ECX700-AL
Ruggedized Fanless Embedded System
User's Manual
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FCC and DOC Statement on Class B
This equipment has been tested and found to comply with the limits for a Class B 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 residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and the receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio TV technician for help.

Notice:
1. The changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.
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About this Manual

This manual can be retrieved from the website.

The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

Warranty

1. Warranty does not cover damages or failures that arises from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.

2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.

3. Unless otherwise instructed in this user’s manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.

4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.
Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.

Important:
Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Precautions

- Use the correct DC / AC input voltage range.
- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging in the power cord.
- There is danger of explosion if battery incorrectly replaced.
- Replace only with the same or equivalent specifications of batteries recommend by the manufacturer.
- Dispose of used batteries according to local ordinance.
- Keep this system away from humid environments.
- Make sure the system is placed or mounted correctly and stably to prevent the chance of dropping or falling may cause damage.
- The openings on the system shall not be blocked and shall be kept in distance from other objects to make sure of proper air ventilation to protect the system from overheating.
- Dress the cables, especially the power cord, so they will not be stepped on, in contact with high temperature surfaces, or cause any tripping hazards.
- Do not place anything on top of the power cord. Use a power cord that has been approved for use with the system and is compliant with the voltage and current ranges required by the system's electrical specifications.
- If the system is to be unused or stored for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
- If one of the following occurs, consult a service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated the system.
  - The system has been exposed to moisture.
  - The system is not working properly.
  - The system is physically damaged.
- The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace the outlet.
- Disconnect the system from the electricity outlet before cleaning. Use a damp cloth for cleaning the surface. Do not use liquid or spray detergents for cleaning.
- Before connecting, make sure that the power supply voltage is correct. The device is connected to a power outlet which should be grounded connection.

The system may burn fingers while running. Wait for 30 minutes to handle electronic parts after power off.
### Specifications

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>Processor</th>
<th>Intel Atom® Processor E3900 Series, BGA 1296 Intel Atom® x7-E3950 Processor, Quad Core, 2M Cache, 1.6GHz (2.0GHz), 12W Intel Atom® x5-E3940 Processor, Quad Core, 2M Cache, 1.6GHz (1.8GHz), 9.5W Intel Atom® x5-E3930 Processor, Dual Core, 2M Cache, 1.3GHz (1.8GHz), 6W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>2GB/4GB/8GB memory onboard</td>
<td></td>
</tr>
<tr>
<td>BIOS</td>
<td>AMI SPI 128Mbit (supports UEFI/Legacy mode and Security Boot (optional))</td>
<td></td>
</tr>
<tr>
<td>GRAPHICS</td>
<td>Controller</td>
<td>Intel® HD Graphics</td>
</tr>
<tr>
<td></td>
<td>Feature</td>
<td>OpenGL 4.2, Direct X 11.1, OpenCL 1.2, OGL ES 3.0 HW Decode: H.264, MPEG2, VC1, VP8, H.265, MPEG4, MVC, VP9, WMV9, JPEG/MJPEG HW Encode: H.264, MPEG4, VP8, H.265, MVC</td>
</tr>
<tr>
<td></td>
<td>Display</td>
<td>1 x HDMI, HDMI: resolution up to 3840x2160@30Hz</td>
</tr>
<tr>
<td>STORAGE</td>
<td>eMMC</td>
<td>Support EMMC up to 8G/16G/32GB/64GB (optional)</td>
</tr>
<tr>
<td>EXPANSION</td>
<td>Interface</td>
<td>1 x Full-size PCIe for 4G LTE module 1 x Full-size Mini PCIe for Canbus 1 x M.2 2230 (USB2.0/PCIe) for WiFi module</td>
</tr>
<tr>
<td>ETHERNET</td>
<td>Controller</td>
<td>2 x Intel® I210AT PCIe (10/100/1000Mbps)</td>
</tr>
<tr>
<td>LED</td>
<td>Indicators</td>
<td>1 x Power Status LED</td>
</tr>
<tr>
<td>BOTTOM I/O</td>
<td>USB</td>
<td>2 x USB 3.0</td>
</tr>
<tr>
<td></td>
<td>LAN</td>
<td>2 x GbE</td>
</tr>
<tr>
<td></td>
<td>Combo</td>
<td>2 x RS232 and 2 x Can bus protocol</td>
</tr>
<tr>
<td></td>
<td>Power</td>
<td>1 x 9~36V DC-IN</td>
</tr>
<tr>
<td>TOP I/O</td>
<td>Antenna Hole</td>
<td>2 x Antenna (LTE)</td>
</tr>
<tr>
<td></td>
<td>Vent</td>
<td>1 x Vent</td>
</tr>
<tr>
<td>FRONT I/O</td>
<td>Display</td>
<td>1 x HDMI or 1 x VGA (optional)</td>
</tr>
<tr>
<td></td>
<td>SIM slot</td>
<td>1 x SIM card slot</td>
</tr>
<tr>
<td></td>
<td>Antenna Hole</td>
<td>2 x Antenna (WiFi)</td>
</tr>
<tr>
<td>WATCHDOG</td>
<td>TPM</td>
<td>fTPM 2.0</td>
</tr>
<tr>
<td>TIMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SECURITY</td>
<td>TPM</td>
<td>TPM 1.2/ 2.0</td>
</tr>
<tr>
<td>POWER</td>
<td>Type</td>
<td>DC-in 9~36V</td>
</tr>
<tr>
<td></td>
<td>Connector</td>
<td>M12 D-code</td>
</tr>
<tr>
<td>OS SUPPORT</td>
<td>Microsoft</td>
<td>Windows 10 IoT Enterprise 64-bit</td>
</tr>
<tr>
<td></td>
<td>Linux</td>
<td>Linux</td>
</tr>
<tr>
<td>MECHANISM</td>
<td>Mounting</td>
<td>Wall Mount</td>
</tr>
<tr>
<td>Dimensions</td>
<td>(W x H x D)</td>
<td>217 x 188 x 87 mm (with wall-mount bracket)</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>2.1 kg</td>
</tr>
<tr>
<td>ENVIRONMENT</td>
<td>Operating</td>
<td>-40 to 70°C (E3950,E3940, E3930 only)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Storage Temperature</td>
<td>-40 to 85°C</td>
</tr>
<tr>
<td></td>
<td>Relative</td>
<td>5 to 95% RH (non-condensing)</td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>IP67 enclosure</td>
</tr>
<tr>
<td></td>
<td>Vibration</td>
<td>Operation Vibration test: MIL-STD-810G 514.6C-2, Figure 514.6C-2</td>
</tr>
<tr>
<td></td>
<td>Certifications</td>
<td>CE, FCC class A</td>
</tr>
</tbody>
</table>

### OS SUPPORT
- Microsoft: Windows 10 IoT Enterprise 64-bit
- Linux: Linux

### MECHANISM
- Mounting: Wall Mount
- Dimensions (W x H x D): 217 x 188 x 87 mm (with wall-mount bracket)
- Weight: 2.1 kg

### ENVIRONMENT
- Operating Temperature: -40 to 70°C (E3950, E3940, E3930 only)
- Storage Temperature: -40 to 85°C
- Relative Humidity: 5 to 95% RH (non-condensing)
- Construction: IP67 enclosure
- Vibration: Operation Vibration test: MIL-STD-810G 514.6C-2, Figure 514.6C-2
- Certifications: CE, FCC class A
Chapter 2 - Hardware Installation

Outlet

Bottom View

- USB 3.0
- USB 3.0
- Circular 23pin
- 2 COM& 2Can bus
- LAN port
- M12 A code (8pin)

- Power status LED
- Power DC-IN
- M12 D code (4pin)
Chapter 2
HARDWARE INSTALLATION

Right View

N type conn. For wifi Antenna

N type conn. For wifi Antenna

HDMI / VGA

SIM

HDMI

SIM slot
Chapter 2  
HARDWARE INSTALLATION

Sky View

N type conn for LTE antenna

Vent

N type conn for LTE antenna
Cable Assembly – LAN cable

This is a standard LAN converter cable after assembly; customer can either use our converter cable or a customized cable to directly connect ECX700 with their devices.
Cable Assembly – 23pin 1to4 cable

Circular 23pin 2 COM & 2 Can bus

23pin 1to4 converter cable to connect ECX700 and cables of RS232 or CAN devices

This is a standard 23pin 1to4 converter cable after assembly; customer can either use our converter cable or a customized cable to directly connect ECX700 with their devices
Cable Assembly – USB cable

This is a standard USB converter cable after assembly; customer can either use our USB converter cable or a customized cable to directly connect ECX700 with their USB devices.

USB3.0 converter cable to connect ECX700 and cables of customer’s USB devices.
Chapter 2
HARDWARE INSTALLATION

Cable Assembly –USB cable

Power DC-IN
M12 D code
(4pin)

Power adaptor
converter cable to
connect ECX700 and
cables of customer’s
power adaptor

This is a standard power converter cable after assembly; customer can either use our power converter cable or a customized cable to directly connect ECX700 with their power adapter.
**Cable Assembly – HDMI cable**

This is a standard HDMI converter cable after assembly; customer can either use our HDMI converter cable or a customized cable to directly connect ECX700 with their Display.
Dimensions
Chapter 2  
HARDWARE INSTALLATION

1. Boot up the system

Step 1:
To prepare an external power cable

Step 2:
To make sure the M12 D code of the external power cable is connected with ECX700

Step 3:
To make sure the DC jack of the external power cable is connected with power adaptor
Boot up the system-2

Step 4:
Notice that your adaptor’s power pin is the same with the following

ECX700 Power Pin Definition
Pin-1 GND
Pin-2 GND
Pin-3 VCC
Pin-4 VCC

Step 5:
When PWR LED turns into Green, it means the system has been already booted up
Step 6:
Use external HDMI cable to connect ECX700 and HDMI display

Step 7:
Connect external HDMI cable with ECX700

Step 8:
Operation system is ready
Chapter 3 - BIOS Settings

Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added. It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.

Note:
The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

Default Configuration
Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

Entering the BIOS Setup Utility
The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen. The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message “Press DEL to run setup” will appear on the screen. If the message disappears before you respond, restart the system or press the “Reset” button. You may also restart the system by pressing the <Ctrl> <Alt> and <Del> keys simultaneously.

Scroll Bar
When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

Submenu
When “►” appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.

Legends

<table>
<thead>
<tr>
<th>Keys</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right / Left arrow</td>
<td>Move the highlight left or right to select a menu</td>
</tr>
<tr>
<td>Up / Down arrow</td>
<td>Move the highlight up or down between submenus or fields</td>
</tr>
<tr>
<td>&lt;Enter&gt;</td>
<td>Enter the highlighted submenu</td>
</tr>
<tr>
<td>+ (plus key)/F6</td>
<td>Scroll forward through the values or options of the highlighted field</td>
</tr>
<tr>
<td>- (minus key)/F5</td>
<td>Scroll backward through the values or options of the highlighted field</td>
</tr>
<tr>
<td>&lt;F1&gt;</td>
<td>Display general help</td>
</tr>
<tr>
<td>&lt;F2&gt;</td>
<td>Display previous values</td>
</tr>
<tr>
<td>&lt;F7&gt;</td>
<td>Popup Boot Device List</td>
</tr>
<tr>
<td>&lt;F9&gt;</td>
<td>Optimized defaults</td>
</tr>
<tr>
<td>&lt;F10&gt;</td>
<td>Save and Exit</td>
</tr>
<tr>
<td>&lt;Esc&gt;</td>
<td>Return to previous menu</td>
</tr>
</tbody>
</table>
The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.

**Main**

- **System Time**: The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

- **System Date**: The date format is <month>, <date>, <year>. Press “Tab” to switch to the next field and press “-” or “+” to modify the value.

**Advanced**

The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.

**System ACPI Parameters**

- **ACPI Configuration**
- **CPU Configuration**
- **Audio Configuration**
- **SATA Configuration**
- **PCI Express Configuration**
- **Console Redirection**
- **SIO NUVOTON6116D**
- **LAN Configuration**
ACPI Configuration

**After G3**

This field is to specify what state the system should be in when power is re-applied after a power failure.

- **Always On**
  - The system automatically powers on after power failure.

- **Always Off**
  - The system enters soft-off state after power failure. Power-on signal input is required to power up the system.

**EIST**

This field is used to enable or disable the Intel SpeedStep® Technology, which helps optimize the balance between system’s power consumption and performance. After it is enabled in the BIOS, EIST features can then be enabled via the operating system’s power management.

**Turbo Mode**

Enable or disable turbo mode of the processor. This field will only be displayed when EIST is enabled.

**C-States**

Enable or disable CPU Power Management. It allows CPU to enter "C states" when it’s idle and nothing is executing.

**Thermal Limit Manual Mode**

Enable this field and manually set a temperature to which the CPU TDP adheres — increments from 80°C to 110°C.

**Note:**

Some of the fields may not be available when the features are not supported by the equipped CPU.
### Audio Configuration

**Audio Controller**
Control the detection of the HD Audio device.

<table>
<thead>
<tr>
<th>Disable</th>
<th>Enable</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDA will be unconditionally disabled.</td>
<td>HDA will be unconditionally enabled.</td>
</tr>
</tbody>
</table>

### SATA Configuration

**SATA Controller(s)**
This field is used to enable or disable the Serial ATA controller.

**SATA Speed**
This field is used to select SATA speed generation limit: Gen1, Gen2 or Gen3.

**SATA Port 0**
Information about the mSATA (Mini PCIe 1) device.

**SATA Port 1**
Information about the SATA SSD Drive device.

**Port 0/1 and Hot Plug**
Enable or disable the Serial ATA port and its hot plug function.
Advanced

### PCI Express Configuration

<table>
<thead>
<tr>
<th>Control the PCI Express Root Port</th>
<th>Enable: Enable PCIe root port</th>
<th>Disable: Disable PCIe root port</th>
</tr>
</thead>
</table>

- **Enable or disable the PCI Express Root Port (M.2 E Key).**
- **PCIe Speed**
  - Select PCIe Speed of the current port — AUTO, Gen1, or Gen2.
- **Hot Plug**
  - Enable or disable hot plug function of the port.

### Console Redirection

**COM1 Console Redirection Settings**

- **Enable or Disable.**

**Console Redirection**

By enabling Console Redirection of a COM port, the sub-menu of console redirection settings will become available for configuration as detailed in the following.
Configure the serial settings of the current COM port.

**Terminal Type**
Select terminal type: VT100, VT100+, VT-UTF8 or ANSI.

**Bits per second**
Select serial port transmission speed: 9600, 19200, 38400, 57600 or 115200.

**Data Bits**
Select data bits: 7 bits or 8 bits.

**Parity**
Select parity bits: None, Even, Odd, Mark or Space.

**Stop Bits**
Select stop bits: 1 bit or 2 bits.

**WatchDog Timer Unit**
Select WatchDog Timer Unit — Second or Minute.

**SuperI0 WatchDog Timer**
Set SuperI0 WatchDog Timer Timeout value. The range is from 0 (disabled) to 255.

**Note:**
The sub-menus are detailed in following sections.
**Serial Port 1/2/3/4 Configuration**

**Serial Port**
Enable or disable the current serial COM port.

**COM1/2/3/4 Mode**
Select the serial mode for the COM ports — RS232, RS422, or RS485.

**NCT6116D HW Monitor**

This section displays the system’s health information, i.e. voltage readings, CPU and system temperature readings.
LAN Configuration

Wake On LAN
Enable or disable the function to wake the system via LAN.

► LAN1/2
Enable or disable a LAN port.

Network Stack
Enable or disable UEFI network stack. The following fields will appear when this field is enabled.

IPv4 PXE Support
Enable or disable IPv4 PXE boot support.

IPv6 PXE Support
Enable or disable IPv6 PXE boot support.
### Security

#### Set Supervisor Password
Set the supervisor password. To clear the password, input nothing and press enter when a new password is asked.

### Boot

#### OS Selection
Select the target OS the system is to boot into — Windows 10, Windows 7, Linux.

#### Setup Prompt Timeout
Set the number of seconds to wait for the setup activation key — 1 to 65535, 65535 (0xFFFF) meaning indefinite waiting.

#### NumLock
Select the keyboard NumLock state — On or Off.

#### Quiet Boot
This section is used to enable or disable quiet boot option.

#### Boot Option Priorities
Rearrange the system boot order of available boot devices.

#### Driver Option Priorities
Select the driver boot order.
Save & Exit

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.

- Exit Saving Changes
- Load Optimal Defaults
- Discard Changes
- Boot Override

Version 2.18.1263. Copyright (C) 2020 American Megatrends, Inc.

Exit Saving Changes
To save the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system after saving all changes made.

Load Optimal Defaults
To restore and load the optimized default values, select this field and then press <Enter>. A dialog box will appear. Select Yes to restore the default values of all the setup options.

Discard Changes
To discard the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system setup without saving any changes.

Boot Override
Move the cursor to an available boot device and press Enter, and then the system will immediately boot from the selected boot device. The Boot Override function will only be effective for the current boot. The "Boot Option Priorities" configured in the Boot menu will not be changed.

Updating the BIOS
To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files and specific instructions about how to update BIOS with the flash utility. For updating AMI BIOS in UEFI mode, you may refer to the how-to video at https://www.dfi.com/Knowledge/Video/5.

Notice: BIOS SPI ROM

1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.

2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.

3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.

Note:
- You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
- When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person’s instructions to confirm that the MAC address should be burned or not.