Slot Termination Components for Pentium II™ and Xeon™ Processor-Based Multiprocessor systems

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GTL Termination for Unused CPU Slots

This application brief addresses issues & techniques associated with terminating the CPU slots for a Pentium II or Xeon Processor- based multiprocessor server or embedded computer system. A family of components developed by Pericom solves the problem of terminating the CPU bus to a predetermined impedance, and biased to a desired voltage.

The newer Pentium II and Xeon processors are intended for server systems with 440BX/440GX and 450NXTM chipsets respectively. These are 100MHz bus speed devices. These systems use a new bus technology called AGTL+ (Associated Gunning Transceiver Logic). The I/O buffers are open drain and require pull-up resistors to 1.5V for providing the high logic level. To provide termination to each bus load, the CPU cartridge contains a 150 ohm internal pull-up resistor.

For two-way Symmetric Multiprocessing (SMP) Pentium II/Xeon processor-based server designs, a termination card must be placed in the unused slots. Depending on which particular slot is unpopulated, different resistance values of the termination will be required.

Pericom's GTL bus switches, PI5C3220X (Figure 1), can take care of this required termination automatically on the motherboard. These switches are all 32-bits wide.

There are four different bus switches offered for GTL termination: PI5C32200, PI5C32201, PI5C32202, and PI5C32203. They differ in termination values offered (see Table 1). They are configured as 4 groups of 8 signals with individual controls for each of these groups. A block diagram of one of the GTL termination switches is shown in Figure 2.
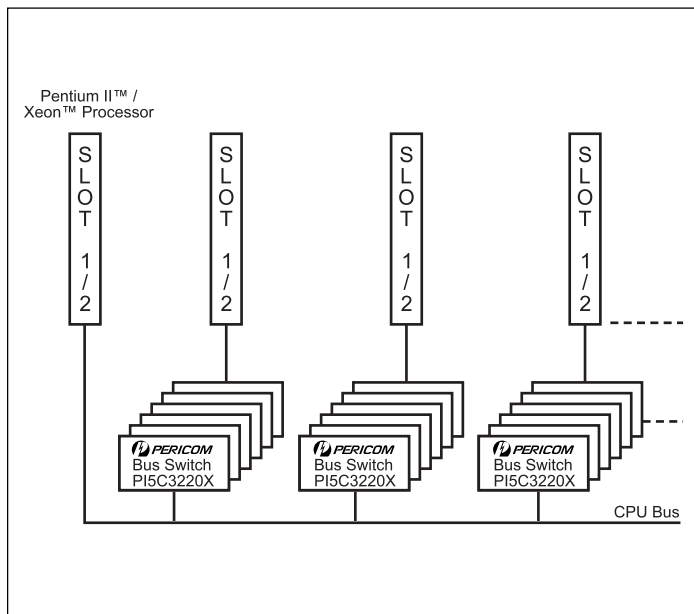

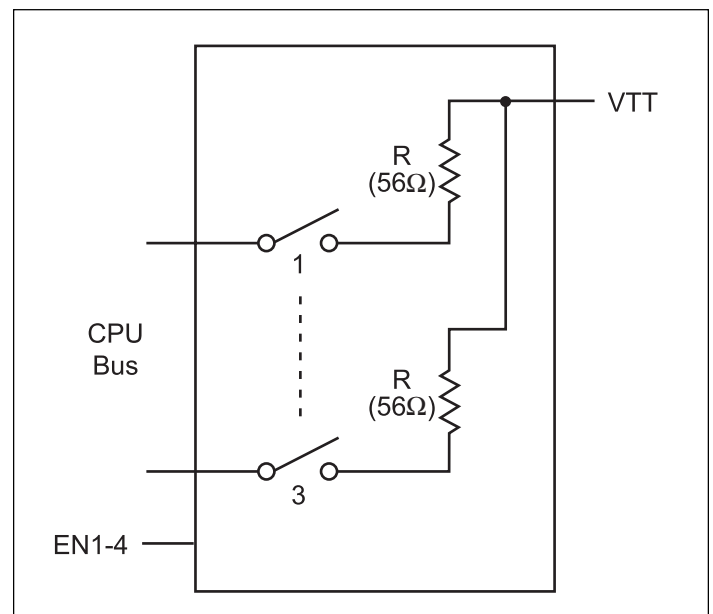**Figure 1. Pericom's Bus Switch in GTL Termination Application**

Figure 2. PI5C32200 GTL Termination Switch Block Diagram

Definition of Slot 1, Slot 2 & Slot M

Each processor module plugs into connectors (otherwise known as slots). There are three different types of slots: Slot 1, Slot 2, and Slot M. All have different electrical bus specifications. Slot 1 is for plugging in Pentium II (with 440BX/440GX chipset)-based CPU modules, Slot 2 is for plugging in a Xeon processor with 450NX chipset CPU modules, and Slot M is for the Merced™-based CPU module.

Multiple Slots?

In any server system motherboard, there may be multiple CPU slots. All these slots on the same motherboard are of the same kind (either Slot 1 or Slot 2).

Why Terminated?

The processor bus has open drain outputs or outputs with weak pullups. To avoid erroneous bus activity, the module bus needs to be terminated. Refer to the Intel processor users manual for circuitry details.

Why Different Impedance?

Pericom's GTL bus switches are available in four different impedance values: 56 ohms, 75 ohms, 100 ohms and 150 ohms. These different impedance values are required to compensate for the PCB traces and the location and loading of the bus.

Why GTL Bus Switch?

The Intel processor bus uses GTL/AGTL (Assisted Gunning Transceiver Logic) levels that offer low signal swings of 0V to 1.5V, thereby cutting down the switching noise of the bus. For impedance matching, this bus needs to be terminated at each of the slots. Otherwise unterminated stubs will cause reflections on the processor bus.

Table 1. Pericom's GTL Termination Bus Switch Offerings

Part Number	Impedance	Application
PI5C32200	56Ω	Pentium II, Slot 2 Processor System
PI5C32201	75Ω	
PI5C32202	100Ω	
PI5C32203	150Ω	

Who are the Users?

Anybody developing systems with a multiprocessor (Intel's CPU) module.

What are the Alternatives?

Current solutions require plugging in and out of a PCB with appropriate resistor combinations through a terminator card. But these entail some mechanical arrangement to permit the card to be screwed in stably. Also, reliability of the mechanical connection is questionable for servers that need to be completely fault-free. The customers also need to keep an inventory of terminator cards in anticipation of any problem. The terminator cards are expensive.

The Intel processor bus must be pulled up to 1.5V (i.e., the Vbias on these switches also needs to be pulled up to this voltage for proper termination). When the motherboard is loaded with Pericom's GTL switches, the system controller will provide the control signal to turn the GTL switches on and off, thus terminating the busses properly.

Note: The information presented in this note should be used in conjunction with information on Pericom's GTL bus switch datasheets and Intel's CPU module information.