DA-682C Series Embedded Computer User's Manual

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www.moxa.com/product



DA-682C Series Embedded Computer User's Manual

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Thank you for purchasing a Moxa DA-682C industrial computer, a multi-functional embedded computer designed especially for IEC 61850-3 substation automation systems.

This manual covers hardware installation, connector interfaces, and BIOS setup of the DA-682C. For software configuration and management, please refer to the user's manual for your operating system.

The following topics are covered in this chapter:

- Overview
- Model Descriptions and Package Checklist
- Appearance
- Dimensions
- Features
- Hardware Block Diagram
 - DA-682C Basic System
- Hardware Specifications

Overview

The DA-682C computer is built around an Intel® Celeron® or Intel® Core[™] i3, i5, or i7 CPU and comes with dual display ports (2 x HDMI), 5 USB ports, 6 gigabit LAN ports, two 3-in-1 RS-232/422/485 serial ports, 6 digital input ports, and 2 digital output ports. The DA-682C is equipped with 2 hot-swappable 2.5" HDD/SSD slots and supports the Intel® RST RAID 0/1 functionality.

Additional value and convenience are provided through a modular design with two independent slots for flexible system integration and expansion. Users have the option to add a variety of different communications modules, including an 8-port RS-232/422/485 module and a 4-port 10/100/1000 Mbps LAN module.

With IEC 61850-3 and IEEE 1613 compliance, the DA-682C is sure to deliver stable and reliable system operation for power applications. It also complies with the IEC 60255 standards, which cover the protection of electrical relays in a smart substation. IEC 60255 is one of the most widely used standards for testing relays and protection equipment, and compliance with the standard ensures that the DA-682C will work reliably and seamlessly with IEDs as part of a robust substation automation system.

EN 50121-4 compliance confirms that the DA-682C can deliver stable and reliable system operations in rail wayside applications, such as station SCADA systems, wayside disaster prevention, traction power, and signaling and safety systems to provide an integrated view of your smart rail setup. The housing is a standard 2U, 19-inch wide, rack mounted rugged enclosure. This robust, rack mountable design provides the hardened protection needed for industrial environment applications.

Model Descriptions and Package Checklist

The DA-682C Series includes the following models:

- DA-682C-KL1-HH-T: Intel® Celeron® 3965U, 2C/2T, 2.2 GHz CPU, with 2x HDMI, 6 Gigabit LAN ports, 2 RS/232/422/485 3-in-1 serial port, 2 PS/2, 6 DI/2DO, 1 mSATA, 2 SATA, 6 USB, dual power, -40 to 70°C temp.
- DA-682C-KL3-HH-T: Intel® Core[™] i3-7100U, 2C/4T, 2.4 GHz CPU, with 2x HDMI, 6 Gigabit LAN ports, 2 RS/232/422/485 3-in-1 serial port, 2 PS/2, 6 DI/2DO, 1 mSATA, 2 SATA, 6 USB, dual power, -40 to 70°C temp.
- DA-682C-KL5-HH-T: Intel® Core™ i5-7300U, 2C/4T, 2.6 GHz CPU, with 2x HDMI, 6 Gigabit LAN ports, 2 RS/232/422/485 3-in-1 serial port, 2 PS/2, 6 DI/2DO. 1 mSATA, 2 SATA, 6 USB, dual power, -40 to 70°C temp.
- DA-682C-KL7-HH-T: Intel® Core[™] i7-7600U, 2C/4T, 2.8 GHz CPU, 2x HDMI, 6 Gigabit LAN ports, 2 RS/232/422/485 3-in-1 serial port, 2 PS/2, 6 DI/2DO, 1 mSATA, 2 SATA, 6 USB, dual power, -40 to 70°C temp.
- **NOTE** Refer to the Component Compatibility Guide (CCG) for the list of components that Moxa has validated to be compatible with this product. You can download the CCG from the Moxa product website. For components with a Moxa P/N, you can order the components together with your product from Moxa and we will install the selected components in your product. Moxa guarantees the compatibility of the components installed in CTO products.

NOTE To order a DA-682C system with preinstalled Debian 9 or Windows 10 Enterprise LTSC 64-bit OS, contact a Moxa sales representative.

Before installing the DA-682C computer, make sure the package contains the following items. If any of these items is missing or damaged, please contact your customer service representative for assistance.

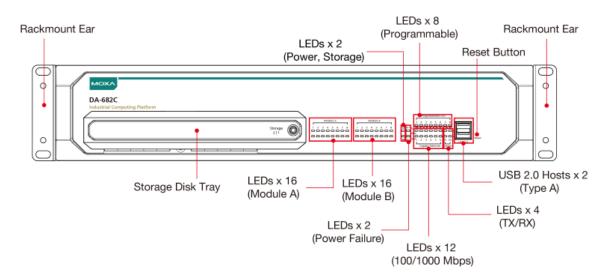
- DA-682C rackmount computer
- Rackmount kit
- Quick Installation Guide (printed)
- Warranty card

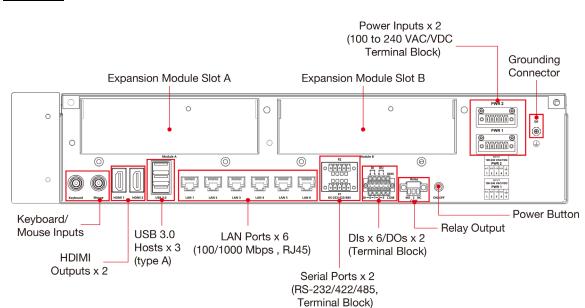
Expansion Modules

- DN-LN04-RJ: 4-port 10/100/1000 Mbps PCIe LAN module
- DN-SP08-I-DB: 8-port RS-232/422/485 serial module with digitally isolated DB9 connector
- DN-SP08-I-TB: 8-port RS-232/422/485 serial module with digitally isolated terminal block

Appearance

Front View

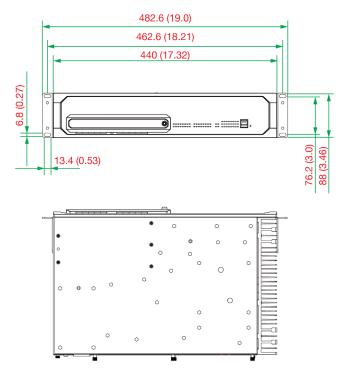




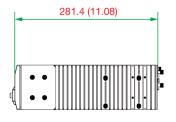
Rear View

Dimensions

Unit = mm (inch)







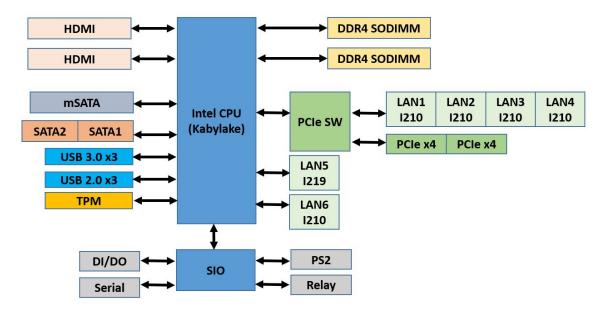
Features

The DA-682C computer has the following features:

- IEC 61850-3, IEEE 1613, and IEC 60255 compliant for power substation automation systems
- 7th Generation Intel® Core[™] Processor
- Built-in DDR4 memory slot; up to 32 GB capacity
- Two hot-swappable 2.5-inch HDD or SSD storage expansion trays
- Redundant power supply (100 to 240 VAC/VDC)
- EN 50121-4 compliant for railway wayside applications

Hardware Block Diagram

DA-682C Basic System



Hardware Specifications

NOTE The latest specifications for Moxa's products can be found at <u>https://www.moxa.com</u>.

Hardware Installation

The DA-682C embedded computers are compact and rugged, making them suitable for industrial applications. The LED indicators allow users to monitor performance and identify trouble spots quickly, and multiple ports are provided for connecting a variety of different devices. The DA-682C embedded computers come with a reliable and stable hardware platform that lets you devote the bulk of your time to application development. This chapter describes hardware installation and connector interfaces of the DA-682C embedded computers.

The following topics are covered in this chapter:

- Installing the Rackmount Ears
- Wiring Requirements
- Connecting the Power
- Wiring the Power Inputs
 - Grounding the Chassis
 - > Power Wiring Methods
- Reset Button
- 🗖 LED
- Connecting to Displays
- Connecting USB Devices
 - Installing a USB Dongle Kit
- Serial Ports
- Gigabit LAN Ports
- Digital Inputs/Digital Outputs
- Relay Output
- Upgrading the Memory Module
- Installing an mSATA Storage Card
- Installing SATA Hard Disks
- Installing the Expansion Module

Installing the Rackmount Ears

The DA-682C computer comes with two rackmount kits that allow users to mount the computer on to a rack. Each rackmount kit includes the following items: a rackmount ear and four screws.



Follow these steps to install the rackmount ears.

 Attach a rackmount ear on the left side of the DA-682C computer, and fasten four screws tightly.



2. Attach the other rackmount ear on the right side of the computer.



Wiring Requirements

The following common safety precautions should be observed before installing any electronic device:

- Power wires and communication/signal wires should be routed through separate paths. If power and communication/signal wires must cross paths, make sure the wires are perpendicular at the intersection point.
- Use the type of signal transmitted through a wire to determine which wires should be bundled together and which kept separate. The rule of thumb is that wiring that carries similar electrical signals can be bundled together.
- When necessary, we strongly advise labeling the wiring for all devices in the system.



ATTENTION

Do not run signal or communication wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.



ATTENTION

Safety First!

Be sure to disconnect the power cord before installing and/or wiring your device.

Electrical Current Caution!

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size.

If the current goes above the maximum rating, the wiring could overheat, causing serious damage to your equipment.

Temperature Caution!

Be careful when handling the unit. When the unit is plugged in, the internal components generate heat, and consequently the outer casing may feel hot to the touch.



Restricted Access Location

This equipment is intended to be used in Restrict Access Location, like computer room. The access can only be gained by SERVICE PERSONS or by USERS who have been instructed about the metal chassis of the equipment is so hot that service persons have to pay special attention or take special protection before touching it. Further, the access is through the use of key or security identity system. Only authorized by well trained professional person can access the restrict access location.



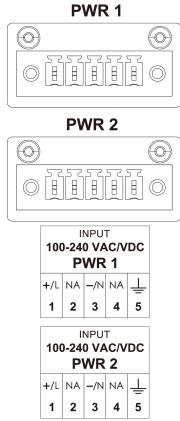
External metal parts are hot!! Before touching it, special attention or protection is necessary.

Connecting the Power

The DA-682C provides dual power inputs using a terminal block, which is located on the rear panel. Connect the power cord wires to the screws, and then tighten the screws. The Power LED will light up to indicate that power is being supplied to the DA-682C, after which the BIOS will initialize the flash disk module, causing the Storage LED to blink. It should take about 30 to 60 seconds for the operating system to complete the boot up process.

Wiring the Power Inputs

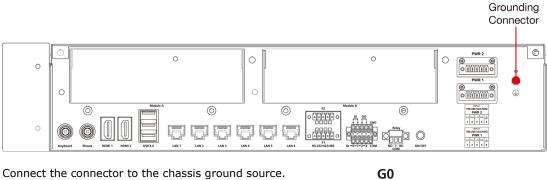
The DA-682C computers come with single power input and dual power inputs models. Refer to the following diagrams and table for a detailed description of the power input wiring. The terminal numbers referred to in the table are shown in the diagrams below.



Terminal Number	Description	Note
	Power Line	PWR Line is connected to the Line (L) terminal for the AC
1	Power Line	power source.
1	Power Positive	PWR Positive is connect to the Positive (+) terminal for the
	Power Positive	DC power source
2	NA	No function
	Power Neutral	PWR Neutral is connected to the Neutral (N) terminal for the
3		AC power source.
3	D. N. H	PWR Negative is connect to the Negative (-) terminal for the
	Power Negative	DC Power
4	NA	No function
г	Dand Fauth	Bond Earth is connected to the Chassis Ground via a jumper
5	Bond Earth	on the terminal block.

Grounding the Chassis

There is a grounding connector located on the rear panel of the computer.



Connect the connector to the chassis ground source.



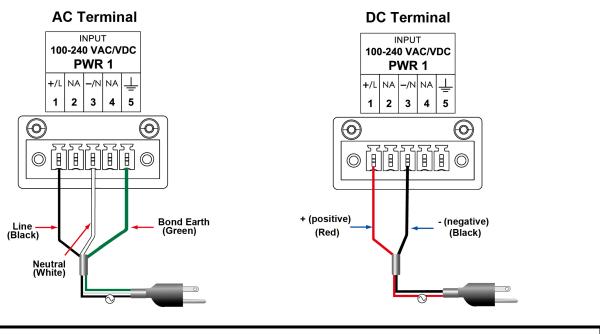


ATTENTION

If protective earthing is used as a safeguard, the instructions shall require connection of the equipment protective earthing conductor to the installation protective earthing conductor (for example, by means of a power cord connected to a socket-outlet with earthing connection).

Power Wiring Methods

The DA-682C comes with single or dual power inputs; both AC and DC power sources are supported. Refer to the following diagrams for detailed wiring methods.

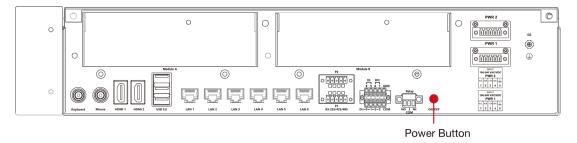




ATTENTION

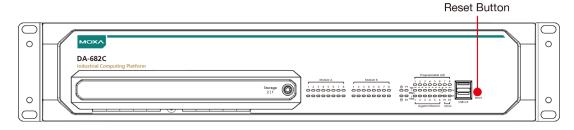
Equipment must be installed according to the applicable country's wiring codes.

In addition, there is a power button on the rear panel, which allows users to power on the computer in case the computer is in the sleep or hibernate mode.



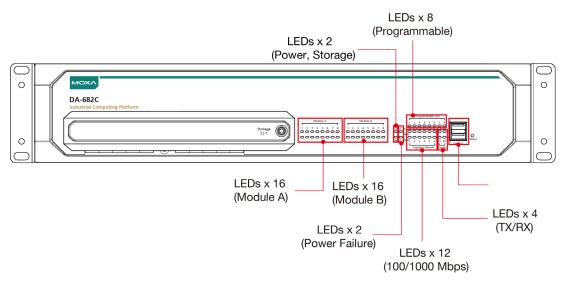
Reset Button

Pressing the Reset button initiates a hardware warm reboot. The button plays the same role as a desktop PC's reset button. After pressing the reset button, the system will reboot automatically. During normal use, you should NOT use the Reset Button. You should only use this button if the software is not working properly. To protect the integrity of data being transmitted or processed, you should always reset the system from the operating system using the software reboot function.



LED

There are 60 LED indicators on the front panel.

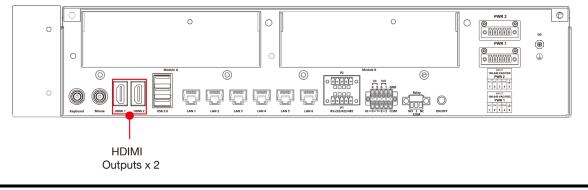


Information about each LED indicator is given in the following table.

LED	Color	Description	
Power	Green	Power is on	
	Off	No power input	
Storage	Yellow/Blinking	Data is being written to or read from the storage unit	
	Off	Storage unit is idle	
Power 1 Failure	Off	The 1 st power supply is on	
	Red	Error in the 1 st power supply	
Power 2 Failure	Off	The 2 nd power supply is on	
	Red	Error in the 2 nd power supply	
Gigabit LAN LEDs 1 to 6 Green		100 Mbps Ethernet mode	
	Orange	1000 Mbps (Gigabit) Ethernet mode	
Serial Port P1/P2 (TX/RX)	Green	Tx: Serial data is being transmitted	
	Yellow	Rx: Serial data is being received	
Programmable LEDs 1 to 8	Green/	Can be used to indicate statuses or for debugging, as	
	Blinking	defined by users.	
Module LEDs 1 to 8	Green/Orange/	Reserved for LAN-port and serial-port expansion cards.	
(Module A/Module B)	Blinking		

Connecting to Displays

The DA-682C comes with 2 HDMI interfaces on the rear panel, allowing users to connect two displays.

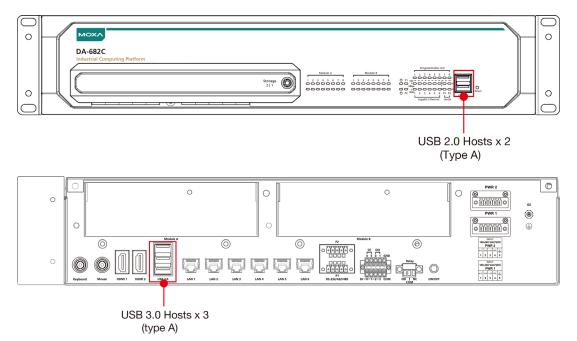


NOTE In order to have a highly reliable video streaming capability, choose certified HDMI cables.

2-7

Connecting USB Devices

The DA-682C comes with 2 USB 2.0 ports on the front panel and 3 USB 3.0 ports on the rear panel. The USB ports can be used to connect to other peripherals, such as flash drives for expanding the system's storage capacity. In addition, both USB ports support system boot up, which can be activated by modifying the BIOS settings. See **Chapter 3: BIOS Setup** for details.



Installing a USB Dongle Kit

You can use a USB Dongle Kit to secure your USB dongle inside your DA-682C computer.

NOTE The USB Dongle Kit is an optional accessory that can be purchased separately.

To install a USB Dongle Kit inside your DA-682C computer, do the following:

1. Power off the DA-682C computer and remove the upper cover of the computer. Find the location of the USB socket.



2. The USB Dongle Kit includes a USB plate and a screw.



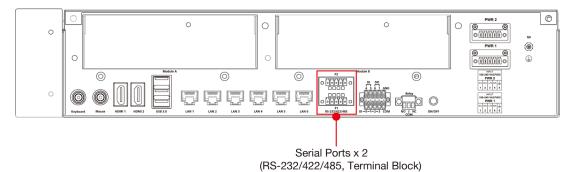
- 3. Attach the USB device to the USB port inside the DA-682C computer.
- Place the USB plate on the rail, and push down to the USB device as close as possible. Finally, fasten the screw on the plate.



5. Replace the upper cover of the computer.

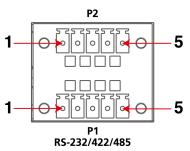
Serial Ports

The DA-682C comes with 2 software-selectable RS-232/422/485 serial ports on the rear panel.



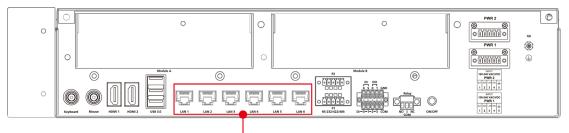
Pin	RS-232	RS-422	RS-485	RS-485
			(4-wire)	(2-wire)
1	TxD	TxD(+)	TxD(+)	-
2	RxD	TxD(-)	TxD(-)	-
3	RTS	RxD(+)	RxD(+)	Data(+)
4	CTS	RxD(-)	RxD(-)	Data(-)
5	GND	GND	GND	GND

The ports use terminal blocks. Refer to the following table for the pin assignments:



Gigabit LAN Ports

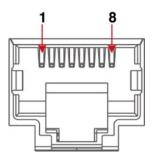
The DA-682C has 6 Gigabit LAN ports. When a LAN cable is properly connected, the LEDs on the front panel will glow to indicate a proper connection.



LAN Ports x 6 (100/1000 Mbps , RJ45)

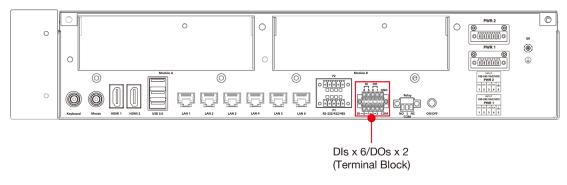
Refer to the following figure and table for the pin sequence and definitions.

Pin	100 Mbps	1000 Mbps
1	Tx+	TRD(0)+
2	Tx-	TRD(0)-
3	Rx+	TRD(1)+
4	-	TRD(2)+
5	-	TRD(2)-
6	Rx-	TRD(1)-
7	-	TRD(3)+
8	-	TRD(3)-

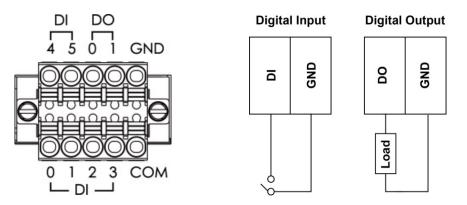


Digital Inputs/Digital Outputs

The DA-682C comes with six digital inputs and two digital outputs in a terminal block. Refer to the following figure for the location of the DI/DO connectors.

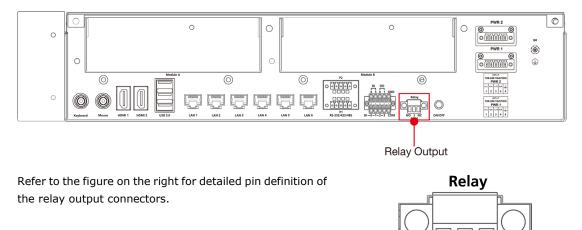


For pin definitions and wiring methods, see the figures below.



Relay Output

The DA-682C provides a relay output located on the rear panel of the computer.



NO

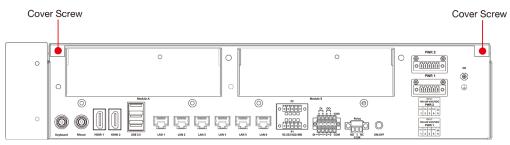
NC

COM

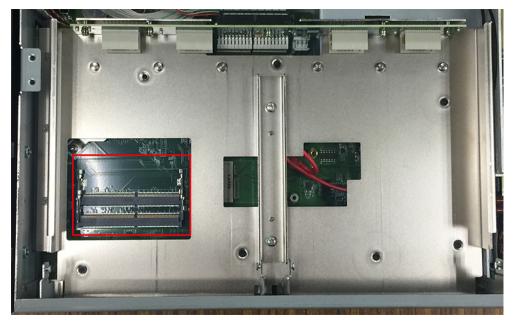
Upgrading the Memory Module

The DA-682C embedded computer supports 2 ECC registered DDR3 1333/1600 SODIMM modules, for up to 16 GB of memory (2 slots, each with 8 GB). To upgrade the SDRAM memory module, follow these instructions:

- 1. Disconnect the DA-682C from its power source.
- 2. Unfasten the screws on the back of the computer, and then take off the upper cover.

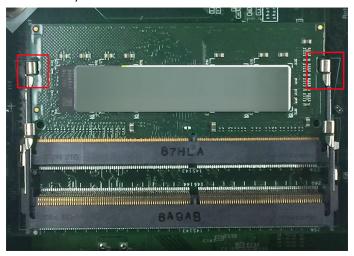


3. Find the location of the SDRAM memory socket.



If a memory module is already installed in the socket, push the two fasteners to free and then remove the module.

4. Insert the new memory module into the socket, making sure you insert the SDRAM in the correct direction. Push down the memory module, making sure that the two fasteners snap in place and are holding the module firmly.

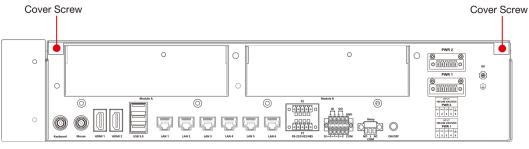


5. When finished, replace the upper cover of the computer and fasten the screws.

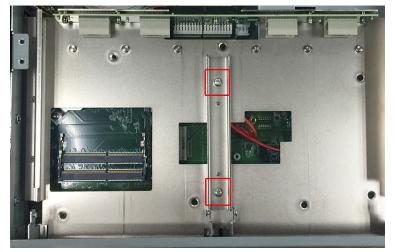
Installing an mSATA Storage Card

The DA-682C embedded computer comes with an mSATA socket. To insert an mSATA storage card, follow these instructions.

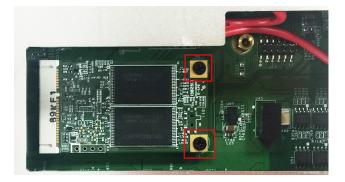
- 1. Disconnect the DA-682C from its power source.
- 2. Unfasten the screws on the back of the computer, and then take off the upper cover.



3. Unfasten the two screws on the metal bar in the middle of the cabinet. The mSATA socket is located below.



4. Insert the mSATA storage card into the socket, and fasten the two screws to fix the card.



5. When finished, restore the metal bar, the upper cover of the computer and fasten the screws.



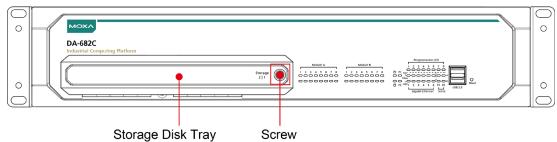
ATTENTION

The DA-682C rackmount computer does not support the mSATA storage card hot swap and PnP (Plug and Play) functions. It is necessary to remove power source first before inserting or removing the mSATA storage card.

Installing SATA Hard Disks

The DA-682C comes with two SATA slots that allow users to install two 2.5" SATA HDD/SSD in the computer. Follow these steps to install a SATA disk.

1. Unfasten the screw on the storage disk tray, and pull down the tray door.



2. There are two disk trays available. The right tray is Storage 1, while the left one is Storage 2. To take out the disk tray, push the clutch to the left.



3. Place the SATA disk on the tray.





4. Turn back to the rear side of the tray, and fasten four screws. See the following diagram for details.



5. There are two plastic rails inside the slot. Make sure to insert the storage tray into the rails.

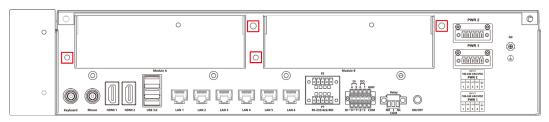


- 6. Push the disk tray into the computer; make sure the storage tray has been successfully inserted. Use the same method to install another disk if necessary.
- 7. Restore the storage tray door to complete.

Installing the Expansion Module

The DA-682C comes with two expansion sockets, allowing users to install various expansion modules such as Gigabit Ethernet module and serial communication module. Follow these steps.

1. Unfasten the two screws on each module plate, and then remove the plate.



2. Insert the expansion module into the slot.



3. Make sure the module has been successfully inserted. Fasten the screws to complete.

	LAN 1	LAN 2	LAN 3	LANA	
I		10/100/1000 Mb	ps Ethernet Port		



ATTENTION

Please ensure to power off the computer first and then install/remove the expansion modules.

BIOS Setup

This chapter describes the BIOS settings of the DA-682C computer. The BIOS is a set of input/output control routines for peripherals, and is used to initialize system peripherals before the operating system is loaded. The BIOS setup allows the user to modify the system configurations of these peripherals' basic input/output.

The following topics are covered in this chapter:

- Entering the BIOS Setup
- Main Page
- Advanced Settings
 - Boot Configuration
 - SATA Configuration
 - Intel® Rapid Storage Technology
 - CPU Configuration
 - > Active Management Technology Support
 - Video Configuration
 - Chipset Configuration
 - ➢ SIO ITE8786E
 - > Console Redirection

Security Settings

- Current TPM Device
- > TPM State
- Clear TPM
- > Set Supervisor Password

Power Settings

- Wake On LAN
- Auto Wake On S5
- Power On USB3 (rear panel)
- Power On USB2 (front panel)
- Power On USB2 (built-i
- PS/2 Keyboard Power-up

Boot Settings

Boot Type

- Network Stack
- PXE Boot capability
- USB Boot
- > Timeout
- > EFI

Exit Settings

- Exit Saving Changes
- > Save Change Without Exit
- Exit Discarding Changes
- Load Optimal Defaults
- Load Custom Defaults
- > Save Custom Defaults
- Discard Changes
- Enable AMT
- Use AMT
- Upgrading the BIOS

Entering the BIOS Setup

To enter the BIOS setup utility, press the **F2** while the system is booting up. The main **BIOS Setup** screen will appear. Five options will be available:

- Continue: Continue to boot up
- Boot Manager: Select the device for booting up
- Device Management: Enter the device configuration menu
- Boot From File: Select the UEFI boot up file
- Setup Utility: Enter the BIOS configuration menu
- Intel® Management Engine BIOS Extension: Enter the AMT configuration menu

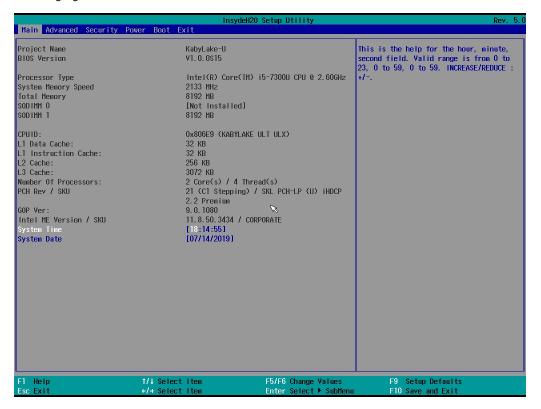
Select F2 to enter the BIOS configuration.

	Front Page	
Front Page		
Continue +Boot Manager +Device Management +Boot From File +Setup Utility +Intel(R) Management Engine BlOS Extension		This selection will direct the system to continue to booting process
	R	
F1 Help 1/4 Select Item	Enter Select 🕨 SubMen	u

When you enter **Setup Utility**, a basic description of each function key is listed at the bottom of the screen. Refer to these descriptions to learn how to use them.

F1	General Help	↑/↓.	Select Item
F5/ F6	Change Values	←/→	Select Menu
F9	Setup Defaults	ESC	Exit
F10	Save and Exit	ENTER	Select or go to Submenu.

The BIOS configuration screen will be shown when you enter the **Setup Utility** option, as shown in the following figure.



Note that the **Processor Type** information for will vary depending on which model you purchased.

Main Page

The **Main** page displays basic system hardware information, such as model name, BIOS version, and CPU type.

	InsydeH20 Se	etup Utility	Rev. 5.0
Main Advanced Security Pow	er Boot Exit		
Project Name BlOS Version	KabyLake-U ¥1.0.0\$15	second	s the help for the hour, minute, field. Valid range is from 0 to to 59, 0 to 59. INCREASE/REDUCE :
Processor Type System Hemory Speed Total Hemory SODIHH O SODIHH 1	Intel(R) Core(TH) i5 2133 HHz 8192 HB [Not installed] 8192 HB		
CPUID: L1 Data Cache: L1 Instruction Cache: L2 Cache: L3 Cache: Number Of Processors: PCH Rev / SKU GOP Ver: Intel HE Version / SKU System Time System Date	0x806E9 (KABYLAKE UL 32 KB 32 KB 256 KB 3072 KB 2 Core(s) / 4 Thread 21 (C1 Stepping) / SI 2.2 Premium 9.0.1080 11.8.50.3434 / CORPOI [10:14:55] [07/14/2019]	s) L PCH-LP (U) iHDCP R	
F1 Help Esc Exit		5/F6 Change Values inter Select ⊨ SubMenu	F9 Setup Defaults F10 Save and Exit

Advanced Settings

Select the "Advanced" option in the main menu to open the "Advanced Features" screen.

NOTE The Active Management Technology is not supported in the DA-682C-KL1 and DA-682-KL3 models.

	Ins	ydeH20 Setup Utility	Rev. 5
Main Advanced Secur	rity Power Boot Exit		
		Con	figures Boot Settings.
Boot Configuration		Con	ingures boot settings.
SATA Configuration			
CPU Configuration			
Active Management Tec	chnology Support		
Video Configuration			
Chipset Configuration	1		
S10 ITE8786E			
Console Redirection			
1 Help	↑/↓ Select Item	F5/F6 Change Values	F9 Setup Defaults
sc Exit	+/→ Select Item	Enter Select ► SubMenu	F10 Save and Exit

Boot Configuration

This item allows users to configure the default value of Numlock.

Options: On (default), Off.

Advanced	Ins	ydeH2O Setup Utility	Rev. 5.
Boot Configuration		Se	lects Power-on state for Numlock
Numlock	<0n>		
1 Help scExit	1/↓ Select Item +/+ Select Item	F5/F6 Change Values Enter Select ► SubMenu	F9 Setup Defaults F10 Save and Exit

SATA Configuration

The host drive controller can be configured for AHCI (default) or Intel RST Premium mode.

Advanced		Insyd	leH2O Setup Utility	Rev. 5.0
SATA Configuration		<ahcl< th=""><th></th><th>Determines how SATA controller(s) operate.</th></ahcl<>		Determines how SATA controller(s) operate.
▶Serial ATA Port 0 Hot Plug ▶Serial ATA Port 1 Hot Plug ▶Serial ATA Port 2 Hot Plug	[Not Installed] [Not Installed] [Not Installed]	<d i="" led="" sab=""> <enab led=""> <enab led=""></enab></enab></d>		
			K	
F1 Help	1/↓ Select	Itan	F5/F6 Change Values	F9 Setup Defaults
Esc Exit	+/+ Select		Enter Select SubMenu	

Serial ATA Port

This setting displays the information about the installed drives.

SATA Port—HotPlug

This item allows you to enable/disable hot-plugging capabilities (the ability to remove the drive while the computer is running) for installed storage drives.

Options: Disabled (default for Port 0), Enabled (default for Port 1 and Port 2)

RAID

Set HDC configuration as "Intel RST Premium" to enable **r**edundant **a**rray of **i**nexpensive **d**isks technology. The DA-682C has three SATA interfaces, which only supports RAID levels 0, 1, and Recovery.

Recovery utilizes RAID 1 (mirroring) functionality to copy data from a designated master drive to a designated recovery drive. The master drive data can be copied to the recovery drive either continuously or on request.

When using the continuous update policy, changes made to the data on the master drive while the system is not docked are automatically copied to the recovery drive when the system is re-docked. When using the on request update policy, the master drive data can be restored to a previous state by copying the data on the recovery drive back to the master drive.

Advanced		Insyde	H2O Setup Utili	ty		Rev. 5.0
SATA Configuration						SATA controller(s)
SATA Mode Selection		<intel prem<br="" rst="">System Accelera</intel>			operate.	
▶Serial ATA Port 0 Hot Plug ▶Serial ATA Port 1 Hot Plug ▶Serial ATA Port 2 Hot Plug	[mSATA 32GB [HOXA FTH-60 SSD [2.5" SATA SSD 3] <disabled>] <enabled> #E] <enabled></enabled></enabled></disabled>				
		K				
F1 Help Esc Exit	t/↓ Select +/+ Select		F5/F6 Chan Enter Sele	ge Values ct ▶ SubMenu		up Defaults e and Exit

Source: http://en.wikipedia.org/wiki/Standard RAID levels for details.

When setting the Intel RST Premium mode, or saving changes and reboot, you can select **Device Management** to configure the following Intel Rapid Storage Technology.

Intel® Rapid Storage Technology

Select **Device Management** on the BIOS main page and then select the **Intel® Rapid Storage Technology** option.

Devic	e Hanager
Devices List ▶Intel(R) Rapid Storage Technology Press ESC to exit.	This formset allows the user to manage RAID volumes on the Intel(R) RAID Controller
×	
F1 Help Esc Exit	t/1 Select Iten Enter Select⊁ SubMenu
Intel(R) Rapid Storage Technology	Storage Technology
Intel(R) RST 15.8.0.3010 RAID Driver	This page allows you to create a RAID volume
≻Create RAID Volume	
Non-RAID Physical Disks: ⊵SATA 0.3, HGST HTS545050A7E680 TM8514GL1A6AJP, 465.7GB ⊵SATA 0.4, Hitachi HTS545050B9A300 28PB4406Q7CJS04L, 465.7GB	

CPU Configuration

 NOTE
 Hyper-Threading is not supported in the DA-682C-KL1 and DA-682C-KL3 models.

 Insydel/20 Setup Utility
 Rev. 5.0

 OPU Configuration
 Number of cores to enable in each

 http://typer-Threading
 <AII>

 http://typer-Threading
 <AII>

 imported of the setup Utility
 Rev. 5.0

 Processor Cores
 <AII>

 http://typer-Threading
 <AII>

 import of cores
 <AIII>

 import of cores
 <t

Active Processor Cores

This item indicates the number of cores to enable in each processor package.

Hyper-threading

This feature makes the processor resources work more efficiently, enabling multiple threads to run on each core. It also increases processor throughput, improving overall performance on threaded software.

Options: Disabled, Enabled (default)

Active Management Technology Support

This item allows you to configure the Intel® Active Management Technology.

NOTE The DA-682C-KL3 model does not support this function.

Advanced	InsydeH20 <	Setup Utility	Rev. 5.0
Advanced Active Management Technology Support ME Unconfig on RTC Clear State Unconfigure ME	<pre> (Enab led> []]</pre>		Rev. 5.0
F1 Help f/4 Sele Esc Exit +/+ Sele		F5/F6 Change Values Enter Select ► SubMenu	F9 Setup Defaults F10 Save and Exit

ME Unconfig on RTC Clear State

Disabling this option will cause ME not to unconfigure on RTC clear.

Options: Disabled, Enabled (default)

Unconfigure ME

Unconfigure ME with resetting MEBx password to default.

Video Configuration

Advanced	Insy	ydeH20 Setup Utility	Rev. 5
/ideo Configuration			Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the
DVMT Pre-Allocated DVMT Total Gfx Hem	<32H> <256H>		Internal Graphics Device.
		R	
1 Help scExit	1/↓ Select Item +/+ Select Item	F5/F6 Change Values Enter Select ► SubMenu	F9 Setup Defaults F10 Save and Exit

DVMT Pre-Allocated

This item allows you to configure pre-allocated memory capacity for the IGD. Pre-allocated graphics memory is invisible to the operating system.

Options: 12 M, 16M, 20M, 24M, 28M, 32M (default), 36M, 40M, 44M, 48M, 52M, 56M, 60M, 64M

DVMT: The amount of video memory your computer has is dependent on the amount of pre-allocated memory set for your system plus the Dynamic Video Memory Technology (DVMT). DVMT dynamically allocates system memory for use as video memory creating the most efficient use of available resources for maximum 2D/3D graphics performance.

DVMT Total Gfx Memory Size

This item allows you to configure the maximum amount of memory DVMT will use when allocating additional memory for the internal graphics device.

Options: 256 MB (default), 128 MB, Max.

Chipset Configuration

This item allows you to configure the chipset settings.

Advanced	InsydeH	20 Setup Utility	Rev. 5.
Chipset Configuration		Thi	s item allows you to enable/disable 💦
Power ON after Power Failure	<0N>	up	computer from automatically powering after a system crash. Options: ON
DO-O Level	<high></high>	(de	fault), OFF, Last State
D0-1 Level	<high></high>		
	Select Item Select Item	F5/F6 Change Values Enter Select ► SubMenu	F9 Setup Defaults F10 Save and Exit

Power ON after Power Failure

This item allows you to enable/disable the computer from automatically powering up after system power is re-enabled.

Options: ON (default), OFF, Last State

DO-0 Level

This item allows users to set the DO 0 as high or low.

Options: High (default), Low

DO-1 Level

This item allows users to set the DO 1 as high or low.

Options: High (default), Low

SIO ITE8786E

This section allows users to configure serial port settings.

Advanced	Insy	rdeH20 Setup Utility	Rev. 5. (
Advanced Serial Port A Serial Port B ⊁Hardware Monitor	<auid> <auid></auid></auid>	Cor [D] Cor	nfigure Serial port using options : isable] No Configuration [Enable] User nfiguration [Auto] EF1/0S chooses nfiguration
F1 Help Esc Exit	1/1 Select Item +/+ Select Item	F5/F6 Change Values Enter Select ≻ SubHenu	F9 Setup Defaults F10 Save and Exit

Serial Port A

This function allows users to configure the resources for serial port A. Disable: No resources Enable: User configures the resources Auto (default): EFI/OS chooses the resources

Serial Port B

This function allows users to configure the resources for serial port B. Disable: No resources Enable: User configures the resources Auto (default): EFI/OS chooses the resources

Hardware Monitor

This item allows you to view stats such as CPU and system temperature, voltage levels, and other chipset information.

Advanced	Insyd	eH20 Setup Utility	Rev. 5.0
Hardware Monitor			
Voltage 3.3V 5V	3.288 V 4.896 V		
Temperature System (°C/°F) System2 (°C/°F) CPU (°C/°F)	47°C/116°F 46°C/114°F 69°C/156°F		
F1 Help Esc Exit	1/1 Select Item +/+ Select Item	F5/F6 Change Values Enter Select ▶ SubMenu	F9 Setup Defaults F10 Save and Exit

Console Redirection

When the Console Redirection Function is enabled, the console information will be output to both the HDMI monitor and through the serial port.

Options: Disabled (default), Enabled

Security Settings

This section allows users to configure security-related settings with a supervisor password and user password.

NOTE These settings will only appear in computers that have the TPM module.

Main Advanced Security Powe		Setup Utility	Rev. 5
Current TPM Device TPM State Clear TPM	<tph (dtph)="" 2.0=""> All Hierarchies En []</tph>		Clear TPM. Removes all TPM context associated with a specific Owner.
Supervisor Password	Not Installed		
Set Supervisor Password			
F1 Help Esc Exit	1/↓ Select Item +/→ Select Item	F5/F6 Change Values Enter Select ▶ SubMenu	F9 Setup Defaults F10 Save and Exit

Current TPM Device

This item shows if the system has TMP device and its type.

TPM State

This item allows you view the status of current TPM settings.

Clear TPM

This item allows users to remove all TPM context associated with a specific owner.

Set Supervisor Password

This item allows you to set the supervisor password. Select the **Set Supervisor Password** option and enter the password and confirm the password again.

To delete the password, select the **Set Supervisor Password** option and enter the old password; leave the new password fields blank, and then press enter.

Hain Advanced Security Power Boot Exit Current TPH Device <tph (dtph)="" 2.0=""> Install or Change the password and the length of password must be greater that one character. IPH State All Hierarchies Enabled, Owned [X] Supervisor Password Not Installed Set Supervisor Password Set Supervisor Password Enter New Password Again: Enter New Password Again:</tph>
Current TPH Device <tph (dtph)="" 2.0=""> TPH State All Hierarchies Enabled, Owned Clear TPH [X] Supervisor Password Not Installed Set Supervisor Password Enter New Password:</tph>
Set Supervisor Password Set Supervisor Password Enter New Password:
Set Supervisor Password Enter New Password:
F1 Help 1/4 Select Item F5/F6 Change Values F9 Setup Defaults Esc Exit +/→ Select Item Enter Select ► SubMenu F10 Save and Exit

After setting the supervisor password, users can choose when asking input password screen will pop up.

		nsydeH20 Setup Utility	Rev. 5.0
Main Advanced Security Pow	er Boot Exit		
Current TPM Device TPM State Clear TPM Supervisor Password	<tpm (<br="" 2.0="">All Hierar [] Installed</tpm>	DTPM)> chies Enabled, Owned	Enable:System will ask input password on post time. Disable:System will ask input password when go to Setup Utility. Config=Only:System will ask input password when user press F2 into Frontpage
Set Supervisor Password Power on Password	<d i="" led="" sab=""></d>	Power on Password Enabled Disabled Config-Only	
F1 Help Esc Exit	1/1 Select Item +/+ Select Item	F5/F6 Change Values Enter Select ► SubMenu	F9 Setup Defaults F10 Save and Exit

Enable: System will ask input password on post time.

Disable: System will ask for the password to go to the setup utility.

Config-Only: System will only ask for the password when you select the config (F2) option

Power Settings

The section allows users to configure power settings.

	Insyde	H2O Setup Utility	Rev. 5.0
Main Advanced Security Pow	ver Boot Exit		
Wake on LAN Auto Wake on S5 Power On USB3(Rear) Power On USB2(Front) Power On USB2(Internal)	<enabled> <disabled> <enabled> <enabled> <enabled></enabled></enabled></enabled></disabled></enabled>		Determines the action taken when the system power is off and a PCI Power Management Enable wake up event occurs.
PS/2 Keyboard Power-Up	<d i="" led="" sab=""></d>		
F1 Help Esc Exit	1/1 Select Item +/+ Select Item	F5/F6 Change Values Enter Select ► SubHenu	F9 Setup Defaults F10 Save and Exit

Wake On LAN

This feature is used to wake the system by a LAN device from a remote host.

Options: Disabled, Enabled (default)

Auto Wake On S5

This item allows you to configure the computer to wake from S5 status. S5 stands for Soft Off, where the PSU remains engaged but power to all other parts of the system is cut. Auto-wake on S5 schedules a soft-reboot at certain periodic times that may be specified in the BIOS.

Options: Disabled (default); By Every Day (user specifies a regular daily time when the computer will power up); By Day of Month (user specifies a regular day each month when the computer will power up)

Power On USB3 (rear panel)

This item allows users to power on or power off the USB ports on the rear panel.

Options: Disabled, Enabled (default)

Power On USB2 (front panel)

This item allows users to power on or power off the USB ports on the front panel.

Options: Disabled, Enabled (default)

Power On USB2 (built-in)

This item allows user to powers on or power off the internal USB port inside the computer.

Options: Disabled, Enabled (default)

PS/2 Keyboard Power-up

This item allows users to press CTRL+P to wake up the system that PSU remains engaged but power to all other parts of the system is cut.

Options: Disabled (default), Enabled

Boot Settings

The section allows users to configure boot settings.

	InsydeH2	0 Setup Utility	Rev. 5.0
Main Advanced Security Pow	ver Boot Exit		
Main Advanced Security Pod Boot Type Network Stack PXE Boot capability USB Boot USB Boot USB Boot USB Boot Boot Order ►EF1	rer Boot Exit <uefi boot="" type=""> <disabled> <disabled> <enabled> [0]</enabled></disabled></disabled></uefi>		Select boot type to Dual type, Legacy type or UEFI type
F1 Help Esc Exit	1/1 Select Item +/→ Select Item	F5/F6 Change Values Enter Select ► SubMenu	F9 Setup Defaults F10 Save and Exit

NOTE If you do not add any storage, you will not see the EFI option.

Boot Type

This item allows you to enable/disable the quick boot function.

Options: Dual Boot Type, Legacy Boot Type, UEFI Boot Type (default)

Network Stack

It deploys an Internet Protocol (IP) stack. The IP stack provides an application library to open/close connections to remote devices and send/receive data between the remote devices.

Options: Disabled (default), Enabled

PXE Boot capability

PXE Booting is booting a system over a network. This item allows users to start PXE over IPv4 or IPv6 Options: Disabled (default), UEFI: IPv4, UEFI: IPv6, UEFI: IPv4/IPv6

USB Boot

Set booting to USB boot devices capability.

Options: Enabled (Default), Disabled

Timeout

This item allows users to set the number of second that the firmware will wait before booting the original default boot selection.

EFI

This item allows users to select the boot order. Use F5 (move down) or F6 (move up) to change the value.

Exit Settings

The section allows users to exit the BIOS environment.

Main Advanced Security	Power Boot Exit	nsydeH20 Setup Utility	Rev. 5.0
Exit Saving Changes Save Change Without Exit Exit Discarding Changes Load Optimal Defaults Load Custom Defaults Discard Changes	POWP BOOT EXIT	Exit system	setup and save your changes.
F1 Help Esc Exit	1/↓Select Item +/→Select Item		Setup Defaults Save and Exit

Exit Saving Changes

This item allows you to exit the BIOS environment and save the values you have just configured.

Options: Yes (default), No

Save Change Without Exit

This item allows you to save changes without exiting the BIOS environment.

Options: Yes (default), No

Exit Discarding Changes

This item allows you to exit without saving any changes that might have been made to the BIOS.

Options: Yes (default), No

Load Optimal Defaults

This item allows you to revert to the factory default BIOS values.

Options: Yes (default), No

Load Custom Defaults

This item allows you to load custom default values for the BIOS settings.

Options: Yes (default), No

Save Custom Defaults

This item allows you to save the current BIOS values as a "custom default" that may be reverted to at any time by the "load custom defaults" selection just above.

Options: Yes (default), No

Discard Changes

This item allows you to discard all settings you have just configured.

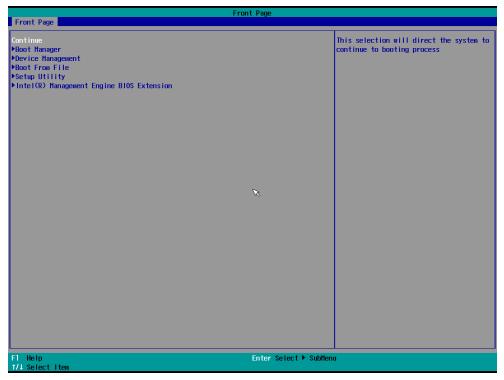
Options: Yes (default), No

Enable AMT

NOTE The AMT function is not supported for DA-682C-KL1 and DA-682C-KL3 models.

To enter the BIOS setup utility, press the **F2** while the system is booting up. The main **BIOS Setup** screen will appear. Five options will be available:

1. Select Intel® Management Engine BIOS Extension to enter the AMT configuration.



2. Press **<Enter>** to start the login procedure.

Intel(R) Management Engine BIOS Extension v11.0.0.0010/Intel(R) ME v11.8.50.3434 Copyright(C) 2003-16 Intel Corporation. All Rights Reserved					
	MAIN MENU				
HEBx Login > Intel(R) ME General Settings > Intel(R) AMT Configuration HEBx Exit					
	Intel(R) ME Password				
Intel(R) ME Password					
[14]=Move Highlight	[Enter]=Select Entry [I	Esc]=Exit			

3. Type the default password: admin

Intel(R) Management Engine BIOS Extension v11.0.0.0010/Intel(R) ME v11.8.50.3434 Copyright(C) 2003-16 Intel Corporation. All Rights Reserved			
	MAIN MENU		
MEBx Login > Intel(R) ME General Settings > Intel(R) AMT Configuration MEBx Exit	Intel(R) ME Password	•	
Intel(R) ME Password			
[↑↓]=Move Highlight	[Enter]=Select Entry	[Esc]=Exit	

4. Type the new password. It must include both upper-case and lower-case characters, numbers, and special symbols. E.g., **Admin'12**.

Intel(R) Management Engine Blos Extension v11.0.0.0010/Intel(R) ME v11.8.50.3434 Copyright(C) 2003-16 Intel Corporation. All Rights Reserved			
	MAIN MENU		
MEBx Login > Intel(R) ME General Settings > Intel(R) AMT Configuration MEBx Exit		1	
	Intel(R) HE New Password		
Intel(R) ME Password			
[↑↓]=Move Highlight	[Enter]=Select Entry	[Esc]=Exit	

5. Select **Intel® AMT Configuration** to enable remote access without a local user present for consent, select **User Consent**, and then select **User Opt-in** and change the value to **None**.

6. Set static IP or DHCP by request.

Intel(R) Management Engine BloS Extension v11.0.0.0010/Intel(R) ME v11.8.50.3434 Copyright(C) 2003-16 Intel Corporation. All Rights Reserved				
WIRED LAN IPV4 CONFIGURATION				
DHCP Mode IPV4 Address Subnet Mask Address Default Gateway Address Preferred DNS Address Alternate DNS Address	<d ab="" is="" led=""> 172. 16. 1. 2 255. 255. 255. 255. 0 0. 0. 0. 0 0. 0. 0. 0 0. 0. 0. 0 0. 0. 0. 0</d>			
Subnet mask (e.g. 255.255.0)				
[↑↓]=Move Highlight	[Enter]=Select Entry	[Esc]=Exit		

7. Set Activate Network Access to enable remote access capability.

Intel(R) Management Engine BIOS Extension v11.0.0.0010/Intel(R) ME v11.8.50.3434 Copyright(C) 2003-16 Intel Corporation. All Rights Reserved					
INTEL(R) AMT CONFIGURATION					
Manageability Feature Selection <enabled> > SOL/Storage Redirection/KVM > User Consent</enabled>					
Password Policy <anytime> > Network Setup</anytime>					
Activate Network Access Unconfigure Network Access > Remote Setup And Configuration > Power Control					
[1]=Move Highlight [Enter]=Select Entry [Esc]=Exit					

Use AMT

The DA-682C's AMT port is LAN1. You can use any of the available AMT tools to execute the remote management function. The easiest method is using a web browser.

1. Type the IP for your DA-682C that was configured in the AMT configuration with port **16992**. The AMT logon screen will appear.

CIntel® Active Management Technology - Windows Interpretent Control (1998)	ernet Explorer	
🚱 🗢 🖻 http://172.16.1.2:16992/logon.htm		+ ×
Intel® Active Management Technology	(intel)	
Log On Log on to Intel® Active Management Technology on this computer. Log On		

Click on "Log On" and type the username (admin) and password to log in and control the DA-682C remotely.

Intel® Active Ma Computer:	nagement Techi	nology	(intel)			
System Status	System Status					
ardware Information System	Power	On				
Processor	IP address	172.16.1.2				
Memory Disk	IPv6 address	Disabled				
Battery	System ID	12345678-1234-5678-90ab-cddeefaabbcc				
ent Log mote Control	Date	8/21/2014				
wer Policies	Time	7:59 pm				
twork Settings 46 Network Settings estem Name Settings eer Accounts	Refresh					
		Copyright @ 2005-2011 Intel Corporation. All Rights Reserved. Intel @ Active Management Technology firmware version: 8.0.0-build 1351				

 NOTE
 Refer to the Intel AMT Implementation and Reference Guide for details:

 https://software.intel.com/sites/manageability/AMT Implementation and Reference Guide/

 default.htm?turl=WordDocuments%2Faccessingintelamtviathewebuiinterface.htm

Upgrading the BIOS

This section describes how to upgrade the BIOS. However, note that it is easy to permanently damage the computer when upgrading the BIOS. We strongly recommend that you contact Moxa's technical support staff for assistance in order to obtain all the necessary tools and the most current advice before attempting to upgrade the BIOS on any Moxa device.

Step 1: Create a Bootable USB Disk

Before upgrading the BIOS, every user should first create a bootable USB drive as a system boot device.

1. Search "format", then select Create and format hard disk partitions.

А	II Apps	Documents	Settings	Photos	Ν
Best	t match				
N.	Create a partition Control pa		d disk	\rightarrow	
Con	nmand				
	format			>	
Sett	tings				
⊕	See the cur formats	rrent date and	time	>	
⊕	Region set	tings		>	
⊕	Set regiona	al format		>	
圮	Emphasize	formatted tex	đ	>	
⊕	Change the	e date and tim	e formats	>	
Q	format				

2. Right click on the USB disk then select "Format".

	-		1	10		F 0	0.5		
Volume	Layout	Туре	File System	Status	Capacity	Free Spa.			_
 (D:) (Disk 0 partition 2) 	Simple Simple	Basic Basic	NTFS	Healthy (P Healthy (E		7.07 GB 100 MB	99 % 100 %		
Recovery	Simple	Basic	NTES	Healthy (190 MB	38 %		_
Windows (C:)	Simple	Basic	NTES	Healthy (B.		15.66 GB			
							Mark Partitio		1/8
							Change Drive Format		
= Disk 0							Change Drive	Letter a	
Basic R	lecovery				Windows (C:)		Change Drive Format	e Letter a	
Basic R 29.80 GB 5	00 MB NTFS	artition)	100 MB Healthy (F	El System Pa	29.21 GB NTFS	ne Fil	Change Drive Format Extend Volum	e Letter a	
Basic R 29.80 GB 5		artition)		FI System Pa		ge Fil	Change Drive Format Extend Volum Shrink Volum	e	
Basic R 29.80 GB 5	00 MB NTFS	artition)		Fl System Pa	29.21 GB NTFS	ge Fil	Change Drive Format Extend Volum Shrink Volum Add Mirror	e	
Basic 29,80 GB Online Disk 1 Removable	00 MB NTFS	artition)		FI System Pa	29.21 GB NTFS	ge Fil	Change Drive Format Extend Volum Shrink Volum Add Mirror Delete Volum	e	

3. Select "FAT32", and click OK to start formatting.

Format D:		×
Volume label:	New Volume	
File system:	NTFS	~
Allocation unit size:	NTFS FAT32 exFAT	
Perform a quick for		
Enable file and fold	er compression	
	ОК	Cancel

Step 2: Prepare the Upgrade File

You must use the BIOS upgrade installation file to upgrade the BIOS. Contact Moxa's technical department for assistance.

- 1. Get the BIOS upgrade file; it includes an **efi** folder and a file **xxxx.efi**.
- 2. Copy efi folder and xxxx.efi file to the Bootable USB Disk.

Step 3: Run the upgrade program on the Computer

- Reboot the computer, and press F2 while booting up to go to the Boot Manager. If BIOS cannot recognize the USB drive as the boot devices, the USB drive could have no partition table. Use windows command line tool **diskpart** to rebuild the partition table.
- 2. Select the USB Disk



3. Screen will be going into the SHELL environment, type **fs0:** then, go to the directory where the upgrade file is located, type :**xxxxxx.efi** (the name is based on the upgrade file you get from Moxa).

Device map	pping table
fs0	:Removable HardDisk - Alias hd24s0b blk0
	PciRoot(0x0)/Pci(0x14,0x0)/USB(0x12,0x0)/HD(1,MBR,0x00DD3D80,0x3F,0xEB5FC1)
blk0	:Removable HardDisk - Alias hd24s0b fs0
	PciRoot(0x0)/Pci(0x14,0x0)/USB(0x12,0x0)/HD(1,MBR,0x00DD3D80,0x3F,0xEB5FC1)
blk1	:Removable BlockDevice - Alias (null)
	PciRoot(0x0)/Pci(0x14, 0x0)/USB(0x12, 0x0)
hd24s0b	:Removable HardDisk - Alias fs0 blk0
	PciRoot(0x0)/Pci(0x14,0x0)/USB(0x12,0x0)/HD(1,MBR,0x00DD3D80,0x3F,0xEB5FC1)
Shell> fs():
fs0:\> xxx	xxxxx.efi

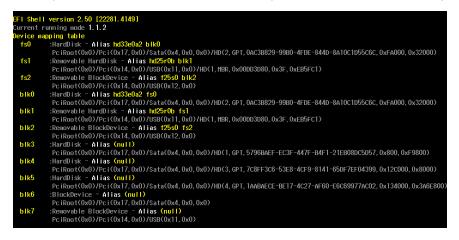
4. The upgrade program will run automatically. Wait patiently until the procedure is finished.

Ρ	lease do not remove the AC power!	
Insyde H	20FFT (Flash Firmware Tool) Version 2.00	
Copyright (C) 2	000-2018 Insyde Software Corp. All Rights Reserved.	
	Current BIOS Model Name: KabyLake-H	
	New BIOS Model Name: KabyLake-H	
	Current BIOS Version: V1.0.0S16	
	New BIOS Version: V1.0.0S16	
	Start BIOS Update	
		31%

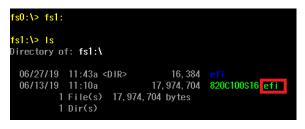
5. When the upgrade is finished, the computer will automatically reboot. You may check BIOS version on the Main page

						Ins
Main	Advanced	Security	Power	Boot	Exit	
Projec					KabyLake-	
BIOS V	orgion				V1.0.0\$16	

6. If the system have more than one boot device, you will see more than one fsx (x means number)



7. Go each **fsx** (x means number), then type **Is** to view the content of the boot device. If find the upgrade file, execute it





ATTENTION

Do NOT switch off the power supply during the BIOS upgrade, since doing so may cause the system to crash.



Safety Installation Instructions

1. RTC Battery Warning



ATTENTION

There is a risk of explosion if the wrong type of battery is used. To avoid this potential danger, always be sure to use the correct type of battery. Contact the Moxa RMA service team if you need to replace your battery.

Caution

There is a risk of explosion if the battery is replaced by an incorrect type. Dispose of used batteries according to the instructions on the battery.

2. Fuse Warning

CAUTION: For continued protection against fire, replace only with the same type and rating of fuse.

3. Rackmount Warning

The following or similar rackmount instructions are included with the installation instructions:

(1) Elevated Operating Ambient: If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the room ambient temperature. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.

(2) Reduced Air Flow: Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

(3) Mechanical Loading: Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

(4) **Circuit Overloading:** Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

(5) Reliable Grounding: Reliable grounding of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., by using power strips).