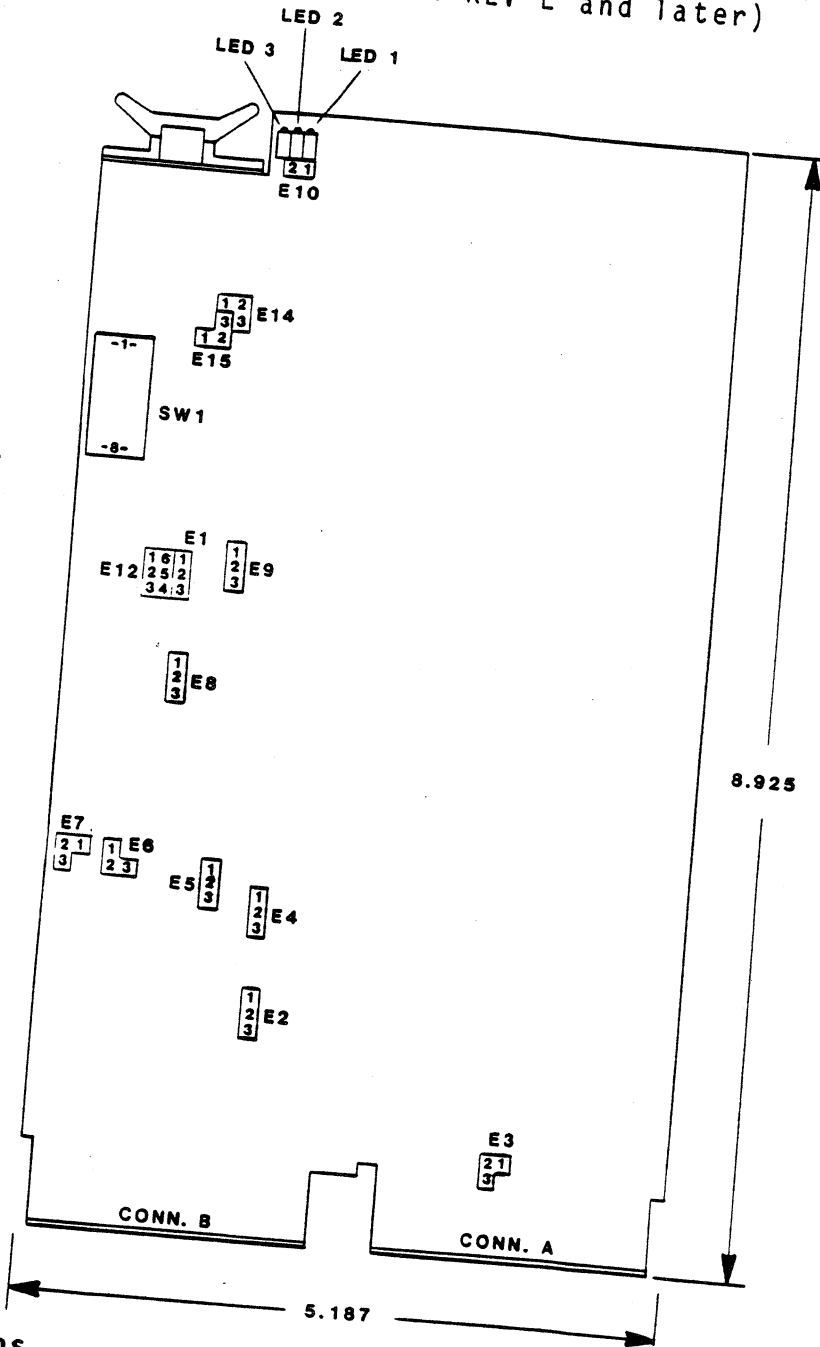
In certain system configurations, it is possible for the DR-216 memory module to short to the stiffener bar of the module below it causing system failure. Therefore, when installing the DR-216, verify that it does not contact the stiffener bar of the module below it. If contact does occur, move either the DR-216 or the other module to prevent possible system malfunction.

# INSTALLATION

## Switch Settings

When installing the DR-216, set the starting address according to Table 1. Set the CSR address according to Table 2.

**Figure 1. DR-216 Jumper Locations**  
(Boards at REV E and later)



## Jumper Options

Table 3 summarizes all jumper functions. Figures 1&2 detail the jumper locations for the different revision levels of artwork.

To determine which drawing to use, inspect switch 1. If switch 1 is an 8 position DIP, use Figure 1. If switch 1 is a 10 position DIP, use Figure 2. For boards with a 10 position DIP, positions 9 and 10 are not used.

Figure 2. DR-216 Jumper Locations  
(Boards at REV D and earlier)

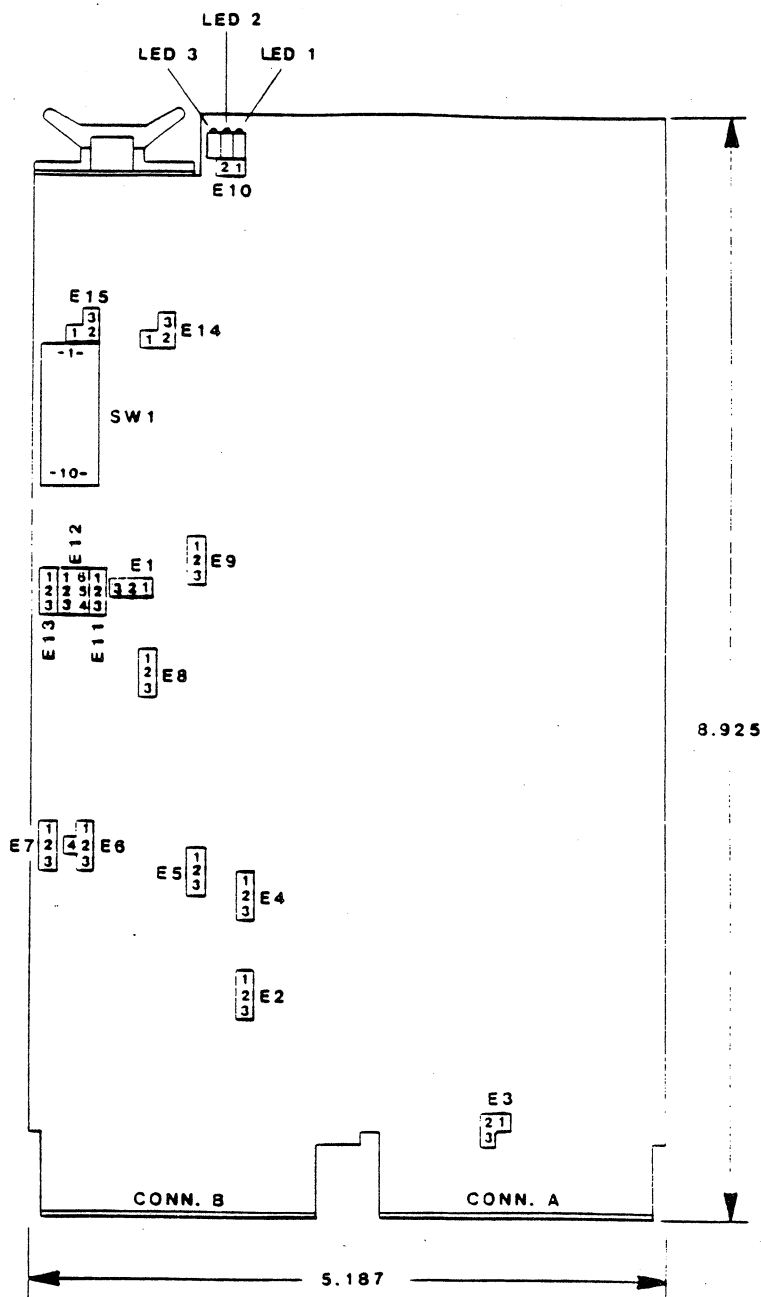


Table 1 - Switch SW1

STARTING ADDRESS	POS 8	POS 7	POS 6	POS 5
0KW	OFF	OFF	OFF	OFF
8KW	ON	OFF	OFF	OFF
16KW	OFF	ON	OFF	OFF
24KW	ON	ON	OFF	OFF
32KW	OFF	OFF	ON	OFF
40KW	ON	OFF	ON	OFF
48KW	OFF	ON	ON	OFF
56KW	ON	ON	ON	OFF
64KW	OFF	OFF	ON	OFF
72KW	ON	OFF	OFF	ON
80KW	OFF	ON	OFF	ON
88KW	ON	ON	OFF	ON
96KW	OFF	OFF	OFF	ON
104KW	ON	OFF	ON	ON
112KW	OFF	ON	ON	ON
120KW	ON	ON	ON	ON

For all other settings use equal increments of 128KW plus the appropriate 8KW increment from the above table.

	POS 4	POS 3	POS 2	POS 1
0 - 128KW	OFF	OFF	OFF	OFF
128 - 256KW	ON	OFF	OFF	OFF
256 - 384KW	OFF	ON	OFF	OFF
384 - 512KW	ON	ON	OFF	OFF
512 - 640KW	OFF	OFF	ON	OFF
640 - 768KW	ON	OFF	ON	OFF
768 - 896KW	OFF	ON	ON	OFF
896 - 1024KW	ON	ON	ON	OFF
1024 - 1152KW	OFF	OFF	OFF	OFF
1152 - 1280KW	ON	OFF	OFF	ON
1280 - 1408KW	OFF	ON	OFF	ON
1408 - 1536KW	ON	ON	OFF	ON
1536 - 1664KW	OFF	OFF	OFF	ON
1664 - 1792KW	ON	OFF	ON	ON
1792 - 1920KW	OFF	ON	ON	ON
1920 - 2048KW	ON	ON	ON	ON

ON = Closed  
OFF = Open

**Table 2 - CSR Address Select**

16 Bit Address	18 Bit Address	22 Bit Address	Jumper E12			
			Pin 1 to 2	Pin 2 to 3	Pin 4 to 5	Pin 5 to 6
172100	772100	17772100	OUT	OUT	OUT	OUT
172102	772102	17772102	IN	OUT	OUT	OUT
172104	772104	17772104	OUT	IN	OUT	OUT
172106	772106	17772106	IN	IN	OUT	OUT
172110	772110	17772110	OUT	OUT	IN	OUT
172112	772112	17772112	IN	OUT	IN	OUT
172114	772114	17772114	OUT	IN	IN	OUT
172116	772116	17772116	IN	IN	IN	OUT
172120	772120	17772120	OUT	OUT	OUT	IN
172122	772122	17772122	IN	OUT	OUT	IN
172124	772124	17772124	OUT	IN	OUT	IN
172126	772126	17772126	IN	IN	OUT	IN
172130	772130	17772130	OUT	OUT	IN	IN
172132	772132	17772132	IN	OUT	IN	IN
172134	772134	17772134	OUT	IN	IN	IN
172136	772136	17772136	IN	IN	IN	IN

**NOTE:**

E5 Pin 2 to 3 disables CSR selection.  
 E7 Pin 2 to 3 must be installed for 16 or 18 bit address operation.



**Table 3 - Jumper Function Summary**

<b>FUNCTION</b>	<b>IN</b>	<b>OUT</b>
<b>CSR Selection</b>		
Disable CSR	E5-2 to E5-3	E5-1 to E5-2
Enable CSR	E5-1 to E5-2	E5-2 to E5-3
	E9-1 to E9-2	E9-2 to E9-3
<b>Parity Error Reporting</b>		
Non-CSR	E1-2 to E1-3	E1-1 to E1-2
With CSR	E1-1 to E1-2	E1-2 to E1-3
<b>Write Wrong Parity Enable</b>		
Enable	E6-1 to E6-2	E6-2 to E6-3
Disable	E6-2 to E6-3	E6-1 to E6-2
<b>Parity</b>		
Disable	E4-2 to E4-3	E4-1 to E4-2
Enable	E4-1 to E4-2	E4-2 to E4-3
<b>Memory Size</b>		
Fully Populated	E14-1 to E14-2	E14-2 to E14-3
Half Populated	E14-2 to E14-3	E14-1 to E14-2
<b>Addressing</b>		
16/18 Bit Address	E7-2 to E7-3	E7-1 to E7-2
22 Bit Address	E7-1 to E7-2	E7-2 to E7-3
<b>Battery Backup</b>		
Battery Backup	E3-2 to E3-3	E3-1 to E3-2
No Battery Backup	E3-1 to E3-2	E3-2 to E3-3
<b>Block Mode</b>		
Enable	E2-1 to E2-2	E2-2 to E2-3
Disable	E2-2 to E2-3	E2-1 to E2-2
<b>I/O Space Size</b>		
4KW	E8-1 to E8-2	----
	E8-2 to E8-3	----
	E9-1 to E9-2	E9-2 to E9-3
2KW	E8-2 to E8-3	E8-1 to E8-2
	E9-1 to E9-2	E9-2 to E9-3
1KW	E8-1 to E8-2	E8-2 to E8-3
	E9-1 to E9-2	E9-2 to E9-3
.5KW	-----	E8-1 to E8-2
	-----	E8-2 to E8-3
	E9-1 to E9-2	E9-2 to E9-3

Table 5-3. (Cont'd)

FUNCTION	IN	OUT
64K/256K DRAMs		
64K	E15-1 to E15-2 E10-1 to E10-2	E15-2 to E15-3 ---
256K	E15-2 to E15-3 ---	E15-1 to E15-2 E10-1 to E10-2

### COMPUTER INSTALLATION

The DR-216 plugs into a dual-width Q-Bus (LSI-11) slot. Install the DR-216 into a LSI-11 computer as follows:

1. Set starting address. Take care not to overlap memory module addresses. If they do, the computer will not boot.
2. Set the CSR address if CSR is enabled. Each CSR must have a unique address. If more than one CSR is used, the CSR addresses must be in increasing order relative to the memory which it is monitoring. For example, if memory locations 0000 to 512K words have a CSR located at address 17772104, the next CSR must be at an address above 17772104 (i.e., 17772106, 17772110). In this configuration, CSR addresses 17772100 and 17772102 cannot be used.
3. Plug the DR-216 into the computer.

### NOTE:

Due to a design change, jumper point E4 has been eliminated and should no longer be inserted on assembly numbers 61545, 61546, 61548 and 61549 revision levels C7 or D4. The assembly number and revision level are stamped on the solder side of the board along one edge.

All other revision levels still require jumper E4-1 to E4-2 to be inserted for parity to be enabled.

### Status Indicators

The DR-216 contains three LED indicators, shown in figure 2 which define the following conditions:

LED1 (RED) - When LED1 is lit, a memory cycle, is in progress.

LED2 (RED) - When LED2 is lit, a parity error has occurred on the memory board. LED2 is reset (extinguished) by initializing the system with BINITL, or by writing a zero into bit 15 of the status register.

LED3 (GREEN) - When LED3 is on, correct power is being supplied to memory. LED3 is powered by the +5VB line. Thus, if the +5VL supply fails, the LED remains lit if proper backup power exists.

## DIAGNOSTICS

The DR-216 is compatible with all DEC memory diagnostics. However some diagnostics will not exercise the entire memory board. The following is a list of recommended diagnostics for the DR-216:

11/23, 11,23+, 11/73 Processors and the MicroPDP.

Use either diagnostic ZMSD?? or VMSA??

### NOTE

The 11/73 processor has an on-board cache that must be disabled prior to running any diagnostics. The steps are as follows:

1. Boot the operating system. XXDP or XXDP+.
2. After the prompt, a period (.), press the break key if enabled or the halt switch on the front panel.
3. Deposit 14 in location 17777746, the cache control register. This will disable the cache on the 11/73.
4. Type P to return to XXDP or XXDP+. Do not use the GO command Because a bus INIT will be issued which will clear the cache control register.

## MICROVAX I

Use diagnostic EHXMS.

### NOTE

The 2 megabyte DR-216 will fail with this diagnostic. The error message will be:

```
Error during test 2, subtest 5
Memory configuration Test, Memory/CSR Correlation Test
Part 1
Too few memory CSRs present; expected at least 2, found 1
```

This error will occur on all board larger than 1 megabyte, including DEC's. Later versions of the diagnostic should have this problem corrected. Presently, the only way around this problem is to disable the halt feature of the diagnostic.

## Determining Bad RAM Locations

If a diagnostic uncovers a bad RAM location it should be replaced to insure data integrity.

All DRAMs are socketed so replacement can be done with little trouble. To find the location of a defective DRAM on the DR-216 follow the procedure outlined below. All addresses are given in both octal and decimal to facilitate replacement.

1. Subtract the starting address of the DR-216 memory board from the address of the bad DRAM.
2. Determine which row the bad DRAM is in by using the appropriate table below. Table 5-4 is for DR-216 memory boards populated with 64K DRAMs and Table 5-5 is for boards with 256K DRAMs. Use only the first two entries in a table for half populated boards.

**Table 5-4. 64K DRAMs**

Address			Row
Octal	Decimal		
0-377777	0-128KB		A
400000-777777	128KB-256KB		C
1000000-1377777	256KB-384KB		B
1400000-1777777	384KB-512KB		D

**Table 5-5. 256K DRAMs**

Address			Row
Octal	Decimal		
0-1777777	0-512KB		A
2000000-3777777	512KB-1024KB		C
1000000-5777777	1024KB-1536KB		B
6000000-7777777	1536KB-2048KB		D

3. The row letter is silkscreened on the edge of the board opposite from the connector fingers. The bit numbers are silkscreened down the side of the DRAM array near the long edge of the board. The parity bits are designated by P0 and P1

## TROUBLESHOOTING GUIDE

The DR-216 is completely tested prior to shipping. However sometimes problems do occur and the board fails to function correctly. If a problem does arise, the following sequence of steps should be followed to isolate the fault.

1. With power off, remove the DR-16 from the backplane and visually inspect it for damaged components and other obvious problems.

2. Check the strapping of the board against Table 5-3, and use Table 5-1 to insure that switch 1 (SW1) is set to the proper starting address.
3. Turn power on and check the backplane for proper voltages at the following pins:

+5V	AA2, BA2, BV1
+5V BBU	AV1
4. Remove power from the backplane and replace the DR-216 in the computer. Turn the computer back on and verify that the DR-216 can be read from and written to under ODT.
5. If the fault has been isolated to the DR-216, run one of the diagnostics recommended in the Diagnostic Section. If the system will not boot with the DR-216, put a working memory board at location 000000 and set the address of the DR-216 in question to start above that of the lower board. Now boot and run the diagnostic.
6. If the problem persists, further assistance on the DR-216 installation can be obtained through DATARAM's toll free number - (800)822-0071.

