ATX Riser Card Specification

Version 1.0

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Version 1.0, December 1999

Revision History

Version	Description	Date
1.0	Initial public release	12/09/99

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1. Executive Summary

The ATX Riser card specification defines a riser card that can be used with any board form factor in the ATX family to achieve a low-cost, low-profile system design. With the addition of a 2x11 connector to a PCI connector on a standard ATX-family desktop board, the board can be used in multiple system configurations. A single board with the riser connector can be used without the riser card as a tower design or with the riser card as a low profile desktop. This design reuse saves research and development time as well as inventory costs.

Market trends indicate a continued need for space-constrained systems in corporate applications such as business client and point-of-sale, as well as new consumer applications. The transition of low-profile designs from the LPX form factor to the NLX form factor confirmed the market need for these low profile systems. The intent of this specification is to outline one possible approach to a cost-effective, low-profile desktop using commonly available form factor building blocks. The riser specification allows the low-profile market to take advantage of the most popular family of form factors available, ATX.

While it is the intent of this specification to offer an approach to achieving a low-profile design using riser technology, the ultimate goal must be kept in mind—to eliminate the use of riser cards entirely. But this is not achievable in the short term without industry encouragement and acceptance. While LPX and NLX form factors allow for ISA- and PCI-compliant I/O cards, both form factors ignore the simpler solution to achieve low-profile designs—the availability of Low Profile I/O cards. Once available, Low Profile cards can be installed directly to the desktop board without the use of riser cards and still maintain a low-profile design. However, there will be continued demand for low-profile systems using full-height I/O cards. Therefore, the market will need ATX Riser cards until all I/O cards can convert to the Low Profile definition.

Table 1 summarizes the features and benefits of the ATX Riser Card.

Table 1. ATX Riser Card Summary

Feature	Benefit
2x11 riser connector	• Allows required signals for PCI-compliant loads. • Allows riser card use with ATX family form factor desktop boards that support the 2x11 connector.
2- and 3-slot riser	• Allows horizontal placement of I/O cards to achieve low-profile system designs. • Allows ATX family desktop boards to scale from low-profile to tower designs.
Passive riser design	• Low-cost riser solution for low-profile designs based on standards.

1.1 ATX Riser Interface Overview

Figure 1 shows an example of a low-profile system layout using an ATX Riser card with a microATX desktop board.

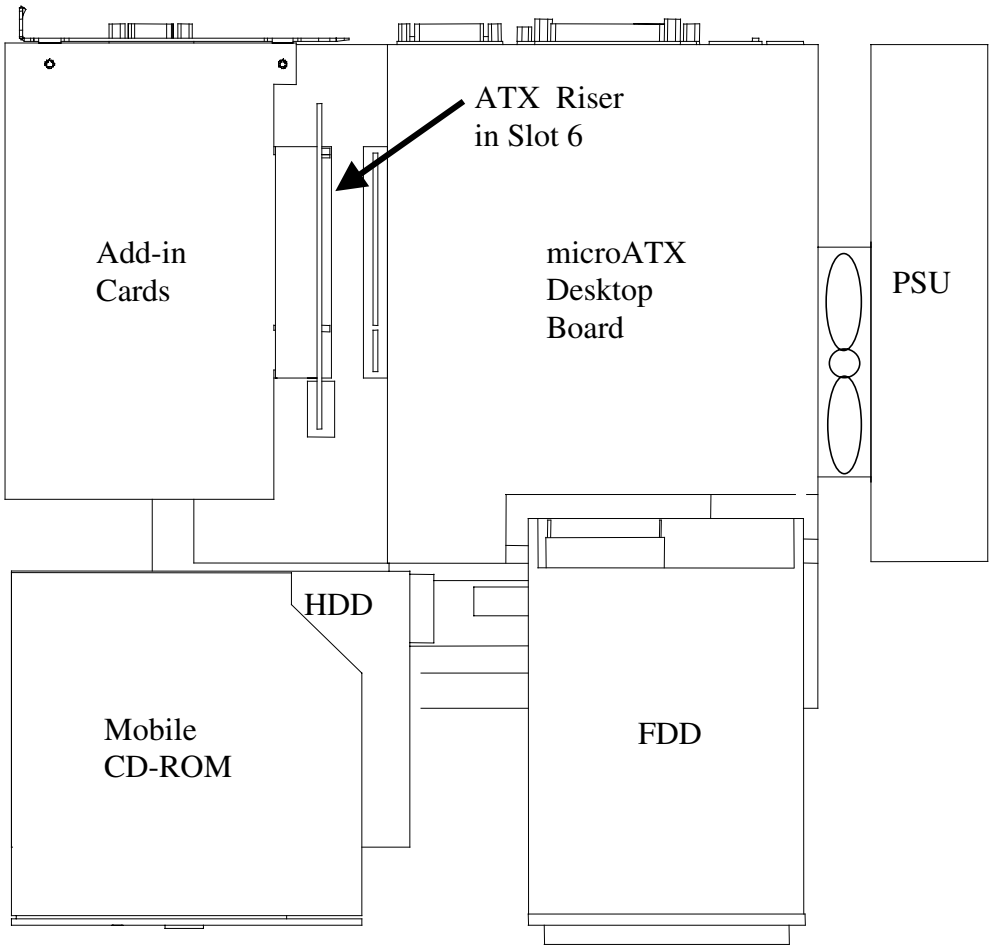

Figure 1. Example System Layout Using ATX Riser (top view)

Figure 2 shows how the ATX Riser card interfaces with a standard microATX desktop board through the slot 6 PCI connector and additional 2x11 riser connector.

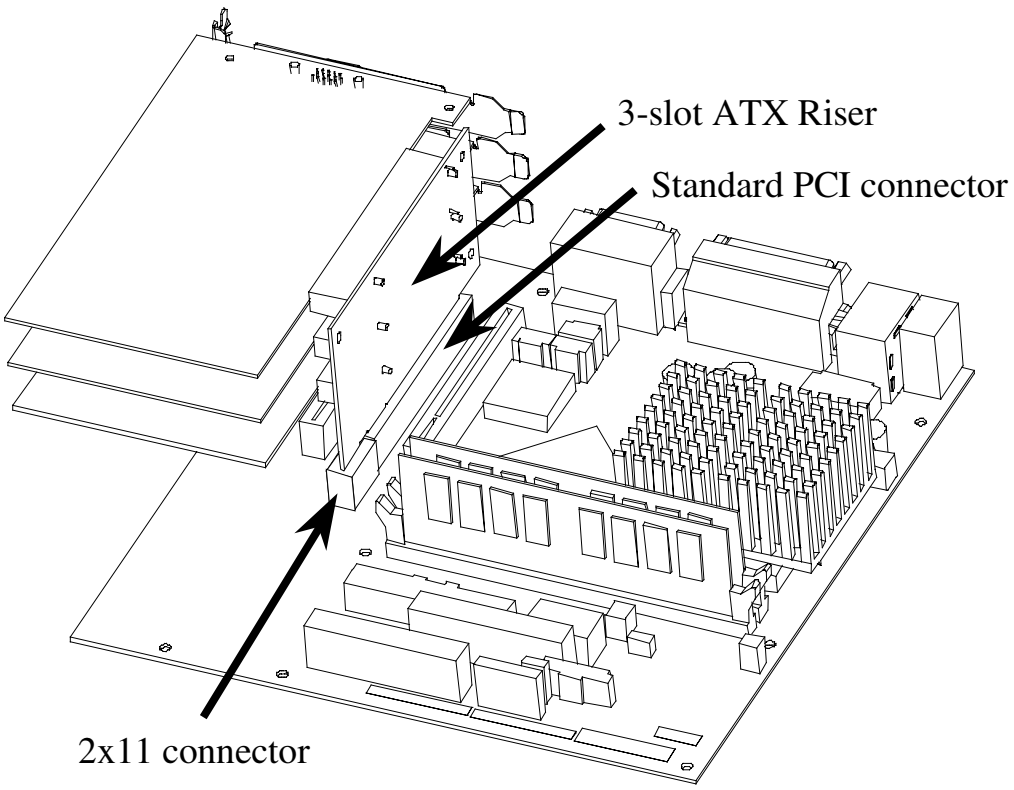

Figure 2. Example ATX Riser with microATX Desktop Board

1.2 Other Technical Documents

For more information, see the series of ATX and microATX design guidelines and suggestions on the Platform Development Support public Web site at

http://www.teleport.com/~ffsupprt

1.3 Benefits to Users

While offering the same benefits of the ATX-family form factor specifications, the ATX Riser interface extends the previous specifications in several key areas.

Current trends in the industry indicate that users require a lower-cost solution for their low-profile PC needs. Without sacrificing the benefits of ATX family products, this interface addresses the cost requirement by introducing a riser design that uses the slot 6 PCI connector. Users will be able to install a standard riser card into their ATX-based low-profile system. Systems using this riser can now be shorter than 4 inches, a potential

savings of over 2 inches in overall system height. The overall effect of using a simple riser is the reduction in costs associated with the entire system design. The expected effect of these reductions is to lower the total system cost to the end user for comparable low-profile designs.

1.4 Benefits to Manufacturers

Through careful design of an ATX Riser chassis, an OEM can capitalize on the benefits of a reduction in overall system height. Cost savings come from the use of a passive riser design to be placed in the slot 6 PCI connector on the desktop board. By extending extra signals to the riser, any PCI-compliant card can be used in the system.

A board vendor can save both cost and development time when implementing an ATX Riser-capable desktop board. Support of the ATX Riser card allows the ATX-family form factor to span from corporate to consumer and from low profile to tower.

2. Mechanical Specification

The following sections define the mechanical requirements of a 2-slot and 3-slot ATX Riser card. The definition includes physical raw card size, mounting hole placement, and connector placement. Compliant ATX Riser cards can be used in any chassis design that supports these features.

2.1 ATX Riser Card Dimensions

The ATX Riser specification supports a 2-slot and 3-slot riser card configuration. System designs that require less than two or more than three slots will require custom riser-card solutions. Figure 3 and Figure 4 detail the card dimensions for the 2-slot and 3-slot riser cards, respectively. The maximum component height on the primary component side of the ATX Riser card is not to exceed 0.600 inches (15.24 mm). The maximum component height on the secondary side is not to exceed 0.105 inches (2.67mm).

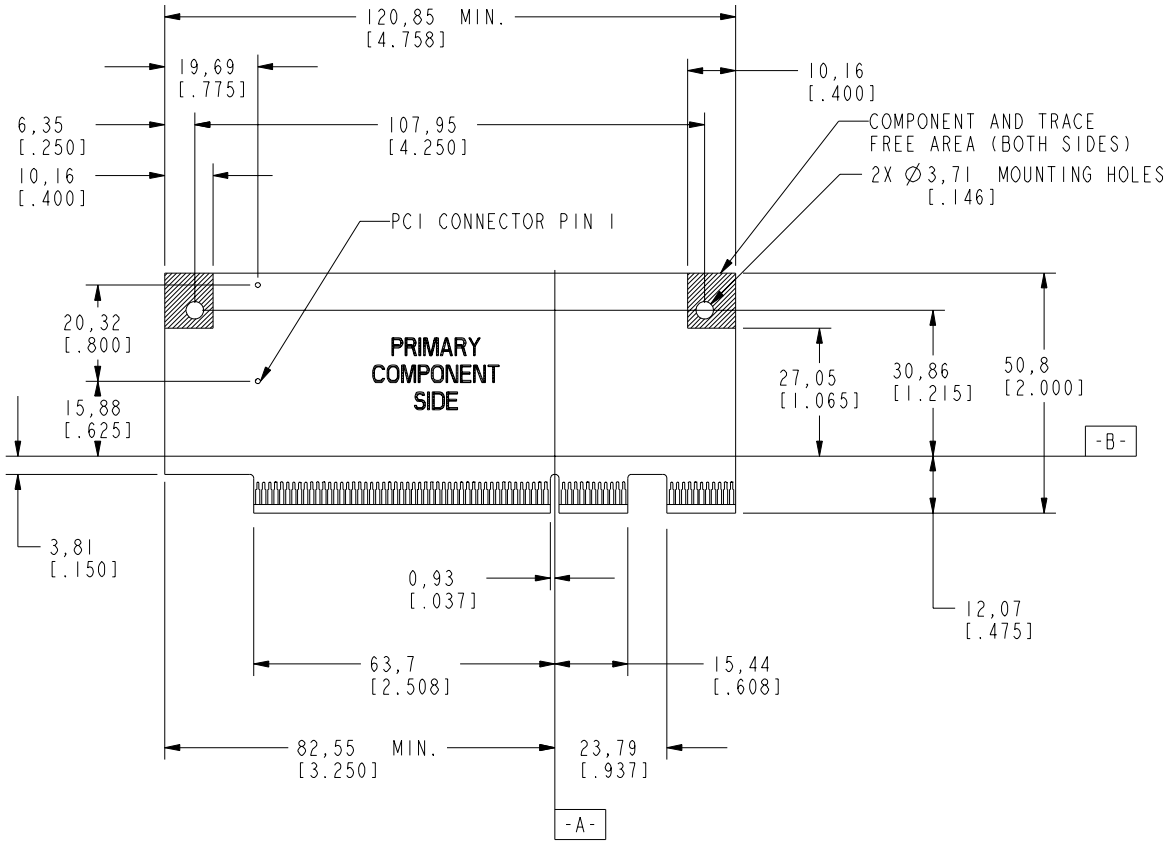

Figure 3. 2-Slot ATX Riser Card Dimensions

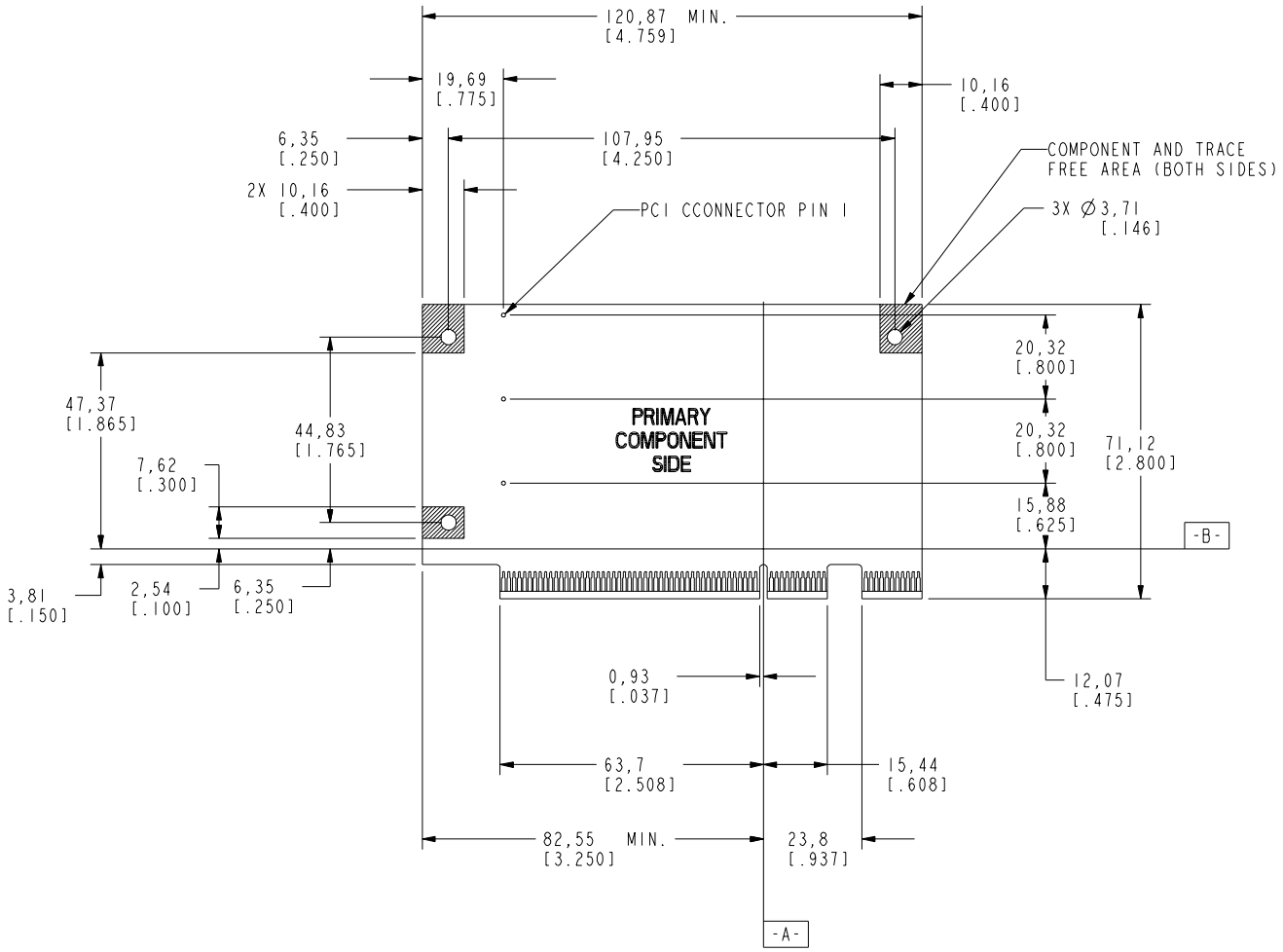

Figure 4. 3-Slot ATX Riser Card Dimensions

2.2 ATX Riser Card Edge Connector

The primary ATX Riser card edge connector on the desktop board consists of a standard PCI connector and the associated PCI signals. In addition, a secondary 2x11 connector is required to provide additional PCI signals to support two extra PCI slots and PCI2ISA on the riser. Figure 5 defines the card edge connector dimensions for the PCI connector and 2x11 riser connector.

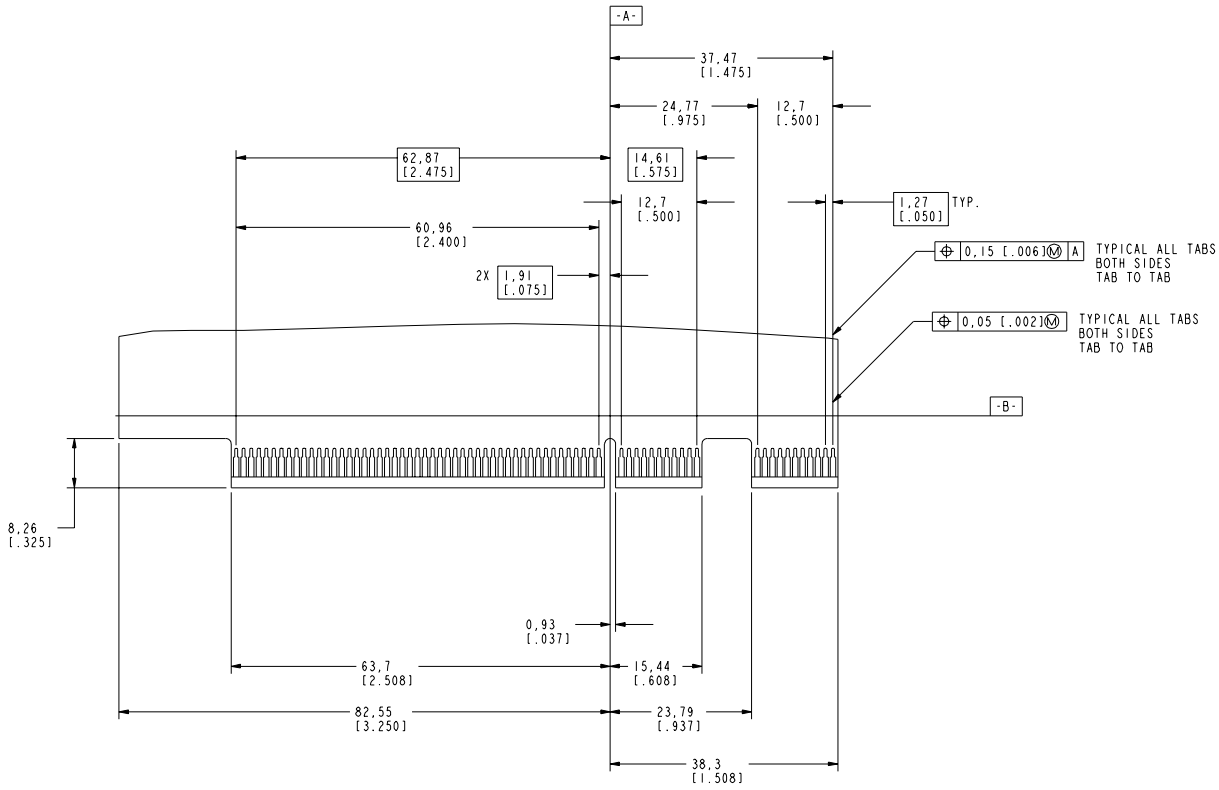

Figure 5. ATX Riser Card Edge Connector Dimensions

2.3 ATX Riser 2x11 Connector Detail

Figure 6 shows the recommended board layout details for the PCI connector and additional 2x11 connector. The dimensions given in the figure show nominal dimensions. Refer to the connector supplier's recommendations for detailed layout tolerancing.

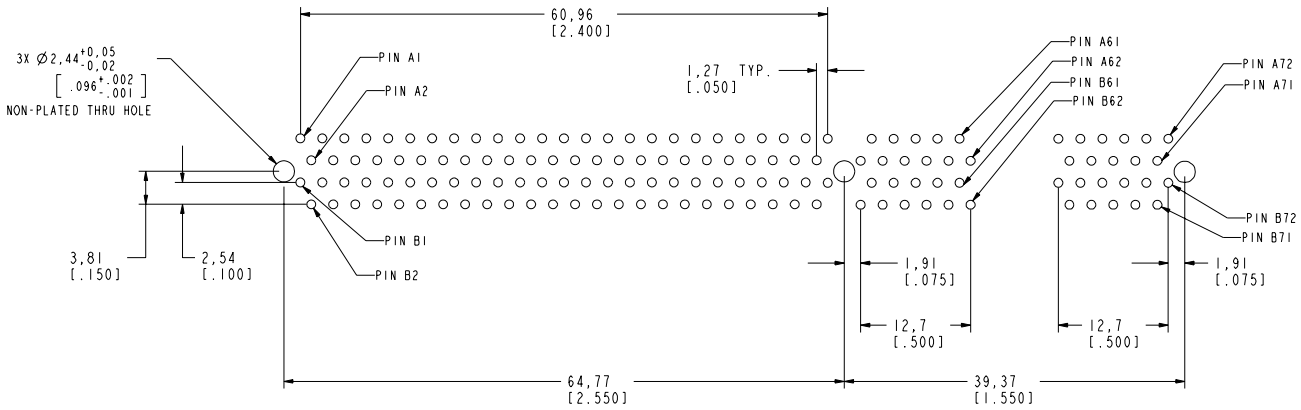

Figure 6. ATX Riser 2x11 Connector Layout Recommendation

Figure 10 in Section 4 shows the 2x11 connector placement on an ATX family desktop board.

3. Electrical Specification

An ATX-family desktop board can be designed to support an ATX Riser card by adding a 2x11 PCI-style connector in-line with a standard 2x60 PCI connector. The added PCI REQ/GNT# pairs are provided by the riser connector to support PCI-compliant loads on the riser card. In addition, the riser connector provides PCI clock signals for support of up to three PCI devices. The REQ/GNT# and PCI clocks may be shared between the slots found on the desktop board and those located on the riser card. This is dependent on the design requirements for the board, number of slots versus down devices on the board. The slots on the desktop board and riser card cannot be used simultaneously. Likewise, the down active devices on the board cannot be shared with the riser slots.

3.1 ATX Riser Card Edge Connector Pin Definitions

The ATX Riser card connects to the ATX family desktop board through a standard PCI connector and additional 2X11 riser connector. The tables in this section associate the ATX Riser specification pin names with their functions and proper location on the card edge connector.

Connector Summary:

- Standard PCI connector and 2x11 riser connector provide PCI signals to support two extra PCI slots and PCI2ISA.
- Foxconn 2x11 connector (Foxconn P/N EH011**-***) or engineering equivalent.
- Signals (PCI clocks, REQ/GNT pairs, Riser_IDs, SER_IRQ, PC/PCI_DREQ/DGNT#s and NOGO) allow for PCI and ISA slots on the ATX Riser card by using a PCI-to-ISA Bridge.
- Rely on full PCI connector to support power requirements as it supports 13 +5 V pins and 12 +3.3 V pins (>25W capable).
- ±12 V relies on standard PCI connector to support its power requirements.
  -12 V requirement is only 100 ma per slot, and +12 V is 500 ma.

Table 2. Signal and Pin List

Signal Name	Type*	Pin Number	# Pins	Notes
+12v	Supply	A10	1	Additional +12v
GND	Ground	B1, A2, B3, A4, B5, B7, B9	7	
PCI_CLK1	Output	B2	1	Riser Slot 3
PCI_CLK2	Output	B6	1	Riser Slot 2
PCI_CLK3	Output	A5	1	Active PCI device
PCI_REQ1#	Input	B4	1	Riser Slot 3
PCI_REQ2#	Input	B8	1	Riser Slot 2
PCI_GNT1#	Output	A1	1	Riser Slot 3
PCI_GNT2#	Output	A3	1	Riser Slot 2
SER_IRQ	Input/Output	A11	1	PCI2ISA
PC/PCI_DREQ#	Input	B10	1	PCI2ISA
PC/PCI_DGNT#	Output	B11	1	PCI2ISA
NOGO	Output	A9	1	PCI2ISA
RISER_ID1	Input	A6	1	Riser ID/Mfg Test
RISER_ID2	Input	A8	1	Riser ID/Mfg Test
RESVD	TBD	A7	1	
	Total		22	

* Type column definitions relative to desktop board:

Output = Output from desktop board to riser

Input = Input from riser to desktop board

Table 3. 2x11 Connector Pinout

Pin #	B	A
1	GND	PCI_GNT1#
2	PCI_CLK1	GND
3	GND	PCI_GNT2#
4	PCI_REQ1#	GND
5	GND	PCI_CLK3
6	PCI_CLK2	RISER_ID1
7	GND	RESVD
8	PCI_REQ2#	RISER_ID2
9	GND	NOGO
10	PC/PCI_DREQ#	+12v
11	PC/PCI_DGNT#	SER_IRQ

3.2 Riser Identification Bits

The riser identification bits are used to support manufacturing tests for presence of the riser card and type of card installed (Table 4). The riser bits can be connected to GPIO pins as input to a desktop board device allowing system BIOS to read status of installed Riser.

Table 4. Riser ID Bits

RISER_ID2*	RISER_ID1	# SLOTS
0	0	3
0	1	2
1	0	Other
1	1	No Riser

* Riser_ID signals use pullup resistors to VCC3 located on the board.

3.3 5V/32-Bit PCI Riser Power

The ATX Riser card is connected to the desktop board through a standard PCI connector and extra 2x11 connector. The total power available to the riser card is power supply-dependent and is not necessarily limited by the connectors on the board. Expansion card is limited to 25 W maximum from all power rails with +3.3 V and +5 V current being system-dependent or there is no specific requirement per connector. The ±12 V current is specified from the power supply per connector.

Table 5. Riser Power Capability

Supply (Nom.)	# Pins	Power @ 1 A/Contact
+3.3 V	12	40 W
+5 V	13	65 W
+12 V	1	12 W
-12 V	1	12 W
Ground	22	

3.4 Riser Card Edge with External Traces

- 20 mil trace width
- 1 oz copper
- ≈1.2 A @ 10 °C Rise
- ≈2 A @ 30 °C Rise
- Because the PCI connector specifies 1 A per contact @ 30 °C temperature rise, then 20 mil trace with 1 oz. copper plating should be sufficient with the above current/power assumptions for the riser card.

Table 6. Riser Power Recommendation

Supply (Nom.)	# Pins	Power @ 1 A @ 30 ºC Rise	Riser
+3.3V	12	40W	32W
+5V	13	65W	52W
+12V	2*	24W	18W
-12V	1	12W	12W

* One pin added to 2x11 connector for +12 V to provide additional power on a 3-slot riser.

3.5 PCI Slot Assignments on ATX Form Factor Boards with ATX Riser Support

ATX Riser capability is implemented on an microATX desktop board using PCI slot 6 (see Figure 10 or slot 2 depending, on which reference used for slot definition. BIOS look-up of the tables below can be chosen to support certain PCI Device numbers, PCI clock enabling/disabling for EMI, and particular interrupts based upon desktop board slots, riser slots, and/or down devices if installed.

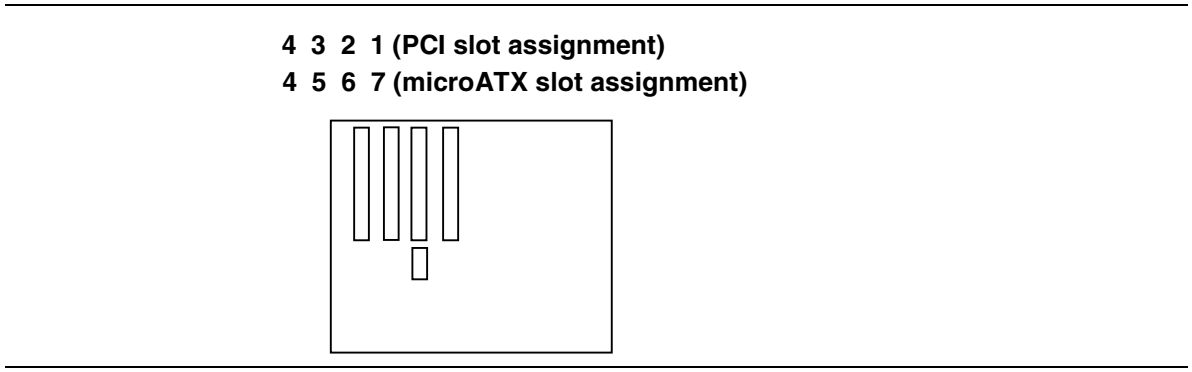

Figure 7. microATX and PCI Slot Location and Assignment

Table 7. Motherboard

Slot or Device	IDSEL/AD	PCI_CLK	INT#	REQ/GNT
1 or NS	W	1	A	0
2 or Riser	X	2	B	1
3 or NS	Y	3	C	2
4 or NS or Down #3	Z	4	D	3
Down #1	IS	IS	IS	4
Down #2	IS	IS	IS	5

IS (Design- or Implementation-Specific but must be in allowable range for IDSEL listed below)

NS (No Slot on motherboard in this location)

W, X, Y & Z Address for IDSEL is (IDSEL >AD16 & < AD27)

Slot	INTA	INTB	INTC	INTD
1	0	1	2	3
2	1	2	3	0
3	2	3	0	1
4	3	0	1	2

MB slot 2 used for Riser

3.6 Recommended PCI IDSEL and INTx# Assignments

The address used for IDSEL should be fixed on the Riser to associate Riser Slot and interrupts to that particular Slot. System.

The BIOS uses table to implement Plug and Play assignment of interrupts. When the BIOS (as well as the OS) assigns an interrupt to an add-in card, the BIOS must know exactly which INTx# pin is connected to corresponding slot.

The BIOS does not know or care about the REQ/GNT assignments. The BIOS can use the order of IDSEL assignment to distinguish between onboard and add-in peripherals. The BIOS scans for devices from low- to high-IDSEL numbers and can enable them in the reverse order. Onboard devices are assigned low numbers with the add-in slots assigned the highest numbers.

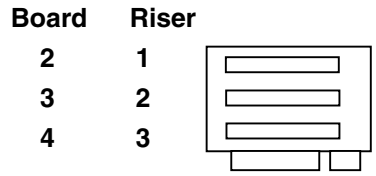

Figure 8. 3-Slot Riser Connector Location and Assignment

Table 8. 3-Slot Riser

Riser Slot	IDSEL/AD	PCI_CLK	INT#	REQ/GNT
1	27	2	B	1
2	29	3	C	2
3	31	4	D	3

Note: Slot 1 on Riser is top connector.

Riser Slot	INTA	INTB	INTC	INTD
1	1	2	3	0
2	2	3	0	1
3	3	0	1	2

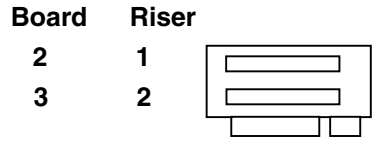

Figure 9. 2-Slot Riser Connector Location and Assignment

Table 9. 2-Slot Riser

Riser Slot	IDSEL/AD	PCI_CLK	INT#	REQ/GNT
1	27	2	B	1
2	29	3	C	2

Note: Slot 1 on Riser is top connector.

Riser Slot	INTA	INTB	INTC	INTD
1	1	2	3	0
2	2	3	0	1

Note: PCI interrupts INT[A..D]# arrive at Riser card edge offset by +1 because Riser uses Motherboard Slot 2.

4. Form Factor Implemention

4.1 ATX Riser Connector Location on ATX Family Desktop Boards

The ATX Riser card allows a low-profile desktop design based on the ATX family form factor. To achieve the smallest system configuration, it is highly recommended that the ATX Riser card is designed for slot 6 of the ATX family desktop board. Figure 10 identifies the slot location on a microATX board form factor.

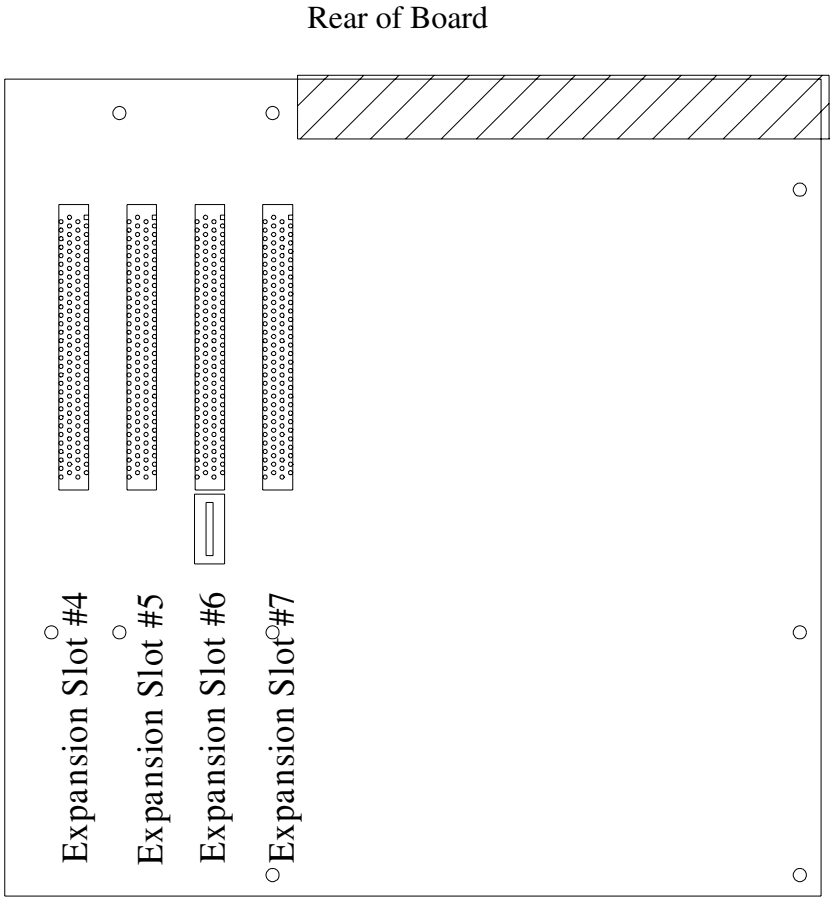

Figure 10. ATX Riser Location on microATX Form Factor