

PACSystems™ IPC 2010

HARDWARE REFERENCE MANUAL



Contents

Section 1:	Introduction	1
1.1	Document History.....	1
1.2	Software Requirements	1
1.3	Features.....	1
Section 2:	Unpacking and Inspection	2
2.1	Package Contents.....	2
2.2	Available Options and Accessories.....	2
2.3	ESD and EMI	3
2.4	Unpack and Inspect	4
2.5	Handling.....	5
Section 3:	Mounting	6
3.1	DIN Rail Mounting.....	6
Section 4:	Installation and Startup	7
4.1	General Installation Guidelines.....	7
4.2	Required Materials.....	7
4.2.1	Power Supply.....	8
4.2.2	Keyboard.....	8
4.2.3	Video Monitor	8
4.3	Minimum System Requirements	8
4.4	Initial Startup	8
4.4.2	Power-Input	9
4.4.3	Serial Console	9
4.4.4	Secure Shell (SSH)	9
4.4.5	IP-Addresses	9
4.4.7	Pre-Installed Software Images.....	10
4.4.8	Ubuntu Desktop Quick Start.....	10
4.5	Thermal Protection.....	11
Section 5:	Installation and Replacement Procedures	12
5.1	External Interfaces.....	12
5.1.1	Power-In.....	12
5.1.2	LEDs.....	12

5.1.3 Ethernet Ports	13
5.1.5 USB.....	14
5.1.6 USB-C	15
5.1.7 Serial Ports	16
5.1.9 μ SD Slot.....	17
5.2 Internal Devices	17
5.2.1 eMMC	17
Section 6: Specifications	18
6.1 Cable Port Restrictions	18
6.2 Power Consumption	18
6.2.1 Example Configuration.....	18
6.3 Temperature.....	19
6.4 Shock and Vibration.....	19
6.6 Regulations and Certifications	20
6.6.1 IPC 2010	20
6.7 Battery	20
6.7.1 Battery Maintenance	20
6.9 Technical Specifications	22
6.10 Dimensions and Weight.....	22
6.11 General Contact Information	23
6.12 Technical Support	23

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.

NOTICE

Notes and information that are not safety-related.

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 the 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 use by trained personnel familiar with the Emerson products referenced herein.

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Section 1: Introduction

The IPC 2010 industrial computing platform delivers high-efficiency computing performance and graphics capabilities in a compact, ruggedized package. Utilize the IPC 2010 computing platform to execute data collection and aggregation, protocol conversion, and basic analytics applications for real-time control and visualization of operations.

1.1 Document History

Rev	Date	Description
A	Oct 2023	Initial Release

1.2 Software Requirements

Ubuntu Linux 20.04

PACEdge v2.3 or higher (pre-installed)

(Optional) PACEdge NExT 4.2.362 or later (PACEdge Movicon)

1.3 Features

Feature	Description
Multicore Processor	2x ARM Cortex-A53 CPU cores at 1.2GHz
Fanless Operation	A robust, reliable solution with no moving parts and minimized dust contamination
Two Gigabit Ethernet Ports	Network implementation flexibility Network segregation and security via multiple independent Ethernet ports
Small Form Factor	Mounting options support DIN Rail mounting.
32 GB or 64 GB SDD Built-in Storage	Favored for their speed, reliability, energy efficiency, durability, and compact form factor
Micro SD Expansion Slot	Removeable, expandable storage
Two USB 2.0 Interfaces	For use with keyboard, mouse, storage devices, external communication adapters.
DisplayPort Interface via USB-C connector	For use with displays
RS-232 Serial Port	Widely used in industrial settings to communicate with various automation and control equipment such as PLCs, sensors, and industrial machines
Optional WiFi/Bluetooth Wireless Connectivity	Useful for Access Points, SSID/Passwords, Internet Connectivity, and Short-Range Communication
Compatible with PACEdge and Connex Software	This device is compatible with Connex, an OPC UA server, I/O data server, gateway and IIoT connectivity engine that provides the foundation for industrial control and building management systems. PACEdge provides all aspects of edge processing to simplify your IIoT application development, deployment, and administration

Section 2: Unpacking and Inspection

This chapter describes unpacking, initial inspection, and required preparation considerations before using the IPC 2010. Perform the procedures in this chapter to verify proper operation after shipping and before system integration.

2.1 Package Contents

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

Table 2-1 Delivery Volume

Item	QTY	Description
IPC 2010	1	PACSystems IPC 2010
24 V Power-In Connector Plug	1	Power Connector Plug
Quick Start Guide	1	Quick Start Guide (GFK-xxx)

2.2 Available Options and Accessories

The following tables list the available accessories for the IPC 2010. For the complete list of orderable product SKUs please refer to the IPC 2010 Datasheet.

Table 2-2 Available Accessories

Item	Description
YLB-UIPC-01-1	USB-C to DisplayPort Cable 1,8m

Note: For the most current information on options and accessories, contact the nearest Emerson sales or service office, or an authorized Emerson sales representative. Options are subject to change without notice.

2.3 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 come up when installing and connecting the system to the other components. 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 has not manufactured the complete system, including the enclosure and cables, then 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).

Products manufactured by Emerson should normally be suitable for use in properly designed and produced customer equipment (cabinets, racks) without any major redesign. However, the systems might be subject to ESD and EMI problems once installed and interconnected with other systems. 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.

CAUTION

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

CAUTION

This is an FCC Class A product intended 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.

2.4 Unpack and Inspect

⚠ CAUTION

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

⚠ CAUTION

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.

NOTICE

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 shipping damages may occur. A 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.

2.5 Handling

WARNING

If the IPC 2010 operates in high ambient temperature up to 70°C (149 ° F). Be careful and do not touch the IPC 2010 with bare fingers.

Si le IPC 2010 est opérée à une température ambiante élevée jusqu'à 70 ° C (149 ° F), la surface du boîtier, en particulier le dissipateur thermique, peut atteindre une température de 85 ° C (185 ° F) et plus. Soyez prudent et ne touchez pas le IPC 2010 avec les doigts nus.

WARNING

Equipment is intended for installation in Restricted Access Area.

Les matériels sont destinés à être installés dans des EMBLEMES À ACCÈS RESTREINT.

Section 3: Mounting

3.1 DIN Rail Mounting

1. To mount the IPC 2010 to a DIN rail, insert the module onto the DIN rail and swing the bottom of the module into place until the spring release tab clicks.
2. After its placement on the DIN rail, ensure that the black spring lever is in the up position to retain the module's position.

To remove the module, pull the spring release tab down before removing.

Figure 1: Attaching a DIN Rail to a IPC 2010



Section 4: Installation and Startup

This chapter describes the installation and initial startup operations.

⚠ CAUTION

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.

4.1 General Installation Guidelines

Adhere to the following guidelines during installation:

- Observe all safety procedures to avoid damaging the system, and to protect operators and users.
- Before installing or removing any board, verify that the system power and external supplies have been turned off.
- Make sure the IPC 2010 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.

4.2 Required Materials

The following items are required to start the IPC 2010 in a standard configuration:

- Power supply, such as Emerson SVL424100, 96W, AC-to-24VDC DIN Power Supply
- Keyboard and mouse (optional)
- Emerson video monitor (optional)
- Emerson USB-C to DP Cable (optional)

4.2.1 Power Supply

CAUTION

Verify that the power supply is turned off while installing boards or modules into the IPC 2010.

Adhere to the following guidelines:

- Verify that the power supply can meet the total power requirements of the IPC 2010.
- Verify that the power supply is not turned ON while opening the enclosure to install add-on boards and modules into the IPC 2010.

4.2.2 Keyboard

A compatible USB keyboard for the initial system operation of the IPC 2010 is required. Depending on your application, this may be a standard keyboard or one that uses membrane switches for harsh environments.

4.2.3 Video Monitor

A video monitor can be used for initial setup using DisplayPort via USB-C port on the front panel of the IPC 2010. Emerson Video Monitor recommended.

A special Emerson USB-C to DisplayPort cable is required: Order-Code YLB-UIPC-01-1

4.3 Minimum System Requirements

The IPC 2010 has been thoroughly tested and is nearly ready for usage 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 USB disk drives, a USB stick, or other accessories connected, to perform the Power-On Self-Test (POST).

4.4 Initial Startup

After power up, the IPC 2010 desktop environment will display on the screen. If you do not see any error messages up to this point, the IPC 2010 is running properly and ready to be configured for your application.

Note: *If the IPC 2010 does not perform as described above, 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.)*

4.4.2 Power-Input

To power the system, a voltage of 24 V DC (supports wide range power supply) must be supplied to the power connector. The IPC 2010 power supply must meet the requirements for SELV (safety extra-low voltage)/LPS (limited power source) or ES1/PS2 appropriately rated for the ambient and altitude of the application. There are no buttons for power or resetting, as the system will start automatically once power is applied. The Power LED (1) will light up green to indicate that the system is now powered on.

The specific plug required is a Phoenix Contact with the part number 1748367, and users must use the same connector type or an equivalent.

For pinout information, refer to Section 5.1.1, *Power-In*.

4.4.3 Serial Console

Optionally, to gain access to the system, utilize the serial console port (4) by connecting it to the host PC's RS232 interface using a null modem cable. Once connected, the host can establish a connection by running a terminal emulator such as HyperTerminal or minicom. The default serial port parameters are **115200, 8N1**

The connector is RJ-45 style with pinout as defined in EIA/TIA-561, so that off-the-shelf adapters to DB9 or USB can be used.

Once a serial connection is established, it can be used to determine an IP address that was assigned by DHCP server, using command: **ip addr**

For pinout information, refer to Section 5.1.7, *Serial Ports*.

4.4.4 Secure Shell (SSH)

To establish a connection with the system, Ethernet can be used instead of the serial console. The system has a SSH server running on port 22, and the default IP address settings are described in the next section.

To connect to the system, use Putty on a Windows host or the default SSH tools on Linux.

The login credentials will vary depending on the pre-installed software (Ubuntu Linux or PACEdge), so it is advised to refer to the sections below for specific details.

4.4.5 IP-Addresses

On preinstalled systems the first ethernet interface (Port 2) is configured to use the static IP-Address: **192.168.3.100** and DHCP as well. Therefore (if the first ethernet interface is connected to a DHCP server) two IP-Addresses are usable on this interface (IP-Address provided by DHCP server and static IP-Address 192.168.3.100).

CAUTION

MULTIPLE DEVICES WITH THE SAME IP ADDRESS ON THE SAME NETWORK CAN LEAD TO ADDRESS CONFLICTS WITH UNPREDICTABLE BEHAVIOR.

If you are using several IPC 2010 devices in the same network, it is **strongly recommended** to change the static IP Address.

4.4.7 Pre-Installed Software Images

IPC 2010 comes with two pre-installed software options:

- Ubuntu Desktop 20.04.05 LTS
- PACEdge v2.3.0 (based on Ubuntu 20.04 Server)

Depending on pre-installed software, login credentials and some of the configuration tasks are different. Sections below will guide through the getting started process for each of these software options.

4.4.8 Ubuntu Desktop Quick Start

Ubuntu Desktop 20.04.05 LTS software package provides a full Linux operating system environment on IPC 2010. Software installation already contains many software packages, but user can easily install additional packages by using **apt** command.

Default User and Passwords

Default Username	ubuntu
Default Password	ubuntu

Note: This user also has sudo permissions to be able to execute privileged operations and to install additional software packages using **apt** command.

Networking Configuration

In Ubuntu Desktop, the interface **Port 1** is named **eth1**, the interface **Port 2** is named **eth0**.

CAUTION

MULTIPLE DEVICES WITH THE SAME IP ADDRESS ON THE SAME NETWORK CAN LEAD TO ADDRESS CONFLICTS WITH UNPREDICTABLE BEHAVIOR.

If you are using several IPC 2010 devices in the same network, it is **strongly recommended** to change the static IP Address.

Additional network configuration

If the system obtains an IP address via DHCP, the server may supply additional information like DNS server addresses or the default gateway to configure the client system.

If this is not the case, or when using manual IP configuration, some additional settings must be made to obtain full network functionality.

Setting the default gateway:

```
ip route set default via <address>
```

Setting a DNS server:

```
resolvectl dns eth0 <server address>
```

4.5 Thermal Protection

To prevent damage to the device due to overheating, the system continuously monitors its processor and board temperature. In the case of an overtemperature event, the system will power off and the TEMP LED at the front plate will light up in red. After the system has cooled down by 5 degrees Celsius, it will automatically restart.

Section 5: Installation and Replacement Procedures

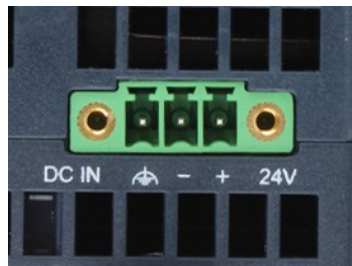
5.1 External Interfaces

5.1.1 Power-In

The corresponding plug must be a Phoenix Contact “1748367” or equivalent.

IPC 2010 can be powered with a DC power supply (recommended power rating at least 25W). IPC 2010 input voltage range is 10V to 30V and maximum power consumption is 11W.

Figure 2: 24V DC-IN

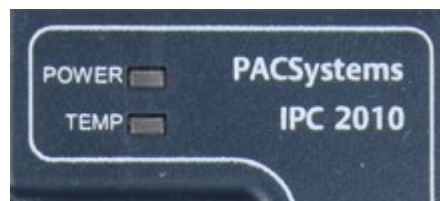


Signal Name	Pin (left to right)
FGND	1
Power - (10V-30V DC)	2
Power + (10V-30V DC)	3

5.1.2 LEDs

The IPC 2010 provides a set of different status-LEDs on the front panel to indicate various functions.

Figure 3: LEDs



LED Name	Color	LED status indication
Power (also a button)	Green	All power rails available and valid, system is powered
	Yellow	N/A
	Red	N/A
TEMP	Green	N/A
	Yellow	N/A
	Red	Temperatures above T_{hot} and T_{crit} An immediate shutdown has occurred to protect the system

5.1.3 Ethernet Ports

The IPC 2010 provides two Ethernet ports. Both Ethernet ports support 10/100/1000 Base-T. For a proper 1000 Mbit connection, a minimum of CAT5e cable is recommended.

Figure 4: Ethernet Ports

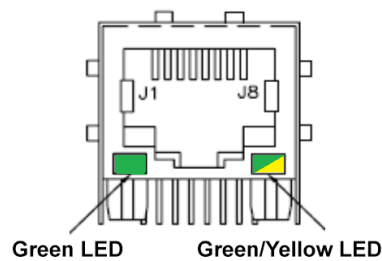


10/100 BaseT Name	1000 BaseT Name	Pin
TxD+	LP_DA+	1
TxD-	LP_DA-	2
RxD+	LP_DB+	3
NC	LP_DC+	4
NC	LP_DC-	5
RxD-	LP_DB-	6
NC	LP_DD+	7
NC	LP_DD-	8

Ethernet Ports LEDs

Same configuration for all Ethernet ports:

Figure 5: Ethernet Ports LEDs



Pin	LED color	LED status indication
12	Green	ACT/LINK Blink with activity, Steady on with no activity at 10/100/1000
13/14	Green Yellow Off	LINK1000 (steady on) LINK100 (steady on) LINK10

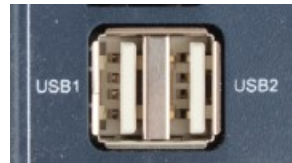
5.1.5 USB

The IPC 2010 provides two USB2.0 (480MBit) type A Host ports and one USB-C port (USB2.0 480MBit + one DP lane up to 5GBit).

Each USB port is protected with an electrical fuse rated up to 1 A.

USB2.0 Type A

Figure 6: USB2 Port and Pinout



Signal Name	Pin
VCC (5V_SBY)	1
USB-	2
USB+	3
GND	4

5.1.6 USB-C

The IPC 2010 provides DisplayPort via the USB-C connector.

The USB-C connector is reversible and can be inserted either side up.

This requires a special Emerson USB-C to Display Port cable: Order Code YLB-UIPC-01-1

This cable has a screw to fix the cable to the housing.

Figure 7: USB-C

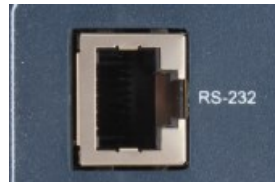


Signal Name	Pin
GND	A1
SSTXp1	A2
SSTXn1	A3
VBUS	A4
CC1	A5
DP1	A6
DN1	A7
SBU1	A8
VBUS	A9
SSRXn2	A10
SSRXp2	A11
GND	A12
GND	B1
SSTXp2	B2
SSTXn2	B3
VBUS	B4
CC2	B5
DP2	B6
DN2	B7
SBU2	B8
VBUS	B9
SSRXn1	B10
SSRXp1	B11
GND	B12
GND	Shield

5.1.7 Serial Ports

The IPC 2010 provides one serial interface (RS232). The connector is a standard RJ45.

Figure 8: Serial Ports



The pinout for RJ-45 (8P8C) connector is defined as follows:

RJ45 Pin	Signal
1	DSR
2	DCD
3	DTR
4	GND
5	RxD
6	TxD
7	CTS
8	RTS
Shield	FGND

5.1.9

μSD Slot

The IPC 2010 provides a μSD card slot.

Figure 9: μSD Slot



Signal Name	Pin
DATA2	1
DATA3	2
CMD	3
VDD	4
CLK	5
VSS	6
DATA0	7
DATA1	8
CD	9

5.2

Internal Devices

5.2.1

eMMC

The IPC 2010 provides 32 or 64 GB eMMC of primary storage device.
A user-accessible μSD slot can be used to expand storage.

Section 6: Specifications

This chapter provides specifications and other useful information about IPC 2010.

6.1 Cable Port Restrictions

Port Name	Maintenance Port (**)	Max. cable length (m)	Shielded Cable Required
DC IN (24V)	No	3m	No
RS-232 (RJ45)	Yes	3m	Yes
USB1	No	3m	Yes
USB2	No	3m	Yes
USB-C	Yes	3m	Yes
Port 1 (ETH-RJ45)	No	≤ 100m	No (*)
Port 2 (ETH-RJ45)	No	≤ 100m	No (*)

*These cables must be shielded if operating at 1 Gbps. If operating at or below 100 Mbps, unshielded cables can be used.

**Maintenance ports can only be cabled temporarily for maintenance/setup tasks.

6.2 Power Consumption

WARNING

The IPC 2010 power supply must meet the requirements for SELV (safety extra-low voltage)/LPS (limited power source) or ES1/PS2 appropriately rated for the ambient and altitude of the application.

The maximum current consumption can vary, depending on the CPU model, load, attached IO (USB or Exp.Port) input voltage, and temperature:

6.2.1 Example Configuration

IPC 2010 with ZU2 (2-core) Soc:
two Gigabit Ethernet connector, one RS232 connector and one DisplayPort connector:

25 °C ambient temperature:

- 18 V DC -> typ 0.48 A (8.6W) max 0.59 A (10.6W)
- 24 V DC -> typ 0.37A (8.8W) max 0.45 A (10.8W)
- 30 V DC -> typ 0.31 A (9.3W) max 0.37 A (11.1W)

Typical Load: at Linux prompt, low load, PACEdge installation

Maximum Load: Linux, 2 Cores 100% load with `ramsm -b1 -p2 memtest`

For additional IO: 3 USB ports: heavy load: 3x 0.5A at 5V: 7.5W additional expansion port IO: 1.5A 5V 7.5W additional.

6.3 Temperature

Ambient temperatures and humidity values for the IPC 2010 are provided in the following table. For more details on the operating temperature and its dependency on application software, please refer to the Thermal Design section.

Temperature	
Storage	-40°C to 85°C
Operating	-20°C up to 70°C, at zero airflow
Humidity	
Storage	5 to 95% rH, non-condensing, at 40°C (104 °F)
Operating	

6.4 Shock and Vibration

Shock and vibration values for the IPC 2010 are provided in the following tables for both mounting variants.

DIN Rail	
Impact, operating	IEC 60068-2-27: 1987 (test Ea) - 15g of 11ms half-sine pulse - 3 shocks each axis (=18)
Sinusoidal Vibration, operating:	IEC 60068-2-6: 2008 (test Fc) 5 to 13.2 Hz @ .079 inch displacement 13.2 -33.9 Hz @ 0.7g acceleration 33.9-57 Hz @ .012 inch displacement 57-500Hz @ 2G 1 Oct/min, 10 Cycles a 3 axes

6.6 Regulations and Certifications

6.6.1 IPC 2010

Item	Specification
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)
Product Safety	LVD Directive 2014/35/EU: EN/IEC 62368-1 UL 62368-1 -1

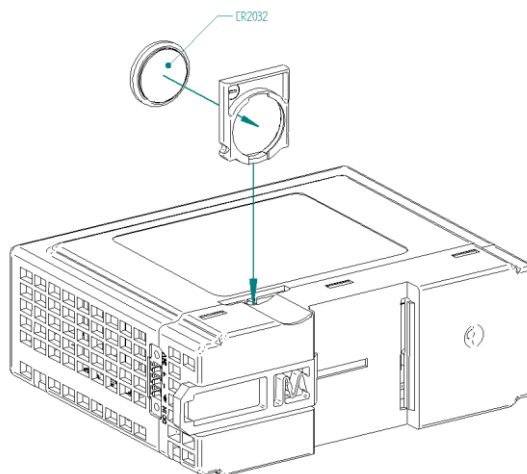
6.7 Battery

The IPC 2010 contains a CR2032 lithium coin battery. It is a industrial CR2032 (-40°C to 125°C) battery and is accessible on the right side of the IPC 2010. Depending on the operating hours and temperature, the estimated battery life is 2 to 10 years. Battery current is not used when the IPC 2010 is supplied with 24V.

6.7.1 Battery Maintenance

To replace the battery, pull the battery holder (on the right side of the system) out of the system, replace the battery and insert the battery holder back into the system.

Figure 10: Battery Removal



⚠ CAUTION

- Only replace with CR2032 battery. Batteries may explode if mistreated. Do not charge, disassemble, or incinerate.
 - Remplacez uniquement par une pile CR2032. Les piles peuvent exploser si elles sont maltraitées. Ne pas charger, démonter ou incinérer.
-

6.9 Technical Specifications

Item	Specification
Processor	ARM Cortex-A53 CPU Cores (2 Cores at 1.2 GHz)
Memory	2 GB DDR4-1600
Ethernet	Two 10/100/1000BASE-T Ethernet ports
Graphics	DisplayPort via USB-C connector
USB	Two USB 2.0
Serial	One RS-232
Internal Storage	eMMC 32 GB or 64 GB
Removeable Storage	One Micro SD Card Slot, SDXC type
Input Power	10V – 30V DC, maximum power consumption 11W, 25W Power Supply Recommended.

6.10 Dimensions and Weight

Item	Specification
Dimensions	120 x 45 x 101 mm
Weight	340g

6.11 General Contact Information

Home link: <http://www.emerson.com/industrial-automation-controls>

Knowledge Base: <https://www.emerson.com/industrial-automation-controls/support>

6.12 Technical Support

Americas

Phone: 1-888-565-4155
1-434-214-8532 (If toll-free option is unavailable)

Customer Care (Quotes/Orders>Returns): customercare.mas@emerson.com
Technical Support: support.mas@emerson.com

Europe

Phone: +800-4444-8001
+420-225-379-328 (If toll free option is unavailable)
+39-0362-228-5555 (from Italy - if toll-free 800 option is unavailable or dialing from mobile)

Customer Care (Quotes/Orders>Returns): customercare.emea.mas@emerson.com
Technical Support: support.mas.emea@emerson.com

Asia

Phone: +86-400-842-8599
+65-6955-9413 (All other Countries)

Customer Care (Quotes/Orders>Returns): customercare.cn.mas@emerson.com
Technical Support: support.mas.apac@emerson.com

Any escalation request should be sent to mas.sfdcescalation@emerson.com

Note: If the product is purchased through an Authorized Channel Partner, please contact the seller directly for any support.

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