**NEXCOM International Co., Ltd.**

# IoT Automation Solutions Business Group
# EtherCAT Motion Controller
# NET 300-ECM
## User Manual

www.nexcom.com

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# PREFACE

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## Acknowledgements

NET 300 is a trademark of NEXCOM International Co., Ltd. All other product names mentioned herein are registered trademarks of their respective owners.

## Regulatory Compliance Statements

This section provides the FCC compliance statement for Class A devices and describes how to keep the system CE compliant.

## Declaration of Conformity

### FCC

This equipment has been tested and verified to comply with the limits for a Class A digital device, pursuant to Part 15 of 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 instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area (domestic environment) is likely to cause harmful interference, in which case the user will be required to correct the interference (take adequate measures) at their own expense.

### CE

The product(s) described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

# RoHS Compliance

**NEXCOM RoHS Environmental Policy and Status Update**

NEXCOM is a global citizen for building the digital infrastructure. We are committed to providing green products and services, which are compliant with European Union RoHS (Restriction on Use of Hazardous Substance in Electronic Equipment) directive 2011/65/EU, to be your trusted green partner and to protect our environment.

RoHS restricts the use of Lead (Pb) < 0.1% or 1,000ppm, Mercury (Hg) < 0.1% or 1,000ppm, Cadmium (Cd) < 0.01% or 100ppm, Hexavalent Chromium (Cr6+) < 0.1% or 1,000ppm, Polybrominated biphenyls (PBB) < 0.1% or 1,000ppm, and Polybrominated diphenyl Ethers (PBDE) < 0.1% or 1,000ppm.

In order to meet the RoHS compliant directives, NEXCOM has established an engineering and manufacturing task force to implement the introduction of green products. The task force will ensure that we follow the standard NEXCOM development procedure and that all the new RoHS components and new manufacturing processes maintain the highest industry quality levels for which NEXCOM are renowned.

The model selection criteria will be based on market demand. Vendors and suppliers will ensure that all designed components will be RoHS compliant.

**How to recognize NEXCOM RoHS Products?**

For existing products where there are non-RoHS and RoHS versions, the suffix "(LF)" will be added to the compliant product name.

All new product models launched after January 2013 will be RoHS compliant. They will use the usual NEXCOM naming convention.

# Warranty and RMA

## NEXCOM Warranty Period

NEXCOM manufactures products that are new or equivalent to new in accordance with industry standard. NEXCOM warrants that products will be free from defect in material and workmanship for 2 years, beginning on the date of invoice by NEXCOM. HCP series products (Blade Server) which are manufactured by NEXCOM are covered by a three year warranty period.

## NEXCOM Return Merchandise Authorization (RMA)

- Customers shall enclose the "NEXCOM RMA Service Form" with the returned packages.

- Customers must collect all the information about the problems encountered and note anything abnormal or, print out any on-screen messages, and describe the problems on the "NEXCOM RMA Service Form" for the RMA number apply process.

- Customers can send back the faulty products with or without accessories (manuals, cable, etc.) and any components from the card, such as CPU and RAM. If the components were suspected as part of the problems, please note clearly which components are included. Otherwise, NEXCOM is not responsible for the devices/parts.

- Customers are responsible for the safe packaging of defective products, making sure it is durable enough to be resistant against further damage and deterioration during transportation. In case of damages occurred during transportation, the repair is treated as "Out of Warranty."

- Any products returned by NEXCOM to other locations besides the customers' site will bear an extra charge and will be billed to the customer.

## Repair Service Charges for Out-of-Warranty Products

NEXCOM will charge for out-of-warranty products in two categories, one is basic diagnostic fee and another is component (product) fee.

## Repair Service Charges for Out-of-Warranty Products

NEXCOM will charge for out-of-warranty products in two categories, one is basic diagnostic fee and another is component (product) fee.

### System Level

- Component fee: NEXCOM will only charge for main components such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistor, capacitor.

- Items will be replaced with NEXCOM products if the original one cannot be repaired. Ex: motherboard, power supply, etc.

- Replace with 3rd party products if needed.

- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

### Board Level

- Component fee: NEXCOM will only charge for main components, such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistors, capacitors.

- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

## Warnings

Read and adhere to all warnings, cautions, and notices in this guide and the documentation supplied with the chassis, power supply, and accessory modules. If the instructions for the chassis and power supply are inconsistent with these instructions or the instructions for accessory modules, contact the supplier to find out how you can ensure that your computer meets safety and regulatory requirements.

## Cautions

Electrostatic discharge (ESD) can damage system components. Do the described procedures only at an ESD workstation. If no such station is available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the computer chassis.

# Safety Information

Before installing and using the device, note the following precautions:

- Read all instructions carefully.

- Do not place the unit on an unstable surface, cart, or stand.

- Follow all warnings and cautions in this manual.

- When replacing parts, ensure that your service technician uses parts specified by the manufacturer.

- Avoid using the system near water, in direct sunlight, or near a heating device.

- The load of the system unit does not solely rely for support from the rackmounts located on the sides. Firm support from the bottom is highly necessary in order to provide balance stability.

- The computer is provided with a battery-powered real-time clock circuit. There is a 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.

# Installation Recommendations

Ensure you have a stable, clean working environment. Dust and dirt can get into components and cause a malfunction. Use containers to keep small components separated.

Adequate lighting and proper tools can prevent you from accidentally damaging the internal components. Most of the procedures that follow require only a few simple tools, including the following:

- A Philips screwdriver

- A flat-tipped screwdriver

- A grounding strap

- An anti-static pad

Using your fingers can disconnect most of the connections. It is recommended that you do not use needle-nose pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.

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# Safety Precautions

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 stable surface during installation. Dropping it or letting it fall may cause damage.

7. The openings on the enclosure are for air convection to 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. Place the power cord in a way so that people will not step on it. Do not place anything on top of the power cord. Use a power cord that has been approved for use with the product and that it matches the voltage and current marked on the product's electrical range label. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.

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:
    a. The power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.
    d. The equipment does not work well, or you cannot get it to work according to the user's manual.
    e. The equipment has been dropped and damaged.
    f. The equipment has obvious signs of breakage.

15. Do not place heavy objects on the equipment.

16. 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 your obsolete outlet.

17. 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.

# Technical Support and Assistance

1. For the most updated information of NEXCOM products, visit NEXCOM's website at www.nexcom.com.

2. For technical issues that require contacting our technical support team or sales representative, please have the following information ready before calling:
   – Product name and serial number
   – Detailed information of the peripheral devices
   – Detailed information of the installed software (operating system, version, application software, etc.)
   – A complete description of the problem
   – The exact wordings of the error messages

Warning!
1. Handling the unit: Carry the unit with both hands and handle it with care.

2. Maintenance: To keep the unit clean, use only approved cleaning products or clean with a dry cloth.

3. CFast: Turn off the unit's power before inserting or removing a CFast storage card.

# Conventions Used in this Manual

Warning:
Information about certain situations, which if not observed, can cause personal injury. This will prevent injury to yourself when performing a task.

Caution:
Information to avoid damaging components or losing data.

Note:
Provides additional information to complete a task easily.

Safety Warning: This equipment is intended for installation in a Restricted Access Location only.

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# Package Contents

Before continuing, verify that the package that you received is complete.
Your package should have all the items listed in the following table.

| Item | Part Number | Description | Specification | Qty |
|------|-------------|-------------|---------------|-----|
| 1 | 4NCPF00310X00 | Terminal Blocks 3P | 3.81mm Female DIP Green | 1 |
| 2 | 4NCPF00316X00 | Terminal Blocks 3P | 5.08mm Female 180D DIP Green | 1 |
| 3 | 50311F0326X00 | Flat Head Screw | F3x5 Nylok NI+Heat Treatment | 8 |
| 4 | 50311F0330X00 | Round Head Screw | P2x3 NI Nylok | 4 |
| 5 | 5060600171X00 | 2.5 HDD Mylar E-LIN | 96.2x70x0.1mm | 1 |
| 6 | 5061500010X00 | HDD Pulling Tab for NISE 4000 | 100x35mm T=0.45mm Silicon | 1 |
| 7 | 6012200052X00 | PE Zipper Bag #8 | 170x240mm, w/China RoHS Symbol | 1 |
| 8 | 6012200053X00 | PE Zipper Bag #3 | 100x70mm, w/China RoHS Symbol | 2 |
| 9 | 60177A0489X00 | NIFE 300 Quick Reference Guide VER:A Size:A4 | Kramer | 1 |
| 10 | 6029900037X00 | DOW Corning 340 Silcone Heat Sink Compound (3g) | | 1 |
| 11 | 602DCD1113X00 | NIFE 300 DVD Driver VER:1.0 | JCL | 1 |

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# Ordering Information

The following information below provides ordering information for the NET 300 series.

- **NET 300 (P/N: A0J10030000X0)**
  Front-access high-performance EtherCAT controller

  **Image Selection**
  NET 300-ECM WES7 32-bit & RTX 2012 (P/N:88J10030000X0)
  NET 300-ECM WES7 32-bit & RTX 2016 (P/N:88J10030001X0)
  NET 300-ECM WES7 64-bit & RTX64 3.0 (P/N:88J10030002X0)

- **24V, 120W AC to DC power adapter w/o power core
  (P/N: 7400120015X00)**

# CHAPTER 1: PRODUCT INTRODUCTION

## Overview

NET 300-ECM is a high-performance EtherCAT controller, built in 6th generation Intel® Core™ i5-6500TE processor (Skylake-S). Based on a real-time operating system, NET 300-ECM's communication cycle time can be up to 250 µs, and also offers EtherCAT distributed clocks functions. The EtherCAT controller supports up to 64 slave modules which could be a wide variety of third-party devices, such as servo motors/drives and I/O modules. NET 300-ECM is the ideal intelligence system for machine applications. Its front-access I/O design simplifies the wiring, and it provides expansion mini-PCIe slot which can integrate other fieldbus devices for more application possibilities.

## Key Features

- EtherCAT technology with NexECM, Class A EtherCAT Master

- EtherCAT communication cycle up to 250 µs

- Support high-level API for CiA 402 profile

- Support 6th generation Intel® Core™ i5-6500TE processor

- Intel® Q170 PCH

- 1x DVI-D, and 1x HDMI for dual independent display support

- 4x USB 3.0, 2x USB 2.0 and 2x RS232/422/485 auto

- 1x Front access 2.5" SATA HDD tray

- 2x mini-PCIe socket support optional modules and mSATA device

- 1x External CFast socket and 1x SIM card socket

# Product Appearance

## Front View
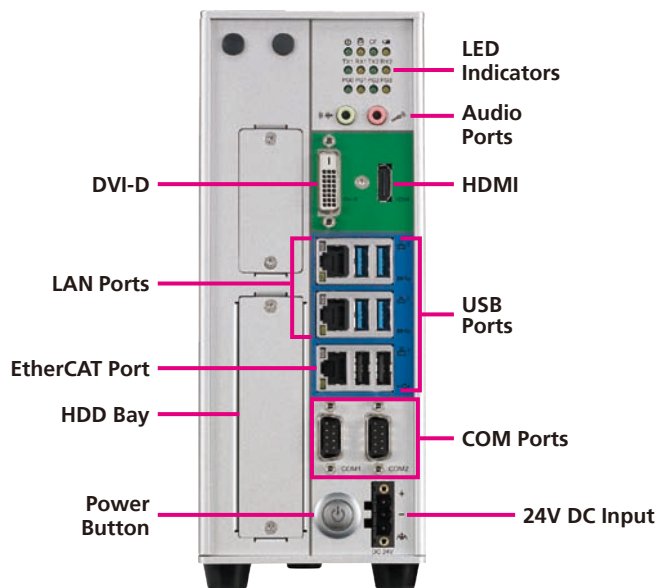


**LED Indicators**

Indicates the power, hard drive, CFast, battery, COM1/2 and GPO activity of the system.

**Audio Ports**

Line-out and mic-in ports to connect headphones, speakers or microphones.

**DVI-D**

Used to connect a digital LCD panel.

**HDMI**

Used to connect a high-definition display.

**LAN Ports**

LAN 1: EtherCAT LAN port.
LAN 2 and LAN 3: GbE LAN port used to connect the system to a local area network.

**USB Ports**

USB 2.0 and USB 3.0 ports to connect the system with USB devices.

**HDD Bay**

A hard drive bay used to install 2.5" HDDs.

**COM1 and COM2**

Two DB9 ports used to connect RS232/422/485 compatible devices.

**Power Button**

Press to power-on or power-off the system.

**24V DC Input**

Used to plug a DC power cord.

# Top View
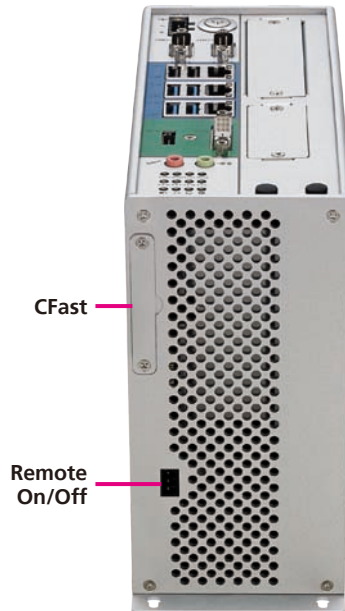
**Fieldbus Module Expansion**

Expansion slot for add-on fieldbus mini-PCIe modules.

**Remote On/Off Switch**

Used to connect a remote to power on/off the system.

**CFast Slot**

Used to insert a CFast card.

CFast —

Remote
On/Off —

# Hardware Specifications

## EtherCAT Master

- Slave module no.: up to 64
- Cycle time: up to 250μs
- Synchronization error: ±50ns
- Support CiA 402 standard protocol

## CPU Support

- Support 6th generation Intel® Core™ i5-6500TE, Quad Core, 2.3GHz, 6M Cache

## Main Memory

- 1x 4GB DDR4 SO-DIMM

## Display Option

- Dual independent display
  - HDMI + DVI-D

## Front I/O Interface

- 1x ATX power on/off switch
- 1x HDMI and 1x DVI-D
- 4x USB 3.0 ports (900mA per each)
- 2x USB 2.0 ports (500mA per each)
- 1x Line-out and 1x Mic-in
- 2x Antenna holes for Wi-Fi/GSM
- 1x Front access 2.5" HDD tray
- 1x mini-PCIe expansion support optional modules
- 2x RS232/422/485 auto with 2.5KV Isolation
- 3x Intel® I210IT GbE LAN ports, support WoL, teaming and PXE

## Top I/O Interface

- 1x 3-pin remote switch
- 1x CFast expansion
- 1x SIM card

## Storage Device

- 1x CFast (SATA 3.0)
- 1x 2.5" HDD (external, SATA 3.0)
- 1x 2.5" HDD (internal, SATA 3.0)
- 1x mSATA (via internal Mini-PCIe socket)

## Expansion Slot

- 2x mini-PCIe sockets for optional Wi-Fi/3.5G/4G LTE/Fieldbus modules

## Power Requirements

- AT/ATX power mode (default with ATX power mode)
- Power input: typical $+24V_{DC}$ ±20%, with reverse polarity protection
- Power adapter: optional AC to DC power adapter ($+24V_{DC}$, 120W)

## Dimensions

- 90 mm (W) x 185mm (D) x 251mm (H)

## Construction

- Aluminum and metal chassis with front access design

## Environment

- Operating Temperature:
  Ambient with air flow: -5°C to 55°C
  (according to IEC60068-2-1, IEC60068-2-2, IEC60068-2-14)

- Storage Temperature: -20°C to 85°C
- Relative Humidity: 10% to 93% (non-condensing)
- Shock Protection:
  – HDD: 20G, half sine, 11ms, IEC60068-27
  – CFast: 50G, half sine, 11ms, IEC60068-27
- Vibration protection w/HDD condition:
  – Random: 0.5Grms @ 5~500 Hz, IEC60068-2-64
  – Sinusoidal: 0.5Grms @ 5~500 Hz, IEC60068-2-64

## Certifications

- CE Approval
  – EN61000-6-2
  – EN61000-6-4
- FCC Class A
- LVD

## Pre-Installed Software Package

- Operating system: Windows Embedded Standard 7
- Real-time extension:
  – RTX2012/RTX2016 for 32-bit OS
  – RTX2014/RTX64 3.0 for 64-bit OS
- EtherCAT Master: NexECM
- EtherCAT configurator

## EtherCAT Support Table

| Feature Name | Short Description | NexECMRtx |
|---|---|---|
| **Basic Features** | | |
| Service Commands | Support of all commands | ✓ |
| IRQ Field in Datagram | Use IRQ information from Slave in datagram header | ✓ |

| | | |
|---|---|---|
| Slaves with Device Emulation | Support Slaves with and without application controller | ✓ |
| EtherCAT State Machine | Support of ESM special behavior | ✓ |
| Error Handling | Checking of network or slave errors, e.g. working counter | ✓ |
| **Process Data Exchange** | | |
| Cyclic PDO | Cyclic process data exchange | ✓ |
| **Network Configuration** | | |
| Reading ENI | Network configuration taken from ENI file | ✓ |
| Compare Network Configuration | Compare configured and existing network configuration during boot-up | ✓ |
| Explicit Device Identification | Identification used for hot connect and prevention against cable swapping | ✓ |
| Station Alias Addressing | Support configured station alias in slave, i.e. enable 2nd Address and use it | ✓ |
| Access to EEPROM | Support routines to access EEPROM via ESC register | ✓ |
| **Mailbox Support** | | |
| Support Mailbox | Main functionality for mailbox transfer | ✓ |
| Mailbox Polling | Polling mailbox state in slaves | ✓ |
| **CAN Application Layer Over EtherCAT (CoE)** | | |
| SDO Up/Download | Normal and expedited transfer | ✓ |
| Complete Access | Transfer the entire object (with all sub-indices) at once | ✓ |
| **Distributed Clocks** | | |
| DC | Support of distributed clock | ✓ |

# Mechanical Dimensions
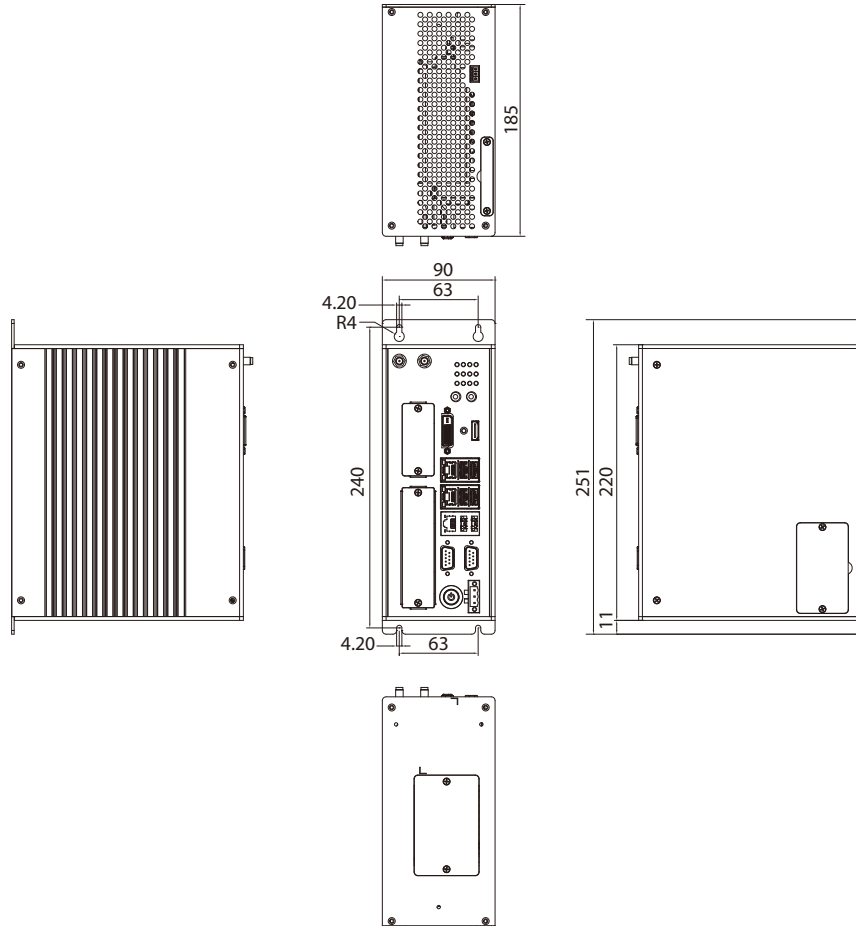
# CHAPTER 2: SOFTWARE OPERATION

NET 300-ECM is an EtherCAT master controller based on IntervalZero's real-time extension RTX. NET 300-ECM integrates NEXCOM's EtherCAT master software, NexECMRtx, to implement real-time operation and high performance communication.

**NET 300-ECM Pre-Installed Software Package**
- Operating system: Windows Embedded Standard
- Real-time extension: RTX
- EtherCAT master: NexECMRtx
- EtherCAT configurator
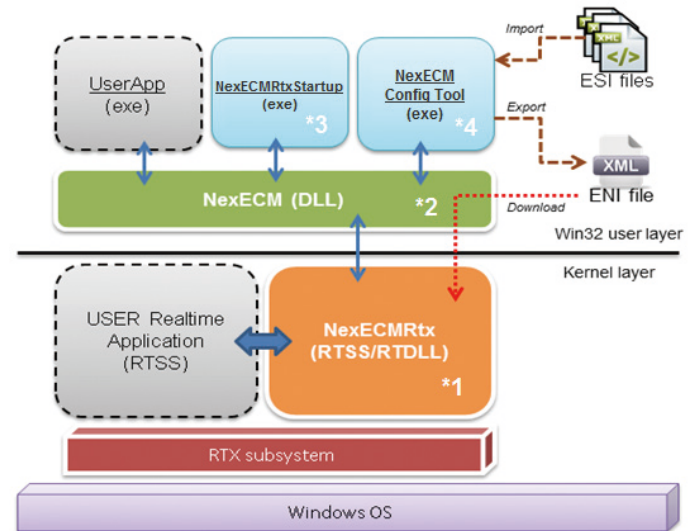
**System Structure**
(*1) NexECMRtx.rtss - EtherCAT Master Runtime stack
(*2) NexECM.dll - EtherCAT Master Win32 API libraries
(*3) NexECMRtxStartup.exe - EtherCAT Master Startup utility
(*4) NexECM Config Tool.exe - EtherCAT Master Configuration utility

The next section describes how to get started with the NET series platform, and the detailed steps of software operation.

# NexECM Introduction

NexECMRtx is an EtherCAT Master Communication Protocol solution. It is based on IntervalZero's RTX (RTX is a real-time extension on Microsoft Windows) to offer real-time communication between EtherCAT master and EtherCAT slave devices. NexECMRtx offers high level C/C++ APIs for rapid application development.

NexECMRtx also provides a configuration utility - NexECM EtherCAT configuration tool, a graphic user interface tool for customers to edit parameters for EtherCAT communication between master and slave devices. Its functions are as follows:

Step 1. Scan EtherCAT slave devices
Step 2. Import ESI file, and export ENI file
Step 3. Configure EtherCAT slave devices
Step 4. Monitor EtherCAT communication quality
Step 5. Test functions for EtherCAT slave devices

According to the EtherCAT standard document: ETG.1500, NexECMRtx currently supports Master functions, which are shown in the table below:

✓: Ready,  △: By Project Request

| Feature Name | Short Description | NexECMRtx |
|---|---|---|
| **Basic Features** | | |
| Service Commands | Support of all commands | ✓ |
| IRQ Field in Datagram | Use IRQ information from Slave in datagram header | ✓ |
| Slaves with Device Emulation | Support Slaves with and without application controller | ✓ |

| | | |
|---|---|---|
| EtherCAT State Machine | Support of ESM special behavior | ✓ |
| Error Handling | Checking of network or slave errors, e.g. working counter | ✓ |
| **Process Data Exchange** | | |
| Cyclic PDO | Cyclic process data exchange | ✓ |
| **Network Configuration** | | |
| Reading ENI | Network configuration taken from ENI file | ✓ |
| Compare Network Configuration | Compare configured and existing network configuration during boot-up | ✓ |
| Explicit Device Identification | Identification used for hot connect and prevention against cable swapping | ✓ |
| Station Alias Addressing | Support configured station alias in slave, i.e. enable 2nd Address and use it | ✓ |
| Access to EEPROM | Support routines to access EEPROM via ESC register | ✓ |
| **Mailbox Support** | | |
| Support Mailbox | Main functionality for mailbox transfer | ✓ |
| Mailbox Polling | Polling mailbox state in slaves | ✓ |
| **CAN Application Layer Over EtherCAT (CoE)** | | |
| SDO Up/Download | Normal and expedited transfer | ✓ |
| Complete Access | Transfer the entire object (with all sub-indices) at once | ✓ |
| SDO Info Service | Services to read object dictionary | ✓ |
| Emergency Message | Receive emergency messages | ✓ |

| Ethernet over EtherCAT (EoE) | | |
|---|---|:---:|
| EoE | Ethernet over EtherCAT | △ |
| **File over EtherCAT (FoE)** | | |
| FoE | File over EtherCAT | △ |
| **Servo over EtherCAT (SoE)** | | |
| SoE | Servo over EtherCAT | △ |
| **Distributed Clocks** | | |
| DC | Support of Distributed Clock | ✔ |

Documents for more detailed information about NexECM can be found from **Start** > **All Programs** > **NEXCOM** > **NexECMRtx** > **Doc**.

# RTX Activation

Every NET series platform comes with a sticker on the bottom of the platform that contains a set of RTX activation key. You need to activate RTX with the runtime license to start EtherCAT master and related operations. The steps required to activate your product will depend on whether or not the machine is connected to the Internet.
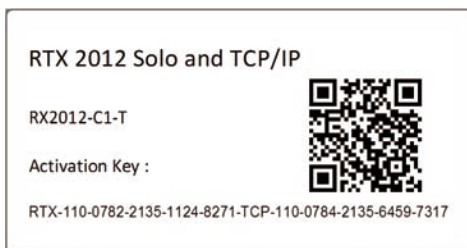


**Figure 1. RTX Activation Key Sticker**

## Activate RTX with Internet Connection

Step 1. Open the **Activation and Configuration** dialog. This dialog appears once RTX has been installed. You can also launch it from **Start** > **All Programs** > **IntervalZero** > **RTX 2012** > **RTX Activation**.
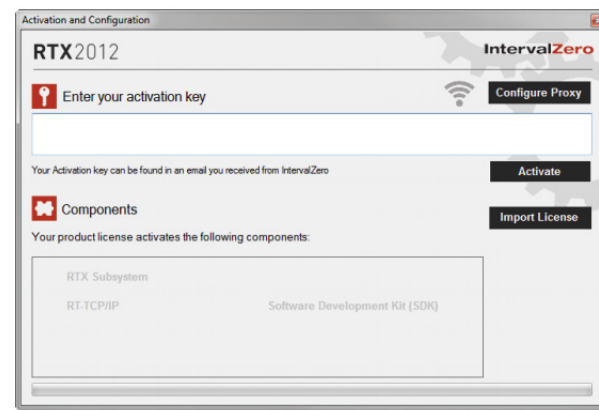


**Figure 2. Activation Dialog**

Step 2. Make sure your machine is connected to the Internet with access to the License Server. If no network connection is found, make sure all network cables are plugged in and click the Network icon to refresh. If a network connection still isn't found, you may need to configure a Proxy Server.

Step 3. Enter the activation key and then click **Activate**. The product components activated by your key are indicated by a check mark in the *Components* box.

You need to enter the full Activation Key at once! Take *Figure. 1* as example, the Activation key you should key in is:
RTX-110-0782-2135-1124-8271-TCP-110-0784-2135-6459-7317
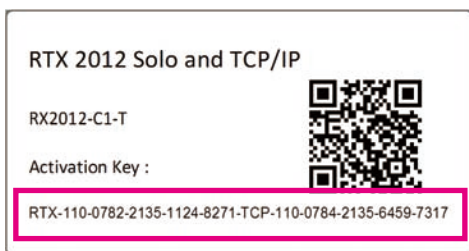


**Figure 3. Key Section in the Sticker**

## Activate RTX without Internet Connection

If the computer on which you installed RTX is not connected to the Internet, the activation process requires a few additional steps.

Step 1. Open the **Activation and Configuration** dialog. You can launch it from **Start** > **All Programs** > **IntervalZero** > **RTX 2012** > **RTX Activation**.

Step 2. Check your Internet connection. Continue with these steps only if there is no connection to the Internet. If you are connected, follow the steps in the previous section.

Step 3. Enter your activation key and then click **Activate**.

Step 4. In the dialog that appears, click **Yes** to create a fingerprint file.
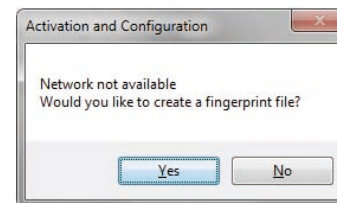


**Figure 4. Fingerprint Dialog**

Step 5. In the **Save As** dialog, name the file fingerprint.rfp. By default, the file will be saved to the desktop.

Step 6. Navigate to the desktop, and then copy and paste the file fingerprint.rfp to an external device.

Step 7. Connect the device to a machine with Internet connectivity.

Step 8. Launch a web browser, and navigate to http://Activation.IntervalZero.com.
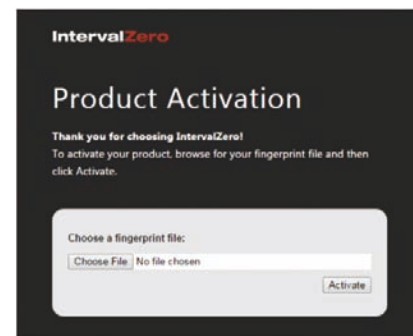


**Figure 5. Product Activation Website**

Step 9. Browse for and open the file fingerprint.rfp.

Step 10. Click **Activate** to generate a license (.lic) file.

Step 11. In the **File Download** dialog, click **Save**.

Step 12. Copy the file License.lic to the external device, and transfer it to the machine on which RTX is installed.

Step 13. In the **Product Activation** dialog, click **Import License File**.

Step 14. Browse for and open the file License.lic.

# Microsoft Visual Studio Installation

For all of the NET series platforms, RTX are pre-installed. If you want to build RTX programs in Visual Studio, please refer to the following installation steps.

Step 1. Install Visual Studio. The supported versions list is in the table below.

| Operating System | RTX Version | Visual Studio Version |
|---|---|---|
| WES7, 32-bit | RTX 2012 | Visual Studio 2010<br>Visual Studio 2012 |
| | RTX 2016 | Visual Studio 2013<br>Visual Studio 2015 |
| WES7, 64-bit | RTX64 2014 | Visual Studio 2013 and up |
| | RTX64 3.0 | Visual Studio 2013 and up |

Step 2. After installation, please check the RTX Version on the NET platform. (**Windows** > **Start Menu** > **Control Panel** > **Programs** > **Programs and Features**). As shown in the example, the version is IntervalZero RTX 2012 with Update 4.
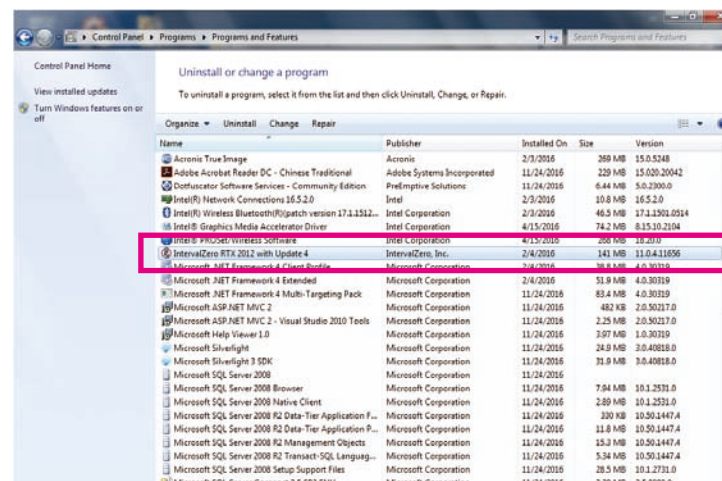


Step 3. Download the related RTX runtime installation file, from the IntervalZero download site.

- RTX 2102
  (http://www.intervalzero.com/rtx-2012-downloads/)
- RTX 2016
  (http://www.intervalzero.com/rtx-2016-downloads/)
- RTX64 2014
  (https://www.intervalzero.com/rtx-downloads/rtx64-downloads/rtx64-2014-downloads)
- RTX64 3.0
  (https://www.intervalzero.com/rtx-downloads/rtx64-downloads/rtx64-3-0-downloads)

Step 4. Double-click the RTX install package, and click **Next >**.
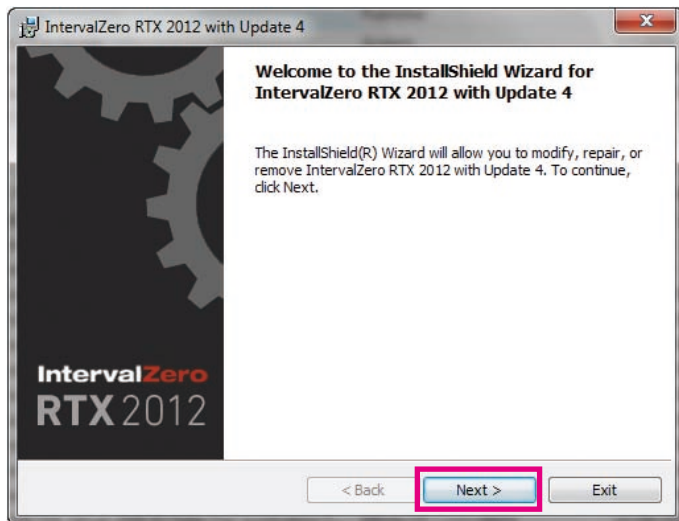
Step 5. Select **Modify**.
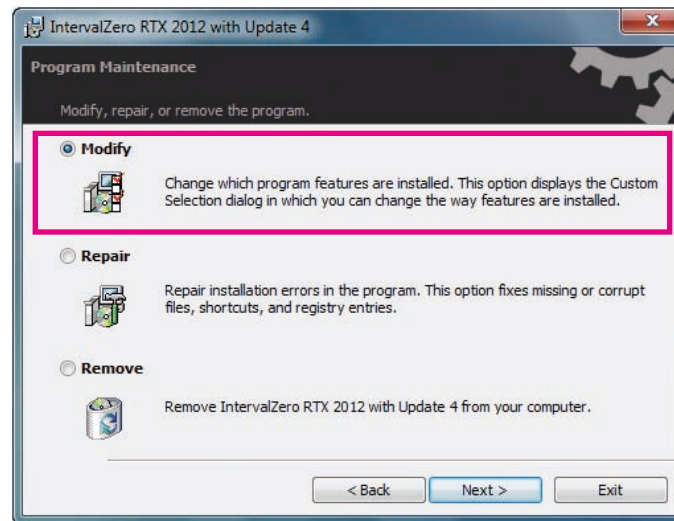
Step 6. Add the installed Visual Studio software in the list.
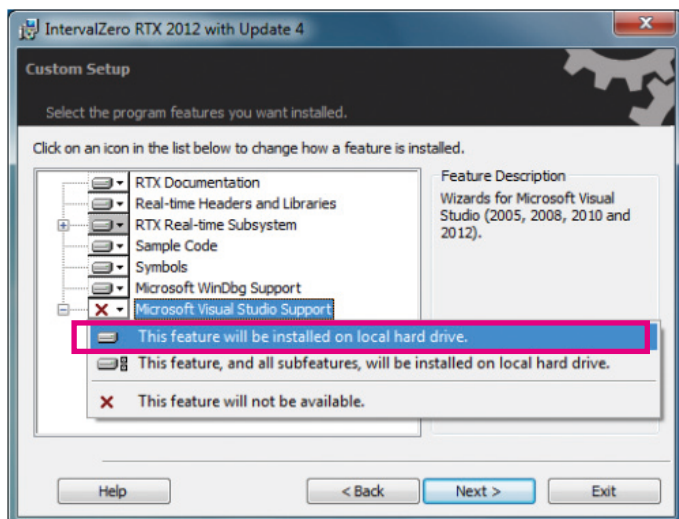
Step 7. Click **Next >**.
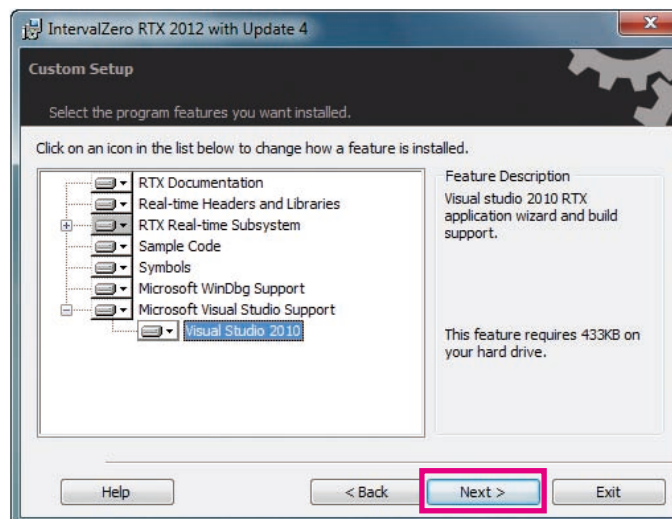
Step 8. Click *Install*, and then click *Finish*.
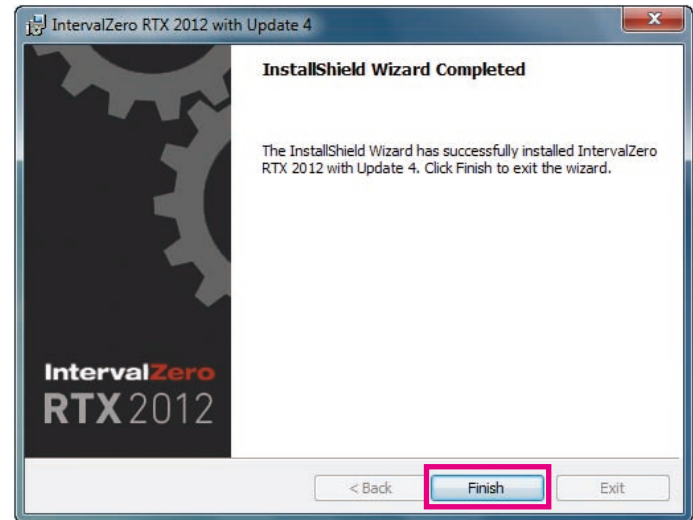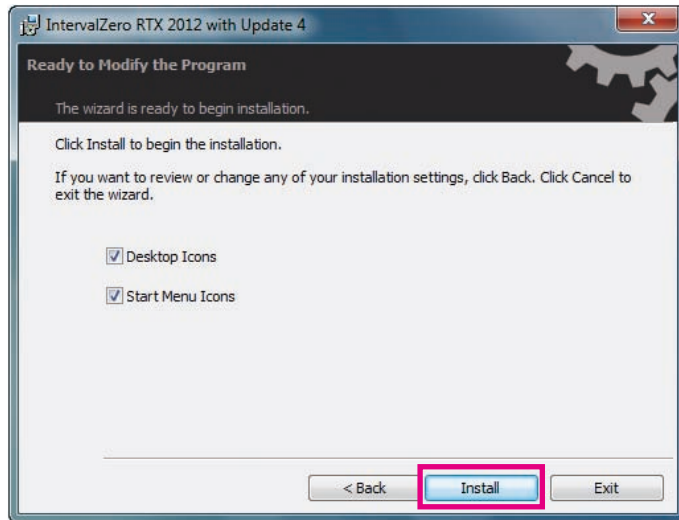
Step 9. Activate RTX license, you can refer to the previous section for the activation steps.
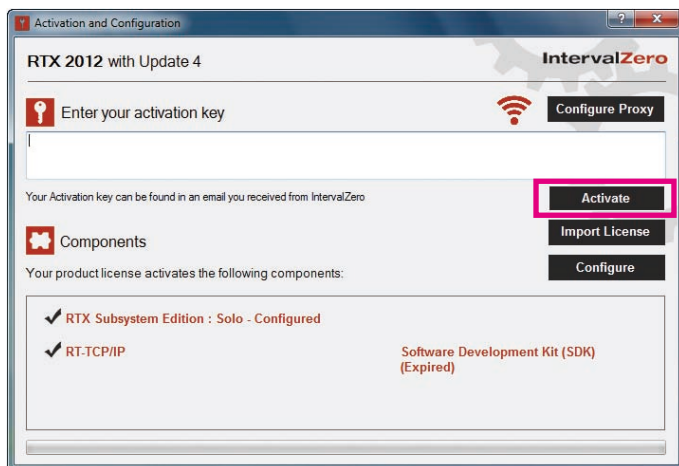


Step 10. After completing the steps, you can start to build your RTX program.

**15**
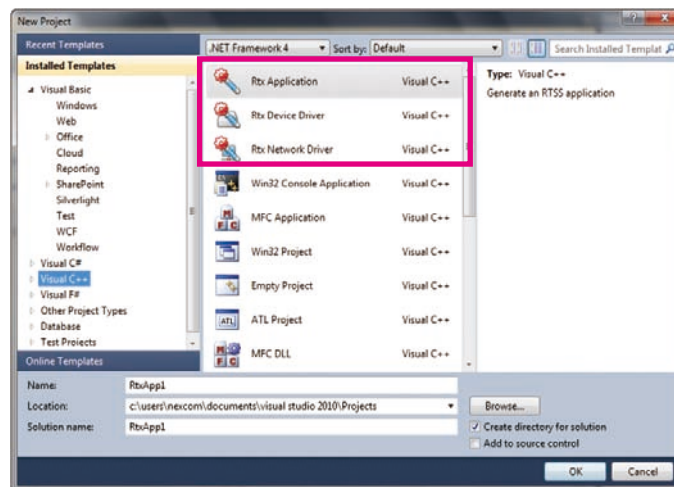
# EtherCAT Utilities

## EtherCAT Configuration Tool

You can achieve the following with the NexECM Configuration Tool master utility:

1. Scan EtherCAT slave device
2. Import ESI file, and export ENI file
3. Edit CoE slave devices PDO mapping
4. ProcessData access
5. CoE slave devices SDO communication test
6. Monitor EtherCAT communication quality
7. Test slave devices' operation

**Operation Flow**
The basic operation flow of NexECM Configuration Tool is as follows:

```
┌─────────────────────┐
│   Load ESI Files    │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Scan Available    │
│  Network Interface  │
│        Cards        │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Scan ECAT Slave   │
│      Devices        │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Set Parameters    │ ─ ─ ─ ┐
└─────────────────────┘       │
          │                   │
          ▼                   │
┌─────────────────────┐       │
│    Communication    │       │
│        test         │       │
└─────────────────────┘       │
          │                   │
          ▼                   │
┌─────────────────────┐       │
│   Export ENI File   │ ◄ ─ ─ ┘
└─────────────────────┘
```
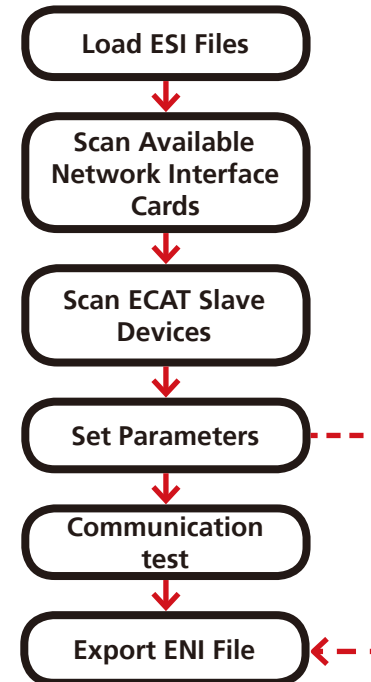
ESI: An XML file to describe the EtherCAT Slave Devices Information.
ENI: An XML file to describe the EtherCAT Network Information.

- **Load ESI Files:**
  When NexECM Configuration Tool starts, it will automatically import all the files in the folder whose location is "Program Files/NEXCOM/NexECMRtx/tools/x32/ESI_File" or "Program Files/NEXCOM/NexECMRtx/tools/x32/ESI_File."

- **Scan Available Network Interface Cards:**
  NexECM Configuration Tool detects RTX environment and automatically finds all available network interface cards. RTX network interface card drivers are pre-installed on every NET series platform, and LAN1 of the platform is set as EtherCAT port.

- **Scan ECAT Slave Devices:**
  NexECM Configuration Tool scans the ECAT slave devices on the selected network port. If a device has no matched ESI file (VendorID, DevicID not matched), it will be defined as "Unknown". Move the mouse cursor to "Unknown" device will pop up the hardware information (VendorID, DeviceID and RevisionNumber).

- **Set Parameters:**
  NexECM Configuration Tool generates the plan of PDO and ProcessData memory according to ESI files, then export to ENI file automatically. Users can also use the NexECM Configuration Tool built-in PDO mapping editor to customize their own plan, and then export the final setting to ENI file.

- **Communication Test:**
  User can start all the EC-Slave devices directly; the status will be changed from initial state (INIT) to operation state (OP). If there is a slave device which cannot be transferred to the operation state successfully, you can find the status and messages from the main page's area 4 and area 5 (in the following figure).

- **Export ENI file:**
  If the tests on each devices show normal, the user can use the function "Export ENI", to export the ENI file to the storage device. Actually, when you use the "Start Network" feature, the system automatically exports the current settings and network topology to ENI file.
  (The default path is C:\ENI_NexCAT_Export.xml)

**NexECM Configuration ToolMain Page**
The NexECM Configuration Tool Main Page is divided into 5 areas, we will explain it in the following:
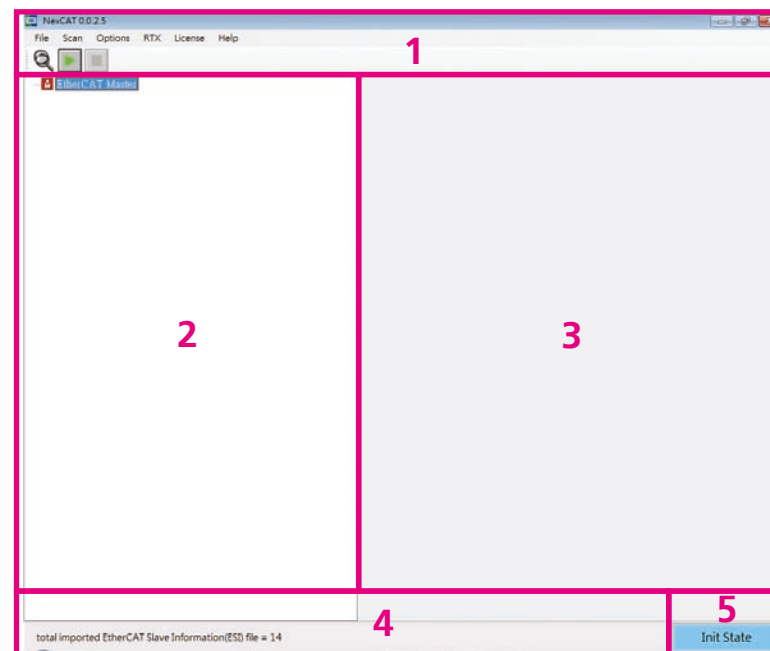
▪ **Area 1:**
Shows the software name and version, e.g. NexECM Configuration Tool0025.

| Icon | Description |
|---|---|
|  | Scan NIC: Find the available network interface and display it on the form |
|  | Start Network: Start communication and export ENI file to the default path (C:\) |
|  | Stop Network: Stop all communication of EtherCAT slave devices |

▪ **Area 2:**
Shows the entire network topology and all online EtherCAT slave devices. If the EtherCAT slave device fails to be scanned and shows "Unknown", please update the ESI file of the slave device by contacting the slave device supplier and import it again.
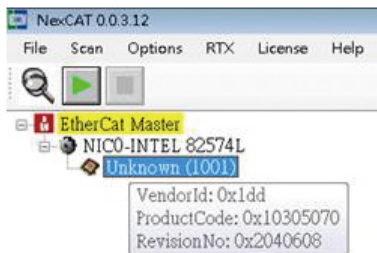


"Unknown" device: Popup info when cursor is moved onto the item.

▪ **Area 3:**
Shows the menu of parameters. You can set the slave device parameters and master parameters here.

▪ **Area 4:**
Shows message and error code.

▪ **Area 5:**
Shows the state of EtherCAT slave devices. Currently we have 4 states:

1. **Initial:** There is no communication and all slave devices are in initial state.
2. **Error:** There is communication but slave devices cannot be switched to OP state. Common errors are: ENI file does not match with the actual network topology; ESI version does not match with the slave device version and so on.
3. **Retry:** When the parameter "Link Error Mode" of ECAT master is set to "Auto re-connect" (refer to the NexECMRtx User Manual "Chapter 3.1.6") and slave device is in "OP" state but experiencing a link problem, the master will show "Retry" status and attempt to re-connect the disconnected slaves until they are working. Master will also try to re-connect those lost link modules, while other modules can operate as usual. This status is displayed continuously until all slaves are back to "OP" state.
4. **Running:** Network is connected and all slave devices are in "OP" state.

**Set Slave Parameters**
Select the slave device and right click to bring up a pop-up menu, choose "Set Slave Parameters".
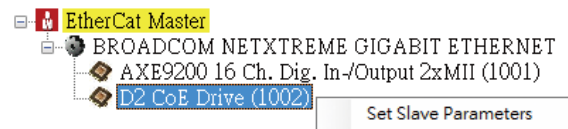
Slave device setting page must be used before starting the Network, because all the parameters changed are valid only before the start of the Network. If user changed the settings after starting the Network, a network re-start is needed.
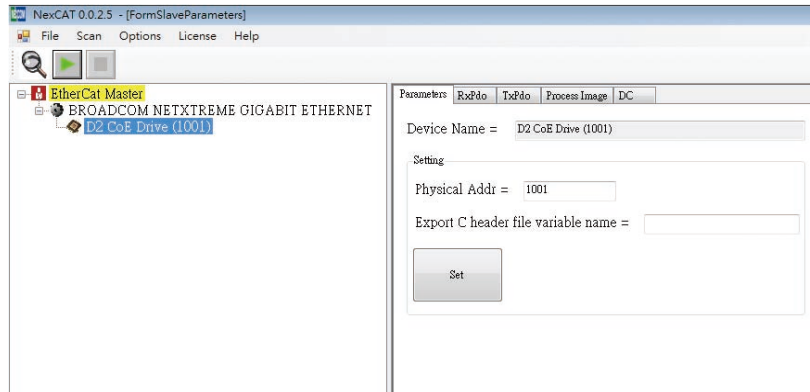


## 1. Parameters Tab



**Device Name:** Shows the name of current selected slave device.
**Physical Addr:** Defines the node address (configured address) for a slave device.
**Export C header file variable name:** Exports the process image for each slave, it must be used with function "Export C file" of Master Parameters setting (refer to the NexECMRtx User Manual "Chapter 3.1.6").

```
#define _Physical Addrdsss (+variable name)_ObjectName
[ProcessData offset]
```

Example:

Export C header file variable name= "_AXIS"

Export C header will be:

```
#define _1001_AXIS_Statusword            16777216
#define _1001_AXIS_PositionActualValue   16777218
#define _1001_AXIS_VelocityActualValue   16777222
#define _1001_AXIS_Controlword           16777216
#define _1001_AXIS_TargetPosition        16777218
```

## 2. RxPdo & TxPdo Tab



**Table Description:**

- **RxPdo(TxPdo) Name:** Default name is based from ESI file, user can change and export it to ENI.
- **Index:** Parameters from CoE. Changes are not recommended.
- **SM:** Number of Sync Manager, user can change the value.
- **Mandatory:** Defines the necessary parameters.
- **Fixed:** Defines which parameter the user can change.
- **Entry Name:** From CoE, user can change and export it to ENI.
- **Indicator:** Parameter from CoE. Changes are not recommended.
- **Sub Indicator:** Parameter from CoE. Changes are not recommended.
- **BitLen:** Parameter from CoE. Changes are not recommended.
- **DataType:** Parameter from CoE. Changes are not recommended.
- **Save Button:** Save changes after editing.
- **Default Button:** Revert to default ESI setting.
- **Clear All Button:** Clear PDO setting.

## 3. Process Image Tab

User can edit settings in the "RxPdo" or "TxPdo" tab. After editing, you can check the corresponding memory address in this tab. The edited settings will be valid after you click on the *save* button.



**Table description:**

- **Input(Output) Name:** Uses the name in the "RxPdo" or "TxPdo" tab.
- **BitSize:** Variables Memory Size.
- **BitOffset:** Variable Offset (based on setting in "RxPdo" or "TxPdo").
- **Memory Address:** Variables Memory Address.

## 4. DC Tab

This tab is used to set DC mode. Default DC settings of each slave are from its ESI file.



- **Mode (Description):**
  Select the DC mode. If the slave supports DC mode, the default is enable "DC" sync mode. As long as (a) slave(s) device's DC mode can be selected in the network, EtherCAT Master will have a DC output information (function) of ENI File. To turn off the DC function from the network, the user must set all slaves as "free run" mode.

- **DC SYNC Activation: (ESC Register 0x0980~0x0981)**
  0x0000 – Disable SYNC0 & SYNC1 (Free Run)
  0x0300 – Activate SYNC0 (DC Sync)
  0x0700 – Activate SYNC0 & SYNC1

  This is an advanced setting. This column will be displayed according to the ESI file selected in the DC mode. It is used to control DC SYNC signal output. Generally leave it at default.

- **Apply To Other:**
  Apply current slave device's settings to other slaves. Clicking the button will pop up the following dialog.

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## Set Master Parameters

Select the device and right click to bring up the pop-up menu, choose "Set Master Parameters".
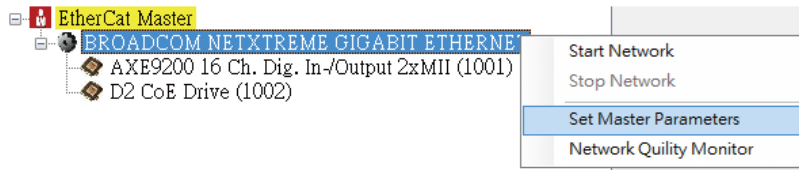


There are 2 tabs:

1. System
2. ProcessImage

Described as below:

## System Tab
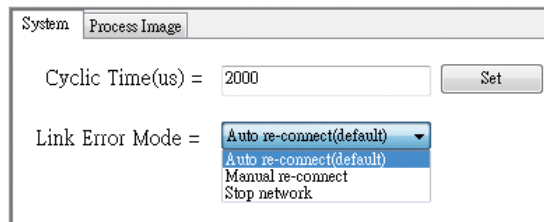


**The Cyclic Time:** Used to set the system performance. The values are communication time or refresh frequency between EC-Master and EC-Slave devices. The minimum value can't be larger than system limit value. This also can be set by calling API. Unit is micro second (us).

**Link Error Mode:** Behavior when there is a link error. After the network has been started, slave devices will be in "Operation" state. There are three modes when EC-Master detects the link error:

User also can set the mode by calling API, please refer to the NexECMRtx User Manual "Chapter 6.2".

▪ **Auto re-connect(default):** When a slave device loses communication, the main page "Area 5" will show "Slave Retry" message, while the system continues to re-connect automatically until the connection succeeds. Other slave devices continue to work at the same time.

▪ **Manual re-connect:** When a slave device loses communication, other slave devices will continue to work normally. The main page "Area 5" will show "Error message" and continue the next time when a network connection is successful.

▪ **Stop network:** When a slave device loses communication, EC-Master will stop the network. The main page "Area 5" will show "Error message".

## Process Image Tab



**Export C header file**
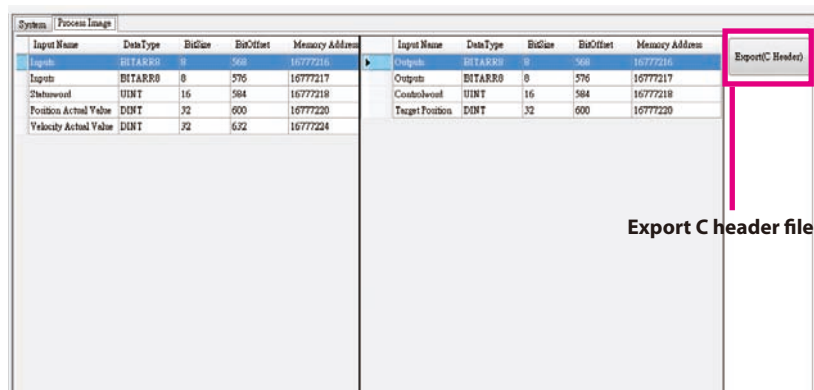
- **Network process image map**
  The format is the same with the process image of a slave described in the NexECMRtx User Manual "Chapter 3.1.5", but here you can see the memory allocation for the entire network topology, or use "Export C Header File" function to output variables of each slave device. You also can write your own program when the memory is accessed directly through the API.

- **Export C header file for process image map**
  Click "Export C Header File" button.
  PDO memory mapping offset can be output as a C header (*.h), It is easy to maintain your code using the define symbol when PDO mapping has changed. Output symbol format please refer to the NexECMRtx User Manual "Chapter 3.1.5".

### ESI List (ESI File Management)

When using NexECM Configuration Tool to scan the devices, you can get how many slave devices and obtain hardware information (e.g. Device ID etc). Through comparing the information, NexECM Configuration Tool will get which ESI belongs to. (About ESI file please refer to the NexECMRtx User Manual "Chapter 3.1.3"). If users get a new ECAT slave device, they must import the ESI of the device.

2 methods to manage the ESI files:
1. Add/Remove the ESI file to the specified folder directly. When you add a new ESI file, you need to restart the NexECM Configuration Tool.

2. Use "ESI list" page to import/delete ESI files. The action of import & delete is applied immediately. No need to restart the NexECM Configuration Tool.



**Show ESI List**



**ESI List Page**
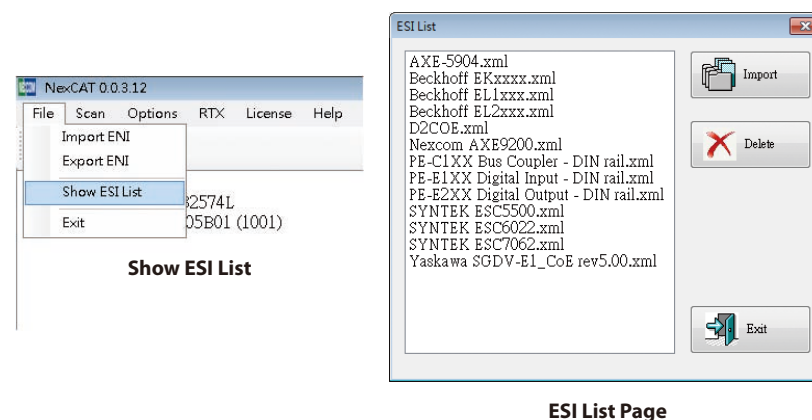
### DIO User Interface

In Area 2, double-click the selected DIO slave device which you want to test, the DIO operation menu will appear. NexECM Configuration Tool will determine the device for DI, DO or DIO devices and automatically calculate the number of IO.

When the mouse cursor is at the DO button, the user can manually press DO button to operate DO, or user can use the "Cyclic function" and let the DO slave device to run automatically to start Marquee features starting from small (0) to large, and repeated run. After you check the box for Cyclic, it operates automatically. After the check is canceled, the program stops at the last channel being executed in operation.
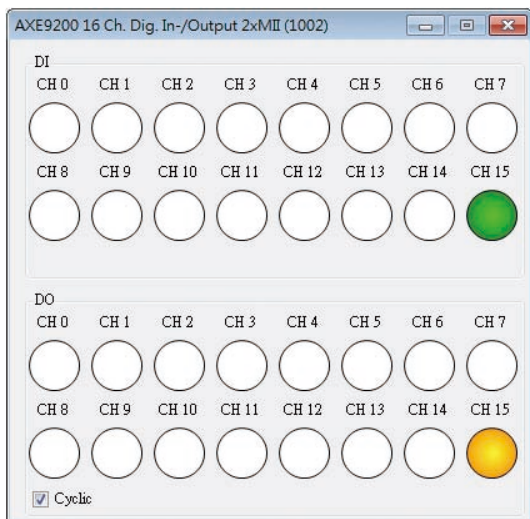
### CoE-SDO Operation Page

In Area 2, double-click the selected CoE slave device which you want to test, the CoE operation menu will appear. NexECM Configuration Tool will automatically determine whether the slave device supports CIA 402.

Press the Refresh button and this will update parameter values automatically, the user can choose to represent decimal or hexadecimal display format. If a parameter is float, then the parameter from binary system will display in float.

If the user wants to change parameters value, you can use the mouse and click the left button twice quickly to edit the parameters value. After editing is complete, press the Enter key or leave the table then it can be successfully written. If the write fails or does not meet the standard written format data form, the parameter values automatically go back to the state before editing.
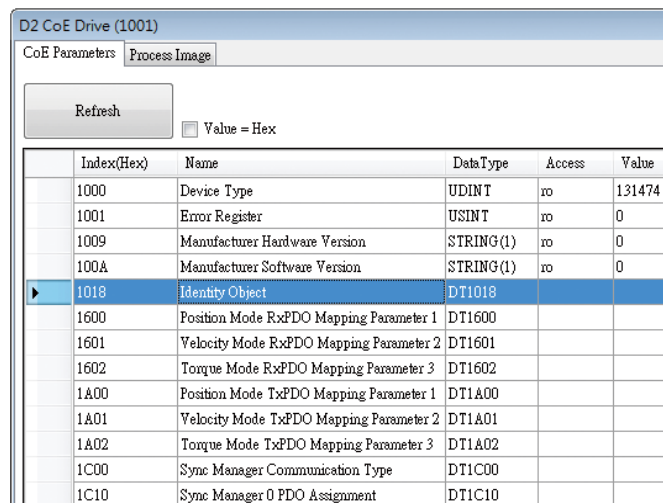
**CoE Parameters**

If the parameter of data type is "dataType", it indicates that the parameters contain sub parameters (Sub index). The user may want to access the parameters by double-clicking the mouse, and determine if the program has sub parameters (Sub Indicator). There will be a child window shown below. It is the same to read and write as mentioned in previous chapter.



**Sub Parameters**

**Process Image Parameters Operation Page**



Users can access PDO (process data object) data after starting the network. When the checkbox "input data (output data) = hex" is checked, the data in the table is display as hexadecimal format.

## Network Quality Monitor

Users can open network communication quality test page after starting the network. Perform a Master to each slave device communication packet test. To show this page, you can right click the mouse on the node of network card (NIC) in NexECM Configuration Tool Area 2 and select "Network Quality Monitor" and the Network quality test page will appear.
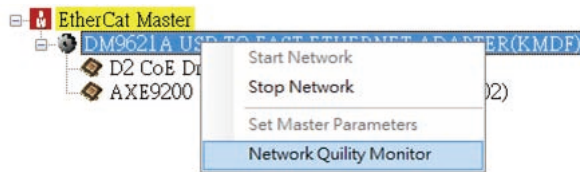


**Right Click on the NIC node**



**Network Quality Monitor Page**

- **Inc Address:** The Slave ID will follow the order of the scanned, zero based.

- **Send Frame Count:** The numbers of test frames are sent to slave device, check if the slave devices are in "OP" state. The frequency of the send frames is 10 ms.

- **Recv Frame Count:** The number of response frames. Normally, Both Send Frame Count and Recv Frame Count should be consistent.

- **Lost Frame Count:** Lost frames.

- **Error Frame Count:** The return frames data content does not belong to the slave device and state != OP.

Their relationship are as the following:

Send Frame count = Recv Frame count + Lost Frame count
Recv Frame count = Normal Frame (state == OP) + Error Data Frame count.

## NexECMRtxStartup

"NexECMRtxStartup.exe" provides the convenience while you're using EtherCAT Master. Based on "NexECMRtxConfig.ini", we offer 3 major functions:

1. Load EtherCAT Master - NexECMRtx.rtss
2. Download ENI file (EtherCAT Network Information)
3. Load user's RTX appliation (ex: UserRTXApp.rtss)

You can modify NexECMRtxStartup.ini content by "Notepad" or text editing software to meet your current files placed circumstances. Usually you need to modify "Application path" and "Network information file (ENI) path". You can find the ".ini" files "C:\Program Files\NEXCOM\NexECMRtx\tools". Please refer to the following illustration.



**NexECMRtxConfig.ini Content**

| | Description |
| --- | --- |
| **PATH_ENI** | |
| PATH: | Network Information File (ENI) Path OPTION: Check the network interface card information by using ENI file. 0: Use ENI file. 1: Do not use ENI file, use Parameter setting. |
| **PATH_NEXECMRTX_DRIVER** | |
| PATH: | NexECMRtx.rtss File Path |
| **PATH_USER_APP (Option)** | |
| PATH: | Fill your RTX application (*.rtss) path and file name. |

# Acronis System Image Recovery

Every NET system platform is equipped with **Acronis Startup Recovery Manager** and users need to activate it in Windows first to enable its recovery function. **Acronis Startup Recovery Manager** is a modification of the bootable agent, residing on the system disk in Windows and configured to start at boot time on pressing F11. It eliminates the need for a separate media or network connection to start the bootable rescue utility.

## Activate Acronis Startup Recovery Manager

Please refer to the following steps to activate **Acronis Startup Recovery Manager**.

Step 1. Open **Acronis** on your desktop, choose **Tools and utilities** page then click **Acronis Startup Recovery Manager**.
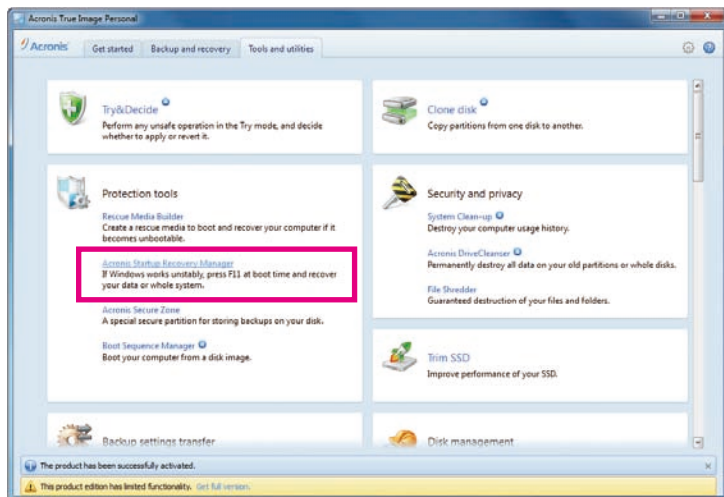


**Figure 1. Acronis Startup Page**

Step 2. Click **Activate**, then you will see the successful information. (Figure 3)
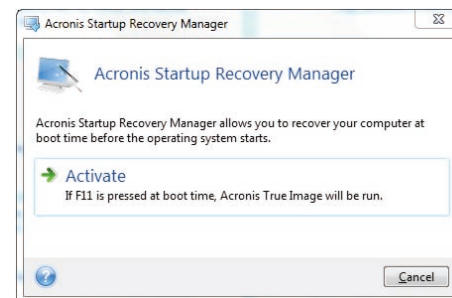


**Figure 2: Acronis Startup Recovery Manager**



**Figure 3: The Information for Startup Recovery Manager**

Step 3. Reboot your NET Series platform, and if the following prompt appears on your screen, it means the configuration for **Acronis Startup Recovery Manager** was successful.

**Starting Acronis Loader…**
**Press F11 to run Acronis Startup Recovery Manager…**

## Backup Your NET Series System

When the installations and license activations of the necessary software in Windows are done, users can backup system image for the complete system. Once the system is backed up, users can always recover the operating system despite of any OS problem. This allows users to have a clean and complete backup image for your NET Series System.

The following steps show you how to back up system image with **Acronis Tools**.

Step 1. Double-click **Acronis** shortcut at desktop, and choose **Backup and recovery page**, then click **Back up data**.
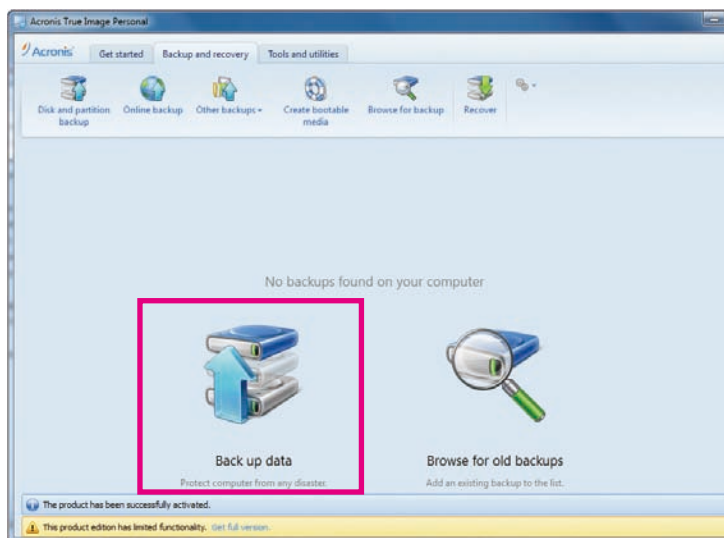


**Figure 4. Backup and Recovery Page**

Step 2. Back up the source to the **Acronis Secure Zone**, and name the backup file, then click **Back up now**.
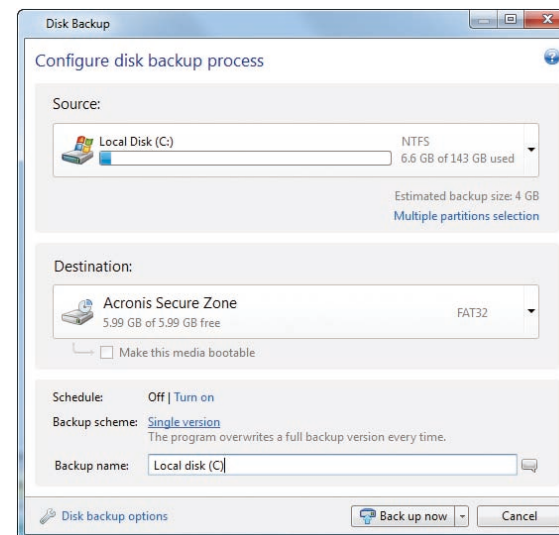


**Figure 5. Disk Backup Page**

Step 3. Wait for a few minutes, the backup file for your system will be created in the **Acronis Secure Zone**.
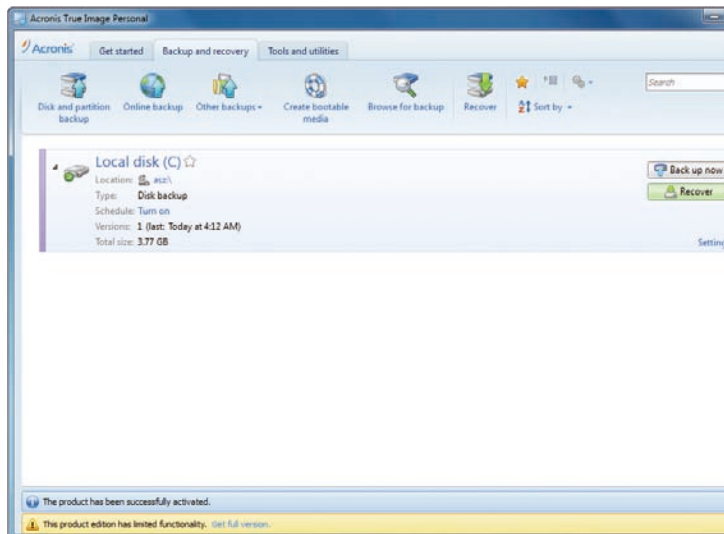


**Figure 6. Back Up Complete**



**Figure 7. Acronis Secure Zone**

**Note:** You can adjust the size for **Acronis Secure Zone** by referring to the following steps.

Step 1. Choose **Tools and utilities** page then click **Acronis Secure Zone**.



**Figure 8. Adjust the Size for Acronis Secure Zone (1)**

Step 2. Choose a selection which you need, then you will see the adjustment selections after you click **Next >**.



**Figure 9. Adjust the Size for Acronis Secure Zone (2)**

Step 3. Choose Disk 1: (C:), then you can adjust the size for **Acronis Secure Zone** (Figure 10), then click **Next >** to finish.
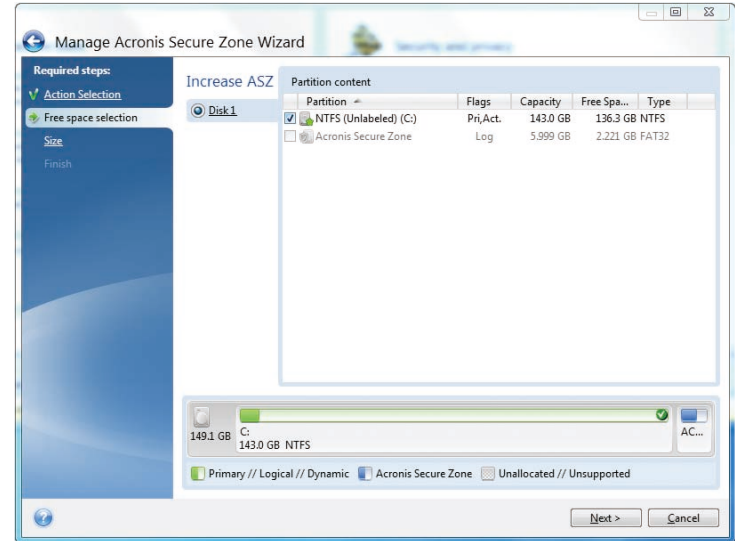


**Figure 10. Adjust the Size for Acronis Secure Zone (3)**
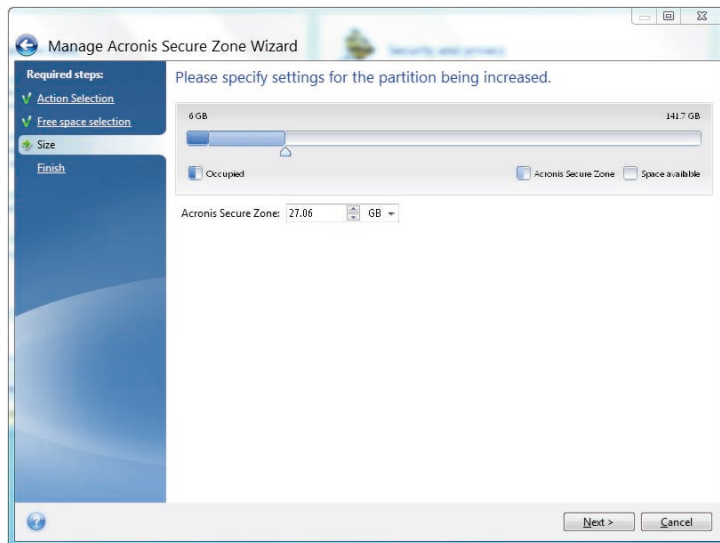
**Figure 11. Adjust the Size for Acronis Secure Zone – Increase Size (4)**

## Recover Your NET Series System

This chapter shows you how to recover your system with **Acronis Startup Recovery Manager**. The prompt "**Press F11 for Acronis Startup Recovery Manager…**" will appear anytime you boot your system and you can simply hit the **F11** key on the keyboard to start the recovery process. The recovery function works even when the operating system fails.

The following steps will show you how to recover the system by using **Acronis Startup Recovery Manager**.

Step 1. Reboot the NET platform, when the following statement appears on your screen, hit **F11** immediately.

> **Starting Acronis Loader…**
> **Press F11 to run Acronis Startup Recovery Manager…**

Step 2. Enter the Linux kernel command line: **quiet** in the Boot menu, then click **OK**.

Step 3. After entering the **Acronis True Image Personal**, click **Acronis True Image**.

Step 4. Wait for initialization to finish and enter into the Home page, click **Recover**, then you will enter the **Recovery Wizard System**.

Step 5. In the **Recovery Wizard System**, you need to select the NET Series backup (which platform is used, e.g., NET3600…) in the Archive selection, then click the **Next >** button.

Step 6. In the **Recovery method** page, choose **Recover whole disk and partitions**, then click the **Next >** button.

Step 7. In the **What to recover** page, select NTFS(C:) in Disk 1, then click the **Next >** button.

Step 8. In the **Specify settings of Partition C** page, the first part is **Partition location**, click **New location**, then choose NTFS(C:) and click **Accept**. The second part is **Partition Type**, click **Change default**, select Primary, then click **Accept**.

Step 9. After completing Steps 1 to 8, you will see the **Summary** information in the **finish** page if those steps are set successfully. Click **Proceed** to start recovery.

# CHAPTER 3: JUMPERS AND CONNECTORS

This chapter describes how to set the jumpers and connectors on the NET 300-ECM motherboard.

## Before You Begin

- Ensure you have a stable, clean working environment. Dust and dirt can get into components and cause a malfunction. Use containers to keep small components separated.

- Adequate lighting and proper tools can prevent you from accidentally damaging the internal components. Most of the procedures that follow require only a few simple tools, including the following:
    - A Philips screwdriver
    - A flat-tipped screwdriver
    - A set of jewelers screwdrivers
    - A grounding strap
    - An anti-static pad

- Using your fingers can disconnect most of the connections. It is recommended that you do not use needle-nosed pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.

- Before working on internal components, make sure that the power is off. Ground yourself before touching any internal components, by touching a metal object. Static electricity can damage many of the electronic components. Humid environments tend to have less static electricity than dry environments. A grounding strap is warranted whenever danger of static electricity exists.

## Precautions

Computer components and electronic circuit boards can be damaged by discharges of static electricity. Working on computers that are still connected to a power supply can be extremely dangerous.

Follow the guidelines below to avoid damage to your computer or yourself:
- Always disconnect the unit from the power outlet whenever you are working inside the case.

- If possible, wear a grounded wrist strap when you are working inside the computer case. Alternatively, discharge any static electricity by touching the bare metal chassis of the unit case, or the bare metal body of any other grounded appliance.

- Hold electronic circuit boards by the edges only. Do not touch the components on the board unless it is necessary to do so. Don't flex or stress the circuit board.

- Leave all components inside the static-proof packaging that they shipped with until they are ready for installation.

- Use correct screws and do not over tighten screws.

# Jumper Settings

A jumper is the simplest kind of electric switch. It consists of two metal pins and a cap. When setting the jumpers, ensure that the jumper caps are placed on the correct pins. When the jumper cap is placed on both pins, the jumper is short. If you remove the jumper cap, or place the jumper cap on just one pin, the jumper is open.

Refer to the illustrations below for examples of what the 2-pin and 3-pin jumpers look like when they are short (on) and open (off).

Two-Pin Jumpers: Open (Left) and Short (Right)
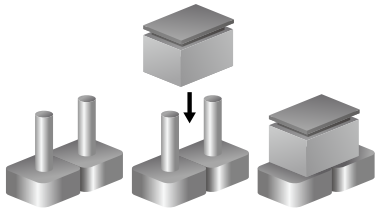
Three-Pin Jumpers: Pins 1 and 2 are Short
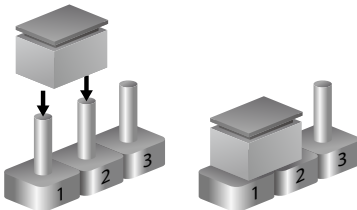
# Locations of the Jumpers and Connectors for NIFB 300

The figure below is the top view of the NIFB 300 main board which is the main board used in NET 300-ECM. It shows the locations of the jumpers and connectors.

**Top View**
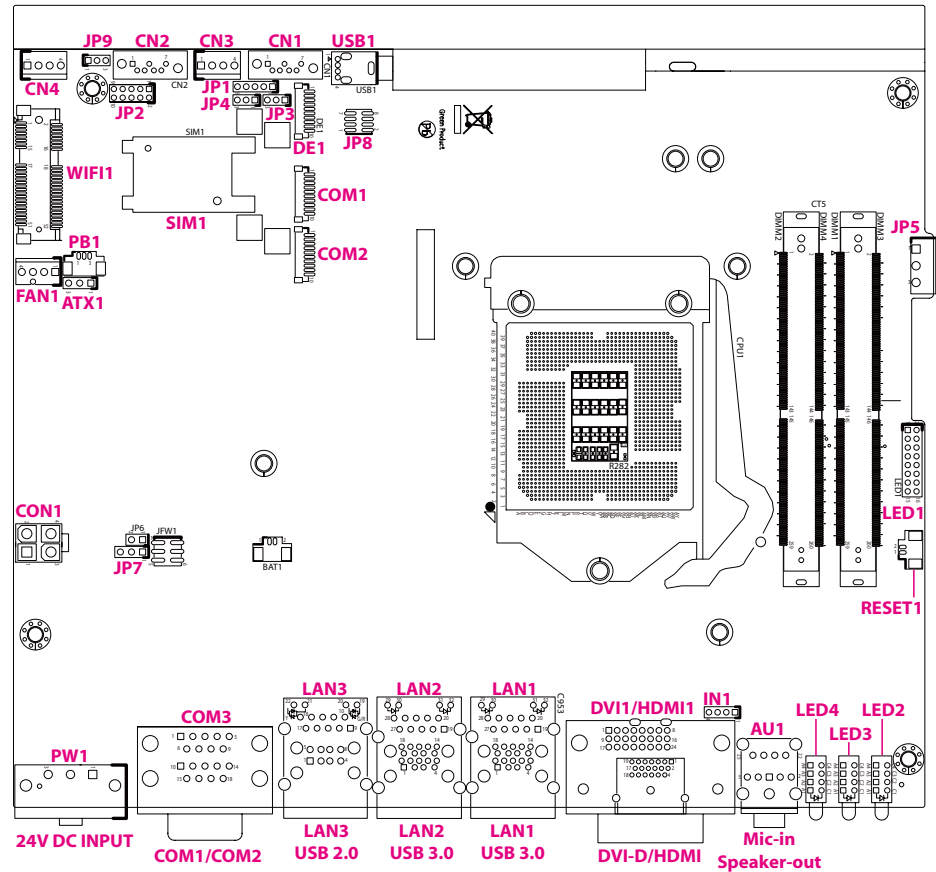
## Bottom View
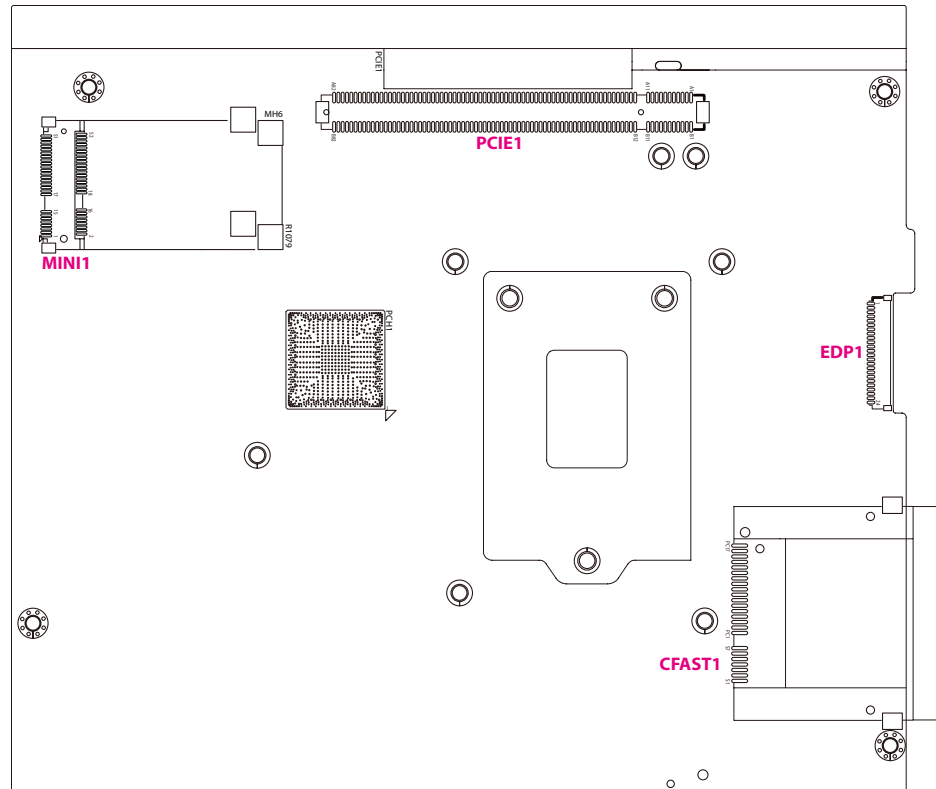
# Jumpers

## AT/ATX Mode Select

Connector type: 1x3 3-pin header
Connector location: ATX1

1 □ ○ ○ 3

| Pin | Settings |
|---|---|
| 1-2 On | ATX Mode |
| 2-3 On | AT Mode |

1-2 On: default

## CMOS Clear Select

Connector type: 1x3 3-pin header
Connector location: JP7

1 □ ○ ○ 3

| Pin | Settings |
|---|---|
| 1-2 On | Normal |
| 2-3 On | Clear CMOS |

1-2 On: default

## COM3 RI Select

Connector type: 1x3 3-pin header
Connector location: JP1

1 □ ○ ○ ○ ○ 5

| Pin | Settings |
|---|---|
| 1-2 On | VCC5 |
| 2-3 On | VCC12 |
| 4-5 On | RING |

4-5 On: default

## PCH Config Pin Header

Connector type: 1x3 3-pin header
Connector location: JP3

1 □ ○ ○ 3

| Pin | Settings |
|---|---|
| 1-2 On | NORMAL |
| 2-3 On | CONFIGURE |
| 4-5 On | RECOVERY |

1-2 On: default

## PCIe Configuration Settings

Connector type: 1x3 3-pin header
Connector location: JP9

1 ▢ ○ ○ 3

| Pin | Settings |
|------|------------------|
| 1-2 On | PCIe x16 |
| 2-3 On | PCIe x8 + PCIe x8 |

1-2 On: default

# Connector Pin Definitions

## External I/O Interfaces - Front Panel

### 24V DC Power Input

Connector type: Phoenix Contact 1x3 3-pin terminal block
Connector location: PW1
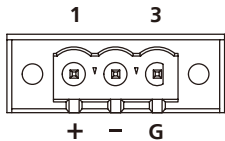


| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| 1 | VIN_1 | 2 | VIN_VSS |
| 3 | PWR_PIN3 | MH1 | NA |
| MH2 | NA | | |

### COM1 and COM2 Port

Connector type: DB-9 port, 9-pin D-Sub
Connector location: COM3A (COM1) and COM3B (COM2)
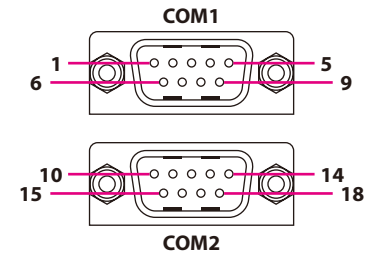


| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| 1 | COM_ISODCD#1 | 2 | COM_ISORXD1 |
| 3 | COM_ISOTXD1 | 4 | COM_ISODTR#1 |
| 5 | ISO_GND | 6 | COM_ISODSR#1 |
| 7 | COM_ISORTS#1 | 8 | COM_ISOCTS#1 |
| 9 | COM_ISORI#1 | MH1 | Chassis_GND |
| MH2 | Chassis_GND | 10 | COM_ISODCD#2 |
| 11 | COM_ISORXD2 | 12 | COM_ISOTXD2 |
| 13 | COM_ISODTR#2 | 14 | ISO_GND |
| 15 | COM_ISODSR#2 | 16 | COM_ISORTS#2 |
| 17 | COM_ISOCTS#2 | 18 | COM_ISORI#2 |
| MH1 | Chassis_GND | MH2 | Chassis_GND |

## LAN3 and USB 2.0 Ports

Connector type: RJ45 port with LEDs and dual USB 2.0 ports, Type A
Connector location: LAN3A (USB) and LAN3B (LAN)
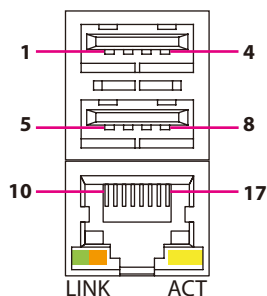
| Act | Status |
|---|---|
| Flashing Yellow | Data activity |
| Off | No activity |

| Link | Status |
|---|---|
| Steady Green | 1G network link |
| Steady Orange | 100Mbps network link |
| Off | 10Mbps or no link |

**USB**

| Pin | Definition | Pin | Definition |
|---|---|---|---|
| 1 | P5V_USB_P45 | 2 | USB2N4_C |
| 3 | USB2P4_C | 4 | GND |
| 5 | P5V_USB_P45 | 6 | USB2N5_C |
| 7 | USB2P5_C | 8 | GND |

**LAN3**

| Pin | Definition | Pin | Definition |
|---|---|---|---|
| 9 | LAN3_VCC | 10 | LAN3_MDI0P |
| 11 | LAN3_MDI0N | 12 | LAN3_MDI1P |
| 13 | LAN3_MDI1N | 14 | LAN3_MDI2P |
| 15 | LAN3_MDI2N | 16 | LAN3_MDI3P |
| 17 | LAN3_MDI3N | 18 | GND |
| 19 | LAN3_LINK100#_LED | 20 | LAN3_LINK |
| 21 | LAN3_ACT#_LED | 22 | LAN3_LED_P |

## LAN2 and USB 3.0 Ports

Connector type: RJ45 port with LEDs and dual USB 3.0 ports, Type A
Connector location: LAN2A (USB) and LAN2B (LAN2)

| Act | Status |
|---|---|
| Flashing Yellow | Data activity |
| Off | No activity |

| Link | Status |
|---|---|
| Steady Green | 1G network link |
| Steady Orange | 100Mbps network link |
| Off | 10Mbps or no link |

**USB**

| Pin | Definition | Pin | Definition |
|---|---|---|---|
| 1 | P5V_USB_P01 | 2 | USB2N0_C |
| 3 | USB2P0_C | 4 | GND |
| 5 | USB3RN1_C | 6 | USB3RP1_C |
| 7 | GND | 8 | USB3TN1_C |
| 9 | USB3TP1_C | 10 | P5V_USB_P01 |
| 11 | USB2N1_C | 12 | USB2P1_C |
| 13 | GND | 14 | USB3RN2_C |
| 15 | USB3RP2_C | 16 | GND |
| 17 | USB3TN2_C | 18 | USB3TP2_C |

**LAN2**

| Pin | Definition | Pin | Definition |
|---|---|---|---|
| 19 | LAN2_VCC | 20 | LAN2_MDI0P |
| 21 | LAN2_MDI0N | 22 | LAN2_MDI1P |
| 23 | LAN2_MDI1N | 24 | LAN2_MDI2P |
| 25 | LAN2_MDI2N | 26 | LAN2_MDI3P |
| 27 | LAN2_MDI3N | 28 | GND |
| 29 | LAN2_LINK100#_LED | 30 | LAN2_LINK |
| 31 | LAN2_ACT#_LED | 32 | LAN2_ACTPW |

## LAN1 and USB 3.0 Ports

Connector type: RJ45 port with LEDs and dual USB 3.0 ports, Type A
Connector location: LAN1A (USB) and LAN1B (LAN1)

| Act | Status |
|---|---|
| Flashing Yellow | Data activity |
| Off | No activity |

| Link | Status |
|---|---|
| Steady Green | 1G network link |
| Steady Orange | 100Mbps network link |
| Off | 10Mbps or no link |

**USB**

| Pin | Definition | Pin | Definition |
|---|---|---|---|
| 1 | P5V_USB_P01 | 2 | USB2N0_C |
| 3 | USB2P0_C | 4 | GND |
| 5 | USB3RN1_C | 6 | USB3RP1_C |
| 7 | GND | 8 | USB3TN1_C |
| 9 | USB3TP1_C | 10 | P5V_USB_P01 |
| 11 | USB2N1_C | 12 | USB2P1_C |
| 13 | GND | 14 | USB3RN2_C |
| 15 | USB3RP2_C | 16 | GND |
| 17 | USB3TN2_C | 18 | USB3TP2_C |

**LAN1**

| Pin | Definition | Pin | Definition |
|---|---|---|---|
| 19 | LAN1_VCC | 20 | LAN1_MDI0P |
| 21 | LAN1_MDI0N | 22 | LAN1_MDI1P |
| 23 | LAN1_MDI1N | 24 | LAN1_MDI2P |
| 25 | LAN1_MDI2N | 26 | LAN1_MDI3P |
| 27 | LAN1_MDI3N | 28 | GND |
| 29 | LAN1_LINK100#_LED | 30 | LAN1_LINK |
| 31 | LAN1_ACT#_LED | 32 | LAN1_ACTPW |

## DVI-D Connector

Connector type: 24-pin D-Sub, 2.0mm-M-180 (DVI)
Connector location: DVI1
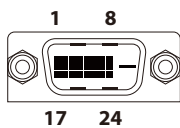


| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | DVI1_DATA2_N_C | 2 | DVI1_DATA2_P_C |
| 3 | GND | 4 | NA |
| 5 | NA | 6 | DVI1_CTRL_CLK_C |
| 7 | DVI1_CTRL_DAT_C | 8 | NA |
| 9 | DVI1_DATA1_N_C | 10 | DVI1_DATA1_P_C |
| 11 | GND | 12 | NA |
| 13 | NA | 14 | DVI1_PWR_C |
| 15 | GND | 16 | DVI1_HPD |
| 17 | DVI1_DATA0_N_C | 18 | DVI1_DATA0_P_C |
| 19 | GND | 20 | NA |
| 21 | NA | 22 | NA |
| 23 | DVI1_CLK_P_C | 24 | DVI1_CLK_N_C |
| MH1 | Chassis_GND | MH2 | Chassis_GND |
| MH3 | Chassis_GND | MH4 | Chassis_GND |

## HDMI

Connector type: HDMI port
Connector location: HDMI1
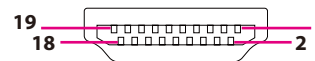


| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | HDMI_DATA2_P_C | 2 | GND |
| 3 | HDMI_DATA2_N_C | 4 | HDMI_DATA1_P_C |
| 5 | GND | 6 | HDMI_DATA1_N_C |
| 7 | HDMI_DATA0_P_C | 8 | GND |
| 9 | HDMI_DATA0_N_C | 10 | HDMI_CLK_P_C |
| 11 | GND | 12 | HDMI_CLK_N_C |
| 13 | NA | 14 | NA |
| 15 | HDMI_CLK | 16 | HDMI_DAT |
| 17 | GND | 18 | HDMI_PWR_C |
| 19 | HDMI_HPD_C | | |
| MH1 | Chassis_GND | MH1 | Chassis_GND |

## Audio Connectors

Connector type: 2x 3.5mm TRS
Connector location: AU1

Line-out

Mic-in

## LED Indicators

Connector location: LED2, LED3 and LED4
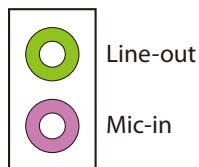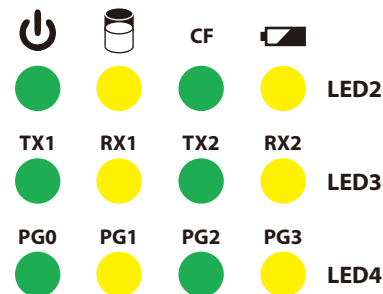
| CF |
| TX1 | RX1 | TX2 | RX2 | LED2 |
| PG0 | PG1 | PG2 | PG3 | LED3 |
| | | | | LED4 |

| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| 1 | AGND | 2 | MIC_OUT-L |
| 3 | AGND | 4 | MIC_JD |
| 5 | MIC_OUT-R | MH1 | Chassis_GND |
| MH2 | Chassis_GND | MH3 | Chassis_GND |
| MH4 | Chassis_GND | NH1 | |
| 22 | LINE_OUT_LC | 23 | AGND |
| 24 | LINEOUT_JD | 25 | LINE_OUT_RC |

| | Pin | Definition | Pin | Definition |
|------|-----|-----------|-----|-----------|
| LED2 | A1 | BAT_LOW | C1 | GND |
| | A2 | CFAST_DET_P | C2 | CFAST_DET |
| | A3 | SATALED#_P | C3 | SATALED# |
| | A4 | PWR_LED_P | C4 | PWR_LED_N |
| LED3 | A1 | RX2_P | C1 | COM2_RXLEDN |
| | A2 | TX2_P | C2 | COM2_TXLEDN |
| | A3 | RX1_P | C3 | COM1_RXLEDN |
| | A4 | TX1_P | C4 | COM1_TXLEDN |
| LED4 | A1 | SIO_GP36_64_P | C1 | SIO_GP36_64 |
| | A2 | SIO_GP37_65_P | C2 | SIO_GP37_65 |
| | A3 | SIO_GP15_66_P | C3 | SIO_GP15_66 |
| | A4 | SIO_GP16_67_P | C4 | SIO_GP16_67 |

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# Internal Connectors

## System Fan Connector

Connector type: 1x4 4-pin Wafer, 2.54mm pitch
Connector location: FAN1

## LED Pin Header

Connector type: 2x8 16-pin header, 2.0mm pitch
Connector location: LED1
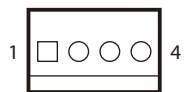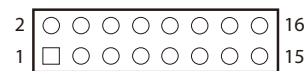
| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | GND | 2 | VCC12 |
| 3 | FAN TAC | 4 | FAN CTL |

| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | PWR_LED_P | 2 | PWR_LED_N |
| 3 | SATALED#_P | 4 | SATALED# |
| 5 | VCC3 | 6 | LAN1_LED_LINK# |
| 7 | VCC3 | 8 | LAN2_LED_LINK# |
| 9 | VCC3 | 10 | LAN3_LED_LINK# |
| 11 | VCC3 | 12 | LAN1_ACT#_LED |
| 13 | VCC3 | 14 | LAN2_ACT#_LED |
| 15 | VCC3 | 16 | LAN3_ACT#_LED |

## Debug Port

Connector type: 1x10 10-pin header, 1.0mm pitch
Connector location: DE1

10 ▢◦◦◦◦◦◦◦◦◦◦▢ 1

| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| 1 | GND | 2 | RST_SIO_N |
| 3 | CLK_PCI_P80 | 4 | LPC_FRAME# |
| 5 | LPC_AD3 | 6 | LPC_AD2 |
| 7 | LPC_AD1 | 8 | LPC_AD0 |
| 9 | VCC3 | 10 | VCC3 |
| MH1 | GND | MH2 | GND |

## SMBus

Connector type: 1x3 3-pin header, 2.0mm pitch
Connector location: JP4

1 ▢◦◦ 3

| Pin | Definition |
|-----|-----------|
| 1 | SMB_CLK |
| 2 | SMB_DAT |
| 3 | GND |

## Remote Power On/Off & S3 Connector

Connector type: 3-pin terminal block connector, 3.81mm pitch
Connector location: JP5



| Pin | Definition |
|-----|------------|
| 1 | PWRBTN#_J |
| 2 | GND |
| 3 | SLP_S3#_C |

## COM3 and COM4 Connector

Connector type: 1x10 10-pin header
Connector location: COM1 (COM3) and COM2 (COM4)



| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | COM_DCD#3 | 2 | COM_RXD3 |
| 3 | COM_TXD3 | 4 | COM_DTR#3 |
| 5 | GND | 6 | COM_DSR#3 |
| 7 | COM_RTS#3 | 8 | COM_CTS#3 |
| 9 | COM_RI#3_T | 10 | GND |
| MH1 | GND | MH2 | GND |

## USB 2.0 Connector

Connector type: USB port
Connector location: USB1

1 —— 4

| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | P5V_USB_P8 | 2 | USB2N8_C |
| 3 | USB2P8_C | 4 | GND |
| MH1 | GND | MH2 | GND |
| MH3 | GND | | |

## Line-in Pin Header

Connector type: 1x4 4-pin header, 2.0mm pitch
Connector location: IN1

1 □ ○ ○ ○ 4

| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | LINE1-L1 | 2 | AGND |
| 3 | LINEIN_JD | 4 | LINE1-R1 |

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## SATA Power Connectors

Connector type: 1x4 4-pin Wafer, 2.54mm pitch
Connector location: CN3 and CN4



## SATA Connectors

Connector type: Standard Serial ATA 7P (1.27mm, SATA-M-180)
Connector location: CN1 and CN2



| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| 1   | VCC12     | 2   | GND       |
| 3   | GND       | 4   | VCC5      |
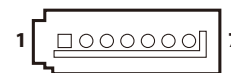
### CN1

| Pin | Definition  | Pin | Definition  |
|-----|-------------|-----|-------------|
| 1   | GND         | 2   | SATA_TXP0_C |
| 3   | SATA_TXN0_C | 4   | GND         |
| 5   | SATA_RXN0_C | 6   | SATA_RXP0_C |
| 7   | GND         |     |             |

### CN2

| Pin | Definition  | Pin | Definition  |
|-----|-------------|-----|-------------|
| 1   | GND         | 2   | SATA_TXP1_C |
| 3   | SATA_TXN1_C | 4   | GND         |
| 5   | SATA_RXN1_C | 6   | SATA_RXP1_C |
| 7   | GND         |     |             |

## SIM Card Slot

Connector location: SIM1
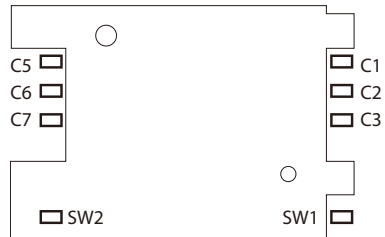
| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| C1 | UIM_PWR | C2 | UIM_RESET |
| C3 | UIM_CLK | C5 | GND |
| C6 | UIM_VPP | C7 | UIM_DATA |
| SW1 | GND | SW2 | GND |

## GPIO Pin Header

Connector type: 2x5 10-pin header, 2.0mm pitch
Connector location: JP2
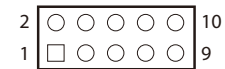
| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| 1 | GPIO_PWR | 2 | GND |
| 3 | GPIO80 | 4 | GPIO84 |
| 5 | GPIO81 | 6 | GPIO85 |
| 7 | GPIO82 | 8 | GPIO86 |
| 9 | GPIO83 | 10 | GPIO87 |

## Reset Connector

Connector type: 1x2 2-pin header, 1.25mm pitch
Connector location: RESET1
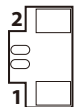
| Pin | Definition |
|-----|------------|
| 1 | PM_RESET#_J |
| 2 | GND |

## Power Connector

Connector type: 2x2 4-pin header
Connector location: CON1
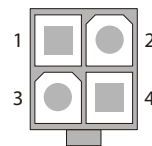
| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | GND | 2 | GND |
| 3 | VIN_3 | 4 | VIN_3 |

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## Power Button

Connector type: 1x3 3-pin header
Connector location: PB1
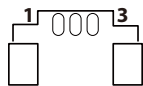


| Pin | Definition |
|-----|------------|
| 1 | PWRBTN#_C |
| 2 | GND |
| 3 | PB_POWER |

## EDP

Connector type: 1x24 24-pin header, 1.0mm pitch
Connector location: EDP1
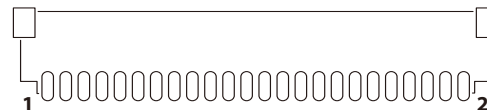


| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | GND | 2 | GND |
| 3 | GND | 4 | EDP_DISP_UTIL |
| 5 | EDP_HPD | 6 | EDP_BKLTEN |
| 7 | EDP_VDDEN | 8 | EDP_BKLTCTL |
| 9 | EDP_AUXN | 10 | EDP_AUXP |
| 11 | EDP_TXN3 | 12 | EDP_TXP3 |
| 13 | EDP_TXN2 | 14 | EDP_TXP2 |
| 15 | EDP_TXN1 | 16 | EDP_TXP1 |
| 17 | EDP_TXN0 | 18 | EDP_TXP0 |
| 19 | GND | 20 | VCC12 |
| 21 | VCC12 | 22 | VCC12 |
| 23 | VCC3 | 24 | VCC3 |
| MH1 | GND | MH2 | GND |

## CFast

Connector type: CFast Socket
Connector location: CFAST1

**PC17    PC1  S7    S1**
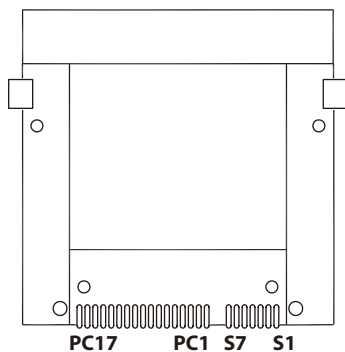
| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| S1 | GND | PC6 | NA |
| S2 | SATA_TP2_C | PC7 | GND |
| S3 | SATA_TN2_C | PC8 | CFAST_LED1_C |
| S4 | GND | PC9 | CFAST_LED2_C |
| S5 | SATA_RN2_C | PC10 | NA |
| S6 | SATA_RP2_C | PC11 | NA |
| S7 | GND | PC12 | NA |
| PC1 | CFAST_CDI | PC13 | VCC3 |
| PC2 | GND | PC14 | VCC3 |
| PC3 | NA | PC15 | GND |
| PC4 | NA | PC16 | GND |
| PC5 | NA | PC17 | CFAST_CDO_C |

## PS2 KB/MS Pin Header

Connector type: 2x4 8-pin header, 1.27mm pitch
Connector location: JP8
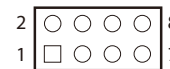
| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| 1 | 5VSB_PS2 | 2 | 5VSB_PS2 |
| 3 | KDAT | 4 | MDAT |
| 5 | KCLK | 6 | MCLK |
| 7 | GND | 8 | GND |

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## Mini-PCIe Connector (WLAN/GSM)

Connector location: WIFI1
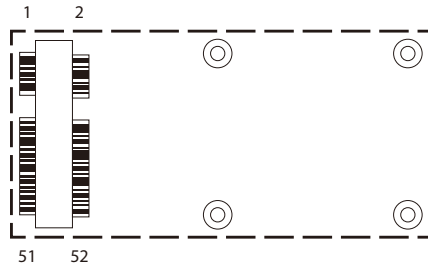


| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | WAKE_N | 2 | 3VSB_MINI1 |
| 3 | NC | 4 | GND |
| 5 | NC | 6 | 1V5_MINI1 |
| 7 | MINICARD1CLKREQ# | 8 | UIM_PWR |
| 9 | GND | 10 | UIM_DATA |
| 11 | CLK_WIFI_N_C | 12 | UIM_CLK |
| 13 | CLK_WIFI_P_C | 14 | UIM_RESET |
| 15 | GND | 16 | UIM_VPP |
| 17 | NC | 18 | GND |
| 19 | NC | 20 | MINICARD1DIS# |
| 21 | GND | 22 | RST_MINIPCIE1 |
| 23 | PCIE_RN3_WIFI_C | 24 | 3VSB_MINI1 |
| 25 | PCIE_RP3_WIFI_C | 26 | GND |

| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 27 | GND | 28 | 1V5_MINI1 |
| 29 | GND | 30 | SMB_CLK |
| 31 | PCH_WIFI_TXN4 | 32 | SMB_DAT |
| 33 | PCH_WIFI_TXP4 | 34 | GND |
| 35 | GND | 36 | USB2N6_C |
| 37 | GND | 38 | USB2P6_C |
| 39 | 3VSB_MINI1 | 40 | GND |
| 41 | 3VSB_MINI1 | 42 | NA |
| 43 | GND | 44 | NA |
| 45 | CL_CLK_C | 46 | NC |
| 47 | CL_DAT_C | 48 | 1V5_MINI1 |
| 49 | CL_RST#_C | 50 | GND |
| 51 | NC | 52 | 3VSB_MINI2 |

## Mini-PCIe/mSATA Connector

Connector location: MINI1
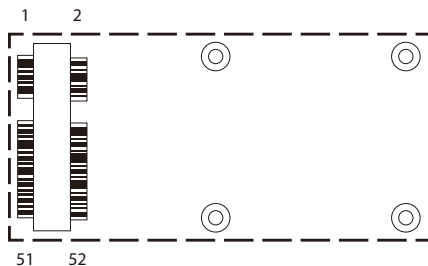


| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1 | WAKE_N | 2 | 3VSB_MINI2 |
| 3 | NC | 4 | GND |
| 5 | NC | 6 | 1V5_MINI2 |
| 7 | MINICARD2CLKREQ# | 8 | NC |
| 9 | GND | 10 | NC |
| 11 | CLK_MINI_N_C | 12 | NC |
| 13 | CLK_MINI_P_C | 14 | NC |
| 15 | GND | 16 | NC |
| 17 | NC | 18 | GND |
| 19 | NC | 20 | MINICARD2DIS# |
| 21 | GND | 22 | RST_MINIPCIE2 |
| 23 | PCIE_mSATA_RXP_C _C | 24 | 3VSB_MINI2 |
| 25 | PCIE_mSATA_RXN_C | 26 | GND |

| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 27 | GND | 28 | 1V5_MINI2 |
| 29 | GND | 30 | SMB_CLK |
| 31 | PCIE_mSATA_TXN_C | 32 | SMB_DAT |
| 33 | PCIE_mSATA_TXP_C | 34 | GND |
| 35 | GND | 36 | USB2N7_C |
| 37 | GND | 38 | USB2P7_C |
| 39 | 3VSB_MINI2 | 40 | GND |
| 41 | 3VSB_MINI2 | 42 | NC |
| 43 | GND | 44 | NC |
| 45 | NC | 46 | NC |
| 47 | NC | 48 | 1V5_MINI2 |
| 49 | NC | 50 | GND |
| 51 | PCIE_mSATA_SEL_51 | 52 | 3VSB_MINI2 |

## PCIe x16 Slot

Connector type: PCIe x16 Slot
Connector location: PCIE1



| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| A1 | PCIE_PRSNT1 | B1 | VCC12 |
| A2 | VCC12 | B2 | VCC12 |
| A3 | VCC12 | B3 | VCC12 |
| A4 | GND | B4 | GND |
| A5 | PCIEX16_TCK | B5 | PCIE_SMCLK |
| A6 | PCIEX16_TDI | B6 | PCIE_SMDAT |
| A7 | NC | B7 | GND |
| A8 | PCIEX16_TMS | B8 | VCC3 |
| A9 | VCC3 | B9 | PCIEX16_TRST# |
| A10 | VCC3 | B10 | 3VSB |
| A11 | RST_PCIEX16 | B11 | 3VSB |
| A12 | GND | B12 | NC |
| A13 | CLK_PEG_A_P | B13 | GND |
| A14 | CLK_PEG_A_N | B14 | PEG_TXP0_C |
| A15 | GND | B15 | PEG_TXN0_C |
| A16 | PEG_RXP0 | B16 | GND |
| A17 | PEG_RXN0 | B17 | PRSNT2#_1_C |
| A18 | GND | B18 | GND |

| Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|
| A19 | NC | B19 | PEG_TXP1_C |
| A20 | GND | B20 | PEG_TXN1_C |
| A21 | PEG_RXP1 | B21 | GND |
| A22 | PEG_RXN1 | B22 | GND |
| A23 | GND | B23 | PEG_TXP2_C |
| A24 | GND | B24 | PEG_TXN2_C |
| A25 | PEG_RXP2 | B25 | GND |
| A26 | PEG_RXN2 | B26 | GND |
| A27 | GND | B27 | PEG_TXP3_C |
| A28 | GND | B28 | PEG_TXN3_C |
| A29 | PEG_RXP3 | B29 | GND |
| A30 | PEG_RXN3 | B30 | NC |
| A31 | GND | B31 | NC |
| A32 | NC | B32 | GND |
| A33 | NC | B33 | PEG_TXP4_C |
| A34 | GND | B34 | PEG_TXN4_C |
| A35 | PEG_RXP4 | B35 | GND |
| A36 | PEG_RXN4 | B36 | GND |

| Pin | Definition | Pin | Definition | Pin | Definition | Pin | Definition |
|-----|-----------|-----|-----------|-----|-----------|-----|-----------|
| A37 | GND | B37 | PEG_TXP5_C | A60 | PEG_RXP10 | B60 | GND |
| A38 | GND | B38 | PEG_TXN5_C | A61 | PEG_RXN10 | B61 | GND |
| A39 | PEG_RXP5 | B39 | GND | A62 | GND | B62 | PEG_TXP11_C |
| A40 | PEG_RXN5 | B40 | GND | A63 | GND | B63 | PEG_TXN11_C |
| A41 | GND | B41 | PEG_TXP6_C | A64 | PEG_RXP11 | B64 | GND |
| A42 | GND | B42 | PEG_TXN6_C | A65 | PEG_RXN11 | B65 | GND |
| A43 | PEG_RXP6 | B43 | GND | A66 | GND | B66 | PEG_TXP12_C |
| A44 | PEG_RXN6 | B44 | GND | A67 | GND | B67 | PEG_TXN12_C |
| A45 | GND | B45 | PEG_TXP7_C | A68 | PEG_RXP12 | B68 | GND |
| A46 | GND | B46 | PEG_TXN7_C | A69 | PEG_RXN12 | B69 | GND |
| A47 | PEG_RXP7 | B47 | GND | A70 | GND | B70 | PEG_TXP13_C |
| A48 | PEG_RXN7 | B48 | NC | A71 | GND | B71 | PEG_TXN13_C |
| A49 | GND | B49 | GND | A72 | PEG_RXP13 | B72 | GND |
| A50 | NC | B50 | PEG_TXP8_C | A73 | PEG_RXN13 | B73 | GND |
| A51 | GND | B51 | PEG_TXN8_C | A74 | GND | B74 | PEG_TXP14_C |
| A52 | PEG_RXP8 | B52 | GND | A75 | GND | B75 | PEG_TXN14_C |
| A53 | PEG_RXN8 | B53 | GND | A76 | PEG_RXP14 | B76 | GND |
| A54 | GND | B54 | PEG_TXP9_C | A77 | PEG_RXN14 | B77 | GND |
| A55 | GND | B55 | PEG_TXN9_C | A78 | GND | B78 | PEG_TXP15_C |
| A56 | PEG_RXP9 | B56 | GND | A79 | GND | B79 | PEG_TXN15_C |
| A57 | PEG_RXN9 | B57 | GND | A80 | PEG_RXP15 | B80 | GND |
| A58 | GND | B58 | PEG_TXP10_C | A81 | PEG_RXN15 | B81 | NC |
| A59 | GND | B59 | PEG_TXN10_C | A82 | GND | B82 | NC |

# CHAPTER 4: HARDWARE INSTALLATION

## Installing a CPU

1. Remove the 4 flat screws on the top cover.
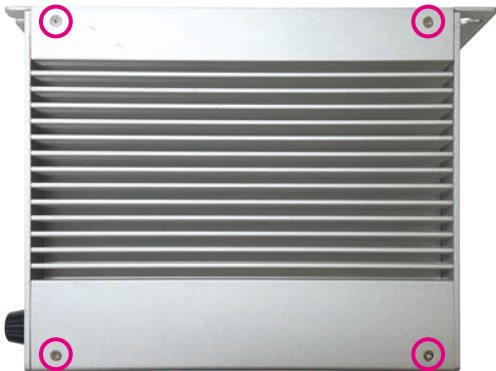
2. Lift up the cover and remove it from the chassis.

3. Remove the mounting screws that secure the heat sink to the chassis.
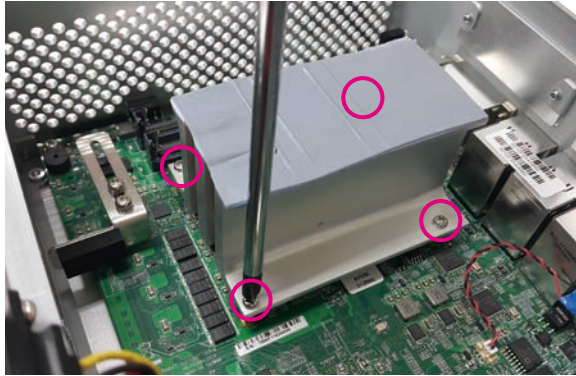


4. The CPU socket is readily accessible after you have removed the heat sink.

**Load lever**
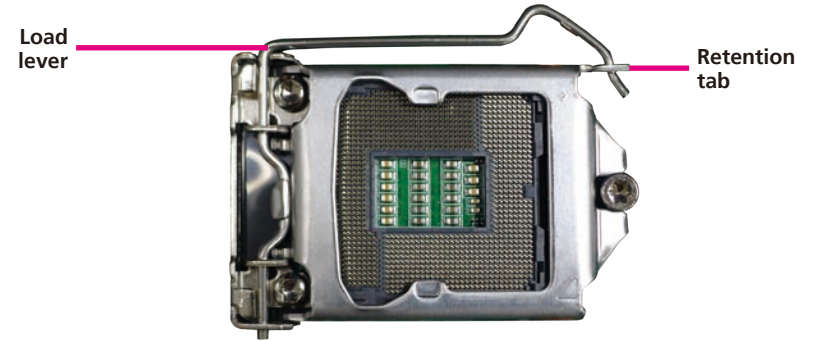
**Retention tab**

5. Unlock the socket by pushing the load lever down, moving it sideways until it is released from the retention tab; then lift the load lever up.
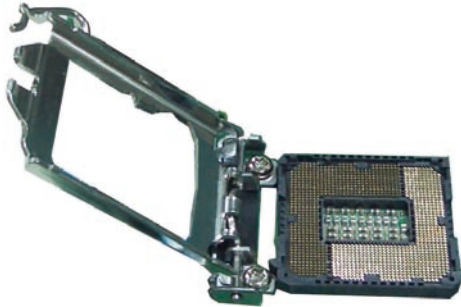
6. Insert the CPU into the socket. The triangular edge on the CPU must align with the corner of the CPU socket shown on the photo.
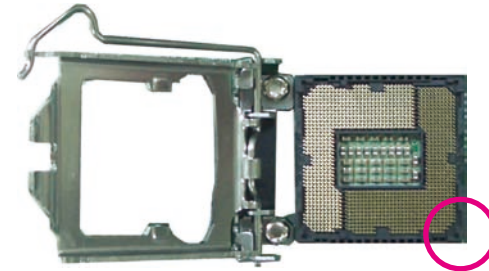
The CPU's notch will at the same time fit into the socket's alignment key.

**Alignment key**

**Alignment key**
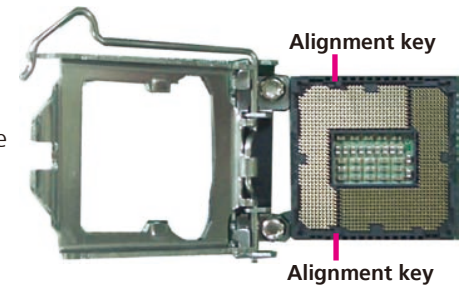
**CAUTION!**
- Handle the CPU by its edges and avoid touching the pins.
- The CPU will fit in only one orientation and can easily be inserted without exerting any force.

7. Close the load plate and then hook the load lever under the retention tab.



8. Apply thermal paste on top of the CPU.



**CAUTION!** Do not force the CPU into the socket. Forcing the CPU into the socket may bend the pins and damage the CPU.

9. Tighten the screws to secure the heat sink in place.
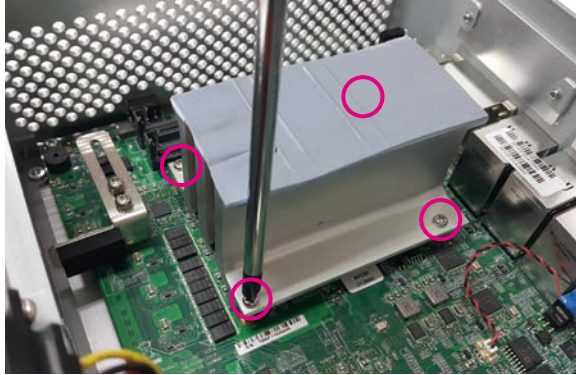
# Installing a SO-DIMM Memory Module

1. Remove the chassis before installing a SO-DIMM module.



2. Locate the SO-DIMM memory sockets.
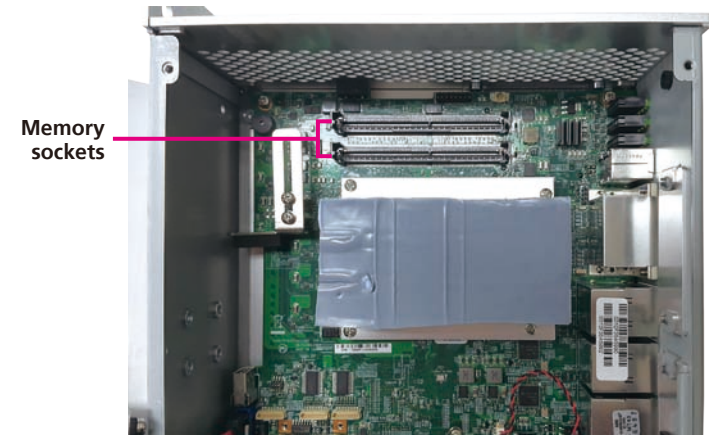
**Memory sockets**

3. Insert the memory module into the socket.
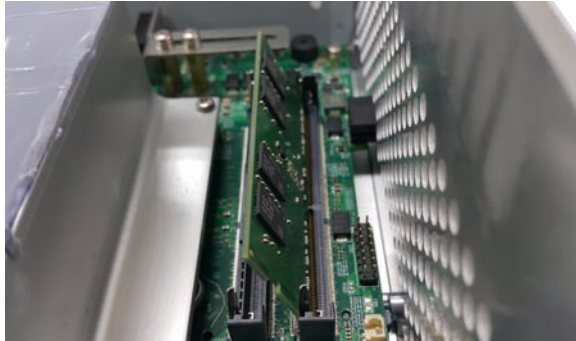


4. Apply even pressure to both ends of the module until it is locked by the latches.

5. Ensure the memory module is installed straight.
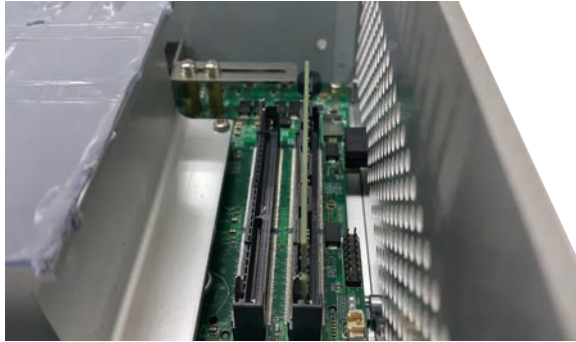


6. Insert another SO-DIMM module into the socket and apply even pressure to both ends of the module until it is locked by the latches.





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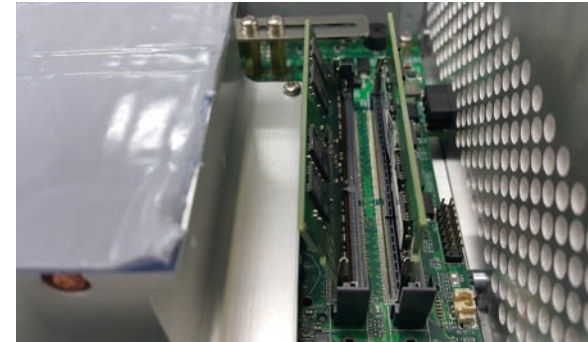
# Installing a SIM Card

1. Locate the mini-PCIe slot and remove the bracket first.
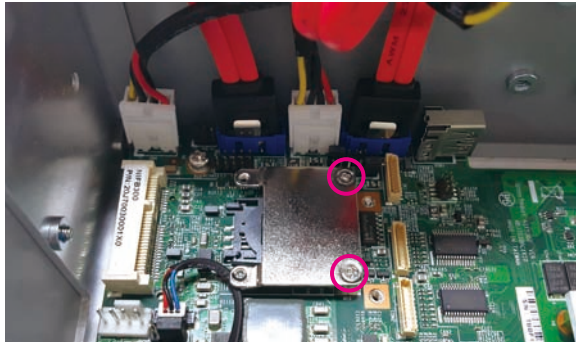


2. Locate the SIM card holder.



**SIM card
holder**

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3. Release the SIM card cover and place the SIM card into the holder.
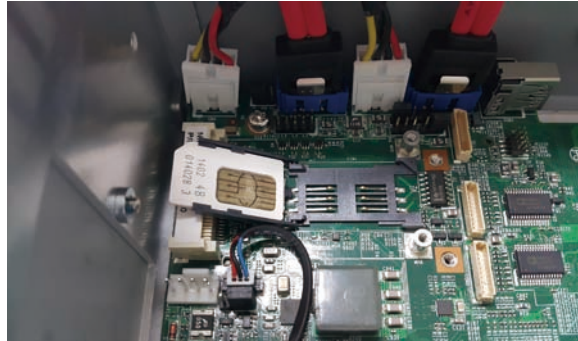


4. Close the cover and secure the SIM card into position.
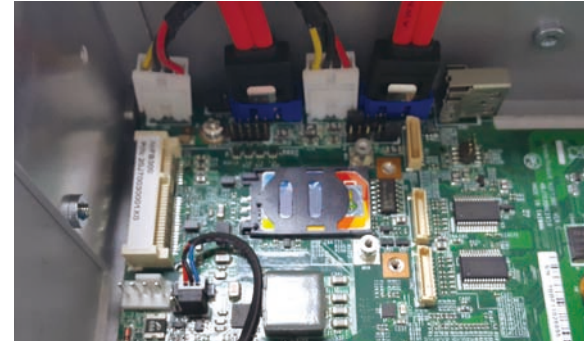
# Installing a CFast Card

1. Locate the CFast socket on the top cover.
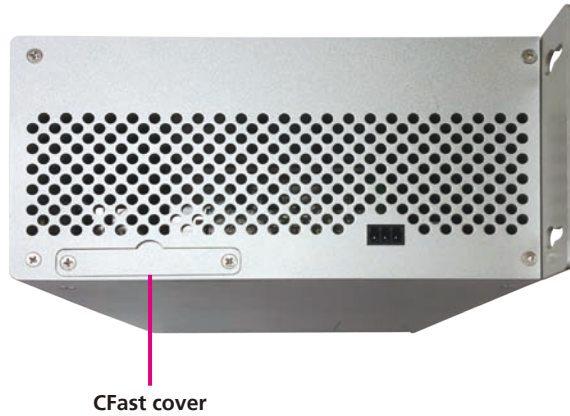


**CFast cover**

2. Remove the cover of the CFast socket.

3. Insert the CFast card into the socket.

4. Ensure the CFast card is installed and engaged firmly with a click sound.

# Installing a 3G/GSM Module

1. Install the 3G/GSM module into the 3G/GSM slot.
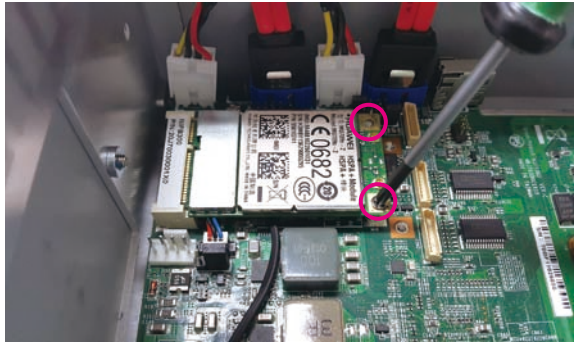


2. Fix the antenna cable to the 3G/GSM module.

3. Locate the antenna hole on the front panel, and insert the antenna jack through the hole.





4. Fix the antenna jack with rings.

5. Install the antenna.

# Installing an mSATA Module

1. Remove the mini-PCIe cover on the side panel.
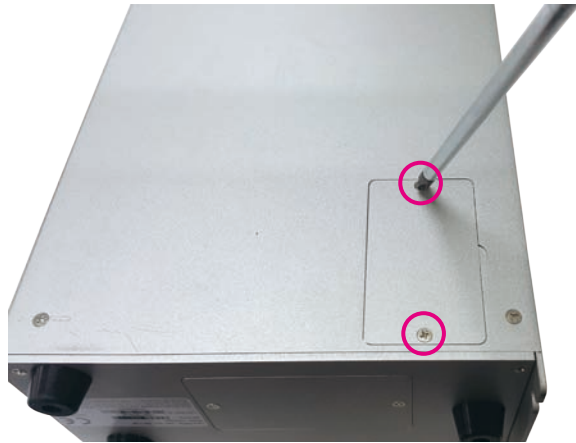


2. Locate the mini-PCIe socket, then install and fix the mSATA module into the socket.
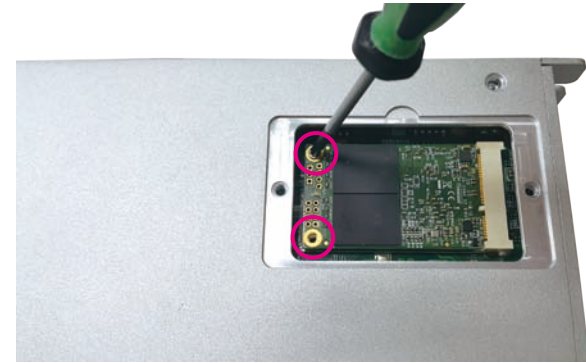
3. Ensure both screws are fixed tightly to the socket.

# Installing an External SATA Hard Drive

1. Remove the external HDD cover.
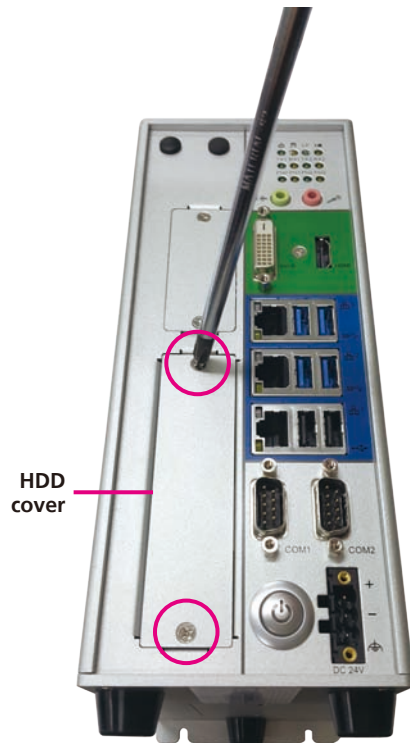
2. Pull out the HDD bracket and place the HDD into the bracket.



**HDD cover**

3. Fix the HDD onto the HDD bracket from the bottom side using screws.
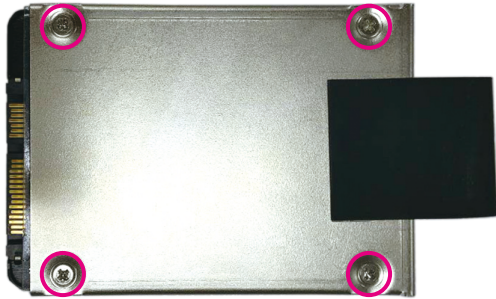


4. Install the HDD bracket into the external HDD drive bay, and secure the external HDD cover back to the drive bay.

# Installing an Internal SATA Hard Drive

1. Remove the chassis cover.
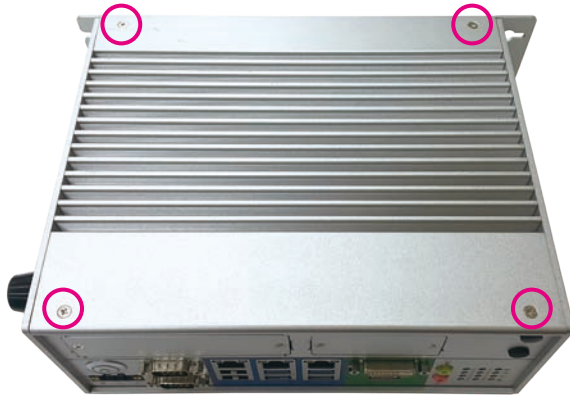


2. Locate the internal HDD bracket.



**HDD bracket**

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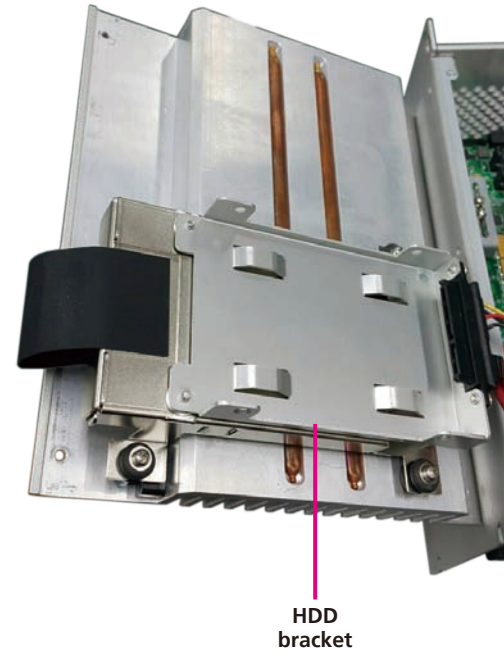
3. Install and fix the HDD to the internal HDD bracket.
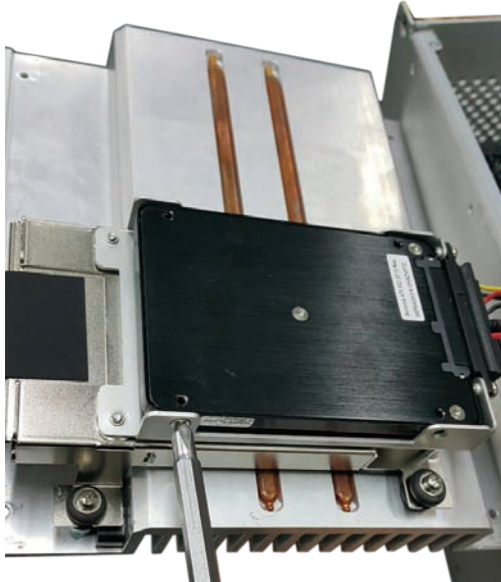
# Wallmount Mounting

The main mounting method of NET 300-ECM is wallmount. Please locate the wallmount fixing holes at the rear of NET 300-ECM for wallmount mounting.

# APPENDIX A: BIOS SETUP

This chapter describes how to use the BIOS setup program for NET 300-ECM. The BIOS screens provided in this chapter are for reference only and may change if the BIOS is updated in the future.

To check for the latest updates and revisions, visit the NEXCOM website at www.nexcom.com.tw.

## About BIOS Setup

The BIOS (Basic Input and Output System) Setup program is a menu driven utility that enables you to make changes to the system configuration and tailor your system to suit your individual work needs. It is a ROM-based configuration utility that displays the system's configuration status and provides you with a tool to set system parameters.

These parameters are stored in non-volatile battery-backed-up CMOS RAM that saves this information even when the power is turned off. When the system is turned back on, the system is configured with the values found in CMOS.

With easy-to-use pull down menus, you can configure items such as:
- Hard drives, diskette drives, and peripherals
- Video display type and display options
- Password protection from unauthorized use
- Power management features

The settings made in the setup program affect how the computer performs. It is important, therefore, first to try to understand all the setup options, and second, to make settings appropriate for the way you use the computer.

## When to Configure the BIOS

- This program should be executed under the following conditions:
- When changing the system configuration
- When a configuration error is detected by the system and you are prompted to make changes to the setup program
- When resetting the system clock
- When redefining the communication ports to prevent any conflicts
- When making changes to the Power Management configuration
- When changing the password or making other changes to the security setup

Normally, CMOS setup is needed when the system hardware is not consistent with the information contained in the CMOS RAM, whenever the CMOS RAM has lost power, or the system features need to be changed.

# 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 Setup

When the system is powered on, the BIOS will enter the Power-On Self Test (POST) routines. These routines perform various diagnostic checks; if an error is encountered, the error will be reported in one of two different ways:

- If the error occurs before the display device is initialized, a series of beeps will be transmitted.

- If the error occurs after the display device is initialized, the screen will display the error message.

Powering on the computer and immediately pressing <Del> allows you to enter Setup.

Press the [Del] key to enter Setup:

# Legends

| Key | Function |
|---|---|
| ← → | Moves the highlight left or right to select a menu. |
| ↑ ↓ | Moves the highlight up or down between sub-menus or fields. |
| Esc | Exits the BIOS Setup Utility. |
| + | Scrolls forward through the values or options of the highlighted field. |
| − | Scrolls backward through the values or options of the highlighted field. |
| Tab | Selects a field. |
| F1 | Displays General Help. |
| F2 | Load previous values. |
| F3 | Load optimized default values. |
| F4 | Saves and exits the Setup program. |
| Enter | Press <Enter> to enter the highlighted sub-menu |

**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**
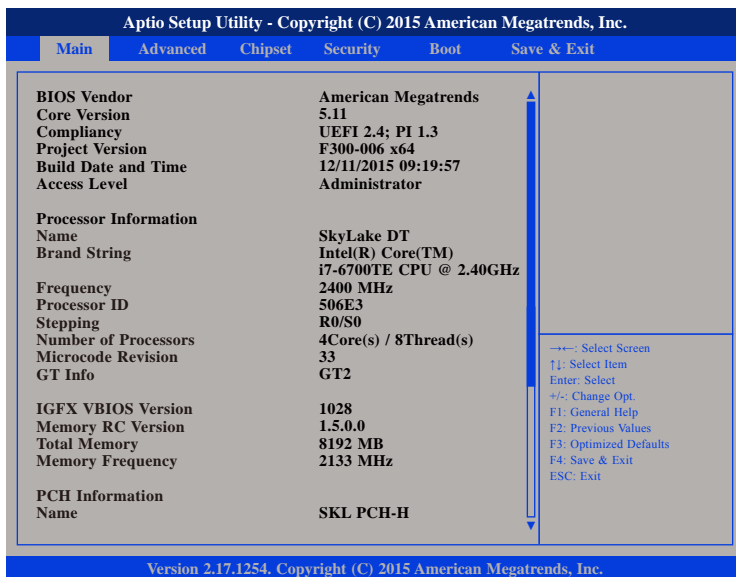
When "▶" appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press Enter↵ .

# BIOS Setup Utility

Once you enter the AMI BIOS Setup Utility, the Main Menu will appear on the screen. The main menu allows you to select from several setup functions and one exit. Use arrow keys to select among the items and press Enter, to accept or enter the submenu.

## Main
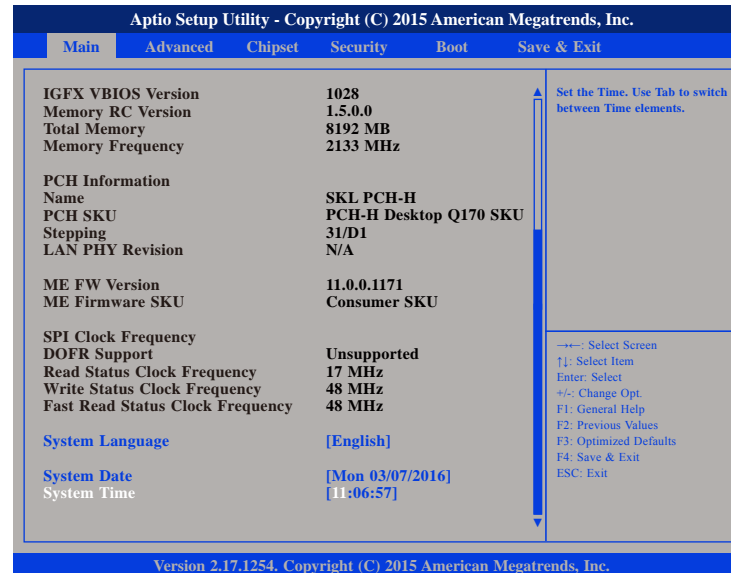
The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.

```
             Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
   Main      Advanced    Chipset    Security      Boot      Save & Exit

   BIOS Vendor                  American Megatrends
   Core Version                 5.11
   Compliancy                   UEFI 2.4; PI 1.3
   Project Version              F300-006 x64
   Build Date and Time          12/11/2015 09:19:57
   Access Level                 Administrator

   Processor Information
   Name                         SkyLake DT
   Brand String                 Intel(R) Core(TM)
                                i7-6700TE CPU @ 2.40GHz
   Frequency                    2400 MHz
   Processor ID                 506E3
   Stepping                     R0/S0
   Number of Processors         4Core(s) / 8Thread(s)       →←: Select Screen
   Microcode Revision           33                          ↑↓: Select Item
   GT Info                      GT2                          Enter: Select
                                                            +/-: Change Opt.
   IGFX VBIOS Version           1028                         F1: General Help
   Memory RC Version            1.5.0.0                      F2: Previous Values
   Total Memory                 8192 MB                      F3: Optimized Defaults
   Memory Frequency             2133 MHz                     F4: Save & Exit
                                                            ESC: Exit
   PCH Information
   Name                         SKL PCH-H

             Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

```
             Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
   Main      Advanced    Chipset    Security      Boot      Save & Exit

   IGFX VBIOS Version           1028                         Set the Time. Use Tab to switch
   Memory RC Version            1.5.0.0                      between Time elements.
   Total Memory                 8192 MB
   Memory Frequency             2133 MHz

   PCH Information
   Name                         SKL PCH-H
   PCH SKU                      PCH-H Desktop Q170 SKU
   Stepping                     31/D1
   LAN PHY Revision             N/A

   ME FW Version                11.0.0.1171
   ME Firmware SKU              Consumer SKU

   SPI Clock Frequency                                       →←: Select Screen
   DOFR Support                 Unsupported                  ↑↓: Select Item
   Read Status Clock Frequency  17 MHz                       Enter: Select
   Write Status Clock Frequency 48 MHz                       +/-: Change Opt.
   Fast Read Status Clock Frequency  48 MHz                  F1: General Help
                                                            F2: Previous Values
   System Language              [English]                    F3: Optimized Defaults
                                                            F4: Save & Exit
   System Date                  [Mon 03/07/2016]             ESC: Exit
   System Time                  [11:06:57]

             Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**System Language**
Configures the default language of the system.

**System Date**
The date format is <day>, <month>, <date>, <year>. Day displays a day, from Monday to Sunday. Month displays the month, from January to December. Date displays the date, from 1 to 31. Year displays the year, from 1999 to 2099.

**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.

# 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.

⚠️ Setting incorrect field values may cause the system to malfunction.

```
            Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
    Main      Advanced    Chipset    Security    Boot    Save & Exit

 ► IT8786 Super IO Configuration                      System Super IO Chip
 ► Hardware Monitor                                   Parameters.
 ► CPU Configuration
 ► SATA Configuration
 ► CSM Configuration
 ► USB Configuration




                                                     →←: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit


            Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

## IT8786 Super IO Configuration

This section is used to configure the serial ports.

```
            Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
               Advanced

    IT8786 Super IO Configuration                     Set Parameters of Serial Port
                                                      1 (COMA)
    Super IO Chip                  IT8786
 ► Serial Port 1 Configuration
 ► Serial Port 2 Configuration
 ► Serial Port 3 Configuration
 ► Serial Port 4 Configuration



                                                      →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit


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```

**Super IO Chip**
Displays the Super I/O chip used on the board.

## Serial Port 1 Configuration

This section is used to configure serial port 1.

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Advanced

Serial Port 1 Configuration                              Enable or Disable Serial Port
                                                         (COM)
Serial Port                      [Enabled]
Device Settings                  IO=3F8h; IRQ=4;
Onboard Serial Port Mode         [RS232]
Terminal resistor                [Enabled]




                                                         →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit


        Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**Serial Port**
Enables or disables the serial port.

**Onboard Serial Port Mode**
Select this to change the serial port mode to RS232, RS422, RS485 or RS485 Auto.

**Terminal Resistor**
Enables or disables the terminal resistor.

## Serial Port 2 Configuration

This section is used to configure serial port 2.

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Advanced

Serial Port 2 Configuration                              Enable or Disable Serial Port
                                                         (COM)
Serial Port                      [Enabled]
Device Settings                  IO=2F8h; IRQ=3;
Onboard Serial Port Mode         [RS232]
Terminal resistor                [Enabled]




                                                         →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit


        Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**Serial Port**
Enables or disables the serial port.

**Onboard Serial Port Mode**
Select this to change the serial port mode to RS232, RS422, RS485 or RS485 Auto.

**Terminal Resistor**
Enables or disables the terminal resistor.

## Serial Port 3 Configuration

This section is used to configure serial port 3.

```
            Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
   Advanced

   Serial Port 3 Configuration                                    Enable or Disable Serial Port
                                                                  (COM)
   Serial Port                    [Enabled]
   Device Settings                IO=3E8h; IRQ=6;




                                                                  →←: Select Screen
                                                                  ↑↓: Select Item
                                                                  Enter: Select
                                                                  +/-: Change Opt.
                                                                  F1: General Help
                                                                  F2: Previous Values
                                                                  F3: Optimized Defaults
                                                                  F4: Save & Exit
                                                                  ESC: Exit


            Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**Serial Port**
Enables or disables the serial port.

## Serial Port 4 Configuration

This section is used to configure serial port 4.

```
            Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
   Advanced

   Serial Port 4 Configuration                                    Enable or Disable Serial Port
                                                                  (COM)
   Serial Port                    [Enabled]
   Device Settings                IO=2E8h; IRQ=10;




                                                                  →←: Select Screen
                                                                  ↑↓: Select Item
                                                                  Enter: Select
                                                                  +/-: Change Opt.
                                                                  F1: General Help
                                                                  F2: Previous Values
                                                                  F3: Optimized Defaults
                                                                  F4: Save & Exit
                                                                  ESC: Exit


            Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```
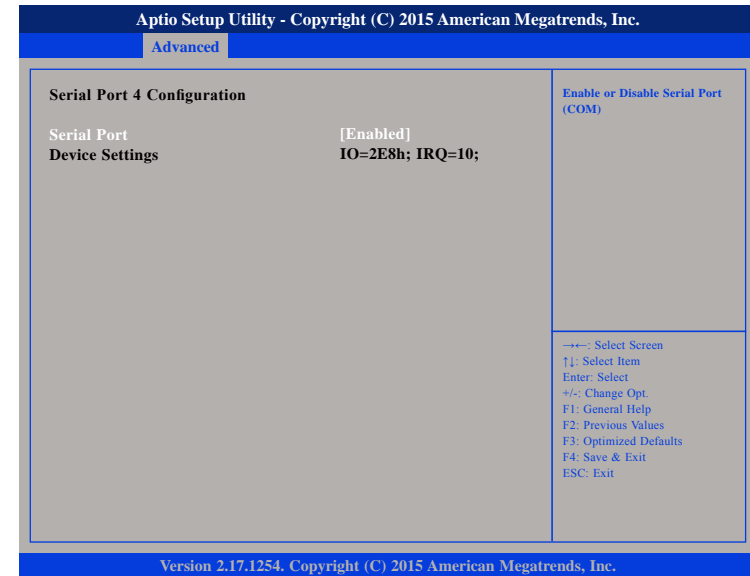
**Serial Port**
Enables or disables the serial port.

## Hardware Monitor

This section is used to monitor hardware status such as temperature, fan speed and voltages.

```
             Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
   Advanced

   Pc Health Status

   FAN Setting                    [Always Full Speed]

   System Temperature             : +26 °C
   CPU Temperature                : +24 °C
   Fan1 Speed                     : N/A
   Fan2 Speed of Riser card       : N/A
   CPU:Vcore                      : +0.996 V
   +3V                            : +3.245 V
   +12V                           : +11.952 V
   +5V                            : +5.100 V

                                              →←: Select Screen
                                              ↑↓: Select Item
                                              Enter: Select
                                              +/-: Change Opt.
                                              F1: General Help
                                              F2: Previous Values
                                              F3: Optimized Defaults
                                              F4: Save & Exit
                                              ESC: Exit

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```

### FAN Setting
Configures the speed of the fan, the options are Always Full Speed, Enable Smart Fan and Disable.

### System Temperature
Detects and displays the current system temperature.

### CPU Temperature
Detects and displays the current CPU temperature.

### Fan1 Speed
Detects and displays fan1 speed.

### Fan2 Speed
Detects and displays fan2 speed of the riser card.

### VCore
Detects and displays the Vcore CPU voltage.

### +3V
Detects and displays 3.3V voltage.

### +12V
Detects and displays 12V voltage.

### +5V
Detects and displays 5V voltage.

## CPU Configuration

This section is used to configure the CPU.

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Advanced

  CPU Configuration                                    Enabled for Windows XP and
                                                       Linux (OS optimized for
  Intel(R) Core(TM) i7-6700TE CPU @ 2.40GHz            HyperThreading Technology)
  CPU Signature              506E3                     and Disabled for other OS (OS
  Microcode Patch            33                        not optimized for
  Max CPU Speed              2400 MHz                  Hyper-Threading Technology).
  Min CPU Speed              800 MHz                   When Disabled only one thread
  CPU Speed                  2400 MHz                  per enabled core is enabled.
  Processor Cores            4
  Hyper Threading Technology Supported
  Intel VT-x Technology      Supported
  Intel SMX Technology       Supported
  64-bit                     Supported
  EIST Technology            Supported
  CPU C3 state               Supported
  CPU C6 state               Supported                 →←: Select Screen
  CPU C7 state               Supported                 ↑↓: Select Item
                                                       Enter: Select
  L1 Data Cache              32 kB x 4                 +/-: Change Opt.
  L1 Code Cache              32 kB x 4                 F1: General Help
  L2 Cache                   256 kB x 4                F2: Previous Values
  L3 Cache                   8 MB                      F3: Optimized Defaults
  L4 Cache                   Not Present               F4: Save & Exit
                                                       ESC: Exit
  Hyper-threading            [Enabled]

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```

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Advanced

  Microcode Patch            33                        Enable or disable CPU C states
  Max CPU Speed              2400 MHz
  Min CPU Speed              800 MHz
  CPU Speed                  2400 MHz
  Processor Cores            4
  Hyper Threading Technology Supported
  Intel VT-x Technology      Supported
  Intel SMX Technology       Supported
  64-bit                     Supported
  EIST Technology            Supported
  CPU C3 state               Supported
  CPU C6 state               Supported
  CPU C7 state               Supported

  L1 Data Cache              32 kB x 4                 →←: Select Screen
  L1 Code Cache              32 kB x 4                 ↑↓: Select Item
  L2 Cache                   256 kB x 4                Enter: Select
  L3 Cache                   8 MB                      +/-: Change Opt.
  L4 Cache                   Not Present               F1: General Help
                                                       F2: Previous Values
  Hyper-threading            [Enabled]                 F3: Optimized Defaults
  Active Processor Cores     [All]                     F4: Save & Exit
  Intel Virtualization Technology [Enabled]            ESC: Exit
  Intel(R) SpeedStep(tm)     [Disabled]
  CPU C states               [Disabled]

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```

### Hyper-threading
Enables or disables hyper-threading technology.

### Active Processor Cores
Select the number of cores to enable in each processor package.

### Intel® Virtualization Technology
Enables or disables Intel Virtualization technology. When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

### Intel® SpeedStep™
Enables or disables Intel SpeedStep.

### CPU C States
Enables or disables CPU C States support.

## SATA Configuration

This section is used to configure the SATA drives.

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Advanced

  SATA Controller(s)              [Enabled]          Enable or disable SATA Device.
  SATA Mode Selection             [AHCI]

  SATA (CN2)                      TS64GSSD370   (64.0GB)
  SATA (CN1)                      Empty
  CFAST                           Empty
  MSATA (MINI1)                   Empty

                                                     →←: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit

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```

### SATA Controller(s)
Enables or disables the SATA controller.

### SATA Mode Selection
Configures the SATA mode.

AHCI    This option configures the Serial ATA drives to use AHCI (Advanced Host Controller Interface). AHCI allows the storage driver to enable the advanced Serial ATA features which will increase storage performance.

RAID    This option allows you to create RAID or Intel Matrix Storage configuration on Serial ATA devices.

## CSM Configuration

This section is used to configure the compatibility support module features.

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Advanced

  Compatibility Support Module Configuration        Enable/Disable CSM Support.

  CSM Support                     [Enabled]

  CSM16 Module Version            07.78

  Boot option filter             [UEFI and Legacy]

  Option ROM execution order

  Network                        [Enabled]
  Onboard LAN PXE                [Disabled]
  Storage                        [UEFI]              →←: Select Screen
  Video                          [Legacy]            ↑↓: Select Item
  Other PCI devices              [UEFI]              Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit

            Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

### CSM Support
Enables or disables CSM support.

### Boot Option Filter
Configures which devices the system will boot from.

### Network
Enables or disables the boot option for legacy network devices.

### Onboard LAN PXE
Enables or disables onboard LAN PXE ROM.

**Storage**
Enables or disables the boot option for legacy storage devices.

**Video**
Enables or disables the boot option for legacy video devices.

**Other PCI Devices**
Determines OpROM execution policy for devices other than network, storage or video.

## USB Configuration

This section is used to configure the USB.



| Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc. | |
|---|---|
| **Advanced** | |

```
USB Configuration                                          Enables Legacy USB support.
                                                           AUTO option disables legacy
USB Module Version              12                         support if no USB devices are
                                                           connected. DISABLE option will
USB Controllers:                                           keep USB devices available
     1 XHCI                                                only for EFI applications.
USB Devices:
     1 Keyboard

Legacy USB Support              [Enabled]
XHCI Hand-off                   [Enabled]

USB hardware delays and time-outs:                         →←: Select Screen
Device reset time-out           [20 sec]                   ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F3: Optimized Defaults
                                                           F4: Save & Exit
                                                           ESC: Exit
```

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**Legacy USB Support**
Enabled   Enables Legacy USB.
Auto      Disables support for Legacy when no USB devices are connected.
Disabled  Keeps USB devices available only for EFI applications.

**XHCI Hand-off**
This is a workaround for OSs that does not support XHCI hand-off. The XHCI ownership change should be claimed by the XHCI driver respectively.

**Device reset time-out**
Selects the USB mass storage device start unit command timeout.

# Chipset

This section is used to configure the system based on the specific features of the chipset.

```
                Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
    Main        Advanced     Chipset      Security      Boot       Save & Exit

  ► System Agent (SA) Configuration                          System Agent (SA) Parameters
  ► PCH-IO Configuration




                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit


                Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

⚠️ Setting incorrect field values may cause the system to malfunction.

## System Agent (SA) Configuration

```
                Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
                              Chipset

  System Agent Bridge Name          Skylake                   VT-d capability
  SA PCIe Code Version              1.5.0.0
  VT-d                              Supported

  VT-d                              [Enabled]

  ► Graphics Configuration
  ► PEG Port Configuration
  ► Memory Configuration

                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit

                Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**VT-d**
Enables or disables VT-d function on MCH.

**Graphics Configuration**
Enters the graphics chip settings sub-menu.

**PEG Port Configuration**
Enters the PEG port settings sub-menu.

**Memory Configuration**
Enters the memory settings sub-menu.

## Graphics Configuration

```
             Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
                    Chipset

   Graphics Configuration                              Select which of IGFX/PEG/PCI
                                                       Graphics device should be
   IGFX VBIOS Version            1028                  Primary Display Or select SG for
                                                       Switchable Gfx.
   Primary Display               [Auto]
     Primary PEG                 [Auto]
     Primary PCIE                [Auto]
   Internal Graphics             [Auto]
   DVMT Total Gfx Mem            [256M]
   ▶ LCD Control


                                                       →←: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit


             Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**Primary Display**

Select which of IGFX/PEG/PCI graphics device should be primary display or select SG for switchable GFx.

**Primary PEG**

Select which PEG device should be the primary PEG.

**Primary PCIE**

Select which PCIE device should be the primary PCIE.

**Internal Graphics**

Keep IGD enabled based on the setup options.

**DVMT Total Gfx Mem**

Select DVMT5.0 Total Graphic Memory size used by the internal graphics device.

## LCD Control

```
            Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
                                    Chipset

   LCD Control                                            Select the Video Device which will
                                                          be activated during POST.
   Primary IGFX Boot Display         [DVI]                This has no effect if external
   Secondary IGFX Boot Display       [Disabled]           graphics present.
   LCD Panel Type                    [VBIOS Default]       Secondary boot display
   Panel Scaling                     [Auto]                selection will appear based on
   Backlight Control                 [PWM Normal]          your selection.
   BIA                               [Auto]                VGA modes will be supported
   Spread Spectrum clock Chip        [Off]                 only on primary display
   Active LFP                        [No LVDS]
   Panel Color Depth                 [18 Bit]


                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit


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```

**Primary IGFX Boot Display**

Select the video device which will be activated during POST. This has no effect if external graphics is present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.

**Secondary IGFX Boot Display**

Select the secondary display device.

**LCD Panel Type**

Select the LCD panel used by the internal graphics device by selecting the appropriate setup item.

**Panel Scaling**

Select the LCD panel scaling option used by the internal graphics device.

**Backlight Control**

Select the backlight control mode.

**BIA**

The options are Auto, Disabled and Level 1 to Level 5.

**Spread Spectrum Clock Chip**

Select how the spread spectrum clock is controlled.

Hardware        Controlled by the chip.
Software        Controlled by the BIOS.

**Active LFP**

Select the Active LFP configuration.

No LVDS         VBIOS does not enable LVDS.
eDP Port-A      LFP driven by Int-DisplayPort encoder from Port-A

**Panel Color Depth**

Select the LFP panel color depth.

## PEG Port Configuration

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
                    Chipset

  PEG Port Configuration                              Enable or Disable the Root Port

  PEG 0:1:0                    Not Present
    Enable Root Port           [Enabled]
    Max Link Speed             [Auto]

  PEG 0:1:1                    Not Present
    Enable Root Port           [Enabled]
    Max Link Speed             [Auto]


                                                      →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit


      Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```
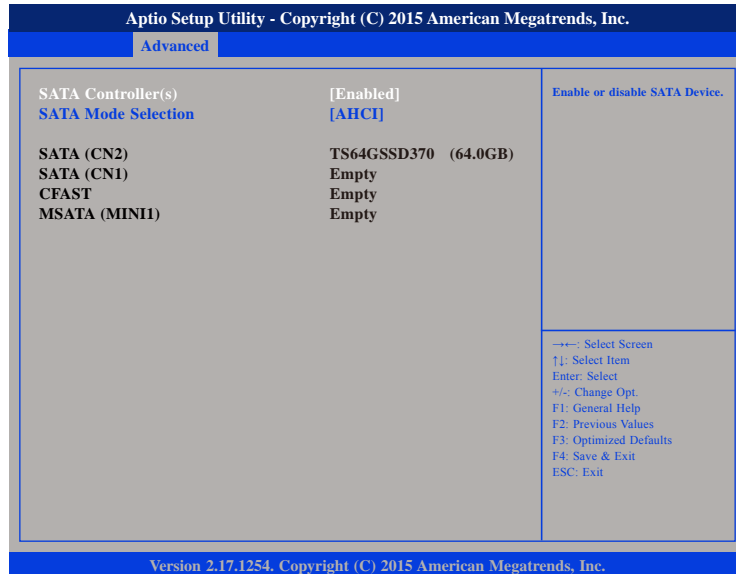
### Enable Root Port
Enables or disables the root port.

### Max Link Speed
Select the maximum link speed of the PEG device.

## Memory Configuration

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
                    Chipset

  Memory Configuration

  Memory RC Version                    1.5.0.0
  Memory Frequency                     2133 MHz
  Total Memory                         8192 MB
  VDD                                  1200
  DIMM#1                               4096 MB
  DIMM#2                               4096 MB
  Memory Timings (tCL-tRCD-tRP-tRAS)   15-36


                                                      →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit


      Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

### Memory Configuration
Displays the information on the memory installed.

# Security

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Main     Advanced     Chipset     Security     Boot     Save & Exit

  Password Description                                    Set Administrator Password

  If ONLY the Administrator's password is set,
  then this only limits access to Setup and is
  only asked for when entering Setup.
  If ONLY the User's password is set, then this
  is a power on password and must be entered to
  boot or enter Setup. In Setup the User Will
  have Administrator rights.
  The password length must be
  in the following range:
  Minimum length                    3
  Maximum length                    20                   →←: Select Screen
                                                         ↑↓: Select Item
  Administrator Password                                 Enter: Select
  User Password                                          +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit

        Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**Administrator Password**
Select this to reconfigure the administrator's password.

**User Password**
Select this to reconfigure the user's password.

# Boot

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Main     Advanced     Chipset     Security     Boot     Save & Exit

  Boot Configuration                                     Number of seconds to wait for
  Setup Prompt Timeout              1                    setup activation key.
  Bootup NumLock State              [On]                 65535(0xFFFF) means indefinite
  Quiet Boot                        [Disabled]           waiting.

  Boot Option Priorities
  Boot Option #1                    [P0: TS64GSSD370
                                    ]
  Fast Boot                         [Disabled]

  Hard Drive BBS Priorities                              →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit

        Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**Setup Prompt Timeout**
This section configures the number of seconds to wait for the setup activation key. 65535(0xFFFF) denotes indefinite waiting.

**Bootup NumLock State**
This allows you to determine the default state of the numeric keypad. By default, the system boots up with NumLock on wherein the function of the numeric keypad is the number keys. When set to Off, the function of the numeric keypad is the arrow keys.

**Quiet Boot**

| Enabled | Displays OEM logo instead of the POST messages. |
|---|---|
| Disabled | Displays normal POST messages. |

**Boot Option Priorities**

Adjust the boot sequence of the system. Boot Option #1 is the first boot device that the system will boot from, next will be #2 and so forth.

**Fast Boot**

Enables or disables fast boot technology to speed up the system boot time. This is achieved by skipping specific tests during BIOS POST routine.

**Hard Drive BBS Priorities**

Sets the order of the legacy devices in this group.

# Save & Exit

```
Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Main      Advanced    Chipset    Security    Boot    Save & Exit

Save Options                                          Exit system setup after saving
Save Changes and Exit                                 the changes.
Discard Changes and Exit

Save Changes and Reset
Discard Changes and Reset

Save Changes
Discard Changes

Default Options
Restore Defaults
Save as User Defaults                                 →←: Select Screen
Restore User Defaults                                 ↑↓: Select Item
                                                      Enter: Select
Boot Override                                         +/-: Change Opt.
P0:  TS64GSSD370                                      F1: General Help
Launch EFI Shell from filesystem device               F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit

           Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.
```

**Save Changes and Exit**

To save the changes and exit the Setup utility, select this field then press <Enter>. A dialog box will appear. Confirm by selecting Yes. You can also press <F4> to save and exit Setup.

**Discard Changes and Exit**

To exit the Setup utility without saving the changes, select this field then press <Enter>. You may be prompted to confirm again before exiting. You can also press <ESC> to exit without saving the changes.

**Save Changes and Reset**
To save the changes and reset, select this field then press <Enter>. A dialog box will appear. Confirm by selecting Yes.

**Discard Changes and Reset**
To exit the Setup utility without saving the changes, select this field then press <Enter>. You may be prompted to confirm again before exiting.

**Save Changes**
To save changes and continue configuring the BIOS, select this field then press <Enter>. A dialog box will appear. Confirm by selecting Yes.

**Discard Changes**
To discard the changes, select this field then press <Enter>. A dialog box will appear. Confirm by selecting Yes to discard all changes made and restore the previously saved settings.

**Restore Defaults**
To restore the BIOS to default settings, select this field then press <Enter>. A dialog box will appear. Confirm by selecting Yes.

**Save as User Defaults**
To use the current configurations as user default settings for the BIOS, select this field then press <Enter>. A dialog box will appear. Confirm by selecting Yes.

**Restore User Defaults**
To restore the BIOS to user default settings, select this field then press <Enter>. A dialog box will appear. Confirm by selecing Yes.

**Boot Override**
To bypass the boot sequence from the Boot Option List and boot from a particular device, select the desired device and press <Enter>.

**Launch EFI Shell From Filesystem Device**
Launches the EFI shell.

# APPENDIX B: GPI/O PROGRAMMING GUIDE

GPI/O (General Purpose Input/Output) pins are provided for custom system design. This appendix provides definitions and its default setting for the ten GPI/O pins in NET 300-ECM. The pin definition is shown in the following table:

| Pin | GPI/O Mode | PowerOn Default | Address | Pin | GPI/O Mode | PowerOn Default | Address |
|-----|-----------|-----------------|---------|-----|-----------|-----------------|---------|
| 1 | VCC | - | - | 2 | GND | - | - |
| 3 | GPI | Low | A07h (Bit0) | 4 | GPO | Low | A07h (Bit4) |
| 5 | GPI | Low | A07h (Bit1) | 6 | GPO | Low | A07h (Bit5) |
| 7 | GPI | Low | A07h (Bit2) | 8 | GPO | Low | A07h (Bit6) |
| 9 | GPI | Low | A07h (Bit3) | 10 | GPO | Low | A07h (Bit7) |

**JP2 – GPI/O Connector**

| Pin | GPI/O Mode | PowerOn Default | Address |
|-----|-----------|-----------------|---------|
| A4 | GPO | Low | A00h (Bit6) |
| A3 | GPO | Low | A00h (Bit5) |
| A2 | GPO | Low | A02h (Bit7) |
| A1 | GPO | Low | A02h (Bit6) |

**LED4 – GPO LED**

Control the GPO pin (4/6/8/10) level from I/O port A07h bit (4/5/6/7).
Control the GPO pin (A3/A4) level from I/O port A00h bit (5/6).
Control the GPO pin (A1/A2) level from I/O port A02h bit (6/7).
The bit is Set/Clear indicated output High/Low

## GPIO programming sample code

```
#define GPIO_PORT        0xA00

#define GPO4_HI                outportb(GPIO_PORT+7, 0x10)
#define GPO4_LO                outportb(GPIO_PORT+7, 0x00)
#define GPO6_HI                outportb(GPIO_PORT+7, 0x20)
#define GPO6_LO                outportb(GPIO_PORT+7, 0x00)
#define GPO8_HI                outportb(GPIO_PORT+7, 0x40)
#define GPO8_LO                outportb(GPIO_PORT+7, 0x00)
#define GPO10_HI               outportb(GPIO_PORT+7, 0x80)
#define GPO10_LO               outportb(GPIO_PORT+7, 0x00)
#define GPOA4_HI               outportb(GPIO_PORT, 0x40)
#define GPOA4_LO               outportb(GPIO_PORT, 0x00)
#define GPOA3_HI               outportb(GPIO_PORT, 0x20)
#define GPOA3_LO               outportb(GPIO_PORT, 0x00)
#define GPOA2_HI               outportb(GPIO_PORT+2, 0x80)
#define GPOA2_LO               outportb(GPIO_PORT+2, 0x00)
#define GPOA1_HI               outportb(GPIO_PORT+2, 0x40)
#define GPOA1_LO               outportb(GPIO_PORT+2, 0x00)

void main(void)
{
  GPO4_HI;
  GPO6_LO;
  GPO8_HI;
  GPO10_LO;
  GPOA4_HI;
  GPOA3_LO;
  GPOA2_HI;
  GPOA1_LO;
}
```

# Appendix C: Watchdog Programming Guide

## ITE8786E WatchDog Programming Guide

```
#define Superio_Port        0x2E
#define Superio_LDN         0x07

;*Enter the MB PnP mode with 0x87, 0x01, 0x55, 0x55
outportb(Superio_Port, 0x87);
outportb(Superio_Port, 0x01);
outportb(Superio_Port, 0x55);
outportb(Superio_Port, 0x55);

;*Set LDN=0x07 point to the WDT function
outportb(Superio_Port, Superio_LDN);
outportb(Superio_Port+1, 0x07);

;*Setup configuration register 0x72, if set 90h is second, set 10h is minute (WDT output through PWRGD)
outportb(Superio_Port, 0x72);
outportb(Superio_Port+1, 0x90);

;*Setup WDT time-out value. this demo code is used to program the time-out value with 4 sec.
outportb(Superio_Port, 0x73);
outportb(Superio_Port+1, 0x04);

;*Exit the MB PnP Mode
outportb(Superio_Port, 0x02);
outportb(Superio_Port+1, 0x02);
```