RXi2-UP Industrial PC

HARDWARE REFERENCE MANUAL

EMERSON™

Warnings and Caution Notes as Used in this Publication

⚠ WARNING

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

⚠ CAUTION

Caution notices are used where equipment might be damaged if care is not taken.

ATTENTION

Indicates a procedure or condition that should be strictly followed to improve these applications.

> *Note:*   *Notes merely call attention to information that is especially significant to understanding and operating the equipment.*

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met during installation, operation, and maintenance. The information is supplied for informational purposes only, and Emerson makes no warranty as to the accuracy of the information included herein. Changes, modifications, and/or improvements to equipment and specifications are made periodically and these changes may or may not be reflected herein. It is understood that Emerson may make changes, modifications, or improvements to the equipment referenced herein or to the document itself at any time. This document is intended for trained personnel familiar with the Emerson products referenced herein.

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Contents

Section 1: Introduction

1.1 Revisions to this Manual

Rev	Date	Description
D	Oct 2021	Updates to support Movicon.NExT software bundle
C	Nov 2021	UKCA Update
B	March 2021	Update to IEC/UL 62368
A	Nov 2019	Emerson Rebranding
-	May 2019	Initial Release

1.2 Related Documentation

Documents	Document Number
RXi2-UP Quick Start Guide	GFK-3221
RXi2-UP Hardware Reference Manual	GFK-3047
RXi2 IPC Secure Deployment Guide	GFK-3200
RXi2-UP Industrial PC Datasheet	00813-0100-0120

1.3 Features

The RXi2-UP IPC industrial computing platform delivers compact, rugged, high-performance computing and high-performance graphics capabilities to run Human-machine Interface (HMI), historian, and analytics applications for real-time control of operations. It offers expansion options of 1, 2, or 4 (mini and low profile) PCI Express (PCIe) slots and CFast storage.

A Computer-On-Module (COM) is a module containing all components necessary for a bootable host computer, packaged as a super component. A COM requires a carrier board to connect I/O and power up. COMs are used to build modular solutions and offer Original Equipment Manufacturers (OEMs) fast time-to-market with reduced development costs. Like integrated circuits, they provide OEMs with significant freedom in meeting form-fit-function requirements. For these reasons, the COM methodology has gained much popularity with OEMs in the embedded industry.

The RXi2-UP IPC is composed of the following components:

- bCOM6L20 COM Express module based on Intel® Kaby Lake 7th Generation Core™ i5/i7 and Xeon® V6 series

- CEC09 COM Express carrier board

- PERC12 (1-slot), PERC10 (2-slot) and PERC11 (4-slot) PCIe riser board

- PIP24VDC power supply module

- SRC SATA riser board for additional 2.5-inch mass storage devices support

- Industrial grade enclosure with heat sink for the module and carrier components

This chapter describes the features, capabilities, and compatibilities of the RXi2-UP IPC and its components.

Figure 1: 0-Slot RXi2-UP IPC

Figure 2: 1-Slot RXi2-UP IPC

Figure 3: 2-Slot RAID RXi2-UP IPC

Figure 4: 4-Slot RXi2-UP IPC

Figure 5: 4-Slot RAID RXi2-UP IPC

Section 2: Capability and Compatibility

The bCOM6L20 COM Express module is a fully IBM-AT compatible single board computer module containing many functions in a very small form factor. It is based on the PICMG COM Express Module Base Specification V2.1 Type 6. (Refer to the documentation located at www.picmg.org.) The bCOM6L20 uses the Intel x86 7th Generation Core Processor and Intel Xeon v6 Processors to provide most of the interface.

The CEC09 COM Express carrier board is also compliant with the PICMG COM Express Module Base Specification V2.1 Type 6.

The PERC10 and PERC11 PCI Express (PCIe) riser boards provide signals from the Edge connector interface to a PCIe packet switch device (limited to PCIe Gen2) through PCIe expansion slots. The PERC12 riser board provides signals from the Edge and is a passive device that supports a PCIe Gen3 link.

The PIP24VDC power supply module provides a voltage input of nominal 24 V (± 25%).

2.1 Software Requirements

- Microsoft® Windows® 10 Professional 64-Bit
- Linux® Kernel 4.8

2.2 Features

RXi2-UP IPC module features are as follows:

- 7th Generation Intel Core Processor and Intel Xeon Processor E3-1200 v6 product line
  - i5-7442EQ 25W 4c/4t HD530 2.1GHz (max 2.9) GHz 6MB, 16GB no ECC with QM175
  - i7-7820EQ 45/35W 4c/8t HD530 3.0 GHz (max 3.7) GHz 8MB, 16GB no ECC with QM175
  - E3-1501L v6 25W 4c/4t HDP530 2.1 GHz (max 2.9) GHz 6MB, 32GB ECC with CM238
  - E3-1501M v6 45W 4c/4t HDP530 2.9 GHz (max 3.6) GHz 6MB, 32GB ECC with CM238
  - E3-1505L v6 25W 4c/8t HDP530 2.2 GHz (max 3.0) GHz 8MB, 32GB ECC with CM238
  - E3-1505M v6 45/35W 4c/8t HDP530 3.0 GHz (max 4.0) GHz 8MB,32GB ECC with CM238
- System memory:
  - 8 GB up to 32 GB DDR3 SDRAM (soldered) with ECC running at 2133/2400 MHz
  - Organized dual channel with two ranks each
- 2x Display Port
- 4x USB 3.0

- 5x Gig Ethernet ports (1 from module plus 4 Ethernet controller (4x i210IT) with TimeSYNC IEEE1588 and 802.1AS
    - Alternative 1x GigE and 4x SFP (4x i210IS) (contact Emerson for support)

- Mini PCIe slot (half and full size)
    - Unified Infrastructure Management (UIM) interface

- M.2 PCIe M-Key (PCIe Gen3 x4) and SATA capability

- M.2 PCIe A-Key (general connectivity)

- TPM V1.2 or V2.0

- Up to 4 serial interfaces (2x RS-232, 2x galvanic isolated RS-485/RS-422)

- Capability for two additional 2.5 inch storage devices with SATA riser board/RAID option

- UIM interface

- 0, 1, 2 or 4-slot with active/passive riser board (depending on slot size)

- Operating at 24 V dc (±25%), including over and under-voltage protection

Figure 6: 2–Slot RXi2-UP IPC System Block Diagram
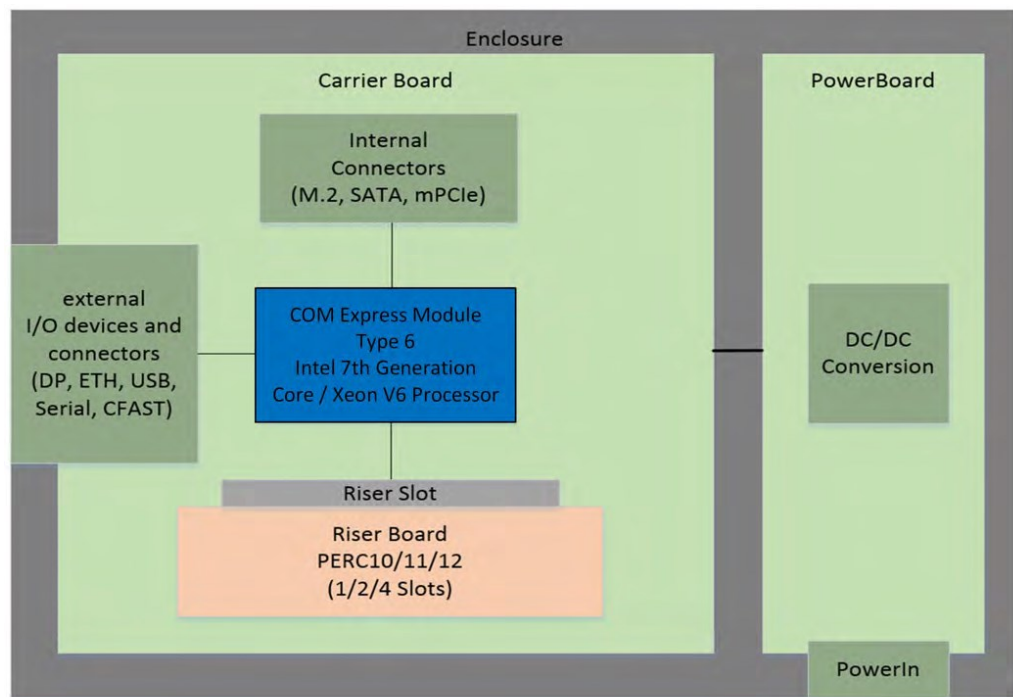
Section 3: Unpacking and Inspection

> ⚠ **CAUTION**
>
> If the RXi2-UP IPC operates in an enhanced ambient temperature up to 65°C (149 ° F), the surface of the enclosure, especially the heat sink, can reach a temperature of 85°C (185 °F) and above. Be careful and do not touch the RXi2-UP IPC with bare fingers.
>
> Install the RXi2-UP IPC only in rooms with restricted access.

This chapter describes unpacking, initial inspection, and required preparation considerations before using the RXi2-UP IPC. Perform the procedures in this chapter to verify proper operation after shipping and before system integration.

3.1   Package Contents

Verify that the delivered package contains the contents listed in the following table.

Table 3-1   Delivery Volume

Qty	Item	Purpose
1	RXi2-UP	RXi2-UP Industrial PC
1	FKCN 2,5/ 3-STF	Power Connector
1	R2X00ACCMP05	Flat Mounting Kit
1	FB-HW-058	Important Information
2	-	keys for RAID caddys

3.2   ESD and EMI

Electrostatic Discharge (ESD) is the discharge of static electricity. Electromagnetic Interference (EMI) is a disturbance generated by an external source that affects an electrical circuit by electromagnetic induction, electrostatic coupling, or conduction. ESD and EMI issues may show up incomplete and operational systems. There are many ways to avoid problems with these issues.

Any operational system with cables for I/O signals, connectivity, or peripheral devices provides an entry point for ESD and EMI. If Emerson does not manufacture the complete system, including enclosure and cables, it is the responsibility of the system integrator and end-user to protect their system against potential problems. Filtering, optical isolation, ESD gaskets, and other measures might be required at the physical point of entry (enclosure wall of box or rack). For example, it is state-of-the-art that protection cannot be done at the internal connector of an RTM if a cable is attached and routed outside the enclosure. It has to be done at the physical entry point as specified in this document.

Products manufactured by Emerson should normally be suitable for use in properly designed and produced customer equipment (system boxes or operational systems) without any major redesign. However, the systems might be subject to problems and issues once assembled, cabled, and used. The end-user, system integrator, or installer must test for possible problems and in some cases show compliance to local regulations as required in his country or by the intended application.

ESD is a major cause of electronic component failure. The component has been packed in a static-safe bag to protect it from ESD while it is in the bag. Before removing the component or any other electronic product from its static-safe bag, be prepared to handle it in a static-safe environment.

⚠ **CAUTION**

Static-sensitive Devices: Handle only at static-safe workstations.

⚠ **CAUTION**

This is an FCC Class A product for use in an industrial environment. In a home or residential environment, this product may cause radio interference in which case the user may be required to take adequate measures.

⚠ **CAUTION**

Drain static electricity before you install or remove any parts. Installing or removing modules without observing this precaution could result in damage to this and/or other modules or components in your system.

Wear a properly functioning anti-static strap and make sure you are fully grounded. Any surface upon which you place the unprotected module or unit should be static-safe, which is usually facilitated by the use of anti-static mats. From the time it is removed from the anti-static bag until it is in the board carrier and functioning properly, extreme care should be taken to avoid zapping the component with ESD. Be aware that you could zap the component without knowing it; a small discharge, imperceptible to the eye and touch, can

often be enough to damage electronic components. Extra caution should be taken in cold and dry weather when electrostatics easily builds up.

Only after ensuring that both you and the surrounding area are protected from ESD, carefully remove the component from the shipping carton by grasping the module on its edges. Place the component, in its anti-static bag, flat down on a suitable surface. You may then remove the component from the anti-static bag by tearing the ESD warning labels.

3.3   Unpack and Inspect

⚠ WARNING

Before installing or removing any board or module, ensure that the system power and external supplies have been turned off.

⚠ WARNING

Do not apply power to the board if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as introduce a fire or shock hazard.

ATTENTION

Retain all packing material in case of future need.

Before unpacking the board or module, or fitting the device into your system, read the manual carefully. Also, adhere to the following guidelines:

- Observe all precautions for electrostatic sensitive modules.

- If the product contains batteries, do not place it on conductive surfaces, anti-static plastic, or a sponge, which can cause shocks and lead to battery or board trace damage.

- Do not exceed the specified operational temperatures. Batteries and storage devices might also have temperature restrictions.

- Keep all original packaging material for future storage or warranty shipments of the board.

After unpacking the component, inspect it for visible damage that may have occurred during shipping or unpacking. Although the product is carefully packaged to protect it against the rigors of shipping, it is still possible that rare shipping damages may occur. Careful inspection of the shipping carton should reveal some information about how the package was handled by the shipping service.

If evidence of damage or rough handling is found (usually in the form of bent component leads or loose socketed components), notify the shipping service as soon as possible and contact Emerson for additional instructions. Depending on the severity of the damage, it may be necessary to return the product to the factory for repair.

Figure 7: RXi2-UP IPC Packaging

3.4   Handling

> ### ⚠ WARNING
>
> If the RXi2-UP IPC operates with an enhanced ambient temperature up to 65°C (149 ° F), the surface of the enclosure, especially the heat sink, can reach a temperature of 85°C (185 °F) and above. Be careful and do not touch the RXi2-UP IPC with bare fingers.

> ### ⚠ CAUTION
>
> Install the RXi2-UP IPC only in rooms with restricted access.

> ### ⚠ CAUTION
>
> Hot surfaces are possible, depending on factors such as CPU load, ambient temperature, and so forth. Be careful and do not touch the RXi2-UP with bare fingers!

Section 4: Mounting

RXi2-UP IPC cooling is designed for the wall-mounted orientation of the box.

- Flat wall mounting

4.1   Flat Wall-Mounting

There are two types of wall mounting:

- Flat wall mounting with mounting plates
- Flat wall mounting through the wall

For the best results of heat dissipation, observe the minimum clearances for flat wall mounting as illustrated in the following figure.

Figure 8: Heat Dissipation Clearance
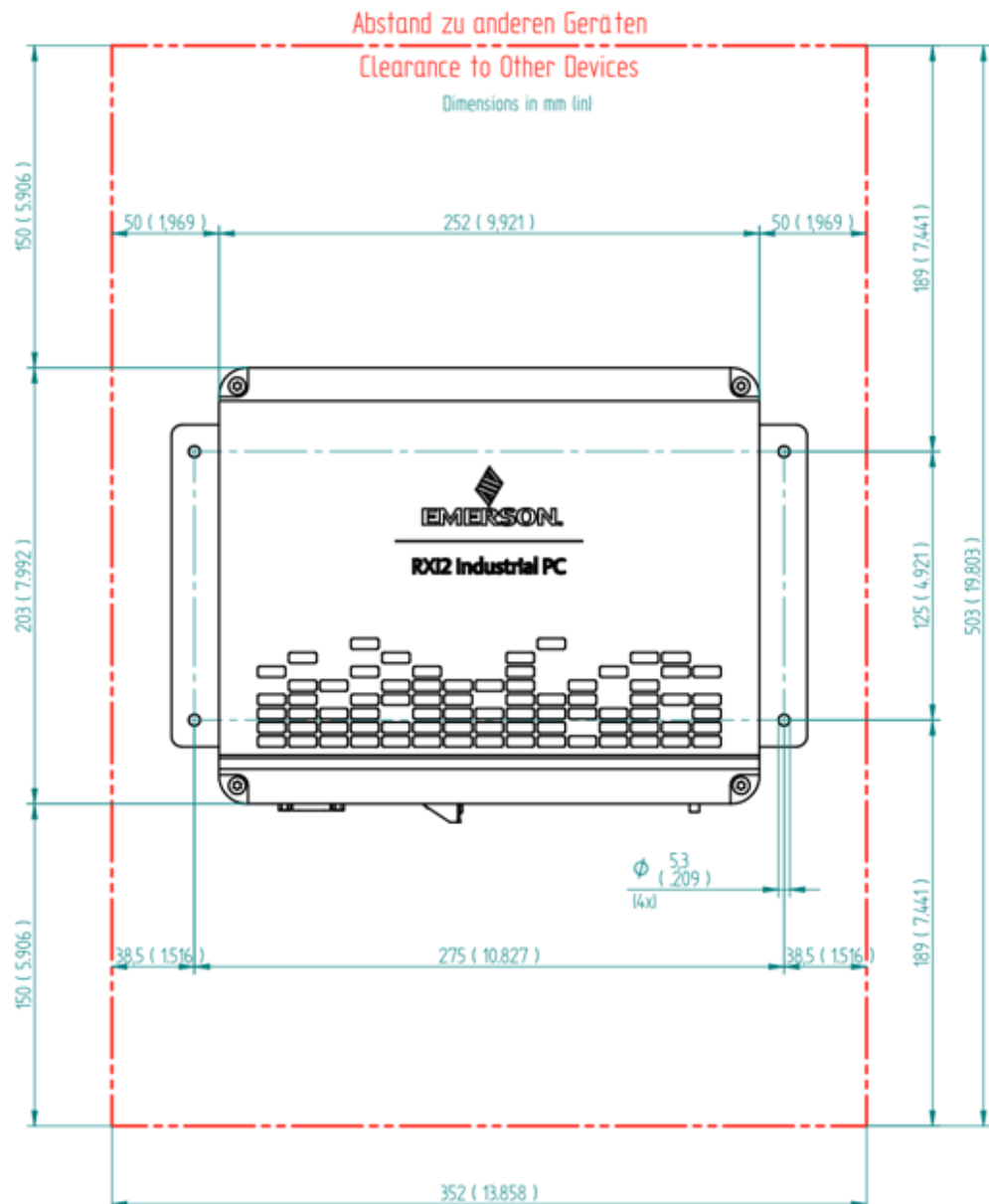
4.1.1   Flat Wall Mounting with Mounting Plates

Mounting

The screws selected for use depend on the nature of the wall. The mounting plates have four drills holes with a diameter of 5.3 mm (0.209 in), so the maximum screw diameter cannot be higher than 5.2 mm (0.205 in). The head of the screws must be smaller than 10 mm (0.4 in) to pass the hole of the top fixing points of the mounting plate.

Note: The mounting plate for the 2-slot and 4-slot versions will be the same.

Figure 9: Flat Wall Mounting with Mounting Plates
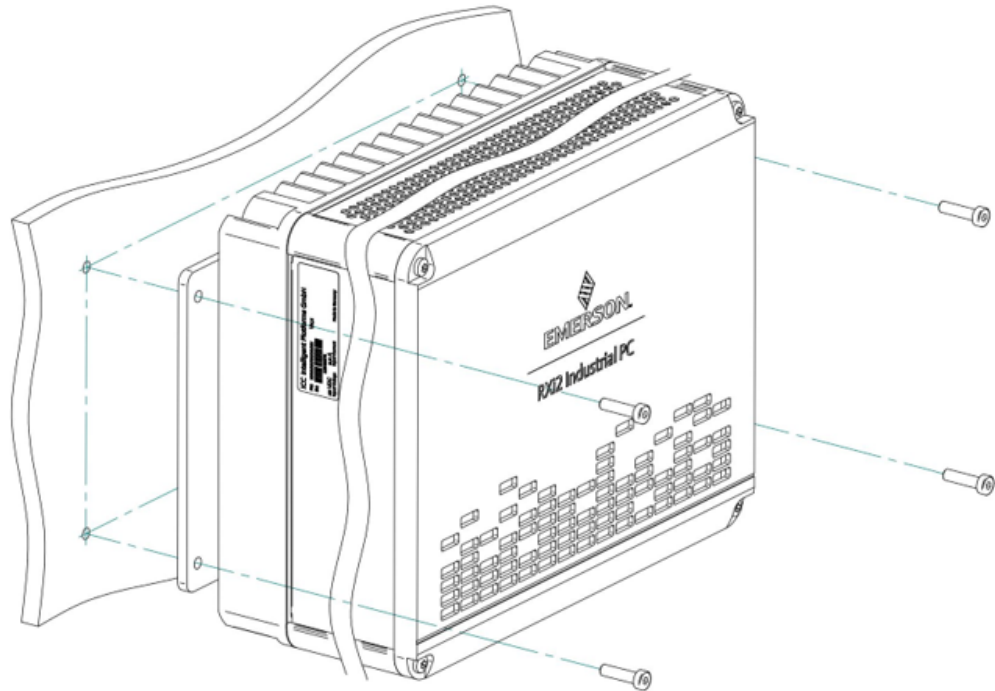
4.1.2   Flat Wall Mounting Through Wall

To mount the IPC with screws from the wall side, place drill holes in the wall. Refer to the following figure for the positions for the holes. The thread in the enclosure is an M6 with a usable thread length of 15 mm (0.60 in). Select the screw length so that a minimum of 10 mm (0.4 in) thread will be used and torque to 3.5 Nm (30.98 in-lb).

Figure 10: Flat Wall Mounting Through Wall
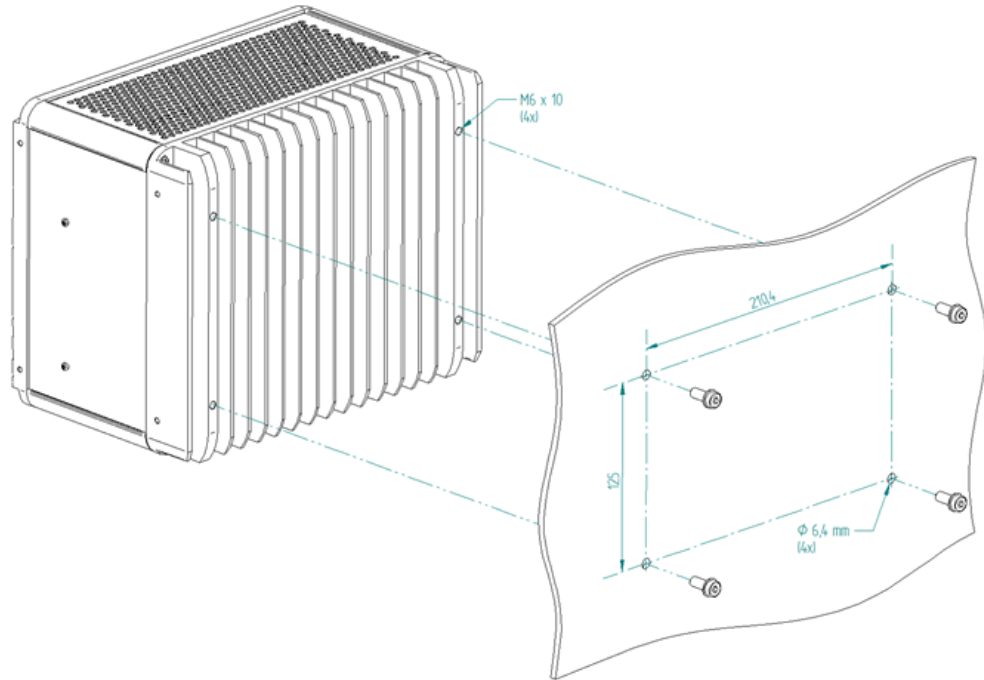
Section 5: Installation and Startup

This chapter describes the installation and initial startup operations. Because the unit is available in several configurations, the description in this chapter is related to a standard configuration.

> ### ⚠ WARNING
>
> Before installing or removing any component, make sure that the system power and external supplies have been turned off.

> ### ⚠ CAUTION
>
> Static-sensitive Devices: Handle only at static-safe workstations.

> ### ⚠ CAUTION
>
> Drain static electricity before you install or remove any parts. Installing or removing modules without observing this precaution could result in damage to this and/or other components in your system.

5.1   General Installation Guidelines

Adhere to the following guidelines during installation:

- Observe all safety procedures to avoid damaging the system and protect operators and users.
- Before installing or removing any board, verify that the system power and external supplies have been turned off.
- Verify that the jumpers (if any) are correctly configured for your application.
- Make sure the RXi2-UP IPC is properly mounted.
- Connect all I/O cables.
- Do not restore power until all components are fitted correctly into the system and all connections have been made properly.

5.2   Required Materials

The following items are required to start the RXi2-UP IPC in a standard configuration:

- Power supply
- Keyboard and mouse
- Video monitor

5.2.1 Power Supply

⚠ WARNING

Verify that the power supply is turned OFF while installing boards or modules into the RXi2-UP IPC.

Adhere to the following guidelines:

- Verify that the power supply is capable of meeting the total power requirements of the RXi2-UP IPC. (Refer to the section Specifications.)

- Verify you do not have the power supply turned ON while opening the enclosure to install add-on boards and modules into the RXi2-UP IPC (such as the PCIe boards or internal SATA drives).

5.2.2 Keyboard

A compatible USB keyboard for the initial system operation of the RXi2-UP IPC is required. Depending on your application, this may be a standard keyboard or one that uses membrane switches for harsh environments.

5.2.3 Video Monitor

Any video monitor with a native Display Port (or a suitable adaptor for the Display Port) can be used for initial setup.

5.3 Minimum System Requirements

The RXi2-UP IPC has been thoroughly tested and is nearly ready for use in the target system. To verify operation for the first time, Emerson recommends that you only configure a minimal system. It is not necessary to have disk drives, a flash disk, or other accessories connected to perform the Power-On Self-Test (POST).

5.4 Power-On Self-Test (POST)

Each time the computer boots up it must pass the POST. If the computer does not pass any of the test items, the unit will fail the POST.

Test items are as follows:

- CPU must exit the reset status mode and thereafter be able to execute instructions
- SPI Flash ROM and Non-Volatile Random-Access Memory (NOVRAM) is readable
- The checksum is valid (readable)
- CMOS is readable (CMOS checksum is valid)
- CPU can read all forms of memory, such as the memory controller, memory bus, and memory module
- The first 64 KB of memory is operational and can be Read and Written to and from, and contains the POST code
- I/O bus/controller is accessible
- I/O bus can Read/Write from the video subsystem and be able to read all video RAM

5.5 Installation Procedures

5.5.1 PCIe Board Installation

Install a PCIe board into the RXi2-UP IPC using the following procedure.

To install the PCIe board

> **⚠ WARNING**
>
> Verify that the power supply is turned OFF while installing boards or modules into the RXi2-UP IPC.

1. Remove the top cover by removing the four screws in each corner (Tx20).

Figure 11: RXI2-UP Top Cover

2. Remove the PCIe support bracket screws (qty 4) (Tx10).

Figure 12: PCIe Support Bracket Screws

3. Remove the PCIe support bracket.

Figure 13: Removed PCIe Support Bracket and Screws

4. Remove the PCIe slot bracket.

Figure 14: Removed PCIe Slot Bracket

5. Insert the PCIe board bracket into the slot.

Figure 15: PCIe Board Bracket Inserted into Slot

6.   Insert the PCIe board bracket into the PCIe connector at the riser board. Ensure that the board fits properly into the connector and is well connected.

Figure 16: PCIe Board Bracket Inserted into PCIe Connector

7.   Reattach the PCIe support bracket.

Figure 17: Reattached PCIe Support Bracket

8.   Reattach the four PCIe support bracket screws (Tx10 [0.6 Nm/5.3 in lb]).

Figure 18: Reattached PCIe Bracket Screws

9.   Adjust the cardholder.

Figure 19: Card Holder Adjustment

10.   Reattach the top cover by reattaching the four screws in each corner (Tx20 [1 Nm/8.9 in lb]).

Figure 20: Reattached Top Cover

5.5.2   Mini PCIe Add-on Board Installation

ATTENTION

The information described in this section applies to service technicians only.

The Mini PCIe (mPCIe) board is connected to the RXi2-UP IPC by inserting the board into either a full-size slot or a half-size slot, depending on the size of the Mini PCIe board you are inserting.

To Install the Mini PCIe Board

⚠ WARNING

Verify that the power supply is turned OFF while installing boards or modules into the RXi2-UP IPC.

1.   Adjust the slot size to allow for the size of the Mini PCIe board being inserted (Tx8 [0.6 Nm/5.3 in lb]).

Figure 21: Short Position for mPCIe Bracket
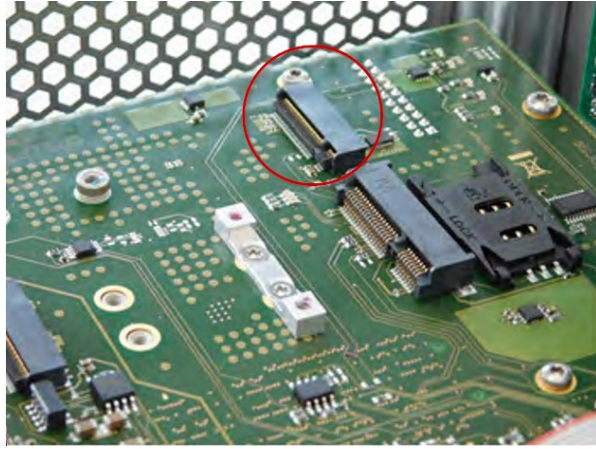
Figure 22: Long Position for mPCIe Bracket
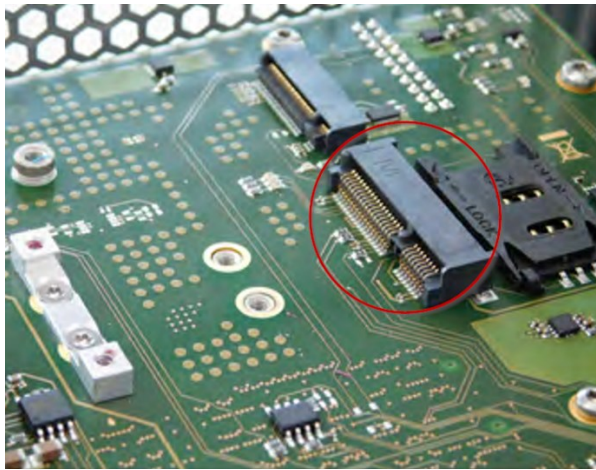
2.   Insert the Mini PCIe board into the connector slot.

Figure 23: Mini PCIe Board Inserted

3.   Mount Mini PCIe board into the connector slot using standard screws (Tx8 [0.6 Nm/5.3 in lb]) screw: ISO14583 M2.5 x 6 or M2.5 x 5.

Figure 24: Mini PCIe Board Mounted to RXi2-UP IPC

SIM Card Interface Installation

Note: Please note that when installing plug-in cards with wireless transmission capabilities, such as a cellular modem or WiFi adapters, the user is responsible for updating CE, FCC and any other required certifications of the final unit.

To Install the SIM card

> ### ⚠ WARNING
>
> Verify that the power supply is turned OFF while installing boards or modules into the RXi2-UP IPC.

1.   Open SIM card holder by moving the upper part in the OPEN → direction (as shown on the part).

Figure 25: SIM Interface Connected to mPCIe – Unlocked but Closed

2.   Open the SIM cardholder.

Figure 26: SIM Card Holder Open
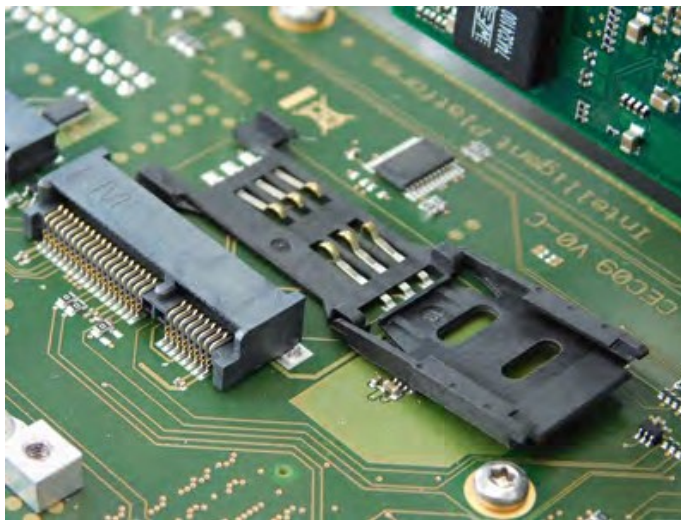
3.   Insert the SIM card.

Figure 27: SIM Card Inserted

4.   Lock the SIM card into position by moving the upper part in the LOCK ← direction (as shown on the part).

Figure 28: SIM Card Holder Closed and Locked

5.5.3 M.2 A-Key Add-on Board Installation

ATTENTION

The information described in this section applies to service technicians only.

The M.2 board is connected to the RXi2-UP IPC by inserting the board with a form factor of 2230.

To Install the M.2 A-Keyboard

⚠ WARNING

Verify that the power supply is turned OFF while installing boards or modules into the RXi2-UP IPC.

1.   Insert the M.2 A-Key board into the connector slot.

Figure 29: RXi2-UP IPC Connector Slot
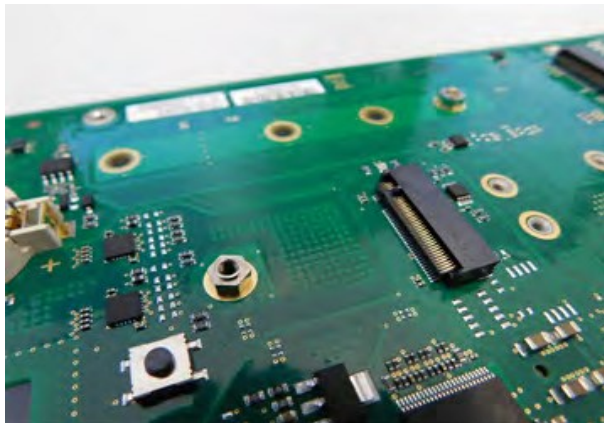
Figure 30: M.2 A-Key Insertion into Connector Slot

2.	Mount the M.2 A-Key board into the connector slot using standard screws (Tx8 [0.45 Nm/5 in lb]), screw: ISO14583 M2.5 x 6, or M2.5 x 5.

Figure 31: M.2 A-Key Mounted to RXi2-UP IPC

5.5.4   M.2 M-Key Add-on Board Installation

> **ATTENTION**
>
> The information described in this section applies to service technicians only.

The M.2 board is connected to the RXi2-UP IPC by inserting the board with the form factor of 2242, 2260, 2280, or 22110.

To install the M.2 M-key board

> **⚠ WARNING**
>
> Verify that the power supply is turned OFF while installing boards or modules into the RXi2-UP IPC.

1.   Insert the M.2 M-Key board into the connector slot.

Figure 32: M.2 RXi2-UP IPC Connector Slot

Figure 33: M.2 M-Key Insertion into Connector Slot
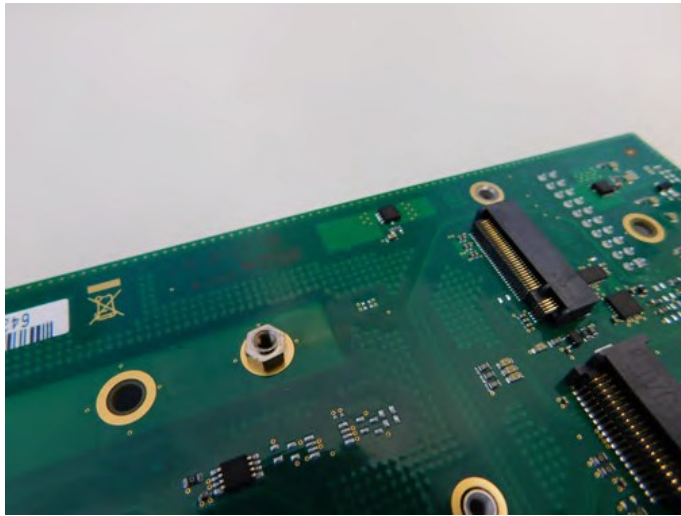
2.   Mount the M.2 M-Key board into the connector slot using standard screws (Tx8
        [0.45 Nm/5 in lb]) screw: ISO14583 M2.5 x 6 or M2.5 x 5.

Figure 34: M.2 M-Key Mounted to RXi2-UP IPC

5.6   Initial Startup

A few seconds after powering up, the RXi2-UP IPC system BIOS banner displays on the screen. If you do not see any error messages up to this point, the RXi2-UP IPC is running properly and ready to be configured for your application.

# 5.7   UEFI Firmware Setup

5.7.1   Entering UEFI Firmware Setup

To enter setup during the initial startup sequence: press the **Delete** or **F2** key during the startup sequence.

Adhere to the applicable on-screen messages when prompted.

To save changes, go to Save & Exit page and choose **Save Changes and Exit** option

5.7.2   Selective Alternative Boot Source

To select an alternative boot device (for example, boot from USB stick), without changing settings in UEFI Firmware, please press and hold the **F7** key during the power-up sequence

5.7.3   Setting up Boot Priority

To configure a particular boot priority, within UEFI Firmware Setup, navigate to the Boot page and configure **Boot Option #1** and **Boot Option #2**, as required. Go to Save & Exit page and choose **Save Changes and Exit** option.

5.7.4   Restoring UEFI Settings

When within UEFI Firmware Setup, navigate to the Save & Exit page, choose **Restore Defaults**, choose **Save Changes and Exit**.

5.7.5   UEFI Passwords

To configure Administrator and User passwords, within UEFI Firmware Setup, navigate to Advanced page, choose **Security**, make required changes. Go to Save & Exit page and choose **Save Changes and Exit** option

5.7.6   Secure Boot Configuration

To configure Secure Boot, change/reset Keys, within UEFI Firmware Setup, navigate to the Advanced page, choose the **Secure Boot** option, make required changes. Go to Save & Exit page and choose **Save Changes and Exit** option

Note: If the RXi2-UP IPC does not perform as described, some damage may have occurred during shipment or the board is not installed or configured properly. Contact Emerson for technical support. (Refer to the section Contact Information.)

5.8   RTC Battery Replacement

⚠ WARNING

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type to Rayovac BR2032. Dispose of used batteries according to Emerson-provided instructions and applicable local regulations.

⚠ CAUTION

Static-sensitive Devices: Handle only at static-safe workstations.

ATTENTION

The information described in this section applies to service technicians only.

5.8.1   To replace the Real-Time Clock (RTC) battery

1.   Remove power from the RXi2-UP IPC.

2.   Loosen the four captive screws on the RXi2-UP IPC's top cover and remove it.

Figure 35: RTC Battery (Removed Top Cover)
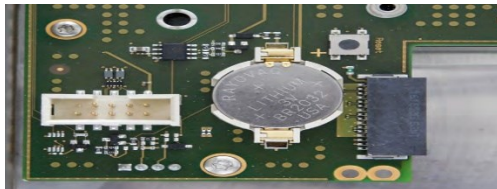
3.   Remove the RTC battery from the retaining clip.

4.   Install a new RTC battery in the retaining clip with the positive (+) side up.

⚠ WARNING

Do not use a different battery type other than the type as removed or equivalent type to Rayovac BR2032 as this may present a risk of fire or explosion!

⚠ WARNING

The battery may explode if mistreated. Do not recharge, disassemble, heat above 100° C (212 °F), or incinerate!

5.   Reattach the top cover on the IPC and tighten the four screws to secure it.

Section 6: Hardware Interface

This chapter describes the hardware interface used in the RXi2-UP IPC. The following diagram provides an overview of the way the hardware interface is used.

Figure 36: RXi2-UP IPC Hardware Interface Overview
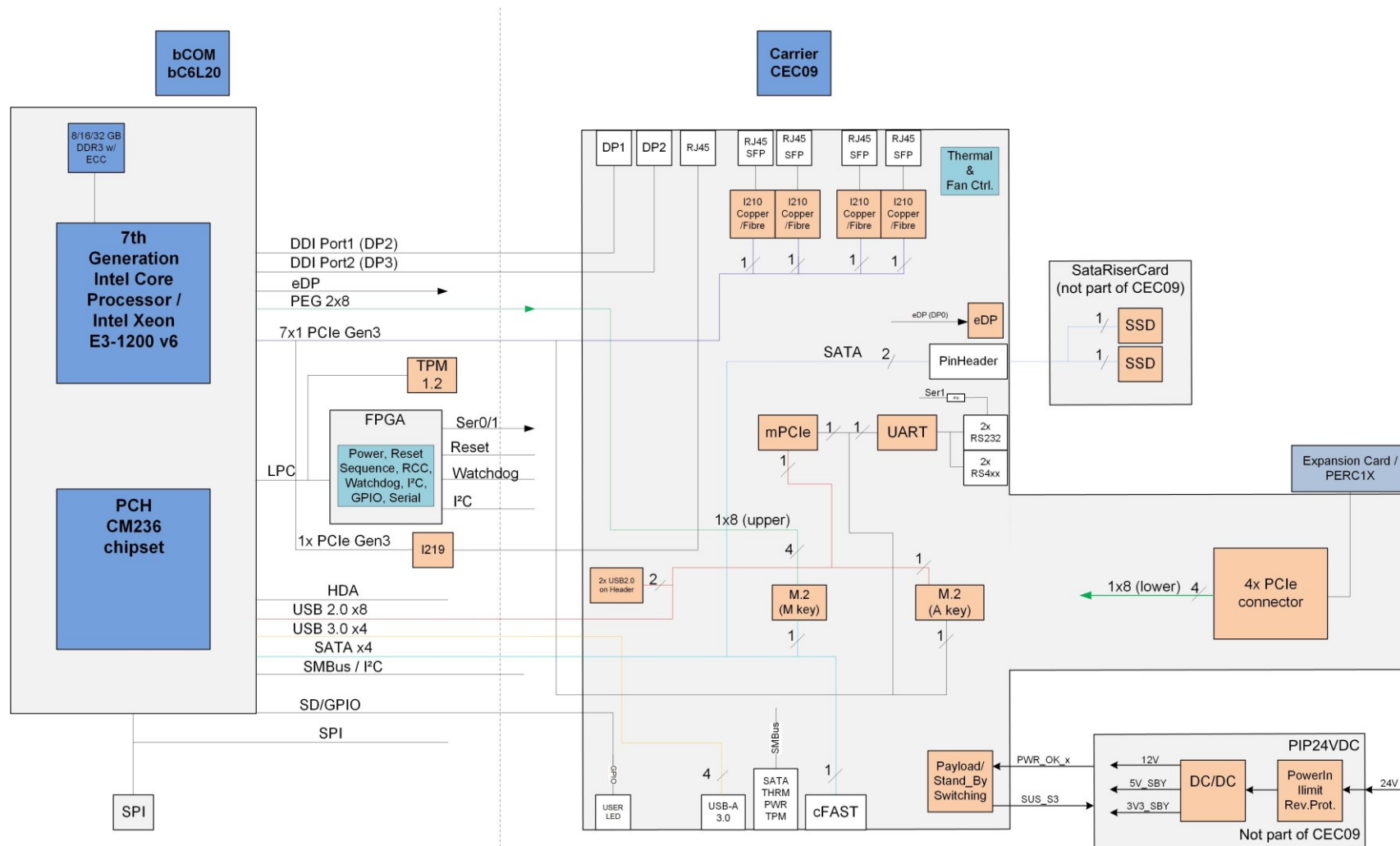
6.1 Interface

Figure 37: RXi2-UP IPC Hardware Interface Overview (2-slot Option)

6.1.1 Status LEDs

The RXi2-UP IPC contains a set of status LEDs to indicate various functions. The CEC09 provides LEDs on the front panel, in a location near the power connector and power button.

Table 6-1   Status LEDs

LED Name	Color	LED Status Indication
PWR (Power)	Red	Standby power available, but no power good signal active (error condition)
	Yellow	Standby power valid (S3, S4, S5)
	Green	All power available and valid (S0)
SATA	Green	SATA access in progress (SATA, CFAST, M.2)
THRM (Port Expander: P0: Green; P1: Red)	Green	Thermal OK
	Yellow	T_{Hot} reached (available also in S5 after Shutdown)
	Red	T_{Crit} reached (available also in S5 after Shutdown)
USER (GPO0)	Green	Switchable from User
TPM (Port Expander: P2: Green and Red)	Yellow	Flashes when TPM button is pressed for a defined amount of time

Figure 38: Status LEDs
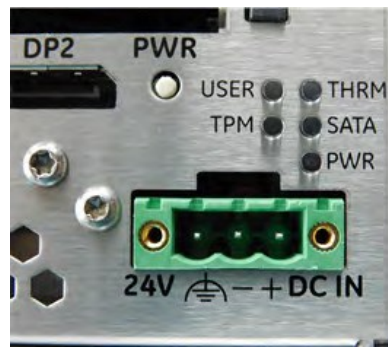
6.1.2   Power Button

The Power button powers on the RXi2-UP IPC. It is located on the front panel.

Figure 39: Power Button
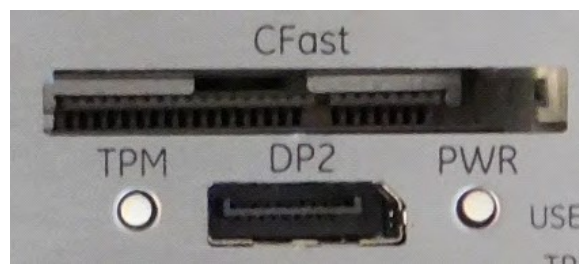
Note: Use an appropriate tool for operation as needed.

Pressing (short push) the power button triggers the operating system to shut down (Power State S5). If the operating system does not immediately shut down, press and hold the Power button for more than 5 seconds to force the RXi2-UP IPC to shut down immediately without support from the operating system.

State S5 (Soft-off mode) switches off the CPU core power and resets the RXi2-UP IPC. The State S5 is indicated with an Amber Power LED. At this stage, it is possible to reactivate the RXi2-UP IPC by pressing (short push) the Power button. This action switches on the CPU core voltage and the boards restart.

6.1.3   TPM Button

Pressing and holding the Trusted Platform Module (TPM) button activates TPM maintenance mode.

Note: **The TPM button is not currently supported**. This feature will be implemented later. After implementation, support will depend on the selected configuration.

6.1.4　Ethernet Ports (Eth1, Eth2, Eth3, Eth4, Eth5)

Five Ethernet interface ports are available on the RXi2-UP IPC. They are located on the front panel. Ethernet interface requires the use of a CAT 5 cable for proper operation with 100/1000BaseT.

Figure 40: Ethernet Interface Ports (1–slot Option)

Table 6-2　Ethernet Interface

10/100BaseT Name	1000BaseT Name	Pin
TxD+	LP_DA+	1
TxD-	LP_DA-	2
RxD+	LP_DB+	3
NC	LP_DC+	4
NC	LP_DC-	5
RxD-	LP_DB-	6
NC	LP_DD+	7
NC	LP_DD-	8

6.1.5　Ethernet LEDs

Two LEDs (green and yellow) are integrated into each of the RJ–45 connectors. These LEDs indicate Ethernet interface link status and activity.

Table 6-3　ETH1 to ETH4 LEDs

Pin	LED Color	LED Status Indication
#GBEx_LINK	Green	Solid = 1000 Mbit Off = 10/100 Mbit
#GBEx_ACT	Yellow	Solid = No activity, but 10/100/1000 Mbit link Blinking = Activity ongoing

Table 6-4   ETH5 LEDs

Pin	LED on RJ–45 Jack	LED Status Indication
#GBE5_LINK	Yellow	Solid = Any LINK
#GBE5_ACT		Blinking = ACTIVITY
#GBE5_LINK100	Orange	LINK100
#GBE5_LINK1000	Green	LINK1000

Figure 6-41   RXi2-UP IPC GBE
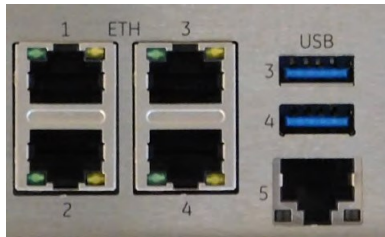
6.1.6   Display Port

A Display port (DP1 and DP2) interface provides signals for connecting either a suitable monitor or an adaptor to several other display standards.

Figure 42: Display Port Interface Ports (2–slot Option)

Table 6-5   Display Port Interface Signals

Signal Name	Pin
TxD0+/-	1/3
TxD1+/-	4/6
TxD2+/-	7/9
TxD3+/-	10/12
AUXSEL	13
NC	14
CLK/AUX+	15
DAT/AUX-	17
HTPLG	18
DP_VCC	20 *Note: DP_VCC is fused with 2 A fuse, but for normal operation do not exceed 1 A at this pin.*
GND	2, 5, 8, 11, 16, 19

6.1.7   USB 3.0 Connectors

Four USB channels are available at standard USB Type-A connectors. Each pair of them is fused with 2 A, but for normal operation does not exceed 0.9 A per connector.

Figure 43: USB 3.0 Connectors
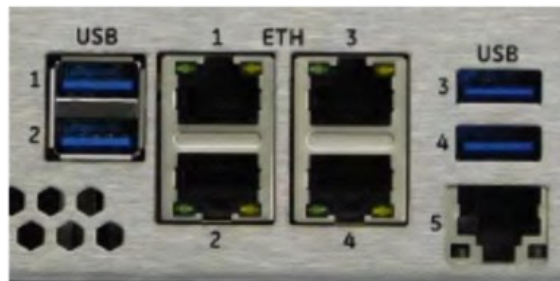
Table 6-6   USB Port 1-2 Signals

Signal Name	Pin
FUSE_VCC	1 Note: FUSE_VCC is fused with 2 A fuse, but for normal operation do not exceed 0.9 A current per connector.
USB-	2
USB+	3
GND	4
SSRX-	5
SSRX+	6
GND	7
SSTX-	8

Signal Name	Pin
SSTX+	9

Table 6-7   USB Port 3-4 Signals

Signal Name	Pin
FUSE_VCC	1 *Note:* *FUSE_VCC is fused with 2 A fuse, but for normal operation do not exceed 0.9 A current per connector.*
USB-	2
USB+	3
GND	4
SSRX-	5
SSRX+	6
GND	7
SSTX-	8
SSTX+	9

6.1.8   Power Connectors

The power inlet into the RXi2-UP IPC is a Phoenix contact Base strip - MSTB 2.5/ 3-GF - 1776702 connector. The corresponding plug is a type FKCN 2.5/ 3-STF - 1732975 from Phoenix contact.

Figure 6-44   Power Connectors
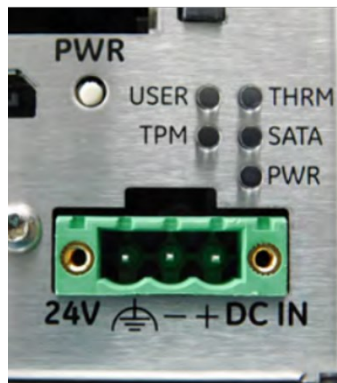
Table 6-8   Power Connectors

Signal Name	Pin (Left to Right)
Frame GND	1
Power -	2
Power +	3

The power input is filtered internally on the RXi2-UP IPC. Directly after the power connector Frame GND and Power – are hard connected. When using a power supply with a supply reference to PE ground, connect the +24 V to power plus and the GND to power minus.

> **ATTENTION**
>
> Never use a power supply generating a -24 V output if the positive supply is related to PE ground. It will be shortened if any external device is connected to the RXi2-UP IPC.

> **ATTENTION**
>
> The power input is secured with one 10 A fuse. If the input power exceeds the limits, the fuse will be blown to protect all circuitry within the RXi2-UP IPC. Contact Emerson for a suitable replacement.

6.1.9   Internal SATA Connector

One M.2 M-Key (PCIe 4x and SATA) with sizes 2242, 2260, 2280, and 22110 is located inside the RXi2-UP IPC.

6.1.10   CFast Connector

Located on the front of the RXi2-UP IPC is a CFast Type 1 flash connector. CFast is a variant of a CompactFlash that supports a higher maximum transfer rate than current Compact Flashcards. Standard CFast cards can be used for the storage of data or the operating system. The device is connected to a standard SATA port of the COM Express module and is hotplug capable with standard OS.

Figure 45: CFast Connector
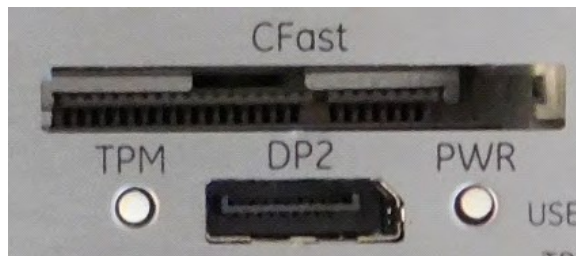
6.1.11   Serial (COM) Ports

The 0-slot and 1-slot variant of the RXi2-UP IPC is provided with two serial ports. The two serial ports are RS–232 on 9–pin, D-connectors for local terminals, or peripheral communication.

The 2-slot and 4-slot variant is equipped with four serial ports. Serial ports 1 and 2 are RS–232, serial ports 3 and 4 are RS–422 / RS–485.

Figure 46: Serial Ports – 2-Slot Variant

Figure 47: Serial Ports – 4-Slot Variant
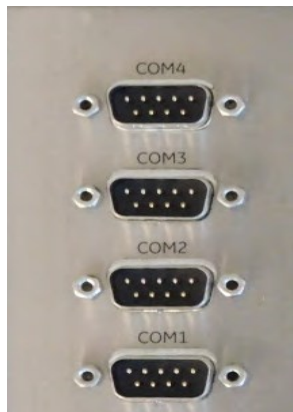
Table 6-9   Serial Ports

Signal Name	Pin
RS–232 Pin	
DCD	1
RxD	2
TxD	3
DTR	4
GND	5
DSR	6
RTS	7
CTS	8
RI	9
RS–422 / RS–485 Pin	
Rx+	1
Rx-	2
Tx-	3
Tx+	4
GND	5

Figure 48: Pin Assignment
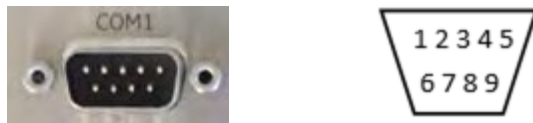
For RS–422 and RS–485-4 wire modes, connect the corresponding RX+/- with the TX+/- of the counterpart and vice versa. For RS–485-2 wire mode connect RX+ and TX+ with the + line of the cable and the RX- and the TX- together with the – line of the cable.

The difference between the various RS–4xx modes is the Tx/Rx control. RS-422 has Tx and Rx always active. RS-485 four-wire enables Tx only when there is something to transmit, Rx is always active. RS-485 two-wire enables Tx and disables Rx when transmitting, disables Tx, and enables Rx when not transmitting. The various modes can be selected within the device driver of the used operating system.

6.1.12   SATA 2.5 inch Drive Tray Replacement

ATTENTION

The information described in this section applies to service technicians only.

Two additional 2.5-inch storage devices are available for use with the SATA riser board or the RAID option. The 2.5-inch hard disk trays (located in the front of the unit) can be used as SSD or rotating devices.

ATTENTION

Before physically ejecting the device, make sure you dismount or eject the drive from the OS.

To Replace the 2.5-inch SATA Drive

Note: Due to the SATA hot-plug capability, there is no need to power down the unit for replacement. Just make sure you dismount or eject the drive from the OS before physically removing the device.

1.   Locate the position of the hard disk device you want to remove.

Figure 49: 2.5 inch SATA Drive Device Tray Location

2. Insert your finger under the handle and carefully remove the storage device tray from the mounted position.

Figure 50: Removing Storage Device Tray from Mounted Position

3.   Pull down until the device tray is as fully open as possible.

Figure 51: Storage Device Tray Fully Open Position

4.   Remove the hard disk tray completely from the unit.

Figure 52: Removal of Storage Device Tray

5. Unscrew the four mounting screws and separate the hard drive from the tray.

Figure 53: Storage Device Tray Screws
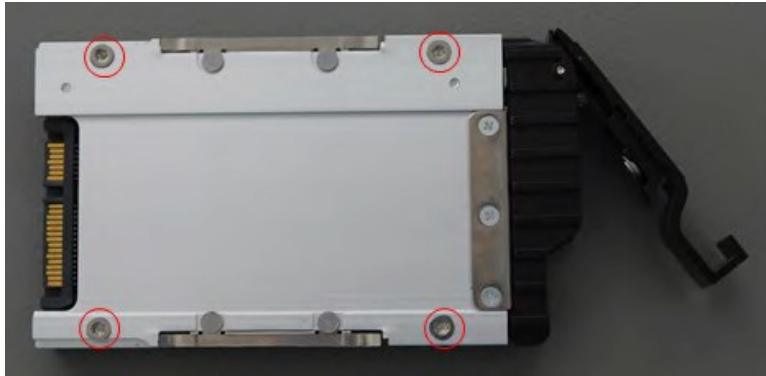
6. Insert the replacement hard drive and screw in the four mounting screws to mount it.

Figure 54: Storage Device Tray

7. Insert the storage device tray ˜25.4 mm (1 in) (maximum) into the slot, move it to the right side until the nose is between the guidance mark of the tray, then push it carefully into the slot.

Figure 55: Tray Insertion

1. Insert the tray until it is fully and firmly seated.

Figure 56: Inserted Tray

Note: You can lock each SSD tray using the provided key.

6.2　Additional Devices

6.2.1　Temperature Sensor

There are two thermal zones on the CEC09 Carrier board that can be observed with an EMC2113 device. This device contains internal temperature sensors and can connect three external temperature sensors. All external sensors are grouped as one thermal group and placed so that the hottest point can be observed no matter the mounting style.

The EMC2113 device measures the temperature of several higher-rated devices (I210IT/IS; RS–232 Transceiver; 4x PCIe2UART) with the help of a common heatsink

A dual THRM LED located on the front panel indicates the current thermal. For more information, refer to the section Status

Table 6-10　THRM LED Indication

LED Color	LED Status Indication
Green	Everything OK
Yellow	T_{Hot} reached (wired to U3080/SMBus Port Expander via pin 0)
Red	T_{Crit} reached (wired to U3080/SMBus Port Expander via pin 1)

6.2.2　NVSRAM

The RXi2-UP IPC offers Non-Volatile Random Access Memory (NVSRAM) as a mPCIe board add-on option that is automatically backed up when the RXi2-UP IPC is switched off or loses power. It is not supplied with battery power but an exhausted Lithium coin battery will not result in a loss of data. Contact Emerson for assistance with the option.

Section 7: Hardware and Firmware Programmable Devices

This chapter describes the hardware and firmware programmable devices of the CEC09 carrier board and the bCOM6L20 module.

7.1 SMBUS Devices

Table 7-1   SMBus Devices

Device	Address	Function
Clock Buffer 8x	1101 110xb [DCh]	PCIe clock
Clock Buffer 4x	1101 110xb [DCh]	PCIe clock
PCA9548A	1110 001xb [E2h]	SMBus switch (to avoid address conflicts from add-in boards)
Fan Controller	0101 110xb [5Ch]	Fan controller includes thermal sensors
Port Expander	0100 000xb [40h]	SMBus port expander

Table 7-2   PC Bus Device

Device	Address	Function
24C512	1010 000x [A0h]	Factory EEPROM of bCOM6L20
24C64	1010 111x [AEh]	Factory EEPROM of CEC09

7.2 Ethernet

The Ethernet controllers provide internal EEPROMs, which contain the MAC address, as well as their configuration.

7.3 PCIe Ports

The PCIe ports are provided by the COMe module. The PCIe allocation is provided in the following table.

Table 7-3   PCI Express Port Usage

Source Device	Port	Connected to
COMe PEG	0:3	Riser board
COMe PEG	8:11	M.2 mass storage device
COMe PCIe	0	Ethernet #1
COMe PCIe	1	Ethernet #2
COMe PCIe	2	Ethernet #3
COMe PCIe	3	Ethernet #4
COMe PCIe	4	M.2 A-Key
COMe PCIe	5	UART
COMe PCIe	6	mPCIe

7.4   PCI Routing

The PCI routings in an RXi2-UP IPC are defined in the following table.

Table 7-4   PCI Routing

Function	Connected to	Vendor	Device (GPU Dependent)	Bus/Dev/Func
bCOM6L20				
Intel Skylake Host Bridge	—	8086	—	0/00/0
HD Graphics	—	8086	—	0/2/0
Gaussian mixture model	—	8086	—	0/8/0
Intel USB 3.0 XHCI	—	8086	—	0/14/0
Intel Thermal Subsystem	—	8086	—	0/14/2
Serial I/O I2C #0	—	8086	—	0/15/0
Serial I/O I2C #1	—	8086	—	0/152
Intel CSME HECI	—	8086	—	0/16/0
Intel SATA Controller [AHCI]	—	8086	—	0/17/0
PCI Bridge	I210 #1	8086	—	0/1C/0
PCI Bridge	I210 #2	8086	—	0/1C/1
PCI Bridge	I210 #3	8086	—	0/1C/2
PCI Bridge	I210 #4	8086	—	0/1C/3
PCI Bridge	M.2 A-Key Slot	8086	—	0/1C/4
PCI Bridge	Pericom UART	8086	—	0/1C/5
PCI Bridge	mPCIe Slot	8086	—	0/1C/6
Intel LPC Controller		8086	—	0/1F/0

Function	Connected to	Vendor	Device (GPU Dependent)	Bus/Dev/Func
Intel PMC		8086	—	0/1F/2
Intel HD Audio		8086	—	0/1F/3
Intel SMBUS		8086	—	0/1F/4
I219-LM	—	8086	—	0/1F/6
CEC09				
Riser slot	—	—	—	1/0/0
Ethernet #1	Front	8086	1531	5/0/0
Ethernet #2	Front	8086	1531	6/0/0
Ethernet #3	Front	8086	1531	7/0/0
Ethernet #4	Front	8086	1531	8/0/0
M.2 A-Key slot	—	—	—	A/0/0
PCIe Serial	Serial	12D8	7954	B/0/0
Mini PCIe slot	—	—	—	C/0/0
PERC10 Riser Board				
PCIe to PCIe bridge	PCI Slots	12D8	2312	1/0/0
PCIe Slot #1	—	—	—	3/0/0
PCIe Slot #2	—	—	—	4/0/0
PERC11 Riser Board				
PCIe to PCIe bridge	PCI Slots	12D8	2612	1/0/0
PCIe Slot #1	—	—	—	2/0/0
PCIe Slot #2	—	—	—	3/0/0
PCIe Slot #3	—	—	—	4/0/0
PCIe Slot #4	—	—	—	5/0/0

Section 8: Specifications

This chapter provides specifications and useful information for the RXi2-UP IPC.

8.1 Power Consumption

The RXi2-UP IPC should be connected to a single main power supply with limited output power (max 250 V A) with a nominal output voltage of 24 V dc (±25%), SELV according to IEC60950-1.

Table 8-1   Input Power

Nominal Input	Input Range	Max Input Ripple
24 V	18-30 V	± 0.2 V

The current consumption can vary, depending on the CPU, load, and input voltage, as follows:

- 18 V dc → 4.41 A (in Burn-In at 25°C (77 °F)
- 24 V dc → 3.33 A (in Burn-In at 25°C (77 °F)
- 30 V dc → 2.64 A (in Burn-In at 25°C (77 °F)

Table 8-2   Power Entry

Operation	Ambient Temperature	Power[†]	
		i3 Dual Core, 2.7 GHz, 8 GB RAM, 128 GB SSD	XEON E3 1505 MV, 2.8 GHz, 32 GB RAM, 128 GB SSD
UEFI Setup or shell	25°C (77 °F)	13 W	22 W
Windows 10 idle	25°C (77 °F)	9.6 W	10.1 W
Windows 7 Heavy Load Tool	25°C (77 °F)	26 W	60 W
Windows 7 Heavy Load Tool	60°C (140 °F)	27 W	63 W
[†] Measured at shown ambient temperature. All values are typical.			

Note: The consumption values include the USB keyboard and an SSD hard disk. For each linked Ethernet channel, add 0.5 W.

8.1.1 Power Budget for Add-on Devices

The CEC09 Carrier board supports a power budget for USB devices, SATA devices, and add-on boards up to a total of 25 W. For add-on boards on the riser board, any share between +12 V, 5 V, and 3.3 V power consumption is possible up to 20 W maximum for all two/four boards together.

8.2   Environmental Specifications

8.2.1   Ambient Temperatures and Humidity

Ambient temperatures and humidity values for the RXi2-UP IPC are provided in the following table.

Table 8-3   Temperature Specifications

Item	Level A
Temperature	
Storage	-40 to 85°C (-40 to 185 °F)
Operating	-40 up to 70°C (-40 to 158 °F) *
Humidity	
Operating	5 to 95% rH, non-condensing, at 40°C (104 °F)
Storage	

* Upper temperature range depends on the CPU SKU, size of the enclosure, number of plug-in PCIe cards, mounting and orientation of the unit and software load that is being executed. Please contact technical support for further guidance.

8.2.2   Shock and Vibration without 2.5 inch Mass Storage

The RXi2-UP IPC without 2.5-inch mass storage options is designed to meet the shock and vibration values listed in the following table.

Table 8-4   Shock and Vibration Specifications without Additional 2.5 inch Mass Storage

Item	Vita 47 V1
Vibration	
Spectrum	5 to 100 Hz
Acceleration	2 g RMS
Shock	
Half sine or sawtooth	20 g
Duration	11 ms

8.2.3   Shock and Vibration with 2.5 inch Mass Storage

Due to additional interchangeable non-rugged mechanical parts, Emerson does not recommend exposing the system to shock and vibration.

8.2.4   Altitude

Altitude air pressure and ambient temperature influence the thermal operation of the components described in this document. They have been developed and tested at ˜500 m (1650 ft) above sea level at a typical ambient temperature of 20°C (68 °F). Because of only marginal variations within a limited range of altitudes, this product operates as specified within altitudes from sea level to 1,000 m (6,560 ft), depending on the level. This is regarding the temperature ranges of air-cooled versions.

> Note: Emerson can assist the user in planning operations outside this altitude range upon request.

Maximum altitude for the RXi2–UP IPC is specified in the following table.

Table 8-5   Maximum Altitude

Item	Level A
Maximum Altitude	
Operating	2 km (6,600 ft)
Storage	12 km (40,000 ft)

8.2.5   Regulations and Certification

Table 8-6   Regulations and Certification

Item	Specification
Electromagnetic Compatibility (EMC)	EMC Directive 2014/30/EU EN 61000-6-4 Emission standard for industrial environments EN 61000-6-2 Immunity standard for industrial environments FCC Part 15 B This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. CAN ICES-3 (A)/NMB-3(A)
CE	Meets CE conformance
Product Safety	LVD Directive 2014/35/EU IEC 62368-1 UL 62368-1 (UL file number E214940)
REACH	Our product and their packaging materials contain none of the 144 substances (SVHC) included in the candidate list (20.6.2013) according to article 59 (1) of Regulation (EC) No 1907/2006 (REACH) (refer to the website of the European Chemical Agency (EChA) http://echa.europa.eu) in a concentration above 0.1% by weight. We comply with the obligation of Article 33(1) of the REACH-compliance.
Certification	According to EN IEC 62368-1

Figure 57: RXi2-XP Data Nameplate
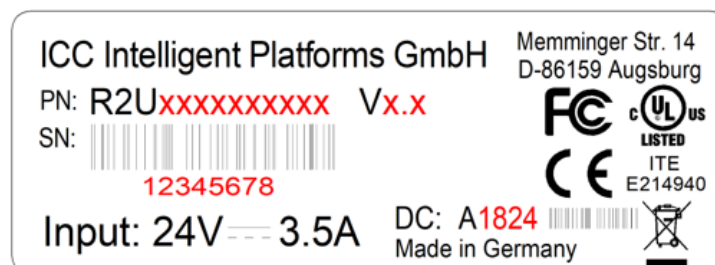
8.2.6   Battery

The RXi2-UP IPC contains a BR2032 lithium coin battery. The maximum current used by the bCOM6L20 module is 6uA. Depending on the operating hours and temperature, the estimated battery life is 2 to 10 years. Battery current is not used when the RXi2-UP IPC is supplied with 24 V.

8.3 Technical Specifications

Table 8-7   Technical Specifications

Item	Specification
Processor	Intel 7th Generation Core Processors (i5 / i7)
	Intel XEON V6 Processors
Memory	Up to 32 GB DDR4 at 2400 Mhz
	Soldered, with 32 GB ECC RAM
NVSRAM	512 KB, 1 MB, or 2 MB NVSRAM
	Storage for process-relevant data
SATA interface	M.2 M-Key SATA (form factor 2242, 2260, 2280, 22110) or optional internal 2.5 inches SATA hard disk drive (HDD)
Ethernet	5 Ethernet (10, 100, 1000 Mbit) ports
Wireless Communication	WLAN optional via internal Mini PCIe board site
Video/graphics interface	2x Display Port
USB Interface	4x USB 2.0 Standard ports – External
	2x USB 2.0 Standard ports – Internal
Serial Communications	RXi2-UP 0/1/2–slot: RS-232 or opto-coupled 422/485
	RXi2-UP 4–slot: RS-232 and opto-coupled 422/485
Expansion	Internal Mini PCIe board slot, half and full length (for WLAN, LTE) Internal M.2 A-Key slot, form factor 2230 (WLAN)
	0 (Slim version) 1, 2, or 4 full-size PCIe Expansion slots
BIOS	UEFI AMI Aptio® 5
Dimensions	0-slot: 252 x 203 x 108.5 mm (9.92 x 8 x 4.24 in)
	1-slot: 252 x 203 x 135.5 mm (9.92 x 8 x 5.33 in)
	2-slot: 252 x 203 x 155.5 mm (9.92 x 8 x 6.13 in)
	4-slot: 252 x 203 x 195.5 mm (9.92 x 8 x 7.70 in)
Weight	0-slot: 3.9 Kg (8.60 lb)
	1-slot: 4.2 kg (9.26lbs)
	2-slot: 4.4 kg (9.70 lb)
	4-slot: 4.7 Kg (10.34 lb)
Enclosure	Aluminum and stainless steel

Section 9: Troubleshooting

9.1   Movicon.NExT License File Recovery in Windows 10

An industrial PC pre-installed with Windows 10 and a Movicon.NExT software package, ships with the license files already activated and ready to use. In the rare case of a major software crash, the IPC will require a re-image of Windows's license files, which will have to be manually re-installed. Emerson Customer Care will assist with this recovery. Please follow the procedure below to re-install your lost license.

1. If you require to reinstall Windows+Movicon image please contact Technical Support, reinstall the image and then proceed with next step.

2. Record the MAC address of the system:

   a. Open a Microsoft File Explorer, navigate to **C:\ Program Files\Emerson\libiipld**

   b. Click (left click) in the file path window, the path will become text and be highlighted. Type: **powershell**

   c. Hit enter and a powershell window will open. In the powershell window execute command: **.\ipldutil.exe select**

   d. You will be shown one or more MAC addresses, please copy the first MAC address in the list and email it along with the Serial Number to Emerson Customer Care. (The serial number can be found on the label located on the left side of the unit, indicated by SN: xxxxxxxx)

   e. Contact information for Emerson Customer Care is provided at the end of this document.

3. Get new license files from Emerson Customer Care:
   a. Email MAC address and hardware serial number to **Emerson Customer Care**, requesting new license files. Please note – do not contact Emerson tech support.
   b. Customer care will respond with two files: **license.json** and **license.sig**

4. Install new license files into the system:

   a. Open Microsoft File Explorer, navigate to **C:\Program Data\Emerson\libiipld**
   Note: you might need to enable "Show hidden files, folders, and drives" feature in File Explorer Options menu in order to see Program Data folder.

   b. Paste the files received from Customer care into this location

5. Verify that the license and features that are enabled:

   a. Start MoviconNeXT software and check license under **Options->License.**

Note: the above procedure is only applicable to Industrial PCs with pre-loaded, unmodified Movicon.NExT package requiring license recovery. In case of one or more of the conditions below, please install Movicon.NExT (if not already installed), start it, go to Options->License->License Manager, then open Snipping Tool in Windows and make License Manager window screen capture. Contact your local sales representative and email the screen capture.

- Movicon.NExT installations by user
- Additional Movicon.NExT features need to be added to a pre-loaded software package
- Modifications to pre-loaded software package have been previously applied

Appendix A: Open Source Software (OSS) List (V0.x)

In accordance with certain software license terms, Emerson Automation Solutions (Emerson) provides the following software package installations. This code is provided on an as-is basis, and Emerson makes no representations or warranties for the use of this code independent of any Emerson-provided software or services. Refer to the licenses and copyright notices files for each package for specific license terms that apply to each software bundle associated with this product release. For further details contact Emerson technical support at www.emerson.com/en-us/support.

Note: These software package versions may change or be removed as needed for updates to this product.

Table 0-1   Open Source Software (OSS) List

Software (by Component)	Company URL	Version	Copyright Notice
EDK	http://www.tianocore.org/	BSD 2.0	Copyright © 2012, Intel Corporation
EDKII	http://www.tianocore.org/	BSD 2.0	Copyright © 2012, Intel Corporation
Crypto Package Using WPA Supplicant	https://w1.fi/wpa_supplicant/	BSD with WPA Supplicant	Copyright © 2003-2016, Jouni Malinen j@w1.fi and contributors
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FPGA I2C core	http://opencores.org/project,i2c	BSD 2.0	Copyright © 2000 Richard Herveille richard@asics.ws

Appendix B: Acronyms and Abbreviations

ACPI   Advanced Configuration and Power Interface

APU   Accelerated Processing Unit

AMD   Advanced Micro Devices

BIOS   Basic Input Output System

COM   Computer-on-module

DDC   Display Data Control

DDI   Digital Display Interface

DP   Display Port

DRAM   Dynamic Random Access Memory

DVI   Digital Visual Interface

ECC   Error Correction Code

eDP   Embedded Display Port

EMI   Electromagnetic Interference

ESD   Electrostatic Discharge

FCH   Fusion Controller Hub

FPGA   Field Programmable Gate Array

GPI   General-purpose Input

GPIO   General-purpose I/O

GPO   General-purpose Output

HDA   High Definition Audio

I²C   Inter Integrated Circuit

IRQ   Interrupt Request

LAN   Local Area Network

LPC   Low Pin-Count Interface

NC   No Connected

PCI   Peripheral Component Interface

PCIe   Peripheral Component Interface Express

PEG   PCI Express for Graphics

RMA   Return Material Authorization

RTC   Real Time Clock

SATA   Serial ATA

SMB   System Management Bus

SMI   System Management Interrupt

SPD   Serial Presence Detect

SPI   Serial Peripheral Interface

SSD   Solid State Drive

TDM   Time Division Multiplex

TDP   Thermal Design Power

TPM   Trusted Platform Module

TMDS   Transition Minimized Differential Signaling

UART   Universal Asynchronous Receiver Transmitter

UEFI   Universal Extensible Firmware Interface

USB   Universal Serial Bus

VGA   Video Graphics Adapter

WDT   Watchdog Timer

Appendix C: Glossary

Word	Description
AC '97	Audio CODEC (Coder-Decoder)
ACPI	Software standard to implement power-saving modes in PC-AT systems
Basic Module	COM Express 125 x 95 mm (4.9 x 3.7 in) module form factor
Binary values (base 2)	Represented as digits followed by 'b' (for example 01b)
BIOS	Firmware in PC-AT system that is used to initialize system components before handing control over to the operating system
BIT	Built-in Test
Carrier Board	An application-specific circuit board that accepts a COM Express module.
CE	Conformité Européenne (European conformity)
CCTV	Closed Circuit Television
Courier Font	Text in Courier font indicates a command entry or output from an Emerson embedded PC product using the built-in character set
CTDP	Configurable TDP (Thermal Design Power)
CVBS	Composite Video Baseband Signal
CU	Compute Unit
DDC	VESA (Video Electronics Standards Association) standard to allow identification of the capabilities of a VGA monitor
DMM	Dual In-line Memory Module
DP	VESA-defined digital video interface display port to transport audio and video in a transmission protocol.
DVI	Digital Display Working Group (DDWG) standard defines a standard video interface supporting both digital and analog video signals. The digital signals use TMDS.
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMI/EMC	Electromagnetic Immunity/Compatibility
ETI	Event Time Indicator
EU	European Union
Extended Module	COM Express 155 x 110 mm (6.1 x 4.3 in) module form factor.
FCC	Federal Communication Commission (USA)
FR4	A type of fiber-glass laminate commonly used for printed circuit boards.
Gb	Gigabit

Word	Description
GbE	Gigabit Ethernet
GT	Giga Transfer I/O
HDCP	High-Bandwidth Digital Content Protection
Hexadecimal values (base 16)	Represented as digits followed by 'h' (for example:0Ch)
Hexadecimal values (base 16)	Represented as digits preceded by 'H' (for example: H0C)
Hexadecimal values (base 16)	Represented as digits preceded by '$' (for example: $0C)
I^{2}C	Two-wire (clock and data) signaling scheme allowing communication between integrated circuits, primarily used to read and load register values
IDE	A parallel Integrated Device Electronics interface for hard disk drives (also known as PATA)
Italics	(Sometimes in blue color) emphasizes words in text or documentation, or chapter titles or web addresses if underlined
Legacy Drive	Relics from the PC-AT computer that is not in use in contemporary PC systems: primarily the ISA bus, UART-based serial ports, parallel printer ports, PS-2 keyboards, and mice. Definitions vary as to what constitutes a legacy device. Some definitions include IDE as a legacy device
LPC	A low-speed pin-count interface is used for peripheral circuits such as Super I/O controllers, which typically combine legacy-device support into a single IC
LS	Least Significant
LVDS	Low Voltage Differential Signaling has been widely used as a physical interface for TFT flat panels. LVDS can be used for many high-speed signaling applications. In this document, it refers only to TFT flat-panel applications
MS	Most Significant
NTSC	National Television Standards Committee video broadcast standard used in North America.
PAL	Phase Alternating Line video broadcast standard used in many European countries
POST	Power-on Self-Test
PCIE	Next-generation high-speed Serialized I/O bus
PHY	Ethernet controller physical layer device
ROM	Read-Only Memory, a legacy term often the device referred to as a ROM can be written to, in a special mode. Such writable ROMs are sometimes called Flash ROMs. UEFI Firmware is stored in ROM or Flash ROM.
RTC	The battery-backed circuit in PC-AT systems keeps system time and date as well as certain system setup parameters.

Word	Description
SATA	Serial AT Attachment: serial-interface standard for hard disks.
SBC	Single Board Computer
SB-TSI	Side Band Temperature Sensor Interface
SCI	System Control Interrupt
SPD	Serial Presence Detect refers to serial EEPROM on DRAMs that has DRAM module configuration information
SPI	Serial Peripheral Interface standard for asynchronous serial data bus with Master-Slave devices
Super I/O	An integrated circuit, typically interfaced via the LPC bus that provides legacy PC I/O functions including PS2 keyboard and mouse ports, serial and parallel port (s), and a floppy interface
SVI2	Serial VID Interface Rev 2
VR	Voltage Regulator
TMDS	A digital Transition Minimized Differential signaling protocol between the graphics subsystem and display that is used for the DVI digital signals
UMI	Unified Media interface between APU and FCH
VGA	PC-AT video graphics adapter standard defined by IBM
VID	Voltage Identification
'#' (hash) suffix to a signal name	Indicates an active low signal. The signal is either true when it is at logic zero level (voltage close to 0 V) or the signal initiates actions on a high-to-low transition
'\' (backslash) prefix to a signal name	Indicates an active low signal. The signal is either true when it is at logic zero level (voltage close to 0 V) or the signal initiates actions on a high-to-low transition

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