	Hard disk	RAM	CPU	Video	Expansion Cards
Basic office Desktop PC	500GB	2-4GB	I3 –i5	Basic (VGA)	n/a
High end office	500GB	4-8GB	I5-i7 Multicore	Basic VGA	Support for 2 screens
Graphic design inc 3D CAD	1TB	8-16GB	I5-17 Multicore	High Res	
Video	1TB x 2	8-16GB	I5-i7	High end	Support for multiple screens
Gaming	500GB	16GB	High end	High end with lots of RAM	
Home server	2TB	4-8GB	I3-i5	Basic	n/a
Cloud service provider with multiple VMs	2TB or more	8-16GB	High End Multicore	Basic	n/a

PC Configurations

Things to memorise

Port numbers

Cable lengths and rates

RAM types and pins for DIMM and SODIMM – DDR2, 3, 4 variants only

Processors and sockets

Storage device capacities and data transfer rates

Wifi standards (802.11)

There are two ways people refer to DDR RAM, as a DDR-XXX or PC-XXXX. For example, DDR200 is also PC1600.

The 200 in DDR200 is the clock rate of the memory modules (the chips on the memory stick). It is double the clock speed of the system it's plugged into, since it is DDR (and so operates twice per cycle).

The 1600 in the PC1600 is the maximum number of bytes per second that the RAM allows, and is not achievable in the real world.

To calculate one from the other, we do

TransferRate = MemoryFrequency x 8

Below are the combinations implemented in the real world:

Name (based on memory freq)	Alt Name (based on transfer speed)	Data Transfer speed in Bps (Bytes per sec)	Data Transfer speed in bps (bits per sec)
DDR200	PC1600	1600Bps	1600x8 = 128,000 bps
DDR266	PC2100		
DDR333	PC2700		
DDR400	PC3200		
DDR2-400	PC2-3200		
DDR2-533	PC2-4200		
DDR2-667	PC2-5300		
DDR2-800	PC2-6400		
DDR2-1066	PC2-8500		
DDR3-800	PC3-6400		
DDR3-1066	PC3-8500		
DDR3-1333	PC3-6400		
DDR3-1600	PC3-12800		

DIMMs and SODIMMs have a different number of pins depending on the type used.

- **DDR SDRAM DIMM**: 184 pins

- **DDR2 SDRAM DIMM**: 240 pins

- **DDR3 SDRAM DIMM**: 240 pins

- **DDR4 SDRAM DIMM**: 288 pins

- **DDR SDRAM SODIMM**: 200 pins

- **DDR2 SDRAM SODIMM**: 144 or 200 pins

- **DDR3 SDRAM SODIMM**: 204 pins

- **DDR4 SDRAM SODIMM**: 260 pins

Socket types

- Intel: LGA, 775, 1155, 1156, 1366

- AMD: 940, AM2, AM2+, AM3, AM3+, FM1, F

Dual-channel motherboards are very common. If you look at a dual-channel motherboard, you see that it has four memory slots, two slots of one color and two slots of another color. Figure 3-3 shows a diagram of four memory slots labeled for a motherboard using an Intel-based CPU. Slots 1 and 3 are one color, and slots 2 and 4 are another color.
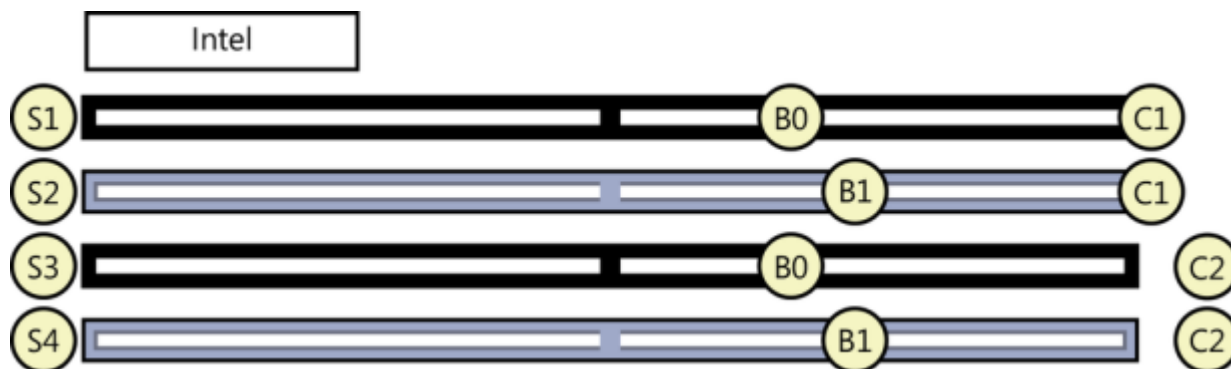

Figure 3-3. Intel-based DDR slots (S), banks (B), and channels (C).

- **Slots**: Each slot can accept one DIMM.

- **Banks**: A bank is composed of two slots. In Figure 3-3, Bank 0 includes slots 1 and 3 and these two slots are normally blue. Bank 1 includes slots 2 and 4 and these slots are normally black. This is standard for Intel CPU-based motherboards.

- **Channels**: Each channel represents a separate 64-bit communication path. Slots 1 and 2 make up one channel, and slots 3 and 4 make up the second channel.

EXAM TIP

On most motherboards, the slots are color-coded to identify the banks. Slots of the same color indicate the same bank, and matched pairs should be installed in these slots.

You can install a single DIMM in slot 1, and the system will have a single-channel RAM. You can purchase DIMMs in matched pairs, and it's important to know in which slots to install them. For the best performance, you should install matched DIMMs in the same bank. Looking at Figure 3-3, you should install the matched pair of DIMMs in slots 1 and 3 (Bank 0), leaving slots 2 and 4 empty. The system will take advantage of the dual-channel architecture by using two separate 64-bit channels.

What happens if you install the DIMMs in slots 1 and 2 instead? The system will still work; however, both DIMMs are installed in channel 1, so the system will work with only a single channel. RAM will be about half as fast as it could be if it were installed correctly to take advantage of the dual channels.

Figure 3-3 and the previous explanation describe the color coding, banks, and channels for Intel-based CPU motherboards. However, most motherboards designed for AMD CPUs are organized differently, as shown in Figure 3-4. On these motherboards, slots 1 and 2 make up

Bank 0, and slots 3 and 4 make up Bank 1. Channel 1 includes slots 1 and 3, and channel 2 includes slots 2 and 4.
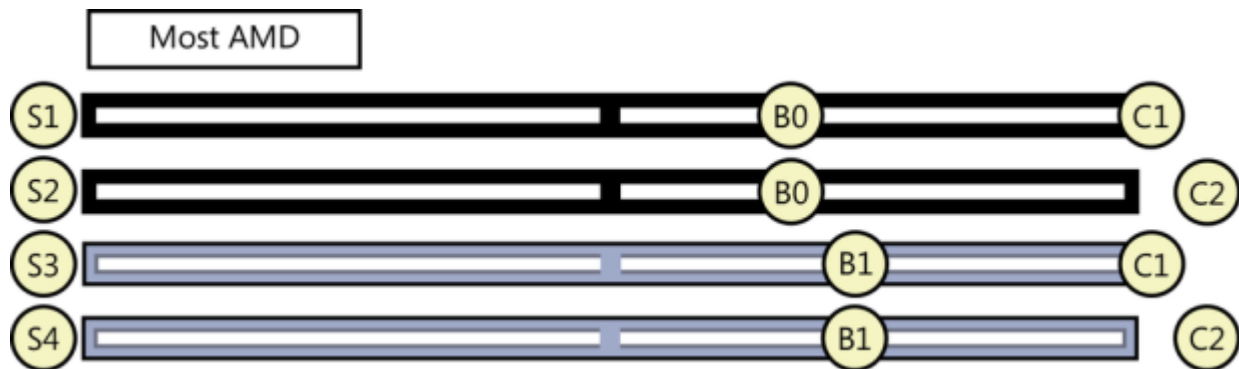

Figure 3-4. AMD-based DDR slots (S), banks (B), and channels (C).

While this can be confusing between different motherboards, the good news is that most motherboard manufacturers use the same color for each bank. For Intel-based motherboards, Bank 0 includes slots 1 and 3, and these will be the same color (often blue). Bank 1 includes slots 2 and 4, and they will be a different color (often black). AMD motherboards also use one color for Bank 0 (slots 1 and 2) and another color for Bank 1 (slots 3 and 4).

EXAM TIP

Many motherboards allow the use of different size DIMMs in different channels. However, for the system to use the multichannel capability, each DIMM within a bank must be the same size. If one DIMM in a bank is 1 GB and the second DIMM in the bank is 2 GB, the sizes are different and the system will use single channel. Also, you can use different speed DIMMs in the same bank, although this is not recommended. The speed of the bank will default to the lower-speed DIMM or, in some cases, to single channel.