IPC Series

BOX-PC
for BX220 Series
# User's Manual

CONTEC CO.,LTD.

Check Your Package

Thank you for purchasing the CONTEC product.

The product consists of the items listed below.

Check, with the following list, that your package is complete. If you discover damaged or missing items, contact your retailer.

Product Configuration List

Name		BX-220D-DC700000 [Base Model] Pcs.	BX-220D-DC7x121x [OS PreInstallModel] Pcs.
BOX-PC		1	1
The attachment fittings		2	2
CFast card removal prevention fitting		1	1
USB removal prevention fitting		1	1
USB removal prevention clamp		1	2
DVI-analog RGB conversion adapter		1	1
Washer assembled screw (M3 x 6)		6	6
Washer assembled and cross recessed hexagonal bolt (M4 x 10, black)		4	4
Cable clamp		1	2
Power supply connector complete set	Power connector	1	1
	Contact	4	4
Product guide		1	1
IPC Precaution List		1	1
Warranty Certificate			
Serial number label		1	1
Royalty consent contract(For OS)		- *1	1
Setup Procedure Document		- *1	1
Recovery Media		- *1	1

*1   Not included in models without OS.

*   The user's manual for this product is available as a PDF file through CONTEC's Web site.

The user's manual provides such information as hardware settings, functions for each component, and BIOS settings. Refer to it as necessary.
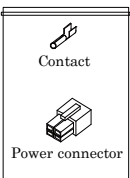
Product Configuration Image
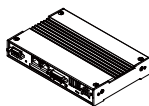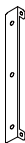
BOX-PC The attachment fittings Cable clamp USB removal prevention clamp

Contact

Power connector

Power supply connector complete set

USB removal prevention fitting

CFast card removal prevention fitting

Wacher assembled screw (M3 x 6)

Wacher assembled and cross recessed hexagonal bolt (M4 x 10, black)

DVI-Analog RGB conversion adapter

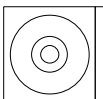Product guide

IPC Precaution List

Warranty Certificate

Product guide

IPC Precaution List

Warranty Certificate

Serial number label

Royalty consent contract (For OS)

Setup Procedure Document

Royalty consent contract

Setup Procedure Document

Recovery Media

* See the Product Configuration List to check if all the components are included for the specified number of units.

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Table of Contents

1. Introduction

About the Product

This product is a fanless computer for embedded applications. It features an Intel Atom processor E3845 chipset. Thanks to a quad-core CPU, simultaneous stable high-speed processing for four applications is possible with four cores. This CPU also allows for computing power almost four times that of conventional products in addition to three times the graphics performance, a significant improvement. Moreover, power consumption has been significantly reduced, resulting in nearly double the power efficiency compared with the previous generation's architecture.It combines sufficient performance and low power consumption in a space-saving design that can be installed in spaces only 50-mm thick with roughly the same area as a paperback book. This "resource-saving PC" helps you design more compact, energy efficient equipment to reduce running costs and promote energy efficiency.

It has extension interfaces such as DVI-I, Display Port, 1000BASE-T, USB 3.0, and serial.　It employs a CFast card for storage and is fanless to ensure a totally spindleless design that simplifies maintenance.

In addition, this product is equipped with a proprietary extended RAS*1 function independent of the main computer functions. This feature provides various functions to increase system reliability by automatically restarting the system when detecting errors such as frozen programs, operating system startup faults, and a rise in internal temperature, and by saving detailed logs of the occurrence of errors, which can be useful in failure analysis.

Embedded-type CPU have been adopted. The use of readily available parts ensures the ease of the use of the product. In addition, the use of Contec-customized BIOS allows support to be provided at the BIOS level.

This product is available in the following 5 models:

- 　Base model with Intel Atom Processor E3845 1.91GHz
   BX-220D-DC700000 (Memory 4GB, ECC, without OS, without CFast)

- 　OS-installed model with Intel Atom Processor E3845 1.91GHz
   BX-220D-DC731211 (Memory 4GB, ECC, Windows Embedded Standard 7 32bit (Japanese version),
                                   CFast Card (SLC) 16GB)
   BX-220D-DC731212 (Memory 4GB, ECC, Windows Embedded Standard 7 32bit (English version),
                                   CFast Card (SLC) 16GB)
   BX-220D-DC761211 (Memory 4GB, ECC, Windows Embedded Standard 7 32bit (Japanese),
                                   CFast Card (MLC) 32GB)
   BX-220D-DC761212 (Memory 4GB, ECC, Windows Embedded Standard 7 32bit (English)
                                   CFast Card (MLC) 32GB)

*1　　Reliability Availability and Serviceability: Support functions for stable system operation.

Features

-   Contributing to reduction of running cost and promotion of energy efficiency
It adopts the low-power platform with Intel® Atom$^{(TM)}$ Processor E3845 that realizes lower power consumption while ensuring sufficient performance.

-   Contributing to compact device design. Ultra-small PC is roughly the same area as a paperback book
It is the smallest [178 (W) x 115 (D) x 29 (H)] and lightest [800 g] PC in the series, and can be installed almost anywhere.

Can be installed in spaces only 50-mm thick with roughly the same area as a paperback book. It largely serves downsizing of your equipment, fits any area with the aestheticness kept.

-   Slitless/fanless design that reduces maintenance work
This product's spindleless design eliminates the heat dissipating slit and CPU fan and adopts CFast card for the storage. There is no need to worry about the intrusion of dust or foreign objects, and the use of parts that degrade over time is minimized to facilitate maintenance.

-   Remote power management function to reduce operation tasks
Supports system startup by external device over network (Wake-on-LAN), by general purpose input (power on by GPI), and by modem reception (power on by ring). It encourages significant labor saving in operation.

-   Major types of peripherals are supported with rich interfaces including the two CFast card slots
It has a variety of extended interface such as DVI-I x 1, Display Port x 1, 1000BASE-T x 2, USB3.0 x 1, serial (RS-232C) x 2.
It has two CFast card slots (one built into main unit), providing the ability to separate data from the operating system, as well as the convenience of being able to use one slot for system startup and the other for maintenance or for taking home system logs or collected data.

-   Built-in monitoring function for improved reliability of industrial equipment
The built-in sub-CPU for monitoring offers the ability to save failure logs documenting such information as start-up failures, abnormal temperatures, abnormal OS operation, and recording media swapped while powered up, as well as the ability to restart the OS or the device. Recording the power-on time and the operation time allows for proactive predictions of malfunctions due to parts having reached their service life. This ability makes it possible to construct stable and highly reliable industrial systems.

-   Falling-off prevention tools and fixing clamps provided to avoid trouble caused by disconnected cable
This product stays trouble-free, being equipped with USB removal prevention fitting and cable clamp for connectors with no locking mechanism, such as USB cable, and with hardware to properly mount and avoid falling out of CFast card.

- Safety design required for embedded applications

For Windows Embedded Standard installed model, it is possible to use the EWF*2 function of OS. It is designed for safety required for embedding purpose, for example, prohibiting unwanted writing to the CF card with EWF function will relieve the concern about the writing limits to the CF card and prevent an unintentional system alteration.

*2   EWF (Enhanced Write Filter) is a function specific to Windows Embedded Standard that protects the disk from being actually written by redirecting the writing to RAM.

- A wide range of power supplies (10.8 - 31.2VDC) supported

As the product supports a wide range of power (10.8 - 31.2VDC), it can be used in a variety of power environments. The separately available AC adapter adds support for 100VAC power.

Supported OS

- Windows Embedded Standard 7 32bit Japanese
- Windows Embedded Standard 7 32bit English

Customer Support

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

Web Site

Japanese	http: //www.contec.co.jp/
English	http: //www.contec.com/
Chinese	http: //www.contec.com.cn/

Latest product information

CONTEC provides up-to-date information on products.
CONTEC also provides product manuals and various technical documents in the PDF.

Free download

You can download updated driver software and differential files as well as sample programs available in several languages.

Note! For product information

Contact your retailer if you have any technical question about a CONTEC product or need its price, delivery time, or estimate information.

Limited One-Year Warranty

CONTEC products are warranted by CONTEC CO., LTD. to be free from defects in material and workmanship for up to one year from the date of purchase by the original purchaser.

Repair will be free of charge only when this device is returned freight prepaid with a copy of the original invoice and a Return Merchandise Authorization to the distributor or the CONTEC group office, from which it was purchased.

This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original products. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization number (RMA) from the CONTEC group office where you purchased before returning any product.

* No product will be accepted by CONTEC group without the RMA number.

Liability

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from inexperienced usage, misuse, or malfunction of this device.

Safety Precautions

Understand the following definitions and precautions to use the product safely.

Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources. Understand the meanings of these labels to operate the equipment safely.

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Caution on the BX-220 Series

Handling Precautions

⚠ WARNING
- Always check that the power supply is turned off before connecting or disconnecting power cables.

- Do not modify the product.

- Always turn off the power before inserting or removing circuit boards or cables.

- This product is not intended for use in aerospace, space, nuclear power, medical equipment, or other applications that require a very high level of reliability. Do not use the product in such applications.

- If using this product in applications where safety is critical such as in railways, automotive, or disaster prevention or security systems, please contact your retailer.

- Do not attempt to replace the battery as inappropriate battery replacement poses a risk of explosion.

- For battery replacement, contact your retailer as it must be performed as a process of repair.

- When disposing of a used battery, follow the disposal procedures stipulated under the relevant laws and municipal ordinances. For details on replacing the battery, refer to the appendix.

⚠ CAUTION

- Do not use or store this product in a location exposed to high or low temperature that exceeds range of specification or susceptible to rapid temperature changes.
  Example: - Exposure to direct sun
                      - In the vicinity of a heat source
- Do not use this product in extremely humid or dusty locations. It is extremely dangerous to use this product with its interior penetrated by water or any other fluid or conductive dust. If this product must be used in such an environment, install it on a dust-proof control panel, for example.
- Avoid using or storing this product in locations subject to shock or vibration that exceeds range of specification.
- Do not use this product in the vicinity of devices that generate strong magnetic force or noise. Such products will cause this product to malfunction.
- Do not use or store this product in the presence of chemicals.
- To clean this product, wipe it gently with a soft cloth dampened with either water or mild detergent. Do not use chemicals or a volatile solvent, such as benzene or thinner, to prevent pealing or discoloration of the paint.
- This product's case may become hot. To avoid being burned, do not touch that section while this product is in operation or immediately after turning off the power. Avoid installation in a location where people may come into contact with that section.
- CONTEC does not provide any guarantee for the integrity of data on CFast.
- Always remove the power cable from the power outlet before mounting or removing an expansion board and before connecting or disconnecting a connector.
- Always remove the power cable from the power outlet before connecting or disconnecting a connector.
- To prevent corruption of files, always shutdown the OS before turning off this product.
- CONTEC reserves the right to refuse to service a product modified by the user.
- In the event of failure or abnormality (foul smells or excessive heat generation), unplug the power cord immediately and contact your retailer.
- To connect with peripherals, use a grounded, shielded cable.
- The CFast card connector doesn't support hot plug. The pulling out opening of the CFast card cannot be done in the state of power supply ON. Please neither pulling out opening of CFast in the state of power supply ON of this product nor come in contact with CFast. This product may malfunction or cause a failure.
- If you use any other CFast than our CFast, we can not guarantee this product's specification. When you newly select CFast for this product, you should read "Chapter 7" at first. If you select unpreferable CFast, the system may work out of order.
- Component Life:

  (1) Battery---The internal calendar clock and CMOS RAM are backed by a Lithium primary battery. The backup time at a temperature of 25°C with the power disconnected is 10 years or more.

  (2) CFast --- Windows Embedded Standard installed model uses a CFast card in the OS storage area. The estimated failure rate is 1 every 60,000 rewrites for SLC models and 1 every 2000 rewrites for MLC models

     * Replacement of expendables is handled as a repair (there will be a charge).

     * The service life for consumable parts are reference values and are not guaranteed values.

     * This product's specifications allow the device to be rebooted from the BIOS screen during startup.

  This has no effect on operation after the OS boots

FCC PART15 Class A Notice

<u>**NOTE**</u>

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

<u>**WARNING TO USER**</u>

Change or modifications not expressly approved the manufacturer can void the user's authority to operate this equipment.

2. System Reference

Specification

Table 2.1. Functional Specification *< 1 / 2 >*

Model		BX-220D-DC7xxxxx
CPU		Intel® Atom™ Processor E3845 1.91GHz
BIOS		BIOS (mfd. by AMI)
Memory		4GB, 204pin SO-DIMM socket x 1, PC3-10600(DDR3L 1333) ECC
Graphic		Intel® HD Graphics (built-in CPU)
System resolution	Analog RGB	640x480, 800x600, 1,024x768, 1,152x864, 1,280x600, 1,280x720, 1,280x768, 1,280x800, 1,280x960, 1,280x1,024, 1,360x768, 1,366x768, 1,400x1,050, 1,440x900, 1,600x900, 1,680x1,050, 1,920x1,080, 1,920x1,200 (16,770,000 colors, ReduceBlanking)
	DVI-D	640x480, 800x600, 1,024x768, 1,152x864, 1,280x600, 1,280x720, 1,280x768, 1,280x800, 1,280x960, 1,280x1,024, 1,360x768, 1,366x768, 1,400x1,050, 1,440x900, 1,600x900, 1,680x1,050, 1,920x1,080, 1,920x1,200 (16,770,000 colors, ReduceBlanking)
	Display Port	640x480, 800x600, 1,024x768, 1,152x864, 1,280x600, 1,280x720, 1,280x768, 1,280x800, 1,280x960, 1,280x1,024, 1,360x768, 1,366x768, 1,400x1,050, 1,440x900, 1,600x900, 1,680x1,050, 1,920x1,080, 1,920x1,200 (16,770,000 colors, ReduceBlanking)
Audio		HD Audio compliant, LINE OUT x 1, MIC IN x 1
CFast card slot		2 slot, CFast CARD Type I x 2 bootable
		BX-220D-DC73121x: Built-in CFast card slot (SLC) (16GB, 1 partition) *1 BX-220D-DC76121x: Built-in CFast card slot (MLC) (32GB, 1 partition) *1 Other models: none
LAN *2		Intel I210IT Controller 1000BASE-T/100BASE-TX/10BASE-T 2 port (Wake On LAN support)
USB		USB 3.0 compliant 1 port USB 2.0 compliant 2 port
Serial I/F		RS-232C (general-purpose)： 2port (SERIAL PORTA, B), 9pin D-SUB connector (male) Baud rate： 50 - 115,200bps RS-422/485 (general-purpose) 1port, Baud rate： 50 - 115,200bps
RAS		WDT: Software programmable, 1sec - 255sec (Time up allows reset, interrupt, or external output) Remote reset: Input signal from external device
General-purpose I/O		Photocoupler insulation inputs/outputs (3 of each) (One output used for WDT external output, one input switched between remote reset or remote power on.)
Hardware monitoring		Monitoring CPU temperature, power voltage
RTC/CMOS		Lithium backup battery life: 10 years or more. The real-time clock is accurate within ±3 minutes (at 25°C) per month
Power Management		Power management setup via BIOS, Power On by Ring / Wake On LAN, Supports PC98/PC99 ACPI Power management

*1: The capacity of CFast is a value when 1GB is calculated by 1 billion bytes. The capacity that can be recognized from OS might be displayed fewer than an actual value.

Table 2.1. Functional Specification < *2 / 2* >

Model	BX-220D-DC7xxxxx
Interface	
Display	DVI-I x 1 (29pin DVI-I connector), Display Port x1
Audio	LINE OUT：　3.5φ Stereo mini jack, Full-scale output level 1.4Vrms(Typ.)
	MIC IN：　3.5φ Stereo mini jack, Full-scale input level 1.4Vrms(Typ.)

CFast card slot	2 slot, CFast CARD Type I x 2, bootable
	BX-220D-DC700000：　-,
	BX-220D-DC73121x：　Built-in CFast card slot contains a CFast card(SLC) .
	                            (16GB, 1 partition)*1
	BX-220D-DC76121x：　Built-in CFast card slot contains a CFast card(MLC) .
	                            (32GB, 1 partition)*1

LAN *2	2 port (RJ-45 connector)
USB	USB3.0 compliant 1port (TYPE-A connector x1) USB2.0 compliant 1port (TYPE-A connector x2)
RS-232C	2 port (9pin D-SUB connector [male])

RS-422/485/
  General-purpose I/O /
  RAS
	1 port (15pin D-SUB connector [femaie])

Power supply	
Rated input voltage	12 - 24VDC *3
Range of input voltage	10.8 - 31.2VDC
Power consumption	12V 2.6A, 24V 1.5A
External device power supply capacity	CFast card slot：　3.3V：　1A(500mAx2) USB3.0 I/F：　+5V：　0.9A (900mAx1) USB2.0 I/F：　+5V：　1A (500mAx2)
Physical dimensions (mm)	178 (W) x 115(D) x 29(H) (No protrusions)
Weight	About 0.8kg (Excluding attachment fittings)

*2:　If you use the 1000BASE-T, be careful of the operating temperature.
　　For more details on this, refer to chapter3, Installation Requirements.

*3:　Use a power cable shorter than 3m.

Table 2.2. Installation Environment Requirements

Model			BX-220D-DC7xxxxx
Ambient specifications	Operating temperature *4		0 - 50°C (When using 1000BASE-T : 0 - 45°C)
	Storage temperature		-10 - 60°C
	Humidity		10 - 90%RH (No condensation)
	Floating dust particles		Not to be excessive
	Corrosive gases		None
	Line-noise resistance	Line noise	AC line / ±2kV *5, Signal line / ±1kV (IEC61000-4-4 Level 3, EN61000-4-4 Level 3)
		Static electricity resistance	Contact discharge / ±4kV (IEC61000-4-2 Level 2, EN61000-4-2 Level 2) Atmospheric discharge / ±8kV (IEC61000-4-2 Level 3, EN61000-4-2 Level 3)
	Vibration resistance	Sweep resistance	10 - 57Hz/semi-amplitude 0.375 mm 57 - 500Hz/5.0G 60 min. each in x, y, and z directions (JIS C60068-2-6compliant, IEC68-2-6-compliant)
	Impact resistance		100G, half-sine shock for 6 ms in x, y, and z directions (JIS C0041-compliant, IEC68-2-27-compliant)
	Grounding		Class D grounding, SG-FG / continuity

*4 : For more details on this, please refer to chapter 3, "Installation Requirements".

*5 : When AC adapter "ACAP19-01" is used.

Power Management Features

- Support both ACPI (Advanced Configuration and Power Interface) .
- ACPI v2.0 compliant
- Hardware automatic wake-up

Power Requirements

Your system requires a clean, steady power source for reliable performance of the high frequency CPU on the product, the quality of the power supply is even more important. For the best performance makes sure your power supply provides a range of 10.8 V minimum to 31.2 V maximum DC power source.

Power Consumption

For typical configurations, the CPU card is designed to operate with at least a 60W power supply. The power supply must meet the following requirements:

-   Rise time for power supply: 2 ms - 30 ms

The following table lists the power supply's tolerances for DC voltages:

Table 2.3.   DC voltage tolerance

DC Voltage	Acceptable Tolerance
+ 12V - 24V	+ 10.8V - 31.2V

Physical Dimensions

BX-220D-DC7xxxxx
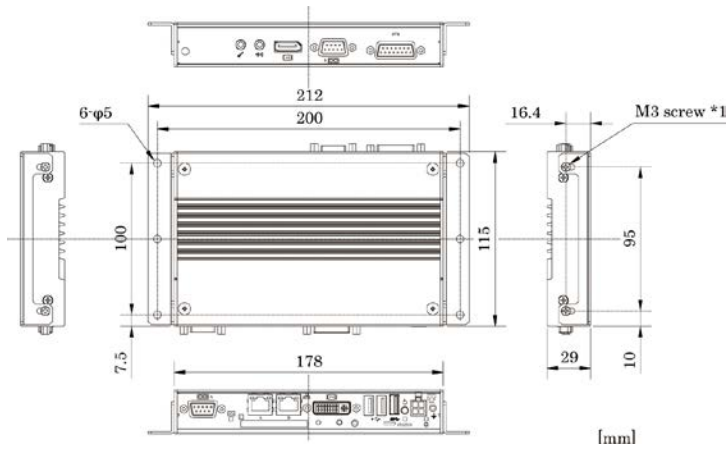
*1： When you fasten the bundled attachment fittings to be fixed to the body, you should use the attached screws (M3 x 6). Otherwise, the length (L) from the surface of the cabinet to the screw tip should be 4mm or less.

Figure 2.1. BX-220D-DC7xxxxx

3. Hardware Setup

Before Using the Product for the First Time

Follow the next steps to set up this product :

STEP1   By referring to the information in this chapter, install, connect and set this product.

STEP2   Connect cables.
Connect the cable of necessary external devices, such as keyboard and a display, to this product using appropriate cables.

STEP3   Turn on the power.
After verifying that you have correctly followed steps 1 and 2, turn on the power.
If you find any abnormality after turning on the power, turn it off and check to see if the setup has been performed properly.

STEP4   Set up BIOS.
By referring to Chapter 4, set up BIOS. This setup requires a keyboard and a display.

        * Before using this product, be sure to execute " Restore Defaults " to initialize the BIOS settings to their default values.
(See Chapter 4, " Save &a Exit.")

⚠ CAUTION
- Be sure to connect the keyboard and mouse to it before turning the power on for the first time.

- Be sure to connect the display before turning the power on. Connecting the display after turning the power on may prevent it from being displayed properly.

Hardware Setup

- Before you start, be sure that the power is turned off.
- Remove only those screws that are explained. Do not move any other screw.

Inserting an Embedded CFast Card

One CFast card (Type I) can be embedded. BX-220D-DC7x121x come with CFast cards with the OS already installed.

(1) Detach the side panel and insert the CFast card.

(2) Reattach the side panel and tighten the screws to secure it.
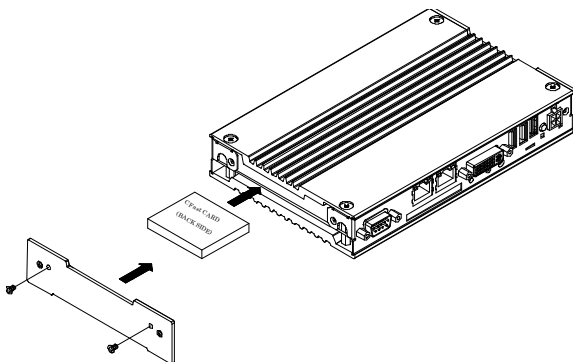
Figure 3.1.   Inserting an Embedded CFast Card

⚠ CAUTION

- Screw holes may be damaged if screws are tightened with a torque greater than the specified torque. The specified tightening torque is 5 - 6kgf·cm.

- If you use a CFast card other than the optional card, we cannot guarantee the specifications of this product. To use the product within its specifications, be sure to use the optional CFast card.

- To prevent potential damage caused by static electricity, take appropriate anti-static measures (for example, wearing an anti-static wristband) when inserting or removing the CFast card.

- Do not touch the electronic board components when inserting or removing the CFast card.

- Do not touch the terminals on the CFast card. Doing so may damage the card.

- Be careful not to mistake the orientation of the CFast card when inserting it. Also, do not use excessive force when inserting the CFast card. Doing so may damage the connector.

- Do not drop or otherwise subject the CFast card to strong impacts before insertion. Doing so may damage the card.

Attaching the CFast Attachment Fittings

(1) After inserting a CFast Card, fasten the bundled CFast attachment fittings with a screw.
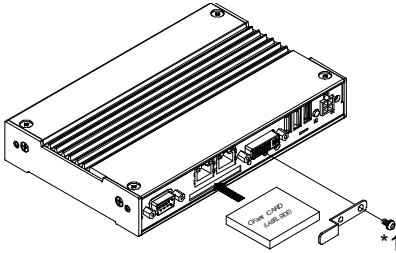
*1   Attached screw (M3 x 6)

Figure 3.2.   Attaching the CFast Attachment Fittings

⚠ CAUTION
- Insert the CFast Card face up.

- Screw holes may be damaged if screws are tightened with a torque greater than the specified torque.The specified tightening torque is 5 - 6 kgf·cm.

Attaching the Attachment Fittings

(1) Use screws to attach the bundled attachment fittings with a screw.
Do not tighten screws with excess force.
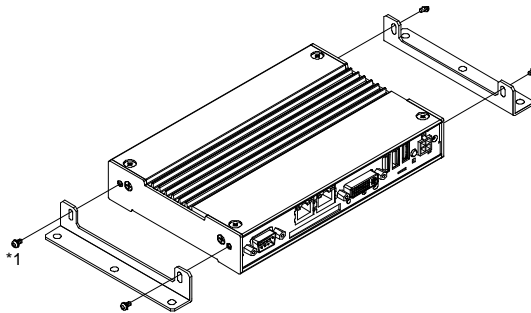
Figure 3.3.   Attaching the Attachment Fittings

⚠ CAUTION
- Screw holes may be damaged if screws are tightened with a torque greater than the specified torque. The specified tightening torque is 5 - 6kgf·cm.

Attaching the FG

(1) Use screws to attach the FG.
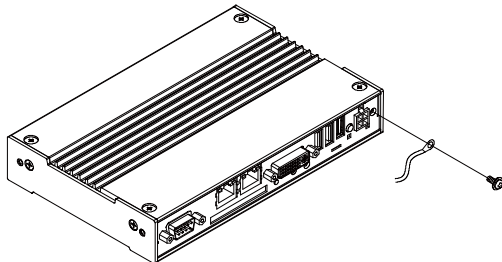
Figure 3.4. Attaching the FG

⚠ CAUTION

- The FG pin of this product is connected to the GND signal of the DC power connector (DC-IN).

- Note that the connection cannot be cut off.

- Screw holes may be damaged if screws are tightened with a torque greater than the specified torque.The specified tightening torque is 5 - 6kgf·cm.

Fastening the Cable

This product comes with clamps for fixing cables.

Fastening the LINEOUT, USB Cable

(1) The system unit has a hole for attaching cable clamp to USB removal prevention fitting. Using a cable clamp for a cable with lock-less connector, such as the LINEOUT and USB Cable, prevents the connector from being unplugged. Use the cable ties and cable clamps appropriately according to the connecting states and wiring directions of cables.

Wind the USB cable around the USB removal prevention fitting.

No. of connected USB cables and winding patterns (removal prevention fitting viewed from above).
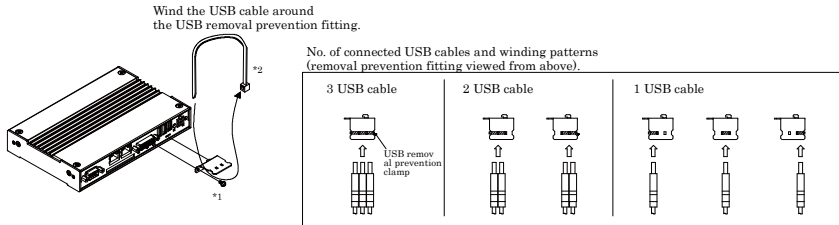
*1   Attached screw (M3 x 6)

*2   Attached USB removal prevention clamp.

Figure 3.5.   Attaching the cable clamp

(2) The photo below shows an example of using a cable clamp. Fix the cable with a clamp without applying stress to the connector.

Figure 3.6.   Using example of cable clamp

Installation Requirements

There are limits to the ambient temperature range depending on the installation orientation.

Be sure that the operating temperature is within the range specified in the installation environment requirement by making space between the product and device that generates heat or exhaust air.

Installable directions at operating temperature 0 - +50°C: (1), (2), (3), (4), (5), (8)
(When using 1000BASE-T: 0 - 45°C)

Installable directions at operating temperature 0 - 45°C (6), (7)
(When using 1000BASE-T: 0 - 40°C)
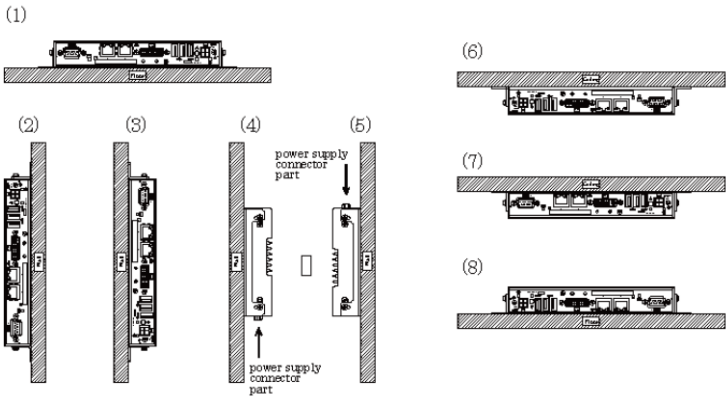
Figure 3.7.   Installation Orientation

⚠ **CAUTION**
Note that even though the ambient temperature is within the specified range, an operational malfunction may occur if there is other device generating high heat; the radiation will influence the product to increase its temperature.

Distances between this product and its vicinity
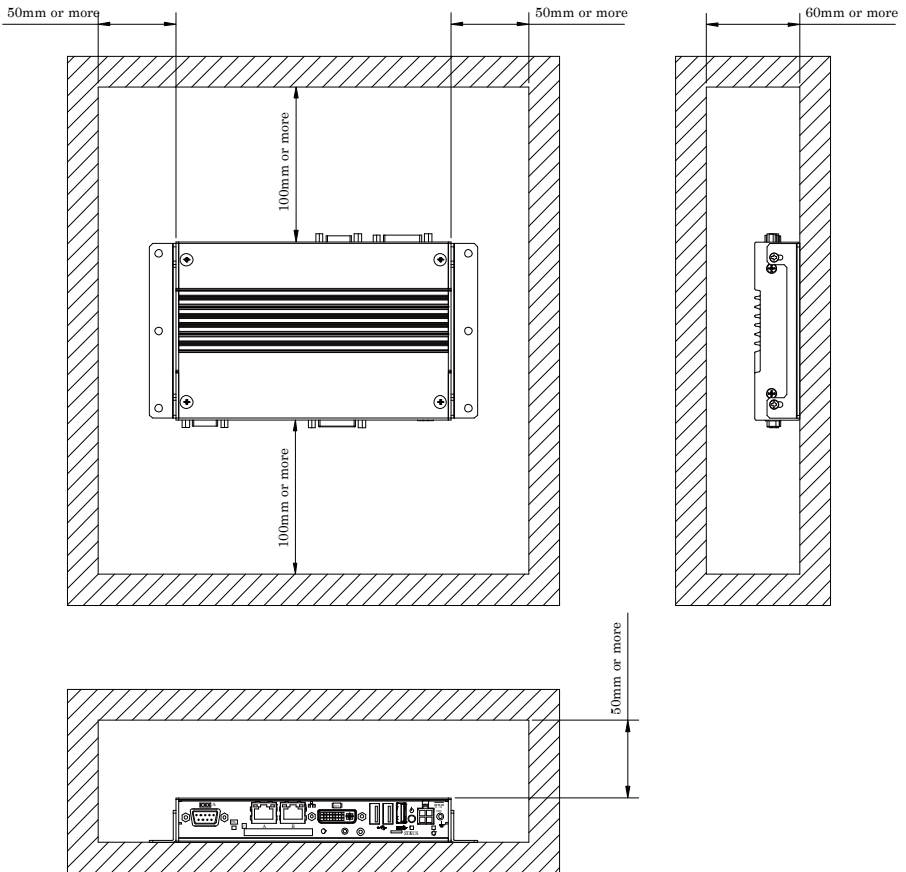
Figure 3.8.   Distances between this product and its vicinity

⚠ CAUTION
- Wall temperatures should be within the guaranteed operating temperature range of the product.
- Adjust the air flow so as not to allow waste heat from the product to accumulate around the product.
- Do not install this product in completely sealed spaces, except when it is possible to adjust the internal temperature using an air conditioner or similar equipment. Temperature increase caused by long-term usage may result in operational malfunction or other problems.

Operating temperature

In this product, the operating temperature is decided from the multiple measurement points as shown below. When making use of the product, the air current should be adjusted to prevent that all the temperatures measured at the measurement points exceed the specified temperature.

⊗ measurement points

[mm]
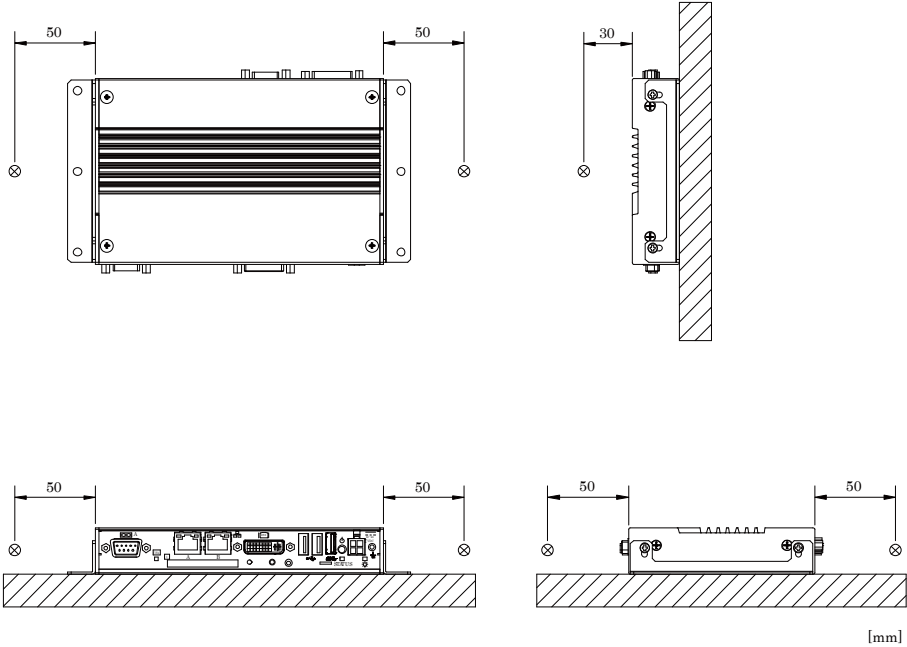
Figure 3.9.   Operating temperature

4. BIOS Setup

Introduction

This chapter discusses American Megatrends's (AMI) Setup program built into the FLASH ROM BIOS. The Setup program allows users to modify the basic system configuration. This special information is then stored in FLASH ROM so that it retains the Setup information when the power is turned off.

The rest of this chapter is intended to guide you through the process of configuring your system using Setup.

Starting Setup

The AMI BIOS is immediately activated when you first power on the computer. The BIOS reads the system information contained in the FLASH ROM and begins the process of checking out the system and configuring it. When it finishes, the BIOS will seek an operating system on one of the disks and then launch and turn control over to the operating system.

While the BIOS is in control, the Setup program can be activated in one of two ways:

1   By pressing <Del> or <ESC> immediately after switching the system on, or

2   By pressing the <Del> or <ESC> key when the following message appears briefly at the bottom of the screen during the POST (Power On Self-Test).

   Press <DEL> ot <ESC> to enter SETUP.

If the message disappears before you respond and you still wish to enter Setup, restart the system to try again by turning it OFF then ON on the system case. You may also restart by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

Using Setup

In general, you use the arrow keys to highlight items, press <Enter> to select, use the PageUp and PageDown keys to change entries, press <F1> for help and press <Esc> to quit. The following table provides more detail about how to navigate in the Setup program using the keyboard.

Table 4.1.   Using Setup

Key	Function
Up Arrow	Move to the previous item
Down Arrow	Move to the next item
Left Arrow	Move to the item on the left (menu bar)
Right Arrow	Move to the item on the right (menu bar)
Esc	Main Menu: Quit without saving changes
	Submenus: Exit Current page to the next higher level menu
Move Enter	Move to the item you desired
+ key	Increase the numeric value or make changes
- key	Decrease the numeric value or make changes
F1 key	General help on Setup navigation keys
F2 key	Load the previous settings.
F3 key	Load the optimal defaults from the BIOS default table.
F4 key	Save all the changed settings to the FLASH ROM and exit

Getting Help

Press F1 to pop up a small help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press <Esc> or the F1 key again.

In Case of Problems

If you cannot boot the computer after using Setup to change and save system settings, the computer will have to be repaired. It is safest not to change system settings you do not fully understand. Therefore, it is strongly recommended that you do not change any of the default settings for the chipset. These defaults have been selected with sufficient consideration by the AMI and system manufacturers to ensure maximum performance and reliability. Even changing the chipset settings slightly can result in an unavoidable need for repairs.

A Final Note About Setup

The information in this chapter is subject to change without notice.

Main Menu

When the setup program (Aptio Startup Utility) is started, the main menu will be displayed. Navigate through the various tabs by pressing the right and left arrow keys.

```
                Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
    Main          Advanced        Chipset         Security        Boot          Save & Exit

    BIOS Information
    BIOS Vendor                    American Megatrends
    Core Version                   5.010
    Compliency                     UEFI 2.4; PI 1.3
    Project Version                B220C 0.02 x64
    Build Data and Time            11/07/2014   20:10:41

    CPU Configuration
    Microcode Patch                901
    BayTrail SoC                   D0 Stepping
                                                               →←:Select Screen
    Memory Information                                         ↑↓:Select Item
    Total Memory                   4096 MB (LPDDR3)            Enter:Select
                                                               +/-:Change Opt.
    GOP Information                                            F1:General Help
    Intel(R) GOP Driver             [N/A]                      F2:Previous Values
                                                               F3:Optimized Defaults
    TXE Information                                            F4:Save & Exit
    Sec RC Version                 00.05.00.00                 ESC:Exit
    TXE FW Version                 01.01.00.1089

    System Language                [English]

    System Date                    [Week Day MM/DD/YYYY]
    System Time                    [HH:MM:SS]

    Access Level                   Administrator

                Version x.xx.xxxx. Copyright (C) 20xx American Megatrends, Inc.
```

Figure 4.1.   Main Manu

Setup Items

The selectable tabs are as follows.

Main
View the basic system structure, and configure the language settings and the date and time settings.

Advanced
Specify the detailed functions that can be set on the system used.

Chipset
Specify the detailed functions that can be set on the system used.

Security
Set the password to be used to protect the security of the system.

Boot
Configure the settings related to how the system will boot.

Save & Exit
Load/save setup items and exit the setup menu.

Main

View the basic system structure. The following items are displayed.

Table 4.2.   Indication item of the main menu

Item	Indication example	Explanation
BIOS Vendor	American Megatrends	Displays the BIOS manufacturer.
Core Version	5.010	Displays the BIOS core version.
Compliency	UEFI 2.4; PI 1.3	Displays the UEFI version.
Project Version	B220C 0.02 x64	Displays the BIOS version.
Build Data and Time	11/07/2014　20: 10: 41	Displays the BIOS creation date and time.
Access Level	Administrator	Displays the access rights level.

This table shows the selections that you can make on the Main Menu.

Table 4.3.   Main Menu Selections

Item	Options	Description
System Date	Week Day Month / Day / Year	Set the system date. Note that the 'Day' automatically changes when you set the date
System Time	Hour : Minute : Second	Set the system time

Advanced

Specify the detailed system functions. The following items are available.

```
                        Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
     Main          Advanced          Chipset          Security          Boot          Save & Exit

        ▶ ACPI Settings
        ▶ RAS Configuration
        ▶ Super IO Configuration
        ▶ H/W Monitor
        ▶ CPU Configuration
        ▶ PPM 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 x.xx.xxxx. Copyright (C) 20xx American Megatrends, Inc.
```

Figure 4.2.   Advanced Manu

ACPI Settings
Configure the ACPI settings.

RAS Configuration
Configure the RAS settings.

Super IO Configuration
Configure the Super IO settings.

H/W Monitor
View such information as the CPU temperature.

CPU Configuration
Configure the CPU settings.

PPM Configuration
Configure the power saving function settings.

SATA Configuration
Configure the SATA controller settings.

CSM Configuration
Configure such settings as the boot options.

USB Configuration
Configure the USB settings.

ACPI Settings

Configure the settings for ACPI power management.

```
Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
      Advanced

  ACPI Settings

  Enable Hibernation              [Enabled]
  ACPI Sleep State                [S3 (Suspend to RAM)]

  Wakeup by RI Control            [Disabled]
  Wake On LAN A Control on S5     [Disabled]
  Wake On LAN B Control on S5     [Disabled]
  Resume On RTC Alarm             [Disabled]

                                                      →←: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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```

Figure 4.3.   ACPI Settings

Table 4.4.   ACPI Settings

Item	Option	Description
Enable Hibernation	Disabled Enabled	Configure the Hibernation settings.
ACPI Sleep State	Suspend Disabled S3 (Suspend to RAM)	Configure the Sleep State settings.
Wakeup by RI Control	Disabled Enabled	Configure the Resume on Ring function settings.
Wake on LAN A Control on S5	Disabled Enabled	Configure the Wake on LAN settings for LAN A.
Wake on LAN B Control on S5	Disabled Enabled	Configure the Wake on LAN settings for LAN B.
Resume on RTC Alarm	Disabled Enabled	Enable or disable the function for automatically turning on the system at the specified date and time. When enabled, use the following items to set the date and time the system will automatically turn on.

Table 4.5.　Resume On RTC Alarm (Only Available When "Enabled" Is Selected)

Item	Option	Description
RTC Wake up Day	1-31	Sets the day the system will automatically turn on.
RTC Wake up Hour	0-23	Sets the time the system will automatically turn on.
RTC Wake up Minute	0-59	Sets the minute the system will automatically turn on.
RTC Wake up Second	0-59	Sets the second the system will automatically turn on.

RAS Configration

Configure such settings as the RAS.

```
              Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
              Advanced


    RAS Configration

    Firmware Version                    01.00

    System Uptime                       XD XXH XXM XXS
    System AC Power-on Time             XD XXH XXM XXS

    WDT during POST                     [Disabled]
    WDT during Boot of the OS           [Disabled]
        WDT Value (Seconds)             [254]
        WDT Timeup Function             [Reset]                    →←:Select Screen
                                                                   ↑↓:Select Item
    PI2 Function                        [Input]                    Enter:Select
                                                                   +/-:Change Opt.
                                                                   F1:General Help
                                                                   F2:Previous Values
                                                                   F3:Optimized Defaults
                                                                   F4:Save & Exit
                                                                   ESC:Exit




              Version x.xx.xxxx. Copyright (C) 20xx American Megatrends, Inc.
```

Figure 4.4.   RAS Configuration (Actual Display May Vary.)

Table 4.6.   RAS Configuraiton

Item	Option	Description
Firmware Version		View the firmware version of the sub-controller.
System Uptime		View the system's cumulated boot time.
System AC Power-on Time		View the system's cumulated power-on time.
WDT during POST	Disabled Enabled	Configure the WDT function settings at BIOS start-up.
WDT during Boot of the OS	Disabled Enabled	Configure the WDT function settings at OS start-up.
PI2 Function	Input Reset Button Power Button	Configure the PI2 pin settings. Input： Use as a general-purpose input. Reset Button： Use as a reset button. Power Button： Use as a power button.

◎ CONTEC

Table 4.7.   WDT during Boot of the OS (Only Enabled)

Item	Option	Description
WDT Value (Seconds)	0-254	Sets the timeout time of WDT functions
WDT Timeup Function	None Reset Shutdown PO2 Output High PO2 Output Low	Sets the timeout behavior of WDT functions None : None Reset : Reset system Shutdown : Shut down system PO2 Output High : PO2 pin output High PO2 Output Low : PO2 pin output Low

Super IO Configuration

Configure the operation settings for Super IO.

```
              Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
        Advanced

   Super IO Configuration

   Super IO Chip                    NCT6106D
 ▶ Serial Port A Configuration
 ▶ Serial Port B Configuration
 ▶ RS-485 Port 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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```

Figure 4.5.   Super IO Configuration

Table 4.8.   Super IO Configuration

Item	Option	Description
Serial Port A Configuration	Refer to Table 4.9.	-
Serial Port B Configuration	Refer to Table 4.10.	-
RS-485 Port Configuration	Refer to Table 4.11.	-

Table 4.9.   Serial Port A Configuration

Item	Option	Description
Serial Port	Disabled Enabled	Configure the operation settings for serial port A.
Change Settings	IO=3F8h; IRQ=4; IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;	Do not change this setting.

Table4.10.   Serial Port B Configuration

Item	Option	Description
Serial Port	Disabled Enabled	Configure the operation settings for serial port B.
Change Settings	IO=2F8h; IRQ=3; IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;	Do not change this setting.

Table 4.11.   RS-485 Port Configuration

Item	Option	Description
Serial Port	Disabled Enabled	Configure the operation settings for RS-485.
RS485 Mode	EC Mode RTS Mode	Configure the operation mode settings for RS-485. There is normally no need to change this setting.
RS485 Terminator Control	Disabled Enabled	Configure the terminating resistor settings for RS-485 Port.

H/W Monitor

View hardware monitor information such as the CPU temperature.

```
                   Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
          Advanced

   Pc Health Status

   System temperature            : +35 C
   CPU temperature               : +42 C
   VCORE                         : +0.888 V
    +1.8V                        : +1.760 V
    +5V                          : +5.024 V
    +5VSB                        : +5.056 V
    +3.3 VSB                     : +3.312 V
    +3.3 VCC                     : +3.296 V
   VBAT                          : +3.216 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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```

Figure 4.6.   H/W Monitor   (Actual Display May Vary.)

CPU Configuration

Configure the operation settings for CPU.

```
         Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
          Advanced

         CPU Configuration                                              │
                                                                        │
         ▶ Socket 0 CPU Information                                     │
                                                                        │
         CPU Speed                      1918MHz                         │
         64-bit                         Supported                       │
                                                                        │
         Execute Disable Bit            [Enabled]                       │
         Intel Virtualization Technology [Disabled]                     │
                                                                        ├─────────────────────
                                                                        │ →←:Select Screen
                                                                        │ ↑↓:Select Item
                                                                        │ Enter:Select
                                                                        │ +/-:Change Opt.
                                                                        │ F1:General Help
                                                                        │ F2:Previous Values
                                                                        │ F3:Optimized Defaults
                                                                        │ F4:Save & Exit
                                                                        │ ESC:Exit


         Version x.xx.xxxx. Copyright (C) 20xx American Megatrends, Inc.
```

Figure 4.7. CPU Configuration

Table 4.12. CPU Configuration

Item	Option	Description
Execute Disable Bit	Disabled Enabled	Do not change this setting.
Intel Virtualization Technology	Disabled Enabled	Do not change this setting.

PPM Configuration

Configure the power saving function settings.

```
                Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
            Advanced

     PPM Configuration

     EIST                              [Disabled]
     CPU C-State Report                [Disabled]
     S0ix                              [Disabled]



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



                Version x.xx.xxxx. Copyright (C) 20xx American Megatrends, Inc.
```
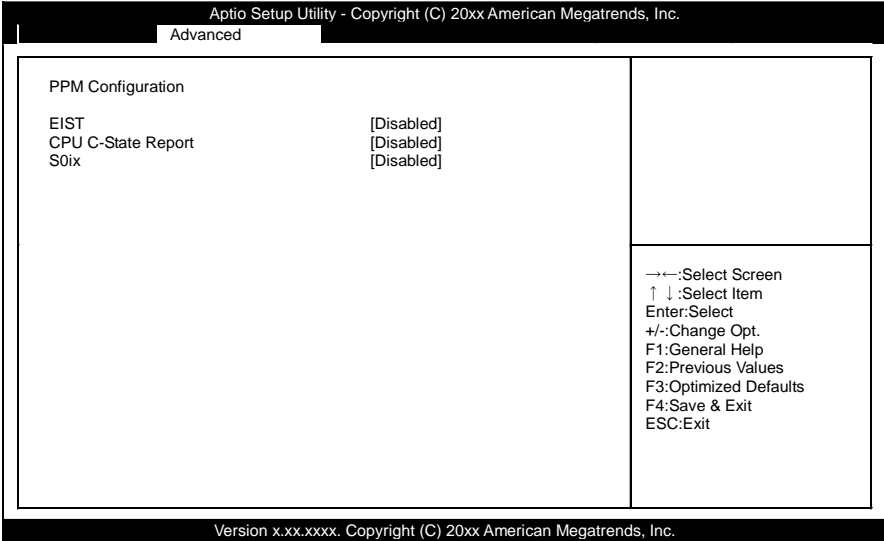
Figure 4.8.   PPM Configuration

Table 4.13   PPM Configuration

Item	Option	Description
EIST	Disabled Enabled	Do not change this setting.
CPU C-State Report	Disabled Enabled	Do not change this setting.
SOix	Disabled Enabled	Do not change this setting.

SATA Configuration

Configure the SATA controller settings.

```
                 Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
        Advanced

   SATA Configuration

   Serial-ATA (SATA)                [Enabled]
   SATA Test Mode                   [Disabled]

   Select SATA Port/CFast Card      [CFast Card]

   SATA Speed Support               [Gen2]
   SATA ODD Port                    [No ODD]
   SATA Mode                        [AHCI Mode]
                                                      →←:Select Screen
   Serial-ATA Port 0                [Enabled]          ↑↓:Select Item
                                                      Enter:Select
   Serial-ATA Port 1                [Enabled]         +/-:Change Opt.
                                                      F1:General Help
   SATA Port 0                                        F2:Previous Values
   xxxx                                               F3:Optimized Defaults
                                                      F4:Save & Exit
   SATA Port 1                                        ESC:Exit
   xxxx


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```

Figure 4.9.   SATA Configuration

Table 4.14.   SATA Configuration

Item	Option	Description
Serial-ATA (SATA)	Enabled / Disabled	Configure the SATA controller operation settings. Changing this setting will cause the CFast drive to become unrecognized.
SATA Test Mode	Enabled / Disabled	Do not change this setting.
Select SATA Port / CFast Card	SATA Port / CFast Card	Do not change this setting.
SATA Speed Support	Gen1 / Gen2	Do not change this setting.
SATA ODD Port	Port0 ODD / Port1 ODD / No ODD	Do not change this setting.
SATA Mode	IDE Mode / AHCI Mode	Specify the SATA device mode. Changing this setting will require the OS to be reinstalled.
Serial-ATA Port 0	Enabled / Disabled	Configure the operation settings for SATA port0.
Serial-ATA Port 1	Enabled / Disabled	Configure the operation settings for SATA port1.

CSM Configuration

Configure settings associated with the CSM (Compatibility Support Module), such as Option ROM execution.

```
                  Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
            Advanced

   Compatibility Support Module Configuration

   CSM Support                    [Enabled]

   CSM16 Module Version           07.76

   GateA20 Active                 [Upon Request]
   Option ROM Messages            [Force BIOS]

   Boot Option filter             [UEFI and Legacy]
                                                         →←:Select Screen
   Option ROM execution                                  ↑↓:Select Item
                                                         Enter:Select
   Network                        [UEFI]                 +/-:Change Opt.
   Storage                        [UEFI]                 F1:General Help
   Video                          [Legacy]               F2:Previous Values
   Other PCI devices              [UEFI]                 F3:Optimized Defaults
                                                         F4:Save & Exit
                                                         ESC:Exit




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```

Figure 4.10.   CSM Configuration

Table 4.15.   CSM Configuration

Item	Option	Description
CSM Support	Disabled Enabled	Do not change this setting.
GateA20 Active	Upon Request Always	Do not change this setting.
Option ROM Message	Force BIOS Keep Current	Do not change this setting.
Boot option filter	UEFI and Legacy Legacy only UEFI only	Do not change this setting.
Network	Do not launch UEFI Legacy	Configure the PXE boot settings.
Storage	Do not launch UEFI Legacy	Do not change this setting.
Video	Do not launch UEFI Legacy	Do not change this setting.
Other PCI devices	Do not launch UEFI Legacy	Do not change this setting.

USB Configuration

Configure the operation settings for USB controller.

```
                    Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
            Advanced

      USB Configuration

      USB Module Version              8.11.02

      USB Devices:
            1 Keyboard, 1 Mouse, 1 Hubs

      Legacy USB Support              [Enabled]
      XHCI Hand-off                   [Enabled]
      EHCI Hand-off                   [Disabled]
      USB Mass Storage Driver Support [Enabled]          →←:Select Screen
                                                         ↑↓:Select Item
      USB hardware delays and time-outs:                 Enter:Select
      Device power-up delay           [Auto]             +/-:Change Opt.
                                                         F1:General Help
                                                         F2:Previous Values
                                                         F3:Optimized Defaults
                                                         F4:Save & Exit
                                                         ESC:Exit

                    Version x.xx.xxxx. Copyright (C) 20xx American Megatrends, Inc.
```

Figure 4.11.　USB Configuration

Table 4.16.　USB Configuration

Item	Option	Description
Legacy USB Support	Enabled Disabled Auto	Configure whether USB keyboards and similar devices will be usable with legacy operating systems (such as MS-DOS).
XHCI Hand-off	Enabled Disabled	Do not change this setting.
EHCI Hand-off	Disabled Enabled	Do not change this setting.
USB Mass Storage Driver Support	Disabled Enabled	Configure the USB storage support settings with BIOS.
Device power-up delay	Auto Manual	Do not change this setting.

Chipset

Specify the detailed chipset functions.

```
                  Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
   Main           Advanced           Chipset          Boot          Security          Save & Exit

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

                  Version x.xx.xxxx. Copyright (C) 20xx American Megatrends, Inc.
```
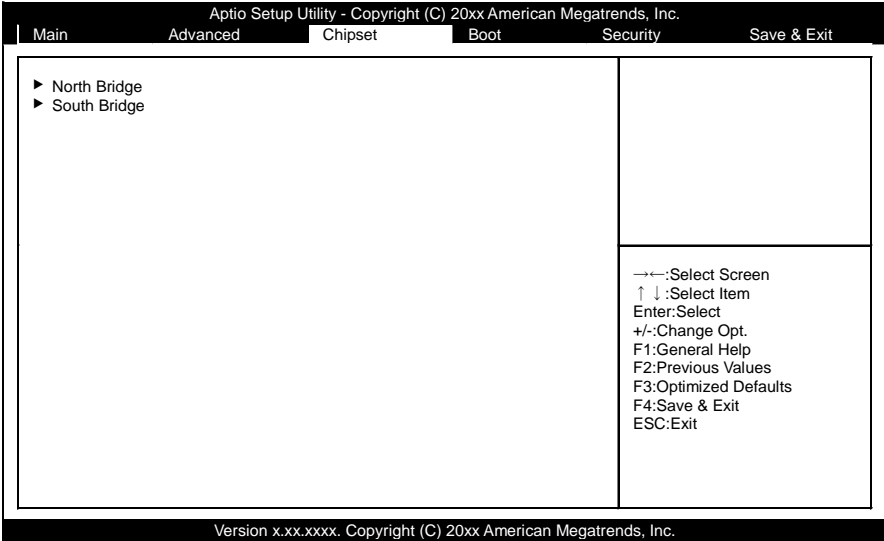
Figure 4.12.   Chipset

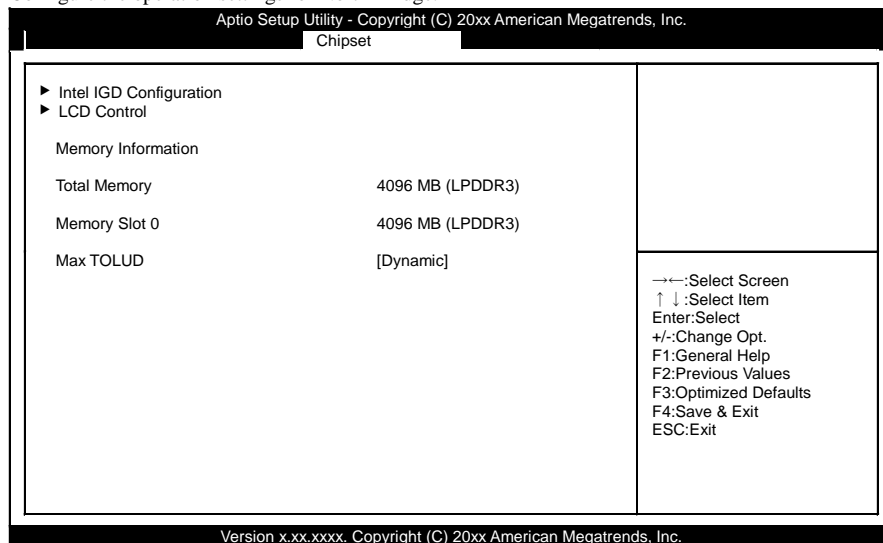The following items are available.

North Bridge
Configure the operation settings for North Bridge.

South Bridge
Configure the operation settings for South Bridge.

◎ CONTEC

North Bridge

Configure the operation settings for North Bridge.

```
                 Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
                                    Chipset

    ▶ Intel IGD Configuration
    ▶ LCD Control

      Memory Information

      Total Memory                    4096 MB (LPDDR3)

      Memory Slot 0                   4096 MB (LPDDR3)

      Max TOLUD                       [Dynamic]
                                                              →←: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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```

Figure 4.13.　　North Bridge

Table 4.17.　　North Bridge

Item	Option	Description
Intel IGD Configuration	Refer to Table 4.18.	-
LCD Control	Refer to Table 4.19.	-
Max TOLUD	Dynamic 2 GB 2.25 GB 2.5 GB 2.75 GB 3 GB	Do not change this setting.

Intel IGD Configuration

Configure how memory will be used when using the graphic function.
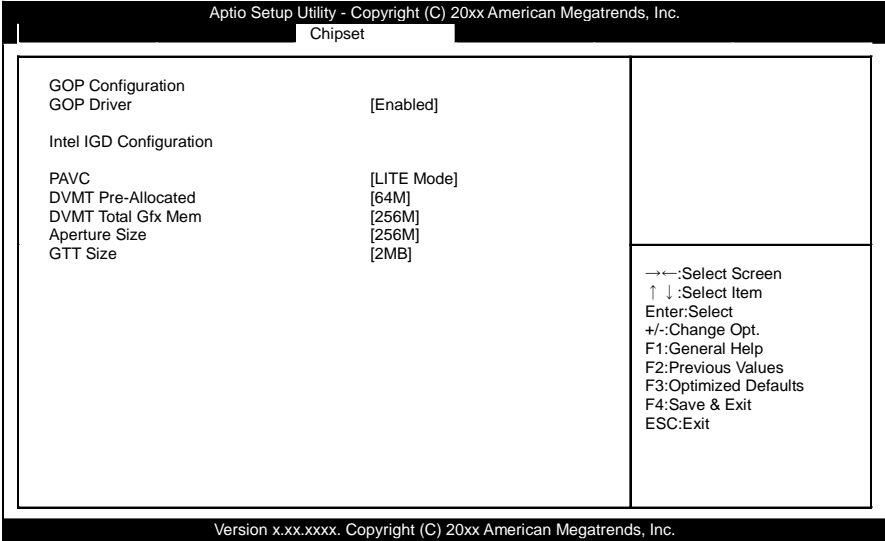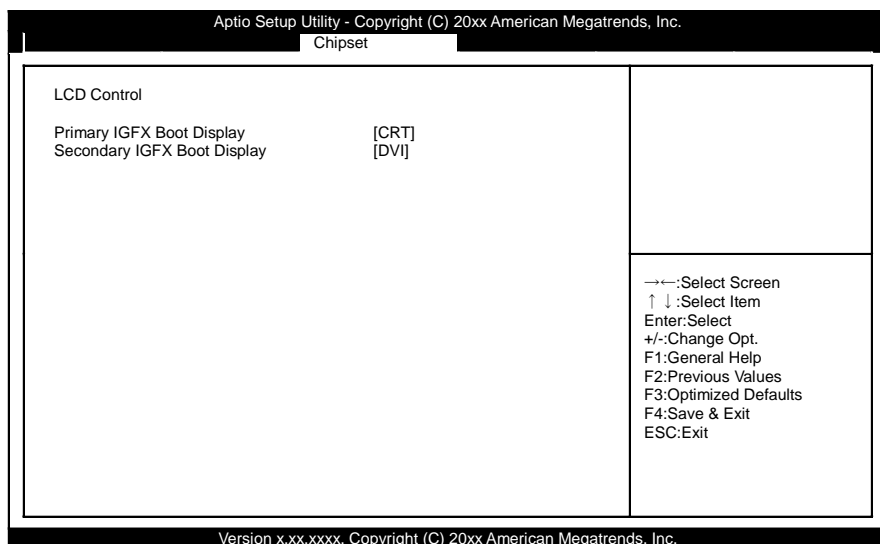Leave these settings as configured before shipment.

```
                Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
                                    Chipset

    GOP Configuration
    GOP Driver                          [Enabled]

    Intel IGD Configuration

    PAVC                                [LITE Mode]
    DVMT Pre-Allocated                  [64M]
    DVMT Total Gfx Mem                  [256M]
    Aperture Size                       [256M]
    GTT Size                            [2MB]
                                                        →←: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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```

Figure 4.14.   Intel GOP Configuration

Table 4.18.   Intel GOP Configuration

Item	Option	Description
GOP Driver	Enabled Disalbed	Do not change this setting.
PAVC	Disabled LITE Mode SERPENT Mode	Do not change this setting.
DVMT Pre-Allocated	64MB 96MB 128MB 160MB 192MB 224MB 256MB 288MB 320MB 352MB 416MB 448MB 512MB	Do not change this setting.

Item	Option	Description
DVMT Total Gfx Mem	128MB 256MB MAX	Do not change this setting.
Aperture Size	128MB 256MB 512MB	Do not change this setting.
GTT Size	1MB 2MB	Do not change this setting.

LCD Control

Configure the LCD settings.

```
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                              Chipset

     LCD Control

     Primary IGFX Boot Display            [CRT]
     Secondary IGFX Boot Display          [DVI]




                                                        →←: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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```

Figure 4.15.   LCD Control

Table 4.19.   LCD Control

Item	Option	Description
Primary IGFX Boot Display	CRT DVI Display Port	Configure the settings for the port that will be output as the main display at start-up. Only the main display is displayed during OS recovery. Change the settings to suit the type of connected display.
Secondary IGFX Boot Display	Disabled CRT DVI Display Port	Configure the settings for the port that will be output as the auxiliary display at start-up. This will make it possible to use an auxiliary display after the OS boots.

South Bridge Configuration

Configure the South Bridge settings.

```
                 Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
                                    Chipset

    ▶ Azalia HD Audio
    ▶ USB Configuration

      High Precision Timer              [Enabled]
      Restore AC Power Loss             [Power On]

      Serial IRQ Mode                   [Quiet]

      Onboard LAN A Controller          [Enabled]
      Onboard LAN B Controller          [Enabled]
                                                        →←: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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```

Figure 4.16.   PCH-IO Configuration

Table 4.20.   PCH-IO Configuration

Item	Option	Description
Azalia HD Audio	Refer to Table 4.21.	-
USB Configuration	Refer to Table 4.22.	-
High Precision Timer	Enabled Disabled	Configure the high-precision event timer settings.
Restore AC Power Loss	Power Off Power On Last State	Set whether to start the system at the same time the power supply starts. Power OFF: Press the power button to start the system. The system does not start at the same time the power supply starts. Power ON: The system will start at the same time the power supply starts. Last State: If the power is turned off while the system is on, the system will start the next time the power supply starts.
Serial IRQ Mode	Quiet Continuous	Do not change this setting.
Onboard LAN A Controller	Enabled Disabled	Configure the LAN A Controller settings.
Onboard LAN B Controller	Enabled Disabled	Configure the LAN B Controller settings.

Azalia HD Audio Configuration

Configure the Azalia HD Audio settings.

```
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                                       Chipset

        Audio Configuration

        Audio Controller                    [Enabled]



                                                                  →←: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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```

Figure 4.17.   Azalia HD Audio Configuration

Table 4.21.   Azalia HD Audio Configuration

Item	Option	Description
Audio Controller	Disabled Enabled	Configure the Audio Controller settings.

USB Configuration

Configure the USB settings.

```
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                          Chipset

      USB Configuration
      USB Overcurrent                    [Disabled]

      OS Selection                       [Windows 7]

      USB 3.0 (XHCI) Support             [Enabled]
      USB2 Link Power Management         [Disabled]

      USB 2.0 (EHCI) Support             [Disabled]

                                                              →←: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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```

Figure 4.18.   USB Configuration

Table 4.22.   USB Configuration

Item	Option	Description
USB Overcurrent	Enabled Disabled	Do not change this setting.
OS Selection	Windows 8.X Android Windows 7	Do not change this setting.
USB3.0 (XHCI) Support	Enabled Disabled Smart Auto	Configure the USB 3.0 settings. This should normally be set to Enabled. Set to Smart Auto to set up a USB 3.0 driver in Windows 7.
USB2 Link Power Management	Enabled Disabled	Do not change this setting.
USB2.0 (EHCI) Support	Enabled Disabled	Do not change this setting. Setting to Disabled will prevent all USB ports from operating.

Security

Configure the security of the system settings.

```
                Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
    Main          Advanced        Chipset          Security        Boot          Save & Exit

       Password Description

       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:                                    →←:Select Screen
       Minimum length                    3                        ↑ ↓ :Select Item
       Maximum length                    20                       Enter:Select
                                                                  +/-:Change Opt.
                                                                  F1:General Help
                                                                  F2:Previous Values
       Administrator Password                                     F3:Optimized Defaults
       User Password                                              F4:Save & Exit
                                                                  ESC:Exit
    ▶ Secure Boot menu


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```

Figure 4.19.   Security

Administrator Password
Set the Administrator Password.
Press Enter to display the following screen for entering the password.

Administrator Password	
Create New Password	[****]
Confirm New Password	[****]

Enter a password at least 3 characters long twice.
To disable the password, enter the Administrator Password entry screen again.

User Password
Set the user password.
Press Enter to display the following screen for entering the password.

User Password	
Create New Password	[****]
Confirm New Password	[****]

Enter a password at least 3 characters long twice.

To disable the password, enter the Administrator Password entry screen again.

⚠ CAUTION
   Be careful to not forget the password. If you forget the password, the product will have to be repaired
   at an extra cost.

Secure Boot menu

Configure the Secure Boot settings.

Leave these settings as configured before shipment.

```
                 Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
   Main          Advanced        Chipset           Security          Boot          Save & Exit

      System Mode                      Setup
      Secure Boot                      Not Active

      Secure Boot                      [Enabled]
      Secure Boot Mode                 [Standard]

    ▶ Key Management

                                                          →←: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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```

Figure 4.20.   Secure Boot

Table 4.23.   Secure Boot

Item	Option	Description
Secure Boot	Disabled Enabled	Do not change this setting.
Secure Boot Mode	Standard Custom	Do not change this setting.

Boot Configuration

Configure the settings boot devices and other devices.

```
                Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
    Main            Advanced         Chipset          Security         Boot          Save & Exit

       Boot Configuration
       Setup Prompt Timeout                  1
       Bootup NumLock State                  [On]

       Quiet Boot                            [Disabled]
       Fast Boot                             [Disabled]

       Boot Option Priorities
       Boot Option #1                        [xxxxxxxx]
       Boot Option #2                        [xxxxxxxx]
       Boot Option #3                        [xxxxxxxx]                  →←:Select Screen
                                                                        ↑↓:Select Item
       CD/DVD ROM Drive BBS Priorities                                  Enter:Select
       Hard Drive BBS Priorities                                        +/-:Change Opt.
       Floppy Drive BBS Priorities                                      F1:General Help
                                                                        F2:Previous Values
                                                                        F3:Optimized Defaults
                                                                        F4:Save & Exit
                                                                        ESC:Exit

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```

Figure 4.21.   Boot Configuration

Table 4.24.   Boot Configuration

Item	Option	Description
Setup Prompt Timeout	1	Set the standby time for BIOS Setup <DEL> or <F2> input. Unit：[second]
Bootup NumLock State	On Off	Set the NumLock status when the system starts.
Quiet Boot	Disabled Enabled	Do not change this setting.
Fast Boot	Disabled Enabled	Do not change this setting.
Boot Option #x	XXXXXXXX (Specify any device)	Set the start order of the connected USB floppy drives.*1
CD/DVD ROM Drive BBS Priorities	XXXXXXXX (Specify any device)	Set the start order of the connected CD/DVD drives. *1
Hard Drive BBS Priorities	XXXXXXXX (Specify any device)	Set the start order of the connected HDD/CFast/USB removable drives. *1
Floppy Drive BBS Priorities	XXXXXXXX (Specify any device)	Set the start order of the connected USB floppy drives. *1

*1： Appears when the device is connected.

⚠ CAUTION
In the Boot Option #x device list, the same device may be displayed as follows.
(1) USB Disk
(2) UEFI: USB Disk
In such cases, if (1) is selected, a legacy boot is performed under the assumption the disk is MBR-formatted. If (2) is selected, a UEFI boot is performed under the assumption the disk is GPT-formatted. Make sure to specify (1) as the boot setting. Booting with (2) will result in non-support. Only devices set as the highest in individual settings like CD/DVD ROM Drive BBS Priorities are listed as selectable under Boot Option #x.

Save & Exit

Load/save setup items and exit the setup menu.

```
                    Aptio Setup Utility - Copyright (C) 20xx American Megatrends, Inc.
   Main          Advanced        Chipset         Security        Boot          Save & Exit

      Save Changes and Exit
      Discard Changes and Exit
      Save Changes and Reset
      Discard Changes and Reset

      Save Option
      Save Changes
      Discard Changes

      Restore Defaults                                   →←:Select Screen
      Save as User Defaults                              ↑↓:Select Item
      Restore User Defaults                              Enter:Select
                                                         +/-:Change Opt.
      Boot Override                                      F1:General Help
      XXXXXXXX                                           F2:Previous Values
      XXXXXXXX                                           F3:Optimized Defaults
                                                         F4:Save & Exit
      Launch EFI Shell from filesystem device            ESC:Exit
    ▶ Reset System with ME disable ModeMEUD000


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```

Figure 4.22.   Save & Exit

Saving Changes and Exit
Save the changed settings and exit.

Discard Change and Exit
Exit without saving the changed settings.

Save Changes and Reset
Save the changed settings and restart.

Discard Change and Reset
Restart without saving the changed settings.

Save Changes
Save the changed settings.

© CONTEC

Discard Changes
Discard the changed settings.

Restore Defaults
Return the settings to their default values.

Save as User Defaults
Save the settings as the user default values.

Restore User Defaults
Return the settings to the user default values.

Boot Override
Configure the settings for temporary booting from a connected device other than that set in Boot Configuration. The bootable devices will be displayed in place of XXXX.

5. Each Component Function

Component Name

Front View

BX-220D-DC7xxxxx

SERIAL A   LAN A   LAN B   DVI-I   USB 3.0   POWER SWITCH
USB 2.0   DC-IN

ACCESS LED   CFast1   STATUS LED   POWER LED
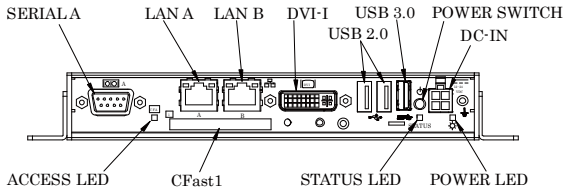
Figure 5.1.   Component Name   *< 1 / 2 >*

Rear View

BX-220D-DC7xxxxx

RAS   SERIAL B   Display Port   MIC IN   LINE OUT
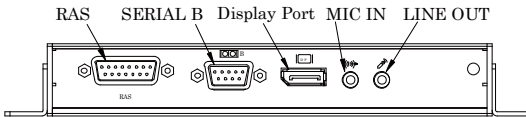
Figure 5.1.   Component Name   *< 2 / 2 >*

Table 5.1. Component Function

Name	Function
POWER LED	Power ON display LED
STATUS LED	Status LED
ACCESS LED	CFast disk access display LED
DC-IN	DC power input connector
POWER-SW	Power switch
MIC IN	Mike in (φ3.5 PHONE JACK)
LINE OUT	Line out (φ3.5 PHONE JACK)
DVI-I	Display (29 pin, female)
Display Port	Display (20 pin, female)
USB3.0	USB3.0 port TYPE-A connector x 1
USB2.0	USB2.0 port TYPE-A connector x 2
LAN A	Ethernet 1000BASE-T/100BASE-TX/10BASE-T RJ-45 connector
LAN B	Ethernet 1000BASE-T/100BASE-TX/10BASE-T RJ-45 connector
CFast1	CFast card slot (SATA connection)
CFast2	CFast card slot (SATA connection)
SERIAL A	Serial port A connector (9pin D-SUB, male)
SERIAL B	Serial port B connector (9pin D-SUB, male)
RAS	RAS function and RS-422/485 connector (15 pinD-SUB, female)

System Configuration

BX-220D-DC7xxxxx
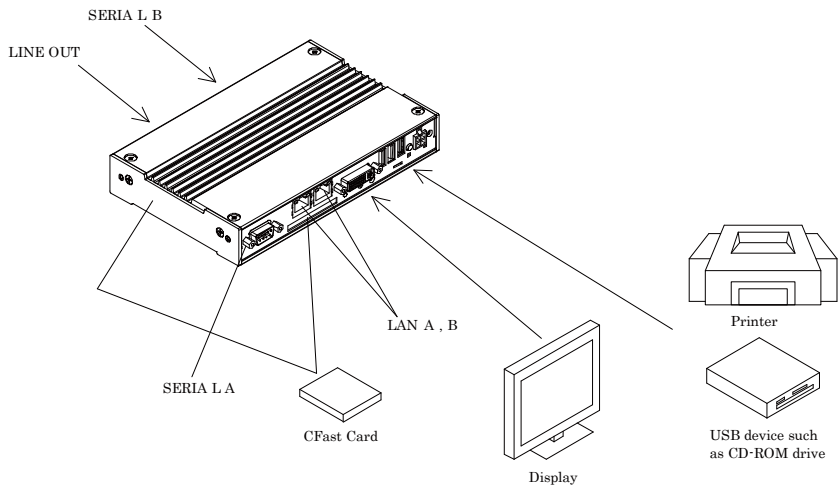
Figure 5.2.   System Configuration

Component Function

LED: POWER, ACCESS, STATUS

There are 3 LED in front of this product.

Table 5.2. Display Contents of LED

LED name	State	Display contents
POWER LED	OFF	Indicates that this product is switched off.
	ON (Green)	Indicates that this product is switched on.
ACCESS LED	ON (Orange)	Indicates that the SATA device is being accessed.
STATUS LED	OFF	You can control the behavior of LED from the user application. *1
	ON (Red)	You can control the behavior of LED from the user application. *1

*1   API that controls STATUS LED is available. For more information, visit the CONTEC's Web site.

DC Power Input Connector: DC-IN
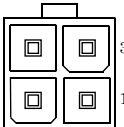
To supply the power, always use the power supply listed below.

Rated input voltage   :   12 - 24VDC
Range of input voltage :   10.8 - 31.2VDC
Power capacity   :   12V 2.6A or more, 24V 1.5A or more

Table 5.3. DC Power Connector

Connector type	9360-04P (mfd. by ALEX)	
	Pin No.	Signal name
	1	GND
	2	GND
	3	12 - 24V
	4	12 - 24V

Applicable connector on the connector side

Housing   :   9357-04 (mfd. by ALEX) or 5557-04R (mfd. by MOLEX)
Contact   :   4256T2-LF (AWG18-24) (mfd. by ALEX) or 5556 (AWG18-24) (mfd. by MOLEX)

Rise time of power supply
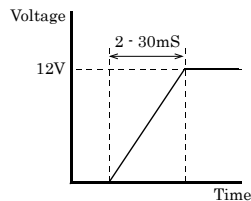
Figure 5.3.   Graph of Rise Time of Power Supply

POWER SW

POWER SW is provided.

LINE OUT Interface :   LINE OUT

The product is equipped with a connector for line output. As such, headphones or an amplified speaker can be connected.
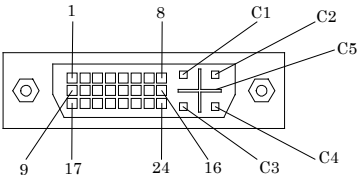
MIC IN Interface :   MIC

The product is equipped with a connector for microphone input. As such, a microphone can be connected for voice input.
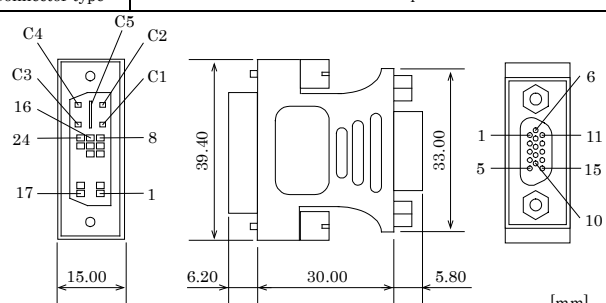
DVI Interface: DVI-I

A DVI-I interface is provided. A CRT display (or a 15-pin D-SUB CRT when the included DVI–Analog RGB conversion adapter is used) or a flat-panel display from CONTEC can be connected. The connector name is DVI (DVI-I 29 pin).

Table 5.4. DVI Connector

Connector type		DVI-I 29 pin			
Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
1	DATA2-	13	N.C.	C1	RED
2	DATA2+	14	+5V	C2	GREEN
3	DATA2 SHIELD	15	GND	C3	BLUE
4	N.C.	16	HPD	C4	HSYNC
5	N.C.	17	DATA0-	C5	GND
6	DDC CLK	18	DATA0+		
7	DDC DATA	19	DATA0 SHIELD		
8	VSYNC	20	N.C.		
9	DATA1-	21	N.C.		
10	DATA1+	22	DATA0 SHIELD		
11	DATA1 SHIELD	23	CLK+		
12	N.C.	24	CLK-		

Table5.5   DVI–analog RGB conversion adapter

Connector type	DVI-I 29 pin		
Analog RGB signals			
Pin No.	Signal name	Pin No.	Signal name
1	RED	9	+5V
2	GREEN	10	GND
3	BLUE	11	N.C.
4	N.C.	12	DDC DATA
5	GND	13	HSYNC
6	GND	14	VSYNC
7	GND	15	DDC CLK
8	GND		

⚠ CAUTION
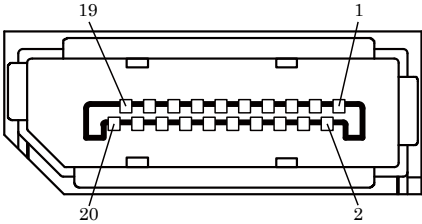
- If the OS is booted without connecting the display cable to the DVI interface, and then the display is connected after the OS boots, the display may not be shown properly.
- When the analog display is used, Windows MS-DOS may not be properly displayed in full-screen mode.
  This is because the frequency and resolution of Windows and MS-DOS (full-screen display) are the same due to the screen settings while the display parameters are different.
  For display, as only one parameter can be stored for one frequency or resolution, only either of Windows or MS-DOS screen can be displayed properly.
  In this case, change the resolution or display frequency of Windows so that it is not the same as for the MS-DOS display.
- When using a digital display, an analog display may be detected even though no analog display is connected.
- This will not affect how the digital display appears. However, change the multi-display settings as necessary.
- To change the settings from digital output to analog output, change the settings from the standard Windows properties screen.

Display Port Interface :   Display Port

A Display Port interface is provided. As such, a display equipped with a Display Port can be connected.

Table 5.6   Display Port Connector

Connector type	Display Port 20 pin		

Pin No.	Signal name	Pin No.	Signal name
1	Lane0+	2	GND
3	Lane0-	4	Lane1+
5	GND	6	Lane1-
7	Lane2+	8	GND
9	Lane2-	10	Lane3+
11	GND	12	Lane3-
13	GND	14	GND
15	Aux+	16	GND
17	Aux-	18	HotPlug
19	GND	20	3.3V
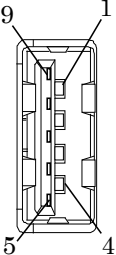
⚠ CAUTION

- When using a digital display, an analog display may be detected even though no analog display is connected.This will not affect how the digital display appears. However, change the multi-display settings as necessary.
- To change the settings from digital output to analog output, change the settings from the standard Windows properties screen.

USB3.0 Port :   USB3.0

This product is equipped with 1 channel for USB 3.0 TYPE-A interface.
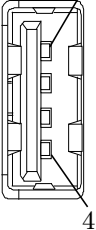
Table 5.7 USB3.0 Connector

Pin No.	Signal name
	USB3.0
1	USB_VCC
2	DATA-
3	DATA+
4	USB_GND
5	SSRX-
6	SSRX+
7	USB_GND
8	SSTX-
9	SSTX+

USB2.0 Port :   USB2.0

This product is equipped with 2 channel for USB 2.0 TYPE-A interface.

Table 5.8 USB2.0 Connector

Pin No.	Signal name
	USB2.0
1	USB_VCC
2	DATA-
3	DATA+
4	USB_GND

Giga bit-Ethernet: LAN A, B

This product is equipped with 2 ports for giga bit.

- Network type : 1000BASE-T/100BASE-TX/10BASE-T
- Transmission speed *2 : 1000M/100M/10M bps
- Max. network path length : 100m/segment
- Controller : Intel I210IT controller

*2 Use a category 5e cable for 1000 Mbps operation.

Table 5.9. Giga bit-Ethernet Connector

Pin No.	Function	
	100BASE-TX	1000BASE-T
1	TX+	TRD+(0)
2	TX-	TRD-(0)
3	RX+	TRD+(1)
4	N.C.	TRD+(2)
5	N.C.	TRD-(2)
6	RX-	TRD-(1)
7	N.C.	TRD+(3)
8	N.C.	TRD-(3)

LEDs for display of network statuses:

Right LED : Link LED
Normal connection : Green ON, Operation: Green Blinking
Left LED : Operation LED
10M: Off, 100M : Green, 1000M: Orange
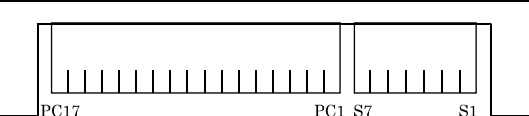
⚠ CAUTION

- If you are using an operating system other than the operating system of the preinstalled model, LAN-1 and LAN-2 may not be assigned to the silkscreen-printed "LAN-A" and "LAN-B."

- Attention should to be paid to the guaranteed operating range of temperature in using 1000BASE-T. For more details on this, refer to chapter3, Installation Requirements. Note that the Ethernet should be configured as 100BASE-TX or 10BASE-T in using under the temperature 0 - 50°C.

CFast Card Connector :   CFast1, 2

The CF Card (Type I :   dedicated to the memory card) can be connected.

Table 5.10   CFast Card Connector

Connector type	CFast Card Connector		
PC17 PC1 S7 S1			
Pin No.	Signal name	Pin No.	Signal name
PC1	CDI	S1	GND
PC2	GND	S2	TX+
PC3	N.C.	S3	TX-
PC4	N.C.	S4	GND
PC5	N.C.	S5	RX-
PC6	N.C.	S6	RX+
PC7	GND	S7	GND
PC8	LED		
PC9	N.C.		
PC10	N.C.		
PC11	N.C.		
PC12	N.C.		
PC13	+3.3V		
PC14	+3.3V		
PC15	GND		
PC16	GND		
PC17	CDO		

⚠ CAUTION
The CFast card is not hotpluggable.While this product is turned on, do not insert or remove the CFast card or touch the CFast card connector on the product.Doing so may lead to a malfunction or failure.

◎CONTEC
BX-220 User's manual

Serial Port Interface: SERIAL A, B

The product has 2 channels of RS-232C compliant serial ports supporting up to a baud rate of 115,200bps with a 16-byte transmission-dedicated data buffer and a 16-byte reception-dedicated data buffer. You can use "Chapter 4 BIOS Setup" to configure an I/O address, interrupt and unused state for each of the ports independently. (The same I/O address and IRQ cannot be shared with any other device.)
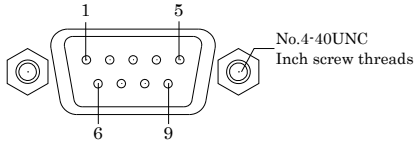
Table 5.11. SERIAL A, B, I/O Addresses and Interrupts

SERIAL	I/O address	Interrupt
A	3F8h - 3FFh	IRQ 4
B	2F8h - 2FFh	IRQ 3
RS-485*3	3E8h – 3EFh*4	IRQ7 *4

*3   API is required to use RS-485. For more information, visit the CONTEC's Web site.

*4   Leave these settings as configured.

Table 5.12. Serial Port Connector
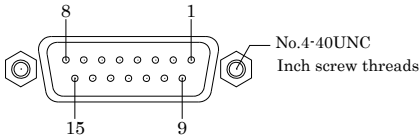
Connector type	9-pin D-SUB (MALE)

No.4-40UNC
Inch screw threads

Pin No.	Signal name	Meaning	Direction
1	CD	Carrier detect	Input
2	RD	Received data	Input
3	TD	Transmitted data	Output
4	DTR	Data terminal ready	Output
5	GND	Signal ground	-----
6	DSR	Data set ready	Input
7	RTS	Request to send	Output
8	CTS	Clear to send	Input
9	RI	Ring indicator	Input

RAS Functions

A RAS port is provided for this product. This port offers watchdog timer, remote reset, and general-purpose I/O RAS functions.

*5   API is required to use RAS. For more information, visit the CONTEC's Web site.

Table 5.13.   RAS Connector

Connector type	15 pin D-SUB (FEMALE)	

Pin No.	Signal name	Function
1	---	None
9	GND	A signal ground
2	TX+	RS-422/485 transmitting line
10	TX-	
3	RX+	RS-422/485 receiving line
11	RX-	
4	NCOM	Minus common dedicated to PO2
12	PO2/WDT	General-purpose output or watch dog timer alarm output
5	PO0	General-purpose output
13	PO1	
6	NCOM	General-purpose output minus common
7	P11	General-purpose input
14	P12/IRQ	General-purpose input or interrupt input
8	PCOM	General-purpose input plus common
15	P10	General-purpose input

⚠ CAUTION
    Pin 4 NCOM (minus common dedicated to PO2) and pin 6 NCOM (minus common shared by PO0 and PO1) are electrically separated from each other.

Connection methods
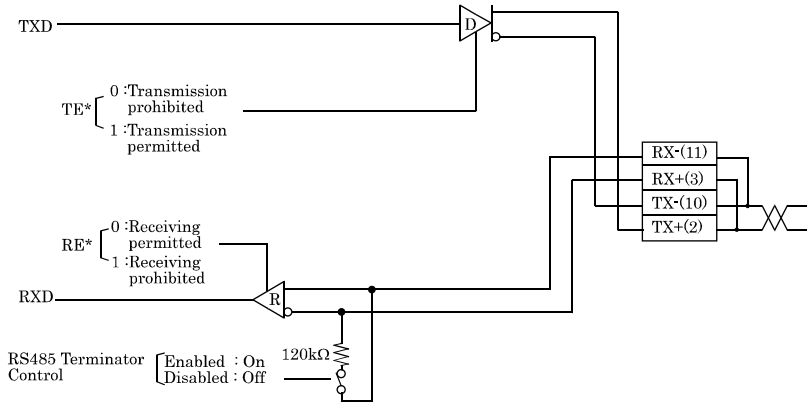
Figure 5.4.   Half-Duplex Connection Method
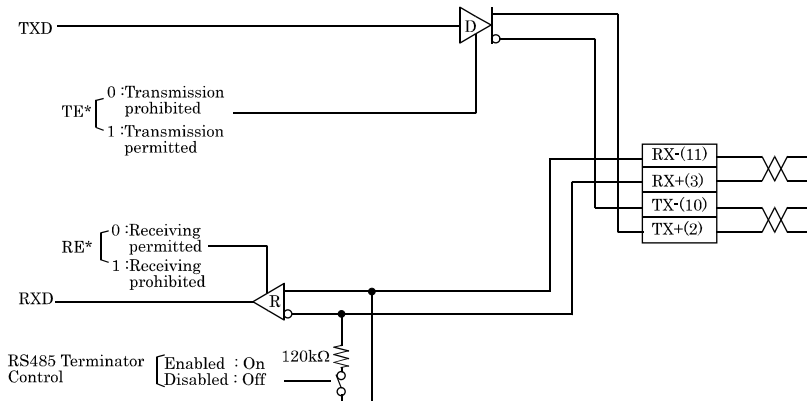
Figure 5.5.   Full-Duplex Connection Method

General Purpose Input/Output and Remote Power On/Reset

This product is equipped with three general purpose insulation-type inputs and outputs. Inputs can be used as remote power on and remote reset inputs.

It is necessary to configure BIOS settings to use an input signal as a remote power on or remote reset signal.

For details on configuring settings, refer to "Integrated Peripherals" in Chapter 4, "BIOS Setup."

Specifications

[Input]

-	Input specifications	:	Current-driven input by photocoupler insulation.
-	Input resistance	:	510Ω
-	Input signal count	:	3 [One of them can be used for remote reset and interrupt input. (bit2<fixed>)]
-	Input protection circuit	:	Equipped with a reverse-connection protection diode
-	Input response time	:	Less than 100μsec
-	External circuit power supply:		12 - 24VDC (±10%)

[Output]

-	Output specifications	:	Open-collector output by photocoupler insulation
-	Output rating	:	Max. 30VDC, 40mA
-	Output signal count	:	3 [One of them can be used for WDT alarm output. (bit2<fixed>)]
-	Output response time	:	Less than 300μsec

External I/O Circuit
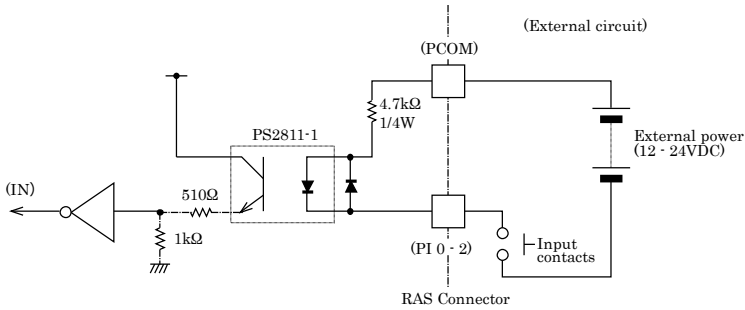
Figure 5.6.   Input circuit
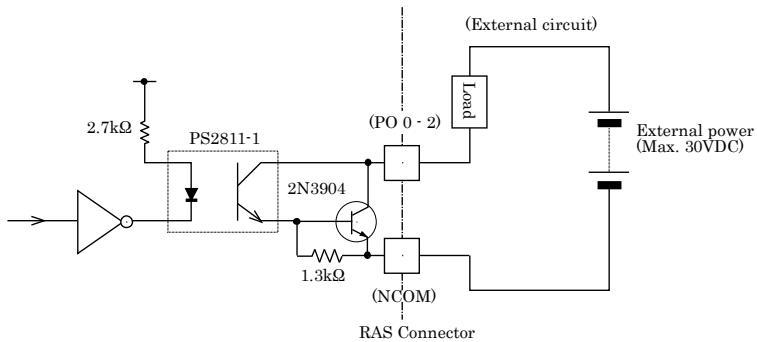
Figure 5.7.   Output circuit

6. Appendix

POST Codes

Table 6.1. POST Codes *< 1 / 3 >*

POST (hex)	Description
< Security (SEC) phase >	
1h	Power ON. The detection of the reset kind (Hard/Soft)
2h	Initialize the microcode load previous AP
3h	Initialize the microcode load previous North Bridge
4h	Initialize the microcode load previous South Bridge
5h	Initialize the microcode load previous OEM
6h	Microcode load
7h	Initialize the microcode load previous AP
8h	Initialize the microcode load previous North Bridge
9h	Initialize the microcode load previous South
Ah	Initialize the microcode load previous OEM
Bh	Cache initialization
< Pre-EFI Initialization (PEI) phase >	
10h	Start of the PEIcore
11h	PRI memory CPU initialization starts
12h - 14h	PRI memory CPU initialization (Specific CPU module)
15h	PRI memory, Nouth Bridge initialization starts
16h - 18h	PRI memory, Nouth Bridge initialization (Specific Nouth Bridge)
19h	PRI memory, South Bridge initialization starts
1Ah - 1Ch	PRI memory, South Bridge initialization (Specific South Bridge)
1Dh - 2Ah	OEM, PRI memory initialization code
2Bh	Memory initialization： Serial Presence Detect(SPD) Data loading
2Ch	Memory initialization： Memory detection
2Dh	Memory initialization： Programming of the memory timing information
2Eh	Memory initialization： Memory configuration
2Fh	Memory initialization： Others
30h	ASL for reserved (Refer to ACPI/ASL Checkpoints)
31h	Memory installed
32h	CPU post memory initialization starts
33h	CPU post memory initialization： Cache initialization
34h	CPU post memory initialization： Application Processor(s)(AP) initialization
35h	CPU post memory initialization： Boot strap processor(BSP) selection
37h	CPU post memory initialization： System Management Mode(SMM) initialization
38h	Post memory, North Bridge initialization starts
39h - 3Ah	Post memory, North Bridge initialization (Specific Nouth Bridge module)
3Bh	Post memory, South Bridge initialization starts
3Ch - 3Eh	Post memory, South Bridge initialization (Specific South Bridge module)
3Fh - 4Eh	OEM post memory initialization code
4Fh	DXE IPL startup
< Driver Execution Environment (DXE) phase >	
60h	DXE core startup
61h	NVRAM initialization
62h	South Bridge runtime services installation

Table 6.1   POST Codes   *< 2 / 3 >*

POST (hex)	Description
63h	CPU DXE installation start
64h - 67h	CPU DXE installation start (Specific CPU module)
68h	PCI host bridge installation
69h	North Bridge DXE initialization starts
6Ah	North Bridge DXE SMM initialization starts
6Bh - 6Fh	North Bridge DXE initialization (Specific North Bridge module)
70h	South Bridge DXE initialization starts
71h	South Bridge DXE SMM initialization starts
72h	South Bridge device initialization
73h - 77h	South Bridge DXE initialization (Specific South Bridge module)
78h	ACPI module initialization
79h	CSM initialization
7Ah - 7Fh	For future AMI DXE codes reserved
80h - 8Fh	OEM DXE initialization code
90h	Boot Device Selection(BDS) Phase
91h	Driver connection start
92h	PCI bus initialization starts
93h	PCI bus hot plug controller initialization
94h	Enumerate PCI bus number
95h	PCI bus resource requests
96h	PCI bus resource allocation
97h	Console output device connection
98h	Console input device connection
99h	Super IO initialization
9Ah	USB installation start
9Bh	USB reset
9Ch	USB detection
9Dh	USB enabling
9Eh - 9Fh	For future AMI codes reserved
A0h	IDE initialization starts
A1h	IDE reset
A2h	IDE detection
A3h	IDE enabling
A4h	SCSI initialization starts
A5h	SCSI reset
A6h	SCSI detection
A7h	SCSI enabling
A8h	Confirm Password Setup
A9h	Starting of a setup
AAh	ASL for reserved (Refer to ACPI/ASL Checkpoints)
ABh	Setup input wait
ACh	ASL for reserved (Refer to ACPI/ASL Checkpoints)
ADh	Boot preparation events
AEh	Legacy boot event
AFh	Boot Service event ends
B0h	Virtual address maps run-time settings begin.
B1h	Virtual address maps of runtime configuration exit
B2h	Legacy option ROM initialization
B3h	System reset

Table 6.1   POST code < *3 / 3* >

POST (hex)	Description
B4h	USB hotplug
B5h	PCI bus hot plug
B6h	NVRAM cleanup
B7h	Configuration reset (Reset the NVRAM settings)
B8h - BFh	For future AMI codes reserved
C0h - CFh	OEM BDS initialization code
ACPI/ASL Checkpoints	
01h	S1 sleep system during migration.
02h	S2 sleep system during migration.
03h	S3 sleep system during migration.
04h	S4 sleep system during migration.
05h	S5 sleep system during migration.
10h	From S1 sleep state during system restoration
20h	From S2 sleep state during system restoration
30h	From S3 sleep state during system restoration
40h	From S4 sleep state during system restoration
ACh	Move to system ACPI mode. The interrupt controller PIC mode.
AAh	Move to system ACPI mode. The interrupt controller APIC mode.

SERIAL I/O Address and Register Function

The following table lists the I/O addresses in case of SERIAL A.

Table 6.2. I/O Port Addresses

I/O address	DLAB	Read/Write	Register	
03F8H	0	W	Transmitter holding register	THR
		R	Receive buffer register	RBR
	1	W	Divisor latch register (LSB)	DLL
03F9H	1	W	Divisor latch register (MSB)	DLM
	0	W	Interrupt enable register	IER
03FAH	X	R	Interrupt ID register	IIR
03FBH	X	W	Line control register	LCR
03FCH	X	W	Modem control register	MCR
03FDH	X	R	Line status register	LSR
03FEH	X	R	Modem status register	MSR
03FFH	X	R/W	Scratch register	SCR

DLAB (Divisor Latch Access Bit)： The value in bit 7 of the line control register.

Table 6.3. Function of Each Register   < 1 / 4 >

I/O address	Description
03F8H	THR: Transmitter Holding Register [DLAB=0] D7 D6 D5 D4 D3 D2 D1 D0 bit7 MSB ← → bit0 LSB Register dedicated to write transmitted data to
03F8H	RBR: Reciever Buffer Register [DLAB=O] D7 D6 D5 D4 D3 D2 D1 D0 bit7 MSB ← → bit0 LSB Register dedicated to read received data from
03F8H	DLL: Divisor Latch (LSB) [DLAB=1] D7 D6 D5 D4 D3 D2 D1 D0 bit7 MSB ← → bit0 LSB Baud rate setting register (LSB)
03F9H	DLH: Divisor Latch (MSB) [DLAB=1] D7 D6 D5 D4 D3 D2 D1 D0 bit7 MSB ← → bit0 LSB Baud rate setting register (MSB)
03F9H	IER: Interrupt Enable Register [DLAB=0] D7 D6 D5 D4 D3 D2 D1 D0 0 0 0 0 EMS ELSI ETHREI ERDAI Received data Interrupt enable Received data register empty Interrupt enable Receiver line status Interrupt enable Modem status interrupt enable [Always used at 0.] 1: Enable interrupt 0: Disable interrupt

Table 6.3.   Function of Each Register   < 2 / 4 >

I/O address	Description
03FAH	IIR : Interrupt Identification Register

IIR : Interrupt Identification Register

D7 D6 D5 D4 D3 D2 D1 D0

| 0 | 0 | 0 | 0 | 0 | ← | → | |

Interrupt details

1: Do not generate interrupts
0: Generate interrupts

bit2	bit1	bit0	Priority	Description
0	0	1	——	Interrupts are not generated.
1	1	0	1 (high)	Generated by overrun, parity, framing error or break interrupt. Cleared when the line status register is read.
1	0	0	2	Generated when the receive buffer register is ready. Cleared when the receiving buffer is read.
0	1	0	3	Generated when the transmitter holding register is empty. Cleared when the IIR is read or when transmitted data is written to THR.
0	0	0	4 (low)	Modem status interrupt is generated. (CTS, DSR, RI, CD) Cleared when the modem status register is read.

03FBH

LCR : Line Contror Regester

D7 D6 D5 D4 D3 D2 D1 D0

D1	D0	Bit table
0	0	5
0	1	6
1	0	7
1	1	8

0 : 1 STOP bit
1 : 1.5 STOP bits at 5-bit length
    2 STOP bits at 6-, 7-, or 8-bit length

0 : Disable parity
1 : Enable parity

0 : Odd parity
1 : Even parity

0 : Disable stick parity
1 : Enable stick parity

0 : Break signal off
1 : Send break signal

DLAB (Divisor Latch Access Bit)
In order to access the divisor latch register, you need to set the bit to 1. To access another register, set the bit to 0.

Table 6.3.   Function of Each Register   < 3 / 4 >

I/O address	Description
03FCH	MCR: Modem Control Register
	D7 D6 D5 D4 D3 D2 D1 D0
	[0] [0] [0] [Loop] [IRQ] [X] [RTS] [DTR]
	DTR 0 : Inactive [HIGH] 1 : Active [LOW]
	RTS 0 : Inactive [HIGH] 1 : Active [LOW]
	Interrupt control bit 0 : Disable 1 : Enable
	Diagnostic local loop-back test 0 : Disable 1 : Enable
03FDH	LSR: Line Status Regester
	D7 D6 D5 D4 D3 D2 D1 D0
	[0] [TEMT] [THRE] [BI] [FE] [PE] [OE] [DR]
	Data ready (1 for existence of received data)
	Overrun error (1 for occurrence of an error)
	Parity error (1 for occurrence of an error)
	Framing error (1 for occurrence of an error)
	Break interrupt (1 for detection of break state)
	Transmitter holding register empty (1 for transmission buffer being empty)
	Transmitter empty (Set to 1 when both transmitter holding register and transmitter shift register are empty.)

Table 6.3.   Function of Each Register   *< 4 / 4 >*

I/O address	Description
03FEH	MSR : Modem Status Register D7 D6 D5 D4 D3 D2 D1 D0 DCD RI DSR CTS DDCD TERI DDSR DCTS Delta CTS Delta DSR Trailing edge RI Delta data carrier detect CTS DSR RI DCD
03FFH	SCR : Scratchpad Register This is an 8-bit, readable/writable register which is available to the user to allow data to be saved temporarily.

Baud Rate Settings

A baud rate is set by software by dividing the clock input (1.8432MHz). The baud rate in terms of hardware can be set to a maximum of 115,200 bps for SERIALA, B. The baud rates available in practice depend on the operating environment (cable, software, etc.). The table below lists typical baud rates and their respective values to be written to the divisor latch register (LSB, MSB).

Table 6.4 Baud Rate Settings

Baud rate to be set	SERIAL A, B Clock input (1.8432MHz)	
	Value to be set in the divisor register (Decimal)	Setting error (%)
50	2304	---
75	1536	---
110	1047	0.026
134.5	857	0.058
150	768	---
300	384	---
600	192	---
1200	96	---
1800	64	---
2000	58	0.69
2400	48	---
3600	32	---
4800	24	---
7200	16	---
9600	12	---
14400	8	---
19200	6	---
28800	4	---
38400	3	---
57600	2	---
76800	---	---
115200	1	---
153600	---	---
230400	---	---

Example： To set 9,600 bps, write "00" to the (MSB) divisor latch register and "12 (decimal)" to the (LSB) divisor latch register.

Watch-Dog-Timer

The watchdog timer serves as a safeguard against possible system lock-up in your industrial computer system. In most industrial environments, there are heavy equipment, generators, high-voltage power lines, or power drops that have adverse effects on your computer system. For instance, when a power drop occurs, it could cause the CPU to come to a halt state or enter into an infinite loop, resulting in a system lock-up.

The application software created by user with the watchdog timer enabled, a RESET automatically generated unless the software periodically triggers the timer within the setting time-out interval. That is, while the system gets hung up, the running program can't trigger the timer periodically. The timer will generate a reset signal to reboot the system.

With this function, running programs can be restarted in the usual way even if an abnormal state occurs.
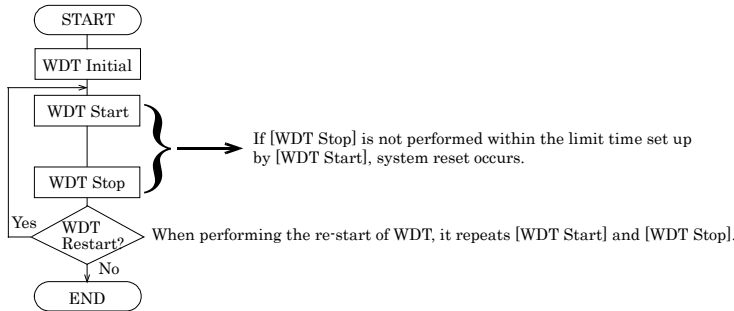
The software can be configured using 255 levels (1 to 255 seconds) of timeout intervals for the watchdog timer. There is also a 2-second tolerance for timeout intervals. To maintain normal system operation, trigger the watchdog timer again using a user-written program with the tolerance in mind.

Ex.) If the time-out interval is set to 30 seconds, the user-created program must retrigger the watchdog timer before 28 seconds will have elapsed in consideration of the tolerance. If the program failed to retrigger the timer (if 28 - 32 seconds have elapsed), the system will automatically reboot.

The I/O port is defined at address 2e/2fH. You can trigger/enable disable the timer by writing address 2e/2fH.

Here is an example for flow chart and programming how to use the watch-dog-timer.

(1) Example flow chart

START
WDT Initial
WDT Start
WDT Stop

If [WDT Stop] is not performed within the limit time set up by [WDT Start], system reset occurs.

Yes WDT Restart?   When performing the re-start of WDT, it repeats [WDT Start] and [WDT Stop].
No
END

*   It is also possible not to perform [WDT Stop] instead of performing [WDT Stop] to [WDT Start], but to perform [WDT Start] continuously at the time of a re-start.

(2) Example programming

The following example is written in Intel8086 assembly language.

```
;==============
;<WDT Initial>
;==============
;----------------------------------------
;Enter the extended function mode
```

```
;------------------------------------------
MOV DX,2EH
MOV AL,87H
OUT DX,AL
OUT DX,AL
;----------------------------------------------
; Select logical device WDT(number 8)
;----------------------------------------------
MOV DX,2EH
MOV AL,07H
OUT DX,AL
MOV DX,2FH
MOV AL,08H
OUT DX,AL
;------------------------------------------------
;Activate logical device WDT(number 8)
;------------------------------------------------
MOV DX,2EH
MOV AL,30H
OUT DX,AL
MOV DX,2FH
MOV AL,0AH
OUT DX,AL
;----------------------------------
;Set timer unit :    second
;----------------------------------
MOV DX,2EH
MOV AL,F0H
OUT DX,AL
MOV DX,2FH
MOV AL,00H
OUT DX,AL
;------------------------------------------
;Exit the extended function mode
;------------------------------------------
MOV DX,2EH
MOV AL,AAH
OUT DX,AL


;==============================
;<WDT START :    counter set and a start >
;==============================
;---------------------------------------------
;Enter the extended function mode
;---------------------------------------------
MOV DX,2EH
MOV AL,87H
OUT DX,AL
OUT DX,AL
;----------------------------------------------
;Select logical device WDT(number 8)
;----------------------------------------------
```

```
    MOV DX,2EH
    MOV AL,07H
    OUT DX,AL
    MOV DX,2FH
    MOV AL,08H
    OUT DX,AL
;-----------------------------------------------
;Set time of WDT and start to count down
;-----------------------------------------------
    MOV DX,2EH
    MOV AL,F1H
    OUT DX,AL
    MOV DX,2FH
;-----------------------------------------------------------------------------
;The data of an example is 15 seconds.(01H=1sec.- FFH=255sec.)
    MOV AL,0FH      ; 0FH = 15Sec.
;-----------------------------------------------------------------------------
    OUT DX,AL
;---------------------------------------
;Exit the extended function mode
;---------------------------------------
    MOV DX,2EH
    MOV AL,AAH
    OUT DX,AL


;=============
;<WDT STOP>
;=============
;---------------------------------------
;Enter the extended function mode
;---------------------------------------
    MOV DX,2EH
    MOV AL,87H
    OUT DX,AL
    OUT DX,AL
;---------------------------------------------
;Select logical device WDT(number 8)
;---------------------------------------------
    MOV DX,2EH
    MOV AL,07H
    OUT DX,AL
    MOV DX,2FH
    MOV AL,08H
    OUT DX,AL
;----------------------------------
;Stop count down of WDT
;----------------------------------
    MOV DX,2EH
    MOV AL,F6H
    OUT DX,AL
    MOV DX,2FH
```

```
;----------------------------------
;The data of 00H is stop WDT
MOV AL,00H
;----------------------------------
OUT DX,AL
;----------------------------------
;Exit the extended function mode
;----------------------------------
MOV DX,2EH
MOV AL,AAH
OUT DX,AL
```

⚠ CAUTION ──────────────────────────────────

The timer's intervals have a tolerance of ±2 seconds.

Battery

Battery Specification

This product uses the following battery.

- Type	:	Lithium primary battery
- Model	:	BR-1/2AA
- Maker	:	Panasonic
- Nominal voltage	:	3V
- Nominal capacity	:	1000mAh
- Lithium content	:	1g or less

Removing the battery

Remove the battery according to the following figure.

Removing the battery

Remove the battery according to the following figure.

Make sure you cut the cable tie and remove the connector.
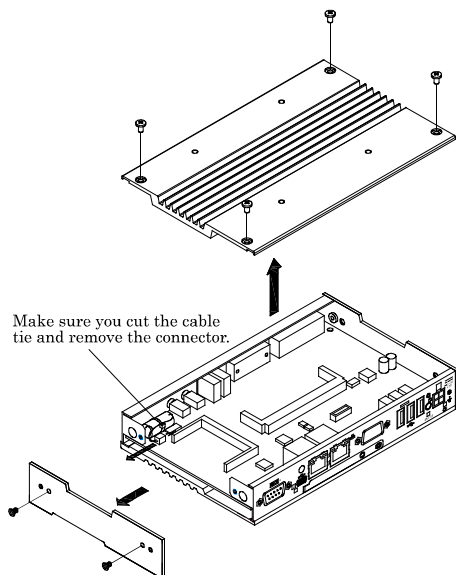
Disposing the battery

Dispose the removed battery properly as instructed by local government.

7. List of Options

AC adapter

- ACAP19-01   AC adapter (Input: 100-240VAC, Output: 19VDC 3.42A)

CFast Card(SLC)

- CFast-4GB-A   4GB CFast Card
- CFast-8GB-A   8GB CFast Card
- CFast-16GB-A   16GB CFast Card

CFast Card(MLC)

- CFS-32GBM-A   32GB CFast Card

Terminal block for connecting the RAS connector

- IPC-PSD-20   Terminal block for connecting the RAS connector

⚠ CAUTION

Precautions when using products other than our options

- If a product other than our option is used, the normal operation may be impaired or the functions may be limited.

BX220 Series

User's Manual
BX-220-DC7xxxxx