



January 21, 2005

**Product Advisory**  
**PA RV100 C1**

**PCI bus hang and system hang using RADEON 7000 and RADEON 7000M**

Customers have reported PCI Bus hangs when using RADEON 7000 on:

- Intel E7525-ICH5 (Tumwater)
- Intel E7520-ICH5(Lindenhurst)
- ServerWorks CSB5 Rev 1.2.

The hang results from the failure of the RADEON 7000 to respond to a particular memory read sequence while in VESA mode.

**Expected Occurrence of this problem in the field**

Reports of this problem from the field are extremely rare and have only been observed under hardware test situations. Only two problem reports have been received in the life cycle history of RADEON 7000 and RADEON 7000M.

**Duplication of the problem**

This problem has been demonstrated in two ways:

1. Using an ATI diagnostic that writes to specific RADEON 7000 registers and then performs specific memory reads. This will always hang the RADEON 7000 on any PCI bus. It has been tested on:
  - Intel E7525-ICH5 (Tumwater)
  - Intel 915-ICH6 (Grantsdale)
  - Intel 865-ICH5 (Springdale)
  - AMD VIA KT400
  - ServerWorks CSB5 Rev 1.2.
2. Using the Linux GRUB boot utility in graphics mode. This tool uses VESA mode 101h to display a countdown screen while it waits for input. Failure occurs after several hours of continuous rebooting.

Note: The diagnostic in point 1 above, hangs the PCI bus after programming specific registers and performing a specific sequence of VESA memory reads (see [System and Application Requirements for Failure](#) below). A VESA application is unlikely to do this since VESA drivers are unaware of vendor specific registers.

**Difference between diagnostic (point 1) and application failure (point 2)**

Diagnostic steps	S/W application steps
1. set VESA mode	1. set VESA mode
2. access ATI specific register	2. perform specific memory access (see below) on PCI bus or access non ATI device on PCI bus
3. read VESA memory in specific sequence	3. read VESA memory in specific sequence

The root cause of the hang is the same in both cases. However, the difference lies in the second step.



## **System and Application Requirements for Failure**

All applications that use VESA modes can be expected to perform memory reads and writes to the RADEON 7000. These can be dword, word, or byte reads from any valid VESA address. This problem only occurs if reads are not dword aligned and if another bus event also occurs.

The following sequence is typical and will not cause a failure:

Byte read from address A30D0  
Byte read from address A30D1  
Byte read from address A30D2  
Byte read from address A30D3  
Byte read from address AFFF0

The hang can occur with a variation on the above sequence if there is some disruptive traffic on the PCI bus (disruptive from the RADEON 7000 point of view). This "disruptive traffic" is generally a memory read that is not intended for the RADEON 7000.

For example:

Byte read from address A30D0  
Memory read for other device at address 040004000 (or any other address) ← This is the disruptive traffic.  
Byte read from address A30D1  
Byte read from address A30D2  
Byte read from address A30D3  
Byte read from address AFFF0 ← This jump will hang.

There are 12 different combinations that have been identified that will cause the hang immediately after the disruptive PCI traffic. In the below "xxx1" means a byte read from an address ending in Hexadecimal 1.

1. xxx1, xxx2, xxx3, xxx4, xxx5, xxx6, xxx7, xxx8, xxx9, xxxa, xxxb, jump
2. xxx1, xxx2, xxx3, xxx4, xxx5, xxx6, xxx7, jump
3. xxx1, xxx2, xxx3, jump
4. xxx3, xxx4, xxx5, xxx6, xxx7, xxx8, xxx9, xxxa, xxxb, jump
5. xxx3, xxx4, xxx5, xxx6, xxx7, jump
6. xxx3, jump
7. xxx5, xxx6, xxx7, xxx8, xxx9, xxxa, xxxb, jump
8. xxx5, xxx6, xxx7, jump
9. xxx7, xxx8, xxx9, xxxa, xxxb, jump
10. xxx7, jump
11. xxx9, xxxa, xxxb, jump
12. xxxb, jump

Summary:

The problem will only occur when:

1. VESA mode, or a 132 column VGA mode, is in use.
  - Register CRTC\_EXT\_CNTL, field VGA\_ATI\_LINEAR = 1
  - OR Register CRTC\_EXT\_CNTL, field VGA\_Text\_132 = 1
2. Disruptive traffic on the bus comes before a specific sequence of memory reads.
3. Video memory is accessed on byte boundaries (as opposed to dword boundaries). The reads do not have to be 1 byte in length they just have to occur on the boundaries shown above which are not dword aligned.

**Risks of failure in various conditions**

	Installation	Boot-Up	Operation
SUSE	30 manual installs done over several weeks, no hangs or unexplained failures.	Over 100 manual boots all the way to XWindow over several weeks (using VESA modes during boot). Hangs only occurred in GRUB (see " <a href="#">Duplication of the Problem</a> " above)	Only the GRUB boot failure has been reported from the field. This Problem has been reported to SUSE.
Red Hat	30 manual installs done over several weeks, no hangs or unexplained failures	Over 500 automated boots all the way to XWindow (using VESA modes during boot). No hangs or unexplained failures.	No failures have been reported from the field. The Problem has been reported to Red Hat.
Windows 2000	10 manual installs done over 1 week, no hangs or unexplained failures.	10 manual boots performed. No hangs or unexplained failures.	No failures have been reported from the field. The Problem has been reported to Microsoft.
Windows 2003	10 manual installs done over 1 week, no hangs or unexplained failures.	10 manual boots performed. No hangs or unexplained failures.	No failures have been reported from the field. The Problem has been reported to Microsoft.
Windows XP	10 manual installs done over 1 week, no hangs or unexplained failures.	10 manual boots performed. No hangs or unexplained failures.	No failures have been reported from the field. The Problem has been reported to Microsoft.

**Proposed workarounds**

There are three proposed workarounds for this problem:

1. Don't allow non-ATI devices to be accessed on the PCI bus at the same time as RADEON 7000 video memory reads.
  - Remove non-ATI devices from the bus or disable them during the time that the S/W application has a potential to hang.
  - Ensure there is no inappropriate traffic on the PCI bus. For example, memory reads that are not intended for legitimate PCI devices.
  - This prevents step 2 in the summary above.
2. Don't allow VESA modes.
  - This prevents step 1 in the summary above.
3. Don't allow VESA memory access in the specific sequence by modifying the S/W application. For example always use dword aligned reads.
  - This prevents step 3 in the summary above.

**Additional Information**



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Please contact your ATI Applications/Field Applications Engineer or technical representative with any questions about this advisory.

### **Revision History**

**PA RV100 C1** January 21, 2005

- Initial Release.