

Progressive 040 / 3000

68040 Accelerator Card for the Amiga 3000

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1. Introduction

Congratulations on your purchase of the Progressive 040 accelerator card for the Amiga 3000 computer. The Progressive 040 brings the high-speed processing power of the leading-edge Motorola® 68040 25MHz CPU to your Amiga™ 3000 computer. A 25MHz A3000 equipped with the Progressive 040 will operate at up to 4 to 6 times its normal speed. The Progressive 040 transforms an Amiga 3000 into a powerful workstation, with performance and capabilities previously found only in high-end workstations costing thousands of dollars more. For 3-D modeling, ray-tracing, multimedia applications, intensive multi-tasking, and any other processor-intensive work, the Progressive 040 produces results several times faster than previously possible.

1.1. About the Motorola 68040

Motorola rates the 68040's performance at about 19.2 MIPS (Million Instructions Per Second) - faster than a SPARC 25MHz processor (19 MIPS), the R3000 RISC 20MHz processor (17 MIPS), a 68030 50 MHz processor (12 MIPS), and the Intel '486 processor. Raw floating point and integer operations are nearly twice as fast as a 50 MHz 68030. You won't need to buy a separate math coprocessor - it's built right in to the 68040 CPU! Performance analysis software, included on the disk, rates the Progressive 68040/A3000 at up to 35 times the speed of a standard Amiga 500.

1.2. About the Progressive 040 Card

The Progressive 040 makes use of the 32-bit wide memory provided on the A3000 motherboard. The accelerator installs in the A3000's processor slot beneath the floppy drive bay, and the installation procedure is simple, requiring little time or technical skill. A low-profile 20+ year "whisper-fan" is mounted on the card to ensure reliable operation in even the most hostile climates. The Progressive 040 is compatible with both PAL and NTSC systems.

1.3. Software Compatibility Issues

Compatibility with AmigaDOS™ release 2.0 and 2.0 - compatible third party application software has been extensively tested for reliability and performance. However, incorrectly written software may not run on a 68040 accelerated Amiga. For these programs, we have provided a software "switch", which allows you to toggle between the 68040 and 68030 processors.

1.4. Progressive 040 Utility Software

Additional software utilities enable and disable specific processor functions, such as instruction and data caching, copyback mode, and write-through mode. The utility disk also includes high performance floating-point software.

1.5. Glossary

Instruction Cache - A 4096 byte buffer inside the 68040 chip which speeds processing times by storing repeated instructions. The Instruction Cache can be turned ON or OFF by a number of available utilities. See **Section 4 Cache Operation**.

Data Cache - A 4096 byte buffer inside the 68040 chip which speeds processing times by storing local data. The Data Cache can operate in either "Write-Through" or "Copyback" modes. The Data Cache can be turned ON or OFF, or placed in "Write-Through" or "Copyback" modes by a number of available utilities. See **Section 4 Cache Operation**.

Copyback Mode - The Data Cache mode which holds local data in the cache and writes it to memory only when the cache is flushed or when the cache is full. See **Section 4 Cache Operation**.

Write-Through Mode - The Data Cache mode which holds local data in the cache and keeps an up-to-date copy of the data in memory. See **Section 4 Cache Operation**.

MIPS - Meaning "Millions of Instructions Per Second", this term is often used to express the speed of a processor.

2. *Hardware Installation*

The hardware installation procedure is not complicated, but it does require that you disassemble your Amiga 3000 to gain access to its motherboard. If you are uncomfortable with this procedure, you may want to have a qualified Amiga technician install the Progressive 040 for you.

2.1. *The Danger of Static Electricity*

The greatest potential for permanent damage to your Amiga 3000 or Progressive 040 comes from static electricity. even the smallest electrical discharge from you to an exposed computer chip can ruin the microcircuitry inside that chip. For this reason you should do everything possible to avoid static electricity and to ensure that you ground yourself each time you work with electronic parts. To reduce this danger, we suggest the following:

- Do not work on or near carpeting.
- Work at a table over a tiled, linoleum or concrete floor.
- Don't wear clothes which attract static electricity (wool, nylon, polyester, etc.).
- Ground yourself each time you are about to pick up any electronic component. The hardware of a kitchen sink or the metal screw on a light switch are acceptable grounds.

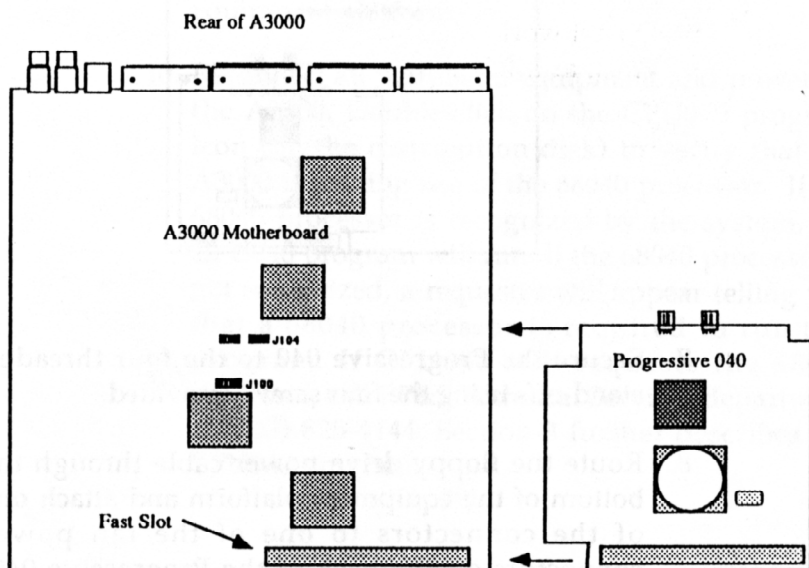
2.2. *Installation Procedure*

Prerequisite: *The AmigaDOS 2.0 ROMs must be installed and tested prior to installing the Progressive 040 accelerator card. The Progressive 040 will not operate if AmigaDOS 1.3*

ROMs are installed in your Amiga 3000. If your Amiga 3000 is not equipped with AmigaDOS 2.0 ROMs, you can obtain a set from your local Amiga Dealer.

Note: During the installation, we will ask you to disassemble your Amiga 3000. Chapter 4 of Introducing the Commodore AMIGA 3000™ (which came with your Amiga 3000 computer) provides complete instructions for disassembling your Amiga.

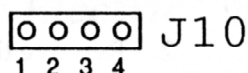
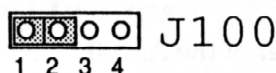
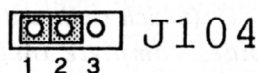
1. Disconnect power from the Amiga 3000
2. Remove the cover of the A3000.
3. Remove the equipment platform and disconnect the equipment cables from the motherboard for whatever equipment is installed on the platform.
4. Orient the A3000 motherboard so that the Fast Slot connector is nearest you. Locate jumpers J100 (4 pin) and J104 (3 pin) on the A3000 motherboard.



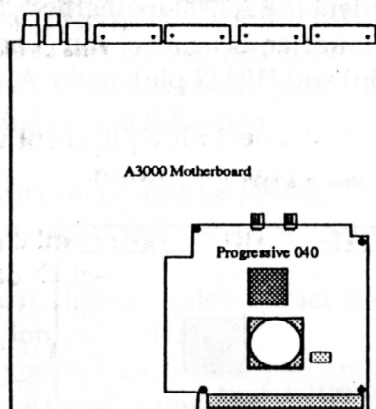
5. Remove the J100 jumper, and move the J104 jumper from pins 1 & 2 to pins 2 & 3.

Original Jumper
Positions

New Jumper
Positions

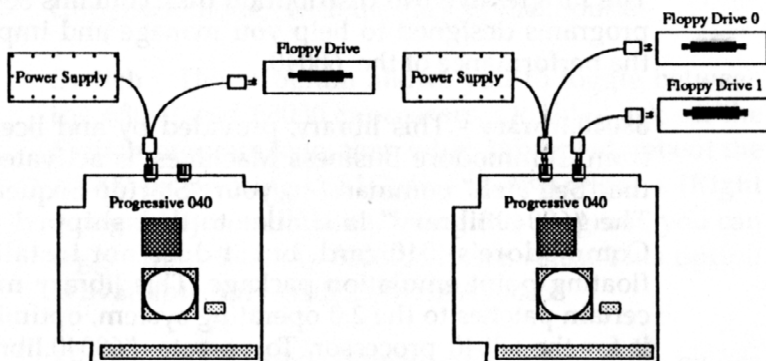


6. Align the Progressive 040 and Fast Slot connectors and firmly but gently plug the Progressive 040 into the Fast Slot.



7. Secure the Progressive 040 to the four threaded stand-offs using the four screws provided.
8. Route the floppy drive power cable through the bottom of the equipment platform and attach one of the connectors to one of the fan power connectors on the back of the Progressive 040.

Route the remaining power connector back up through the equipment platform to provide power to the floppy drive.



Note: If your A3000 is equipped with two floppy drives, attach one end of the power pass-through cable (provided) to the free fan power connector, then route the other end of the pass-through cable up through the equipment platform to provide power to the second floppy drive. On some Amiga 3000s, only one end of this cable will fit the floppy drive connector.

9. Reconnect all equipment cables and reattach the equipment platform.
10. Reconnect all peripheral equipment and power up the A3000. Double-click on the CPU040 program icon (on the distribution disk) to verify that the A3000 is making use of the 68040 processor. If the 68040 processor is recognized by the system, the CPU040 program will run. If the 68040 processor is not recognized, a requester will appear telling you that a 68040 processor is required to run this program. If CPU040 still requests the 68040 processor, call PP&S Technical Services department at (303) 825-4144. Section 3 further describes the CPU040 program.

3. *Software Installation*

The Progressive 040 distribution disk contains several programs designed to help you manage and improve the performance of the 68040.

68040.library - This library, provided by and licensed from Commodore Business Machines, is activated by the "SetPatch" command in your "Startup-Sequence". The "68040.library" is similar to that shipped with Commodore's '040 card, but it does not install the floating point emulation package. This library makes certain patches to the 2.0 operating system, optimizing it for the 68040 processor. To operate, "68040.library" must reside in your LIBS: directory. An installation program, "InstallLIB", copies the "68040.library" to the current LIBS: directory for you. Double-click on the "InstallLib" icon to start the installation. You will be asked to confirm the installation by typing "Y" followed by a [Return], or abort the installation by typing a "N" followed by a [Return]. Alternatively, you can copy the "68040.library" to the LIBS: directory manually, using a disk utility program or the CLI.

FastSys - Running this program copies certain system pointers and routines from their current location to the fastest Ram found in the system. Doing this increases the performance of the 68040, especially when performing floating point operations. Add the following command to your "Startup-Sequence":

FastSys

FP040 - The 68040 does not contain all of the instructions found on the 68881 and 68882. FP040 emulates these missing instructions. You can have the Amiga 3000 run this program automatically by placing it (with its icon) in the "WBStartup" drawer of your A3000. You can also run FP040 from the CLI.

CPU040 - Running this program allows you to quickly turn on/off Instruction cache, Data cache, Burst mode, and toggle between Write-through mode and Copyback mode, with the click of the mouse.

Switch - This program allows you to toggle between the 68040 and 68030 processors. Double-click on the Switch program icon, then when prompted, reboot the A3000 by pressing the [Ctrl] + [Left Amiga] + [Right Amiga] key combination. Using this program, you can toggle from 68040 to 68030, or vice versa. This option is available only with 25 MHz A3000's!

SysInfo - This public domain program, written by Nic Wilson, provides information about the system software, available memory, available drives, and internal hardware. It also provides speed comparisons between your Amiga and other Amiga systems. Complete SysInfo documentation is on the distribution disk in file form.

4. Cache Operation

The 68040 processor contains a 4096 byte Instruction Cache and a separate 4096 byte Data Cache. Using the two caches to buffer information speeds code execution several times over.

4.1 Instruction Cache

The instruction Cache works by holding groups of instructions that may be repeated, making them immediately accessible by the CPU. When the Instruction Cache is OFF, the CPU reads all of its instructions directly from memory. If groups of these instructions repeat, the CPU has to read them each time they repeat (figure 1). However, when the Instruction Cache is ON, the 68040 holds the repeated instructions in its Instruction Cache, so that it doesn't have to access the memory until new instructions are executed (figure 2). If a program never repeats any instructions, having the Instruction Cache ON has no effect on processing speed.

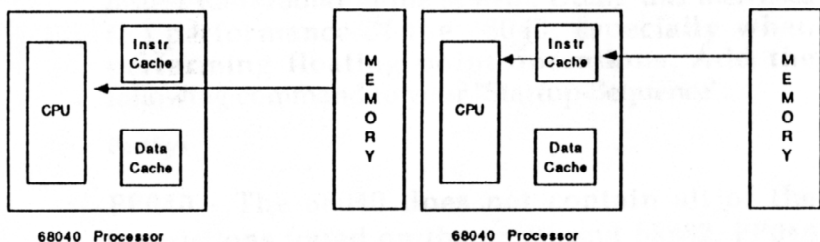


Figure 1

Figure 2

4.2 Data Cache

Like the Instruction Cache, the Data Cache holds information within the 68040 to avoid memory access whenever possible. The Data Cache can be OFF, or can be ON in one of two modes: Write-Through and Copyback. When the Data Cache is OFF, the CPU reads and writes all data directly from memory (figure 3). However, when the Data Cache is ON, the 68040 holds local data in its Data Cache, allowing immediate access to the local data (figure 4). The Data Cache may contain CPU modified data. At some time, the memory will have to be updated so that it contains the same data as the Data Cache. The Data Cache mode determines when the 68040 updates the memory with the modified data.

4.2.1 Write-Through Mode

When the Data Cache is in Write-Through mode, the 68040 writes the data held in the Data Cache to memory during the next available memory bus cycle. The CPU can still operate on the data held in the Data Cache without waiting for it to be written to memory. This is the traditional Data Cache mode used by the 68030 processor.

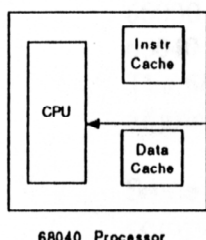


Figure 3

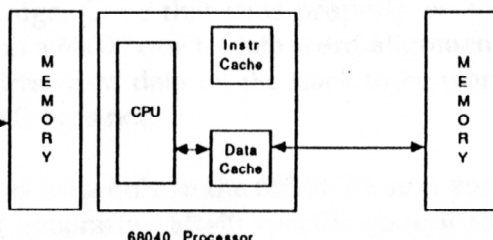


Figure 4