ECR #: 39
Title: USB Resistors on Motherboard
Release Date: Oct. 21, 1997
Impact: Clarification
Spec Version: A.G.P. 1.0
Status: Under Development

Summary: The 15KΩ pull-down resistors required by USB on downstream ports must be located on the motherboard. Also, the OVRCNT# pin should be pulled up to a voltage not exceeding 3.6 volts on the motherboard to prevent this line from floating when there is no add-in card present.

Background: If an A.G.P. card does not implement USB, the DAT+ and DAT- lines need termination to ground to inform the USB controller that the port is unconnected. The pull-down resistors are a standard part of the USB data termination specification and are generally on the motherboard in any case. This ECR is meant only to clarify that these resistors must be located on the motherboard. Similarly, the OVRCNT# line, required from ECR-14, needs to have a pull-up resistor to keep it from floating. The pull-up resistor and voltage are implementation specific, but should hold the line between 2.4 volts and 3.6 volts and the total current from the motherboard should not exceed ±20 μA.

Change Current Specification as shown:

"**4.3.5.8 USB DESIGN CONSIDERATIONS FOR THE MOTHERBOARD**

Two key issues that must be addressed for USB: signaling and power distribution. The USB data lines on the motherboard need to be designed to 45Ω ±15% to match the impedance of the USB drivers and cable in order to preserve the signal integrity. The standard 15KΩ pull-down resistors on both data lines need to be included on the motherboard to signal to the USB host controller that either there is no add-in card or that no USB device is attached to the add-in card. The power lines should be properly bypassed to decouple noise. Since the USB port has to support hot attach, the power lines have to have sufficient bulk capacitance to filter the surge currents. Refer to the "Universal Serial Bus Specification," version 1.0, January 19, 1996, for more details.

Any system that delivers power to a cable (i.e. for I^2C and USB), will need to provide overcurrent protection on the card to comply with regulatory safety requirements (UL, CSA, etc.). This can take the form of active current limiting circuits or a simple self-resetting fuse. The overcurrent protection should be set to limit the current available to the cable at 2 amperes. Additionally, USB requires that this condition be reported on the **OVRCNT#** pin. The overcurrent detection and indication is the responsibility of the add-in card. The motherboard must provide a pull-up resistor to prevent the **OVRCNT#** line from floating in the absence of an add-in card. The pull-up resistor and voltage are implementation specific, but should hold the line between 2.4 volts and 3.6 volts. The total current from the resistor, motherboard leakage and USB host controller leakage should not exceed ±20 μA."