



# **PROCELERANT™**

## **CE915GM COM EXPRESS MODULE**

### **QUICK START GUIDE**

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**CE760A-0**

**CE738A-0**

**CE373A-0**

**CE370A-0**


**CE738A-E-512**



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[www.radisys.com](http://www.radisys.com)

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## Release history

Release	Date	Description
-0000	April 2007	First release, introducing CE760A, CE738A, CE373A, and CE370A modules.

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## TABLE OF CONTENTS

<b>Preface .....</b>	<b>5</b>
About this guide.....	5
Where to get more information.....	5
Safety notices.....	5
Lithium cell battery .....	5
Electrostatic discharge .....	6
<b>Chapter 1: Checking your order.....</b>	<b>7</b>
COM Express module product codes.....	7
CR100 carrier board product codes.....	7
Optional components.....	8
Memory modules.....	8
Fansinks .....	8
Video adapter .....	10
<b>Chapter 2: Preparing Components and Accessories.....</b>	<b>11</b>
Preparing COM Express components.....	11
Power supply .....	12
CD-ROM .....	12
Hard disk .....	12
Keyboard and mouse .....	12
Video devices.....	13
DVI and VGA Monitors.....	13
LVDS panel.....	13
TV or other S-Video devices.....	13
Ethernet .....	13
Miscellaneous attachments .....	13



- Chapter 3: Identifying Key Components..... 15**
  - COM Express module layout..... 15
  - CR100 carrier board layout..... 16
  
- Chapter 4: Assembling the Module and Carrier Board ..... 17**
  - Install the memory module..... 17
  - Install the fansink..... 18
  - Install the module assembly on the carrier board ..... 24
  - Install the CR100 carrier board in the chassis ..... 26
  - Connect internal devices and set jumpers..... 26
  - Connect external I/O devices and chassis components..... 28
  - Power on the system ..... 29
  - Check the BIOS settings..... 29
  
- Chapter 5: Installing Operating System and Drivers ..... 31**
  - Install the operating system ..... 31
  - Install drivers..... 31



## PREFACE

### About this guide

Procelerant™ COM Express™ family products are designed to provide a wide range of processor options enabling high reuse and interchangeability of COM Express modules and carrier boards. Additionally, all CE915GM COM Express modules, their heatsink assemblies, and the CR100 carrier boards are RoHS compliant.

This guide is for the technician or engineer who will physically install the Procelerant COM Express embedded computing module on an application-specific carrier board. The Procelerant CR100 FlexATX carrier board was designed for this purpose, and is used as the sample carrier board in this guide.

For detailed information and technical specifications, refer to the *Procelerant CE915GM COM Express Module Product Manual* available on the RadiSys Web site, [www.radisys.com](http://www.radisys.com).

For information about the CR100 carrier board, refer to the *Procelerant CR100 FlexATX Carrier Board Product Manual*.

### Where to get more information

Please visit the RadiSys® Web site at [www.radisys.com](http://www.radisys.com) for product information and other resources. Downloads (manuals, release notes, software, etc.) are available via the Technical Support Library product links at [www.radisys.com/support](http://www.radisys.com/support) or the product pages at [www.radisys.com/products](http://www.radisys.com/products).

### Safety notices

#### Lithium cell battery

#### WARNING

The CR100 carrier board contains a lithium cell battery.

- DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of batteries according to the manufacturer's instructions.
- When removing or replacing the lithium cell, do not use a conductive instrument, as a short-circuit may cause the cell to explode. Always replace the cell with one of the same type. This product uses a CR2032 cell. Dispose of a spent cell promptly—do not recharge, disassemble, or incinerate a cell. Keep cells away from children.



## Electrostatic discharge

### WARNING

This product contains static-sensitive components and should be handled with care. Failure to employ adequate anti-static measures can cause irreparable damage to components.

Electrostatic discharge (ESD) damage can result in partial or complete device failure, performance degradation, or reduced operating life. To avoid ESD damage, the following precautions are strongly recommended.

- Keep each module/PCB in its ESD shielding bag until you are ready to install it.
- Before touching a module, attach an ESD wrist strap to your wrist and connect its other end to a known ground.
- Handle the module only in an area that has its working surfaces, floor coverings, and chairs connected to a known ground.
- Hold modules only by their edges and mounting hardware. Avoid touching PCB components and connector pins.

For further information on ESD, visit [www.esda.org](http://www.esda.org).



## CHECKING YOUR ORDER

1

Check the RadiSys product codes on the Procelerant COM Express module, CR100 carrier board, and accessories to make sure you received the correct products for your application.

### COM Express module product codes

The following table lists the CE915GM modules available at the time of publication. Check the CE915GM product page on the RadiSys Web site or contact your sales representative for the latest information about product offerings. Note that memory modules are not necessarily included and must be purchased separately.

Product code	Description
CE760A-0	CE915GM with Intel® 2GHz Pentium® M 760 BGA processor, no memory module, RoHS
CE738A-0	CE915GM with Intel 1.4GHz LV Pentium M 738 BGA processor, no memory module, RoHS
CE373A-0	CE915GM with Intel 1.0GHz ULV Celeron M 373 BGA processor, no memory module, RoHS
CE370A-0	CE915GM with Intel 1.5GHz Celeron® M 370 BGA processor, no memory module, RoHS
CE738A-E-512	CE915GM with Intel 1.4GHz LV Pentium M 738 BGA processor, 512MB memory module, with extended temperature to -25°C to 70°C, RoHS

### CR100 carrier board product codes

This guide assumes that you will use the CR100 carrier board with the COM Express module. Two CR100 carrier board options are available to accommodate your graphics requirements.

Product code	Description
CR100-2DVI	Flex ATX Carrier, Dual DVI
CR100-PCIE16	Flex ATX Carrier, PCIE x16, SVGA

## Optional components

### Memory modules

The COM Express module requires one memory module to operate. For supported memory module options that have been validated for use with these COM Express modules, refer to the ProcLerant CE915GM Memory Validation List documentation on the RadiSys Web site.

### Fansinks

The table below lists the product codes of fansinks offered by RadiSys. A complete list of all the components in each fansink kit is provided in the tables that follow.

Product code	Description
CE-AHSA	Active heatsink assembly (a fan is built into the heatsink) for any COM Express module in a 2U chassis. The power connector for the CE-AHSA fansink is ATX-compliant. Heatsink dimensions: 125 x 95 x 26.90mm Fansink dimensions: 80 x 80 x 15mm Fansink power supply: +5V to +13.8V (+12V recommended)
CE-PHSA	A passive heatsink for any COM Express module in a 1U chassis. A chassis fan is required with this option. Dimensions: 125 x 95 x 26.90mm
CE-PHS17A	A 17mm low-profile passive heatsink for COM Express modules CE373A or CE738A in a 6HP (ATCA) blade. An air velocity of 400 lfm [2 m/sec] is required. Use with CE738A requires a chassis fan. Dimensions: 125 x 95 x 14.94mm
CE-HSPA	Heat spreader for CE760A, solid aluminum, compliant with PICMG COM.0 COM Express specification Revision 1.0 Dimensions: 125 x 95 x 11mm
CE-TIM	Thermal compound application bar, phase change at 58°C (136°F)



### CE-AHSA package contents

Product code	Description	QTY	Part number
Backer plate	41x36mm, sheet metal (supplied with four M2 flat head screws)	1	010-02709-00xx
CE-AHSA	Aluminum active fansink, 125x94x42mm, 12V input	1	019-00352-00xx
Carrier screws	M2.5x0.45x4mm, pan head (used to tighten the carrier board and module)	5	09-0293-00xx
Heatsink screws	M2.5x0.45x16mm, pan head (used to tighten the heatsink and module)	5	009-01707-00xx
Heatsink spacer	M2.5 clear, 4.5mm outside diameter, 6mm long	1	009-01587-00xx
Module screw	M2.5x0.45x12mm, pan head (used with the heatsink spacer)	1	09-0344-00xx
Standoffs	M2.5x0.45x5mm, hex jam, 4.5mm outside diameter	5	009-01190-00xx
Washers	2.5mm inside diameter, spring lock (used with heatsink screws)	5	009-01208-00xx

### CE-PHSA package contents

Product code	Description	QTY	Part number
Backer plate	41x36mm, sheet metal (supplied with four M2 flat head screws)	1	010-02709-00xx
CE-PHSA	Aluminum active fansink, 125x94x27mm, 12V input	1	019-00352-00xx
Carrier screws	M2.5x0.45x4mm, pan head (used to tighten the carrier board and module)	5	09-0293-00xx
Heatsink screws	M2.5x0.45x16mm, pan head (used to tighten the heatsink and module)	5	009-01707-00xx
Heatsink spacer	M2.5 clear, 4.5mm outside diameter, 6mm long	1	009-01587-00xx
Module screw	M2.5x0.45x12mm, pan head (used with the heatsink spacer)	1	09-0344-00xx
Standoffs	M2.5x0.45x5mm, hex jam, 4.5mm outside diameter	5	009-01190-00xx
Washers	2.5mm inside diameter, spring lock (used with heatsink screws)	5	009-01208-00xx

## CE-PHS17A package contents

Product code	Description	QTY	Part number
Backer plate	41x36mm, sheet metal (supplied with four M2 flat head screws)	1	010-02709-00xx
CE-AHSA	Aluminum active fansink, 125x95x17mm, 12V input	1	019-00352-00xx
Carrier screws	M2.5x0.45x4mm, pan head (used to tighten the carrier board and module)	5	09-0293-00xx
Heatsink screws	M2.5x0.45x16mm, pan head (used to tighten the heatsink and module)	5	009-01707-00xx
Heatsink spacer	M2.5 clear, 4.5mm outside diameter, 6mm long	1	009-01587-00xx
Module screw	M2.5x0.45x12mm, pan head (used with the heatsink spacer)	1	09-0344-00xx
Standoffs	M2.5x0.45x5mm, hex jam, 4.5mm outside diameter	5	009-01190-00xx
Washers	2.5mm inside diameter, spring lock (used with heatsink screws)	5	009-01208-00xx

## Video adapter

If you are using the CR100 carrier board and need to attach a VGA monitor to a DVI-I port, a DVI-to-SVGA adapter is required. Refer to [DVI and VGA Monitors](#) on page 13 for further information on VGA support on DVI-I ports.

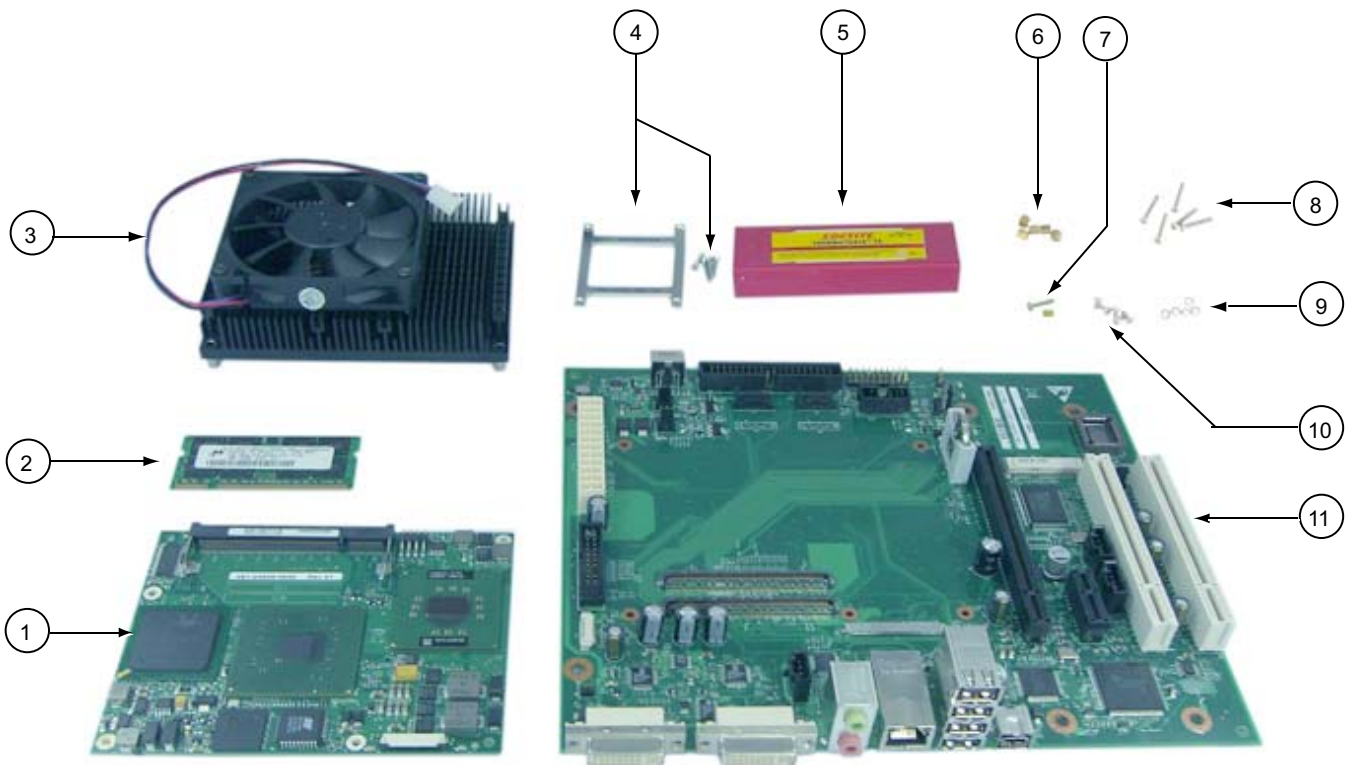
Product Code	Description
CE-DVI-VGA	DVI-to-SVGA adapter



## Preparing COM Express components

Lay out all the components on a grounded work surface as shown in *Figure 1, "Basic component preparation,"* on page 11 to prepare for assembly. Note that you may have different parts depending on what you ordered.

Figure 1. Basic component preparation



Item	Component description	Item	Component description
1	COM Express module	7	Heatsink spacer and module screw
2	DDR2 memory module	8	Heatsink screws
3	Active fansink assembly	9	Washers (use with item 8)
4	Fansink backer plate (supplied with four M2 flat head screws)	10	Carrier screws
5	Phase-change thermal interface material, Thermstrate® TC	11	CR100 FlexATX carrier board
6	Standoffs (use with items 8 and 9)		

## Power supply

The COM Express module will work with an ATX-compliant power supply or a power supply that is compliant with PICMG COM.0 COM Express Specification Revision 1.0. When selecting a power supply, be sure to consider the maximum power, AC input, frequency, input current, and DC out specifications of the power supply.

Theoretically, COM Express modules require at least 8A on the +12V power rail. Considering the power consumption of the carrier board, though, it is best to allow a certain amount of leeway on the two power rails. For this reason, the power supply should be rated above 200 Watts with at least 12A output on the +12V power rail.

A typical power supply for the CR100 Flex ATX carrier board may have these specifications:

Type: ATX  
 Max Power: 350W  
 AC input: 100–120V AC, 200–240V AC  
 Frequency: 50/60Hz  
 Input current: 10 A @ 115V, 6 A @ 230V  
 DC output:

Voltage	+3.3V	+5V	+12V	-5V	-12V	+5V Standby with 12V power supply
Current	14A	30A	15A	0.5A	0.8A	3.0A

### Note

- It is recommended that you use an ATX P4 power supply with a 24-pin cable, which is typically labeled "BTX." A 20-pin cable can also be used, in which case you would plug the 20-pin cable in on the pin #1 end of the carrier board's ATX power supply connector and leave the two pairs of pins on the other end exposed. No adapter is required.
- When multiple fans are used, additional amperage is required. For example, if a 4U chassis with two fans has 2A surge current for each fan, 16A is required (12A + 2A + 2A).

## CD-ROM

A USB CD-ROM or IDE CD-ROM drive is usually required for you to install the operating system and other software.

## Hard disk

Standard computer IDE and SATA hard disks (60GB, 80GB, 120GB, etc.) can be attached to the CR100 carrier board. The CR100 carrier board contains one IDE header and two SATA headers.

## Keyboard and mouse

The CR100 carrier board supports a standard USB keyboard and USB mouse. The CR100 does not support the use of a PS/2 keyboard or mouse.

## Video devices

### DVI and VGA Monitors

The CR100-2DVI carrier board contains two DVI-I ports that comply with the Digital Video Interface (DVI) specification. Dual independent displays can be used with the appropriate drivers installed. Alternatively, you can attach a single analog VGA monitor to one of the DVI-I ports. For detailed instructions, see [Connect internal devices and set jumpers](#) on page 26.

#### NOTE

Connection of a VGA monitor with a DB15 cable connector to the DVI port requires a VGA-to-DVI adapter (see [Video adapter](#) on page 10).

The CR100-PCIE16 carrier board is designed to use a PCI Express graphics card in the PCI Express x16 graphics slot for high-performance graphics acceleration. The two DVI-I ports on this carrier board do not support DVI monitors, but one of the ports can be used to attach a VGA monitor. For detailed instructions, see [Connect internal devices and set jumpers](#) on page 26.

### LVDS panel

On the CR100 carrier board, a low-voltage differential signaling (LVDS) interface allows the connection of one LVDS flat panel. This attachment typically requires a custom cable. Use the LVDS interface pinout chart in the *Procelerant CR100 FlexATX Carrier Board Product Manual* as a guide for obtaining a suitable cable.

### TV or other S-Video devices

Use a standard MiniDin4 male S-Video cable to connect video equipment or other S-Video compatible devices.

### Ethernet

Use the RJ45 Ethernet port to connect to a LAN, router, or other device via Ethernet cable. For 10/100Base-T connections, a Cat 5 cable is required. A 1000Base-T connection requires a Cat5E cable.

### Miscellaneous attachments

Additional interfaces, such as an RS-232 port, USB ports, front panel LEDs, IEEE 1394b, and backlight control, may be added to the chassis. For connector locations on the CR100 carrier board and cable selection for internal connections, refer to the *Procelerant CR100 FlexATX Carrier Board Product Manual*, which provides connector locations, connector pinout definitions and a list of part numbers for all carrier board connectors.





This chapter describes the key components and interfaces on the COM Express module and CR100 carrier board.

## COM Express module layout

Figure 2 and Figure 3 show the main components of COM Express modules. For features and functionality of these components, refer to the *Product Manual*.

Figure 2. COM Express module top view

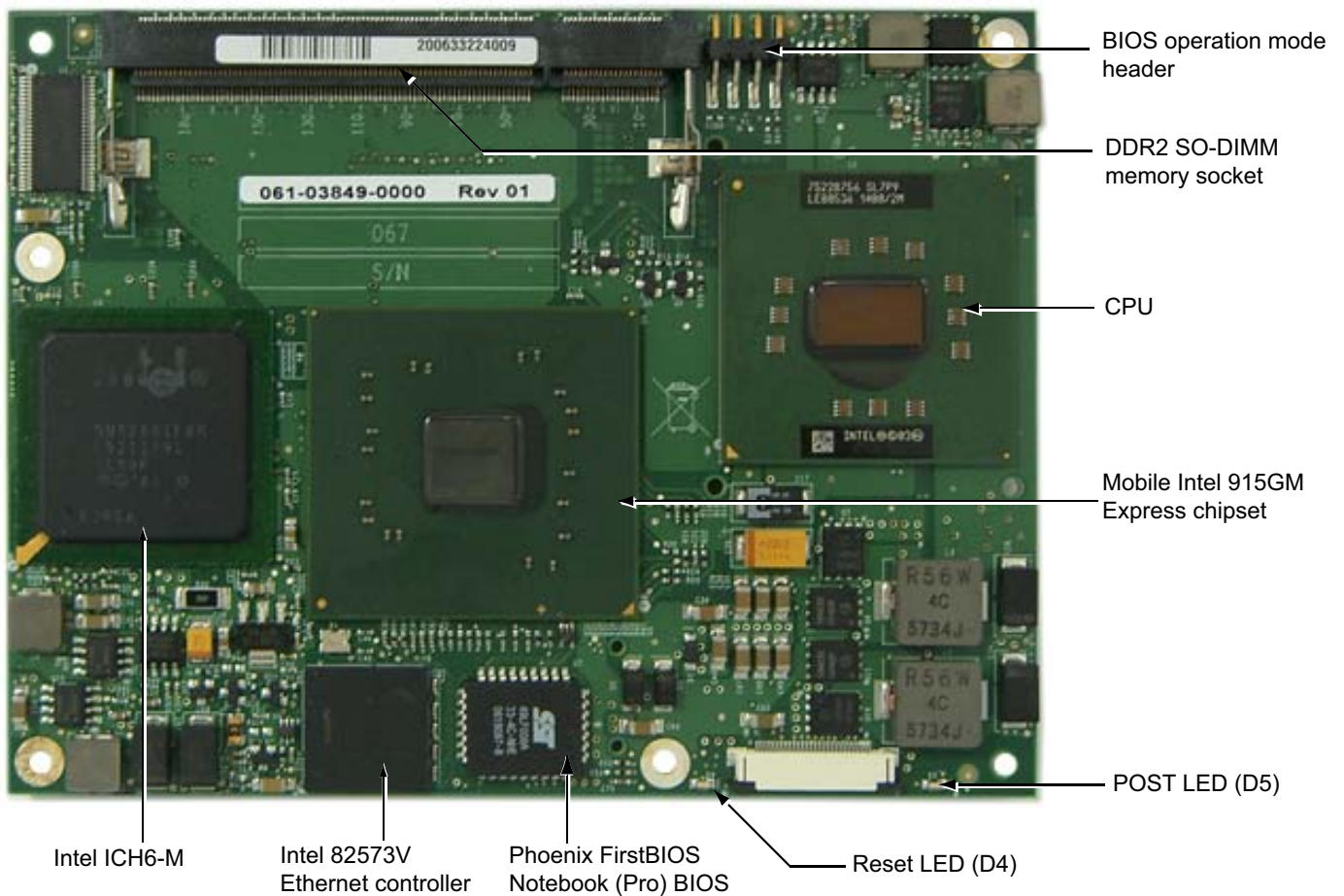
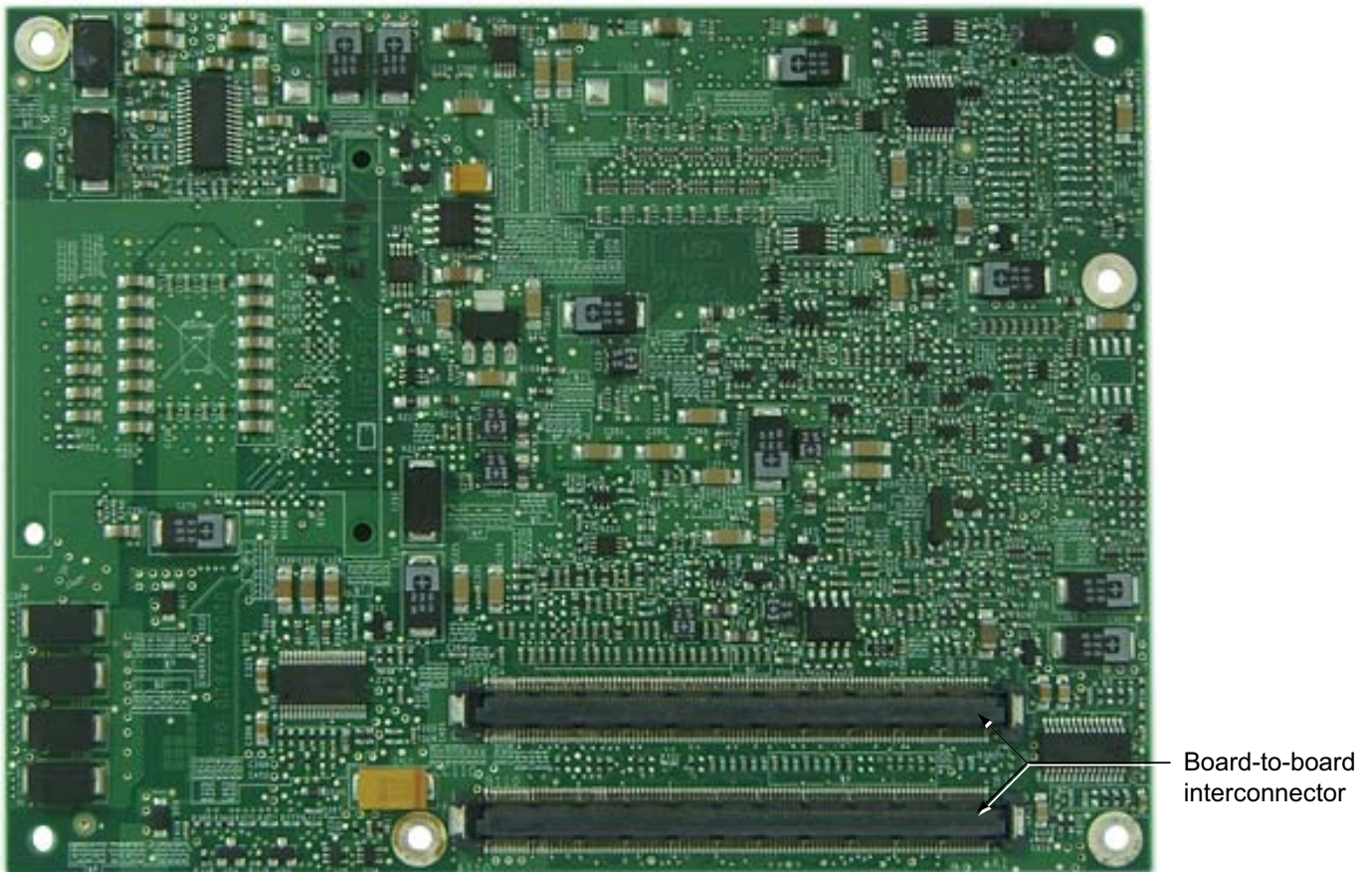




Figure 3. COM Express module bottom view



### CR100 carrier board layout

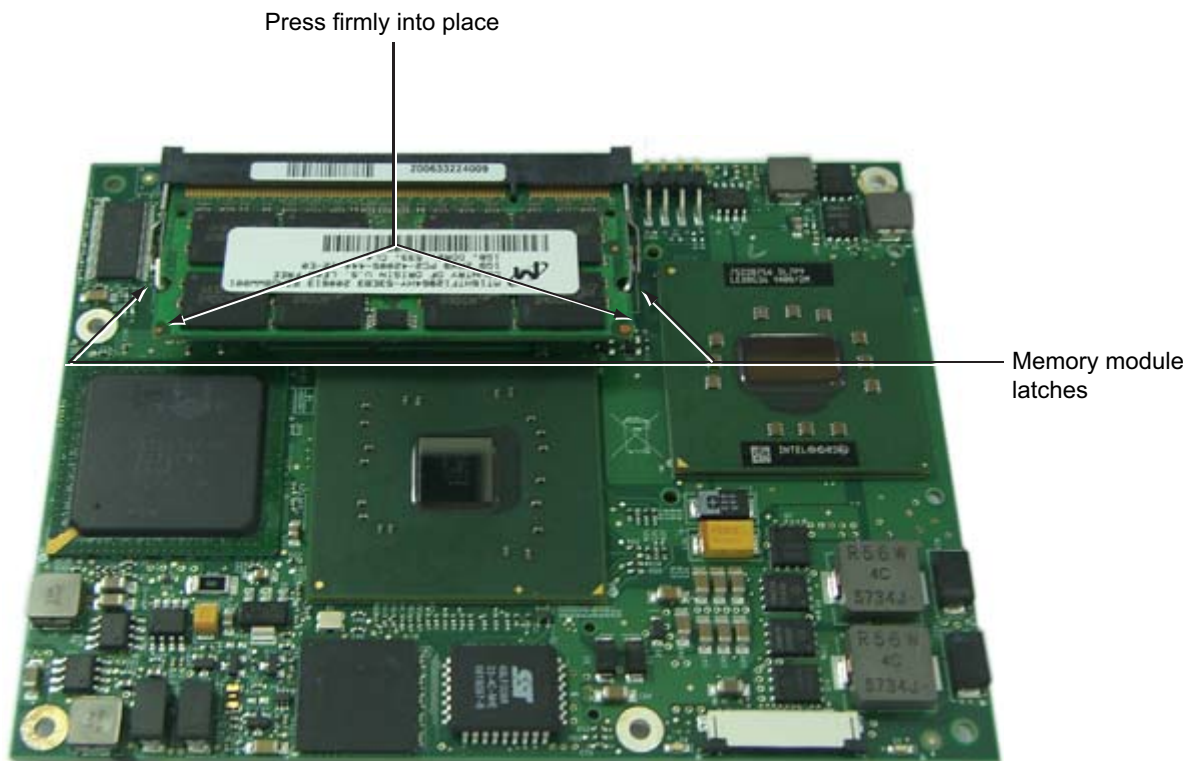
For locations of key components on the CR100 carrier board, refer to the *Proclerant CR100 FlexATX Carrier Board Product Manual*.





## Install the memory module

1. Insert one memory module into the lower DDR2 SO-DIMM memory socket. Press down on the corners of the memory module until the latches click into place.



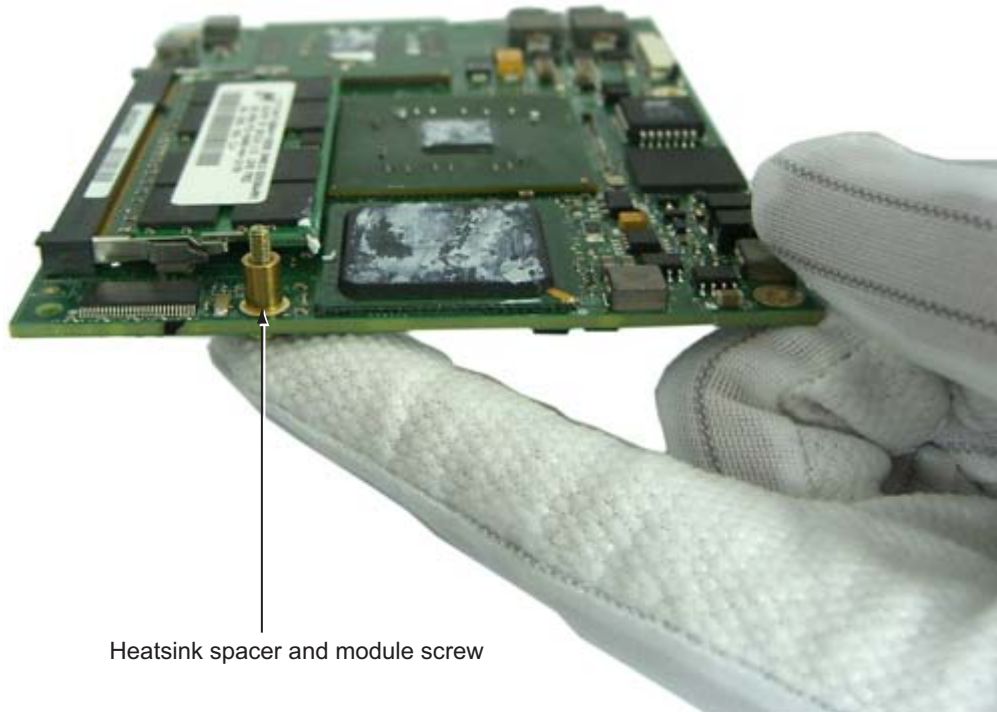
2. To remove a memory module, open the latches on both sides of the memory socket, lift the free end of the memory module, and remove it from the socket.

## Install the fansink

1. Apply the Thermstrate TC phase-change material to the processor, GMCH, and ICH6-M chipsets. When assembled, heat from the chips will be conducted through the thermal interfaces to the fansink.

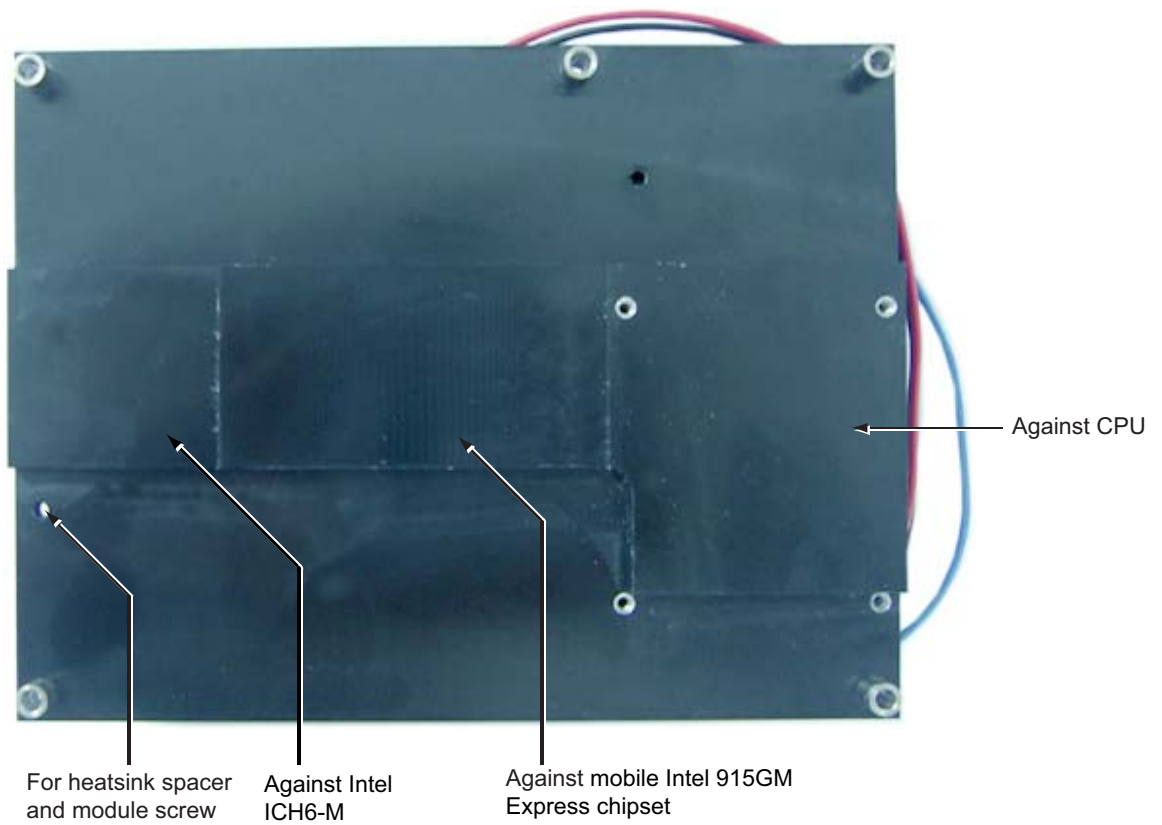


2. Install the heatsink spacer and module screw through the module as shown below. The screw will secure the fansink.



Heatsink spacer and module screw

3. Check the bottom side of the fansink for correct alignment against the module.



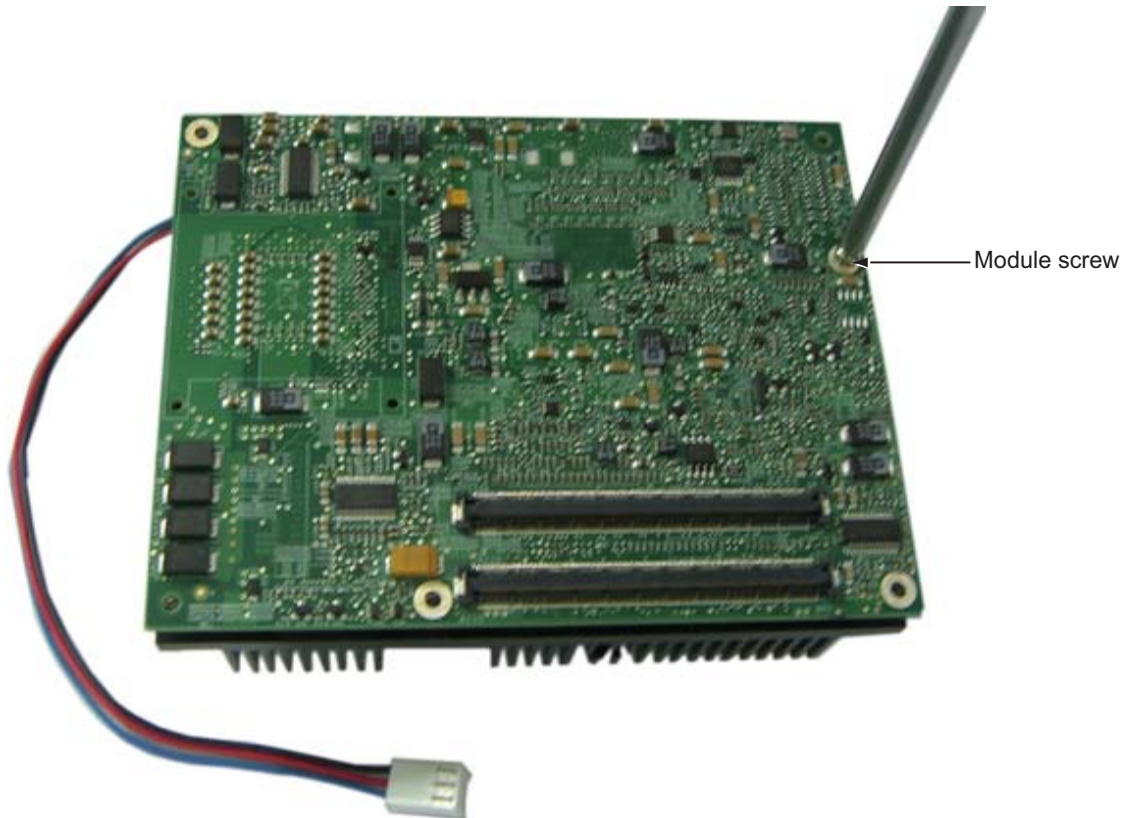
4. Place the fansink assembly on the module as shown, lining up the standoffs on the fansink with the screw holes in the module.



5. Hold the module and fansink together and turn them over. Tighten the module screw to a torque value of 0.34 N·m (3 lbf·in).

**WARNING**

To avoid damaging the module, be careful not to overtighten the screws.

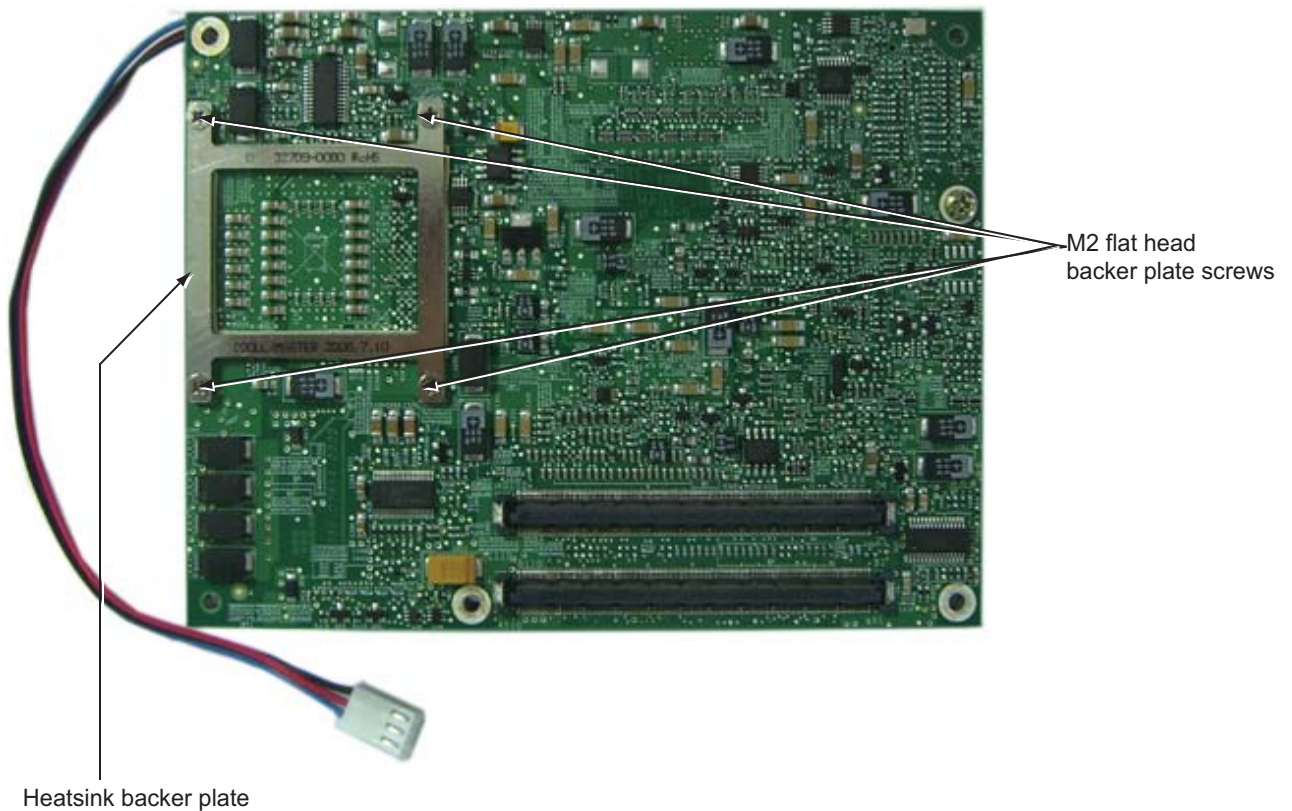




- Place the heatsink backer plate on the module as shown. Tighten the supplied backer plate screws until they reach the PCB, and then back off 1/2 turn.

**WARNING**

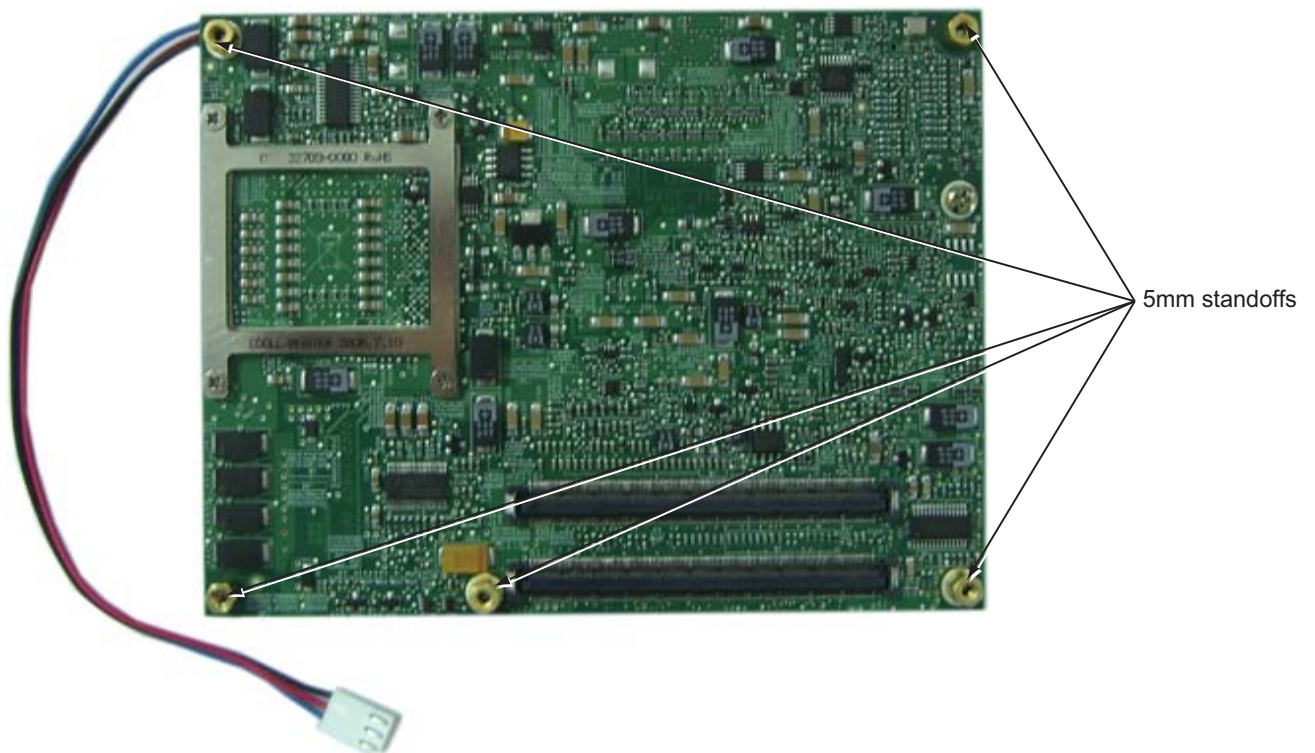
To avoid damaging the module, be careful not to overtighten the screws.



7. Turn the assembly over again, and insert the five heatsink screws through their washers and into the holes at the locations shown.



8. The heatsink screws will protrude through the module. Use the five 5mm standoffs shown, and tighten the screws to a torque value of 0.34 N·m (3 lbf·in).



9. RadiSys recommends you place the assembly in a temperature chamber at a temperature of 60°C for 10 minutes to allow the thermal interface material to phase change and conform to an optimal shape between the chips and fansink.

**WARNING**

The CPU may be damaged if this step is not performed prior to operating the system.

As an alternative to using a temperature chamber, you can perform this step immediately after assembling the system by temporarily covering the fansink to trap heat and elevate the temperature. To verify that the temperature reaches 60°C, enter the BIOS Setup utility by pressing F2 during system boot, and navigate to the Information > System Monitors submenu. After 10 minutes of operation at 60°C, be sure to uncover the fansink before using the system further.

This completes the assembly of the module and fansink.

## Install the module assembly on the carrier board

1. Line up the board-to-board interconnectors on the module and the CR100 carrier board as shown, then press the connectors firmly into place.

**WARNING**

To avoid damaging any components, make sure the COM Express module is firmly seated in the CR100 board's interconnectors before using screws to complete the assembly.

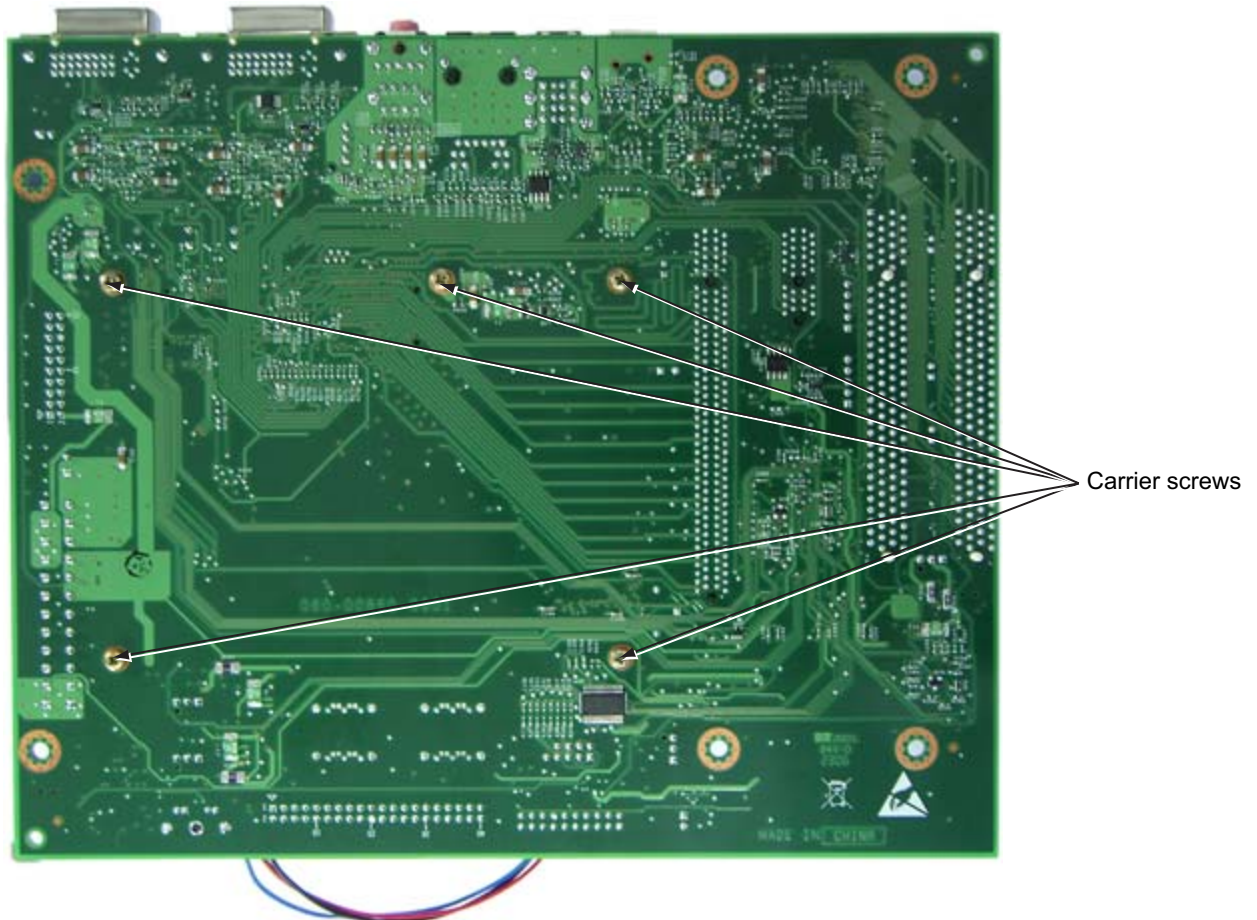
When the module is fully seated, its five standoffs should be touching the CR100 carrier board.



2. Plug the fan's 3-wire cable into the processor fan connector on the CR100 carrier board.
3. Insert the five carrier screws through the back of the CR100 carrier board at the locations shown, then tighten the screws to a torque value of 0.3136N·m (2.78 lbf·in).

**WARNING**

Do not overtighten the screws, or the CR100 carrier board may be damaged.



## Install the CR100 carrier board in the chassis

1. Prepare a chassis designed to accept a standard FlexATX-sized board.
2. Remove any I/O shielding included with the chassis, and replace it with the CR100 carrier board's I/O shielding from RadiSys.
3. Fit the module and carrier board assembly into the chassis and snap the carrier board's rear I/O panel into the I/O shielding.

### Note

To avoid electromagnetic interference, ensure that the springs on the I/O shielding are in full contact with the CR100 carrier board's rear I/O panel.

4. Use the screws and standoffs supplied with the chassis to mount the carrier board. Torque values vary according to the size and material of the screws used. Check with your chassis manufacturer for the recommended torque values of any screws they provide.

## Connect internal devices and set jumpers

This section gives the procedure for connecting internal devices to the CR100 carrier board, such as disk drives and LAN cards, and configuring jumper settings.

1. Connect the following internal devices to connectors on the carrier board as needed. The installation order is not important.

Device to connect	CR100 connector	Cable type
Up to two internal USB devices	Internal USB headers	Standard 5-pin USB cable
PCI Express x1 device, such as a LAN card	PCI Express x1 slot	N/A
One IDE device, such as a CD-ROM drive or hard disk drive	IDE header	Standard IDE cable, complies with the ATAPI industrial specification
Up to two SATA devices, such as hard disk drives	SATA connectors	Standard SATA cable, compliant with SATA specification 1.0
One LVDS flat panel	LVDS flat panel connector	Standard 30-pin LVDS cable
One backlight control connector for the LVDS flat panel	Backlight control connector	Custom; attaches to 7-pin 1.25mm header

For further information about attaching devices, refer to the *Procelerant CR100 FlexATX Carrier Board Product Manual*.

2. If you have a CR100-2DVI carrier board, you may need to specify which DVI-I connector will output VGA signals with the 2-pin DVI output selection header. For instructions on connecting a DVI digital video monitor or analog VGA monitor, see [Connect external I/O devices and chassis components](#) on page 28.
  - Pins 1 and 2 jumpered (default)—Obtains analog VGA output from the secondary DVI-I port J2
  - Pins 1 and 2 open—Obtains VGA output from the primary DVI-I port J1

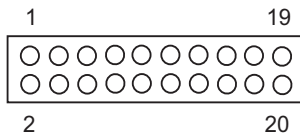
3. If you have a CR100-PCIE16 carrier board, insert a PCI Express graphics card into the PCI Express x16 graphics slot.
4. The 2-pin boot BIOS selection header specifies whether the system will use the BIOS on the carrier board or the BIOS on the module when booting:
  - Pins 1 and 2 open (default)—The system will boot from the COM Express module BIOS, which is based on the Phoenix® FirstBIOS™ Notebook (Pro) BIOS with RadiSys extensions.
  - Pins 1 and 2 jumpered—The system will boot from the carrier board BIOS.

#### Note

Refer to the *Procelarant CR100 FlexATX Carrier Board Product Manual* if you plan to install a BIOS chip on the CR100 carrier board.

5. Connect the power supply to the 24-pin ATX PSU connector on the CR100 carrier board. The power supply connector must be a 24-pin or 20-pin<sup>1</sup> connector that complies with ATX Specification Version 2.2.
6. Connect the power switch and LED indicator cables to the front panel I/O header. Pin #1 is marked by an asterisk (\*) on the CR100 carrier board.

Function	Cable setting
Hard disk drive LED	Pins 1 and 3: <ul style="list-style-type: none"> <li>• 1: HDD LED cathode (to VCC, typically white in two-wire cables)</li> <li>• 3: HDD LED anode (from HD_ACT#)</li> </ul>
Reset switch	Pins 5 and 7
Power-on switch	Pins 6 and 8
Speaker	Pins 10 through 16: <ul style="list-style-type: none"> <li>• 10: 5V supply</li> <li>• 12: Audio signal (speaker)</li> <li>• 14: Not connected</li> <li>• 16: Audio signal (speaker)</li> </ul>



#### Note

The CR100 carrier board does not support the power LED indicator. If you have a custom carrier board that supports this function, make sure that you connect the cathode and anode of the power LED cable correctly.

<sup>1</sup> If a 20-pin cable is used, plug the 20-pin cable in to the pin #1 end of the connector, and leave the two pairs of pins on the other end exposed. No adaptor is required. Pin #1 is marked by an asterisk (\*) on the CR100 carrier board.

## Connect external I/O devices and chassis components

Connect external devices to the connectors on the rear I/O panel of the CR100 carrier board.

1. Connect the keyboard and mouse to any of the USB ports.
2. If you have a CR100-2DVI carrier board, connect one or two monitors according to your needs. Assuming you have left the jumper in the DVI output selection header to enable VGA output on the secondary DVI-I connector:
  - Connect a digital video monitor to the primary DVI-I connector.
  - Connect a VGA monitor to the secondary DVI-I connector. If the VGA monitor cable has a DB15 connector, you will need a DVI-to-VGA adaptor as shown below (RadiSys product code CE-DVI-VGA).



DVI side of adaptor



VGA side of adaptor

3. If you have a CR100-PCIE16 carrier board, connect one or more displays to the PCI Express graphics card according to the instructions provided with the graphics card.
4. Connect the following devices to external ports on the rear I/O panel as needed. The installation order is not important. For additional information, refer to the *Product Manual* and the *Procelerant CR100 FlexATX Carrier Board Product Manual*.

Device to connect	CR100 connector	Cable type
TV or other S-Video-compatible device	S-Video output port (located on front of CR100 carrier board)	Standard MiniDin4 male S-Video cable
LAN, router, or other Ethernet device	Ethernet port	For 10/100Base-T connections, a Cat5 cable is required; for 1000Base-T, a Cat5E cable is required.
Microphone and speaker	Audio jacks	Standard audio cables with 3.5mm male connectors

### NOTE

The CR100 carrier board does not provide an on-board PC speaker. It is recommended that you connect an external speaker to the front panel I/O header in order to hear diagnostic sounds during system boot.

## Power on the system

1. If an LVDS flat panel is attached and requires an external power supply, power it up before powering up the system. Otherwise, the panel's power supply will be provided by the CR100 carrier board via the backlight control connector.
2. Plug in the power supply. The system should automatically power on the first time the power supply is connected, but you may have to press the power button on the chassis (if connected) or the power button on the CR100 carrier board.

## Check the BIOS settings

It is a good idea to check the BIOS settings before installing the operating system to make sure the default settings are appropriate for devices you have installed. To enter the BIOS Setup utility, press F2 during system boot.

After installing the operating system, you may also want to change the boot order in the BIOS, so that the hard disk is checked first.

If problems are encountered during boot up, error messages may be displayed on the monitor. You can also use a POST card to determine where the system encountered problems.

Online help is provided in the BIOS setup to explain options. For further information, refer to the *Product Manual*.





## Install the operating system

The COM Express module runs under Microsoft® Windows® XP, Windows XP Embedded, and Red Hat® Desktop (version 4.0 or later). Contact RadiSys to verify support of other operating systems.

Install the operating system using a bootable CD-ROM. Follow the installation instructions provided with the operating system.

## Install drivers

This sections lists the drivers you need to install with supported operating systems. Drivers are available for download from RadiSys Web site, [www.radisys.com/service\\_support](http://www.radisys.com/service_support). Search for "Procelerant CE" by product name, and then click "Procelerant CE915GM."

### Microsoft Windows XP and Windows XP Embedded

Install the Intel chipset drivers first. Other drivers can be installed in any order, and include the following:

- Intel 915GM video card driver
- HDA for STAC9200 audio driver
- 10/100/1000M Base-T Ethernet device driver
- Dual-DVI driver (optional, for dual-DVI output)

### Red Hat Desktop

- Intel 915GM video card driver (does not support 3D graphics)
- HDA for STAC9200 audio driver
- Intel Gigabit network driver

