

DEALING WITH PCI DEVICE CONFLICTS

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This document is provided to assist customers in dealing with certain PCI device conflict scenarios which may arise with respect to installing a Masterclock, Inc. TCR-500PCI, TCG-100PCI, or GPS-PCI product. However, issues discussed here will also be useful as general troubleshooting tips when dealing with any PCI bus adapter cards in x86 architecture computers.

PCI Is Plug And Play?

Unlike the ISA architecture, PCI bus devices were designed with “plug and play” functionality from the inception. This means that, in general, the user does not control the configuration for bus devices (including add-in adapter cards). Configuration is instead managed by the computer BIOS and/or the operating system.

In an ideal world PCI bus devices would be free from the hardware resource conflicts that plagued computer system configuration/assembly during the heyday of ISA bus architecture. In reality there are two problems which can arise that can be particularly aggravating to the computer technicians.

PCI Combined With Legacy Architectures

Many PCI-based computer systems still have one or more ISA-bus slots to provide legacy support for older devices. ISA devices run the gamut from no plug and play support whatsoever to minimal/questionable plug and play support. Special consideration has to be given for these devices when they are installed in a computer with a PCI bus.

A common problem that occurs with ISA devices in such scenarios is that they are configured for one or more interrupts (either via physical jumpers, vendor-specific configuration utilities, or ISA plug and plug specifications). Often, the PCI bus can't know about these interrupt allocations and the BIOS will proceed to allocate interrupts for PCI devices that are already in use by one or more ISA devices. This results in operational failure of one or more devices, or the entire system.

Solution: To work around this problem, most computers have BIOS support such that the user can reserve certain interrupts for legacy ISA devices. The procedure for doing this varies from computer to computer, but it is absolutely essential for the computer technician to observe this requirement when installing cards into mixed-bus computers. Once reserved, the PCI resource allocation will “avoid” the legacy interrupts allowing the PCI and ISA devices to (usually) live in harmony.

Shared PCI Interrupts

PCI bus interrupts are, by design, shareable. Vendors of PCI devices are assumed to be creating devices which share interrupts, and most motherboard/BIOS vendors as well as operating systems will expect this functionality. In a “busy” computer it is not unusual to find two or more PCI devices sharing an interrupt channel. This works fine until sharing is attempted with a PCI device whose hardware or drivers don't properly support sharing. When this happens, hard lock-ups occur early and often.

The problem is especially aggravating for two reasons: 1) the user has little if any control over PCI device interrupt allocation, and 2) it is often difficult to even determine which interrupt has been allocated to which PCI device. With respect to #2, most computer BIOSs briefly display a list of PCI devices in the computer and the interrupt(s) that were allocated to them. In addition, some computer vendors provide BIOS or software-based tools that can provide this information to the user. Finally, Masterclock, Inc. provides a DOS-based tool with each adapter card product which provides some diagnostic information about PCI devices in the computer and resources which have been allocated for them.

If you are experiencing this problem it is probably in relation to your installation of a Masterclock, Inc. PCI adapter card into an existing computer system. All Masterclock, Inc. PCI adapter card products fully support interrupt sharing in Windows 95, 98, Me, NT 3.51/4.0 and 2000. If you are experiencing a problem it is probably related to another PCI device which isn't capable of properly sharing interrupts. Masterclock, Inc. has identified several products, including some popular NIC cards, which have this problem.

Your first step in solving the problem will be to determine which interrupt has been allocated to our card, and which other PCI device has also been assigned this same interrupt. Ultimately, this device will have to either be removed or installed in such a way that it has its own unique interrupt. If it can't share interrupts with one of our cards it won't be able to share interrupts with a disk controller, in-port mouse, or other PCI device.

Solution #1: Many computers have motherboard-integrated PCI bus peripherals that may not be in use, such as IDE channels (often 2), in-port mouse, USB ports (often 2), sound controllers, and more. Disabling these devices in the BIOS (assuming they are not in use) may free up many interrupts and act as a quick and painless solution to the interrupt sharing problem.

Solution #2: Sometimes shuffling PCI add-in adapter cards to different slots can alter the resource assignments provided to them by the BIOS. Such shuffling may isolate a problem PCI device on its own interrupt thereby avoiding the interrupt sharing problem. This is an empirical procedure which will vary from computer to computer, and may or may not provide a useful outcome.

Solution #3: Remove the offending PCI device. If a PCI device cannot share interrupts it is not truly PCI compliant and will probably continue to cause compatibility problems in any computer in which it is installed. Replace the device with a PCI-compliant equivalent, or check for updated drivers that might fix the problem.