IBM Support Information – Solving 1801 Errors

Solving 1801 Errors in xSeries 236, x260, x336, x346, x366, x460 Servers; and System x3800, x3850, x3950, x3850 M2, x3950 M2 Servers

Revision history:
10/05/2007 Rev 1.6 added x3850 M2 and x3950 M2
01/27/2007 Rev 1.5 added QLA2342
01/26/2007 Rev 1.4 confirmed with development engineer that no changes needed for System x3xxx or Tulsa; updated Table 11 with RoHS PNs and new NICs
08/25/2005 Rev. 1.3 original

This document only applies to the xSeries 236 (8841), x260 (8865), x336 (8837), x346 (8840), x366 (8863), and x460 (8872 and 8874) servers; and System x3800 (8865 and 8866), x3850 (8863 and 8864), x3950 (8878 and 8879), x3850 M2 (7141), and x3950 M2 (7141) servers. To use the methods described in this document, x260, x366, x460, x3800, x3850, and x3950 systems require an RSA II SlimLine to be installed.

Background: System POST 1801 errors are caused by an over-subscription of limited PCI ROM resource space. Specifically, 'A PCI adapter has requested memory resources that are not available.' This space is limited by PC architecture to 128 KB; any requests that will push the system beyond this limit cannot be serviced, and will generate this error message.

Steps for problem resolution:

1. Understand the nature of the problem.
2. Understand base system ROM resources needed before option cards are added.
3. Identify requirements for desired add-in elements (PCI, PCI-X, or PCI-e adapters)
4. Identify failure point and list all desired ROM device requirements. This document shows a sample failing configuration.
5. Experiment on paper with alternate solutions; try to formulate a working sequence. This document shows three alternate solutions for the sample problem.
6. Implement the above step in the system. Use any or all of the three alternate solutions to solve the problem.

Notes:

1. There are other potential configuration issues with PCI adapters. For example, 1802 errors are caused by 'No more I/O space is available for a PCI adapter.' Although similar in nature, these other errors are not as common, and are not addressed here.
2. There are variables related to this issue. For example, code/firmware updates to certain devices may modify ROM space requirements. Also, the sequence in which devices are located makes a difference. An example is boot sequence. If a customer configures his Start Options to boot from a SCSI adapter in slot #2, the ROM scan sequence may produce different results. Thus it is difficult to provide blanket solutions to these problems.

Understanding ROM elements in xSeries servers

Certain devices commonly use option ROM as a method of executing low level device commands during system operation. These elements typically use ROM space:

Video

SCSI/SAS/RAID
Network

These elements typically do not use ROM space and will not affect this problem:

Serial/Parallel ports
USB
Floppy disk/IDE devices (CDROMs)
System memory/DIMMs

The system BIOS searches for and executes ROM in a logical sequence. The sequence is important, and can be understood by the following typical example:

Step 1: The onboard video device is located, enabled, and its ROM is executed. *This is needed to establish a video display for further system operation.*

Step 2: Likely boot devices must be located. Since xSeries systems are designed for rapid-deployment, the first boot device is preset to the network. The onboard network device is located and its ROM is executed. *This initializes the network chip and checks for a link to an attached boot server using the PXE protocol.*

Step 3: Other likely boot devices are located. This is preset to the onboard storage device. The onboard SCSI, SAS, or RAID ROM is then loaded and executed. *A boot device is typically located at this time. However, system BIOS is not yet complete and it must identify any additional devices.*

Step 4: PCI slots are scanned following a standard format. Any PCI card may or may not request ROM space. *This is where an 1801 error is most likely encountered.*

Step 5: Assuming the successful completion of the above, system BIOS identifies all of the base system and add-in devices to the operating system, for driver installation and OS boot.

Runtime vs. POST Sizes

Certain devices have two different sizes for ROM code. When this type of a device's ROM code is executed, one of the first steps of its execution is to identify the specific device and application present. Then, only the portions of ROM code that are relevant are executed, and others portions can be discarded. The result is that the initial (POST) ROM space requested, for example 64 KB, is then reduced to a lower runtime number, such as 12 KB. This characteristic will be important in solving some 1801 error conditions.

ROM Sharing

Another complexity on some devices is ROM sharing. An example is a system with multiple ServeRAID-6M adapters installed. The ROM code on the first card will search for other ServeRAID-6M adapters installed in the system, and when they are found, take over operation of the secondary cards, eliminating the need to load subsequent ServeRAID-6M ROM.

Base ROM elements in system before PCI adapters are considered

To get started with tabulating the option ROM, you should understand which ROMs are loaded in the base system before any additional adapters are installed.

Each of following tables identifies the base ROM elements in each system type. The table contains six columns; the device, the order in which the device ROM is executed, the POST and runtime size of each

device, and then a sequential running total of the memory used in POST and runtime. The POST running total is obtained by using the runtime total from the previous entry and adding the current POST size. The maximum available Option ROM space is 128 KB per PC architecture. If the POST running total ever exceeds 128 KB, an 1801 Error will occur.

x236 Base option ROMs

Device	Default Scan	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
Video [1]	1	44	44	44	44
Ethernet ports 1 & 2	2	64	5	108	49
SCSI/ServeRAID-7k [2]	3	64 / 32	20 / 13	113 / 81	69 / 62
RSA II SlimLine	n/a	0	0		
TOTALS					
Onboard SCSI				113	69
ServeRAID-7k				81	62

Table 1. x236 Option ROM characterization – motherboard devices and default settings.

[1] Video device ROM is contained within base system BIOS.

[2] When installed, the ServeRAID-7k RAID adapter takes control of the on-planar SCSI controller. The ServeRAID-7k adapter is scanned in place of the on-planar SCSI.

x336 Base option ROMs

Device	Default Scan	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
Video [1]	1	44	44	44	44
Ethernet ports 1 & 2	2	64	5	108	49
SCSI/ServeRAID-6i+	3	64 / 32	16 / 14	113 / 81	65 / 63
RSA II SlimLine	n/a	0	0		
TOTALS					
Onboard SCSI				113	65
ServeRAID-6i+				81	63

Table 2. x336 Option ROM characterization – motherboard devices and default settings.

[1] Video device ROM is contained within base system BIOS.

[2] When installed, the ServeRAID-6i+ RAID adapter takes control of the on-planar SCSI controller. The ServeRAID-6i+ adapter is scanned in place of the on-planar SCSI.

x346 Base option ROMs

Device	Default Scan	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
Video [1]	1	44	44	44	44
Ethernet ports 1 & 2	2	64	5	108	49
SCSI/ServeRAID-7k	3	50 / 32	39 / 13	99 / 81	88 / 62
RSA II SlimLine	n/a	0	0		
TOTALS					
Onboard SCSI				99	88
ServeRAID-7k				81	62

Table 3. x346 Option ROM characterization – motherboard devices and default settings.

[1] Video device ROM is contained within base system BIOS.

[2] When installed, the ServeRAID-7k adapter takes control of the on-planar SCSI controller. The ServeRAID-7k adapter is scanned in place of the on-planar SCSI.

x260, x366, x460, x3800, x3850, x3950 Base option ROMs

Device	Default Scan Order	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
Video [1]	1	44	44	44	44
Ethernet ports 1 & 2	2	64	5	108	49
SAS/ServRAID-8i [2,3]	3	64 / 32	20 / 16	113 / 81	69 / 65
RSA II SlimLine	n/a	0	0		
TOTALS					
Onboard SAS				113	69
ServeRAID-8i				81	65

Table 4. x260, x366, x460, x3800, x3850, x3950 Option ROM characterization – motherboard devices and default settings.

[1] Video device ROM is contained within base system BIOS.

[2] When installed, the ServeRAID-8i adapter takes control of the on-planar SAS controller. The ServeRAID-8i adapter is scanned in place of the on-planar SAS.

[3] ServeRAID-8i BIOS is contained within the ServeRAID-8i update utility.

x3850 M2, x3950 M2 Base option ROMs

Device	Default	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
Video [1]	1	44	44	44	44
Ethernet ports 1 & 2	2	68	7	112	51
SAS/ServeRAID-MR10k [2,3]	3	45 / 32	23 / 21	157 / 144	74 / 72
RSA II SlimLine	n/a	0	0		
TOTALS					
Onboard SAS				157	74
ServeRAID-MR10k				144	72

Table 5. x3850 M2, x3950 M2 Option ROM characterization – motherboard devices and default settings.

[1] Video device ROM is contained within RSA II SlimLine.

[2] When installed, the ServeRAID-MR10k controller takes control of the on-planar SAS controller. The ServeRAID-MR10k controller is scanned in place of the on-planar SAS.

[3] ServeRAID-MR10k BIOS is contained within the ServeRAID-MR10k update utility

Considering PCI Adapters

The next step in resolving 1801 errors is to identify the PCI slot device characteristics. The following table can be used to determine the extent of the problem.

Fill out the table below for the system configuration. View the entries under the IBM Setup utility at the time of the 1801 error. See the Reference section for how to do this. This

function is only available in x260, x366, x460, x3800, x3850, x3950 if an RSA II SlimLine is installed.

Device	Default Scan Order	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
Base System w/ServeRAID-8i				81 [1]	65 [1]
Slot 1					
Slot 2					
Slot 3					
Slot 4					
Slot 5					
Slot 6					

Table 5. Example: x366 Option ROM characterization – PCI devices

[1] This number is taken from the base system configuration total, see Table 4.

Sample of problem configuration

This table is an example of a configuration that creates an 1801 error. Notice that the card information for each populated slot is filled out, then the total scan/runtime values are calculated by using the previous run total, and adding the POST/Runtime sizes.

Device	Default Scan Order	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
System w/ServeRAID-8i					65 [1]
Slot 1					
Slot 2					
Slot 3 – BCM 1000T dualport	4 [4]	12 [2]	8 [3]	77 [5]	73
Slot 4 – BCM 1000T dualport	6	12	8	89	81
Slot 5 – Emulex 10000E Fibre	7	48	0	129 **	81
Slot 6 – Emulex 10000E Fibre	8	48	0	129 **	81

Table 6. Example: x366 Option ROM characterization – slot devices sample

[1] This number is taken from the base system configuration total, see Table 4.

[2] This POST number is taken from the BIOS utility with subject adapter plugged in, see reference section.

[3] This Runtime number is taken from the BIOS utility with subject adapter plugged in, see reference section.

[4] This Sequence number is taken as next consecutive number from base system (Table 4). Empty slots are not counted.

[5] Math as follows:

65 (previous total) + 12 (POST value this row) = 77

65 (previous total) + 8 (RUNTIME value this row) = 73 this is the new total

** Notice that the entries for slots 5 & 6 exceed the 128 KB maximum, and result in the 1801 errors. This can occur when either the POST or Runtime values exceed 128 KB.

Solution #1 - Sample problem solved by reducing base system ROM

The simplest solution to some 1801 errors is to reduce the base system ROM requirements to the minimum necessary. Typically, this can be achieved by disabling the PXE (Network boot) ROM capability of the onboard Ethernet. Note that this does not disable the device in the operating system, it only disables its capability to perform a network boot.

Configuration sequence for disabling PXE:

Note: Assumes default settings are loaded.

1. While booting the system, hit the F1 key at the IBM splash screen.
2. Select **Start Options** and press Enter.
3. Select **Planar Ethernet PXE/DHCP.**
4. Use right arrow to set **Disable** (this will only disable PXE booting for this device)
5. Press Esc key to return to the main setup screen.
6. Select **Save Settings** and press Enter. Press 'Enter' again to confirm.
7. Select **Exit Setup** and press Enter. Select **Yes** to confirm.

The following tables show the result.

Device	Default Scan Order	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
Video [1]	1	44	44	44	44
Ethernet ports 1 & 2	2	0 *	0 *	44	44
SAS/ServRAID-8i [2,3]	3	64 / 32	20 / 16	108 / 76	64 / 60
RSA II SlimLine	n/a	0	0		
TOTALS					
Onboard SAS				108	64
ServeRAID-8i				76	60

Table 7. Example: x366 Option ROM characterization – motherboard devices, PXE disabled settings

* Device ROM disabled

Device	Default Scan Order	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
System w/ServeRAID-8i (PXE Disabled)					60 [1]
Slot 1					
Slot 2					
Slot 3 – BCM 1000T dualport	4	12	8	72	68
Slot 4 – BCM 1000T dualport	5	12	8	80	76

Slot 5 – Emulex 10000E Fibre	6	48	0	124	76
Slot 6 – Emulex 10000E Fibre	7	48	0	124 **	76

Table 8. Example: x366 Option ROM characterization – solution #1 slot scan

[1] This number is taken from the base system configuration total with PXE disabled, see Table 7.

** Notice that lowering the base system ROM requirement solves this error. The running total never exceeds 128 KB.

Solution #2 - Sample problem configuration solved by re-sequencing

This table shows by example how the same configuration as above was fixed, but with device re-sequencing. The same cards were used, but in a different slot sequence.

IBM Support Recommendations:

1.) Change slot plugging order to the following:

a. Slot #1 - Emulex 10000E Fibre
b. Slot #2 - Emulex 10000E Fibre
c. Slot #4 - Broadcom 1000T Ethernet
d. Slot #5 - Broadcom 1000T Ethernet

Device	Default Scan Order	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
System w/ServeRAID-8i					65 [1]
Slot 1 – Emulex 10000E Fibre	4	48	0 **	113	65
Slot 2 – Emulex 10000E Fibre	5	48	0	113	65
Slot 3 – reserved for future Emulex					
Slot 4 – BCM 1000T dualport	6	12	8	77	73
Slot 5 – BCM 1000T dualport	7	12	8	85	81
Slot 6 – reserved for future BCM					

Table 9. Example: x366 Option ROM characterization – solution #2 slot devices reordered

[1] This number is taken from the base system configuration total, see Table 4.

** Notice that placing the cards with 0 KB runtime size first in the scan order (lower slot numbers) solves this error.

Solution #3 - Sample problem configuration solved by slot ROM disable

This table shows by example how the same failing configuration was fixed with a different technique. Notice that the same cards were used, but some card ROMs are disabled.

IBM Support Recommendations:

1.) Disable ROM devices on the following:
   a. Slot #3 NetXtreme BCM 1000T adapter.
   b. Slot #4 NetXtreme BCM 1000T adapter.

Device	Default Scan Order	POST Size (KB)	Runtime Size (KB)	Running Total POST (KB)	Running Total Runtime (KB)
System w/ ServeRAID-8i					65 [1]
Slot 1					
Slot 2					
Slot 3 – BCM 1000T dualport	4	0 *	0	65	65
Slot 4 – BCM 1000T dualport	5	0 *	0	65	65
Slot 5 – Emulex 10000E Fibre	6	48	0	113	65
Slot 6 – Emulex 10000E Fibre	7	48	0	113 **	65

Table 10. Example: x366 Option ROM characterization – solution #3, slot ROM disabled

[1] This number is taken from the base system configuration total, see Table 4.

* Device ROM disabled

** Notice that disabling the ROMs on the LAN adapters solves this error.

Disabling slot ROMs:

In general, LAN adapters do not require option ROMs unless the attached LAN is used for network boot. Disabling the ROM for the device will not affect LAN operation in the operating system. Other adapter types should only have their ROMs disabled under the consultation with the adapter supplier.

Summary – solving problem configurations

Steps for problem resolution:

1. Understand base system ROM resources needed before option cards are added. *Reduce base system requirements, if possible (Solution #1).*
2. Identify requirements for desired add-in elements (PCI Adapters).
3. Identify failure point and list all desired ROM device requirements. *Capture failing configuration information as described in this document.*
4. Experiment on paper with alternate solutions; try to formulate a working sequence. *Three alternate solutions are described in this document. Solutions #2 and #3 apply to slot devices.*
5. Implement the above step in customer system. *Use any or all of the three alternate solutions to solve the problem.*

Reference Information

To enable/disable option ROM settings on the x236, x336, x460, x3800, x3850, x3950, and x346 servers:

To access these options:

1. While booting the system, press the F1 key at the IBM splash screen.
2. Select **Advanced Setup** and press Enter.
3. Select **PCI Bus Control** and press Enter.
4. Select **PCI ROM Control** and press Enter.
5. A list of slots will be displayed. Toggle the **Enable/Disable** field for the desired slot.
6. Press Esc key three times to return to the main screen.
7. Select **Save Settings** and press Enter. Press Enter again to confirm.
8. Select **Exit Setup** and press Enter. Select **Yes** to confirm.

Note that device allocations may be modified by adapter firmware levels, and base system device allocations may be modified by system BIOS or other firmware updates.

To enable/disable option ROM settings on the x260, x366, x460, x3800, x3850, x3950 servers:

Note – Do not modify settings if you are uncertain about desired values and results.

IBM xSeries BIOS, when configured with an RSA II SlimLine, offers a PCI device utility within the main setup utility.

To access and use the utility:

1. While booting the system, press F1 at the IBM splash screen.
2. Select **Advanced Setup** and press Enter.
3. Select **PCI Slot/Device Information** and press Enter.
    a. **Select device to be modified (1-6)**
    b. Select **Slot #**.
    c. Observe the **Function #:** value from the screen.
    d. Highlight the **Next Device Select** line
    e. Hit the Enter key to change Function # to 0 (zero).
    [Some PCI devices contain multiple functions, for instance multiple network ports]
    f. Use the up/down arrows to scroll through the various device settings.
    g. **Record the information for option ROM space initial and runtime values into the table.**
    h. Certain settings can be changed, for example **Option ROM Execution.**
    i. For example: (do not do this unless instructed): Use down arrow to select **Option ROM Execution**.
    j. Use right arrow to select **Disabled.**
    k. Press Esc to access the PCI Slot/Device Information menu.
4. Repeat for other slots.
5. Press Esc to exit PCI utility screen.
6. Select **Yes, save and exit PCI Utility ***

7. Press Esc three times to return to the main screen.
8. Select **Save Settings** and press Enter. Press Enter again to confirm.
9. Select **Exit Setup** and press Enter. Select **Yes** to confirm.

* This utility saves settings in a different location than traditional CMOS. You must save these PCI device setting changes explicitly from this menu.

Device fields shown follow the industry standard PCI Bus Specification.
Note that device allocations may be modified by adapter firmware levels, and base system device allocations may be modified by system BIOS or other firmware updates.

Characterization of other known PCI-X and PCIe adapters

Device (option PN)	POST ROM	Runtime ROM	ROM Share	Max PCI-X, PCI-e Bus Speed
FAStT FC2-133 Host Bus Adapter (24P0960) Harp3	44K	10K	Yes	133 MHz
Single Channel Ultra320 SCSI Ctrl (Kendall-2 13N2249)	48K	33.5K	Yes	133 MHz
ServeRAID-6M Ultra 320 SCSI Controller (256M) (02R0988)	32K[1]	32K[1]	Yes	133 MHz
ServeRAID-6M Ultra 320 SCSI Controller (128M) (32P0033)	32K[1]	32K[1]	Yes	133 MHz
SeveRAID-8i (dedicated) (13N2227)	32K	32K	N/A	133 MHz
NetXtreme 1000 SX Fiber Ethernet Adapter 2 (73P4001, RoHS 39Y6088)	12K	9K	No	133 MHz
NetXtreme 1000 T Ethernet Adapter 2 (73P4101, RoHS 39Y6079)	12K	9K	No	133 MHz
NetXtreme 1000 T Dual Port Ethernet Adapter 2 (73P4201)	12K	9K	No	133 MHz
Intel Pro/1000 MT Server Ethernet Adapter (31P9601)	20K	6K	No	133 MHz
Intel Pro/1000 MT Dual Port Server Ethernet Adapter (73P2701)	20K	6K	No	133 MHz
Intel Pro/1000 GT Server Ethernet Adapter RoHS (39Y6105)	20K	6K	No	133 MHz
Intel PRO/1000 GT Dual Port Server Ethernet Adapter (73P5101) RoHS	20K	6K	No	133 MHz
Intel PRO/1000 GT Quad Port Server Ethernet Adapter RoHS (73P5201)	20K	6K	No	133 MHz
DS4000 2Gb FC Single Port PCI-X hba QLA2340 (24P0960) [3]	44K	10K	?	133 MHz
DS4000 2Gb FC Dual Port PCI-X hba QLA2342 (23P8053) [3]	44K	10K	?	133 MHz
DS4000 4Gb FC Single Port PCI-X hba QLA2460 (39M5894) [4]	44K	10K	?	266 MHz
DS4000 4Gb FC Dual Port PCI-X hba QLA2462 (39M5895) [4]	44K	10K	?	266 MHz
DS4000 4Gb FC Single Port PCIe hba QLE2460 (39R6525) [4]	44K	10K	?	2.5 GHz
DS4000 4Gb FC Dual Port PCIe hba QLE2462 (39R6527) [4]	44K	10K	?	2.5 GHz

IBM iSCSI Server Adapter GbE-iSCSI-TOE (Darlington 73P3601)	0/12K[2]	9K	No	133 MHz

Table 11. Other known adapter characteristics

[1] The ServeRAID adapters require 32 KB of POST and runtime ROM. However; it will drop to 0 KB if there is a previous initialized ServeRAID adapter.
[2] Only used if configured for boot operation.
[3] Limited to 2 adapters per node when ServeRAID-8i is installed to avoid reduced performance.
[4] Limited to 4 adapters per node when ServeRAID-8i is installed to avoid reduced performance.