



**NEXCOM International Co., Ltd.**

# **Mobile Computing Solutions**

## **Modular Vehicle Computer System**

### **MVS 5600 and MVS 5603**

#### **User Manual**

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# PREFACE

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## Acknowledgements

MVS 5600 and MVS 5603 are trademarks of NEXCOM International Co., Ltd. All other product names mentioned herein are registered trademarks of their respective owners.

## Regulatory Compliance Statements

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

## Declaration of Conformity

### FCC

This equipment has been tested and verified to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area (domestic environment) is likely to cause harmful interference, in which case the user will be required to correct the interference (take adequate measures) at their own expense.

### CE

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

## RoHS Compliance



### **NEXCOM RoHS Environmental Policy and Status Update**

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

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

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

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

### **How to recognize NEXCOM RoHS Products?**

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

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

## Warranty and RMA

### NEXCOM Warranty Period

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

### NEXCOM Return Merchandise Authorization (RMA)

- Customers shall enclose the “NEXCOM RMA Service Form” with the returned packages.
- Customers must collect all the information about the problems encountered and note anything abnormal or, print out any on-screen messages, and describe the problems on the “NEXCOM RMA Service Form” for the RMA number apply process.
- Customers can send back the faulty products with or without accessories (manuals, cable, etc.) and any components from the card, such as CPU and RAM. If the components were suspected as part of the problems, please note clearly which components are included. Otherwise, NEXCOM is not responsible for the devices/parts.
- Customers are responsible for the safe packaging of defective products, making sure it is durable enough to be resistant against further damage and deterioration during transportation. In case of damages occurred during transportation, the repair is treated as “Out of Warranty.”
- Any products returned by NEXCOM to other locations besides the customers’ site will bear an extra charge and will be billed to the customer.

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

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

#### System Level

- Component fee: NEXCOM will only charge for main components such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistor, capacitor.
- Items will be replaced with NEXCOM products if the original one cannot be repaired. Ex: motherboard, power supply, etc.
- Replace with 3rd party products if needed.
- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

#### Board Level

- Component fee: NEXCOM will only charge for main components, such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistors, capacitors.
- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

## Warnings

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

## Cautions

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



## Safety Information

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

- Read all instructions carefully.
- Do not place the unit on an unstable surface, cart, or stand.
- Follow all warnings and cautions in this manual.
- When replacing parts, ensure that your service technician uses parts specified by the manufacturer.
- Avoid using the system near water, in direct sunlight, or near a heating device.
- The load of the system unit does not solely rely for support from the rackmounts located on the sides. Firm support from the bottom is highly necessary in order to provide balance stability.
- The computer is provided with a battery-powered real-time clock circuit. There is a danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
- There must be a disconnect device in front of "MVS 5600 and MVS 5603" to keep the worker or field side maintainer be cautious and aware to close the general power supply before they start to do maintenance. The disconnect device hereby means a 20A circuit-breaker. Power installation must be performed with qualified electrician and followed with National Electrical Code, ANSI/NFPA 70 and Canadian Electrical Code, Part I, CSA C22.1.
- The front of the equipment requires wiring terminals with the following specifications:
  - Wire size: 30-12 AWG
  - Wire Type: copper wire only
  - Terminal Blocks Torque: 5 lb In.
  - For supply connections, use wires suitable for at least 75°C.

## Installation Recommendations

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

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

- A Philips screwdriver
- A flat-tipped screwdriver
- A grounding strap
- An anti-static pad

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

## Safety Precautions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a stable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection to protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Place the power cord in a way so that people will not step on it. Do not place anything on top of the power cord. Use a power cord that has been approved for use with the product and that it matches the voltage and current marked on the product's electrical range label. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
  - a. The power cord or plug is damaged.
  - b. Liquid has penetrated into the equipment.
  - c. The equipment has been exposed to moisture.
  - d. The equipment does not work well, or you cannot get it to work according to the user's manual.
  - e. The equipment has been dropped and damaged.
  - f. The equipment has obvious signs of breakage.
15. Do not place heavy objects on the equipment.
16. The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace your obsolete outlet.
17. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER. DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

## Technical Support and Assistance

1. For the most updated information of NEXCOM products, visit NEXCOM's website at [www.nexcom.com](http://www.nexcom.com).
2. For technical issues that require contacting our technical support team or sales representative, please have the following information ready before calling:
  - Product name and serial number
  - Detailed information of the peripheral devices
  - Detailed information of the installed software (operating system, version, application software, etc.)
  - A complete description of the problem
  - The exact wordings of the error messages

### Warning!

1. Handling the unit: carry the unit with both hands and handle it with care.
2. Maintenance: to keep the unit clean, use only approved cleaning products or clean with a dry cloth.
3. CFast: Turn off the unit's power before inserting or removing a CFast storage card.

## Conventions Used in this Manual



### Warning:

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



### Caution:

Information to avoid damaging components or losing data.



### Note:

Provides additional information to complete a task easily.

## Global Service Contact Information

### Headquarters

#### NEXCOM International Co., Ltd.

9F, No. 920, Chung-Cheng Rd.,  
ZhongHe District, New Taipei City, 23586,  
Taiwan, R.O.C.

Tel: +886-2-8226-7786

Fax: +886-2-8226-7782

[www.nexcom.com](http://www.nexcom.com)

### America

#### USA

#### NEXCOM USA

2883 Bayview Drive,  
Fremont CA 94538, USA

Tel: +1-510-656-2248

Fax: +1-510-656-2158

Email: [sales@nexcom.com](mailto:sales@nexcom.com)

[www.nexcom.com](http://www.nexcom.com)

### Asia

#### Taiwan

#### NEXCOM Intelligent Systems

#### Taipei Office

13F, No.920, Chung-Cheng Rd.,  
ZhongHe District,  
New Taipei City, 23586, Taiwan, R.O.C.

Tel: +886-2-8226-7796

Fax: +886-2-8226-7792

Email: [sales@nexcom.com.tw](mailto:sales@nexcom.com.tw)

[www.nexcom.com.tw](http://www.nexcom.com.tw)

### NEXCOM Intelligent Systems

#### Taichung Office

16F, No.250, Sec. 2, Chongde Rd.,  
Beitun Dist.,

Taichung City 406, R.O.C.

Tel: +886-4-2249-1179

Fax: +886-4-2249-1172

Email: [sales@nexcom.com.tw](mailto:sales@nexcom.com.tw)

[www.nexcom.com.tw](http://www.nexcom.com.tw)

### Japan

#### NEXCOM Japan

9F, Tamachi Hara Bldg.,  
4-11-5, Shiba Minato-ku,  
Tokyo, 108-0014, Japan

Tel: +81-3-5419-7830

Fax: +81-3-5419-7832

Email: [sales@nexcom-jp.com](mailto:sales@nexcom-jp.com)

[www.nexcom-jp.com](http://www.nexcom-jp.com)

### China

#### NEXCOM China

Floor 5, No.4, No.7 fengxian middle Rd.,  
(Beike Industrial Park), Haidian District,  
Beijing, 100094, China

Tel: +86-10-5704-2680

Fax: +86-10-5704-2681

Email: [sales@nexcom.cn](mailto:sales@nexcom.cn)

[www.nexcom.cn](http://www.nexcom.cn)

## **NEXCOM Shanghai**

Room 603/604, Huiyinmingzun Plaza Bldg., 1,  
No.609, Yunlin East Rd.,  
Shanghai, 200333, China  
Tel: +86-21-5278-5868  
Fax: +86-21-3251-6358  
Email: sales@nexcom.cn  
www.nexcom.cn

## **NEXCOM Surveillance Technology Corp.**

Room202, Building B,  
the GuangMing Industrial Zone Zhonghua Rd.,  
Minzhi Street, Longhua District,  
Shenzhen 518131, China  
Tel: +86-755-8364-7768  
Fax: +86-755-8364-7738  
Email: steveyang@nexcom.com.tw  
www.nexcom.cn

## **NEXCOM United System Service**

Hui Yin Ming Zun Building Room 1108,  
Building No. 11, 599 Yunling Road, Putuo District,  
Shanghai, 200062, China  
Tel: +86-21-6125-8282  
Fax: +86-21-6125-8281  
Email: frankyang@nexcom.cn  
www.nexcom.cn

## **Europe**

### **United Kingdom**

#### **NEXCOM EUROPE**

10 Vincent Avenue,  
Crownhill Business Centre,  
Milton Keynes, Buckinghamshire  
MK8 0AB, United Kingdom  
Tel: +44-1908-267121  
Fax: +44-1908-262042  
Email: sales.uk@nexcom.eu  
www.nexcom.eu

### **Italy**

#### **NEXCOM ITALIA S.r.l**

Via Lanino 42,  
21047 Saronno (VA), Italia  
Tel: +39 02 9628 0333  
Fax: +39 02 9625 570  
Email: nexcomitalia@nexcom.eu  
www.nexcomitalia.it

## Package Contents

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

### MVS 5600 Package Contents

Item	Part Number	Description	Specification	Qty
1	603POW0234X00	Power Cable 8-pin to 6-pin 12V DC OUT SUNJET: SLNEX822910	ATX 2x4 PIT: 3.0mm to ATX 2x3 PIT: 4.2mm UL1007 22AWG L=200mm	1
2	60233SAM05X00	GPS Antenna ARKNAV: A-130 GPS Antenna 5M SMA180P R1 L3	For VTC 5M/SMA 180P	1
3	602DCD1308X00	MVS 5603/5600 Series DVD Driver VER: 1.0	JCL	1
4	50333P0028X00	Washer for SMA Connector Kang Yang: WS6-0.8(B)	12.8x6.4x0.8mm PC Black	4
5	50311F0099X00	Round Head Screw Long Fei: P3*6ISO + NIGP	P3x6 NI Nylok	4
6	5061600105X00	MVS 5603 Transistor Washer Kang Yang: TW-6A	A6.2 B3.55 C3 D1.4 E1.2 PBT Natural	4
7	4NCPM01601X00	Terminal Blocks 2x8 ANYTEK: KD161051A000G	3.5mm Male 16P 180D Plug Green	1
8	4NCPM00302X00	Terminal Blocks 3P Phoenix Contact: 1777992	5.08mm Male DIP Green	1

### MVS 5603 Package Contents

Item	Part Number	Description	Specification	Qty
1	603POW0234X00	Power Cable 8-pin to 6-pin 12V DC OUT SUNJET: SLNEX822910	ATX 2x4 PIT: 3.0mm to ATX 2x3 PIT: 4.2mm UL1007 22AWG L=200mm	1
2	60233SAM05X00	GPS Antenna ARKNAV: A-130 GPS Antenna 5M SMA180P R1 L3	For VTC 5M/SMA180P	1
3	602DCD1308X00	MVS 5603/5600 Series DVD Driver VER:1.0	JCL	1
4	603POW0246X00	Power Cable for MVS 5603 ST: MD-5105301	Terminal Blocks 3P to Terminal Blocks 3P UL1007 18AWG L=200mm	1
5	50311F0099X00	Round Head Screw Long Fei: P3*6ISO+NIGP	P3x6 NI Nylok	8
6	5061600105X00	MVS 5603 Transistor Washer Kang Yang: TW-6A	A6.2 B3.55 C3 D1.4 E1.2 PBT Natural	8
7	50333P0028X00	Washer for SMA Connector Kang Yang: WS6-0.8(B)	12.8x6.4x0.8mm PC Black	4
8	4NCPM01601X00	Terminal Blocks 2x8 ANYTEK: KD161051A000G	3.5mm Male 16P 180D Plug Green	1
9	4NCPF00510X00	Terminal Blocks 5P Phoenix Contact: 1778014	5.08mm Female DIP Green	1

## Ordering Information

The following information below provides ordering information for MVS 5600 and MVS 5603.

### **MVS 5600-7BK (P/N: 10VS0560000X0)**

6th generation Intel® Core™ dual core i7-6600U, 2.6GHz, 2GB DDR3L industrial grade SO-DIMM, 2x 10/100/1000 Ethernet, VGA/HDMI output, 2x RS232, 1x RS-232/422/485, 4x USB, 12VDC output, 1x CAN

### **MVS 5600-3BK (P/N: 10VS0560001X0)**

6th generation Intel® Core™ dual core i3-6100U, 2.3GHz, 2GB DDR3L industrial grade SO-DIMM, 2 x 10/100/1000 Ethernet, VGA/HDMI output, 2x RS232, 1x RS-232/422/485, 4x USB, 12VDC output, 1x CAN

### **MVS 5603-7C8SK (P/N: 10VS0560300X0)**

6th generation Intel® Core™ dual core i7-6600U, 2.6GHz, 2GB DDR3L industrial grade SO-DIMM, 8x 10/100/1000 PoE, 2x 10/100/1000 Ethernet, VGA/HDMI output, 2x RS232, 1x RS-232/422/485, 4x USB, 12VDC output, 1x CAN

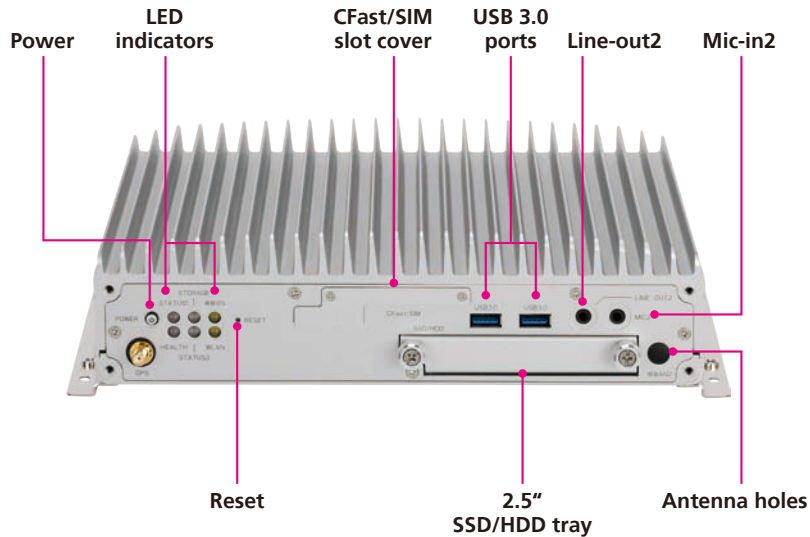
### **MVS 5603-3C8SK (P/N: 10VS0560301X0)**

6th generation Intel® Core™ dual core i3-6100U, 2.3GHz, 2GB DDR3L industrial grade SO-DIMM, 8x 10/100/1000 PoE, 2x 10/100/1000 Ethernet, VGA/HDMI output, 2x RS232, 1x RS-232/422/485, 4x USB, 12VDC output, 1x CAN

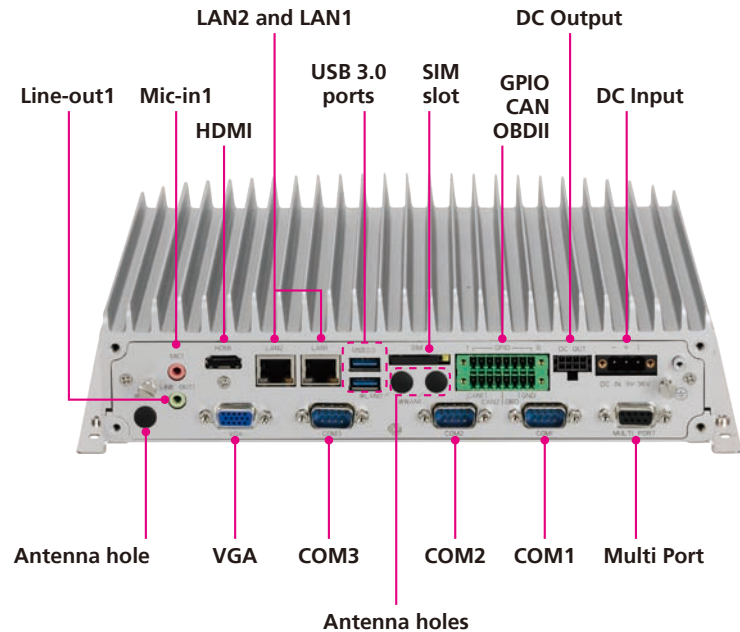
# CHAPTER 1: PRODUCT INTRODUCTION

## Physical Features

### MVS 5600 Front View



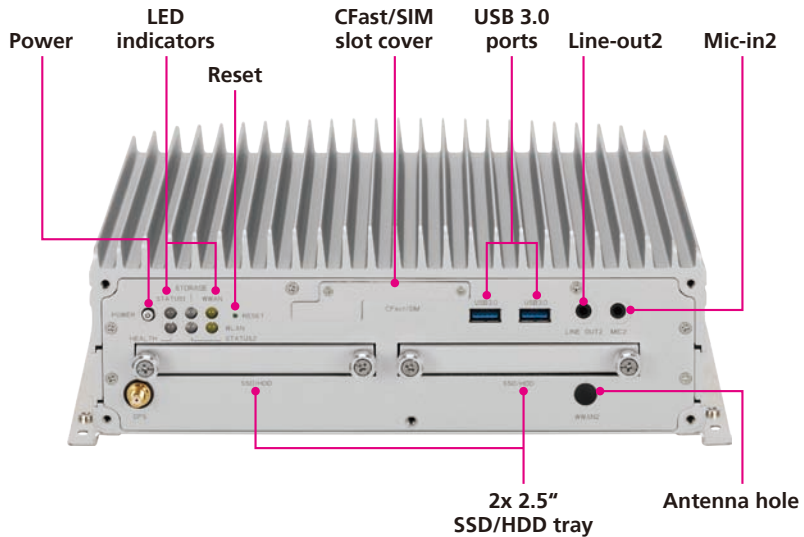
### MVS 5600 Rear View



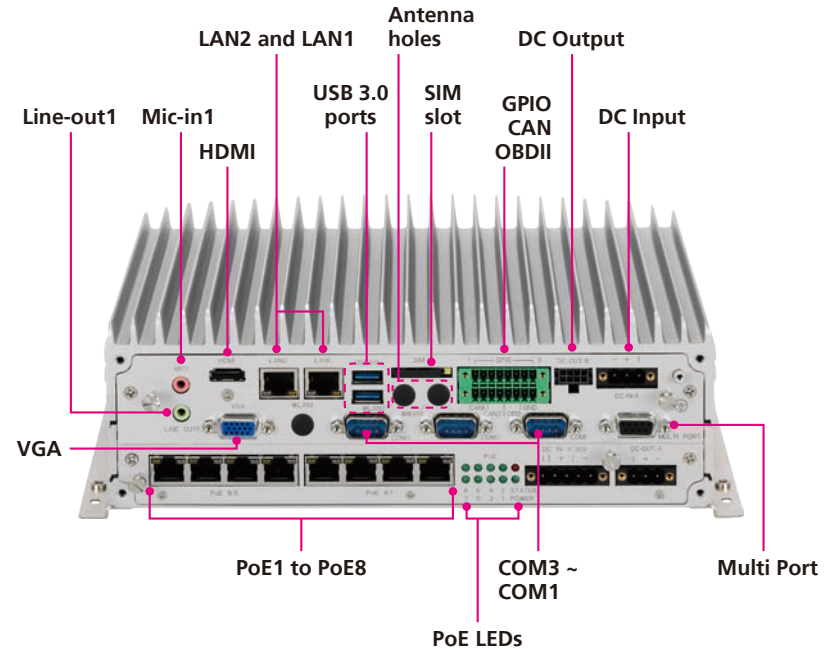


## Physical Features

### MVS 5603 Front View



### MVS 5603 Rear View



## MVS 5600 Overview

MVS 5600, based on 6th generation Intel® Core™ dual core i7-6600U 2.6GHz and i3-6100U 2.3GHz, is specifically designed for the harsh in-vehicle environment. It allows MVS 5600 to comply with stringent MIL-STD-810G military standard in rugged, fanless and compact mechanism.

MVS 5600 is a modular design, it is flexible to use other kinds of expansion boards to extend different I/O functions for different applications. MVS 5600 leverages wireless networks to simplify fleet management with capabilities such as remote, real-time video monitoring. This remote capability keeps transit fleets in service around the clock. Vehicle data integration and diagnostics are also carried out via CAN Bus and OBDII.

With iButton function, it is easy to perform driver identification management. Optional internal back-up battery guards against any unexpected vehicle power failure or unstable vehicle power.

## MVS 5600 Key Features

- Modular design for flexible I/O expansion
- Three SIM cards + dual WWAN modules support
- Wake on RTC/SMS via WWAN module
- Built-in u-blox NEO-M8N module, optional Dead Reckoning support
- Intel® Core™ dual core i7-6600U/i3-6100U
- Voice communication via WWAN module
- iButton for driver ID identification
- Built-in CAN 2.0B. OBD function (OBDII, SAE J1939, SAE J1708)

## MVS 5603 Overview

MVS 5603 8-CH PoE Mobile NVR increases safety and security for bus passenger transportation with high video resolution and 2 removable extensive storage HDD/SSD capacity. It connects up to 8 IP cameras + PoE function providing reliable and high quality video coverage around the bus.

MVS 5603 is a modular design, it is flexible to use other kinds of expansion boards to extend different I/O functions for different applications.

MVS 5603 leverages wireless networks to simplify fleet management with capabilities such as remote, real-time video monitoring. This remote capability keeps transit fleets in service around the clock.

Vehicle data integration and diagnostics are also carried out via CAN Bus and OBDII. MIL-STD-810G for shock and vibration is designed to operate in harsh environments. Optional internal back-up battery guards against any unexpected vehicle power failure or unstable vehicle power.

## MVS 5603 Key Features

- Modular design for flexible I/O expansion
- Three SIM cards + dual WWAN modules support
- 8x 10/100/1000 Mbps 802.3af PoE ports
- Built-in u-blox NEO-M8N module, optional Dead Reckoning support
- Intel® Core™ dual core i7-6600U/i3-6100U
- Dual removable SATA 3.0 SSD/HDD
- iButton for driver ID identification
- Built-in CAN 2.0B. Optional OBD function (OBDII, SAE J1939, SAE J1708)

## Hardware Specifications

### MVS 5600

#### CPU

- 6th generation Intel® Core™ dual core i7-6600U, 2.6GHz/i3-6100U, 2.3GHz

#### Memory

- 2-channel 204-pin DDR3L SO-DIMM socket support 1600MHz up to 16GB, default 2GB industrial grade memory

#### Storage

- 1x 2.5" SATA 3.0 SSD/HDD (removable & hot swappable), RAID 0, 1 supported (optional lockable storage available)
- 1x CFast (externally accessible)

#### Expansion

- 1x full size Mini-PCIe socket (USB 2.0)
- 1x full size Mini-PCIe socket (USB 2.0 + PCIe)
- 1x half size Mini-PCIe socket (USB 2.0 + PCIe)

#### GPS and Onboard Sensor

- 1x default U-blox NEO-M8N GNSS module for GPS/Gloness/QZSS/Galileo/Beidou
- Optional GPS module with Dead Reckoning function
- Built-in G-sensor
- Built-in TPM

#### I/O Interface-Front

- 6x LED indicators for power/storage/WLAN/WWAN/Programmable/Health
- 1x CFast socket with cover

- 1x Reset button
- 2x USB type A USB 3.0 port
- 2x phone jacks 3.5mm for 1x Mic-in and 1x Line-out
- 1x externally accessible SIM card socket
- 2x antenna holes for WWAN/WLAN/BT/GPS

#### I/O Interface-Rear

- 2x RJ45 10/100/1000 Intel® Fast Ethernet with LED
- 1x 9~36VDC input with ignition and 34W typical power consumption
- 2x USB type A USB 3.0 port
- 2x phone jacks 3.5mm for 1x Mic-in and 1x Line-out
- 1x DB-15 VGA, resolution up to 2560 x 1600 @60Hz
- 1x HDMI port, resolution up to 2560 x 1600 @60Hz
- 2x DB-9 RS-232
- 1x DB-9 RS-232/422/485 (R/5V/12V selectable)
- 1x 12VDC output (2A) + SM Bus + 2x MDI + power button
- 1x 16-pin terminal block connector
  - 1x CAN Bus 2.0B (onboard)
  - 1x OBDII from optional VIOB-OBD-03 module (SAE J1939)
  - 1x CAN Bus 2.0B from optional VIOB-CAN-03 module
  - 1x DB9 connector for optional DR signal input, 2x MDO and iButton
  - 8x programmable GPIO
    - (4x Digital inputs, w/ optional 3KV isolation protection)
      - Input voltage (internal type): 5VDC TTL (default)
      - Input voltage (source type): 3 ~24VDC
    - (4x Digital outputs, w/ optional 3KV isolation protection)
      - Digital output (sink type): 5VDC TTL (default), max current: 20mA
      - Digital output (source type): 3 ~ 24VDC, max current: 150mA
- 1x externally accessible SIM card socket
- 1x internal SIM card socket

## Power Management

- Selectable boot-up & shut-down voltage for low power protection by software. Setting 8-level power on/ off delay time by software. Support S3/S4 suspend mode
- Optional internal 1100mAh, Li-Polymer rechargeable battery

## Operating System

- Windows 7/WES7/Windows 8/WES8/Windows 10/Linux kernel 3.X

## Dimensions

- 260mm (W) x 196mm (D) x 66.5mm (H) (10.24" x 7.72" x 2.62")
- 2.1kg

## Environment

- Operating temperatures:
  - 30°C~60°C (w/ industrial SSD) with air flow
- Storage temperatures: -40°C~80°C
- Relative humidity: 10% to 90% (non-condensing)
- Vibration (random):
  - 1g@5~500 Hz (in operation, HDD)
- Vibration (SSD/HDD):
  - Operating: MIL-STD-810G, Method 514.6, Category 4, common carrier US highway truck vibration exposure
  - Non-operating: MIL-STD-810G, Method 514.6, Category 24, minimum integrity test
- Shock (SSD/HDD):
  - Operating: MIL-STD-810G, Method 516.6, Procedure I, functional shock=20g
  - Non-operating: MIL-STD-810G, Method 516.6, Procedure V, crash hazard shock test=75g

## Certifications

- CE approval, FCC Class A, E13 Mark

## MVS 5603

### CPU

- 6th generation Intel® Core™ dual core i7-6600U, 2.6GHz/i3-6100U, 2.3GHz

### Memory

- 2-channel 204-pin DDR3L SO-DIMM socket support 1600MHz up to 16GB, default 2GB industrial grade memory

### Storage

- 2x 2.5" SATA 3.0 SSD/HDD (removable & hot swappable), RAID 0, 1 supported (optional lockable storage available)
- 1x CFast (externally accessible)

### Expansion

- 1x full size Mini-PCIe socket (USB 2.0)
- 1x full size Mini-PCIe socket (USB 2.0 + PCIe)
- 1x half size Mini-PCIe socket (USB 2.0 + PCIe)

### GPS and Onboard Sensor

- 1x default U-blox NEO-M8N GNSS module for GPS/Gloness/QZSS/Galileo/Beidou
- Optional GPS module with Dead Reckoning function
- Built-in G-sensor
- Built-in TPM

### Power over Ethernet

- 8-port RJ45 for 10/100/1000 Mbps PoE IEEE 802.3af conformity, total 60W

### I/O Interface-Front

- 6x LED indicators for power/storage/WLAN/WWAN/Programmable/Health

- 1x CFast socket with cover
- 1x Reset button
- 2x USB type A USB 3.0 port
- 2x phone jacks 3.5mm for 1x Mic-in and 1x Line-out
- 1x externally accessible SIM card socket
- 2x antenna holes for WWAN/WLAN/BT/GPS

### I/O Interface-Rear

- 8x RJ45 10/100/1000 Mbps PoE ports with LED
- 2x RJ45 10/100/1000 Intel® Fast Ethernet with LED
- 1x 9~36VDC input with ignition and 40W typical power consumption
- 2x USB type A USB 3.0 port
- 2x phone jacks 3.5mm for 1x Mic-in and 1x Line-out
- 1x DB-15 VGA, resolution up to 2560 x 1600 @60Hz
- 1x HDMI port, resolution up to 2560 x 1600 @60Hz
- 2x DB-9 RS-232
- 1x DB-9 RS-232/422/485 (RI/5V/12V selectable)
- 1x 12VDC output (2A) + SM Bus + 2x MDI + power button
- 1x DB9 connector for optional DR signal input, 2x MDO and iButton
- 1x 16-pin terminal block connector
  - 1x CAN Bus 2.0B (onboard)
  - 1x OBDII from optional VIOB-OBD-03 module (SAE J1939)
  - 1x CAN Bus 2.0B from optional VIOB-CAN-03 module
  - 8x programmable GPIO
    - (4x Digital inputs, w/ optional 3KV isolation protection)
      - Input voltage (internal type): 5VDC TTL (default)
      - Input voltage (source type): 3 ~24VDC
    - (4x Digital outputs, w/ optional 3KV isolation protection)
      - Digital output (sink type): 5VDC TTL (default), max current: 20mA
      - Digital output (source type): 3 ~ 24VDC, max current: 150mA
- 1x externally accessible SIM card socket
- 1x internal SIM card socket

## Power Management

- Selectable boot-up & shut-down voltage for low power protection by software. Setting 8-level power on/ off delay time by software. Support S3/S4 suspend mode
- Optional internal 1100mAh, Li-Polymer rechargeable battery

## Operating System

- Windows 7/WES7/Windows 8/WES8/Windows 10/Linux kernel 3.X

## Dimensions

- 260mm (W) x 196mm (D) x 91mm (H) (10.24" x 7.72" x 3.58")
- 4kg

## Environment

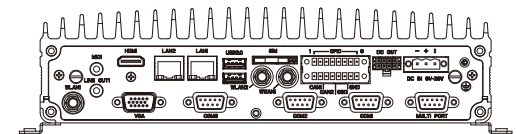
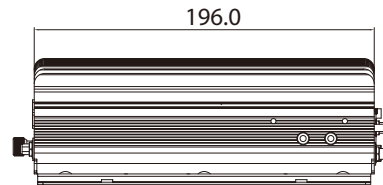
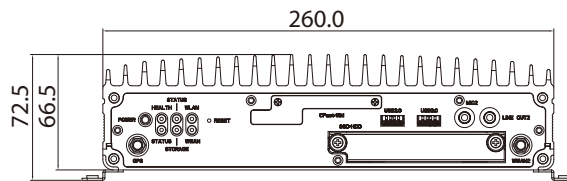
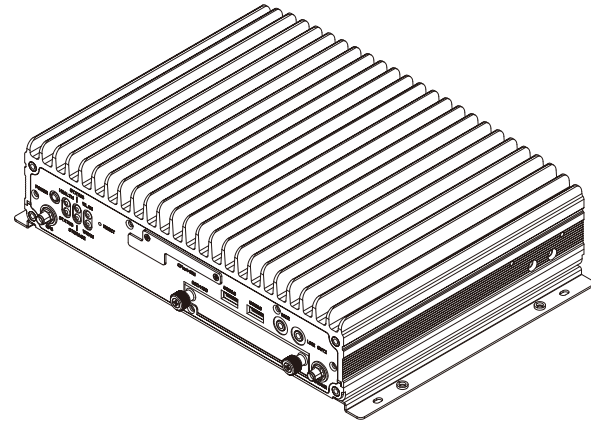
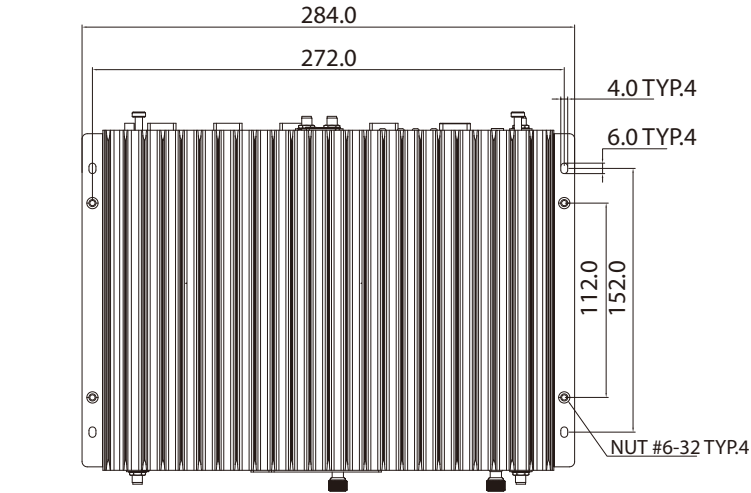
- Operating temperatures:
  - 30°C~60°C (w/ industrial SSD) with air flow
- Storage temperatures: -40°C~80°C
- Relative humidity: 10% to 90% (non-condensing)
- Vibration (random):
  - 1g@5~500 Hz (in operation, HDD)
- Vibration (SSD/HDD):
  - Operating: MIL-STD-810G, Method 514.6, Category 4, common carrier US highway truck vibration exposure
  - Non-operating: MIL-STD-810G, Method 514.6, Category 24, minimum integrity test
- Shock (SSD/HDD):
  - Operating: MIL-STD-810G, Method 516.6, Procedure I, functional shock=20g
  - Non-operating: MIL-STD-810G, Method 516.6, Procedure V, crash hazard shock test=75g

## Certifications

- CE approval, FCC Class A, E13 Mark

# Mechanical Dimensions

## MVS 5600



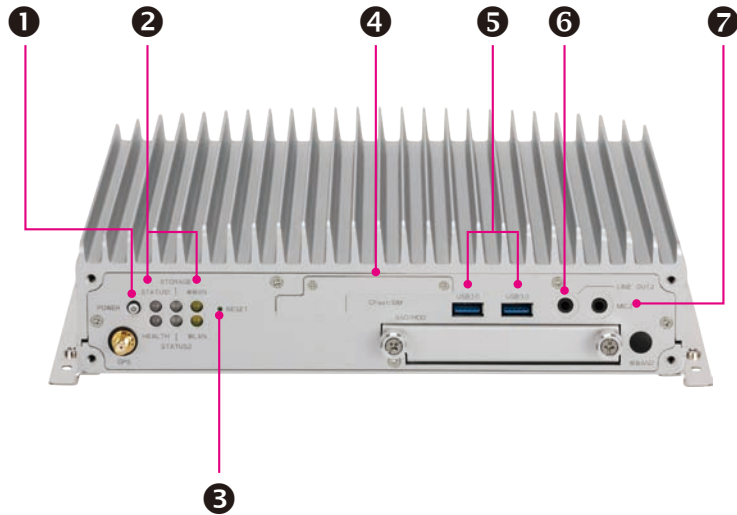




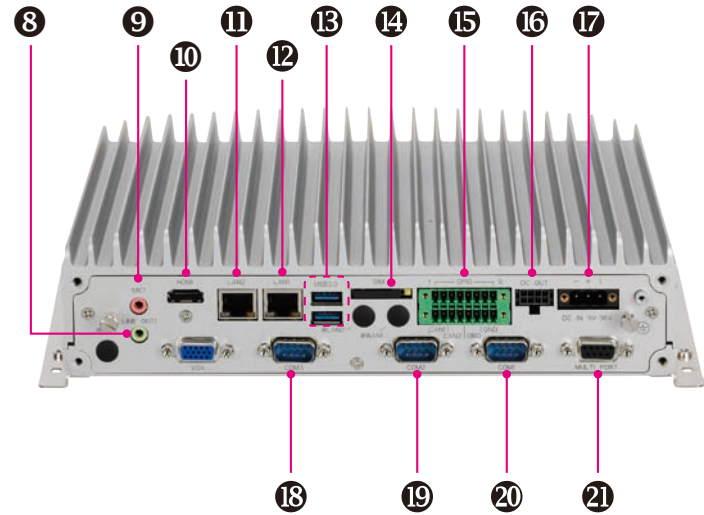
## Connector Numbering

The following diagrams indicate the numbers of the connectors. Use these numbers to locate the connectors' respective pinout assignments on chapter 2 of the manual.

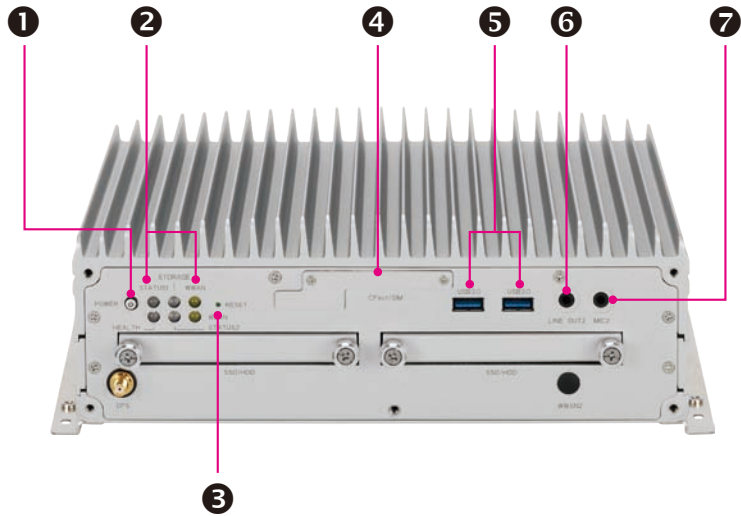
**MVS 5600 Front View**



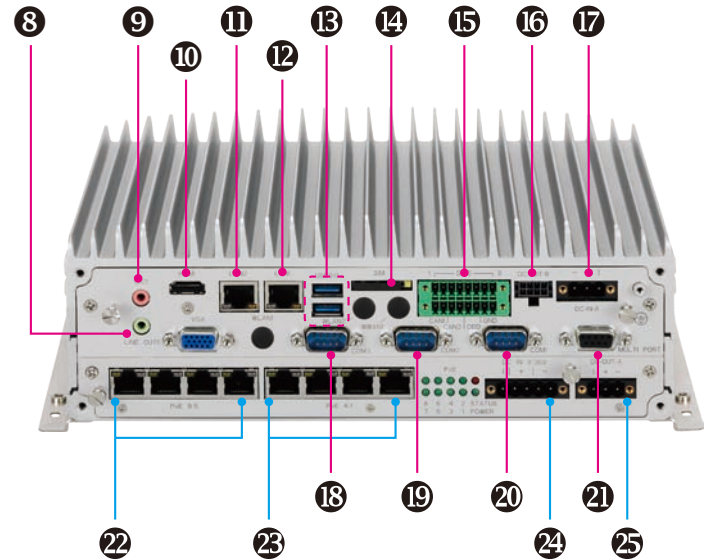
**MVS 5600 Rear View**



### MVS 5603 Front View



### MVS 5603 Rear View



# CHAPTER 2: EXTERNAL CONNECTORS PINOUT DESCRIPTION

## Power Button

Connector number: 1



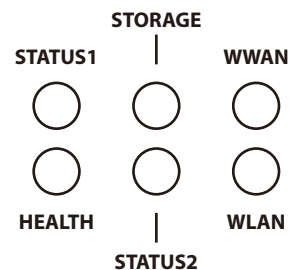
Color	LED Behavior
Blue	Power On
Red	Power Fail

When the ignition is from “low” to “high”, the system will turn on automatically. When the ignition is “high”, press the power button to turn on/off the system.

When the ignition is from “high” to “low”, the system will turn off automatically. When the ignition is “low”, pressing the power button will not turn on the system.

## LED Indicators

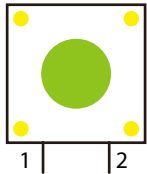
Connector number: 2



LED	LED Behavior
Storage	LED On: Active
WWAN	LED Blinking: Active
WLAN	LED Blinking: Active
Health	LED Blinking: System booting in BIOS Solid Green: System in OS
Status1	Programmable Green / Red bi-color LED
Status2	Programmable Green / Red bi-color LED

## Reset Switch

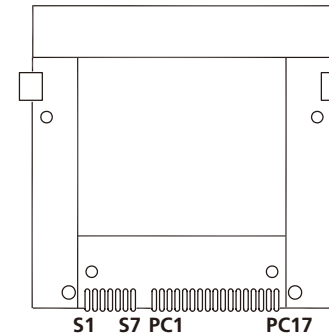
Connector number: 3



Pin	Definition
1	GND
2	RESET

## CFast Card Slot

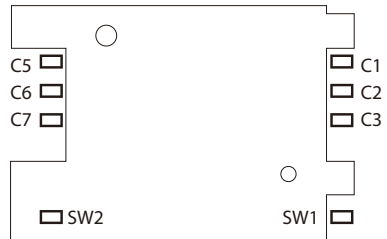
Connector number: 4



Pin	Definition	Pin	Definition
S1	GND	S2	SATA_TXP2
S3	SATA_TXN2	S4	GND
S5	SATA_RXN2	S6	SATA_RXP2
S7	GND	PC1	CFAST_CDI
PC2	GND	PC3	NC
PC4	NC	PC5	NC
PC6	NC	PC7	GND
PC8	CFAST_LED1_C	PC9	CFAST_LED2_C
PC10	NC	PC11	NC
PC12	NC	PC13	NC
PC14	NC	PC15	GND
PC16	GND	PC17	CFAST_CDO

## SIM Card Slot (SIM Card 3 for WWAN Module 2)

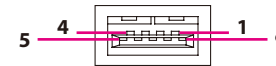
Connector number: 4



Pin	Definition	Pin	Definition
C1	UIM_PWR	C2	UIM_RST
C3	UIM_CLK	C5	GND
C6	NC	C7	UIM_DATA
SW1	SIM2_DET#	SW2	GND

## USB 3.0 Ports

Connector number: 5



Pin	Definition	Pin	Definition
1	USB3_VCC5_1/ USB3_VCC5	2	USB_2N/ USB_1N
3	USB_2P/ USB_1P	4	GND
5	USB3_RX2_N_C/ USB3_RX1_N_C	6	USB3_RX2_P_C/ USB3_RX1_P_C
7	GND	8	USB3_TX2_N_CL/ USB3_TX1_N_CL
9	USB3_TX2_P_CL/ USB3_TX1_P_CL		

## Line-out2 Connector

Connector number: 6



Pin	Definition	Pin	Definition
1	FRONT_OUT_R_CA	2	FRONT_JD
3	NC	4	FRONT_OUT_L_CA
5	GND	6	GND

## Mic-in2 Connector

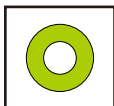
Connector number: 7



Pin	Definition	Pin	Definition
1	M-CON	2	MIC_JD
3	NC	4	MIC_R
5	GND	6	GND

## Line-out1 Connector

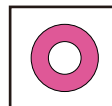
Connector number: 8



Pin	Definition	Pin	Definition
22	SURR_OUT_L	23	A_GND
24	SURR_JD	25	SURR_OUT_R
MH1	AA_GND	MH2	AA_GND
MH3	AA_GND	MH4	AA_GND

## Mic-in1 Connector

Connector number: 9

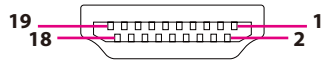


Pin	Definition	Pin	Definition
1	A_GND	2	MIC_L
3	A_GND	4	MIC_JD
5	NC		



## HDMI

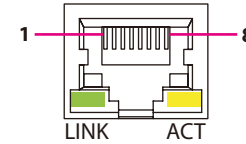
Connector number: 10



Pin	Definition	Pin	Definition
1	HDMI_TX2P_L	2	HDMI_GND
3	HDMI_TX2N_L	4	HDMI_TX1P_L
5	HDMI_GND	6	HDMI_TX1N_L
7	HDMI_TX0P_L	8	HDMI_GND
9	HDMI_TX0N_L	10	HDMI_CLK_P_L
11	HDMI_GND	12	HDMI_CLK_N_L
13	NC	14	NC
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	HDMI_P5V
19	HDMI_HPD	H1	CH_GND
H2	CH_GND	NH1	NC

## LAN2 Port

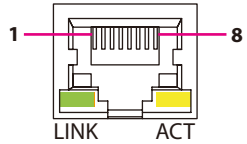
Connector number: 11



Pin	Definition	Pin	Definition
1	LAN_MDI_0P_R2	2	LAN_MDI_0N_R2
3	LAN_MDI_1P_R2	4	LAN_MDI_1N_R2
5	LAN_MDI_2P_R2	6	LAN_MDI_2N_R2
7	LAN_MDI_3P_R2	8	LAN_MDI_3N_R2
9	LAN2_LED_LINK#	10	LAN2_LED_LINK1G#
11	LAN2_LED_ACT#	12	VCC3
NH1	NC	NH2	NC
MH1	Chassis_GND	MH2	Chassis_GND

## LAN1 Port

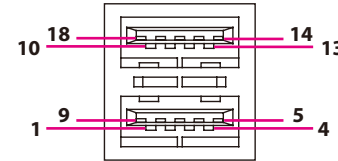
Connector number: 12



Pin	Definition	Pin	Definition
1	LAN_MDI_OP_R	2	LAN_MDI_ON_R
3	LAN_MDI_1P_R	4	LAN_MDI_1N_R
5	LAN_MDI_2P_R	6	LAN_MDI_2N_R
7	LAN_MDI_3P_R	8	LAN_MDI_3N_R
9	LAN-1_LED_LINK#	10	LAN-1_LED_LINK1G#
11	LAN-1_LED_ACT#	12	VCC3
NH1	NC	NH2	NC
MH1	Chassis_GND	MH2	Chassis_GND

## Dual USB 3.0 Ports

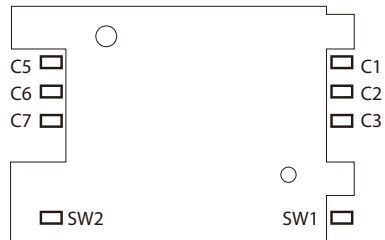
Connector number: 13



Pin	Definition	Pin	Definition
1	VCC	2	USB_ON_C
3	USB_OP_C	4	GND
5	USB3_RX0_N_C	6	USB3_RX0_P_C
7	GND	8	USB3_TX0_N_CL
9	USB3_TX0_P_CL	10	VCC
11	USB_1N_C	12	USB_1P_C
13	GND	14	USB3_RX1_N_C
15	USB3_RX1_P_C	16	GND
17	USB3_TX1_N_CL	18	USB3_TX1_P_CL

## SIM Card Slot (SIM Card 1 for WWAN Module 1)

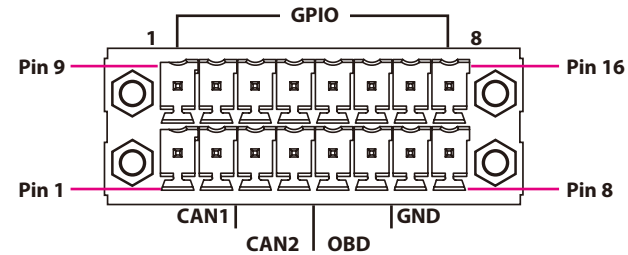
Connector number: 14



Pin	Definition	Pin	Definition
C1	UIM1_PWR	C2	UIM1_RST
C3	UIM_CLK	C5	GND
C6	NC	C7	UIM1_DAT
SW1	SIM1_DET#	SW2	GND

## GPIO Connector

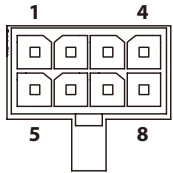
Connector number: 15



Pin	Definition	Pin	Definition
1	CAN1_H_R	9	GPIO_R_1
2	CAN1_L_R	10	GPIO_R_2
3	CAN_M_L_R	11	GPIO_R_3
4	CAN_M_H_R	12	GPIO_R_4
5	SAE J1939-L	13	GPIO_R_5
6	SAE J1939-H	14	GPIO_R_6
7	CAN_GND	15	GPIO_R_7
8	ISO_GND	16	GPIO_R_8

## DC-Out-B

Connector number: 16



Pin	Definition	Pin	Definition
1	MDI1	2	MDI2
3	GND	4	GND
5	SML0_DATA_M	6	SML0_CLK_M
7	PUSH_BTN_IN#	8	OUT_12V

## DC Power Input

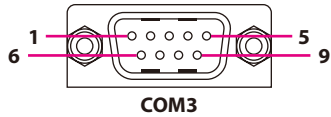
Connector number: 17



Pin	Definition
1	GND_IN
2	V_IN
3	IGNITION

## COM3 RS232/422/485 Connector

Connector number: 18



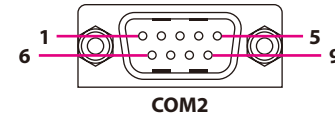
Pin	Definition	Pin	Definition
1	SP_DCD_3	2	SP_RXD_3
3	SP_TXD_3	4	SP_DTR_3
5	COM3_GND	6	SP_DSR_3
7	SP_RTS_3	8	SP_CTS_3
9	SP_RI_3		

RS485: Pin 1 → DATA-; Pin 2 → DATA+

RS422: Pin 1 → TX-; Pin 2 → TX+; Pin 4 → RX-; Pin 3 → RX+

## COM2 RS232 Connector

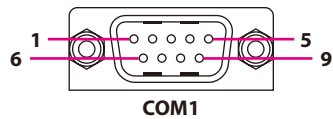
Connector number: 19



Pin	Definition	Pin	Definition
1	SP_DCD_2	2	SP_RXD_2
3	SP_TXD_2	4	SP_DTR_2
5	COM2_GND	6	SP_DSR_2
7	SP_RTS_2	8	SP_CTS_2
9	SP_RI_2		

## COM1 RS232 Connector

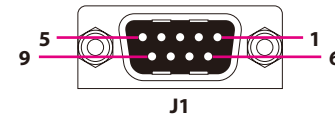
Connector number: 20



Pin	Definition	Pin	Definition
1	SP_DCD_1	2	SP_RXD_1
3	SP_TXD_1	4	SP_DTR_1
5	COM1_GND	6	SP_DSR_1
7	SP_RTS_1	8	SP_CTS_1
9	SP_RI_1		

## Multi-Port

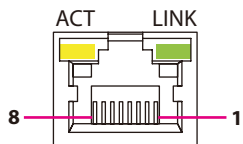
Connector number: 21



Pin	Definition	Pin	Definition
1	MULTI_GND	2	iButton
3	DR_DIRECTIO_M	4	SPEED
5	GND	6	NC
7	NC	8	MCU-DO2
9	MCU-DO1		

## PoE5 to PoE8 Ports

Connector number: 22

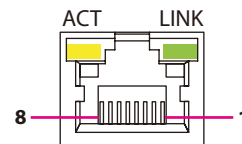


Pin	Definition	Pin	Definition
1	LAN <sub>X</sub> _MDI_0P	2	LAN <sub>X</sub> _MDI_0N
3	LAN <sub>X</sub> _MDI_1P	4	LAN <sub>X</sub> _MDI_2P
5	LAN <sub>X</sub> _MDI_2N	6	LAN <sub>X</sub> _MDI_1N
7	LAN <sub>X</sub> _MDI_3P	8	LAN <sub>X</sub> _MDI_3N
9	SPD100M <sub>X</sub>	10	SPD1G <sub>X</sub>
11	GND / P2 <sub>ACT</sub> / P5 <sub>ACT</sub> / P7 <sub>ACT</sub>	12	GND / P1 <sub>ACT</sub> / P3 <sub>ACT</sub> / P4 <sub>ACT</sub> / P6 <sub>ACT</sub> / P8 <sub>ACT</sub>

Red 'X' denotes the port number.

## PoE1 to PoE4 Ports

Connector number: 23

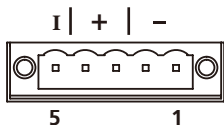


Pin	Definition	Pin	Definition
1	LAN <sub>X</sub> _MDI_0P	2	LAN <sub>X</sub> _MDI_0N
3	LAN <sub>X</sub> _MDI_1P	4	LAN <sub>X</sub> _MDI_2P
5	LAN <sub>X</sub> _MDI_2N	6	LAN <sub>X</sub> _MDI_1N
7	LAN <sub>X</sub> _MDI_3P	8	LAN <sub>X</sub> _MDI_3N
9	SPD100M <sub>X</sub>	10	SPD1G <sub>X</sub>
11	GND / P2 <sub>ACT</sub> / P5 <sub>ACT</sub> / P7 <sub>ACT</sub>	12	GND / P1 <sub>ACT</sub> / P3 <sub>ACT</sub> / P4 <sub>ACT</sub> / P6 <sub>ACT</sub> / P8 <sub>ACT</sub>

Red 'X' denotes the port number.

### 9V-36V DC Power Input

Connector number: 24



Pin	Definition	Pin	Definition
1	GND_IN	2	GND_IN
3	V_IN	4	V_IN
5	IGNITION		

### DC-Out-A

Connector number: 25



Pin	Definition
1	GND_IN
2	V_IN
3	IGNITION_X



# CHAPTER 3: JUMPERS AND CONNECTORS

This chapter describes how to set the jumpers and connectors on the MVS 5600 and MVS 5603 motherboard.

## Before You Begin

- Ensure you have a stable, clean working environment. Dust and dirt can get into components and cause a malfunction. Use containers to keep small components separated.
- Adequate lighting and proper tools can prevent you from accidentally damaging the internal components. Most of the procedures that follow require only a few simple tools, including the following:
  - A Philips screwdriver
  - A flat-tipped screwdriver
  - A set of jewelers screwdrivers
  - A grounding strap
  - An anti-static pad
- Using your fingers can disconnect most of the connections. It is recommended that you do not use needle-nosed pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.
- Before working on internal components, make sure that the power is off. Ground yourself before touching any internal components, by touching a metal object. Static electricity can damage many of the electronic components. Humid environments tend to have less static electricity than

dry environments. A grounding strap is warranted whenever danger of static electricity exists.

## Precautions

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

Follow the guidelines below to avoid damage to your computer or yourself:

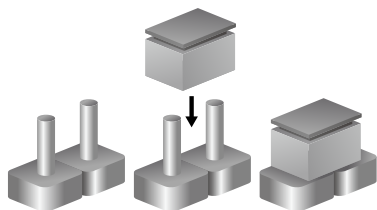
- Always disconnect the unit from the power outlet whenever you are working inside the case.
- If possible, wear a grounded wrist strap when you are working inside the computer case. Alternatively, discharge any static electricity by touching the bare metal chassis of the unit case, or the bare metal body of any other grounded appliance.
- Hold electronic circuit boards by the edges only. Do not touch the components on the board unless it is necessary to do so. Don't flex or stress the circuit board.
- Leave all components inside the static-proof packaging that they shipped with until they are ready for installation.
- Use correct screws and do not over tighten screws.

## Jumper Settings

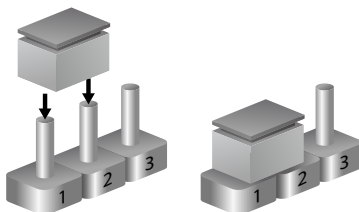
A jumper is the simplest kind of electric switch. It consists of two metal pins and a cap. When setting the jumpers, ensure that the jumper caps are placed on the correct pins. When the jumper cap is placed on both pins, the jumper is short. If you remove the jumper cap, or place the jumper cap on just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

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

Two-Pin Jumpers: Open (Left) and Short (Right)



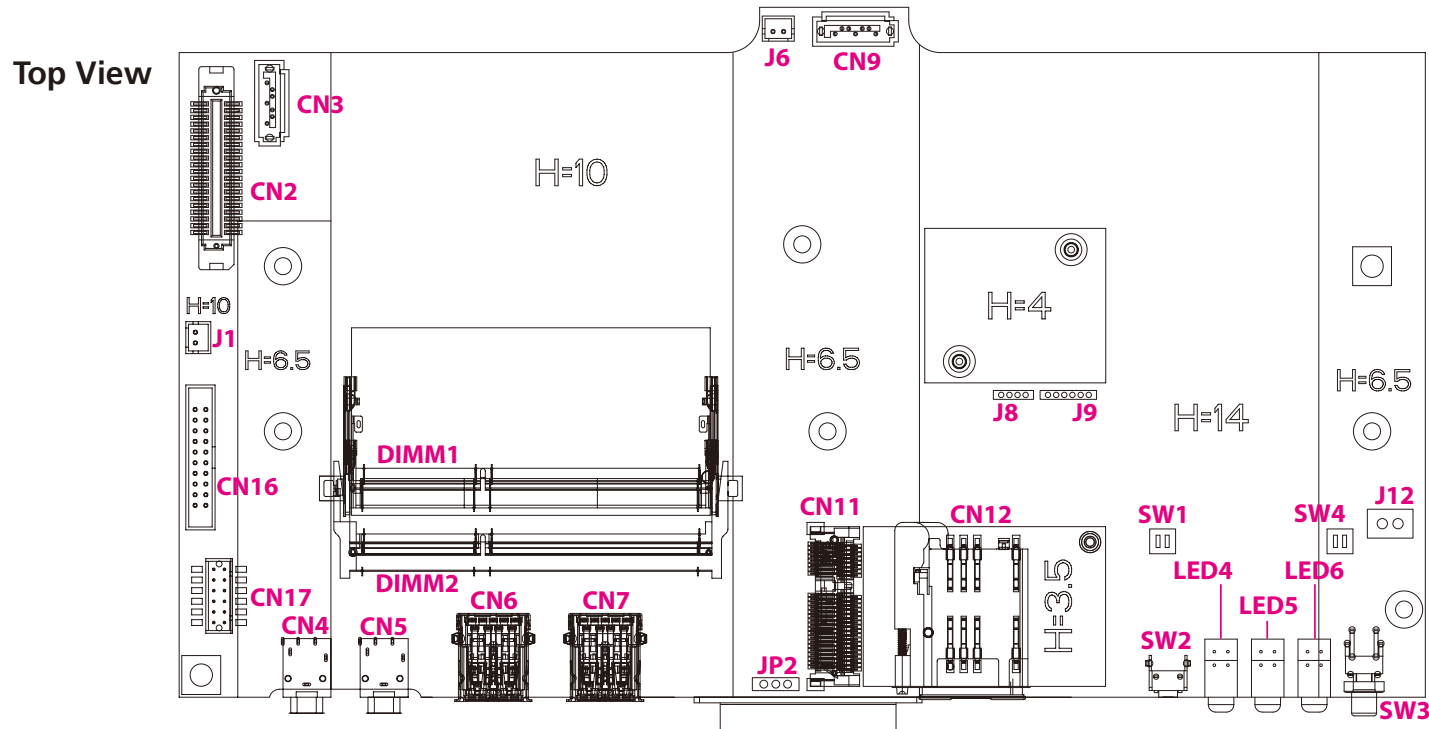
Three-Pin Jumpers: Pins 1 and 2 are Short



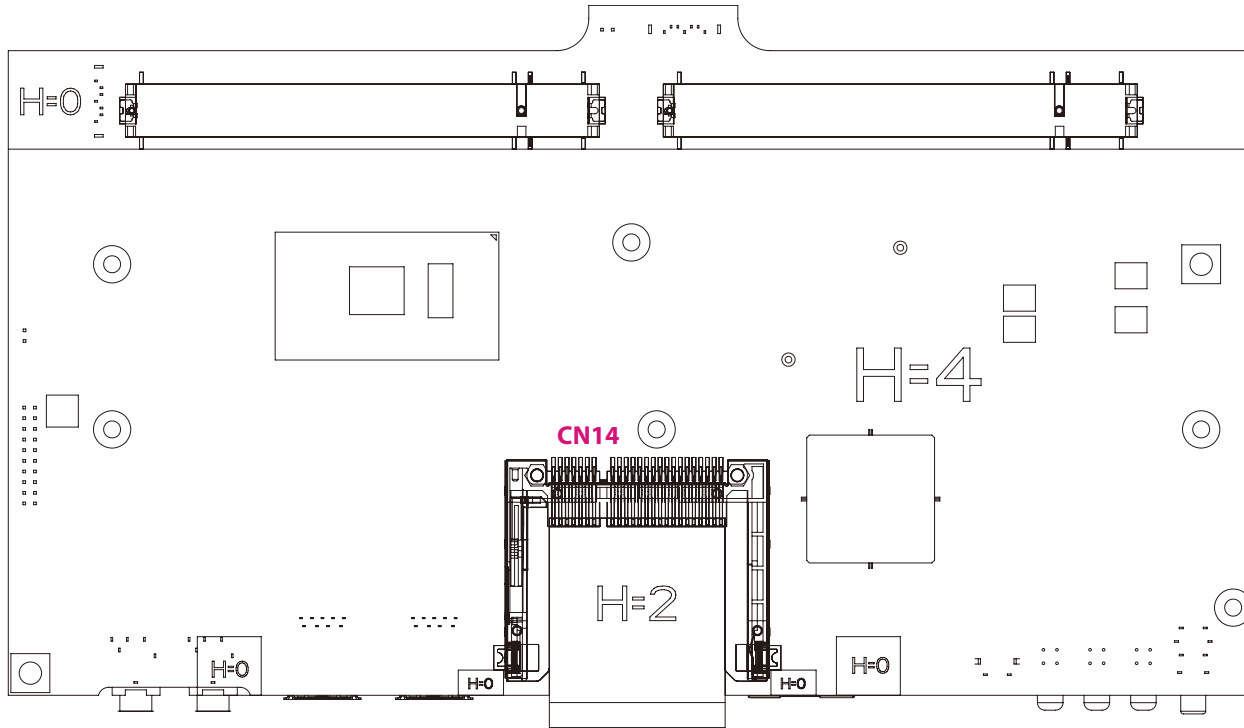
# MVS 5600 and MVS 5603 System Components

The MVS 5600 and MVS 5603 consist of a motherboard and I/O board, with the MVS 5603 featuring a PoE board. This chapter lists the location and pinout assignment of the jumpers and connectors on each component.

## Locations of the Jumpers and Connectors for the Motherboard



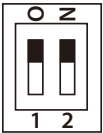
Bottom View



## DIP Switch Settings

### ME/RTC Clear Switch

Connector location: SW4

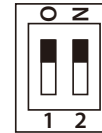


Function	Definition
Clear CMOS/ME	1-2 ON
Normal	*1-2 OFF

(\*) Default

### Input Voltage Control

Connector location: SW1



Function	Definition			
	12V	24V	9~36V	RFID/Disable I Button
	H (SW OFF)	H (SW OFF)	L (SW ON)	L (SW ON)
	H (SW OFF)	L (SW ON)	L (SW ON)	H (SW OFF)

## Internal Connectors

### Debug 80 Port Connector

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

Connector location: J7



Pin	Definition	Pin	Definition
1	GND	2	PCIRST#
3	33M_CLK	4	LPC_FRAME#
5	LPC_AD3	6	LPC_AD2
7	LPC_AD1	8	LPC_ADO
9	VCC3	10	VCC3

### CPU UART Connector

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

Connector location: CN10

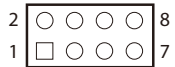


Pin	Definition	Pin	Definition
1	GND	2	PCH_UART0_TXD
3	PCH_UART0_RXD	4	GND
5	PCH_UART1_TXD	6	PCH_UART1_RXD
7	NC	8	NC
9	NC	10	NC

## MCU FW Update Connector

Connector type: 2x4 8-pin header, 1.27mm pitch

Connector location: JP3



Pin	Definition	Pin	Definition
1	V3P3	2	STM_NJTRST
3	STM_JTDI	4	STM_JTMS
5	STM_JTCK	6	STM_JTDO
7	STM_RST	8	GND

## MCU Reset Connector

Connector type: 1x2 2-pin header, 2.54mm pitch

Connector location: JP4



Pin	Definition
1	STM_RESET
2	GND

## MCU (UART6) to Debug Connector

Connector type: 1x3 3-pin header, 2.54mm pitch

Connector location: JP2



Pin	Definition
1	USART6_TXD
2	USART6_RXD
3	GND

## GPS Connector

Connector type: 1x6 6-pin header, 1.0mm pitch

Connector location: J9



Pin	Definition	Pin	Definition
1	GPS_BAT	2	GPS_LED#
3	GPS_TX	4	GPS_RX
5	GND	6	VCC3_GPS



## GPS DR Connector

Connector type: 1x4 4-pin header, 1.0mm pitch

Connector location: J8



Pin	Definition	Pin	Definition
1	GND	2	1PPS
3	DR_ODOMETER_M	4	DR_DIRECTIO_M

## SATA Power Connectors

Connector type: 1x2 2-pin header, 2.54mm pitch

Connector location: J1 and J6

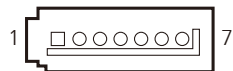


Pin	Definition
1	5V_SATA1/5V_SATA2
2	GND

## SATA Connectors

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

Connector location: CN3 and CN9



Pin	Definition	Pin	Definition
1	GND	2	SATA1/0_TXP
3	SATA1/0_TXN	4	5V_SATA1_EN/ 5V_SATA2_EN
5	SATA1/0_RXN	6	SATA1/0_RXP
7	GND		

## USB 2.0 Connector

Connector type: 1x4 4-pin header, 1.0mm pitch

Connector location: J5



Pin	Definition	Pin	Definition
1	GND	2	USB_10P
3	USB_10N	4	USB3_VCC5

## Reset Connector

Connector type: 1x2 2-pin header, 1.25mm pitch

Connector location: J10



Pin	Definition
1	GND
2	Reset

## RTC Battery Connector

Connector type: 1x2 2-pin header, 1.25mm pitch

Connector location: J23

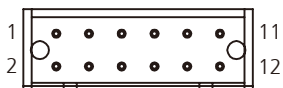


Pin	Definition
1	GND
2	RTC_BAT

## Wire to BD Connector

Connector type: 2x6 12-pin header, 2.0mm pitch

Connector location: CN17

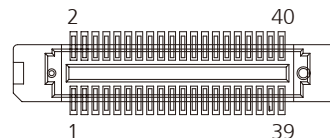


Pin	Definition	Pin	Definition
1	UART5_TX_S2	2	PM_SLP_S3#
3	UART5_RX_S2	4	PCIE_CLK_REQ5#
5	SMB_DATA	6	PCIE_CLK_REQ4#
7	SMB_CLK	8	VCC3
9	GND	10	GND
11	VIN_M	12	VIN_M

## WTB Connector

Connector type: 2x20 40-pin header, 1.27mm pitch

Connector location: CN2

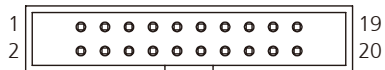


Pin	Definition	Pin	Definition
1	GND	2	CLK_PCIE_N5
3	CLK_PCIE_P5	4	GND
5	PCIE_RXP6	6	PCIE_RXN6
7	GND	8	PCIE_RXN9
9	PCIE_RXP9	10	GND
11	PCIE_TXP6	12	PCIE_TXN6
13	GND	14	CLK_PCIE_N4
15	CLK_PCIE_P4	16	GND
17	PCIE_TXP9	18	PCIE_TXN9
19	GND	20	USB3_RXN5
21	USB3_RXP5	22	GND
23	USB3_TXP5	24	USB3_TXN5
25	GND	26	USB_5N
27	USB_5P	28	GND
29	USB_9P	30	USB_9N
31	GND	32	EXP_POE_POK
33	EXP_ID_1	34	EXP_IGN_EN
35	EXP_ID_2	36	MCU_I2C3_SCL_M
37	EXP_ID_3	38	MCU_I2C3_SDA_M
39	EXP_ID_4	40	CB_RESET#_B

## Expansion Connector

Connector type: 2x10 20-pin header, 2.0mm pitch

Connector location: CN16



Pin	Definition	Pin	Definition
1	VIN_M	2	VIN_M
3	VIN_M	4	VIN_M
5	3V3ALW	6	12VSB
7	GND	8	GND
9	GND	10	GND
11	MCU_I2C2_SCL	12	MCU_I2C2_SDA
13	CHG_IOUT	14	CHG_EN#
15	BAT_ID	16	MCU_VIN_EN
17	CHG_POK	18	BAT_INSERT#
19	BACKUP_BAT	20	BACKUP_DISCHG

## RTC Battery Connector

Connector type: 1x2 2-pin header, 1.25mm pitch

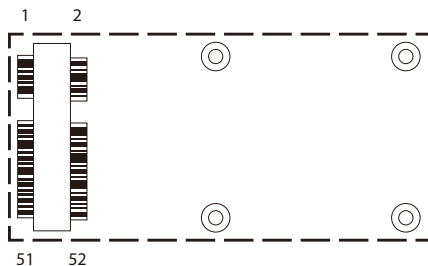
Connector location: J12



Pin	Definition
1	GND
2	RTC_3V

## Mini-PCle Connector for WWAN Module 2

Connector location: CN11

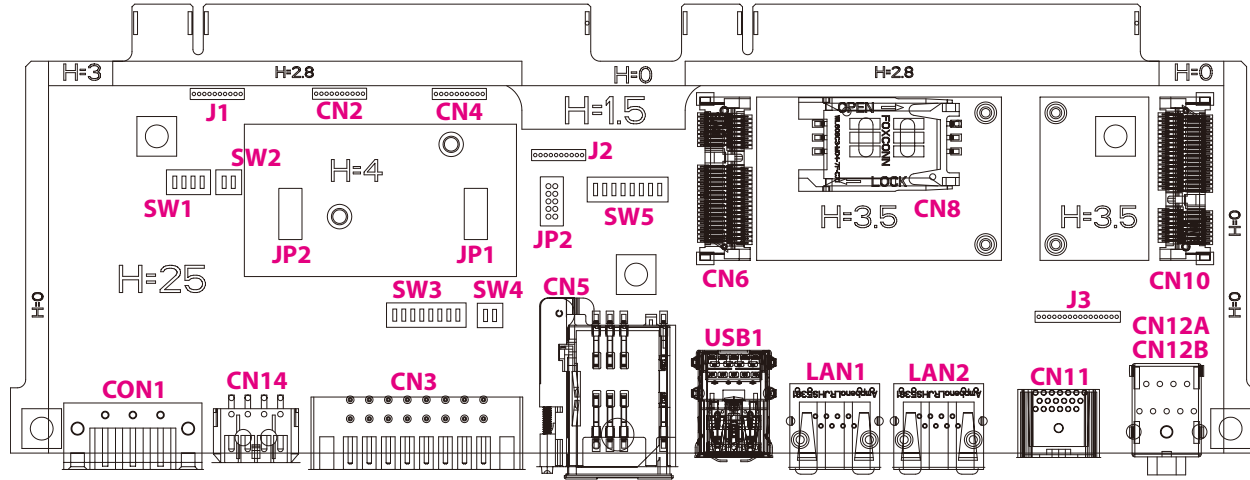


Pin	Definition	Pin	Definition
1	NC	2	+V3.3_MINI1
3	NC	4	GND
5	NC	6	+V1.5S_MINI1
7	PCIE_CLK_REQ0#	8	UIMB_PWR
9	GND	10	UIMB_DAT
11	CLK_PCIE_N0	12	UIMB_CLK
13	CLK_PCIE_P0	14	UIMB_RST
15	GND	16	NC
17	NC	18	GND
19	NC	20	MINICARD1_DIS#
21	GND	22	CB_RESET#_B
23	PCIE_RXN2	24	+V3.3_MINI1
25	PCIE_RXP2	26	GND

Pin	Definition	Pin	Definition
27	GND	28	+V1.5S_MINI1
29	GND	30	SMB_CLK
31	PCIE_TXN2	32	SMB_DAT
33	PCIE_TXP2	34	GND
35	GND	36	USB6N
37	GND	38	USB6P
39	+V3.3_MINI1	40	GND
41	+V3.3_MINI1	42	NC
43	GND	44	PCIE1_LED_R
45	NC	46	PCIE1_LED_R
47	NC	48	+V1.5S_MINI1
49	NC	50	GND
51	MINI1_BT_DIS#	52	+V3.3_MINI1

## Locations of the Jumpers and Connectors for the I/O Module (VIOA-IO01 Module)

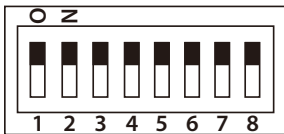
Top View



## DIP Switch Settings

### WWAN Module Selection (For Wake-Up & Voice Functions on Mini-PCle CN6)

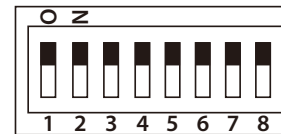
Connector location: SW5



SW	WWAN HE910 Wake-Up & Voice (Default)	SIM5360E	WWAN MC7304/MC7354 Wake-Up & Voice
SW5.1	OFF	OFF	OFF
SW5.2	OFF	ON	OFF
SW5.3	ON	OFF	ON
SW5.4	NA	NA	NA
SW5.5	ON	OFF	OFF
SW5.6	OFF	ON	ON
SW5.7	OFF	ON	ON
SW5.8	ON	OFF	OFF

### GPIO Switch

Connector location: SW3

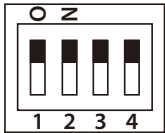


SW	On (Default)	Off
SW3.1	Pull up VCC5	Don't Care
SW3.2	Pull up VCC5	Don't Care
SW3.3	Pull up VCC5	Don't Care
SW3.4	Pull up VCC5	Don't Care
SW3.5	Pull up VCC5	Don't Care
SW3.6	Pull up VCC5	Don't Care
SW3.7	Pull up VCC5	Don't Care
SW3.8	Pull up VCC5	Don't Care



## MDIO Setting

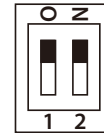
Connector location: SW1



SW	On (Default)	Off
SW1.1 (MDI 1)	Pull up 3.3V	Don't Care
SW1.2 (MDI 2)	Pull up 3.3V	Don't Care
SW1.3 (MDO 1)	Pull up 3.3V	Don't Care
SW1.4 (MDO 2)	Pull up 3.3V	Don't Care

## CAN Bus Terminating Resistor Setting

Connector location: SW4



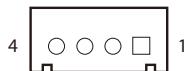
SW	On (Default)	Off
SW4.1	Terminating Resistor	Don't Care
SW4.2	Terminating Resistor	Don't Care

## Internal Connectors

### USB 2.0 Connector

Connector type: 1x4 4-pin header, 2.5mm pitch

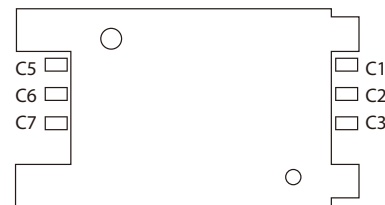
Connector location: J5/J6



Pin	Definition	Pin	Definition
1	GND	2	USB0/1_N_C
3	USB0/1_P_C	4	P5V_OCO_C

### SIM Card Slot (SIM Card 2 for WWAN Module 1)

Connector location: CN8

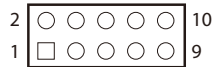


Pin	Definition	Pin	Definition
C1	UIM2_PWR	C2	UIM2_RST
C3	UIM_CLK	C5	GND
C6	NC	C7	UIM2_DAT

## COM\_PWR Select Switch

Connector type: 2x5 10-pin header, 2.0mm pitch

Connector location: JP3



Pin	Definition	Pin	Definition
1	12V	2	12V
3	COM3_RI#_PW_R	4	COM3_RI#_PW_R
5	COM3_RI#	6	NC
7	COM3_RI#_PW_R	8	COM3_RI#_PW_R
9	VCC5	10	VCC5

## VGA Connector

Connector type: 1x16 16-pin header, 1.0mm pitch

Connector location: J3



Pin	Definition	Pin	Definition
1	GND	2	VGA_+5V
3	VGA_CLK	4	VGA_DATA
5	VGA_VS	6	VGA_HS
7	GND	8	GND
9	GND	10	VGA_GND
11	BLUE	12	VGA_GND
13	GREEN	14	VGA_GND
15	RED	16	VGA_GND

## COM1 RS232 Connector

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

Connector location: CN2



Pin	Definition	Pin	Definition
1	COM1_GND	2	COM1_GND
3	SP_CTS_1	4	SP_DSR_1
5	SP_DTR_1	6	SP_RXD_1
7	SP_RI_1	8	SP_RTS_1
9	SP_TXD_1	10	SP_DCD_1

## COM2 RS232 Connector

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

Connector location: CN4



Pin	Definition	Pin	Definition
1	COM2_GND	2	COM2_GND
3	SP_CTS_2	4	SP_DSR_2
5	SP_DTR_2	6	SP_RXD_2
7	SP_RI_2	8	SP_RTS_2
9	SP_TXD_2	10	SP_DCD_2

## COM3 RS232/422/485

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

Connector location: J2

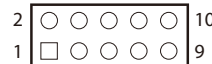


Pin	Definition	Pin	Definition
1	COM3_GND	2	COM3_GND
3	SP_CTS_3	4	SP_DSR_3
5	SP_DTR_3	6	SP_RXD_3
7	SP_RI_3	8	SP_RTS_3
9	SP_TXD_3	10	SP_DCD_3

## CAN Module Connector

Connector type: 2x5 10-pin header, 2.0mm pitch

Connector location: JP1 and JP2



### JP1 Input

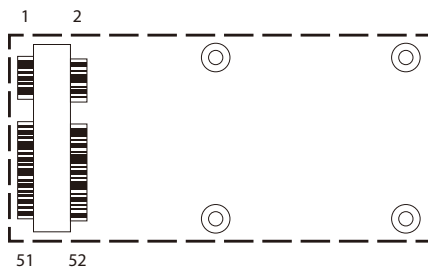
Pin	Definition	Pin	Definition
1	USB_C_TXD5	2	USB_C_RXD5
3	CAN_DI1	4	CAN_DO1
5	GND	6	GND
7	NC	8	NC
9	CAN_M_VCC5	10	NC

### JP2 Output

Pin	Definition	Pin	Definition
1	CAN_M_H	2	SAE J1939-H
3	CAN_M_L	4	SAE J1939-L
5	CAN_ISO	6	GND
7	NC	8	NC
9	NC	10	NC

## Mini-PCIe Connector for WWAN Module 1

Connector location: CN6

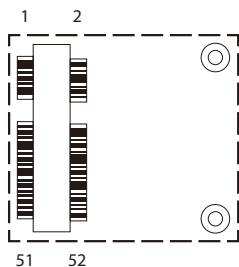


Pin	Definition	Pin	Definition
1	MIC_P/WAKE_N	2	+V3.3A_MINI4
3	NC	4	GND
5	NC	6	NC
7	NC	8	UIMA_PWR
9	GND	10	UIMA_DAT
11	VCC_MSM26_DIG	12	UIMA_CLK
13	SPI_MRDY_3G	14	UIMA_RST
15	GND	16	NC
17	USART2_TXD_3.5G	18	GND
19	USART2_RXD_3.5G	20	3.5G_DIS#
21	GND	22	3.5G_RST#
23	NC	24	+V3.3A_MINI2
25	NC	26	GND

Pin	Definition	Pin	Definition
27	GND	28	MC8090_WAKE
29	GND	30	NC
31	NC	32	CM8K_WAKE
33	UMTS_RESET#	34	GND
35	GND	36	USB-
37	GND	38	USB+
39	+V3.3A_MINI4	40	GND
41	+V3.3A_MINI4	42	3.5G_LED#
43	GND	44	NC
45	PCM_CLK	46	NC
47	PCM_RX	48	NC
49	PCM_TX	50	GND
51	PCM_SYNC	52	+V3.3A_MINI2

## Mini-PCIe Connector for WLAN/Bluetooth

Connector location: CN10

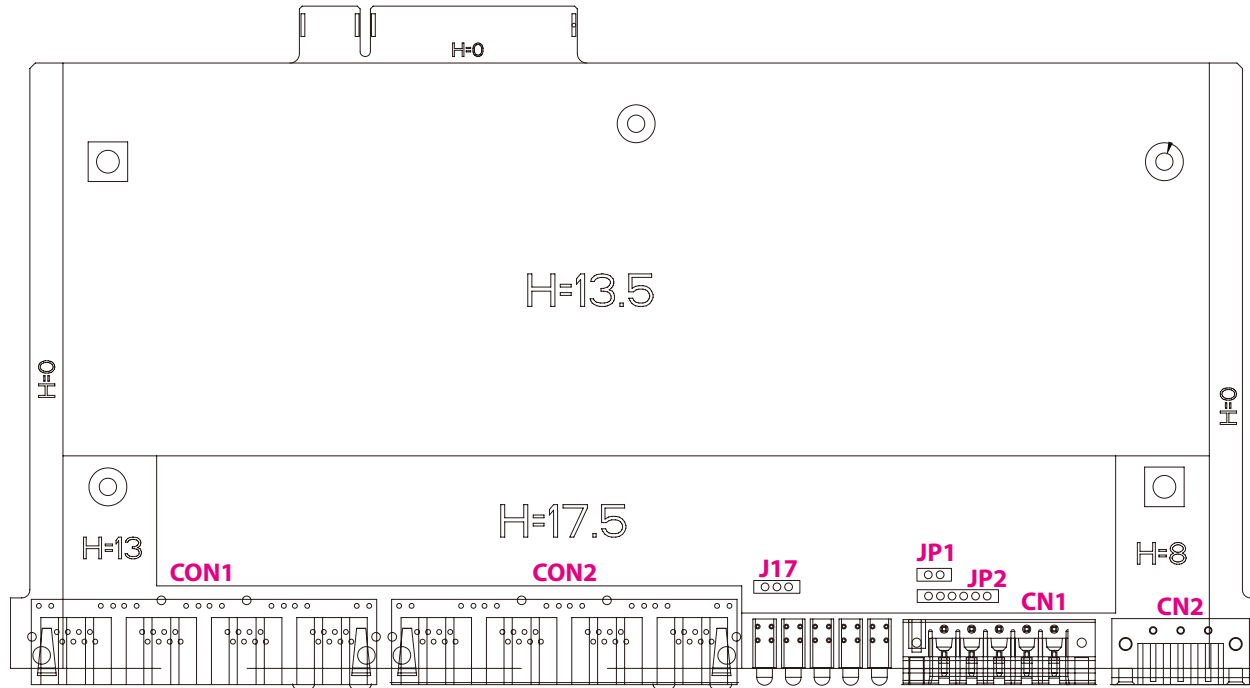


Pin	Definition	Pin	Definition
1	NC	2	+V3.3_MINI1
3	NC	4	GND
5	NC	6	+V1.5S_MINI1
7	NC	8	NC
9	GND	10	NC
11	CLK_PCIE_N3	12	NC
13	CLK_PCIE_P3	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	MINICARD2_DIS#
21	GND	22	CB_RESET#_B
23	PCIE_RXN5	24	+V3.3_MINI1
25	PCIE_RXP5	26	GND

Pin	Definition	Pin	Definition
27	GND	28	+V1.5S_MINI1
29	GND	30	SMBCLK
31	PCIE_TXN5	32	SMBDAT
33	PCIE_TXP5	34	GND
35	GND	36	USB-
37	GND	38	USB+
39	+V3.3_MINI1	40	GND
41	+V3.3_MINI1	42	NC
43	GND	44	MINI2_LED_R
45	NC	46	MINI2_LED_R
47	NC	48	+V1.5S_MINI1
49	NC	50	GND
51	MINI_BT_DIS#	52	+V3.3_MINI1

## Locations of the Jumpers and Connectors for the PoE Expansion Module (VIOC-POE01 Module)

Top View





## Internal Connectors

### MCU Update Connector

Connector type: 1x2 2-pin header, 2.0mm pitch

Connector location: JP1

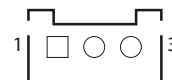


Pin	Definition
1	MCU_BOOT
2	GND

### MCU Debug Connector

Connector type: 1x3 3-pin header, 1.0mm pitch

Connector location: J17



Pin	Definition
1	MCU_RX
2	GND
3	MCU_TX

## MCU Update Firmware Connector

Connector type: 1x6 6-pin header, 2.54mm pitch

Connector location: JP2

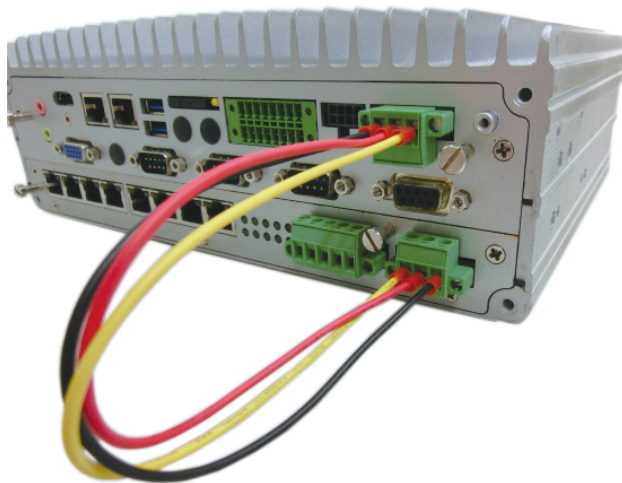


Pin	Definition	Pin	Definition
1	VCC3	2	SWDIO
3	SWDCLK	4	SWO
5	nRESET	6	GND

# CHAPTER 4: SYSTEM SETUP

## Power Connection

For the power connection of MVS 5603, please connect a power cable between DC-In-A connector and DC-Out-A connector. Connect DC In 9~36V connector with vehicle battery.



## Removing the Chassis Bottom Cover



Prior to removing the chassis cover, make sure the unit's power is off and disconnected from the power sources to prevent electric shock or system damage.

1. Remove the screws on the bottom of the enclosure.



MVS 5600



MVS 5603

2. Remove the screw on the front panel.



MVS 5600



MVS 5603

3. Remove the screw on the rear panel. (For MVS 5603)



MVS 5603

## Removing the I/O Module

1. Release the screws on the left and right sides of the I/O panel cover.



MVS 5600



MVS 5603

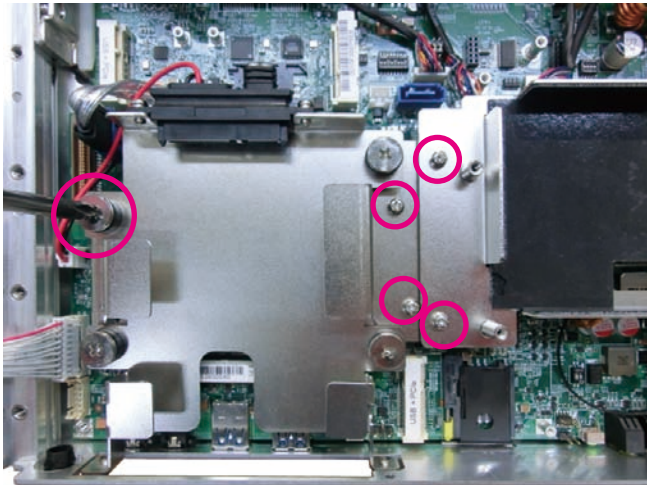
## Removing the PoE Module (MVS 5603)

1. Release the screws on the left and right sides of the PoE panel cover.

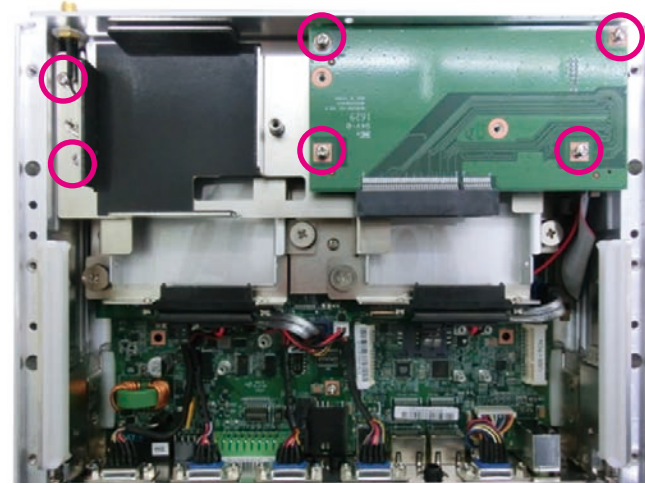


## Installing a SO-DIMM

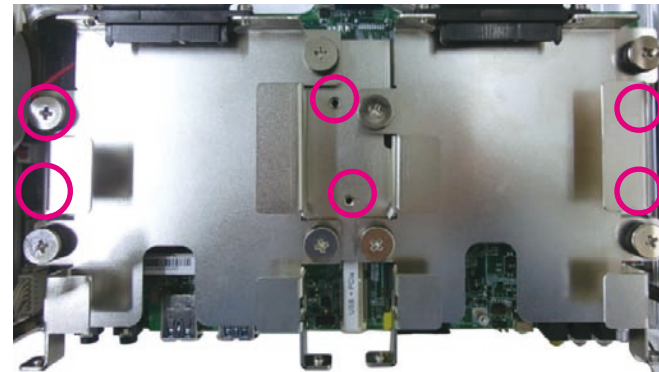
1. To access the SO-DIMM slot, release the screws on the storage bracket (MVS 5600/5603) and battery bracket (MVS 5603).



MVS 5600 Storage Bracket



MVS 5603 Battery Bracket



MVS 5603 Storage Bracket

2. Push the ejector tabs which are at the ends of the socket outward. Then insert the module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely disappear inside the socket.





## Installing WWAN Module 1

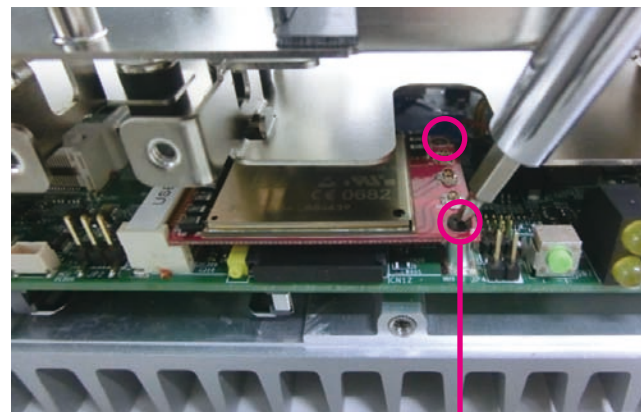
1. Locate the WWAN Mini PCI Express slot (CN8). Insert the module into the Mini PCI Express slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten screws into the mounting holes to secure the module.



**Mounting  
screws**

## Installing WWAN Module 2

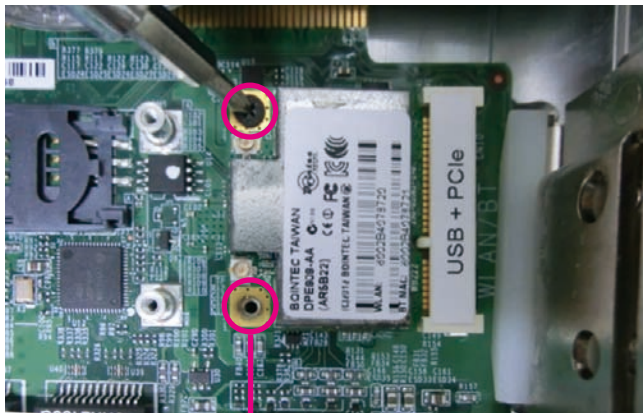
1. Locate the WWAN Mini PCI Express slot (CN12). Insert the module into the Mini PCI Express slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten screws into the mounting holes to secure the module.



**Mounting  
screws**

## Installing a WLAN Module (Half Mini-PCle)

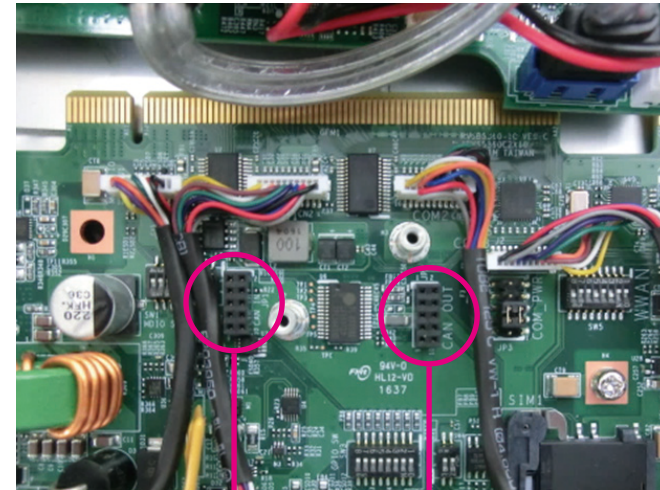
1. Locate the WLAN Mini PCI Express slot (CN10). Insert the module into the Mini PCI Express slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten screws into the mounting holes to secure the module.



**Mounting  
screws**

## Installing an OBDII Module

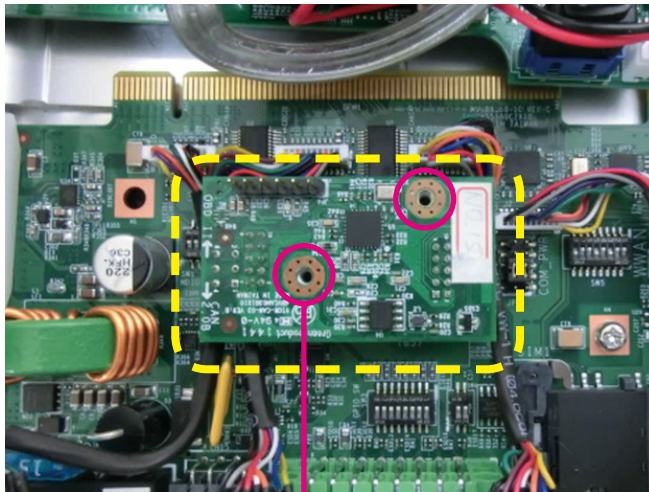
1. Locate the OBDII connectors (JP1 and JP2).



**JP1**

**JP2**

2. Connect the OBDII module to JP1 and JP2 and secure the OBDII module with screws.

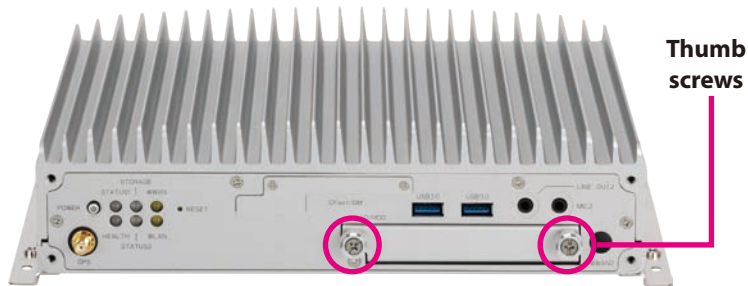


**Mounting  
screws**

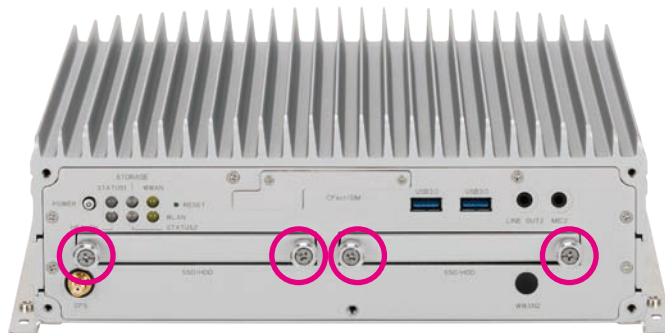
## Installing a SSD/HDD Drive

1. The SSD/HDD bay on the front is used to install a 2.5" hard drive. Loosen the thumb screws and remove the cover.

MVS 5600 features one SSD/HDD bay while MVS 5603 features two SSD/HDD bays.



MVS 5600

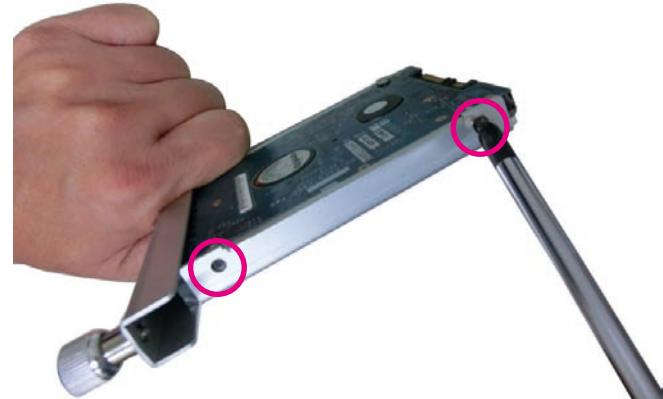


MVS 5600



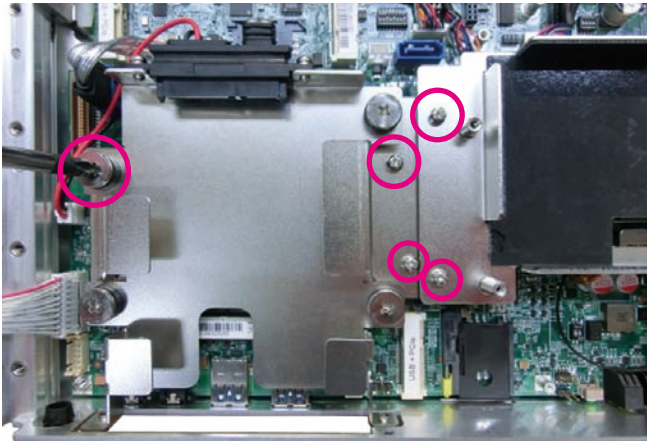
The instructions covered here illustrate how to install a single 2.5" hard drive. The same instructions can be used for installing a second hard drive for MVS 5603.

2. Insert the hard drive into the drive bay with the SATA data and power connector facing towards the end. Align the hard drive's mounting holes with the mounting holes on the drive bay, and use the provided screws to secure the hard drive in place.

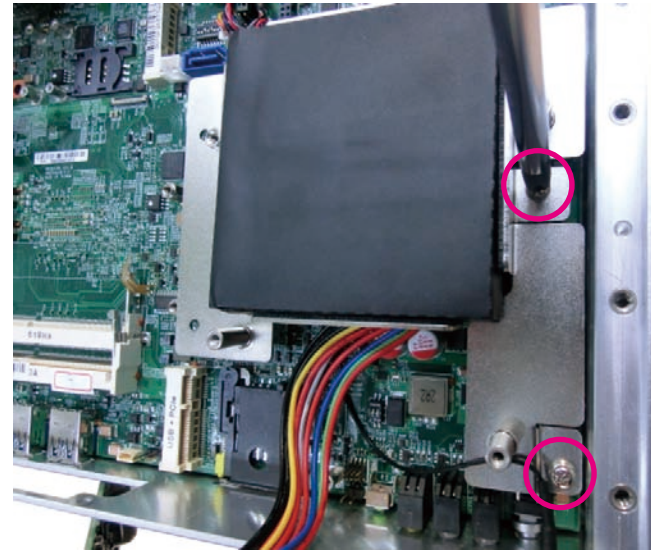


## Installing Backup Battery for MVS 5600 (VTK-BAT01)

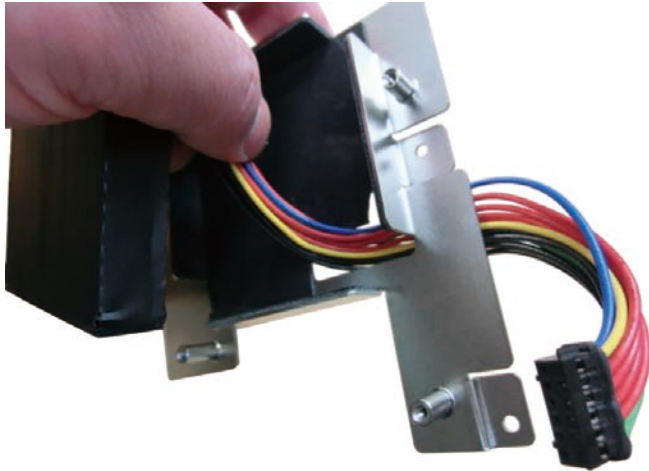
1. Remove the screws on the storage bracket and remove it from the motherboard.



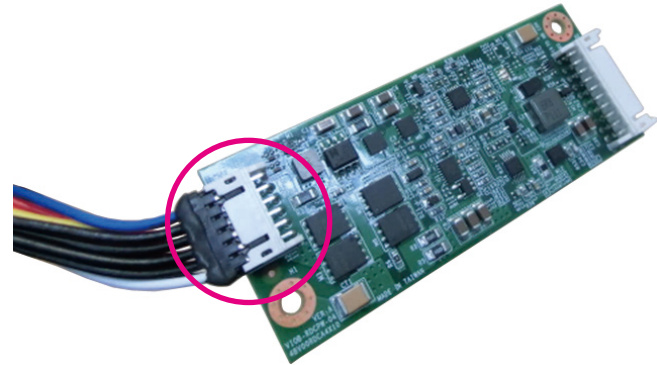
2. Remove the screws on the battery bracket and remove it from the motherboard.



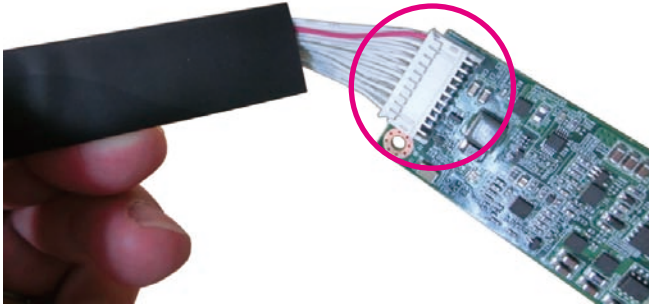
3. Run the battery cable through the opening in the battery bracket.



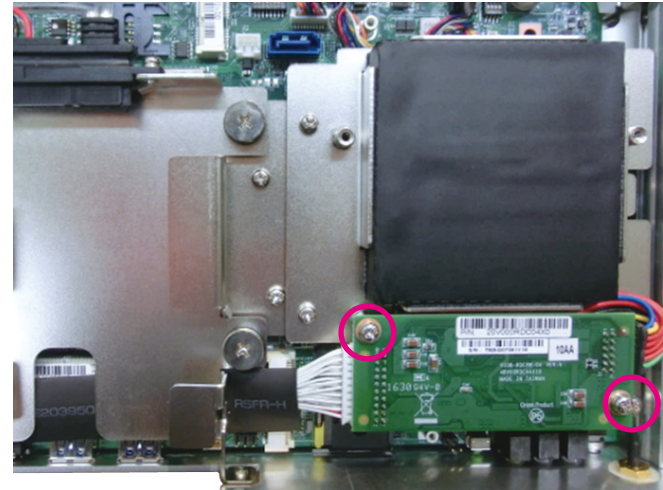
4. Connect the battery cable with the CN1 connector on the battery charge board.



5. Connect the cable between the CPU board (CN16) and battery charge board (CN2).

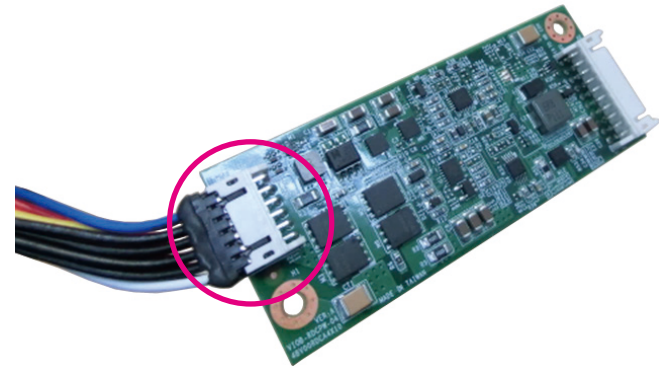
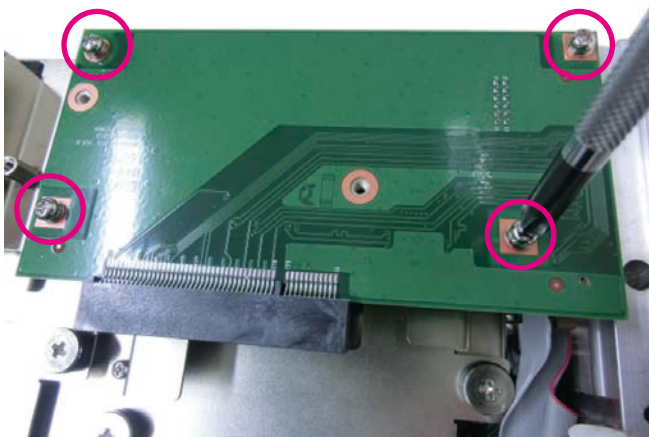


6. Align the mounting holes on the battery charge board to the mounting standoffs and secure it with 2 screws as shown below.



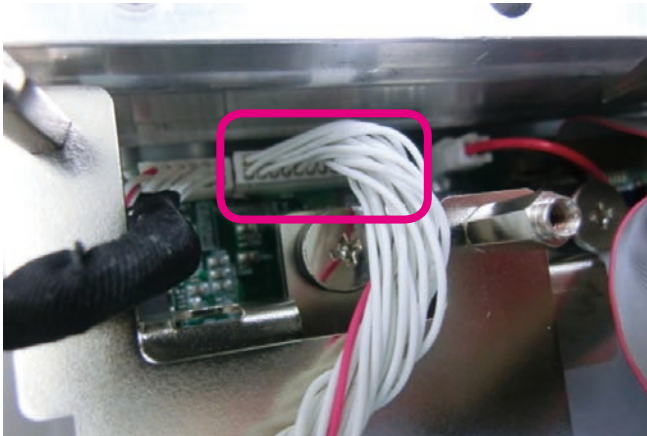
## Installing Backup Battery for MVS 5603 (VTK-BAT01)

1. Remove the screws on the battery bracket and remove it from the motherboard.
2. Connect the battery cable with the CN1 connector on the battery charge board.

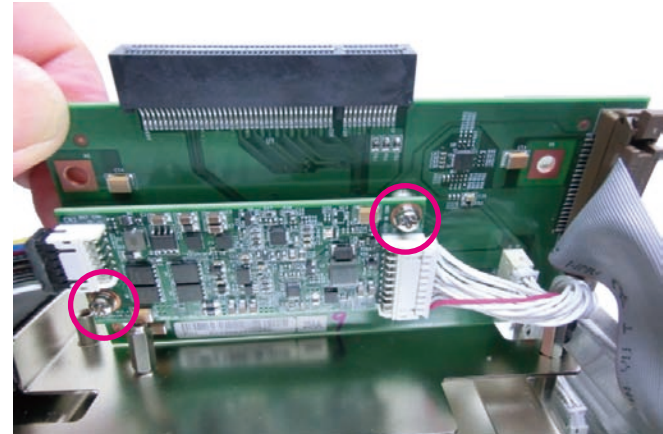




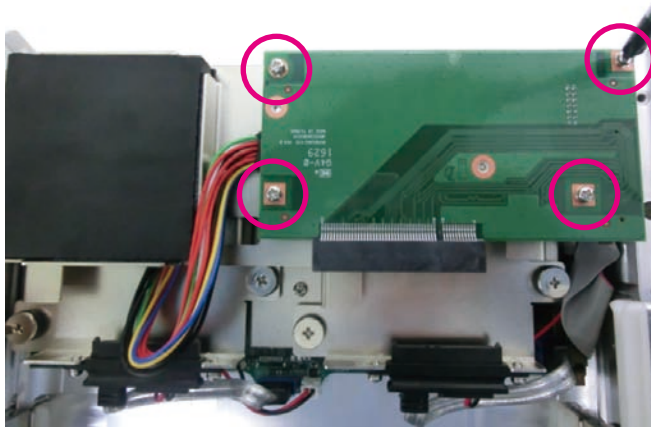
3. Connect the cable between the CPU board (CN16) and battery charge board (CN2).



4. Align the mounting holes on the battery charge board to the mounting standoffs and secure it with 2 screws as shown below.



5. Secure the battery bracket back to its original location.



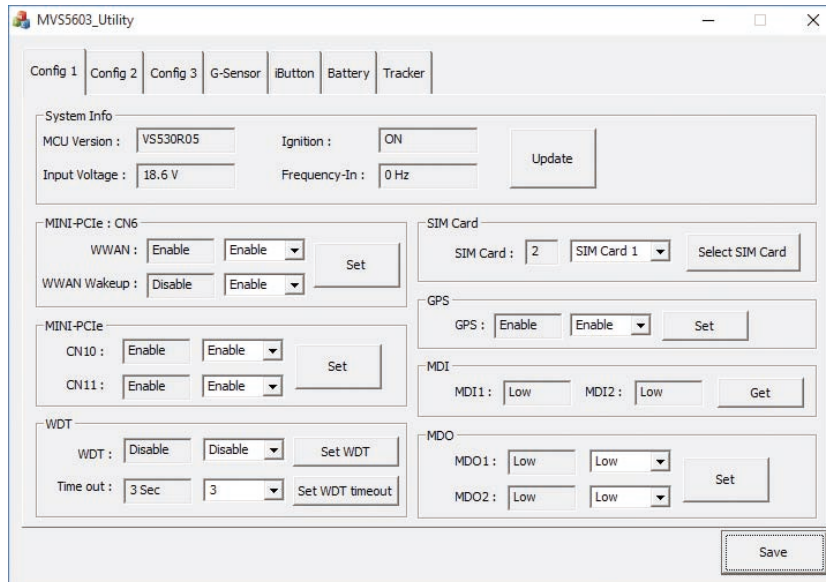
# APPENDIX A: SOFTWARE DEMO UTILITY FOR I/O PORTS OF FUNCTION CONTROL

NEXCOM's software demo utility enables users to test and control different I/O port functions on the MVS 5600 series. This document shows how to use the utility.


There are also source code files of the utility in the CD. Users can refer to the source codes to develop their applications.

## Menu Screen

### Config1



### Config2



## 1. Config1

### 1.1 System Info

MCU Version: Shows the MCU Version.

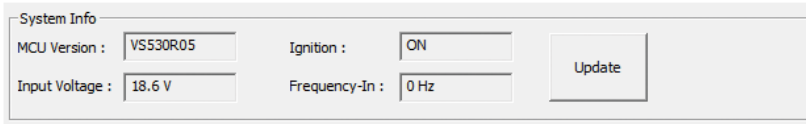
Ignition: Shows the signal of ignition.

ON: Signal of ignition is high.

OFF: Signal of ignition is low.

Input Voltage: Shows the voltage level of power-in.

Frequency-In: Shows the frequency of speed pulse signal.



System Info

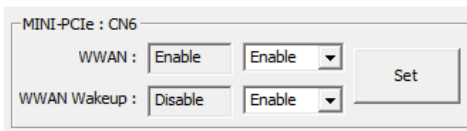
MCU Version :	VS530R05	Ignition :	ON	Update
Input Voltage :	18.6 V	Frequency-In :	0 Hz	

### 1.2 Mini-PCle : CN6

Enables or disables the WWAN function on CN6 Mini-PCle socket.

Enables or disables the WWAN Wakeup function on CN6 Mini-PCle socket.

The setting can also be cleared by the Set button.



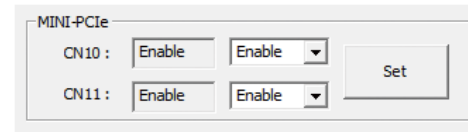
MINI-PCle : CN6

WWAN :	Enable	Enable	Set
WWAN Wakeup :	Disable	Enable	

### 1.3 Mini-PCle

Enables or disables the Module function on CN10 and CN11 Mini-PCle socket.

The setting can also be cleared by the Set button.



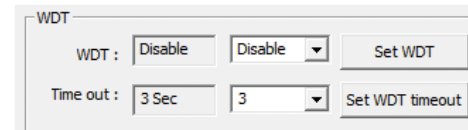
MINI-PCle

CN10 :	Enable	Enable	Set
CN11 :	Enable	Enable	

### 1.4 WDT

Enables or disables the WDT function. There are several selections of time.

The timer of WDT can also be cleared by the Set WDT Timeout button.



WDT

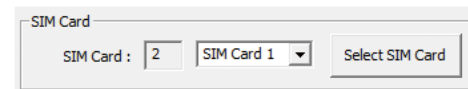
WDT :	Disable	Disable	Set WDT
Time out :	3 Sec	3	Set WDT timeout

### 1.5 SIM Card

Selects the SIM Card.

SIM Card 1: SIM Card at CN5 SIM socket.

SIM Card 2: SIM Card at CN8 SIM socket.

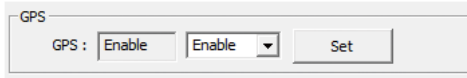


SIM Card

SIM Card :	2	SIM Card 1	Select SIM Card
------------	---	------------	-----------------

## 1.6 GPS

Enables or disables the GPS function.

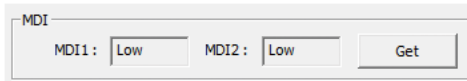


GPS

GPS :

## 1.7 MDI

Shows the status of the MCU GPI.



MDI

MDI1 :  MDI2 :

## 1.8 MDO

Selects MCU GPO ports and makes the output low or high.



MDO

MDO1 :

MDO2 :

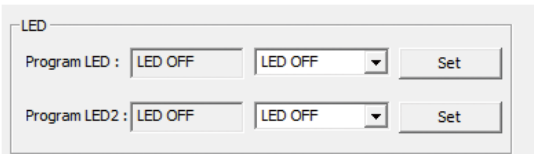
## 2. Config2

### 2.1 LED

Control 2 LEDs for turn-on and turn-off.

Program LED: STATUS1 LED

Program LED2: STATUS2 LED



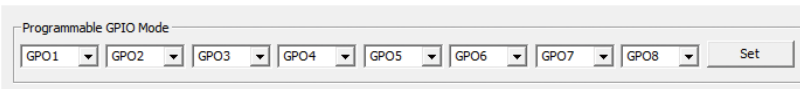
LED

Program LED : LED OFF LED OFF Set

Program LED2 : LED OFF LED OFF Set

### 2.2 Programmable GPIO Mode

Defines GPIO port as GPO or GPI.

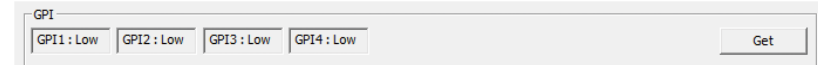


Programmable GPIO Mode

GPO1 GPO2 GPO3 GPO4 GPO5 GPO6 GPO7 GPO8 Set

### 2.3 GPI

Reads the status of GPI.

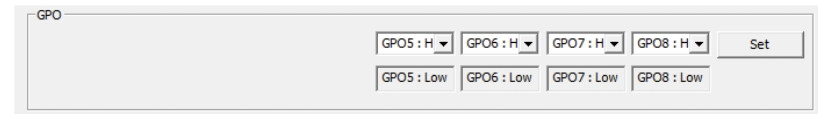


GPI

GPI1 : Low GPI2 : Low GPI3 : Low GPI4 : Low Get

### 2.4 GPO

Selects the GPO ports and makes the output low or high.

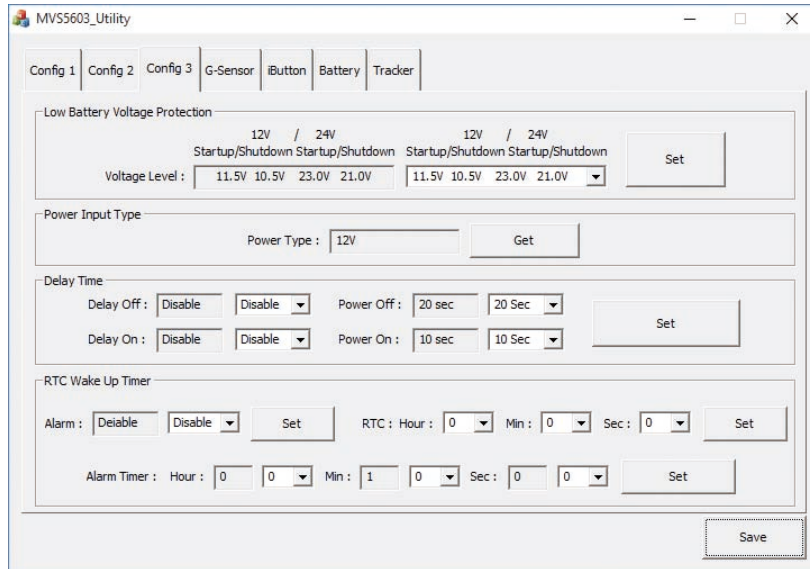


GPO

GPO5 : H GPO6 : H GPO7 : H GPO8 : H Set

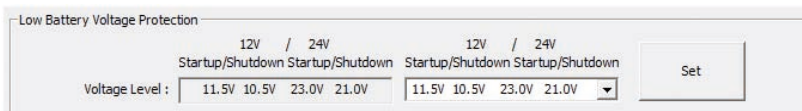
GPO5 : Low GPO6 : Low GPO7 : Low GPO8 : Low

### 3. Config3



#### 3.1 Low Battery Voltage Protection

Sets the Low Battery Voltage Protection Startup/Shutdown voltage level during 12V/24V.



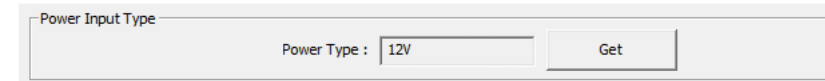
#### 3.2 Power Input Type

Shows the setting of input voltage in SW1 DIP switch.

If the setting is 12V: 12V is shown.

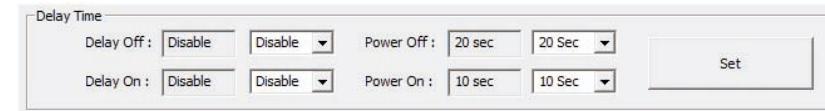
If the setting is 24V: 24V is shown.

If the setting is 9V~36V: 9V~36V is shown.



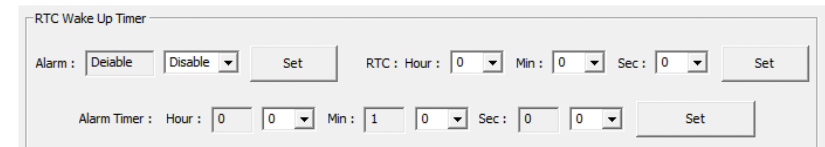
#### 3.3 Delay Time

Enables or disables the delay time function. There are several selections of delay time.



#### 3.4 RTC Wake Up Timer

Enables or disables the RTC wake up function. The timer setting of RTC and Alarm Timer can be configured.



## 4. G-Sensor

Num	Name	Type	Value	Description
0	DEVID	R	E5	Device ID
1~28	Reserved			Reserved; do not access
29	THRESH_TAP	R/W	00	Tap threshold
30	OFSX	R/W	00	X-axis offset
31	OFSY	R/W	00	Y-axis offset
32	OFSZ	R/W	00	Z-axis offset
33	DUR	R/W	00	Tap duration
34	Latent	R/W	00	Tap latency
35	Window	R/W	00	Tap window
36	THRESH_ACT	R/W	00	Activity threshold
37	THRESH_INACT	R/W	00	Inactivity threshold
38	TIME_INACT	R/W	00	Inactivity time
39	ACT_INACT_CTL	R/W	00	Axis enable control for activity and inactivity detection
40	THRESH_FF	R/W	00	Free-fall threshold
41	TIME_FF	R/W	00	Free-fall time
42	TAP_AXES	R/W	00	Axis control for single tap/double tap
43	ACT_TAP_STATUS	R	00	Source of single tap/double tap
44	BW_RATE	R/W	0A	Data rate and power mode control
45	POWER_CTL	R/W	0A	Power-saving features control
46	INT_ENABLE	R/W	00	Interrupt enable control
47	INT_MAP	R/W	00	Interrupt mapping control

### 4.1 G-Sensor Registers

Selects the registers inside G-Sensor to read or write the data.

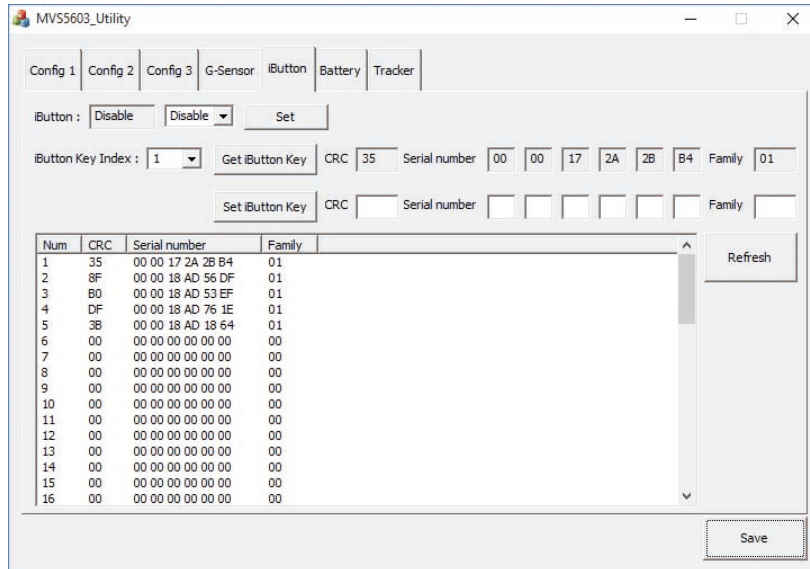
### 4.2 Register Table

Shows the value of all registers in G-Sensor, once the Refresh Button is pressed.

Num	Name	Type	Value	Description
0	DEVID	R	E5	Device ID
1~28	Reserved			Reserved; do not access
29	THRESH_TAP	R/W	00	Tap threshold
30	OFSX	R/W	00	X-axis offset
31	OFSY	R/W	00	Y-axis offset
32	OFSZ	R/W	00	Z-axis offset
33	DUR	R/W	00	Tap duration
34	Latent	R/W	00	Tap latency
35	Window	R/W	00	Tap window
36	THRESH_ACT	R/W	00	Activity threshold
37	THRESH_INACT	R/W	00	Inactivity threshold
38	TIME_INACT	R/W	00	Inactivity time
39	ACT_INACT_CTL	R/W	00	Axis enable control for activity and inactivity detection
40	THRESH_FF	R/W	00	Free-fall threshold
41	TIME_FF	R/W	00	Free-fall time
42	TAP_AXES	R/W	00	Axis control for single tap/double tap
43	ACT_TAP_STATUS	R	00	Source of single tap/double tap
44	BW_RATE	R/W	0A	Data rate and power mode control
45	POWER_CTL	R/W	0A	Power-saving features control
46	INT_ENABLE	R/W	00	Interrupt enable control
47	INT_MAP	R/W	00	Interrupt mapping control

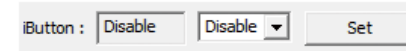


## 5. iButton



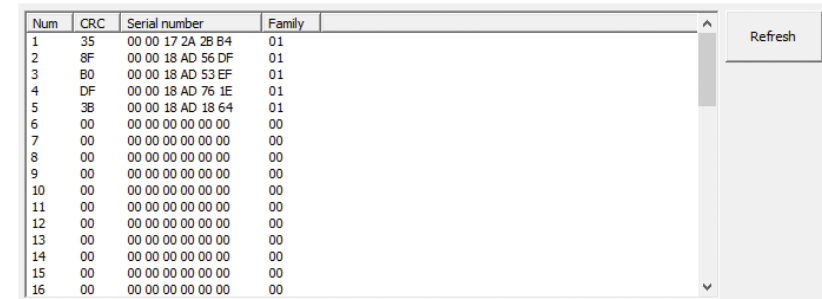
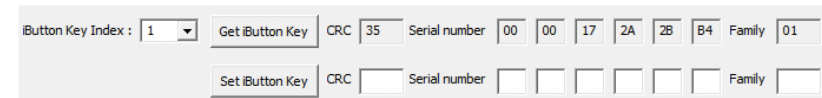
### 5.1 iButton

Enables or disables the iButton function.



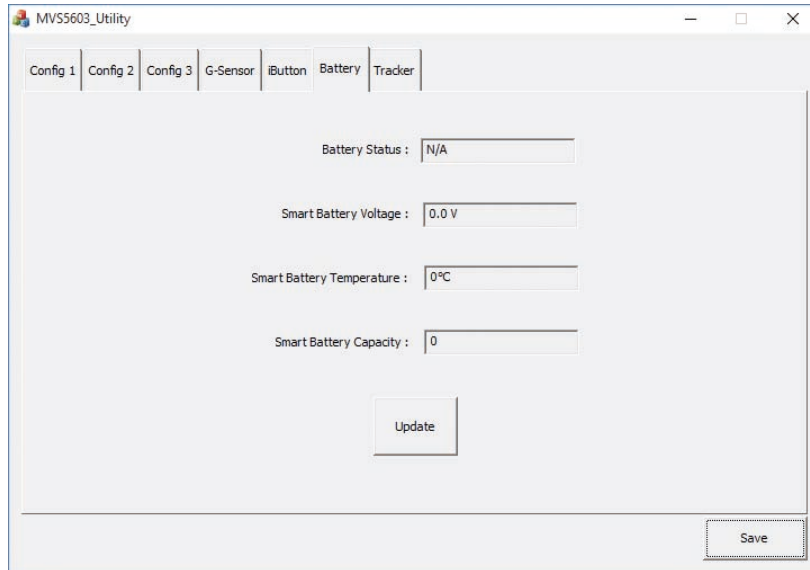
### 5.2 iButton Key Index

Retrieves or defines iButton Key Number by selecting iButton Key Index.



Once the iButton Key Numbers are defined, all the iButton Key Numbers will be shown by pressing Refresh Button.

## 6. Battery



### 6.1 Battery Status

Shows the status of backup battery.

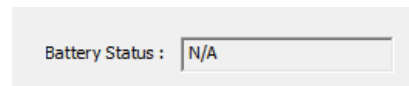
Status 1: N/A. Backup battery isn't installed.

Status 2: Backup battery charge finishes.

Status 3: Backup battery charge now.

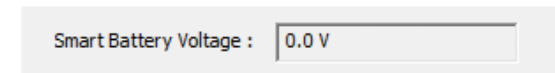
Status 4: Backup battery discharge now.

Status 5: Backup battery charge stops. (When the temperature of backup battery is too high or too low).



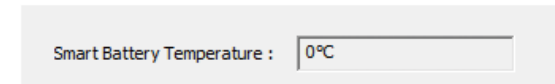
### 6.2 Smart Battery Voltage

Shows the voltage of the backup battery.



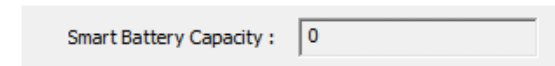
### 6.3 Smart Battery Temperature

Shows the temperature of the backup battery.



### 6.4 Smart Battery Capacity

Shows the capacity of the backup battery.



## 7. Tracker

The screenshot shows the 'Tracker' configuration window in the MVS5603\_Utility application. The window has several tabs: Config 1, Config 2, Config 3, G-Sensor, iButton, Battery, and Tracker. The Tracker tab is active. The configuration includes:

- WWAN APN: internet (two input fields)
- WWAN DNS1: 8.8.8.8 (two input fields)
- WWAN DNS2: 8.8.4.4 (two input fields)
- Server IP: 59.120.0.36 (two input fields)
- Server Port: 1200 (two input fields)
- Machine Name: MVS5601 (two input fields)
- Phone Number: 01 (dropdown and two input fields)
- IMEI: (input field)
- SMS: Disable (dropdown), SMS Coding Type: ASCII Code (dropdown), ASCII (dropdown)
- SMS Content: Help (two text areas)
- Tracker: Disable (dropdown)
- Tracker Mode: Event (dropdown)
- Activation Time: 10 Seconc (dropdown), 1 min (dropdown)
- Send Period: 1 min (dropdown), 1 min (dropdown)
- Acceleration Force: 8 g (dropdown), 4 g (dropdown)
- Tilt Angle: 30° (dropdown), 30° (dropdown)
- Buttons: Set, Get, Save

### 7.1 Network Settings

Configures the network settings for the server.

This close-up shows the network settings configuration fields:

- WWAN APN: internet (two input fields)
- WWAN DNS1: 8.8.8.8 (two input fields)
- WWAN DNS2: 8.8.4.4 (two input fields)
- Server IP: 59.120.0.36 (two input fields)
- Server Port: 1200 (two input fields)

**APN:** internet (default). It can be adjusted based on users' situation.

**DNS1:** 8.8.8.8 (default). It can be adjusted based on users' situation.

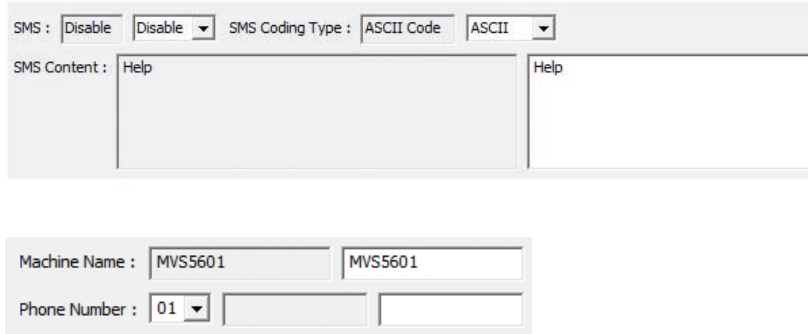
**DNS2:** 8.8.4.4 (default)

**Server IP:** 59.120.0.36 (default). It can be adjusted based on users' situation.

**Server Port:** 1200 (default). It can be adjusted based on users' situation.

## 7.2 SMS and Phone Number

Configures the SMS content and phone numbers for delivering SMS message.



SMS :   SMS Coding Type :

SMS Content :

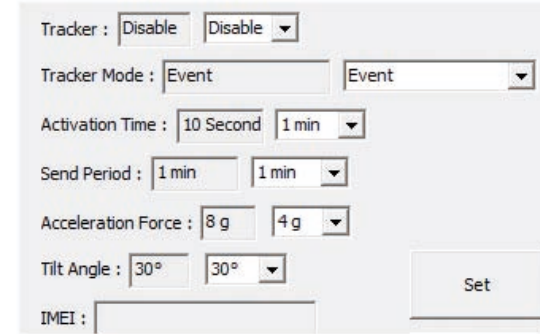
Machine Name :

Phone Number :

If SMS Control is enabled, once event is triggered (defined by Acceleration Force & Tilt Angle), SMS Message will be sent to the phone numbers that are registered automatically. There are up to 10 phone numbers that can be registered. SMS Content can be defined inside the text field.

## 7.3 Tracker Settings

Configures settings for the tracker.



Tracker :

Tracker Mode :

Activation Time :

Send Period :

Acceleration Force :

Tilt Angle :

IMEI :

If Tracker function is "Enable" and Tracker Mode is "Event", once event is triggered (defined by Acceleration Force & Tilt Angle), following information will be sent to server.

If Tracker function is "Enable" and Tracker Mode is "Continue", following information will be sent to server, based on the interval time defined in Send Period.

**(Information)**

Date: YYMMDD

Time: HHMMSS

GPS Status: 0: Searching 1: Fixed

GPS Latitude

GPS Longitude

G Sensor X value: 0 ~ 65535

G Sensor Y value: 0 ~ 65535

G Sensor Z value: 0 ~ 65535

**Activation Time:** Define when tracker function starts after ignition signal becomes low.

**Send Period:** Define the interval time to send the information to server, when Tracker Mode is "Continue".

**Acceleration Force:** Define the value of G-sensor that triggers the event.

**Tilt Angle:** Define the value of tilt angle that triggers the event.

**IMEI:** IMEI of WWAN module will be shown.



Note:

It is required to press the Save Button for saving the settings made in the Utility.

# APPENDIX B: GPS FEATURE

## uBlox-NEO M8N Overview

The NEO-M8 series of standalone concurrent GNSS modules is built on the exceptional performance of the u-blox M8 GNSS (GPS, GLONASS, Galileo, BeiDou, QZSS and SBAS) engine in the industry proven NEO form factor.

The NEO-M8 series provides high sensitivity and minimal acquisition times while maintaining low system power. The NEO form factor allows easy migration from previous NEO generations. Sophisticated RF-architecture and interference suppression ensure maximum performance even in GNSS-hostile environments.

The NEO-M8 combines a high level of robustness and integration capability with flexible connectivity options. The future-proof NEO-M8N includes an internal Flash that allows simple firmware upgrades for supporting additional GNSS systems. This makes NEO-M8 perfectly suited to industrial and automotive applications.

The DDC (I2C compliant) interface provides connectivity and enables synergies with most u-blox cellular modules. For RF optimization the NEO-M8N features an additional front-end LNA for easier antenna integration and a front-end SAW filter for increased jamming immunity.

u-blox M8 modules use GNSS chips qualified according to AEC-Q100, are manufactured in ISO/TS 16949 certified sites, and fully tested on a system level. Qualification tests are performed as stipulated in the ISO16750 standard: "Road vehicles – Environmental conditions and testing for electrical and electronic equipment".

## Technical Specifications

### Features

<b>Receiver type</b>	72-channel u-blox M8 engine GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1 SBAS L1 C/A: WAAS, EGNOS, MSAS Galileo-ready E1B/C (NEO-M8N)		
<b>Nav. update rate<sup>1</sup></b>	Single GNSS: up to 18 Hz Concurrent GNSS: up to 10 Hz		
<b>Position accuracy</b>	2.0 m CEP		
<b>Acquisition</b>		NEO-M8N/Q	NEO-M8M
	Cold starts:	26 s	27 s
	Aided starts:	2 s	4 s
	Reacquisition:	1 s	1 s
<b>Sensitivity</b>	Tracking & Nav:	-167 dBm	-164 dBm
	Cold starts:	-148 dBm	-147 dBm
	Hot starts:	-156 dBm	-156 dBm
<b>Assistance</b>	AssistNow GNSS Online AssistNow GNSS Offline (up to 35 days) AssistNow Autonomous (up to 6 days) OMA SUPL & 3GPP compliant		
<b>Oscillator</b>	TCXO (NEO-M8N)		
<b>RTC crystal</b>	Built-in		
<b>Noise figure</b>	Extra LNA for lowest noise figure (NEO-M8N)		

## Features cont.

<b>Anti jamming</b>	Active CW detection and removal. Extra onboard SAW band pass filter (NEO-M8N)
<b>Memory</b>	Flash (NEO-M8N)
<b>Supported antennas</b>	Active and passive
<b>Odometer</b>	Travelled distance
<b>Data-logger</b>	For position, velocity, and time (NEO-M8N)

<sup>1</sup> For NEO-M8M/Q

## Electrical data

<b>Supply voltage</b>	2.7 V to 3.6 V (NEO-M8N)
<b>Power consumption<sup>2</sup></b>	23 mA @ 3.0 V (continuous) 5 mA @ 3.0 V Power Save Mode (1 Hz, GPS only)
<b>Backup Supply</b>	1.4 to 3.6 V

<sup>2</sup> NEO-M8M

## Interfaces

<b>Serial interfaces</b>	1 UART 1 USBV2.0 full speed 12 Mbit/s 1 SPI (optional) 1 DDC (I <sup>2</sup> C compliant)
<b>Digital I/O</b>	Configurable timepulse 1 EXTINT input for Wakeup
<b>Timepulse</b>	Configurable 0.25 Hz to 10 MHz
<b>Protocols</b>	NMEA, UBX binary, RTCM

## VIOB-GPS-02 Module Connector Pin Definitions



J2 (GPS Side)



J9 (PC Side)

### J2 Pin Definition

Pin	Definition	Pin	Definition
1	GPS_3V3	2	GND
3	GPS_TXD_M	4	GPS_RXD_M
5	NC	6	+V3.3ALW

### J9 Pin Definition

Pin	Definition	Pin	Definition
1	GPS_BAT	2	GPS_LED#
3	GPS_TX	4	GPS_RX
5	GND	6	VCC3_GPS

### COM Port for GPS: COM 4 Baud Rate: 9600

# APPENDIX C: GPS WITH DEAD RECKONING FEATURE

## uBlox-NEO M8L Overview

The NEO-M8L standalone concurrent GNSS module with 3D dead-reckoning (DR) is built on the exceptional performance of the u-blox M8 concurrent GNSS (GPS, GLONASS, Galileo-ready<sup>1</sup>, BeiDou, QZSS and SBAS) engine in the compact and industry proven NEO form factor.

The NEO-M8L delivers a complete, self-contained solution for road-vehicle Automotive Dead Reckoning (ADR) applications in an exceptionally compact 16 x 12 mm form-factor. The module combines information from GNSS, on-board 3-Dimensional inertial sensors, and speed data from the vehicle to deliver continuous navigation in road-vehicle applications. Its size and features make it suitable for aftermarket and first-fit navigation and Telematics applications. Position measurement rates of up to 2 Hz are available with optional extrapolation (based on vehicle dynamics) extending reporting rates to 20 Hz. Inertial sensor measurements are available to external applications at rates up to 10 Hz.

For ease of application, both hardware and message interfaces are supported for vehicle speed. u-blox' ADR and GNSS technologies deliver continuous and accurate positioning throughout the journey. u-blox' tightly-coupled navigation solution delivers significant improvements in navigation accuracy, especially in difficult urban environments. Dead reckoning sensors in conjunction with speed information from the vehicle also provide navigation before GNSS signals are acquired and during periods of complete signal loss. The introduction of three dimensional sensing and signal processing (for both acceleration and direction) extend accurate navigation to urban multi-level highways and car-parks as well as extending dead-reckoned range in tunnels and urban canyons. 3D sensing also enables flexibility in orientation of the receiver with respect to the vehicle frame.

The NEO form factor allows easy migration from previous NEO generations. Sophisticated RF architecture and interference suppression ensure maximum performance even in GNSS-hostile environments. The NEO-M8L module includes an internal Flash that allows simple firmware upgrades. These features make the NEO-M8L perfectly suited to industrial and automotive applications. UART, SPI and DDC (I<sup>2</sup>C compatible) interfaces provide connectivity and enable synergies with most u-blox cellular modules.

u-blox M8 modules use GNSS chips qualified according to AEC-Q100, and are manufactured in ISO/TS 16949 certified sites. Qualification tests are performed as stipulated in the ISO16750 standard: "Road vehicles - Environmental conditions and testing for electrical and electronic equipment".

u-blox' AssistNow Assistance services supply aiding information, such as ephemeris, almanac and time, reducing the time to first fix significantly and improving acquisition sensitivity. The u-blox M8 generation extends validities of AssistNow Offline data (up to 35 days) and AssistNow Autonomous data (up to 6 days), providing the benefits of faster acquisition for longer durations since last use.

---

<sup>1</sup> With future flash firmware update.



## Technical Specifications

Parameter	Specification			
<b>Receiver type</b>	72-channel u-blox M8 engine GPS L1C/A, SBAS L1C/A, QZSS L1C/A GLONASS L1OF, BeiDou B1, Galileo E1B/C <sup>2</sup>			
GNSS	GPS & GLONASS	GPS & BeiDou	GPS	
<b>Time-To-First-Fix<sup>3</sup></b>	Cold start	27 s	28 s	30 s
	Hot start	1.5 s	1.5 s	1.5 s
	Aided starts <sup>4</sup>	4 s	6 s <sup>5</sup>	3 s
<b>Sensitivity<sup>6</sup></b>	Tracking & Navigation <sup>7</sup>	-160 dBm	-160 dBm	-160 dBm
	Reacquisition	-159 dBm	-159 dBm	-159 dBm
	Cold start	-147 dBm	-147 dBm	-147 dBm
	Hot start	-156 dBm	-156 dBm	-156 dBm
Navigation	GPS & GLONASS	GPS & BeiDou	GPS	
<b>Horizontal Position accuracy<sup>8</sup></b>	Autonomous	2.5 m	2.5 m	2.5 m
	SBAS	2.0 m	2.0 m	2.0 m
<b>Velocity accuracy<sup>9</sup></b>		0.05 m/s	0.05 m/s	0.05 m/s
<b>Heading accuracy<sup>9</sup></b>		0.3 degree	0.3 degree	0.3 degree
<b>ADR position error<sup>10</sup></b>	Gyro + speed pulse + accelerometer		typ. 3 % of distance travelled without GNSS	
<b>Frequency of time pulse signal</b>			0.25 Hz ... 10 MHz	
<b>Maximum navigation rate (High Rate output)<sup>11</sup></b>			20 Hz	

Navigation	GPS & GLONASS	GPS & BeiDou	GPS	
<b>Maximum navigation rate (Measurement rate)</b>		2 Hz		
<b>Navigation latency<sup>12</sup></b>		300 ms nominal		
<b>Maximum sensor measurement message output rate</b>		10 Hz		
<b>Sensor measurement message output bandwidth<sup>13</sup></b>		nominal 50% of output rate		
<b>Accuracy of time pulse signal</b>	RMS 99%	30 ns 60 ns	30 ns 60 ns	30 ns 60 ns
<b>Operational limits</b>	Dynamics		≤ 4G	
	Altitude		50,000m	
	Velocity		500 m/s	

<sup>2</sup> Ready to support Galileo E1B/C when available with a flash firmware update

<sup>3</sup> All signals at -130 dBm

<sup>4</sup> Dependent on aiding data connection speed and latency

<sup>5</sup> BeiDou assisted acquisition is not available

<sup>6</sup> Demonstrated with a good external LNA

<sup>7</sup> Optimized for best navigation performance with dead-reckoning

<sup>8</sup> GNSS fix available, CEP, 50%, 24 hours static, -130dBm, > 6 SVs

<sup>9</sup> GNSS fix available, 50% @ 30 m/s

<sup>10</sup> Typical road and vehicle conditions

<sup>11</sup> For update rates > 2 Hz, extrapolation techniques are applied.

<sup>12</sup> Dependent on signal conditions but measurements are delivered with time-stamp corresponding to measurement time

<sup>13</sup> Higher bandwidths are used for navigation

<sup>14</sup> Assuming Airborne < 4 g platform

## VIOB-GPS-DR02/VTK-GPS-DR02 Module Connector Pin Definitions



J2 (GPS Side)



J9 (PC Side)



J3 (GPS Side)



J8 (PC Side)

### J2 Pin Definition

Pin	Definition	Pin	Definition
1	GPS_3V3	2	GND
3	GPS_TXD_M	4	GPS_RXD_M
5	NC	6	+V3.3ALW

### J9 Pin Definition

Pin	Definition	Pin	Definition
1	GPS_BAT	2	GPS_LED#
3	GPS_TX	4	GPS_RX
5	GND	6	VCC3_GPS

**COM Port for GPS: COM 4**  
**Baud Rate: 9600**

### J3 Pin Definition

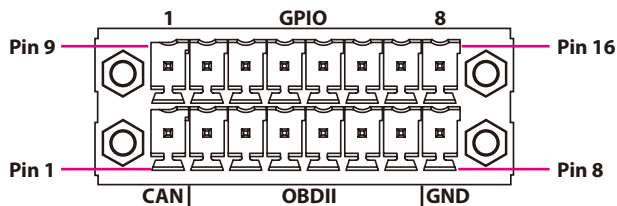
Pin	Definition	Pin	Definition
1	DR_DIRECTIO_M_R	2	DR_ODOMETER_M_R
3	1PPS_R	4	GND

### J8 Pin Definition

Pin	Definition	Pin	Definition
1	GND	2	1PPS
3	DR_ODOMETER_M	4	DR_DIRECTIO_M

# APPENDIX D: SIGNAL CONNECTION OF DI/DO

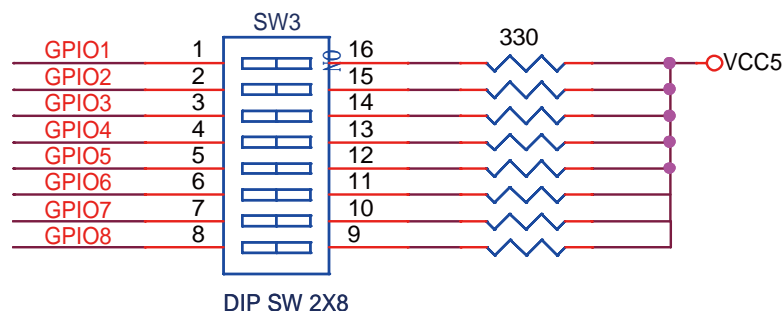
## GPIO Pinout Description



Pin	Definition
9	GPIO1 (Default: GPI1)
10	GPIO2 (Default: GPI2)
11	GPIO3 (Default: GPI3)
12	GPIO4 (Default: GPI4)
13	GPIO5 (Default: GPO1)
14	GPIO6 (Default: GPO2)
15	GPIO7 (Default: GPO3)
16	GPIO8 (Default: GPO4)

GPIO can be programmed by S/W.  
Please refer to the source code in utility.

## SW3 Setting



GPIO (SW3)	
On	Pull up VCC5
Off	Don't Care

Default Settings:

GPIO (SW3)	
SW3.1~SW3.8	Pull up VCC5

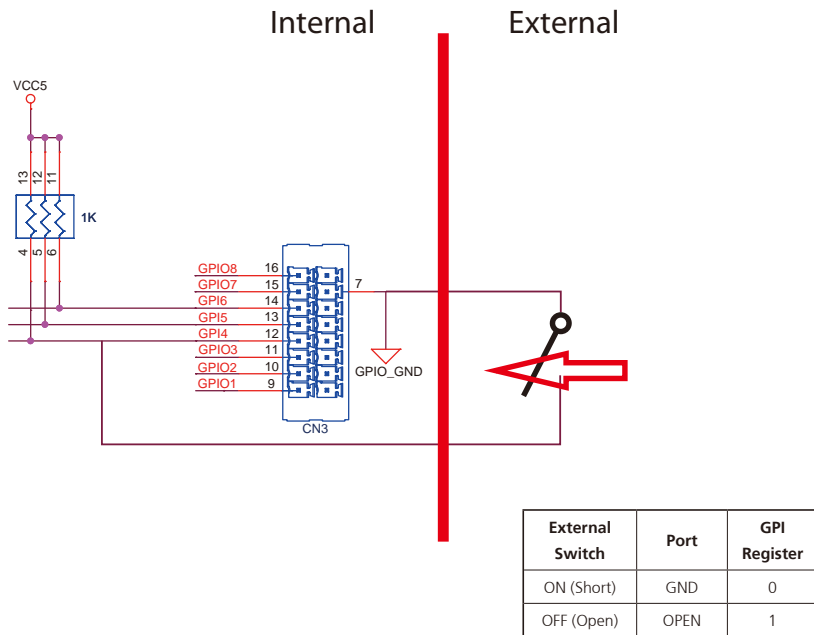
# Digital Input

CN3 connector for GPI signal (digital signal input)  
 The CN3 has 4 digital input channels by default.

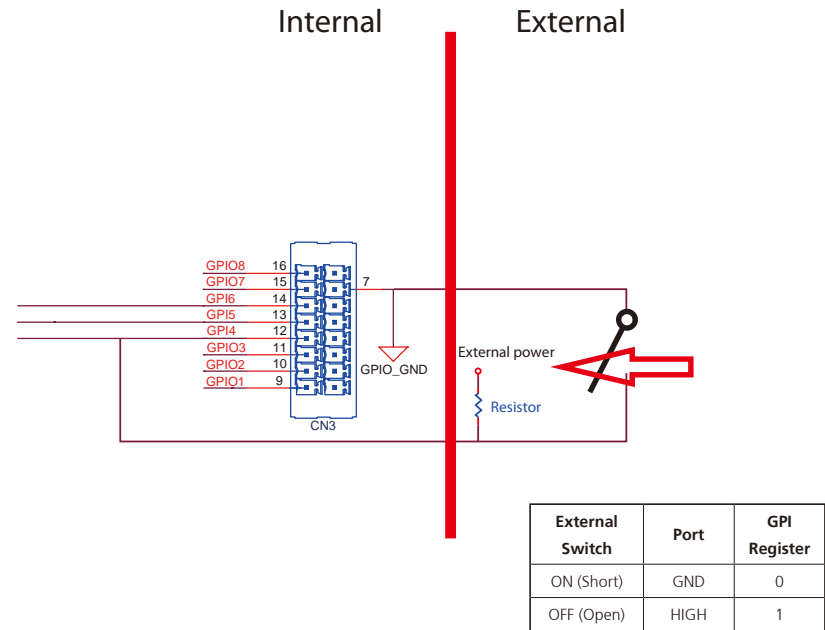
Wet Contact (default)

The GPI signals have a pull up resistor to 5V internally.

The figure below shows how to connect an external output source to one of the input channel.



Dry Contact:



## Digital Output

CN3 connector for GPO signal (digital signal output)

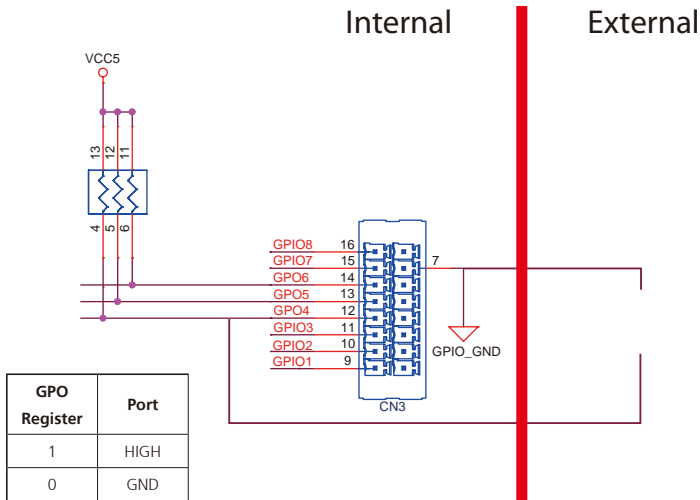
The CN3 connector has 4 digital output channels by default. The signal connection of CN3 support two connected methods for output signal type.

The output signal has two states, one is low level (driven to 0V from GPO signal) other is open (high voltage is provided from external device).

Wet Contact (default)

The SW3 needs to switch to "ON" state. The GPO signal will have a pull up resistor to 5V internally when you switch "SW3" to "ON" state. The output signal has two states, one is low level (driven to 0V from GPO signal ) other is high level (driven to 5V from GPO signal).

The figure below shows how to connect an external input source to one of the output channel.

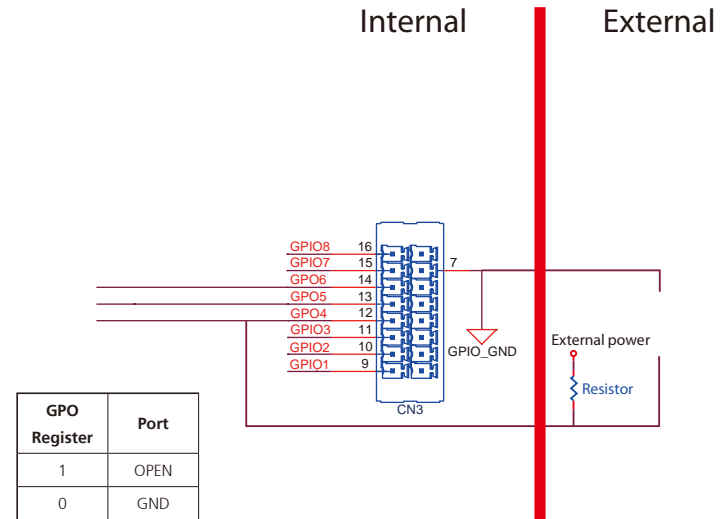


Dry Contact

Each channel can accept 3~18Vdc voltage. And it is able to drive 150mA current for low level.

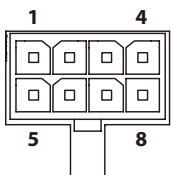
The SW3 needs to switch to "OFF" state. The GPO signal will no have a pull up resistor internally when you switch "SW3" to "OFF" state.

The figure below shows how to connect an external input source to one of the output channel.



# APPENDIX E: SIGNAL CONNECTION OF MCU DI/DO

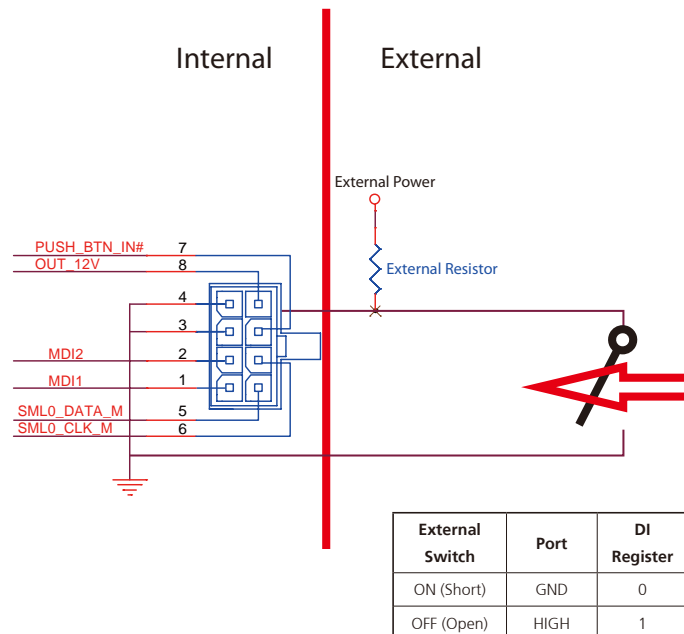
## MCU-DI Pinout Description



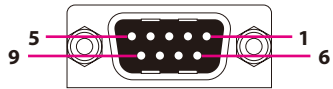
Pin	Definition	Pin	Definition
1	MDI1	2	MDI2
3	GND	4	GND
5	SML0_DATA_M	6	SML0_CLK_M
7	PUSH_BTN_IN#	8	OUT_12V

## Digital Input

The figure below shows how to connect an external output source to one of the input channel.



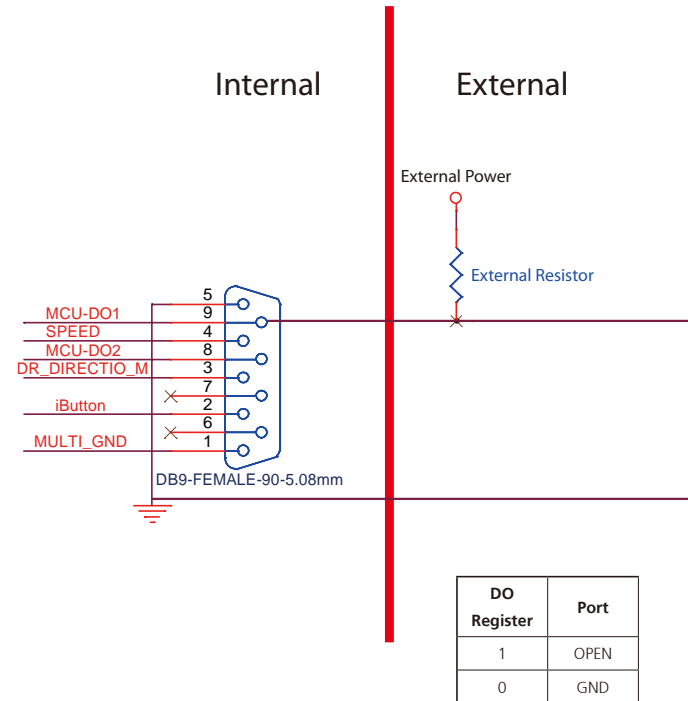
## MCU-DO Pinout Description



Pin	Definition	Pin	Definition
1	MULTI_GND	2	iButton
3	DR_DIRECTIO_M	4	SPEED
5	GND	6	NC
7	NC	8	MCU-DO2
9	MCU-DO1		

## Digital Output

The figure below shows how to connect an external input source to one of the output channel.



# APPENDIX F: VEHICLE POWER MANAGEMENT SETUP

## Entering BIOS Menu

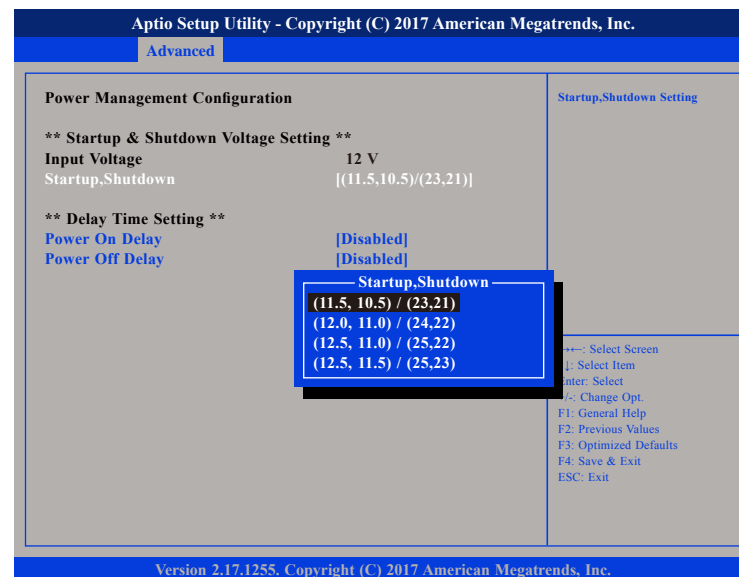
In the BIOS menu, go to **Advanced**→**Power Management Configuration**.



## Startup and Shutdown Voltage Setting

Set the startup voltage to 11.5V or 23V and the shutdown voltage to 10.5V or 21V. If the input voltage is 12V: the startup voltage to 11.5V and the shutdown voltage to 10.5V.

If the input voltage is 24V: the startup voltage to 23V and the shutdown voltage to 21V.

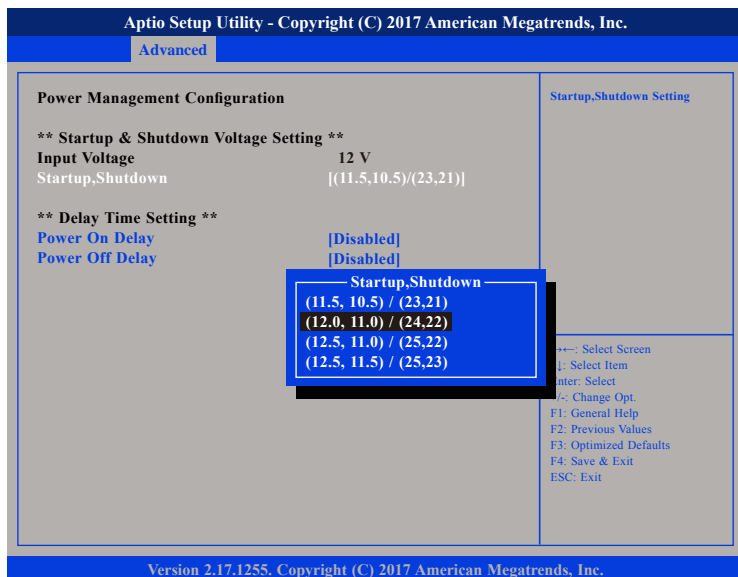




### Set the startup voltage to 12.0V or 24V and the shutdown voltage to 11.0V or 22V

If the input voltage is 12V: the startup voltage to 12V and the shutdown voltage to 11V.

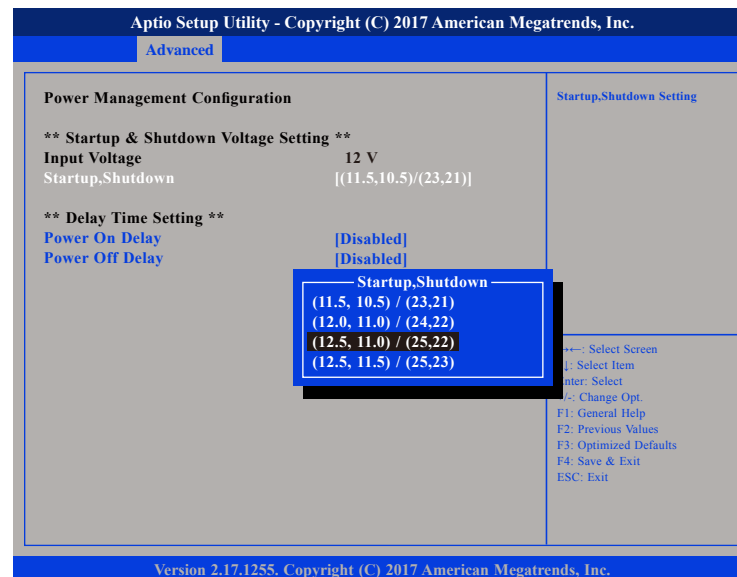
If the input voltage is 24V: the startup voltage to 24V and the shutdown voltage to 22V.



### Set the startup voltage to 12.5V or 25V and the shutdown voltage to 11.0V or 22V

If the input voltage is 12V: the startup voltage to 12.5V and the shutdown voltage to 11V.

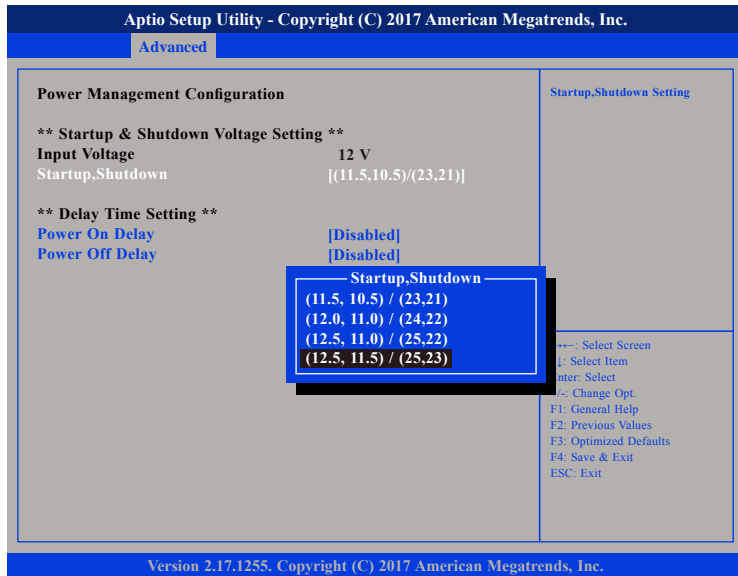
If the input voltage is 24V: the startup voltage to 25V and the shutdown voltage to 22V.



### Set the startup voltage to 12.5V or 25V and the shutdown voltage to 11.0V or 22V

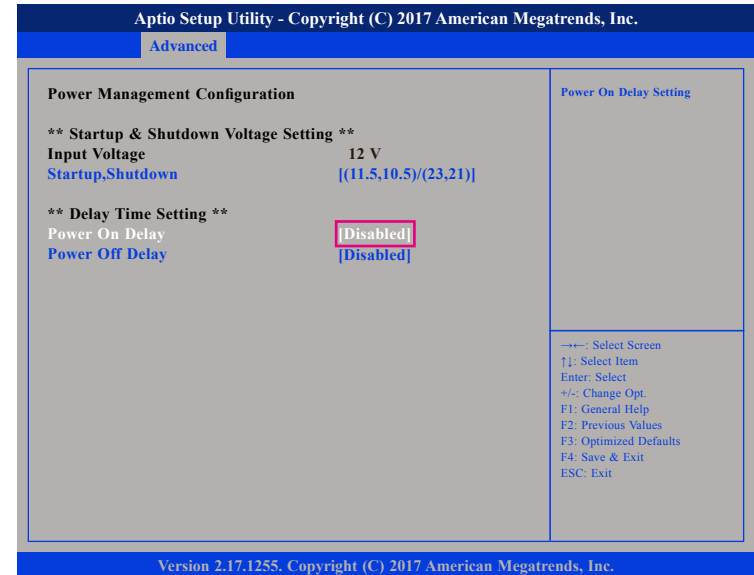
If the input voltage is 12V: the startup voltage to 12.5V and the shutdown voltage to 11.5V.

If the input voltage is 24V: the startup voltage to 25V and the shutdown voltage to 23V.



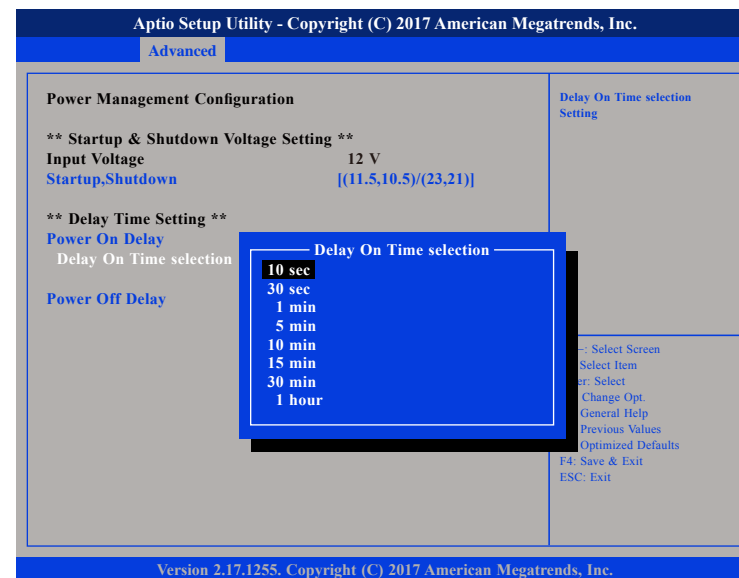
## Power-on Delay Setting

### Disable Power-on Delay



## Enable Power-on Delay

Delay time can be set at 10sec/30sec/1min./5min./10min./15min./30min./1hour.



# Power-off Delay Setting

## Disable Power-off Delay



## Enable Power-off Delay

Delay time can be set at 20sec/1min./5min./10min./30min./1hour/6hour/18hour.



Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.

Advanced

**Power Management Configuration**

**\*\* Startup & Shutdown Voltage Setting \*\***  
Input Voltage 12 V  
Startup,Shutdown [(11.5,10.5)/(23,21)]

**\*\* Delay Time Setting \*\***  
Power On Delay  
Power Off Delay  
Delay Off Time selection

Delay On Time selection

- 20 sec
- 1 min
- 5 min
- 10 min
- 30 min
- 1 hour
- 6 hour
- 18 hour

Delay Off Time selection Setting

ESC: Exit

Version 2.17.1255. Copyright (C) 2017 American Megatrends, Inc.

# APPENDIX G: POWER CONSUMPTION

## MVS 5600

OS: Windows 10

Burn-in Software: Version 6.0

Device: Dual 3G module + Wi-Fi + SSD (Transcend-64G) + HDD (WD-1T) + CFast (Transcend-64G) + Headphone (Sound volume max) + USB 3.0 (1A) x6 + DC Out 12V (2A) + COM 12V (1A)

### MVS 5600-3BK

Burn-in Mode	S0	S5
Loading	9.93A/12V	9mA/12V
Power Consumption	121.4W	0.11W

### MVS 5600-7BK

Burn-in Mode	S0	S5
Loading	11.03A/12V	9mA/12V
Power Consumption	132.4W	0.11W

## MVS 5603

OS: Windows 10

Burn-in Software: Version 6.0

Device: Dual 3G module + Wi-Fi + SSD (Transcend-64G) + HDD (WD-1T) + CFast (Transcend-64G) + Headphone (Sound volume max) + USB 3.0 (1A) x6 + DC Out 12V (2A) + COM 12V (1A) + PoE x8

### MVS 5603-3C8SK

Burn-in Mode	S0	S5
Loading	18.9A/12V	9mA/12V
Power Consumption	227.2W	0.11W

### MVS 5603-7C8SK

Burn-in Mode	S0	S5
Loading	20.2A/12V	9mA/12V
Power Consumption	242.4W	0.11W