DOUBLE DENSITY THE PERCOM WAY

Can you modify your Model I Double Density Adapter? Sure you can!

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If you bought the Radio Shack Model I Double Density Adapter Kit to increase disk storage on your old Model I you soon realized that you were all alone in the world. All your Model I owning friends had done the smart thing. They bought the PERCOM Doubler which let them use all the neat new operating systems on the market. You and I were stuck with Model I Double Density TRSDOS and little else. You may have decided to make the best of a bad deal and live with your double density (of a sort), but I spent a lot of time looking at my NEWDOS80 Version 2 manual with all those PDRIVE command options, references to "double density" and so forth.

Circuit descriptions

A comparison of the schematics showed me that the same double density disk controller chip was used on both adapter boards. The only differences between the two were the method of addressing the bit which selected single or double density and the method of enabling write precompensation. On the Radio Shack version, density selection is done by using the upper three (3) bits of data written to the sector write register at address 37EEH (A1 is high and A0 is low). See figure 1 for the schematic of the circuit. A normal write to the sector-write register will contain zeroes in data bits D5-D7 (there are no sectors greater than 31). This inhibits the density select decoder (U10) by placing a logic high on the G2A input. A write to the sector write register with any of D5-D7 active (D5'-D7' low) will enable the select decoder (U10) and allow a density change to occur. Remember that all data lines on both adapter boards are present only in their inverted state. See Table 1 for the control functions of each combination of D5-D7. Notice that write precompensation is enabled by the software.

The PERCOM method of density selection is entirely different (as we already knew). This circuit, shown in figure 2, clocks a D-type flip-flop when address lines A1 and A0 are low (this forms address 37ECH when the disk controller write enable line is active) and data lines D3-D7 are high. Data line D0 is then latched into the flip-flop to select single or double density. Address 37ECH is the address for the disk controller's command register. At first glance it appears that this method of addressing would cause the active controller to execute an unwanted (and possibly data-eating) instruction. A peek at the command summary for both controller chips quickly shows why this is not a problem: There is no instruction which corresponds to a high condition on datalines D3-D7. The active disk controller does not mind being given a meaningless command and we can safely swap active controller chips without fear. Write precompensation is always selected in double density with the PERCOM system.

D7	D6	D5	FUNCTION
0	0	0	No function
0	0	1	No function
0	1	0	Select drive side 0 N/A PERCOM
0	1	1	Select drive side 1 N/A PERCOM
1	0	0	Set double-density mode
1	0	1	Set single-density mode
1	1	0	Disable precompensation
1	1	1	Enable precompensation

TABLE 1—CONTROL FUNCTIONS of data lines for the Radio Shack Double-Density Adapter.

At this point you might say that this is an interesting comparison of two relatively simple address decoding schemes, but where's my double density?

Because of an interesting quirk on the part of the designers of the 7400 TTL family I found a reliable solution to my problem. The Radio Shack circuit board uses a 74LS10 integrated circuit (U11) in the enable circuit for the select decoder. This chip is a collection of three NAND gates with three inputs each. I was able

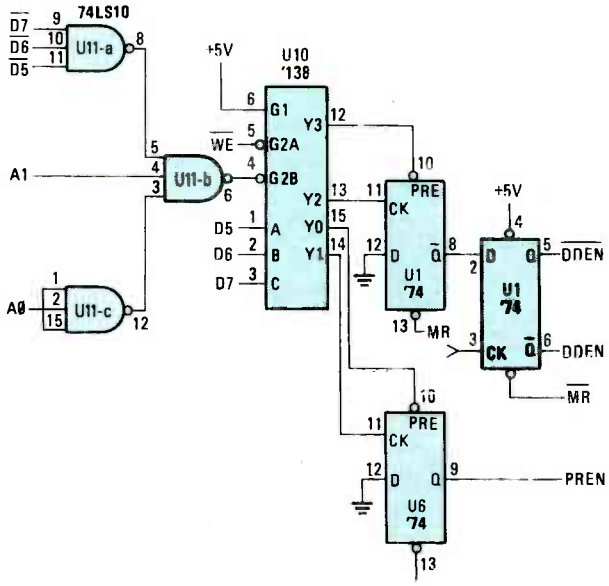

FIG. 1—SCHEMATIC DIAGRAM of the Radio Shack double-density adapter enable circuitry.

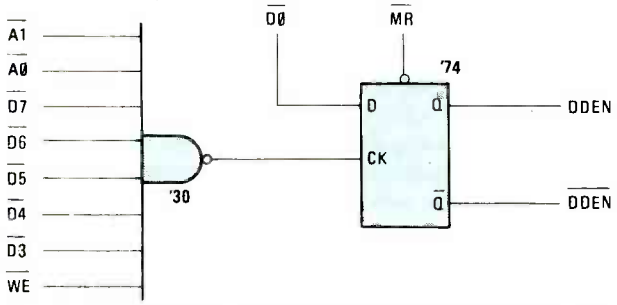

FIG. 2—REPRESENTATION OF PERCOM doubler enable circuitry.