

# New Technical Notes

Macintosh



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Developer Support

## CMOS On Macintosh LC PDS

### Hardware

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February 1991

This Technical Note provides PDS card developers with some important information about making PDS cards for the Macintosh LC.

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Due to the way the Macintosh LC was designed, Apple strongly recommends that all PDS cards be developed with CMOS parts.

### Why?

Apple recommends using CMOS parts because of the way the timing works inside the V8 ASIC. When a CPU access to VIA1 takes place at exactly the same time as a VRAM transfer cycle, the LS245 buffers between the memory bus and the processor bus are disabled three clocks before the end of the CPU cycle. Since all the parts on the bus are CMOS, even though the bus is not driven, it does not return wrong data because bus capacitance keeps the bus in the correct state.

If an expansion card is added to the system, and that expansion card uses a TTL buffer, the load caused by the TTL part can cause the bus to discharge, resulting in wrong read data. If expansion cards are built using CMOS buffers or CMOS ASICs, then these problems are avoided and all are happy.

### Solution

Therefore, all expansion cards for the Macintosh LC should have CMOS drivers on the high byte of the data bus. This can be done either by using a CMOS buffer, such as a 74ACT245, or by driving the bus directly from a CMOS gate array. Since this only shows up when the CPU is accessing VIA1 at the same time as a video refresh happens, it does not show up frequently. For this reason, it would be a good idea to test any system with a new I/O card by writing a tight loop that reads VIA1 and verifies correct data over a several second period. This would ensure that the data bus is not being discharged by the expansion card.