Expanding RAM on the Amiga 4000

by Adam Levin-Delson

Commodore currently sells the Amiga 4000 with two megabytes of Chip RAM and four megabytes of Fast RAM. Chip RAM refers to memory that both the CPU and the Amiga's custom chips can access directly. The custom chips cannot directly access Fast RAM. Two megabytes is the maximum amount of Chip RAM that the computer can presently access, but Fast RAM can be upgraded to a maximum of either four or 16 megabytes, depending upon the type of RAM used.

Memory Layout

All the A4000's RAM is packaged in SIMM (single in-line memory module) format, which is easy to handle, making upgrading a simple procedure. A single four-megabyte SIMM is used to give the Amiga its four megabytes of Fast RAM. This leaves three more Fast RAM SIMM slots, each capable of holding another four megabytes for a total of eight, twelve, or the maximum of sixteen megabytes of Fast RAM. It is possible to use less expensive one megabyte SIMMs as Fast RAM, but since SIMM types cannot be mixed this would require the removal of the existing four-megabyte SIMM. Since there are only four SIMM slots, using one-megabyte SIMMs would yield a maximum of four megabytes of memory.

The single slot for Chip RAM is unique in that it has no neighboring slot to its right. This allows the use of a double-sided SIMM (with chips on both sides), instead of the single-sided SIMMs as required by the spacing of the Fast RAM SIMM slots. A single two-megabyte SIMM is used to give the Amiga its two megabytes of Chip RAM. This SIMM may be removed and a one-megabyte SIMM used in its place, giving a total of one megabyte of Chip RAM.

Adding Memory

Adding SIMMs to the existing Fast RAM requires no additional action. Changing from four megabyte to one megabyte SIMMs (or vice versa) requires changing a jumper on the motherboard. This jumper (J852) is on the left side of the motherboard (the same side as the SIMM slots are on). It is labelled ‘‘SIMM SIZE’’ and has two positions: ‘‘256K x 32’’ and ‘‘1M x 32’’. Jumper the ‘‘256K’’ pin and the center pin for one megabyte SIMMs, the ‘‘1M’’ pin and the center pin for four megabyte SIMMs.

No jumper change is required when switching between one-megabyte and two-megabyte Chip RAM SIMMs.

SIMM Specifications

Each one megabyte Fast RAM SIMM must meet the following specifications:

physical: 72-pin, single-sided SIMM with a maximum height of one inch (If this SIMM is to be used as Chip RAM, it may be double-sided).
electrical: 80-nanosecond DRAM, 256 kilobytes by 32 bits or 256 kilobytes by 36 bits.

Each two megabyte Fast RAM SIMM must meet the following specifications:

physical: 72-pin, SIMM with a maximum height of one inch (This SIMM is only suitable as Chip RAM. As such, it may be double-sided).
electrical: 80-nanosecond DRAM, 512 kilobytes by 32 bits or 512 kilobytes by 36 bits.

Each four megabyte Fast RAM SIMM must meet the following specifications:

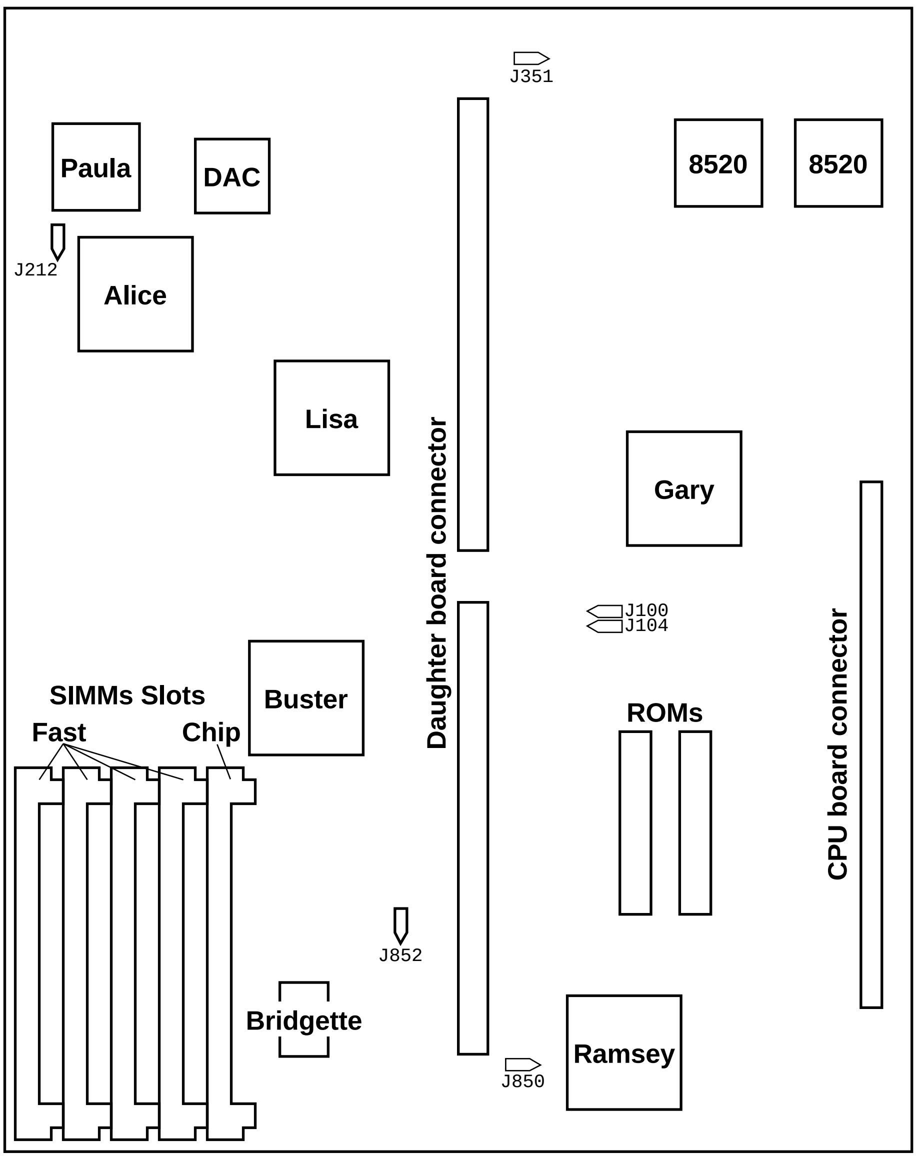
physical: 72-pin, single-sided SIMM with a maximum height of one inch.
electrical: 80-nanosecond DRAM, 1 megabyte by 32 bits or 1 megabyte by 36bits.

The ‘‘by 36 bits’’ parts are overkill in that only the first 32 bits are used, but they may be more readily available than the ‘‘by 32 bits’’ parts.

Amiga 4000 Block Diagram

Below is a block diagram of a production A4000 motherboard. It shows the approxomate position of most of its major chips and most of the jumpers that may be of interest to delelopers.

J100/J104 - Both are three pin jumpers. Together, these jumpers determine the source of the CPU clock. For both J100 and J104, if pins 1 and 2 are connected, the CPU daughterboard uses the internal clock on the motherboard. If pins 2 and 3 are connected, the daughterboard uses its own clock. As the 68040 daughterboard has its own clock, pins 2 and 3 are the default. These two jumpers must be set to the same clock!



J212 - This is a three pin jumper. If pins 1 and 2 are connected, the system defaults to an NTSC system. If pins 2 and 3 are connected, the system defaults to a PAL system.

J351 - This is a two pin shunt. If it is closed, the system will assume floppy drive DF1: is a 880K floppy drive. If it is open, the system assumes DF1: is a 1.76M floppy drive.

J850 - This is a two pin shunt. If it is closed, the system will use the DSACK signal to terminate a bus cycle. If it is open, the system will use the STERM signal.

J852 - This is a three pin jumper. If pins 1 and 2 are connected, the system assumes that the Fast RAM SIMMs are 4 Megabyte SIMMs. If pins 2 and 3 are connected, the system assumes that the Fast RAM SIMMs are 1 Megabyte SIMMs.

SIMM Manufacturers

The following companies make the listed SIMMs which are known to work in the A4000. This list is not intended to endorse any particular manufacturer, nor to imply that other sources do not exist. This list is included solely for completeness of information.

Part	Commodore part number	Manufacturer	Manufacturer part number
1 megabyte SIMMs	391396-01	Motorola	MCM32256S-80
			MCM32L256S-80
		Micron	MT8D25632M-80
2 megabyte SIMMs	391517-01	Motorola	MCM32512S-80
		Micron	MT16D51232M-80
		Texas Instruments	TM512CBK32-80
4 megabyte SIMMs	391518-01	Motorola	MCM32100S-80
		Micron	MT8D132M-80
		Texas Instruments	TM124BBK32-80