

User Manual



## APAX-5570/5571

PC-based Controller with  
Celeron M CPU

**ADVANTECH**

*eAutomation*

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This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

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2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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## Declaration of Conformity

### CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

### FCC Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## Technical Support and Assistance

1. Visit the Advantech web site at [www.advantech.com/support](http://www.advantech.com/support) where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
  - Product name and serial number
  - Description of your peripheral attachments
  - Description of your software (OS, version, application software, etc.)
  - A complete description of the problem
  - The exact wording of any error messages

## Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.

Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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## Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
  15. The power cord or plug is damaged.
  16. Liquid has penetrated into the equipment.
  17. The equipment has been exposed to moisture.
  18. The equipment does not work well, or you cannot get it to work according to the user's manual.
  19. The equipment has been dropped and damaged.
  20. The equipment has obvious signs of breakage.
21. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
22. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**
23. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

**DISCLAIMER:** This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

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# Chapter 1

Overview

## 1.1 Introduction

APAX-557X is a high performance controller (CPU module) with Intel Celeron M grade CPU and Windows XP Embedded operating system. The operating system is installed in the internal CF card. Therefore, no extra external HD is required for the operating system and application programs. Besides, APAX-557X provides an external SD slot for data storage (data-logging).

By connecting with different APAX-5000 I/O modules, APAX-557X can execute control tasks for various industrial control and automation applications. Through built-in utility, programmers can configure related hardware settings for the APAX-5000 I/O modules. Then, programmers can build their own application programs under Microsoft Visual Studio .NET or C/C++ programming environment.

**Note!** Please refer to APAX-557X software manual for how to configure the hardware and program under Microsoft Visual Studio .NET or C/C++.



APAX-557X offers two serial ports (1 x RS-232 port and 1 x RS-422/485 port) and two Ethernet ports to communicate with other devices. The two Ethernet ports are served as two different MAC address, enabling APAX-557X to connect with two different Ethernet network. Programmers can leverage the communication ability through Modbus/RTU master/slave and Modbus/TCP server/client.

APAX-557X provides one DVI-I interface and Four USB ports. Through these, APAX-557X can be connected to Advantech Industrial Monitor (FPM) or standard monitor with DVI or VGA input. Touch functionality is connected via USB. Audio interface enables APAX-5570 to connect with other audio device such as microphone.

## 1.2 System Architecture

There are two slots on APAX-557X that you can insert various APAX-5000 I/O modules, making it a complete control system. When connected with other APAX-5001 or APAX-5002 backplane modules, even more APAX-5000 I/O modules can be integrated into the system to handle more complicated applications (refer to section 3.1.1 for how to assemble APAX-5000 I/O modules). APAX-557X is powered by a standard power supply with 18 ~ 30 VDC voltage input through the power connector. Users can also leverage the APAX-5343 power supply module provided by Advantech, which features the same form factor as APAX-557X. APAX-5343 can be stacked on the left side of APAX-557X. Since APAX-557X supports dual power input, two APAX-5343's can be connected to one APAX-557X. Refer to Section 3.1.2 for how to connect APAX-5343 with APAX-557X.

**Note!** With expansion port on backplanes, users can build a remote expansion architecture, remaining fast local-bus data transmission speed. Refer to Section 3.1.1 for how to build remote expansion.

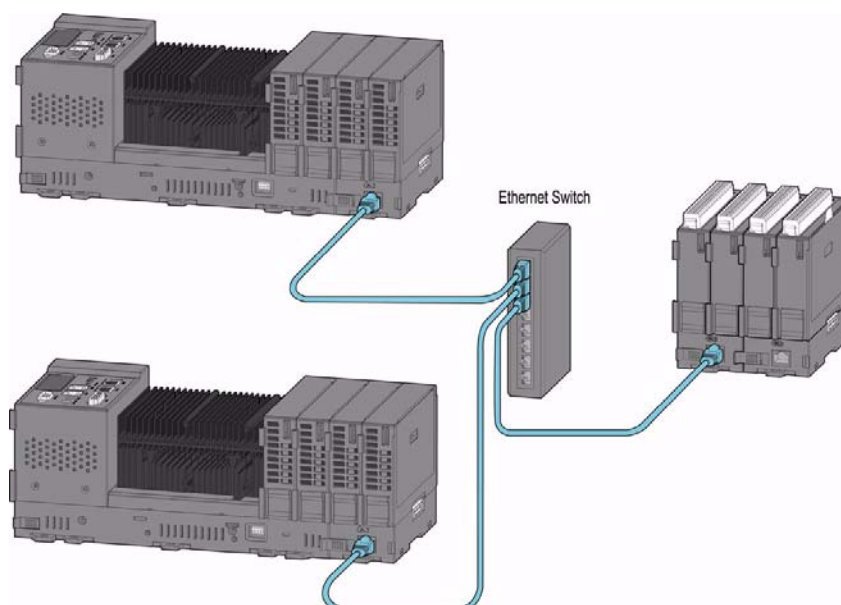



APAX-557X supports backup function. To leverage this functionality, two CPU modules (controllers) with the same control program are installed in one system. After both controllers have enabled the backup function, APAX-5000 system will automatically delegate one of the two controllers as the master controller. The master controller will run the control program to execute the control process, while another controller (the backup controller) is put on standby.




The master controller will periodically send live messages to the backup controller. If within 500 milliseconds, it will automatically become the master controller, take control responsibility, and restart the control process. The maximum operation time for the backup controller to become master controller (the take over time) won't be greater than 1.5 seconds. Changing the master controller means there is something wrong with the previous master controller. Therefore, engineers can check or change the previous master controller with a new one and enable it to have backup functionality, becoming a second backup controller. Then if the new master controller fails again, the second backup controller will automatically take control.

This mechanism ensures the system will continuously run the control process and won't be stopped, even if controller fails. In the figure below there are two APAX-557X modules installed in one system. For each APAX-557X module, one APAX-5002 backplane is stacked backward for expansion. The APAX-5000 I/O modules are inserted on the backplanes. Unmanaged industrial Ethernet switches (such as EKI-2528) with 100 Mbps transmission speed and standard Ethernet cable, connect the two APAX-557X modules and APAX-5000 I/O modules. APAX-5000 series will automatically decide which one is the master controller. Be aware that two APAX-557X modules **MUST** be configured with different controller ID numbers.



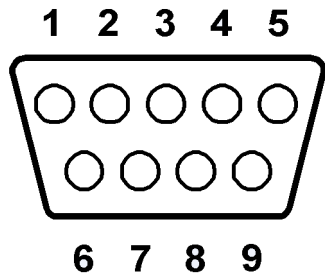
- Warning!**  1. It is suggested to power on all the I/O modules and the two APAX-557X controllers together to avoid any unpredictable situation.
2. DO NOT use managed switch, hub or router between backplanes for expansion.
3. The network for the expansion should be a local network, NOT an external network (such as public network, including Internet).
4. Shielded industrial Ethernet cable **MUST** be used instead of standard Ethernet cable when the system is used in harsh environment, such as factory automation. Cat 6 Ethernet cable is strongly recommended for better data transmission quality.

**Note!**  The maximum length for the Ethernet cable between two backplanes is 100 m.

## 1.3 Hardware Functionality

### 1.3.1 RS-232 Interface (COM 1)

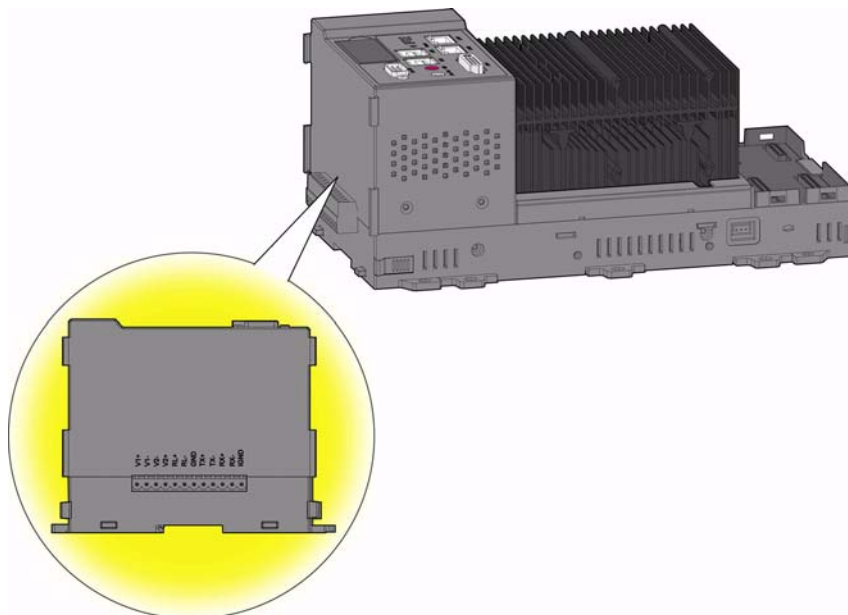
The APAX-557X offers one standard RS-232 serial communication interface port, COM 1 (9-pin Sub-D plug connector), and it is located on the front panel of APAX-557X. Refer to figure below for RS-232 port pin assignment.

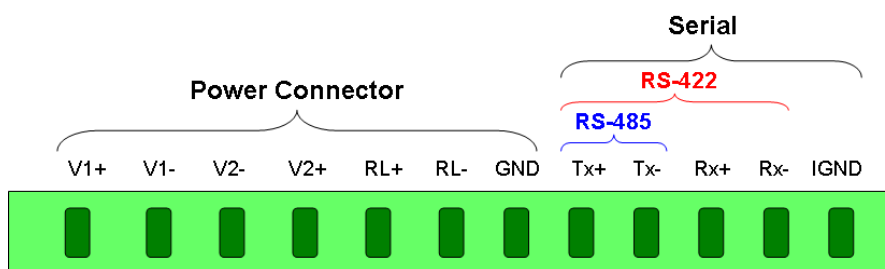


Pin	Assignment	Description
1	DCD	Data Carrier Detect
2	RxD	Receive Data
3	TxD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Dataset Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

### 1.3.2 RS-422/485 Interface (COM 2)

APAX-557X delivers one isolated RS-422/485 serial communication interface port, COM 2, to connect with other devices. RS-422/485 interface uses the same connector as power input.





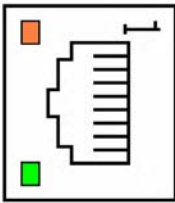
RS-422		
Pin	Assignment	Description
1	Tx+	Data Transmit +
2	Tx-	Data Transmit -
3	Rx+	Data Receive +
4	RX-	Data Receive -
5	IGND	Ground

RS-485		
Pin	Assignment	Description
1	Tx+	Data +
2	Tx-	Data -
3	IGND	Ground

In RS-485 mode, it supports auto data flow control functionality: it automatically detects the direction of incoming data and switches its transmission direction accordingly. So no handshaking signal (e.g. RTS signal) is necessary. This lets you conveniently build an RS-485 network with just two wires. More importantly, application software previously written for half duplex RS-232 environments can be maintained without modification.

### 1.3.3 Ethernet Ports

The APAX-557X is equipped with two Ethernet ports which are fully compliant with IEEE 802.3u 10/100/1000 Mbps Ethernet. The two Ethernet ports provide a standard RJ-45 jack on board, and LED indicators on the front side to show its status. Refer to Table below. Each Ethernet port has individual MAC address, and you can configure different IP address for the two Ethernet ports. Therefore, APAX-557X can link to two different Ethernet network.

	Bottom LED (Speed)	
	OFF	10 Mbps
	Orange	100 Mbps
	Green	1000 Mbps
	Up LED (Link/Activity)	
	OFF	Not Link
	Green	Link/Activity

Pin	Assignment
1	LAN MDI 0+
2	LAN MDI 0-
3	LAN MDI 1+
4	LAN MDI 2+
5	LAN MDI 2-
6	LAN MDI 1-
7	LAN MDI 3+
8	LAN MDI 3-

**Note!** *The Ethernet port is only used in LAN, not for connection to telecommunication circuits.*



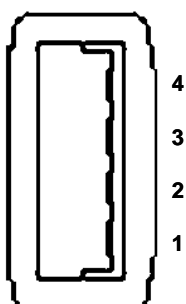
**Note!** *APAX-557x LAN ports support teaming functionality through built-in Intel LAN chipset. You can enable the teaming function in the device manager. (After enabling the teaming function, the two LAN ports can link to the same device, offering communication redundancy. (The two LAN ports share the same IP address.)*



#### 1.3.4 USB Ports

The USB connector is used for connecting any device that conforms to the USB interface. Many recent digital devices conform to this standard. The USB interface supports Plug and Play, which enables you to connect or disconnect a device whenever you want, without turning off the computer.

The APAX-557X provides four connectors of USB interfaces. The USB interface complies with USB EHCI, Rev. 2.0 compliant. The USB interface can be disabled in system BIOS setup. Refer to figure below for its pin assignments.

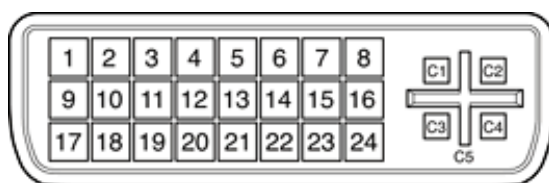


Pin	Assignment	Description
1	VBUS	Power (+ 5V)
2	D-	Data-
3	D+	Data+
4	GND	Ground

### 1.3.5 DVI-I Display

APAX-557X provides DVI-I interface, which transfer analog and digital data and is suitable for connection to analog graphics cards with 15 pin D-sub connector and digital graphics card with DVI-D output. You could directly link your DVI monitor. Besides, the DVI interface uses VGA signal, so the connection of CRT VGA monitor to APAX-557X using a DVI to VGA adapter is also possible. The adapter is available as an accessory. Refer to figure below for DVI-I pin assignments.

**Note!** *APAX-557X DVI-I interface supports dual signal output. Through a DVI-I to DVI and VGA Y-cable, APAX-557X can connect to a DVI monitor and VGA monitor at the same time.*



Pin	Assignment	Pin	Assignment
1	TMDS Data 2-	13	N/C
2	TMDS Data 2+	14	+5V Power
3	TMDS Data 2 Shield	15	Ground for +5V Power
4	Analog DDC Clock	16	Hot Plug Detect
5	Analog DDC Data	17	TMDS Data 0-
6	DDC Clock	18	TMDS Data 0+
7	DDC Data	19	TMDS Data 0 Shield
8	Analog Vertical Sync	20	N/C
9	TMDS Data 1-	21	N/C
10	TMDS Data 1+	22	TMDS Clock Shield
11	TMDS Data 1 Shield	23	TMDS Clock +
12	N/C	24	TMDS Clock -

Pin Assignment (cross)	
Pin	Assignment
C1	Analog Red Video Out
C2	Analog Green Video Out
C3	Analog Blue Video Out
C4	Analog Horizontal Sync
C5	Analog Ground

### 1.3.6 Battery Backup RAM and SD Card

APAX-557X provide 512 KB battery backup RAM for saving important data. This ensures that you have a safe place to store critical data. You can now write software applications without being concerned that system crashes will erase critical data from the memory. When the external power for the system is loss, the battery can continuously provide power to the battery backup RAM to keep the data.

There is a BAT LED on the front panel of the APAX-557X. Please replace the lithium battery with a new one if the BAT LED is activated. (Meaning battery runs out of its power)

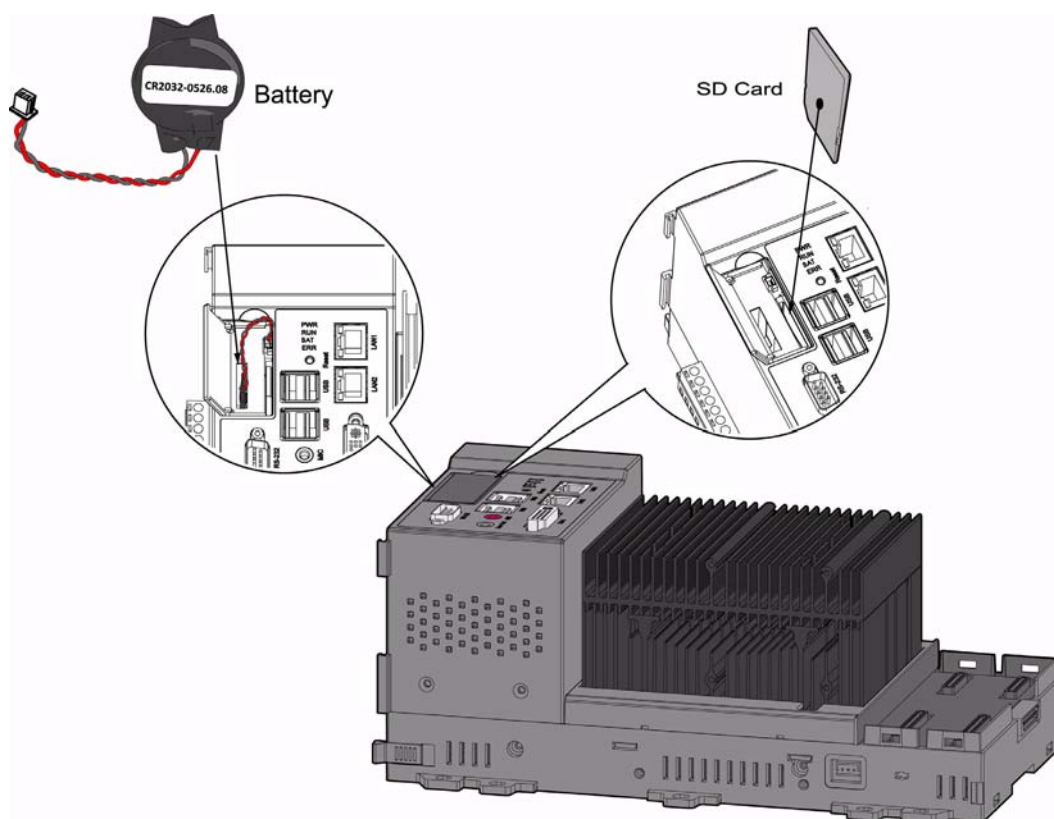
**Note!** *The battery is special designed to connect with APAX-557X. Spare batteries can be ordered from Advantech.*




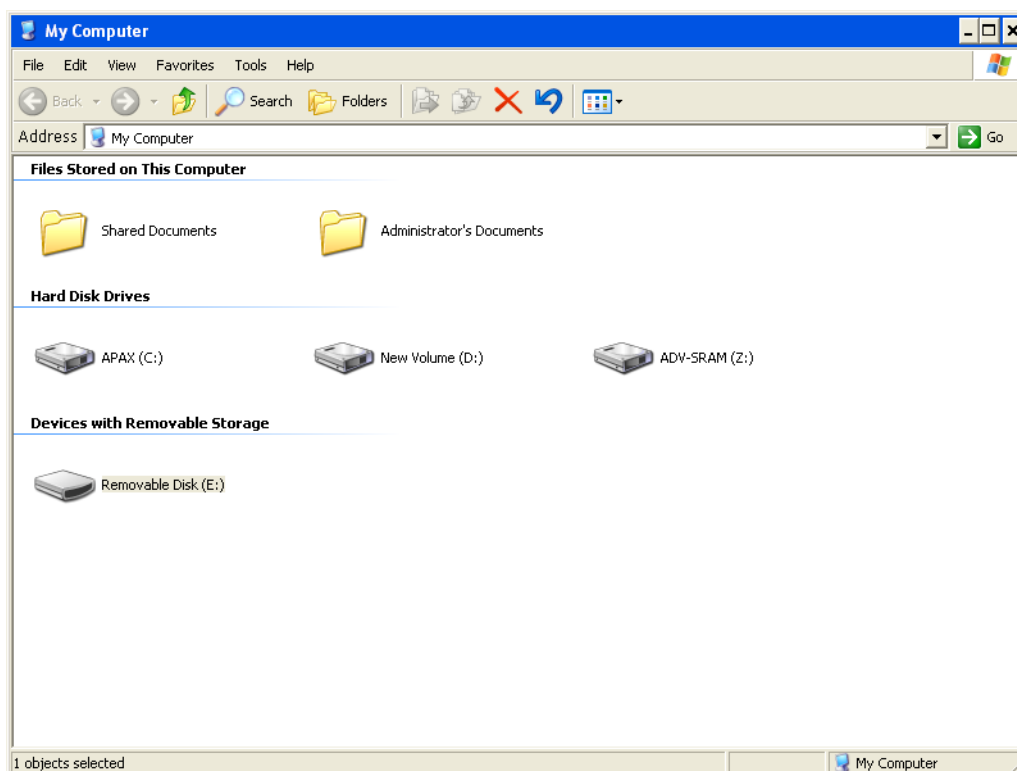
**Warning!** *Don't turn off the external power supply connected to APAX-557x when changing the battery to prevent from data loss in battery backup memory.*



APAX-557X has built-in Microsoft Windows XP Embedded operating system. The operating system is installed in the internal CF card. Your application program will also be stored on the internal CF card. Besides, APAX-557X provides one external SD card slot for data storage, and you can use standard SD card to store your data. The maximum size for the SD card is 16 GB. Refer to figure below for the location of SD card slot.




**Note!**  There are four disk devices provided by APAX-557x: Internal CF (C, D), External SD slot (E) and Battery Backup RAM (Disk Z). Refer to the figure below. The operating system (Windows XP Embedded) and program applications are installed on the internal CF. Considering data storage for your applications, we strongly suggest NOT to use the internal CF. Repeat writing CF will decrease the life for CF card. You can store your data in the battery backup RAM or SD card.



### Battery Specifications:

- Battery Type: CR2032
- Electrical Properties
  - Nominal voltage: 3.0 V
  - Nominal capacity: 210 mAh (Load: 15 k, End voltage: 2.0 V)
- Dimensions:
  - Diameter: 21.0 mm
  - Height: 5.5 mm
  - Weight: 3.0 g

**Warning!**  Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.



### 1.3.7 Reset Button

APAX-557X features a reset button on the front panel. Operators can manually reboot the system with the reset button.

### 1.3.8 Audio

APAX-557X offers the audio interface. MIC input and Line Out output are available. The audio interfaces are accessed via the operating system.

### 1.3.9 Real Time Clock (RTC)

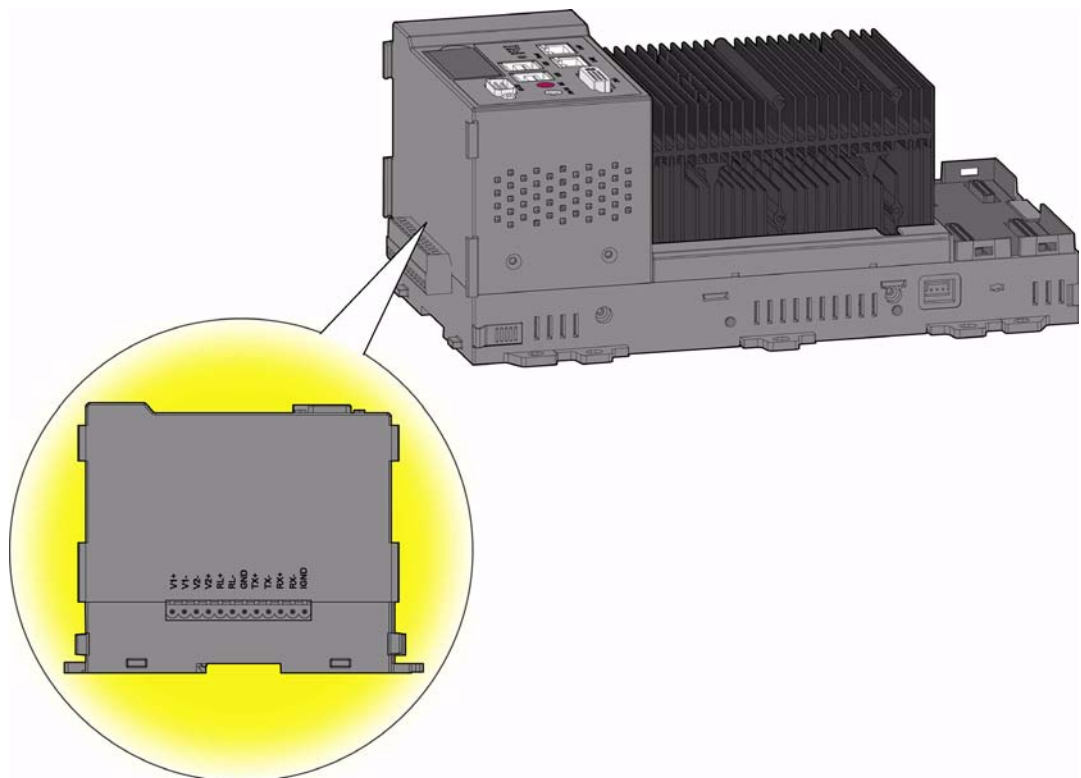
APAX-557X delivers built-in real-time clock, and programmers can use it in their application programs. When the power is loss, the RTC can still run using the power from battery which has been described in section 1.3.6.

### 1.3.10 Fan Cartridge

APAX-557X with higher performance CPU needs fan for heat dissipation, such as APAX-5571XPE. The fan is fixed on the side of the heat sink with screws. A cover is provided to prevent items enter and damage the fan when the fan is running. The fan is powered by APAX-557X without any external power device.

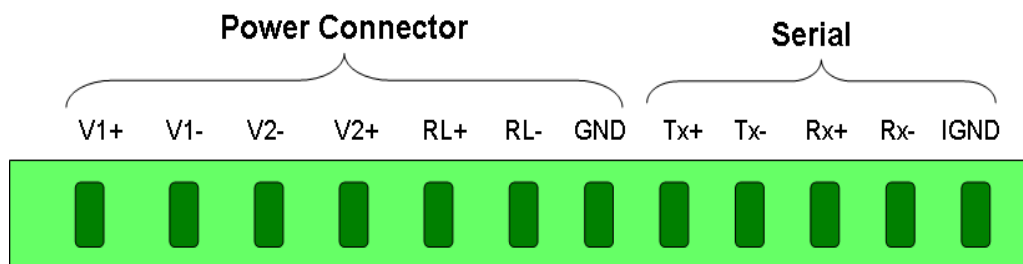
### 1.3.11 Power Connector

APAX-557X needs external DC power supply through the connector on the left side.



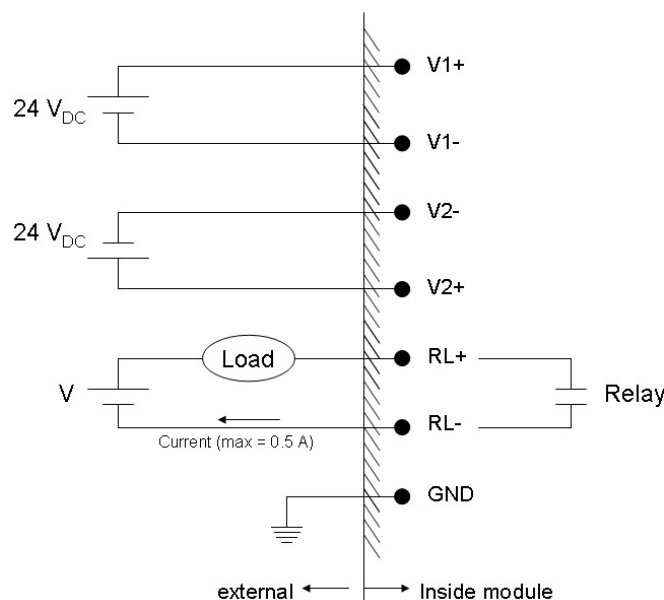
APAX-557X supports dual 18 ~ 48 VDC power input and power fail relay output. Two DC power inputs can be connected to the system through the four pins: "V1+", "V1-", "V2+" and "V2-". APAX-557X delivers one relay output to display if the two power inputs are both available, through the "RL+" and "RL-" pin. You can connect an alarm indicator, buzzer or other signaling equipment through the relay output. Refer to table below for how it changes its status.





Pin	Assignment	Description
1	V1+	Power Input 1 +
2	V1-	Power Input 1 -
3	V2-	Power Input 2 -
4	V2+	Power Input 2 +
5	RL+	Relay Output +
6	RL-	Relay Output -
7	GND	Power Ground

Power Supply V1	Power Supply V2	Power Relay Status
Available	Available	ON (Close)
Available	None	OFF (Open)
None	Available	OFF (Open)
None	None	OFF (Open)



Except connecting to standard DC power input, Advantech also provides power supply module APAX-5343. It is the same that dual power inputs are supported, so you can combined two APAX-5343 modules to one APAX-557X. Refer to Section 2.2.1 for its specification and Section 3.1.2 for how to assembly it with APAX-557X.



# Chapter 2

## Product Specifications

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## 2.1 CPU Modules

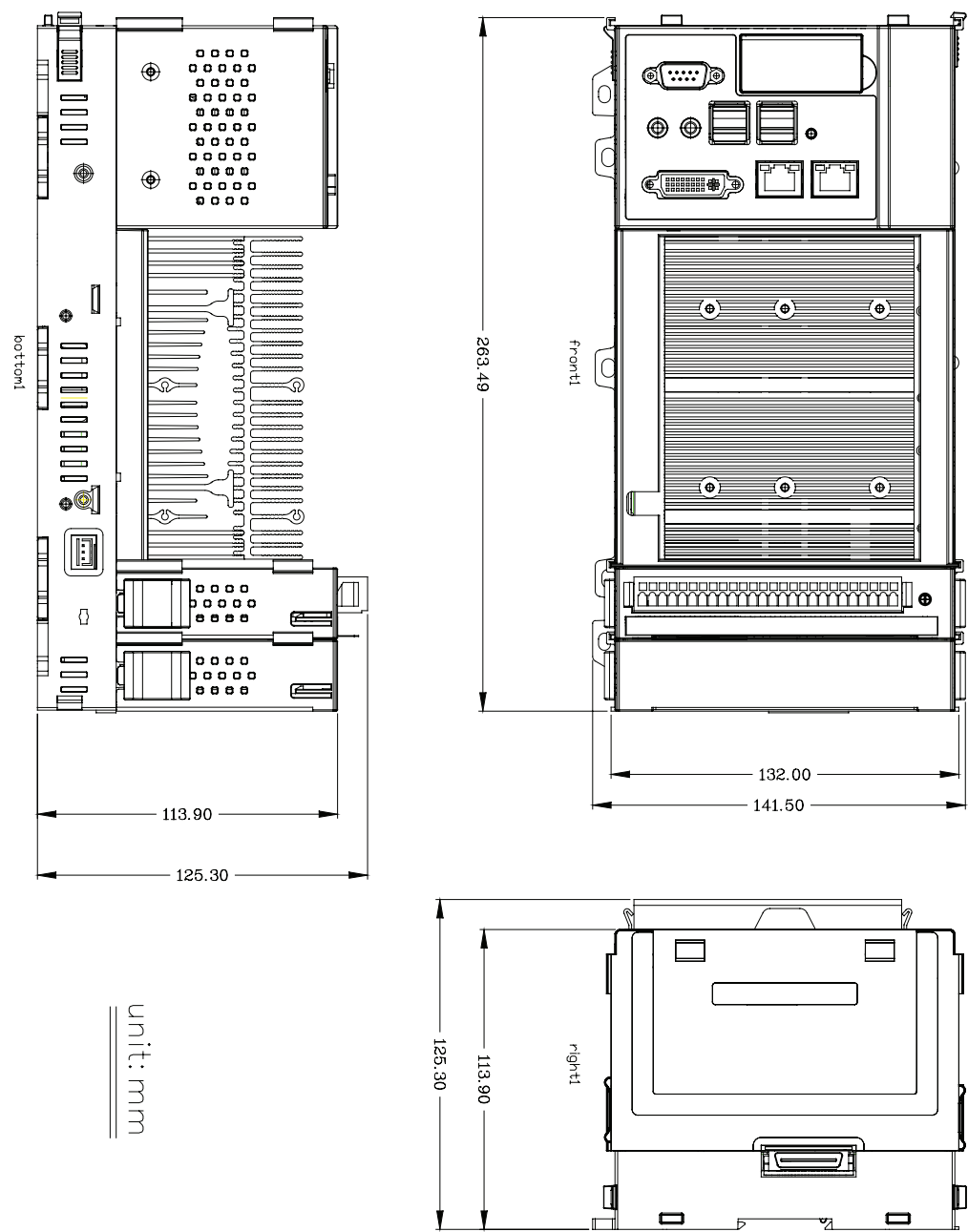
### 2.1.1 APAX-5570XPE

- **CPU:** Intel Celeron M 1 GHz
- **Memory:** 512 MB DDR2 DRAM onboard (Dual Channel Mode)
- **Battery Backup Memory:** 512 KB
- **Operating System:** Windows XP Embedded
- **Diagnostic LEDs:** 1 x Power, 1 x Run (controlled by software), 1 x Battery, 1 x Error (controlled by software), 2 x LAN link/activity/speed
- **Real-time Clock:** Yes (battery-backed)
- **Watchdog Timer:** Yes
- **Reset Button:** Yes
- **Control Software:** .NET class library and C/C++ API
- **Power Consumption:** 30 W @ 24 VDC (typical, without module inserted)
- **VGA:** 1 (DVI-I interface)
- **Audio Interface:** MIC input, Line Out output
- **USB Ports:** 4 (USB 2.0)
- **LAN Ports:** 2 (10/100/1000 Mbps)
- **Serial Ports:** 2 (COM 1: RS-232, COM 2: RS-422/485)
- **Serial Baud Rate (RS-232):** 50 bps ~ 115.2 kbps
- **Serial Baud Rate (RS-422/485):** 50 ~ 115200 bps
- **Storage:** 1 x SD card slot (External)
- **Dimensions:** 270 x 142 x 126 mm (Width x Height x Depth)
- **Weight:** Approximate 2.42 kg
- **Cooling System:** Heat Sink (fanless)
- **Power Input:** 18 ~ 30 VDC (Supports dual power input and power input reversal protection)
- **Isolation Protection:** 2500 VDC (between RS-422/485 and backplane)
- **Operating Temperature:** -10 ~ 55° C (Vertical mounting)
- **Storage Temperature:** -40 ~ 70° C
- **Relative Humidity:** 5 ~ 95% (non-condensing)
- **Shock Resistance:** 30 G @ wall mounting, duration 11 ms  
(tested to IEC 60068 2-27)
- **Vibration Resistance:** 2 Grms @ wall mounting, random, 5 ~ 500 Hz, 3-axes,  
1 hr/axis. (Tested to IEC 60068-2-64)

### 2.1.2 APAX-5571XPE

- **CPU:** Intel Celeron M 1.5 GHz (1 MB L2 cache)
- **Memory:** 512 MB DDR2 DRAM onboard (Dual Channel Mode)
- **Battery Backup Memory:** 512 KB
- **Operating System:** Windows XP Embedded
- **Diagnostic LEDs:** 1 x Power, 1 x Run (controlled by software), 1 x Battery, 1 x Error (controlled by software), 2 x LAN link/activity/link
- **Real-time Clock:** Yes (battery-backed)
- **Watchdog Timer:** Yes
- **Reset Button:** Yes
- **Control Software:** .NET class library and C/C++ API
- **Power Consumption:** 45 W @ 24 VDC (typical, without module inserted)
- **VGA:** 1 (DVI-I interface)
- **Audio Interface:** MIC input, Line Out output
- **USB Ports:** 4 (USB 2.0)
- **LAN Ports:** 2 (10/100/1000 Mbps)
- **Serial Ports:** 2 (COM 1: RS-232, COM 2: RS-422/485)
- **Serial Baud Rate (RS-232):** 50 bps ~ 115.2 kbps
- **Serial Baud Rate (RS-422/485):** 50 ~ 115200 bps
- **Storage:** 1 x SD card slot (External)
- **Dimensions:** 270 x 142 x 126 mm (Width x Height x Depth)
- **Weight (Approximate):** 2.46 kg
- **Cooling System:** Heat Sink with fan
- **Power Input:** 18 ~ 30 VDC (Supports dual power input and power input reversal protection)
- **Isolation Protection:** 2500 VDC (between RS-422/485 and backplane)
- **Operating Temperature:** -10 ~ 55° C (Vertical mounting)
- **Storage Temperature:** -40 ~ 70° C
- **Relative Humidity:** 5 ~ 95% (non-condensing)
- **Shock Resistance:** 30 G @ wall mounting, duration 11 ms, (tested to IEC 60068 2-27)
- **Vibration Resistance:** 2 Grms @ wall mounting, random, 5 ~ 500 Hz, 3-axes, 1 hr/axis. (Tested to IEC 60068-2-64)

2.1.3 APAX-557X Dimensions



## 2.2 Power Supply Module

### 2.2.1 APAX-5343

#### Input

- **Rated Voltage:** 115/230 VAC
- **Voltage Range:** 90 ~ 264 VAC
- **Input Current:** 1.5 A (at rated load)
- **Input Frequency Range:** 47 ~ 63 Hz
- **Inrush Current:** 50 A (one cycle at 25° C)

#### Output

- **Output Power:** 72 watt
- **Rated Voltage:** 24 VDC
- **Rated Output Current:** 3 A
- **Efficiency:** > 87% (at 115/230 VAC Input Voltage, Rated load)

#### Protection

- **Isolation Protection (In/Out):** 42/42 VDC
- **Over Voltage Protection:** 26 ~ 29 VDC, Latch off mode
- **Over Load Protection:** auto-recovery mode
- **Short Circuit Protection:** auto-recovery mode

#### General

- **Diagnostic LEDs:** 1 x Power
- **Dimensions (W x H x D):** 75 x 151 x 115 mm
- **Operating Temperature:** -10 ~ 55° C
- **Storage Temperature:** -20 ~ 70° C
- **Relative Humidity:** 5 ~ 95% (non-condensing)





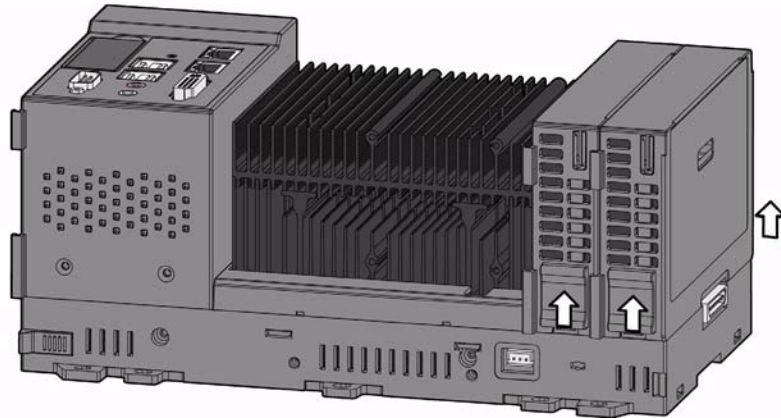
# Chapter 3

Installation and  
Initiation

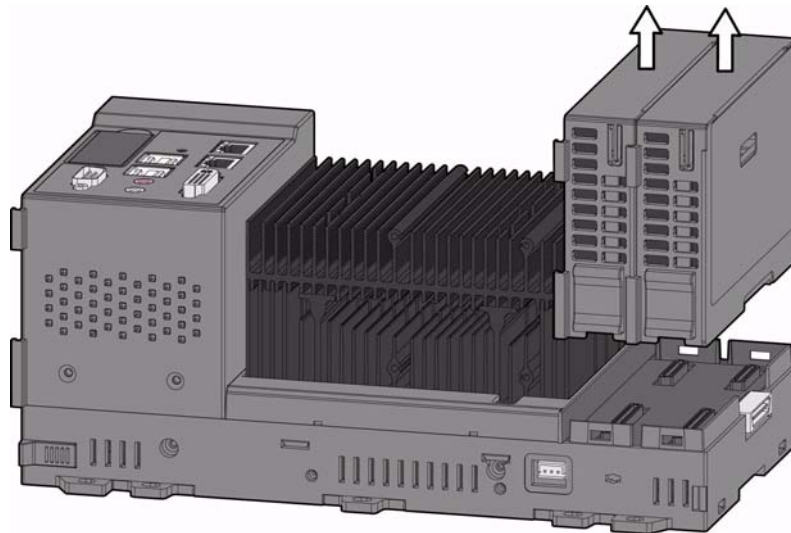
## 3.1 Assembly and Power Connections

### 3.1.1 Combining APAX-5000 I/O Modules with APAX-557X

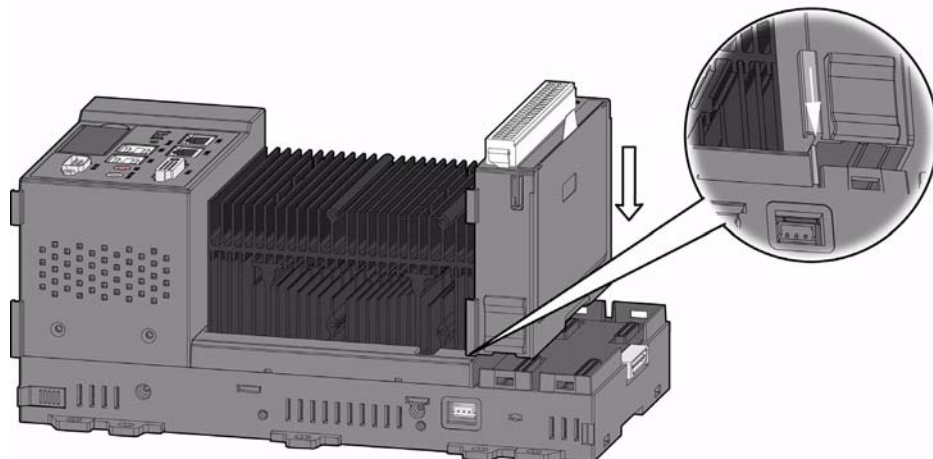
1. There are two blank modules inserted on APAX-557X in default. Pull up the module locks on the two blank modules.



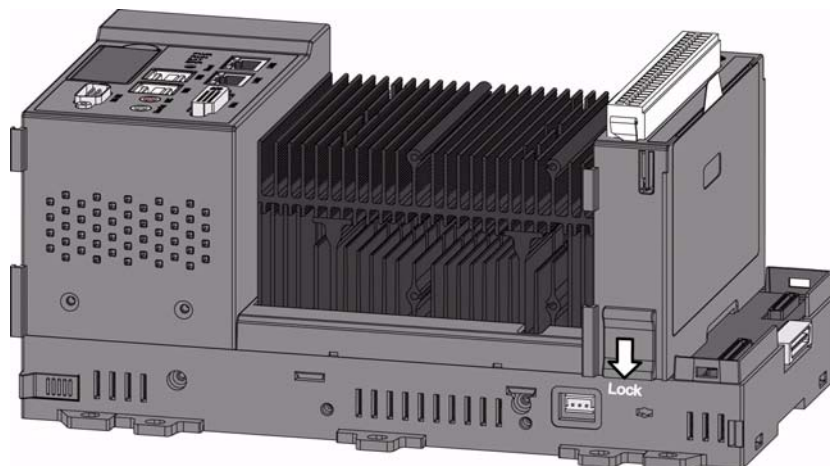
2. Detach the two blank modules from APAX-557X.



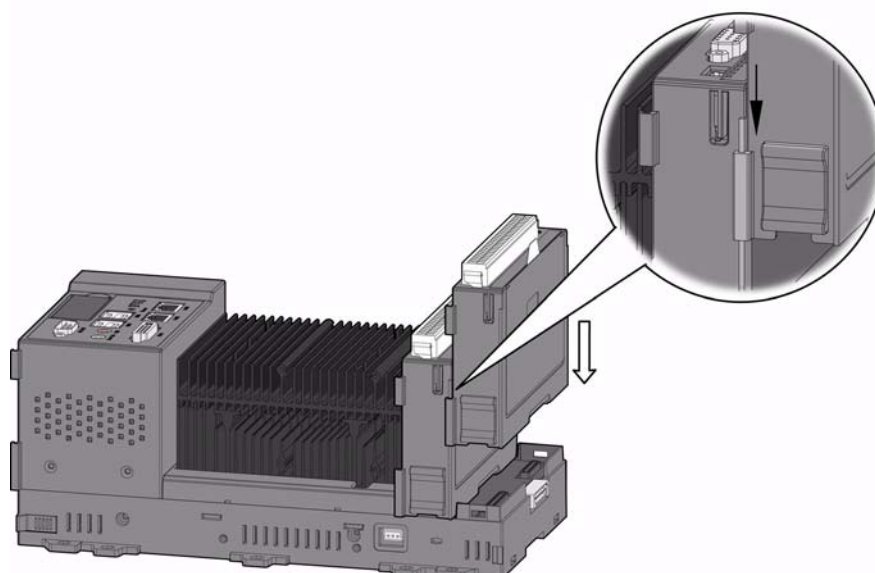
3. Insert APAX-5000 I/O module on the first slot on APAX-557X. Use tongue-and-groove slots to move the module.



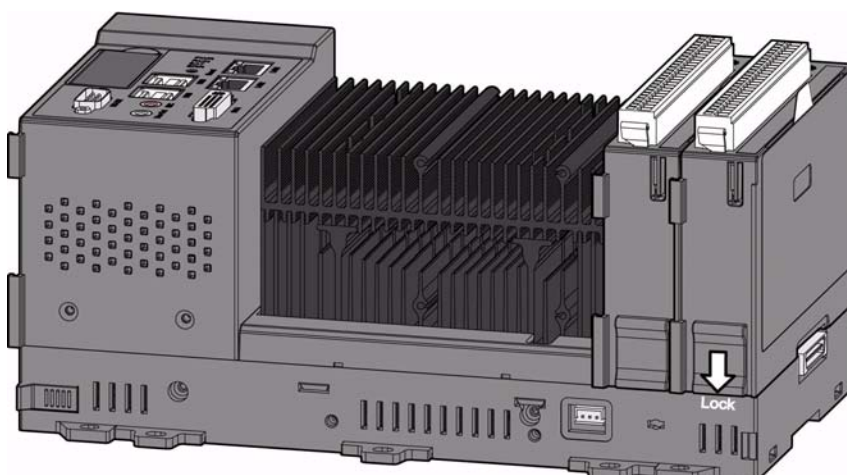
4. Lock the APAX-5000 I/O modules to the APAX-557X by pulling down the module locks.



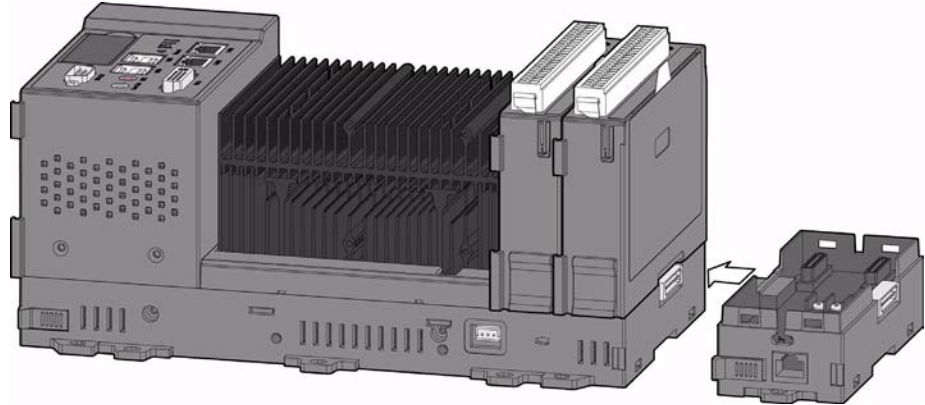
5. If needed, insert another APAX-5000 I/O module on the second slot on APAX-557X. Use tongue-and-groove slots to move the module.



6. Lock the second APAX-5000 I/O module to APAX-557X by pulling down the module locks.



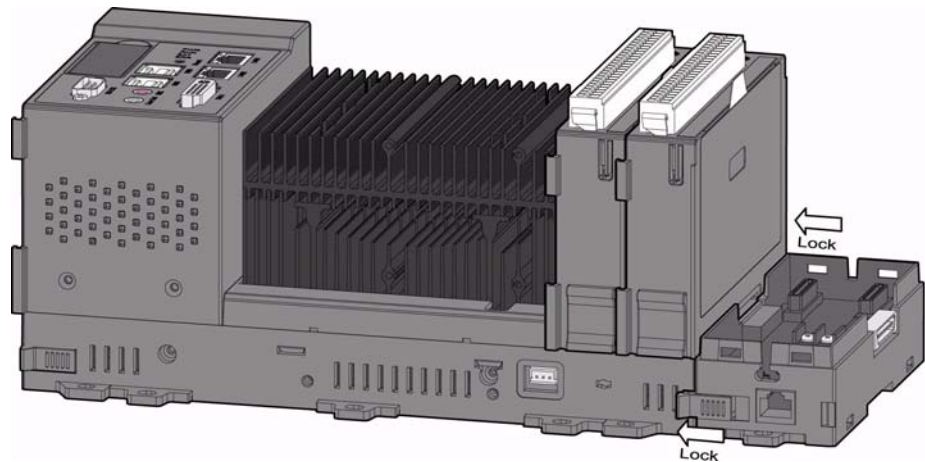
7. If you need more than two APAX-5000 I/O modules, stack one APAX-5002 backplane to the right side of APAX-557X.



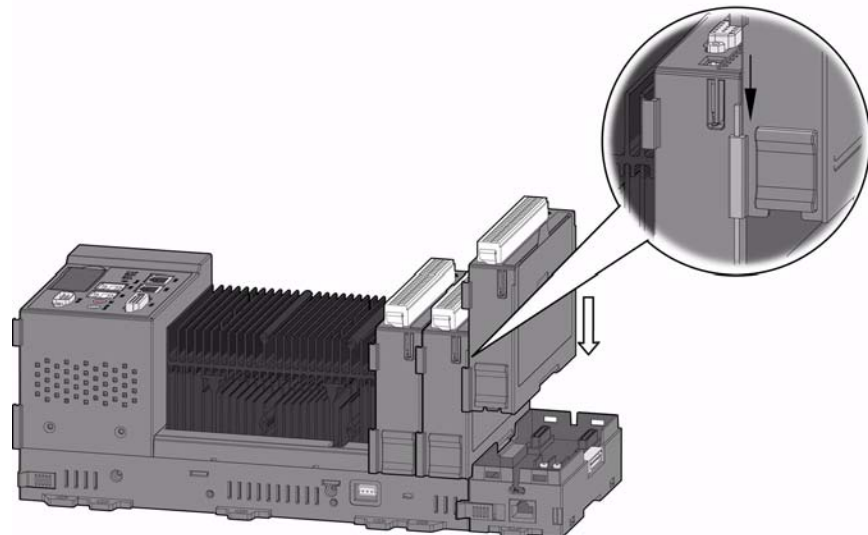
**Warning!** When you assembly different backplanes with APAX-557x together, remember to turn off the power connected to APAX-557x. If not, the backplanes may be damaged. Turn on the power again after you complete the assembly for all backplanes.



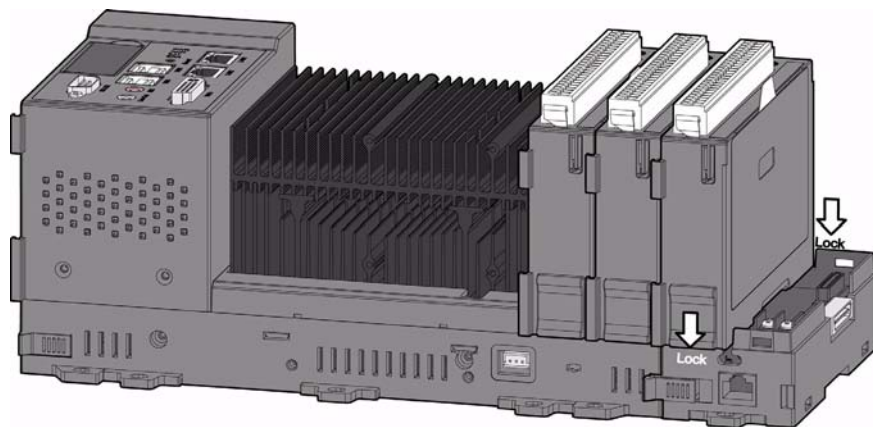
8. Lock the stacked APAX-5002 backplane to APAX-557X by the backplane locks.



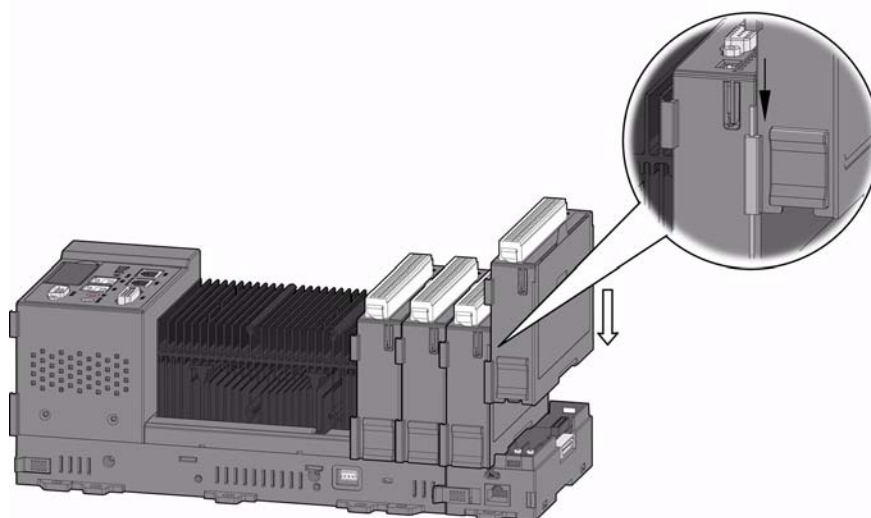
9. Insert the third APAX-5000 I/O module to the stacked APAX-5002 backplane. Use tongue-and-groove slots to move the module.



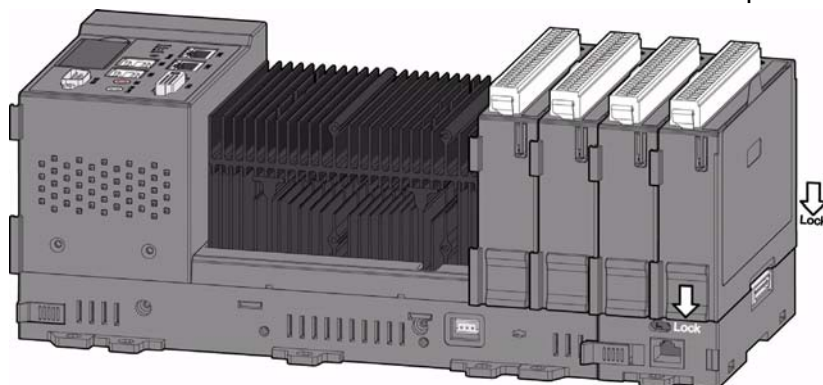
10. Lock the third APAX-5000 module to the stacked APAX-5002 backplane.



11. If needed, insert the fourth APAX-5000 I/O module to the stacked APAX-5002 backplane. Use tongue-and-groove slots to move the module.

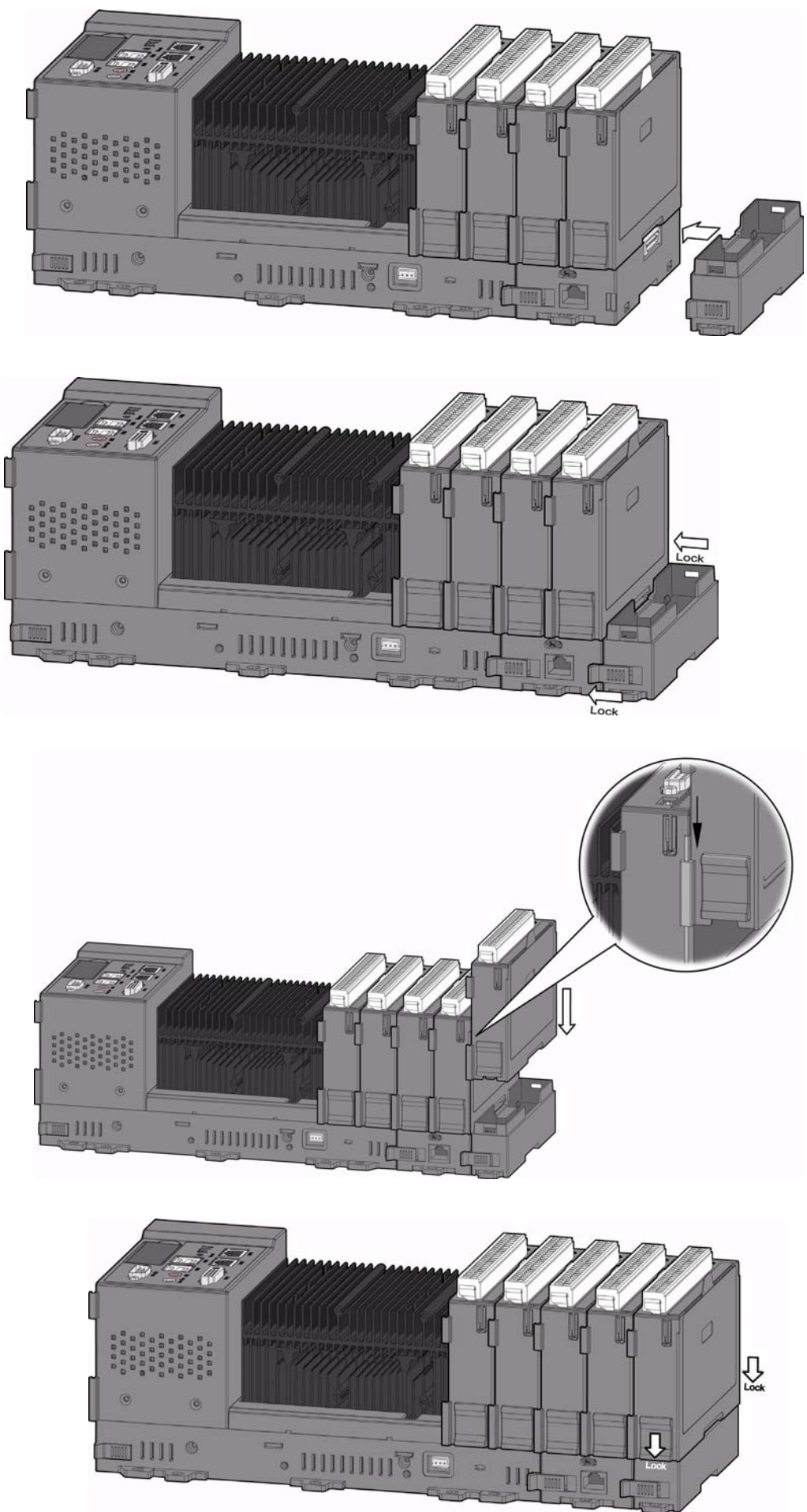


12. Lock the fourth APAX-5000 I/O module to APAX-5002 backplane.




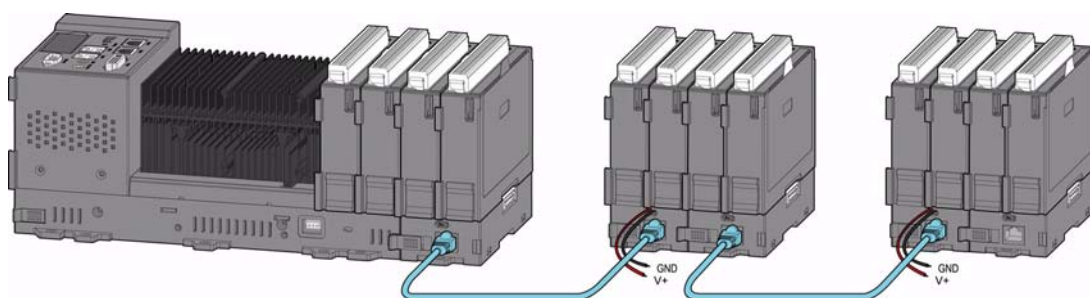
If you need more APAX-5000 I/O module, repeat Step 7 ~ Step 12 until all necessary APAX-5000 I/O modules are inserted on the backplanes. When the total number of APAX-5000 I/O modules is odd, you can use 1-slot APAX-5001 backplane module as the last backplane in the system.




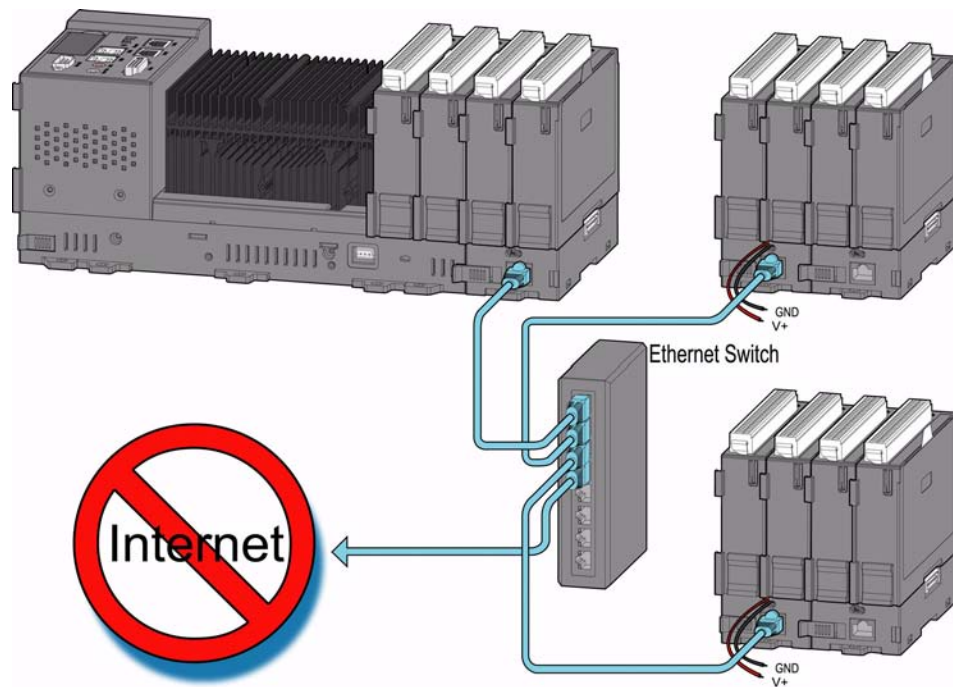


There is an expansion port on front side of APAX-5002. With this port, users can build a remote expansion architecture, remaining fast local-bus data transmission speed. Standard Ethernet cables can be used to connect any two APAX-5002. However, shielded industrial Ethernet cable **MUST** be used instead of standard Ethernet cable when the system is used in harsh environment, such as factory automation. Unmanaged industrial Ethernet switches (such as Advantech EKI-2528) with 100 Mbps transmission speed can also be used between two APAX-5002. Therefore, you can flexibly build any remote expansion with line, tree or star topology. All the APAX-5000 I/O modules can benefit from the remote expansion architecture with local bus speed. Refer to figure below for the expansion topology.

- Warning!** 1. *DO NOT use managed switch, hub or router between backplanes for expansion.*
-  2. *The network for the expansion should be a local network, NOT to connect with other external network (such as public network in enterprise network, including Internet).*
3. *Cat 6 Ethernet cable is strongly recommended for better data transmission quality.*
4. *It is suggested to power on APAX-557X and all the I/O modules together to avoid any unpredictable situation.*



- Warning!** For the line topology, as shown by figure above, the maximum distance between two backplanes is 100 m. And there are maximum 30 APAX-5002 backplanes used in the system for line topology to remain real-time performance.
- 



**Warning!** For the star topology, use an unmanaged industrial Ethernet switch (such as Advantech's EKI-2528) with 100 Mbps transmission speed for expansion. DO NOT use management switch, hub or router between backplanes. The network for the expansion should be a local network, **do not** connect with other external network (like public network in enterprise network, including Internet).

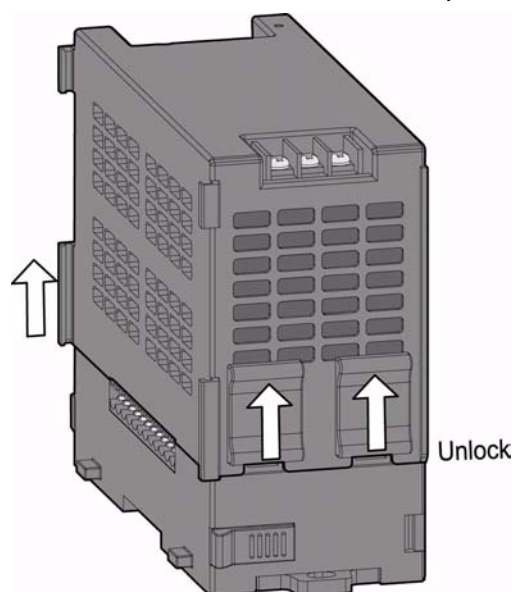




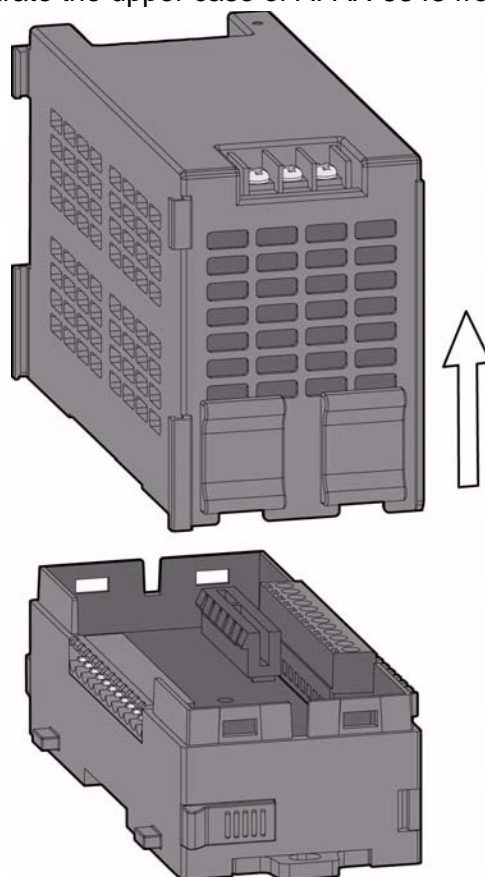
### 3.1.2 Combine with APAX-5343 Power Supply Module

As described in Section 1.2, APAX-557X can be power-on by the power connector or APAX-5343 power supply module. Refer to figures below for how to assembly APAX-5343 with APAX-557X.

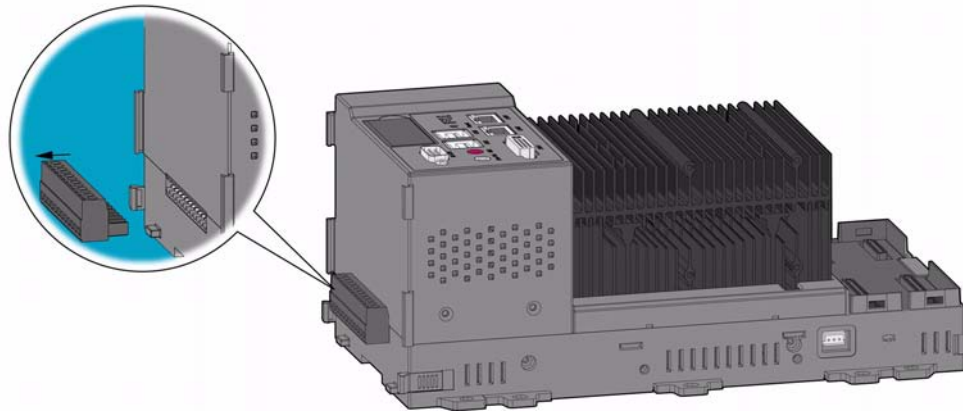
1. Pull up the module locks on the upper case of one APAX-5343. Then you can separate the upper case of APAX-5343 from its backplane.



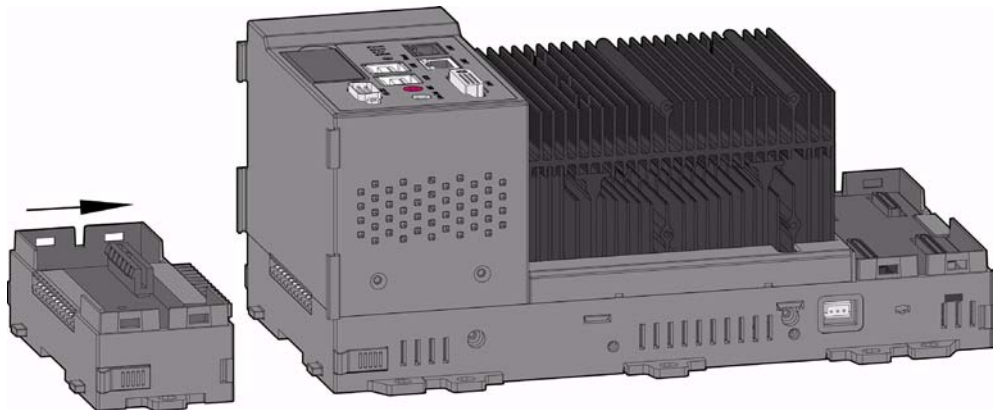
2. Then you can separate the upper case of APAX-5343 from its backplane.



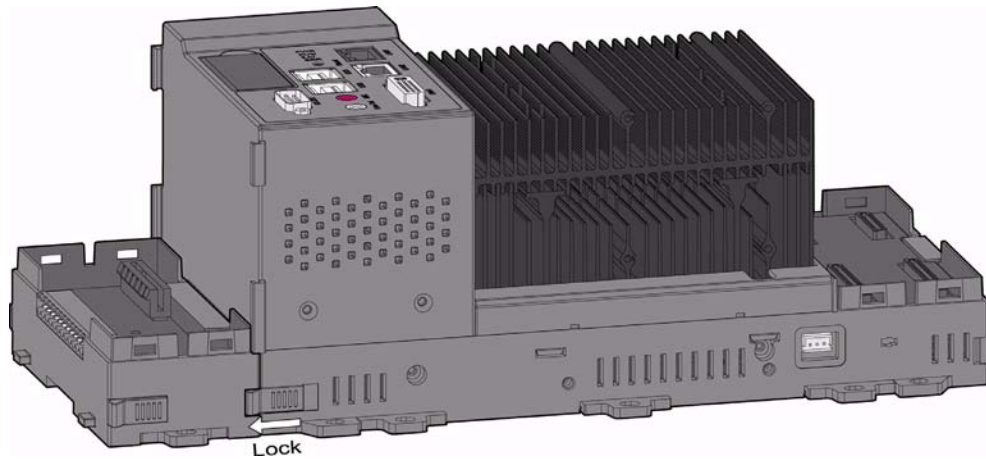
3. Remove the power connector on the left side of APAX-557X.



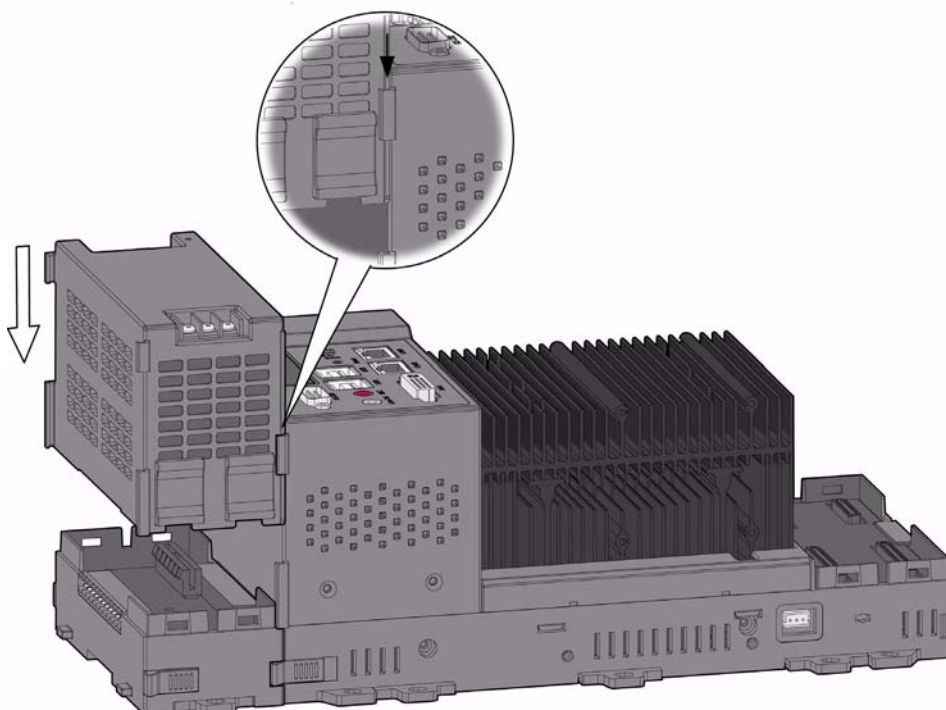
4. Stack the backplane of APAX-5343 to the left side of APAX-557X.



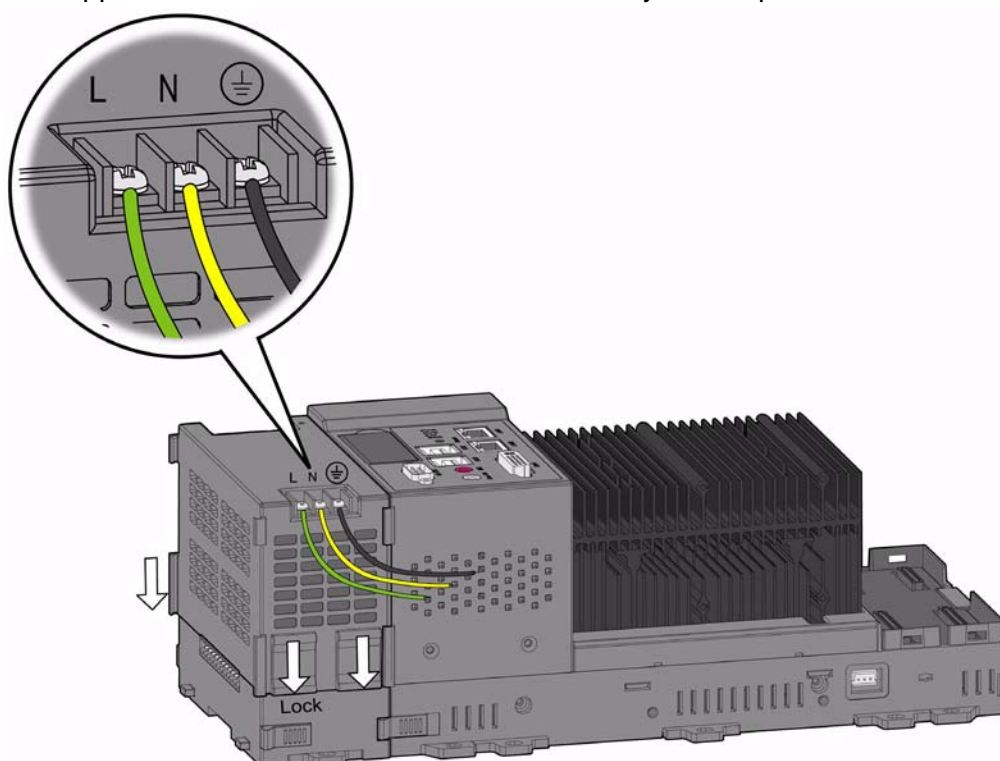
5. Lock the stacked APAX-5343 backplane with APAX-557X by the backplane locks on the APAX-557X.



6. Insert the upper case of APAX-5343 back on its backplane. Use tongue-and-groove slots to move the upper case.

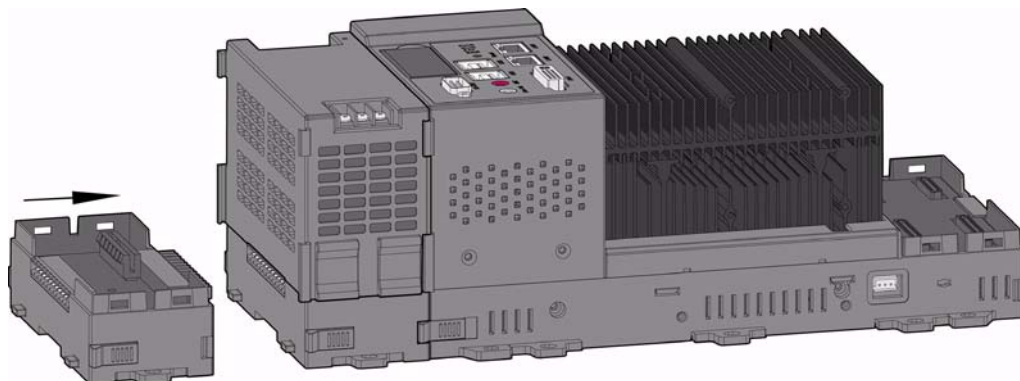


7. Lock the upper case of APAX-5343 to its backplane by pulling down the module locks on the upper case. Connect AC power code to the power connectors on the upper case of APAX-5343. Then the whole system is powered-on.

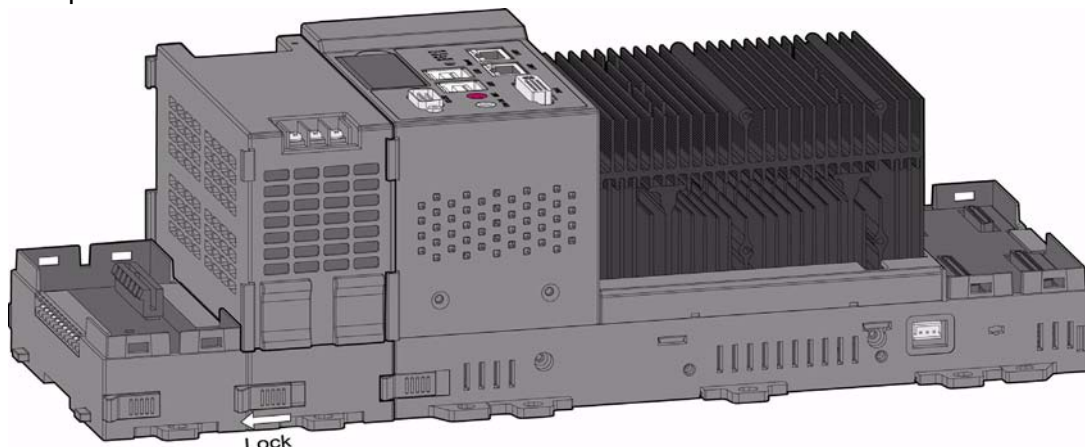


8. APAX-557X supports dual power input. If you need the second power input, repeat step 1 ~ step 2 to separate another APAX-5343.
9. Stack the backplane of the second APAX-5343 to the left side of the first APAX-5343.

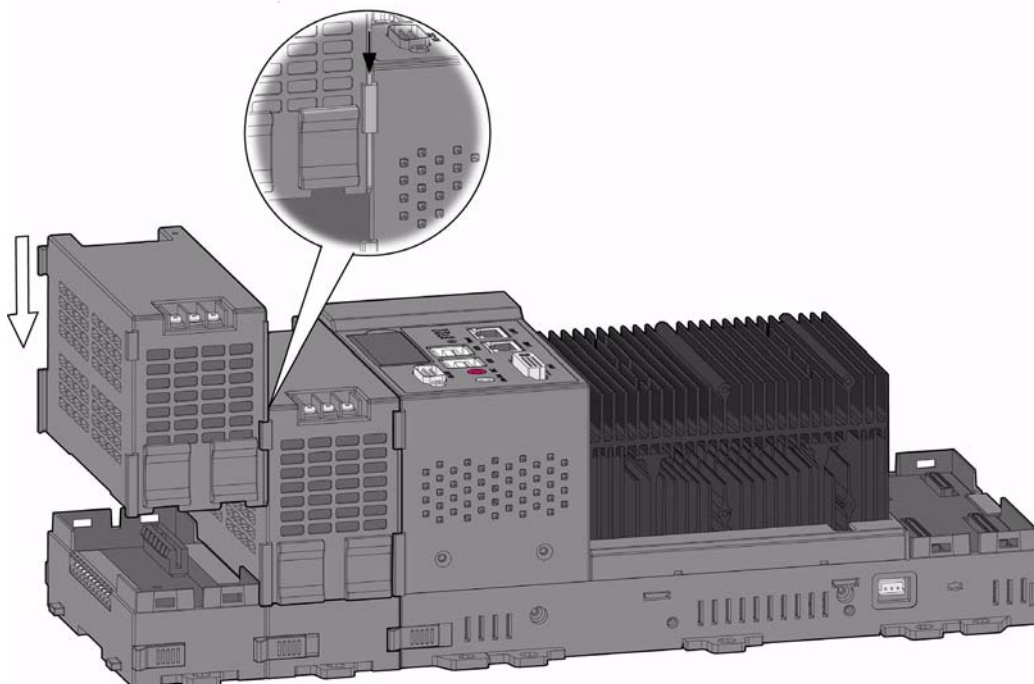
**Warning!** When you stack the backplane of the second APAX-5343 to the first APAX-5343, remember to turn off the power connected to the first APAX-5343. If not, the backplanes may be damaged. Turn on the power again after you complete the assembly for second APAX-5343.



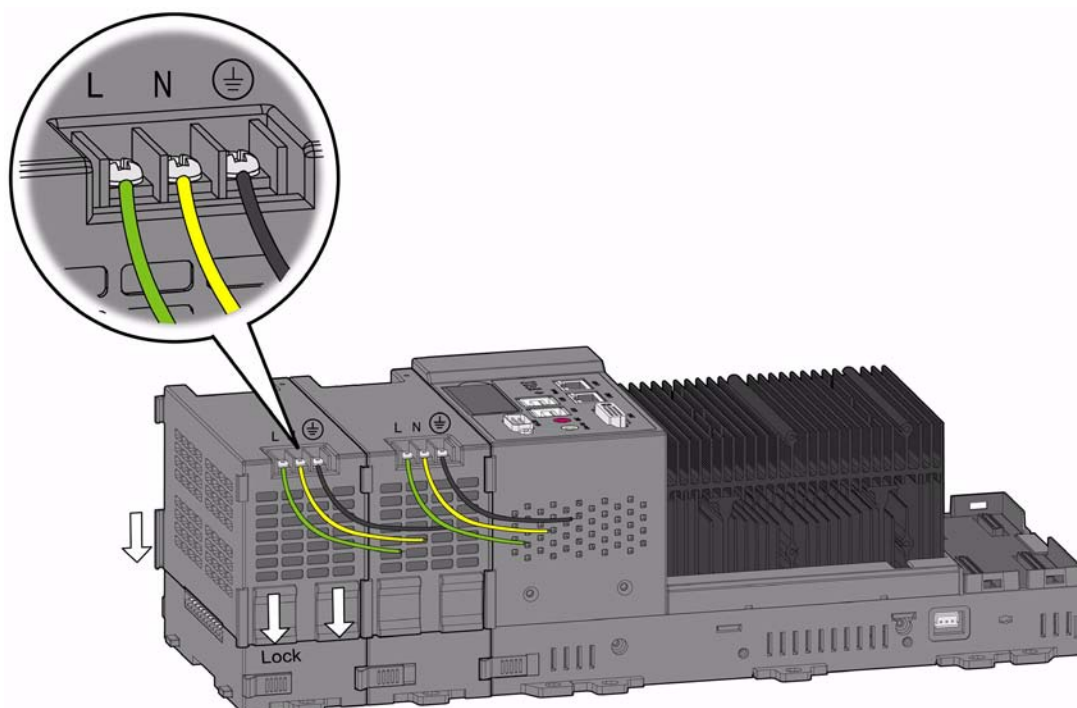
10. Lock the second APAX-5343 backplane with the first APAX-5343 by the backplane locks on the first APAX-5343.



11. Insert the upper case of second APAX-5343 back on its backplane. Use tongue-and-groove slots to move the upper case.



12. Lock the upper case of the second APAX-5343 to its backplane by pulling down the module locks on the upper case. Connect AC power code to the power connectors on the upper case of the second APAX-5343. Then there are two power supply modules for the whole system.





## 3.2 Decommission and Disposal

The procedure to disassembly APAX-5000 I/O modules are opposite to the procedure of assembling APAX-5000 I/O modules. Before detaching every APAX-5000 I/O modules, pull up the module locks first. And then detach the APAX-5000 I/O modules from the APAX-557X or APAX-500x (APAX-5001 or APAX-5002) backplane.

APAX-5000 I/O modules support hot-swap functionality. Therefore, you can detach the APAX-5000 I/O modules when the system is powered-on. (No matter they are inserted on the APAX-557X or APAX-500X backplane.) It is the same that the APAX-5000 I/O modules can be inserted back to the backplane when the system is powered-on.

There are some PCI modules, such as APAX-5090P, which can only be inserted on the two slots on APAX-557X. If you want to detach these PCI modules, remember to power off the system before detaching them. Then, pull up the module lock and detach the PCI modules from APAX-557X.

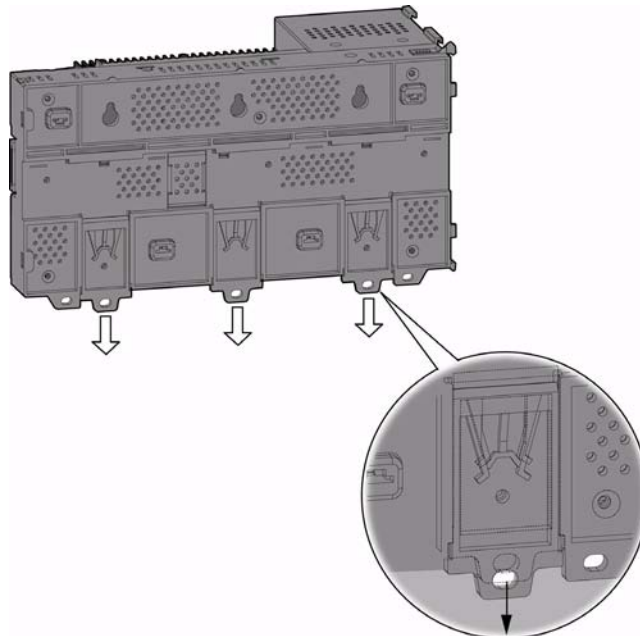
The device must be fully dismantled in order to dispose of it. Electronic parts must be disposed of in accordance with national electronics scrap regulations.

## 3.3 Mounting

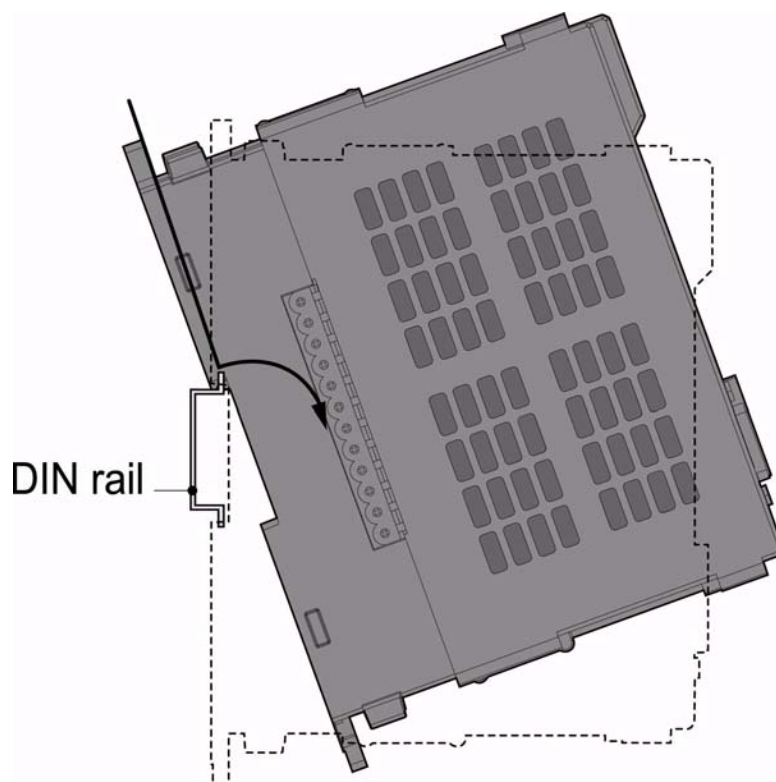
### 3.3.1 DIN-rail Mounting

APAX-557X can be mounted to the following DIN-rails: 35 x 7.5 mm or 35 x 15 mm. Below are the procedures for the DIN-rails mounting.

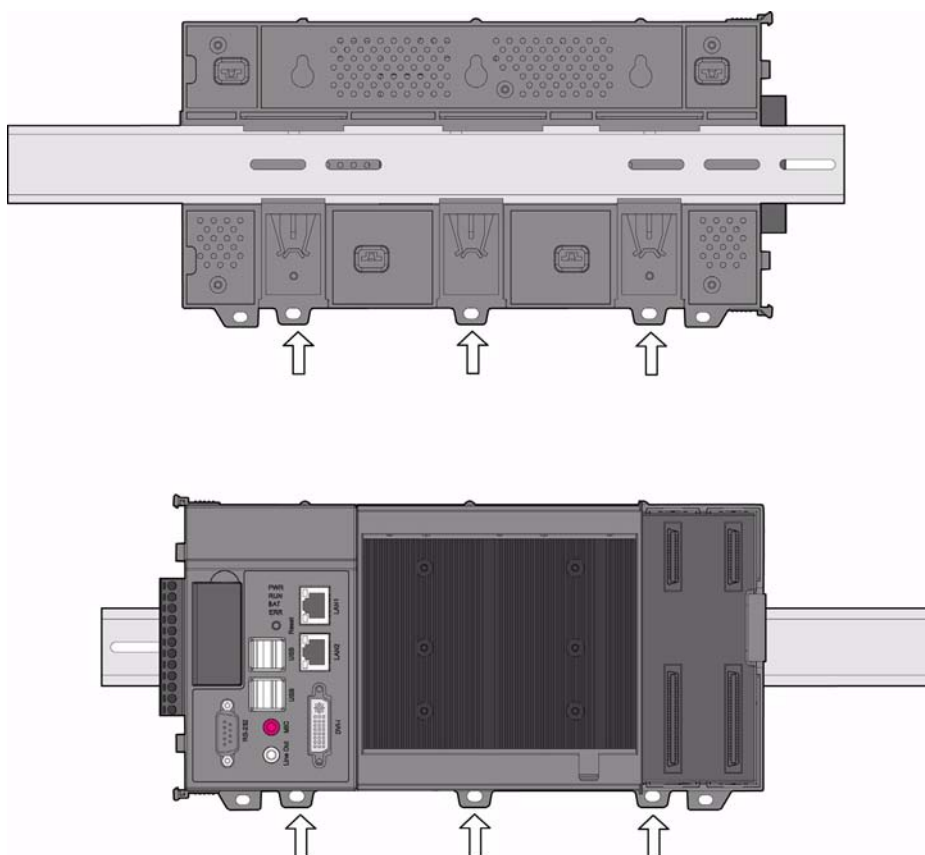
1. Pull down the DIN-rail lock at the back of APAX-557X.



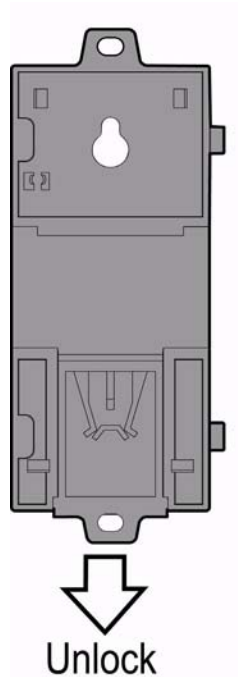
2. Latch the APAX-557X to the DIN-rail.



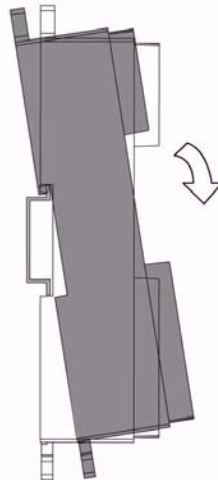
3. Slide the DIN-rail lock of APAX-557X into the position, to fix APAX-557X on the DIN-rail.



4. If more than two APAX-5000 I/O modules are needed, other APAX-5002 backplanes are needed to attach to the DIN-rail. Pull down the DIN-rail lock at the back of APAX-5002 backplane.



5. Latch the APAX-5002 backplane to the DIN-rail.



6. Repeat Step 4~ Step 5 until necessary APAX-5002 backplanes are all attached on the DIN-rail.

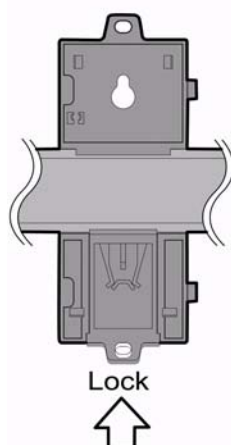
**Note!** When the total number of APAX-5000 I/O modules is odd, you can use APAX-5001 (1-slot backplane) as the last backplane in the system. And the procedure to attach APAX-5001 on the DIN-rail is similar as APAX-5002.



7. Move all backplanes to stack all the backplanes and APAX-557X together. Then slide the backplane locks on the backplanes to fasten all backplanes and APAX-557X. (Similar to Step 7 and 8 in section 3.1.1)



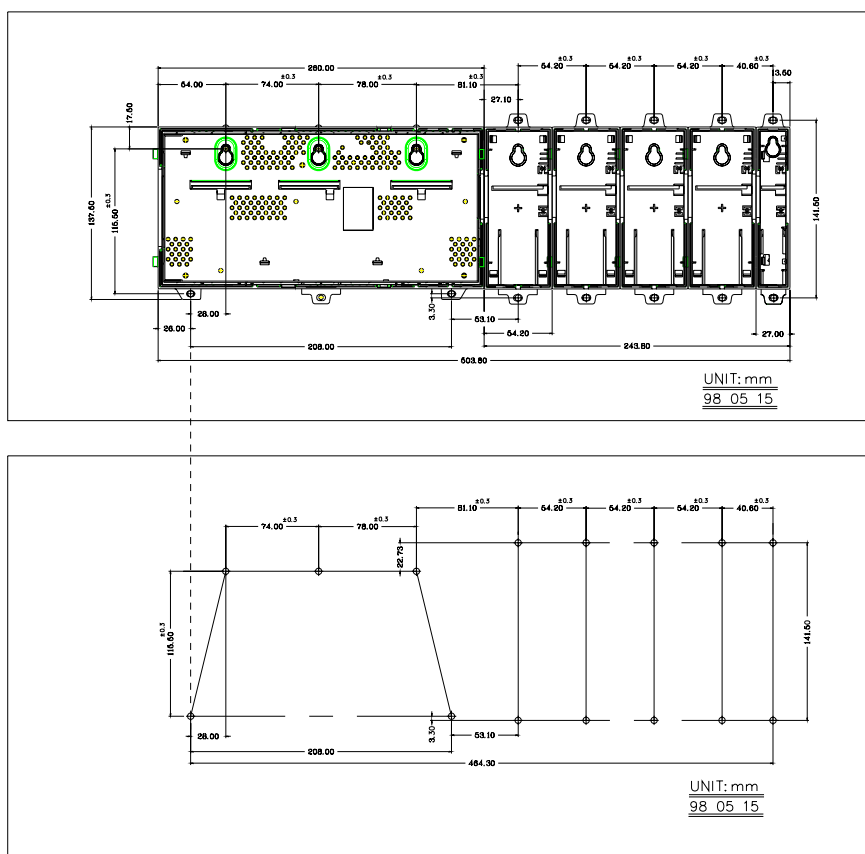
8. Slide the DIN-rail lock of all backplanes into the position, to fix all backplanes to the DIN-rail.



9. Insert all necessary APAX-5000 I/O modules to the APAX-557X slots and stacked backplanes. (Similar to Step 3, Step 5, Step 9 and Step 11 in section 3.1.1)
10. Slide the module lock of all APAX-5000 I/O modules into the position, to fix these modules to related backplanes, including APAX-557X slots. (Similar to Step 4, Step 6, Step 10 and Step 12 in section 3.1.1)

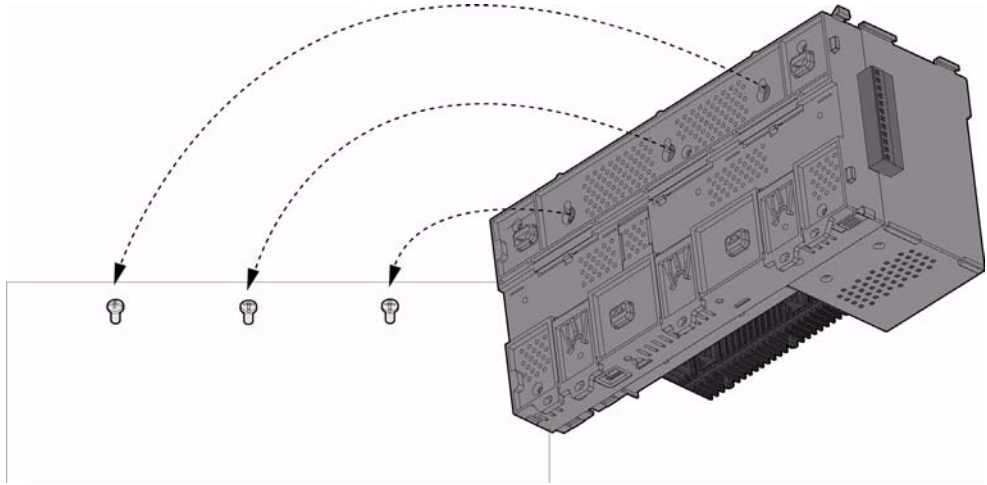
### 3.3.2 Wall (Panel) Mounting

Mount the APAX-557X module to a wall (panel) through backplane using 5 screws per module (You can use 8 screws to strengthen the mounting) Refer to figure below for the dimensional template:

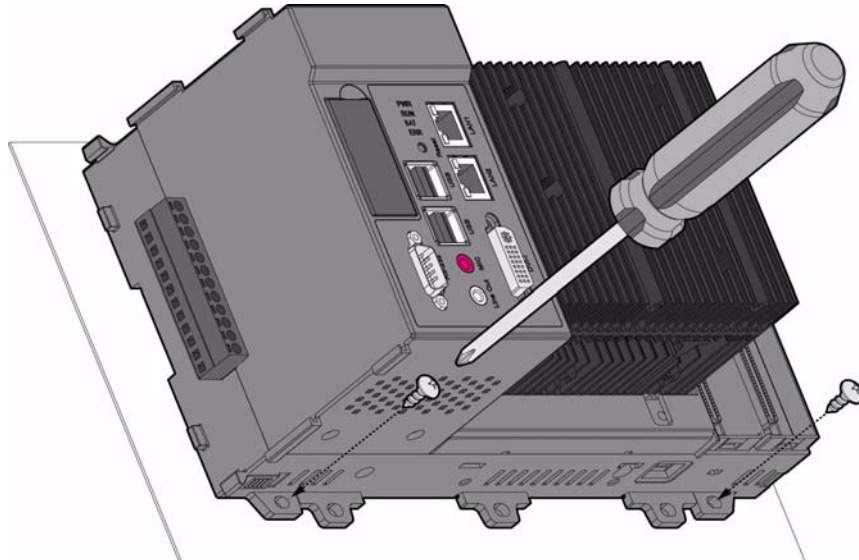


Below are the procedures for the wall (panel) mounting.

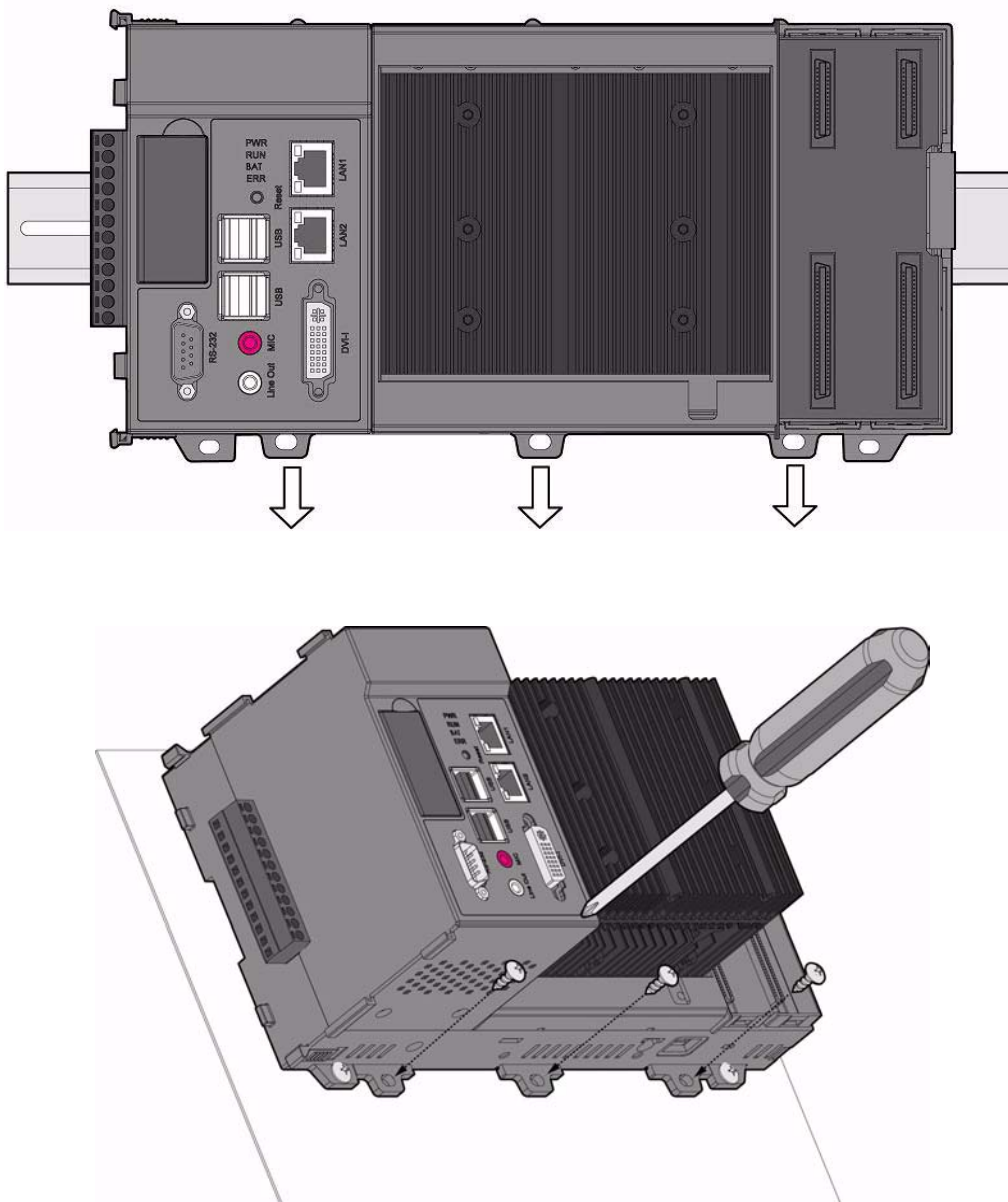
1. Hang the APAX-557X onto the screw on the wall (panel). The screws for APAX-557X need to be special-designed. We have provided it in the accessory.



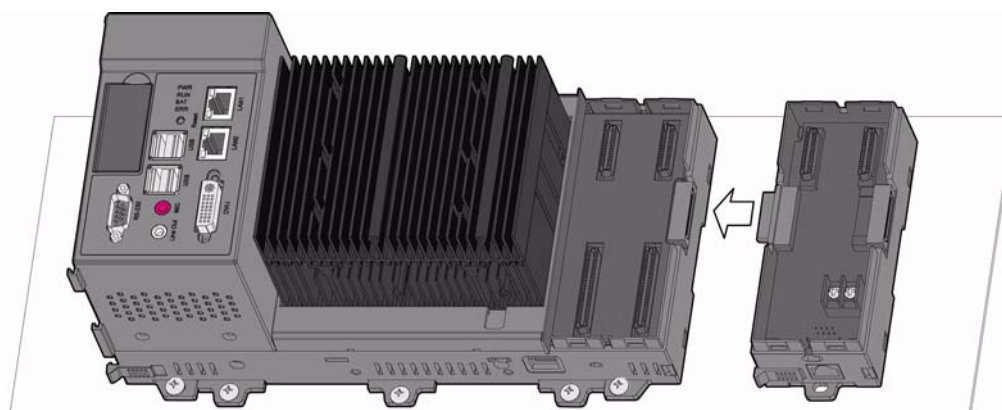
2. Mount APAX-557X to the wall (panel) using two screws.

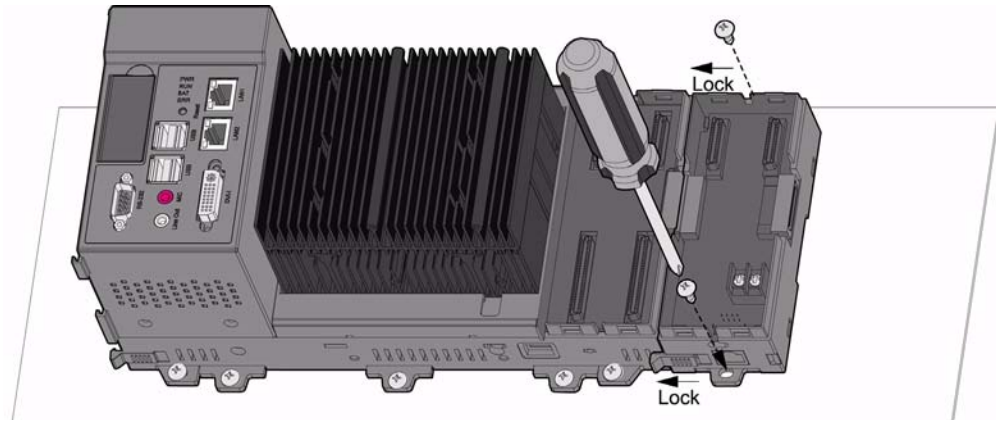


3. If you want to have stronger mounting effect, pull down the DIN-rail locks and screw the three DIN-rail locks with three screws.



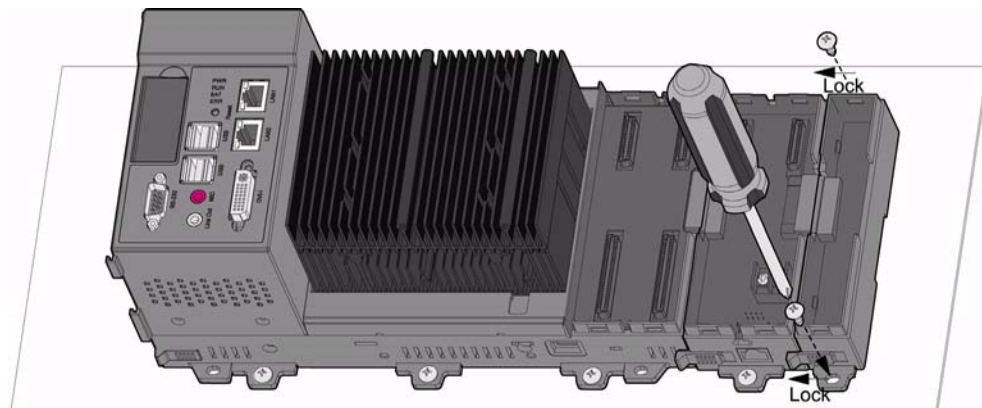
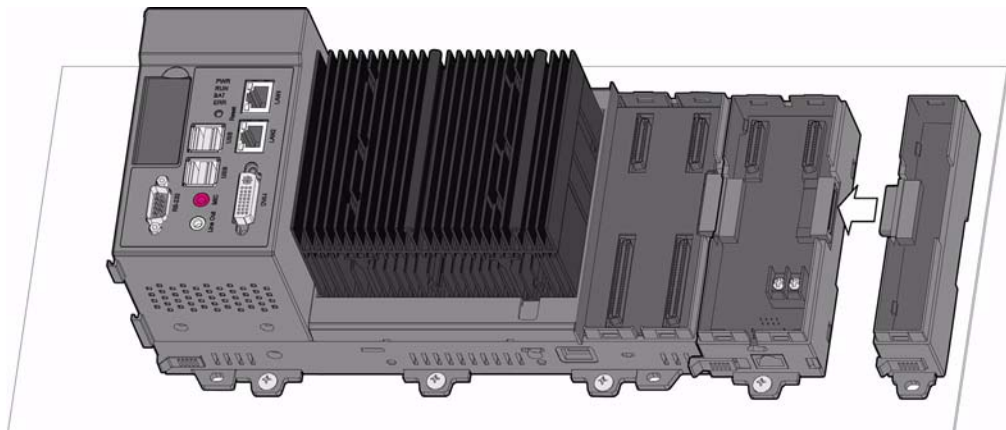
4. If needed, stack APAX-5002 backplane to APAX-557X. Lock the APAX-557X backplane to APAX-557X by the backplane locks. Mount that APAX-5002 backplane to the wall (panel) using two screws.





5. Repeat Step 4 until all necessary APAX-5002 backplane are screwed on the wall (panel).

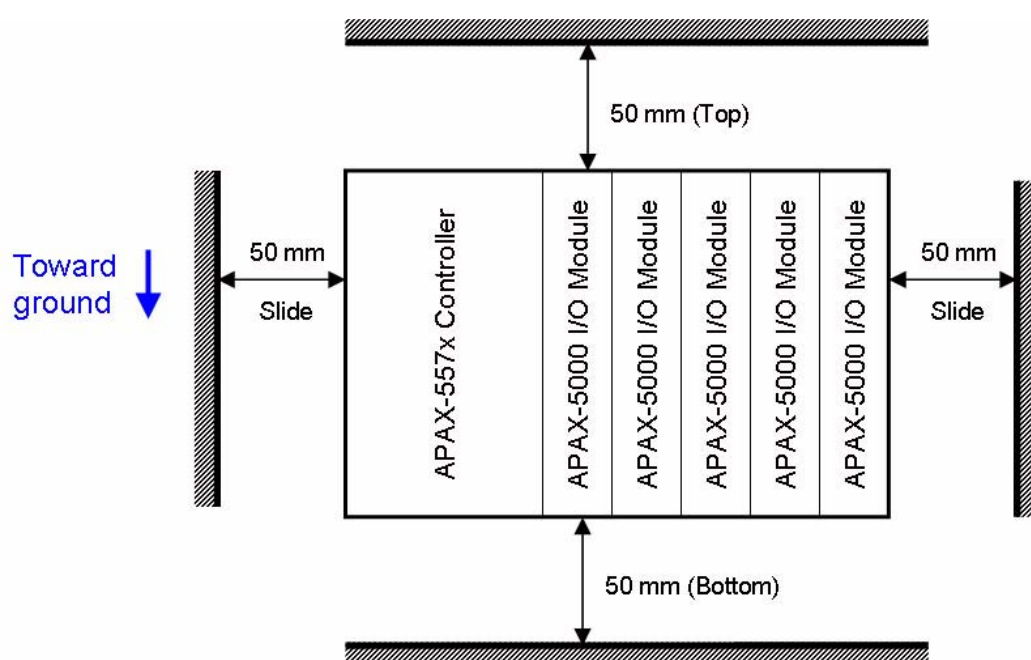
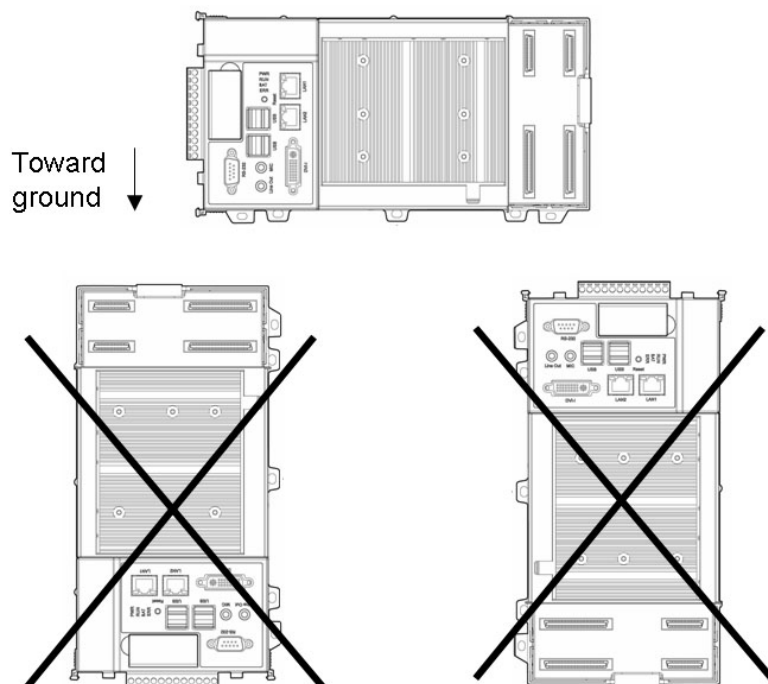
**Note!** When the total number of APAX-5520 and APAX-5000 I/O modules is odd, you can use APAX-5001 (1-slot backplane) as the last backplane in the system. The procedure to screw APAX-5001 on the wall (panel) is similar as APAX-5002.



6. Inserted all necessary APAX-5000 I/O modules on the APAX-557X slots and the backplanes. (Similar to Step 3, Step 5, Step 9 and Step 11 in section 3.1.1)

7. Slide the module lock of and all APAX-5000 I/O modules into the position, to fix these modules to related backplanes and APAX-557X slots. (Similar to Step 4, Step 6, Step 10 and Step 12 in section 3.1.1)

**Warning!** *APAX-557X will generate a significant heat, which is dissipated via a passive ventilation system. This system requires the unit to be mounted correctly (placed vertically). In order to have better ventilation, please keep enough space between the enclosure and adjacent equipment. The APAX-557X can also be placed vertically for better ventilation.*





# Chapter 4

## Error Handling and Diagnostics

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## 4.1 Error Handling and Diagnostics

There are four LED for diagnostics on the front panel of APAX-557X. When the LED is lit, its color will become orange. Below are the meanings for the 4 LED:

**PWR:** When the APAX-5520 is powered, this LED will be lit

**RUN:** Programmer can use software program controlling when this LED is lit.

**BAT:** When the battery runs out of power, this LED will be lit.

**ERR:** Programmer can use software program controlling when this LED is lit.