ioThinx 4530 Series Hardware
User Manual

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www.moxa.com/products

ioThinx 4530 Series Hardware User Manual

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Safety Symbols

⚠️ **DANGER**

Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠️ **WARNING**

Indicates a moderate risk, which, if not avoided can cause a potentially hazardous situation.

⚠️ **CAUTION**

Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

✏️ **NOTE**

Indicates a potential malfunction which, if not avoided, will not result in damage to property.

✏️ **INFORMATION**

This information is important for preventing errors.

Table of Contents

1. Preface

In this chapter, we explain the scope of and how to use this document.

Revision History

Version	Change	Date
v1.0	First Release	2019-01-25
v1.1	Added power calculator	2019-08-14
v1.2	Corrected typo. Changed "total system current is 1.594 A" to "total system current is 1.529 A" in the text of chapter 3.	2019-12-23
v1.3	Added 45ML module information	2020-07-09
v1.4	Modified description in cloud integration of User Scenarios.	2020-12-18
V1.5	Modified ' Introduction', 'System and Field Power Wiring', ' LED Indicators' and 'Reset Button: Factory Reset Process' sections.	2024-03-05

Introduction

The ioThinx 4530 Series advanced modular controllers with built-in serial port excel in performance, security, and user-friendliness. Built around a Cortex-A7 dual-core processor, ioThinx 4530 is highly versatile and suitable for a variety of industrial solutions. The Moxa Industrial Linux operating system enhances control precision by enabling the ioThinx 4530 to handle computations and control actions simultaneously.

Featuring a distinctive mechanical design, the ioThinx 4530 minimizes installation and removal time, streamlining deployment and maintenance processes. Additionally, ioThinx 4530 supports C/C++ and Python, providing advanced programming options to facilitate the creation of customized applications with ease.
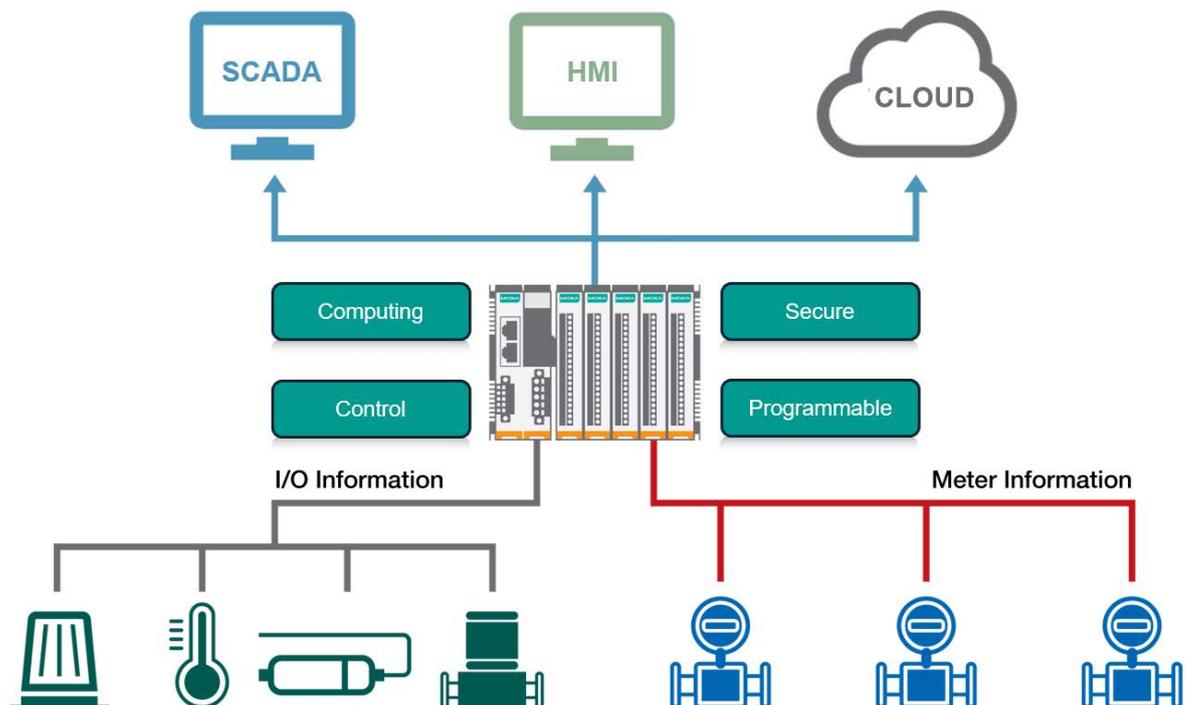
Relevant Models

This document is only applicable to the models listed below.

Model Name	Description
ioThinx 4533-LX	Controller with Cortex-A7 1 GHz dual-core CPU, 512 MB RAM, 3-in-1 serial ports, Linux OS, -20 to 60°C operating temperature
ioThinx 4533-LX-T	Controller with Cortex-A7 1 GHz dual-core CPU, 512 MB RAM, 3-in-1 serial ports, Linux OS, -40 to 75°C operating temperature

Package Contents

The following items are included in the product package.

- The ioThinx 4530 Series device
- Quick installation guide (Printed)
- Warranty card

Hardware and Software Requirements

You will need the following hardware and software to use the ioThinx 4530 Series.

- A power source that provides 12 to 48 VDC, and power wires
- A PC running Linux OS (we recommend Debian 11, kernel 5.10) and an Ethernet cable
- 45MR/ML modules, if available

Safety Precautions

Please observe the following safety precautions when installing and using the ioThinx 4530 Series:

⚠️ **DANGER**

Never work on the device while the power source is switched on. Disconnect all power sources to the device before performing installation, repair, or maintenance work.

⚠️ **DANGER**

Disconnect the power when you want to remove or replace components, or disconnect equipment unless the area is known to be free of ignitable substances.

- If you connect or disconnect the Removable Terminal Block when field power is applied, an electrical arc can occur. This could cause an explosion when installed in hazardous locations. Ensure that power is removed, or the area is non-hazardous before installation.
- If you connect or disconnect wiring while the power is on, an electrical arc can occur. This could cause an explosion in hazardous environments. Ensure that power is removed, or the area is nonhazardous before installation.
- Do not disconnect the unit unless the power has been disconnected or the area is known to be nonhazardous. In a hazardous area, the unit must be powered down before removing it.

⚠ WARNING

This unit is sensitive to Electrostatic Discharge, which can cause internal damage and affect operations. Follow these guidelines when you handle this unit:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wristband.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the device in appropriate static-safe packaging when not in use.

⚠ WARNING

Check the voltage supplied by the power source. Make sure the voltage provided by the power source matches the voltage required by the device.

⚠ WARNING

Check the voltage or current of the sensors or loads. Make sure the voltage and/or current indicated on the sensors or loads corresponds to the specifications of your 45MR/45ML module before you connect the device.

⚠ WARNING

Connect your device to an earthed ground.

⚠ CAUTION

Do not use the device if the device is already damaged. Replace defective or damaged devices to ensure that your devices function properly.

⚠ CAUTION

Do not attempt to repair the device yourself. If your device needs to be repaired, return the device to Moxa's customer service department. Attempting to repair the device yourself could invalidate the device's warranty.

Additional Resources

Refer to the following documents for additional information.

- Datasheets for the following products:
  - ➢ ioThinx 4530 Series
  - ➢ ioThinx 4500 Series (45MR) Modules
  - ➢ ioThinx 4500 Series (45ML) Modules
- User's Manual for the following products:
  - ➢ ioThinx 4500 (45MR) Module Series
  - ➢ ioThinx 4500 (45ML) Module Series
- Programming Guide
  - ➢ ioThinx 4530 Series Programming Guide

In this chapter, we give an overview of each ioThinx 4530 Series product.

Specifications

✎ **NOTE**
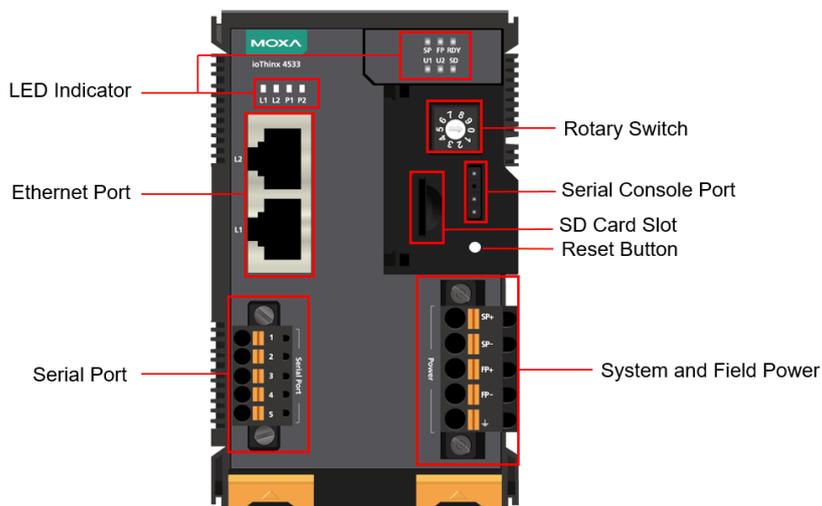
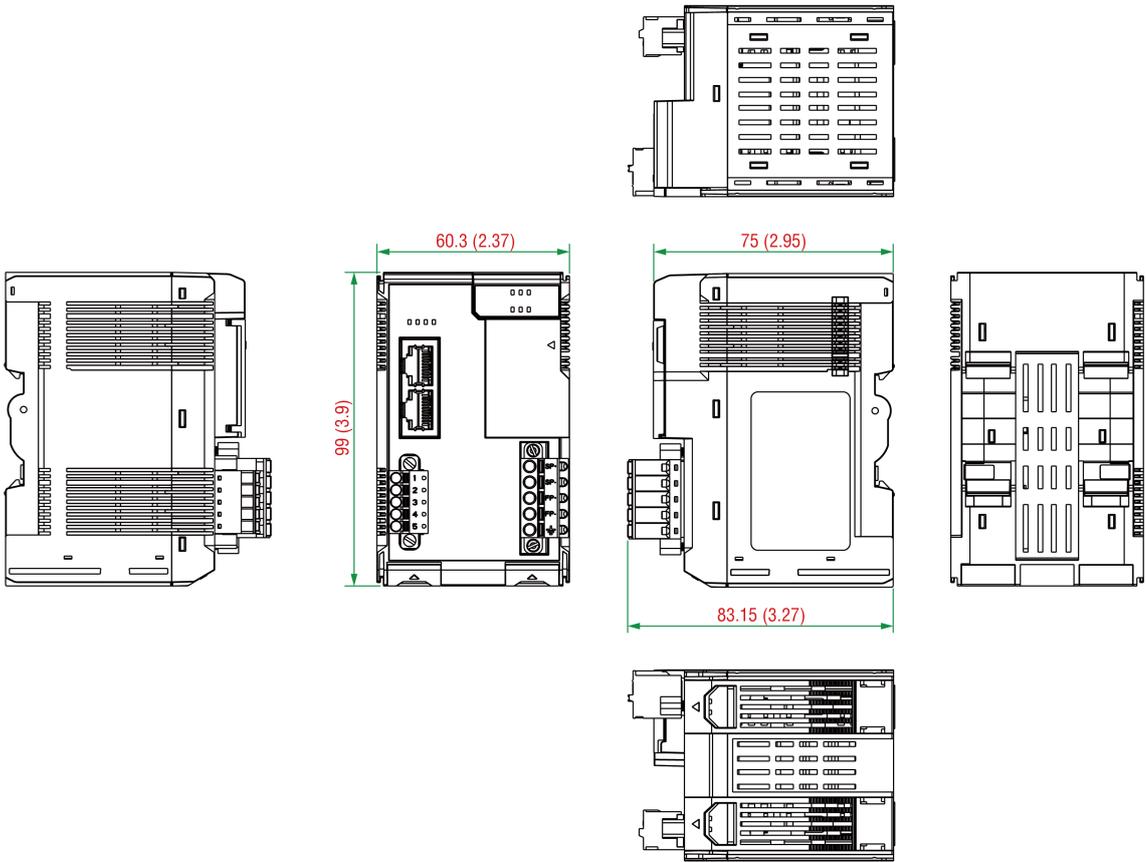The latest specifications for Moxa's products can be found at https://www.moxa.com.
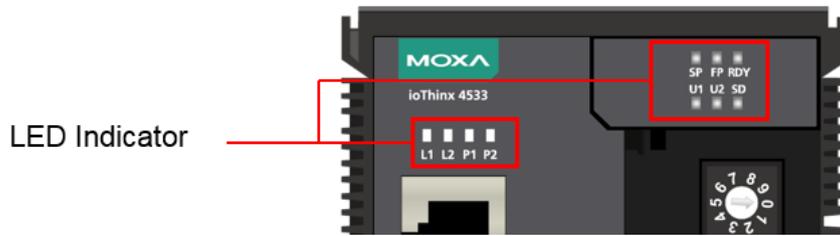
Appearance

Front View

Physical Dimensions

Unit: mm (inch)

60.3 (2.37)

75 (2.95)

99 (3.9)

83.15 (3.27)

LED Indicators

| Label	Usage	Qty	Color	Action
SP	System Power	1	Green	On: Power on Off: Power off
FP	Field Power	1	Green	On: Power on Off: Power off
RDY	System (kernel)	1	Green/Red	Green: System ready Green (blinking): System is booting up or setting up the factory default values
U1/U2	User defined	1 of each	Green/Red	User-defined
SD	microSD card	1	Green	Green: Micro SD card inserted and working normally Off: Micro SD card is not detected
L1/L2	Ethernet	1 of each	Green/Amber	Green: 100Mb Amber: 10Mb Blinking: Data is being transmitted Off: Inactive
P1/P2	Serial	1 of each	Green/Amber	Green: Tx Amber: Rx Blinking: Data is being transmitted Off: Inactive

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✏️ **NOTE**

DO NOT DISCONNECT THE POWER OR NETWORK CABLE when the RDY LED is blinking.

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3. Hardware Installation

In this chapter, we describe how to install ioThinx 4530 Series products.

System and Field Power Wiring

Unit: mm (in.)
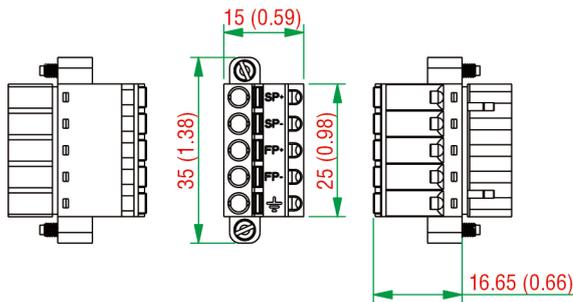
⚠️ **CAUTION**

Be sure to note the maximum possible current for each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If currents exceed the maximum rating, the wires will overheat, which could cause serious damage to your equipment. For safety reasons, we recommend using 2-mm diameter wire to connect to the power supply (e.g., 12 AWG).

✏️ **NOTE**

Powering the unit requires connecting both the system and field power to the power supply. If only one of the power sources is connected, the device may not work properly.

✏️ **NOTE**

We recommended using different power supplies to ensure that the system power and field power are isolated from each other. If using the same power supply for system power and field power, 3 KV or above isolation between them is recommended.
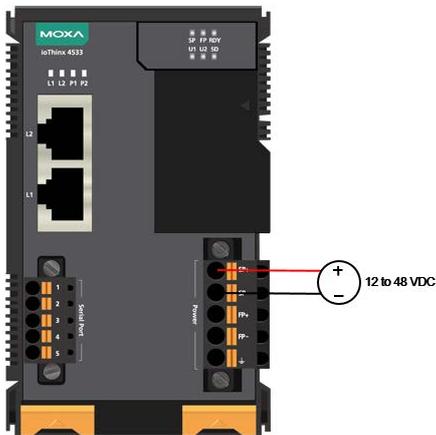

System Power

Wire Range:

12 to 16 AWG (ferrule diameter: 2.053 mm to 1.291 mm)

Wire Strip Length: 10 mm

This device requires a 12 to 48 VDC system power input. The system power powers this device and the expansion modules via an internal bus, which is galvanically connected to the system power supply.

The amount of system current required to support an expansion module is 1 A. If more modules and more power consumption is needed, an additional power module (45MR-7210) is required. Below is an example:

- 10 x 45MR-1600 (59.4 mA) = 594 mA
- 5 x 45MR-3810 (187 mA) = 935 mA

The total system current is 1.529 A, which is greater than 1 A. Therefore, an additional 45MR-7210 is needed.

✏️ **NOTE**

Install the 45MR-7210 to the left-hand side of the module where the power consumption would be exceeded.

✏️ **NOTE**

When booting up the device in a low temperature environment, it may take up to two minutes until the device is up and running.

✏️ **NOTE**

To avoid damaging your devices, reset all power supplies connected to this device and 45MR-7210 modules at the same time.
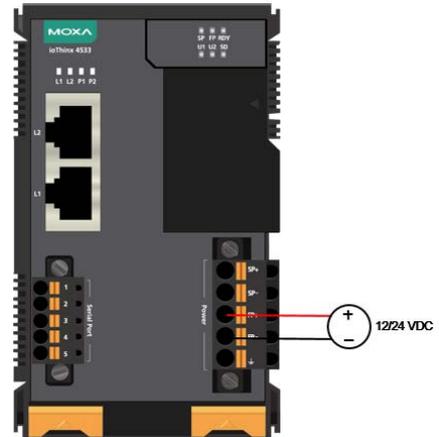

✏️ **NOTE**

Click the following link to see how many 45MR-7210 power modules you will need to support your ioThinx 4500 Series project: http://iothinxcalculator.moxa.com

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Field Power

Wire Range: 12 to 18 AWG (ferrule diameter: 2.053 to 1.024 mm)

Wire Strip Length: 10 mm

This device provides 12/24 VDC field power input, which is a passive power supply without protection and the maximum current output is 2 A.


✏️ **NOTE**

The 12/24 VDC field power supply can be connected directly to 45MR modules. If more connection points are needed, purchase 45MR-7820 (8 x FP+ and 8 x FP-) modules.

Ethernet Port Wiring

The maximum cable length of a 10/100BaseT connection is usually stated as 100 m (350 feet), but the actual limit for your application could be longer or shorter depending on the amount of electrical noise in the environment. To minimize the amount of noise, Ethernet cables should not run parallel to power cables or other types of cables that generate electrical noise. The following diagram and table show the pin assignments for the RJ45 Ethernet ports:
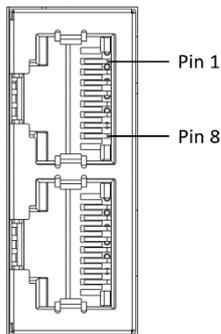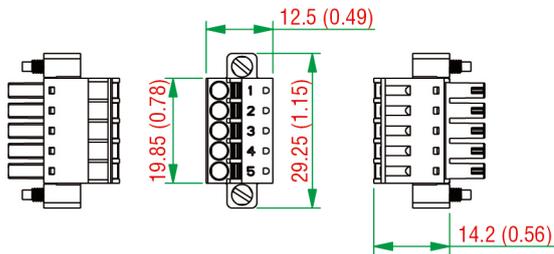

Pin	Media Direct Interface Signal
1	Tx+ (transmit)
2	Tx- (transmit)
3	Rx+ (receive)
4	Not used
5	Not used
6	Rx- (receive)
7	Not used
8	Not used

Serial Port Wiring

Wire Range: 16 to 28 AWG (ferrule diameter: 1.291 to 0.321 mm)

Wire Strip Length: 10 mm

Unit: mm (in.)

Pin	RS-232	RS-422	RS-485 (P1/P2)
1	TXD	TXD+	DATA1+
2	RXD	TXD-	DATA1-
3	RTS	RXD+	DATA2+
4	CTS	RXD-	DATA2-
5	GND	GND	GND

✏️ **NOTE**

Connect the signal common pin (e.g. GND pin on the serial port pin assignment) between each of the serial device units. For insulated wire (shielding cable) that is used to reduce electrical noise, connect the cable shield drain wire to the chassis ground.

✏️ **NOTE**

To ensure that wires are securely connected to terminal block connectors, strip 7 to 9 mm of insulation off the ends of the wires before connecting them to the terminal block.
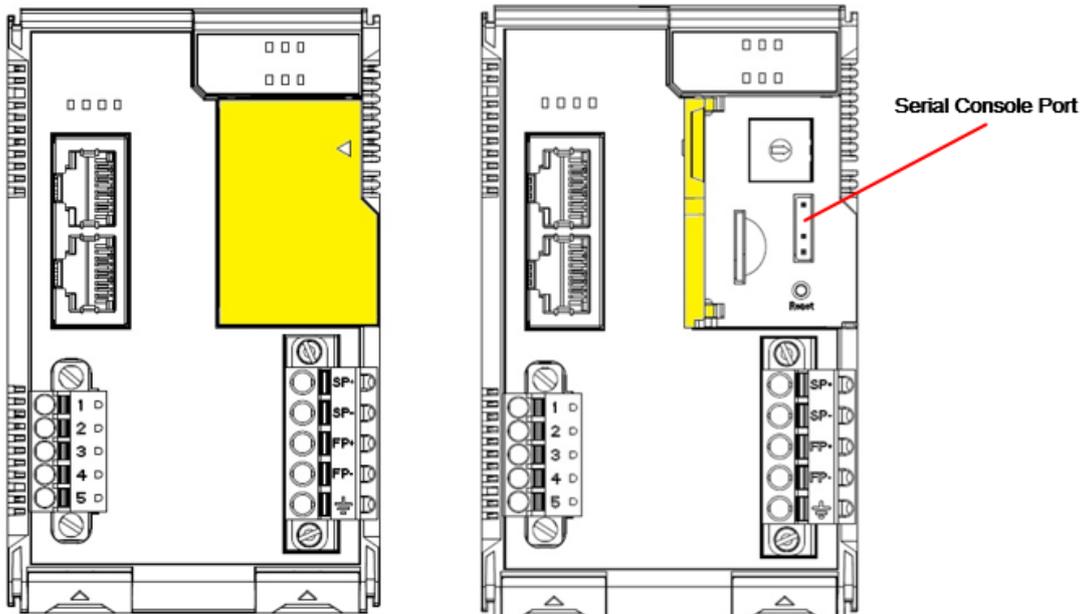

Serial Console (Debug Port)

The serial console gives users a convenient way of connecting to the programmable controllers. This method is particularly useful when using the computer for the first time. The serial console is also effective for connecting to the Moxa programmable controllers when you do not know target network settings and IP addresses.
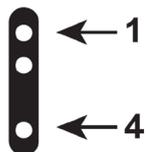
Step 1:

Open the card cover.

Console port for the ioThinx Series

Step 2:

Attach the 4-pin serial console cable to the console port. The following diagram shows the 4-pin serial connector and pin connections.

Pin Assignment for the Serial Console Port

Pin	Definition
1	TxD
2	RxD
3	NC
4	GND

Serial Console Default Settings

Parameter	Value
Baudrate	115200 bps
Parity	None
Data bits	8
Stop bits	1
Flow Control	None
Terminal	VT100

Linux Users

✎ **NOTE**

These steps apply to the Linux PC you are using to connect to the ioThinx 4530 controller. Do not apply these steps to the ioThinx 4530 controller itself.

To connect to the ioThinx 4530 controller from your Linux PC, do the following:

1. Install the **minicom** package from the package repository of your operating system.

   Centos and Fedora:
   ```
   user@PC1:~# yum -y install minicom
   ```
   Ubuntu and Debian:
   ```
   user@PC2:~# apt-get install minicom
   ```

2. Use the `minicom -s` command to enter the configuration menu and configure the serial port settings.
   ```
   user@PC1:~# minicom -s
   ```

3. In the **Configuration** menu, select **Serial port setup**.

   ```
   +------[configuration]------+
   | Filenames and paths       |
   | File transfer protocols   |
   | Serial port setup         |
   | Modem and dialing         |
   | Screen and keyboard       |
   | Save setup as dfl         |
   | Save setup as..           |
   | Exit                      |
   | Exit from Minicom         |
   +---------------------------+
   ```

4. Select **A** to change the serial device settings.

✎ **NOTE**

You need to know which device node is connected to the ioThinx 4530 controller.

```
+---------------------------------------------------------------+
| A -    Serial Device      : /dev/tty8                         |
| B - Lockfile Location     : /var/lock                         |
| C -    Callin Program     :                                   |
| D -  Callout Program      :                                   |
| E -    Bps/Par/Bits       : 115200 8N1                        |
| F - Hardware Flow Control : No                                |
| G - Software Flow Control : No                                |
|                                                               |
|    Change which setting? █                                    |
+---------------------------------------------------------------+
            | Screen and keyboard      |
            | Save setup as dfl        |
            | Save setup as..          |
            | Exit                     |
            | Exit from Minicom        |
            +--------------------------+
```

5. Select **E** to configure the port settings according to the **Serial Console Port Settings** table provided.
6. Select **Save setup as dfl** (from the main configuration menu) to use default values.
7. Select **Exit from minicom** (from the configuration menu) to leave the configuration menu.
8. Run **minicom** after completing the configuration settings.
   ```
   user@PC1:~# minicom
   ```


Windows Users

✏️ **NOTE**

These steps apply to the Windows PC you are using to connect to the ioThinx 4530 controller. Do not apply these steps to the ioThinx 4530 controller itself.

To connect to the ioThinx 4530 controller from your Windows PC, do the following:

1. Download the PuTTY tool from http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html to set up a serial connection with the ioThinx 4530 controller in a Windows environment.

2. The configuration window is displayed when a connection is established.
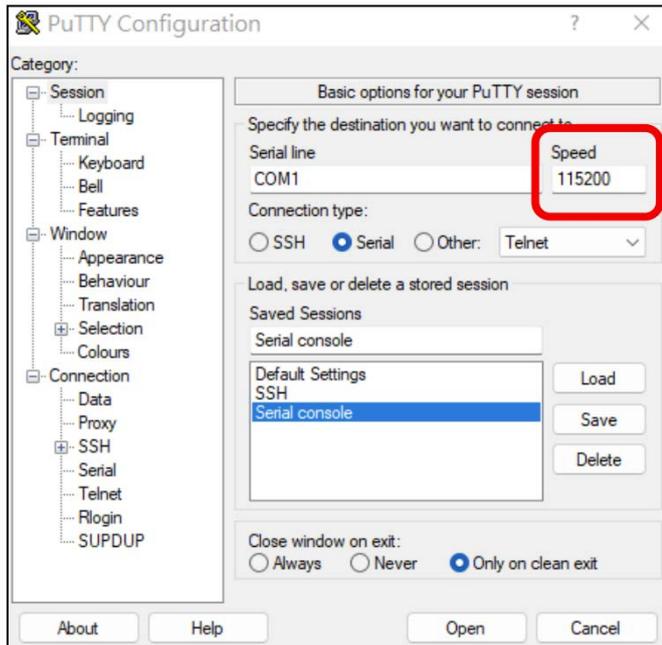
3. Select the **Serial** connection type and choose settings similar to the Minicom settings.

4. Enable **VT100 line drawing** option to enable the MCM GUI configurator to show correctly.
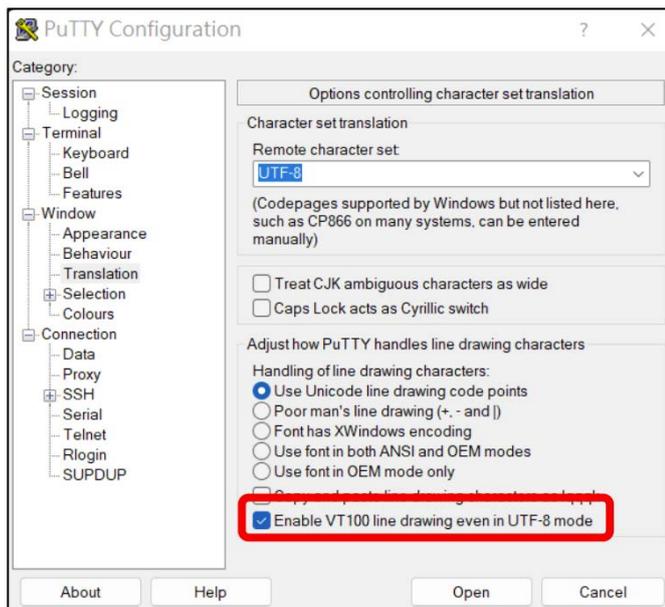
Grounding the Unit

This device has two ground pins. One pin is for system power and the other pin is for field power.

Connecting the System Power Ground

The system power ground connector is at the back of the unit. Once the device has been installed on a DIN rail, the system power ground connector will connect to the DIN rail.
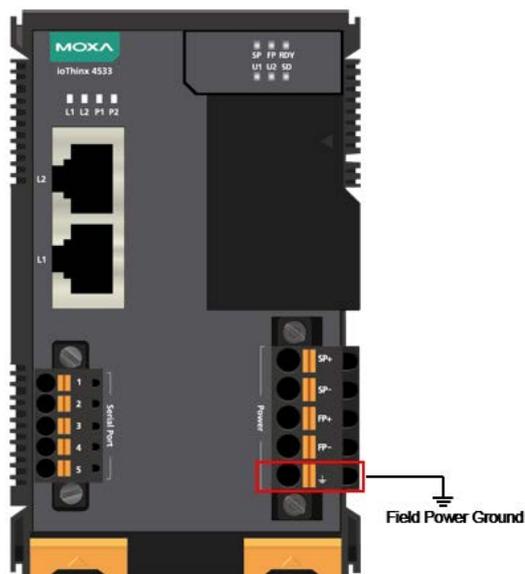

Back View
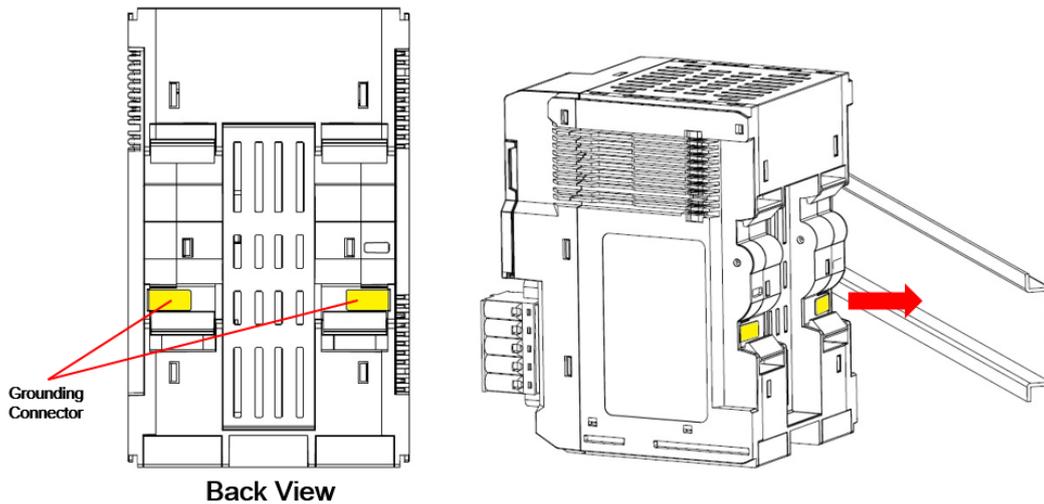
⚠️ **CAUTION**

For surge protection, connect the DIN rail to earth ground.

Connecting the Field Power Ground

Connect the field power ground pin ($\perp$) to your field power ground.

Field Power Ground

> ⚠️ **CAUTION**
>
> Be sure to note the maximum possible current for each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If currents exceed the maximum rating, the wires will overheat, which could cause serious damage to your equipment. For safety reasons, we recommend using 2 mm diameter wire to connect to the power supply (e.g., 12 AWG).

Mounting the Unit

In this section, we describe how to mount the device on a DIN rail and how to unmount the device from a DIN rail.

> ⚠️ **DANGER**
>
> Never install the device while the power source is switched on.

Installing the Unit on a DIN Rail

Take the following steps to install the unit on a DIN rail.

Step 1: Hook the mounting clip of the unit onto the DIN rail, and then lower the clip onto the DIN rail. At least 55 mm of space above the DIN rail should be kept free to ensure that the installation can be done correctly.

Reserve 55 mm space above DIN-rail
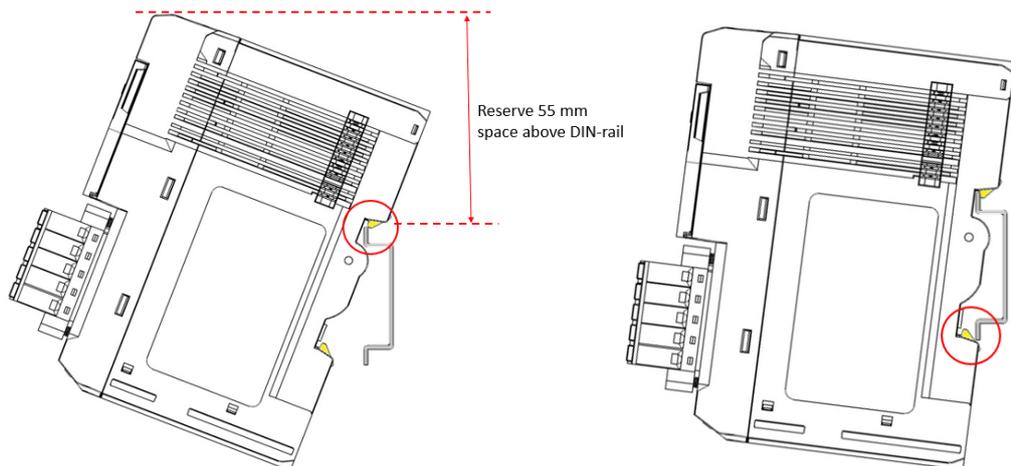
Step 2: Push the unit towards the DIN rail until the end of the mounting clip snaps into place.
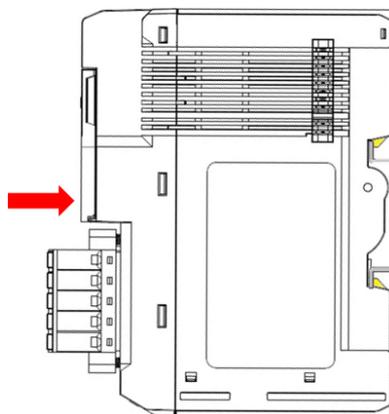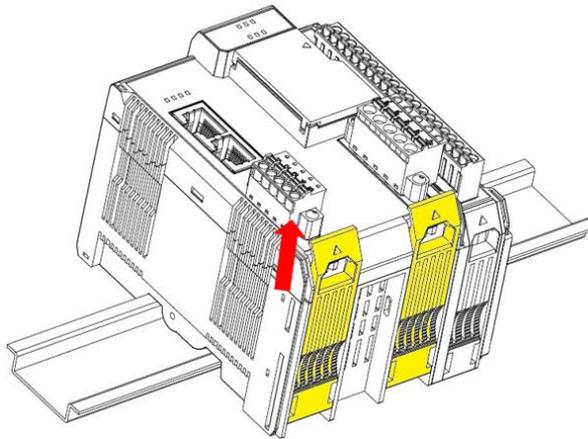

✏ **INFORMATION**

When the I/O module is inserted into the correct position, the connection between the internal bus and the previous module is established.
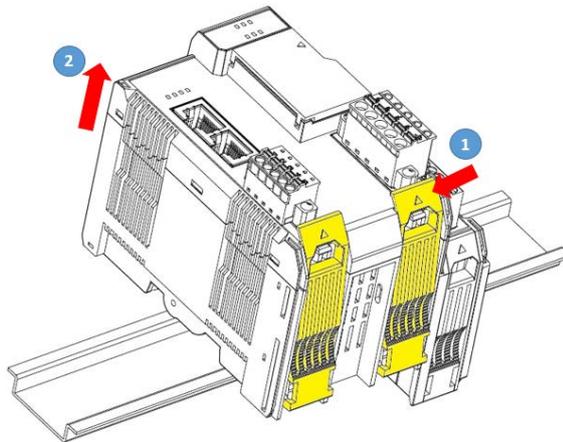

Removing the Unit from a DIN Rail

Take the following steps to remove the unit from a DIN rail.

Step 1: Use your finger to pull the release tab on the lower part of the module.

Step 2: Press the release tab (item 1 in the figure) and then remove the CPU module from the DIN rail (item 2 in the figure).
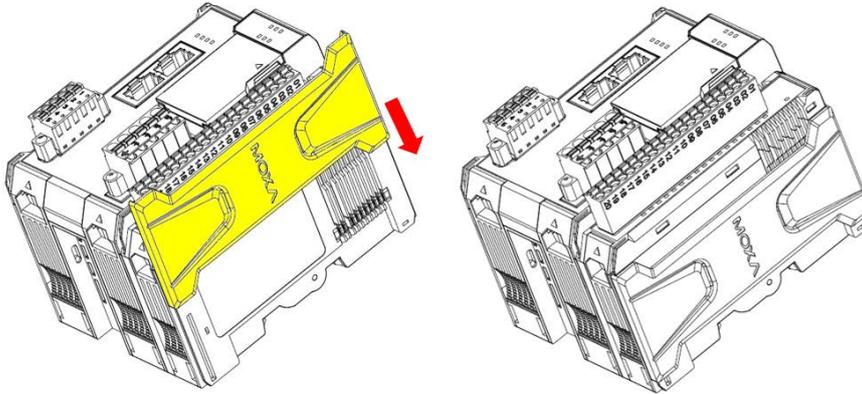

✏ **NOTE**

Disconnect all connections, including Ethernet, serial, and power cables, from the device before removing the device from the DIN rail.

Installing Covers on the Left-most Serial Module and the Right-most I/O Module

Insert the covers on the left side of the device on the serial module and on the right side of the device on the I/O module. Make sure they cover the internal bus of the modules as indicated in the diagrams.
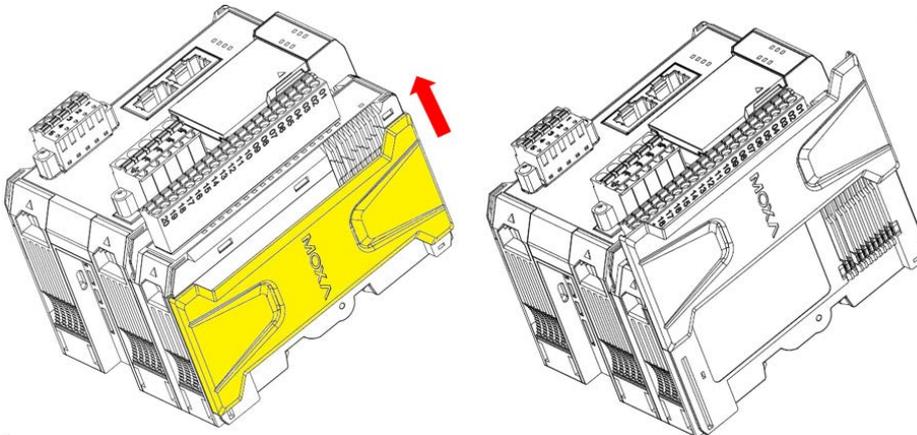

✏️ **NOTE**

The covers provide protection against electrostatic discharge.


Removing the Covers on the Left-most and the Right-most Modules

Before adding a new module to the left-most or the right-most modules, you need to remove the cover. To remove a cover, place your hand on the cover and slide it up as indicated in the diagram below.

Horizontal Installation

Before installing the device, ensure there is enough space around the device so that it can dissipate heat. In order to ensure the device works properly, we suggest reserving the space shown in the figure below.
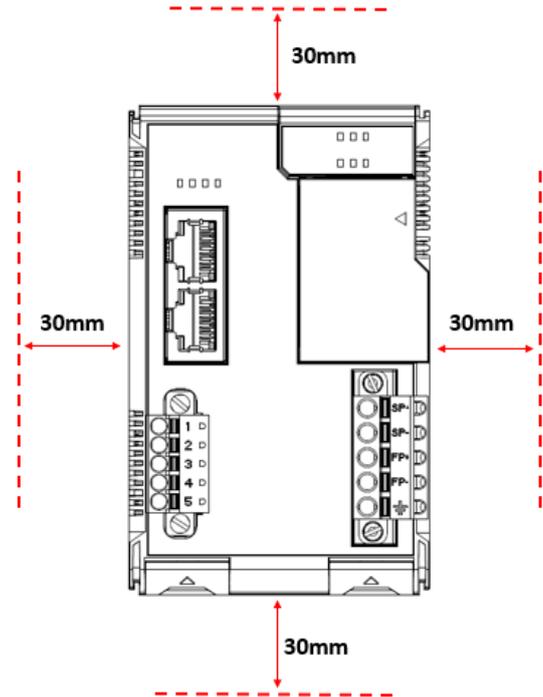
⚠️ **CAUTION**

DO NOT install the device vertically, as the fan-less heat dissipation design will not perform as intended.

Powering on the Unit

After turning on the power supply, it will take 5 to 10 seconds for the operating system to boot up. The green Ready LED will illuminate continuously until the operating system is ready.

Reset Button: Factory Reset Process

✏️ **NOTE**

When you reset the ioThinx, all of your tag definitions, software programs, and files will be deleted, and the service and runtime engine will be restarted.

To reset the ioThinx to the factory default, press and hold the reset button for 7 to 9 seconds.

When the reset button is held down, the LED will blink once every second. The LED will become steady when you hold the button continuously for 7 to 9 seconds. Release the button immediately when the LED becomes steady to load the factory default settings.

✏️ **NOTE**

For additional details on the LEDs, refer to the ioThinx 4530 Series quick installation guide.

For additional details on the functions of the reset button, refer to Manual for ioThinx 4530 Series (Linux).