A1200 CPU Card Expansion RAM

by Michael Sinz

When the Amiga OS boots, it automatically notices and utilizes expansion hardware (such as RAM). Prior to the A3000, the only CPU native to any Amiga was the MC68000, which could only address a 24-bit wide address space. As a result, the address space that was available to these machines was only 24 bits wide. CPU expansion products for the MC68000-based Amigas (like the A2630 for the A2000) can utilize address space beyond the 24-bit limit, but the CPU board cannot use the AutoConfig process to add expansion RAM in the address space beyond the 24-bit limit.

Like the MC68000 based Amigas, the Amiga 1200 also has a CPU that only addresses a 24-bit wide address space, the MC68EC020. Also like most of the MC68000 based Amigas, it is possible to add a CPU expansion device. One way the A1200 differs from its 24-bit siblings is the A1200 has set aside a 128 Megabyte range of address space ($0800 0000 through $0FFF FFFF) specifically for such a device (just like the A3000). Any expansion RAM on the A1200's CPU card should appear in this range.

The Release 3 OS in the current A1200 is not smart enough to recognize a 32-bit CPU expansion device vs. a 24-bit expansion device. As a result, the system assumes that the expansion device is a 24-bit expansion device. If a user expands their A1200 with a 32-bit CPU card that has 32-bit expansion memory on it, the OS cannot automatically add the CPU card's expansion memory during the autoconfig process. The CPU card's ROM has to add the memory to the system.

The code to make the A1200 smart enough to recognize a 32-bit CPU card will be in a future ROM revision. This change will allow the OS to automatically notice and add the CPU card's expansion RAM. This makes it possible for the system to add this 32-bit memory to the A1200's system memory relatively early in the boot process. Because the memory is available earlier in the boot process, Exec has the opportunity to use the 32-bit memory for system purposes (this can include the supervisor stack, ExecBase, and most other library bases).

This change presents a minor problem for an A1200 CPU card that adds its own memory. Before the CPU card can add its memory to the system memory list, it must make sure the OS has not already added that memory. The CPU card can use the following code to test if the A1200 has already added the CPU card's expansion memory. This code queries the system about the type of memory located at the low end of the coprocessor slot expansion address range. If the system has already added memory at this location, TypeOfMem() returns the characteristics of that memory. If no memory is at that location, TypeOfMem() returns zero.

```
/*
 * Note that we check the memory 16K from the start as the
 * first few bytes may have been used by the OS when doing
 * the automatic testing...
 */
if (!TypeOfMem(0x08001000))
{
     /*
      * If TypeOfMem() returned 0, the memory does not
      * exist.  At this point, you can do whatever
      * memory tests that may be needed and then
      * AddMemList() the memory as needed.
      *
      * **NOTE**  Do *NOT* do the memory test if the memory
      * has already been added as it may be in use by some
      * very important things, including interrupt vectors
      * and/or code.
      */
     AddMemList(size,MEMF_FAST|MEMF_PUBLIC,pri,0x08000000,"CPU RAM");
}
```

More About the New A1200 Code

The code to make the A1200 detect 32-bit CPU cards will also notice ‘‘natural wrapping’’ in the board's memory. If a board has only a limited amount of memory, it is possible to design the board so that the physical memory is accessible at many addresses at regular address intervals. For example, if the board has four megabytes of memory, that memory could be accessed at four megabyte intervals (address $0800 0000, $0840 0000, $0880 0000, and so on).

Because the OS notices the wrap, CPU cards can use a more economical design because they don't have to be as complex. It also cuts down on the need for jumpers or switch settings. The code requires that the A1200 CPU board's memory sizes be in multiples of 1 megabyte (512K is not supported).