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THE COMPUTER CORNER

Memory 2 – The "Sticks"

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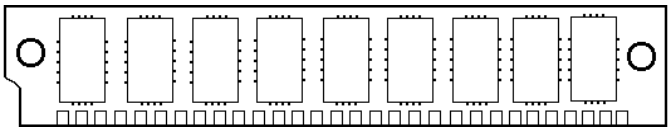
SIMM, DIMM, Fast Page Mode DRAM, EDO RAM, Burst EDO, SDRAM, RDRAM. What a bunch of alphabet soup! What do they all mean? What are they for? What do they look like? Here we go with a continuation of last month's discourse. Let us begin with the physical aspects of memory, especially the SIMMs and DIMMs, alias memory "sticks".

Back in the old XT and early AT days, you added memory to a motherboard by plugging in individual chips, typically little 14-pin guys or DIPs. Typically, a computer with one megabyte of memory (640 kb of "DOS" or conventional memory) used 4 rows of these chips, each row containing nine chips, for a total of 36. A row of 9 chips was called a "bank" of memory. Motherboards were really large back then. They had to be to hold enough sockets for all four banks of chips! Later, Single Inline Memory Modules (SIMMs) were invented. As shown here (a



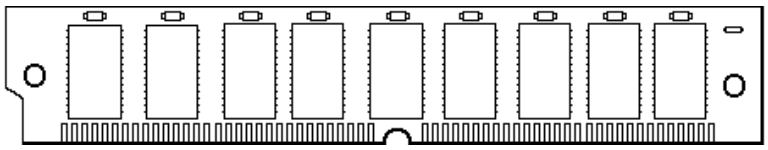
30-pin, 256kb module, 3½ inches long), these were actually little circuit boards designed to plug into the motherboard. Each SIMM typically carried 9 DIP chips soldered to them, although there were models with 8 chips (non-parity) and later, others with only three. Surface mount technology allowed DIP packages to be made smaller than the old style that plugged directly into the motherboard, so the SIMMs took less space than equivalent DIPs. Furthermore, SIMM boards were mounted in a vertical position in their sockets, thus saving even more space on the motherboard. The majority of motherboards carried four sockets (though many carried eight, and I once had one that carried 16!). The four were arranged as two banks of memory, each bank containing two SIMMs. As SIMM technology advanced, four DIPs were combined into one physical chip, resulting in circuit boards which carried only three chips total - two large and one small. A 386SX motherboard with four SIMM sockets could carry up to 16 Mb of memory total. SIMMs themselves were commonly found in 256kb, 1Mb and 4Mb sizes (though 16Mb versions were available, too). Given four sockets and the 3 common sizes of SIMMS, there were 12 possible memory configurations:

FIRST BANK		SECOND BANK		
SIMM #1	SIMM #2	SIMM #3	SIMM #4	TOTAL
256kb	256kb	None	None	0.5Mb
1Mb	1Mb	None	None	2Mb
4Mb	4Mb	None	None	8Mb
256kb	256kb	256kb	256kb	1Mb
256kb	256kb	1Mb	1Mb	2.5Mb
256kb	256kb	4Mb	4Mb	8.5Mb
1Mb	1Mb	256kb	256kb	2.5Mb
1Mb	1Mb	1Mb	1Mb	4Mb
1Mb	1Mb	4Mb	4Mb	10Mb
4Mb	4Mb	256k	256k	8.5Mb
4Mb	4Mb	1Mb	1Mb	10Mb
4Mb	4Mb	4Mb	4Mb	16Mb

All SIMMs in a bank had to be the same size and speed, and some 386SX machines required the SIMMS in the second bank had to be the same size or larger than those in the first, so some of

the duplicate total memory configurations in the above table wouldn't work. Such was the world of the 16-bit data path found in 286 and 386SX computers.

The 386DX and all 486 machines had a 32-bit data path. SIMMs with 72 pins were designed for these models (though many of these machines still used the 30-pin jobs). The 72-pin SIMMS were larger in size (4¼ inches long) and had a slightly different configuration so they could not be mistakenly plugged into a 30-pin socket or vice-versa. Notice the half-moon cutout on the bottom.



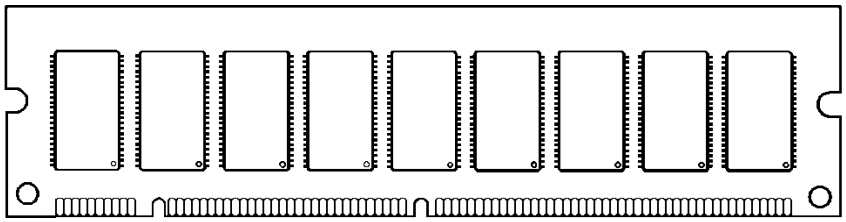
A corresponding bump on the socket prevented mistakenly trying to insert a 30-pin SIMM in a 72-pin socket.

The memory configurations for a 486 that used 72-pin SIMMs were a bit different than earlier computers. First, a single 72-pin "stick" made up one memory bank all by itself, and these came in 4, 8, 16, 32, 64 and 128 Mb sizes. Many 486 machines only had two 72-pin slots on the motherboard. Given these conditions, here are some of the most common possibilities:

FIRST BANK	SECOND BANK	
SIMM #1	SIMM #2	TOTAL
4Mb	None	4Mb
4Mb	4Mb	8Mb
4Mb	8Mb	12Mb
4Mb	16Mb	20Mb
4Mb	32Mb	36Mb
8Mb	None	8Mb
8Mb	8Mb	16Mb
8Mb	16Mb	24Mb
8Mb	32Mb	40Mb
16Mb	None	16Mb
16Mb	16Mb	32Mb
16Mb	32Mb	48Mb
32Mb	None	32Mb
32Mb	32Mb	64Mb

You can see from comparing the tables that there is one major difference besides total memory available. The 30-pin SIMMS have to be used in pairs to fill a single bank of memory, while the 72-pin versions can be used singly. A nice touch!

Pentiums are 64-bit machines and would require eight 30-pin modules or two 72-pin sticks. A newer module was devised for current machines with 168-pins, called the Dual Inline Memory Module (DIMM). While the little gold contacts on 30 and 72-pin SIMMS were the same on both sides of the board (and connected to each other), the 168-pin DIMMs, shown here, are different



on the two sides. These modules are also larger than their predecessors (5¼ inches wide) and have two notches. A single DIMM services an entire memory bank, and they come in 8, 16, 32, 64, 128 and (!) 256 Mb capacities. We've gone from 256kb SIMMs just a few years ago to 256Mb DIMMs. That is an order of magnitude jump. Wow!

That's all for this month. I've left a lot of stuff out, like SIMM and DIMM speed, and the dangers of using sticks with gold contacts in tin sockets or vice versa. Next time we'll do types of RAM. Happy computing!