

User Manual



APAX-6572

PC-based Controller with Atom
Dual Core CPU

ADVANTECH

eAutomation

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1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
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.6572

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 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.

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

By leveraging the technology of Advantech Embedded Automation Computer, APAX-6572 is a high performance controller (CPU module) with Intel Atom Dual Core CPU.

APAX-6572 offers two kinds of programming environments for user to develop their application. One is the pure Windows Embedded System, another is the KW Softlogic IEC-61131-3 programming environment.

APAX-6572WES : It performs as a standalone PC-base controller when it connects with APAX-5000 I/O modules. 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 by Advantech.NET class libraries to control APAX-5000 I/O modules under Microsoft Visual Studio programming environment. Due to the open architecture and high performance CPU, user can also run other 3rd party software on it, such as SCADA software.

APAX-6572KW : It provides KW MultiProg as programming environment. It is IEC-61131-3 softlogic programming tool that PLC programmers are familiar with. KW MultiProg supports Instruction List (IL), Structure Text (ST), Function Block Diagram (FBD), Sequential Function Chart (SFC) and Ladder Diagram (LD). After programmers complete their program, it can be downloaded to APAX-6572KW, and the built-in KW ProConOS kernel will execute the control program. KW MultiProg and ProConOS feature real-time I/O control performance (guaranteed execution time), which is very important for many control applications. Since APAX-6572KW is equipped with the KW softlogic environment, it becomes a Programmable Automation Controller (PAC).

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



APAX-6572 offers two serial ports (1 x RS-232 port and 1 x RS-422/485 port) and three Ethernet ports to communicate with other devices. The three Ethernet ports are served as three different MAC address, enabling APAX-6572 to connect with different Ethernet network. Programmers can leverage the communication ability through Modbus/RTU master/slave and Modbus/TCP server/client.

APAX-6572 provides one VGA interface and four USB ports. Through these, APAX-6572 can be connected to Advantech Industrial Monitor (FPM) or standard monitor. Touch functionality can be connected via USB. Audio interface enables APAX-6572 to connect with other audio device such as microphone.

1.2 System Architecture

There are four slots on APAX-6572 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/L 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-6572 is powered by a standard power supply with 10 ~ 36 V_{DC} voltage input through the power connector.

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-6572 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. For example, there are two APAX-6572 modules installed in one system. For each APAX-6572 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-6572 modules and APAX-5000 I/O modules. APAX-5000 series will automatically decide which one is the master controller. Be aware that two APAX-6572 modules MUST be configured with different controller ID numbers.

Note! *You need one APAX-5002 backplane stacked after each APAX-6572 to have expansion port for backup architecture as figure below.*



Warning!



1. It is suggested to power on all the I/O modules and the two APAX-6572 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

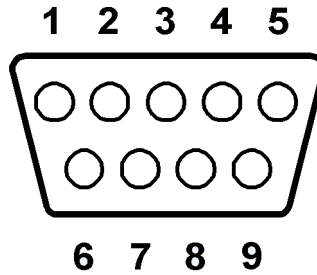
1.3.1 RS-232 Interface (COM 1)

The APAX-6572 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-6572. 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-6572 delivers one RS-422/485 serial communication interface port, COM 2, to connect with other devices.



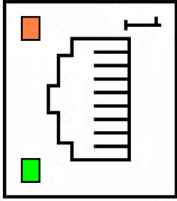
RS-422		
Pin	Assignment	Description
1	Tx-	Data Transmit -
2	Tx+	Data Transmit +
3	Rx+	Data Receive +
4	RX-	Data Receive -
5	GND	Ground

RS-485		
Pin	Assignment	Description
1	Data-	Data - signal
2	Data+	Data + signal
5	GND	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-6572 is equipped with three Ethernet ports which are fully compliant with IEEE 802.3u 10/100/1000 Mbps Ethernet. These 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 each Ethernet port. Therefore, APAX-6572 can link to 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.*



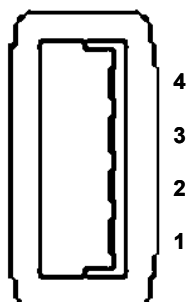
Note! *APAX-6572 LAN ports support teaming functionality through built-in Intel LAN chipset. You can enable the teaming function in the device manager. (After enabling the teaming function, the two LAN ports can link to the same device, offering communication redundancy. (The two LAN ports share the 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-6572 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 Battery Backup RAM

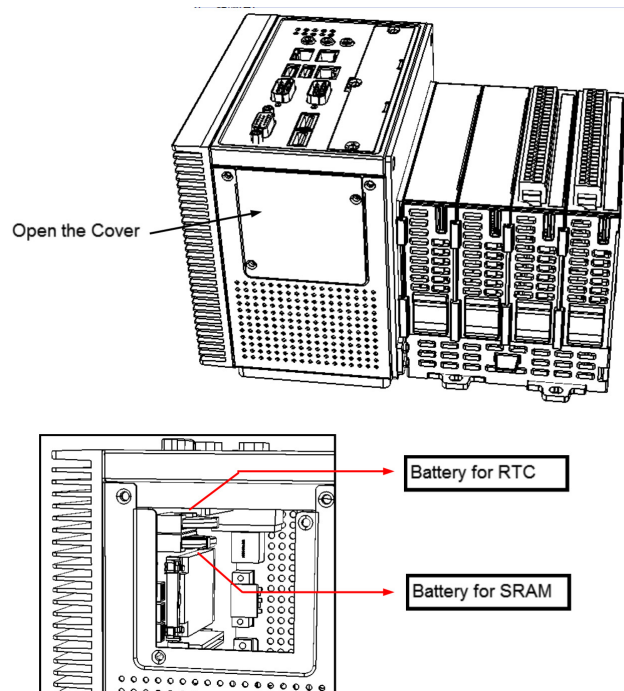
APAX-6572 provide 512 KB battery backup RAM for saving important data. This ensures that you have a safe place to store critical data. You can now write software applications without being concerned that system crashes will erase critical data from the memory. When the external power for the system is loss, the battery can continuously provide power to the battery backup RAM to keep the data.

There is a BTR LED on the front panel of the APAX-6572. Replace the lithium battery with a new one if the BAT LED is activated. (Meaning battery runs out of its power).

Battery Specifications:

- Battery Type: BR2032
- 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

Refer to below diagram to change the battery.

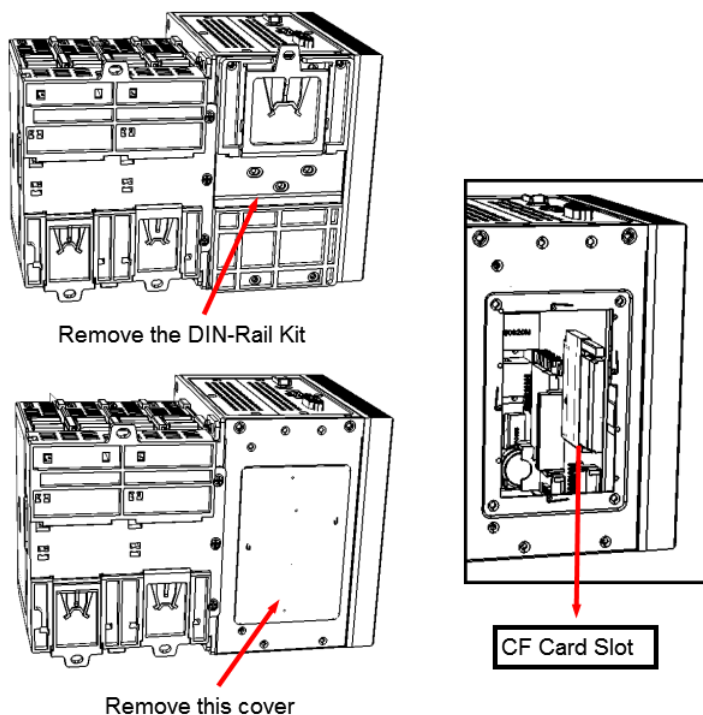


Warning! Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.



1.3.6 Compact Flash Card

APAX-6572 build-in one Compact Flash Card Slot for user to install the CF. Suggest to use the Industrial Grade CF card to secure the reliability. Please refer below diagram to install or access the CF.



1.3.7 Reset Button

APAX-6572 features a reset button on the top panel. Operators can manually reboot the system with the reset button.

1.3.8 Audio

APAX-6572 offers the audio interface. MIC, LIN-OUT, LINE-IN are available. The audio interfaces are accessed via the operating system.

1.3.9 Real Time Clock (RTC)

APAX-6572 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 1.3.5.

1.3.10 Power Connector

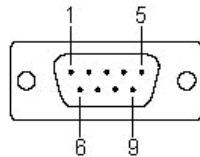
APAX-6572 needs external DC power supply though the connector on the top side.

1.3.11 Remote Monitoring and Control Function

APAX-6572 series provides a lot of remote diagnosis to monitor controller's health for enhancing the system reliability. Through these function provided, the centre control room could easily know or control the current status of APAX-6572 remotely.

The control terminal is on the top cover of APAX-6572, and is a DB9 male pin-out. User can direct wiring by the hand-made terminal or use ADAM-3909-AE to facilitate the wiring.

The pin definition is as below table

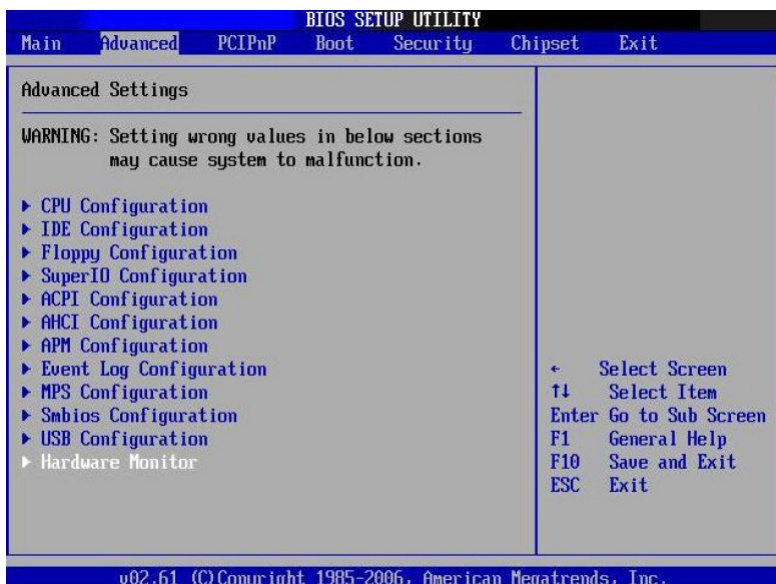


Remote Diagnosis and Control Function			
Pin #	Function	Direction	Definition
1	PWR_CTRL	Input	Power Control, function the same as the power switch on the top cover
2	SYS_RST	Input	System Reset, function the same as the Reset button on the top cover
3	PWR_Status	Output	Report the input power status
4	Reserve		
5	N/A	GND	Ground
6	Reserve		
7	BAT_FAIL	Output	Report the low battery alarm for RTC & SRAM
8	OVER_TEMP	Output	System temperature over the setting value
9	ABNORMAL_VOL	Output	Power input voltage over/under the setting value

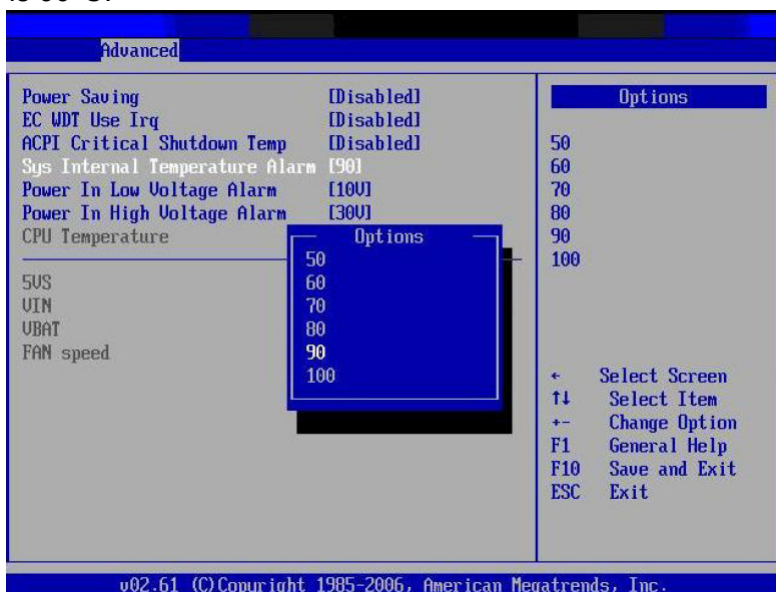
Users can configure the OVER_TEMP and ABNORMAL_VOL setting in the BIOS. Please refer to the steps below to complete it.

1.3.11.1 Configure OVER_TEMP and ABNORMAL_VOL:

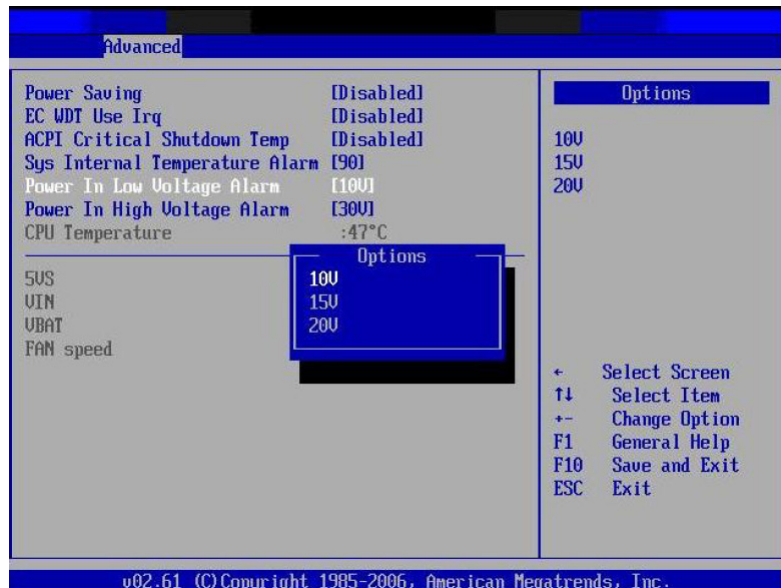
1. Enter BIOS mode and select "Hardware Monitor" in Advanced



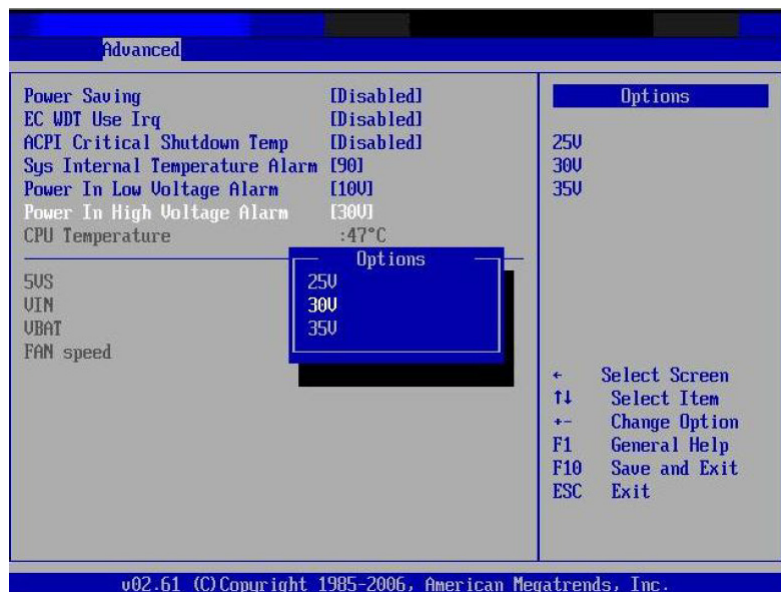
2. Select "Sys Internal Temperature Alarm" to set the temperature. APAX-6572 will trigger the alarm on the OVER_TEMP pin and light the TEMP. LED in the front panel while the system temperature is higher than the setting value. The default setting is 90°C.



3. Select "Power In Low Voltage Alarm" to set the low limit for input voltage. APAX-6572 will trigger the alarm on the ABNORMAL_VOL pin and light the VOLT. LED in the front panel while the power input voltage is lower than the setting value. The default setting is 10V.



4. Select "Power In High Voltage Alarm" to set the high limit for input voltage. APAX-6572 will trigger the alarm on the ABNORMAL_VOL pin and light the VOLT. LED in the front panel while the power input voltage is higher than the setting value. The default setting is 35V.



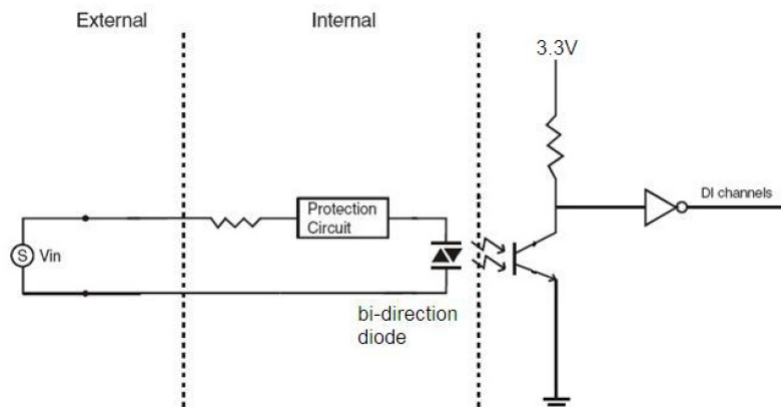
1.3.11.2 Signal Wiring of Input Direction

The input signal mentioned on the “Remote Diagnosis and Control Function” table support the Wet contact wiring. The supported signal voltage level is:

Logic level 1: 10~50V

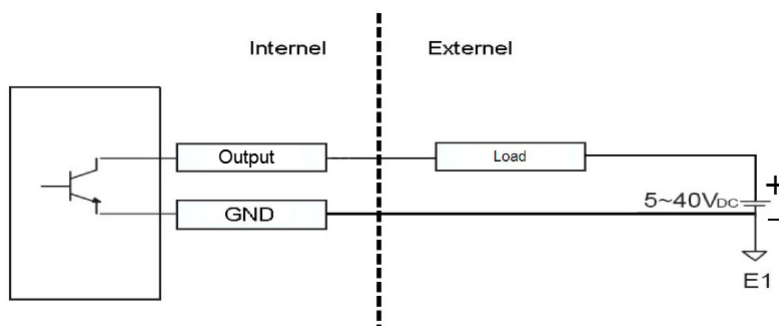
Logic level 0: 3Vmax

And the wiring diagram is as below:



1.3.11.3 Signal Wiring of Output Direction

The output signal mentioned on the “Remote Diagnosis and Control Function” table is the open collector format. Please refer to below diagram for the signal wiring:



The external voltage support 5 ~ 40 V_{DC}. And the maximum current follow support is 200mA for each output pin.

1.3.12 Advanced Watchdog Timer

The APAX-6572 provides a 7-tier Watchdog Timer for users to have a chance to escalate system status before the forced system reset. Each tier has the same time interval from 1~255 seconds and users can have an event handling after the time-out of each tier. Install the driver from companion disc and refer to the software manual for details.

Chapter 2

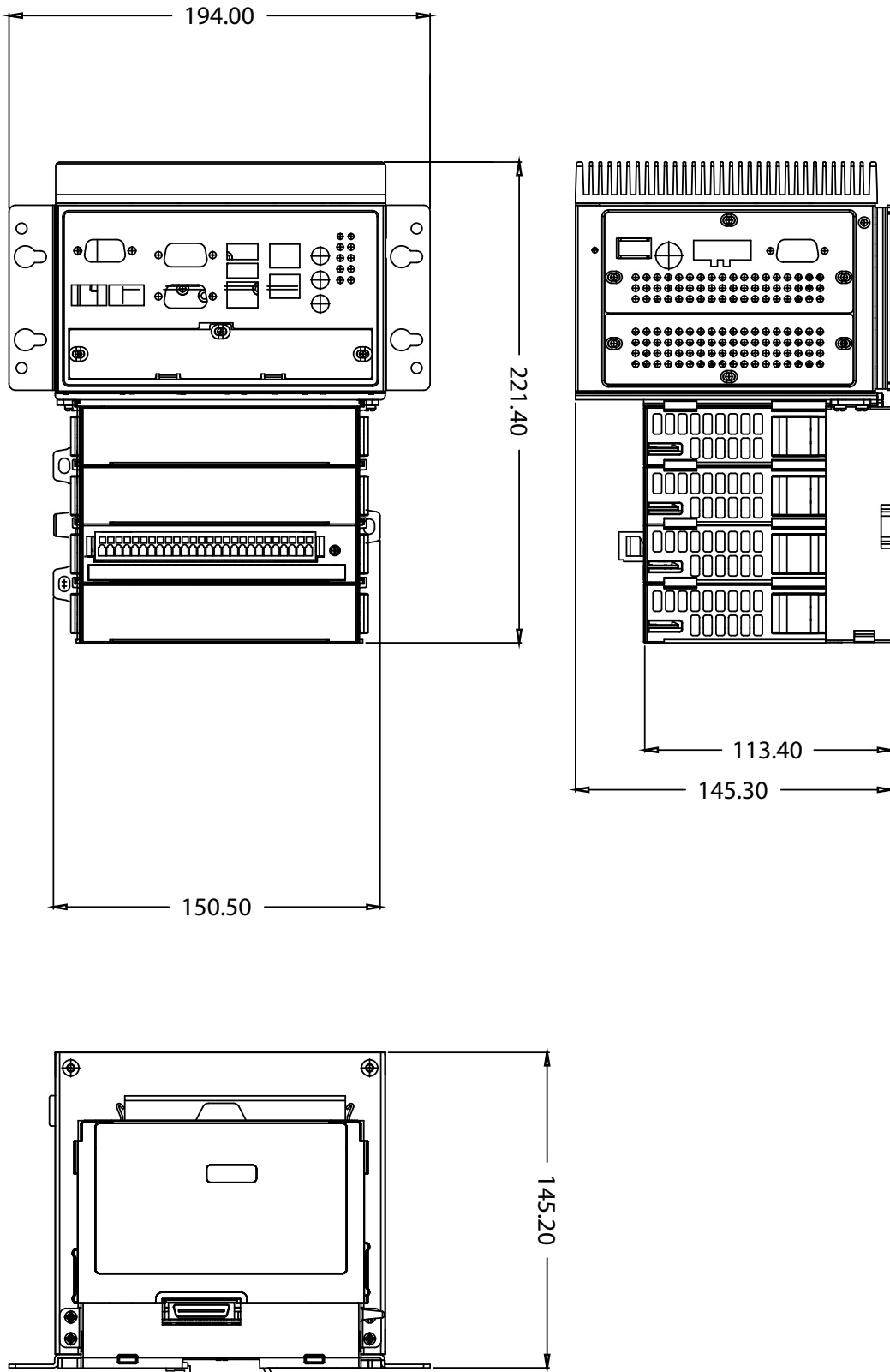
Product Specifications

2.1 CPU Modules

2.1.1 APAX-6572

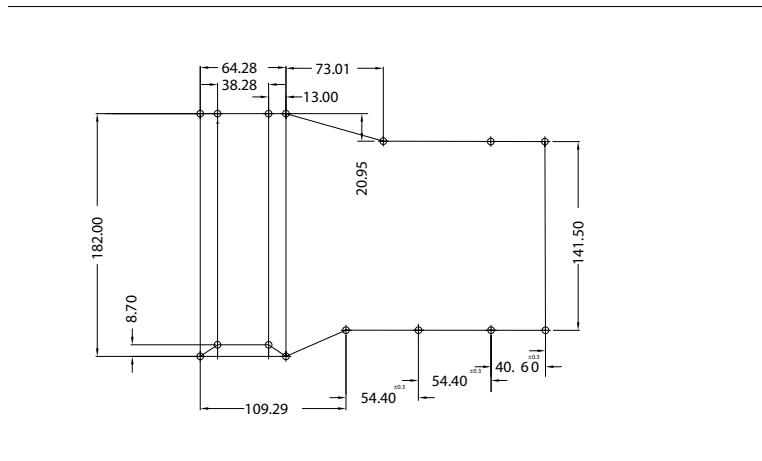
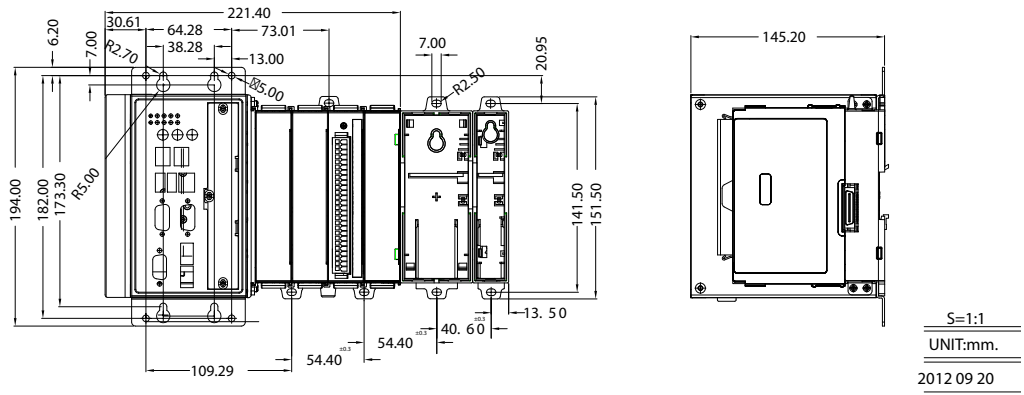
- CPU: Atom D510 1.66 GHz
- Memory: 2 GB DDR2 SDRAM on board
- Battery-backup RAM: 1 MB Battery-backup SRAM
- VGA/Keyboard/Mouse: DB-15 VGA Connector, Mini-DIN connector for PS/2 keyboard & mouse
- Serial Ports: 1x RS-232, 1x RS-422/485 with DB9 connectors
- Automatic RS-485 data flow control
- Serial Speeds: RS-232: 50~115.2 kbps, RS-422/485: 50~115.2 kbps
- LAN: Three 10/100/1000 Base-T RJ-45 Ports
- USB interface: Four USB ports, USB EHCI, Rev. 2.0 compliant
- Audio: Mic in, Line in, Line out
- Storage: 1 x internal type I/II CompactFlash slot
- LEDs:
 - PWR: Power Standby
 - CF: CF Read/Write Indicator
 - R.BTR: RTC Battery Low
 - B.BTR: SRAM Backup Battery Low
 - TEMP: Over Temperature Alarm
 - VOLT: Voltage Abnormal Alarm
 - ERR: Softlogic Error Status
 - RUN: Softlogic Running Status
- Mini PCIe: 1 x Mini PCIe
- I/O Expansion: Build in 4x APAX bus with PCI signal which could adopt APAX-5090P or APAX-5095P as well as general APAX IO modules.
- Shock Protection: IEC 60068-2-27, CompactFlash: 50G @ Wallmount, half sine, 11ms, HDD: 20G @ wallmount, half sine, 11ms
- Vibration Protection: IEC 60068-2-64 (Random 1 Oct./min, 1hr/axis), Compact-Flash: 2Grms@ 5~500Hz, HDD: 1 Grms @ 5~500Hz
- Power Supply Voltage: 10-36 V_{DC}, reversed wiring protection
- Power Requirement: Min. 24 W (10 ~ 36 VDC) (e.g +24 V @ 1 A)
- Power Consumption: 35W (Typical)
- Operating Temperature: -10~50°C (14~149°F)
- Storage Temperature: -20~80°C (-4~176°F)
- Relative humidity: 95% @ 40°C
- Weight: 2.6KG

2.1.2 APAX-6572 Dimensions



2.1.3 Wall (Panel) Mounting

To mount the APAX-6572 to a wall (panel), change the DIN-rail kit on the rear side to be the plate of wall-mount kit (PN:1960056552N000). And follow the below figure for the dimensional template:



Chapter 3

Error Handling and
Diagnostics

3.1 Error Handling and Diagnostics

There are four LED for diagnostics on the front panel of APAX-6572. When the LED is lit, its color will become orange. Below are the meanings for the 4 LED:

PWR: When the APAX-6572 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.

TEMP: Temperature over the setting value

VOLT: Power Voltage over/under the setting value

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