



VULCAN X

Vehicle Mount Computer

User's Manual



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Safety Precautions

1. Read these safety instructions carefully.
2. Keep this user's manual for later reference.
3. Disconnect this equipment from any power source 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. Do not leave this equipment in either an unconditioned environment or in an above 40°C storage temperature as this may damage the equipment.
8. The openings on the enclosure are for air convection to protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
9. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
10. 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.
11. All cautions and warnings on the equipment should be noted.
12. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
13. Never pour any liquid into an opening. This may cause fire or electrical shock.
14. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
15. If one of the following situations arise, 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.

16. Do not place heavy objects on the equipment.
17. 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.
18. **CAUTION:** DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY RE- PLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE REC- OMMENDED BY THE MANUFACTURER. DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

19. **CAUTION:** Hot surface Do not touch



Regulatory and Certification

FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Shielded interconnect cables and shielded power cable must be employed with this equipment to insure compliance with the pertinent RF emission limits governing this device. Changes or modifications not expressly approved by the system's manufacturer could void the user's authority to operate the equipment.



Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device is operable in 5.15 – 5.25GHz frequency range, then restricted in indoor use only, Outdoor operations in the 5.15 – 5.25GHz is prohibitive.

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

CE Marking

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. Please contact your local representative for ordering information.

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

VULCAN X Conforms to the Following Specifications

LVD 2014/35/EU

EN 62368-1: 2014 +A11: 2017

EMCD 2014/30/EU

EN 55032

EN 55035

RED 2014/53/EU

ETSI EN 300 328

ETSI EN 300 440

ETSI EN 301 893

ETSI EN 303 413

ETSI EN 301 489-1
 ETSI EN 301 489-17
 ETSI EN 301 489-19
 EN 62311

	BE	BG	CZ	DK	DE	EE	IE
	EL	ES	FR	HR	IT	CY	LV
	LT	LU	HU	MT	NL	AT	PL
	PT	RO	SI	SK	FI	SE	

RF Power Table

Function	Frequency	Maximum Output Power(EIRP)
WIFI	2412-2472 MHz	19.39dBm
	5150-5350 MHz	21.17dBm
	5470-5725 MHz	21.05dBm
	5725-5850 MHz	13dBm
Bluetooth	2402-2480 MHz	12.61dBm

2.4GHz Conducted result

Ch.	802.11 b Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
1	2412	1 Mbps	16.30	16.12	18.52	20
7	2442	1 Mbps	16.20	16.09	18.49	20
13	2472	1 Mbps	16.10	15.99	18.39	20
Ch.	802.11 g Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
1	2412	6 Mbps	17.00	16.85	19.25	20
7	2442	6 Mbps	17.00	16.98	19.38	20
13	2472	6 Mbps	16.90	16.84	19.24	20
Ch.	802.11 n20 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
1	2412	HT 8	17.00	16.85	19.25	20
7	2442	HT 8	16.90	16.77	19.17	20
13	2472	HT 8	16.90	16.75	19.15	20
Ch.	802.11 n40 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
3	2422	HT 8	17.00	16.87	19.27	20
7	2442	HT 8	16.90	16.71	19.11	20
11	2462	HT 8	17.00	16.88	19.28	20

5GHz Conducted result

Ch.	802.11 a Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
36	5180	6 Mbps	16.70	16.63	20.03	23.00
64	5320	6 Mbps	16.80	16.74	19.94	23.00
100	5500	6 Mbps	16.80	16.74	20.14	23.00
140	5700	6 Mbps	17.10	16.90	20.30	23.00
Ch.	802.11 n20 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
36	5180	HT 8	16.80	16.73	20.13	23.00
64	5320	HT 8	16.70	16.48	19.68	23.00
100	5500	HT 8	16.90	16.75	20.15	23.00
140	5700	HT 8	17.00	16.93	20.33	23.00
Ch.	802.11 n40 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
38	5190	HT 8	17.70	17.61	21.01	23.00
62	5310	HT 8	17.80	17.69	20.89	23.00
102	5510	HT 8	17.70	17.62	21.02	23.00
134	5670	HT 8	17.70	17.61	21.01	23.00
Ch.	802.11 ac80 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
42	5210	VHT 0	17.90	17.75	21.15	23.00
58	5290	VHT 0	17.80	17.76	20.96	23.00
106	5530	VHT 0	17.80	17.57	20.97	23.00
122	5610	VHT 0	17.60	17.56	20.96	23.00
Ch.	802.11 ac160 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
50	5250	VHT 0	17.80	17.59	20.99	23.00
114	5570	VHT 0	17.60	17.43	20.83	23.00

Ch.	802.11 a Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
149	5745	6 Mbps	8.84	8.77	12.17	13.97
157	5785	6 Mbps	8.83	8.79	12.19	13.97
165	5825	6 Mbps	8.91	8.80	12.20	13.97
Ch.	802.11 n20 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
149	5745	HT 8	8.65	8.49	12.46	13.97
157	5785	HT 8	8.82	8.73	12.67	13.97
165	5825	HT 8	8.76	8.67	12.62	13.97
Ch.	802.11 n40 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
151	5755	HT 8	8.82	8.75	12.69	13.97
159	5795	HT 8	8.78	8.74	12.69	13.97
Ch.	802.11 ac80 Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
155	5775	VHT 0	8.85	8.69	12.64	13.97

BT Maximum Conducted Power

Ch.	BT-1M Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
0	2402	1M	10.30	10.11	12.51	20
39	2441	1M	10.30	10.20	12.60	20
78	2480	1M	10.30	10.15	12.55	20
Ch.	BT-3M Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) Tnom	EIRP Limit (dBm)
0	2402	3M	8.40	8.31	10.71	20
39	2441	3M	8.40	8.38	10.78	20
78	2480	3M	8.40	8.22	10.62	20

BLE Maximum Conducted Power

Ch.	BLE-1M Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) T _{nom}	EIRP Limit (dBm)
0	2402	1M	7.00	6.93	9.33	20
19	2440	1M	6.90	6.79	9.19	20
39	2480	1M	6.80	6.73	9.13	20
Ch.	BLE-2M Freq.(MHz)	Data Rate	Target	Avg.(dBm)	EIRP (dBm) T _{nom}	EIRP Limit (dBm)
0	2402	2M	7.00	6.81	9.21	20
19	2440	2M	6.90	6.88	9.28	20
39	2480	2M	6.80	6.68	9.08	20

Lithium Battery Safety Statement



Lithium battery inside. Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type of battery recommended by battery manufacturer.

Disposal of a BATTERY into fire or a hot oven, or mechanically crushing or cutting of a BATTERY, that can result in an EXPLOSION;

Leaving a BATTERY in an extremely high temperature surrounding environment that can result in an EXPLOSION or the leakage of flammable liquid or gas;

A BATTERY subjected to extremely low air pressure that may result in an EXPLOSION or the leakage of flammable liquid or gas.

THIS PRODUCT CONTAINS LITHIUM-ION BATTERY PACKS. IT MUST BE DISPOSED OF PROPERLY. CONTACT LOCAL ENVIRONMENTAL AGENCIES FOR INFORMATION ON RECYCLING AND DISPOSAL PLANS IN YOUR AREA.

Chapter 1. Product Introduction

VULCAN X is a 10.4” in-vehicle terminal with 1200nits brightness display and is flexible to support a wide range of wireless connection capability. The device is well-suited for warehouse management, harbor management, asset management applications. VULCAN X’s optimized power system is designed for cold cranking, load dump, transient voltage and electronic static discharge (ESD) protection. The device is engineered with IP66 protection rating, a wide temperature design, wide input range, and rich expanding interfaces that support in-vehicle connectivity.

Hardware Specifications

Item	Description
Processor	Whiskey Lake Intel Core i5-8365UE 1.6GHz, Quad core/6M Cache Whiskey Lake Intel Celeron 4305UE 2.0GHz, Dual core/2M Cache
Memory	DDR4 SO-DIMM, 2400MHz (i5)/ 2133MHz (Celeron)
Storage	1 x M.2 2280 keyB/M support PCIe x4/ x2/ SATA3.0 1 x Micro SD card slot
Display	<ul style="list-style-type: none"> ● Display Size: 10.4" XGA ● Resolution: 1024 x 768 ● Contrast: 1:700 (typ) ● Brightness: Min. 960nits / Typ. 1200nits ● Viewing angle: 160/160 (H/V) (CR>10)
Touch Panel	<ul style="list-style-type: none"> ● Resistive touch screen support optional defrost ● Capacitive multi touch (PCT) support optional defrost
Wireless Connectivity	<ul style="list-style-type: none"> ● Wi-Fi 802.11 a/b/g/n/ac <ul style="list-style-type: none"> ■ Support external or internal antenna. ■ The default setting is internal antenna. ■ RP-SMA jack connectors for external antenna connection. ■ External antenna connector is RP-SMA jack. ● Bluetooth V5.0 <ul style="list-style-type: none"> ■ Support external or internal antenna.

	<ul style="list-style-type: none"> ■ The default setting is internal antenna. ■ RP-SMA jack connectors for external antenna connection. ■ External antenna connector is RP-SMA jack. ● Optional GNSS (GPS / QZSS or GLONASS, COM8) <ul style="list-style-type: none"> ■ Support external antenna only ■ SMA jack connectors for external antenna connection. ■ External antenna connector is SMA plug. ● Optional 4G LTE / GPRS / HSPA+ or 5G <ul style="list-style-type: none"> ■ WWAN support external antenna only. ■ RP-SMA jack connectors for external antenna connection. ■ External antenna connector is RP-SMA jack.
Item	Description
Power Input	9~60VDC,14A
Power Consumption	42W: 25°C, run Burn-In test and without USB Type C, RS232 loading 69W: 25°C, run Burn-In test and with USB Type C, RS232 loading 108W: 0°C, run Burn-In test and with USB Type C, RS232 loading and defrost/ defog function turn on
Battery	LI-ION battery pack for graceful shutdown
Housing (Mechanical)	Die-casting aluminum, fanless design
Certification	CE, FCC, CB

Environment

- Operating temperature:
 - -30°C (-22°F) to 55°C (131°F)
 - In accordance with MIL-STD-810H Method 501.7 High Temperature Procedure II - Operation
 - In accordance with MIL-STD-810H Method 502.7 Low Temperature Procedure II - Operation
- Storage temperature:
 - -40°C (-40°F) to 70 °C (158°F)
 - In accordance with MIL-STD-810H Method 501.7 High Temperature Procedure I - Storage
 - In accordance with MIL-STD-810H Method 502.7 Low Temperature Procedure I - Storage
- Relative humidity: 5% to 95% @ 30°C (86°F) to 60°C (140°F) non-condensing in accordance with MIL-STD-810H Method 507.6 Humidity Procedure II Aggravated Cycles
- Vibration Test:
 - Operating: MIL-STD-810H Method 514.8 Category 4,
Fig 514.8C-2 Common carrier (US highway truck vibration exposure);
Fig 514.8C-4 Composite two-wheeled trailer;
Fig 514.8C-6 Composite wheeled vehicle.
 - Operating: IEC 60721-3-5 Class 5M3
 - Non-Operating: MIL-STD-810H Method 514.8 Category 24 Figure 514.8E-1
General minimum integrity
- Shock Test:
 - Operation: MIL-STD-810H Method 516.8 Procedure 1 Functional Shock
 - Non-Operation: MIL-STD-810H Method 516.8 Procedure V Crash Hazard Shock

I/O Ports

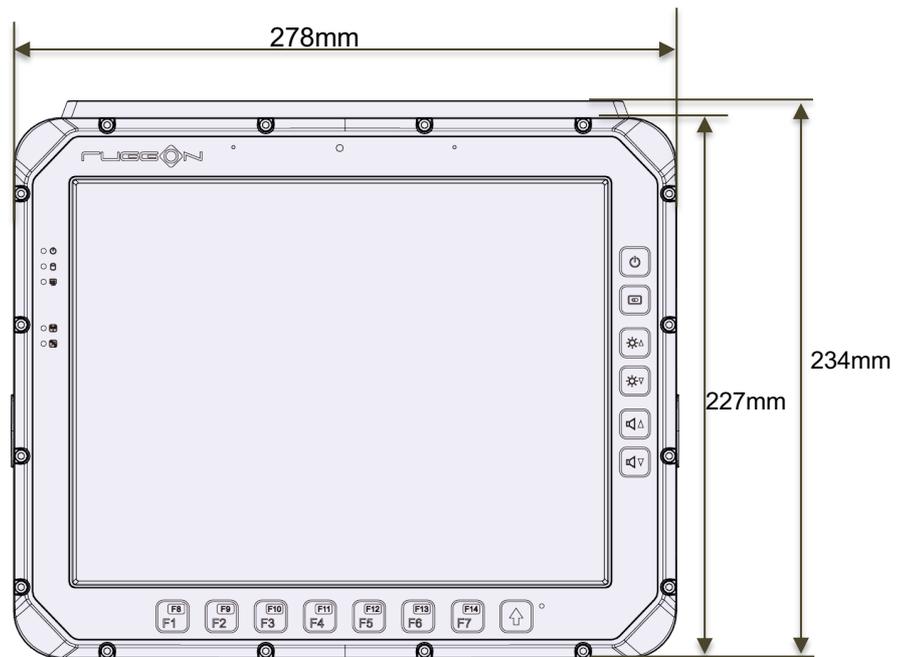
Item	Description
Serial	RS-232 full pin with power x 1 (COM1)* RS-232(TX,RX)/422/485 x 1 (COM2)*, RS-232(TX,RX) x 2 (COM3/ COM4)*, RS-485 x 2 (COM5/ COM6)* * Operate up to 115K bps * The transmission speed is in counter-relationship to the transmission distance
USB	USB 3.1 x 1, USB 2.0 x 2 USB 3.1 type C x 1 (DisplayPort Alt Mode supported)
Ethernet	Gigabit Ethernet x 2
CAN	Optional CAN bus 2.0B x 2 or SAE J1939 x 1
Digital I/O	DI x 2, DO x 2
Audio	Mic in x 2, Line out (L/R) x 1
Video	Optional video input
Speaker	Dual speakers (3W)

Dimension and Weight

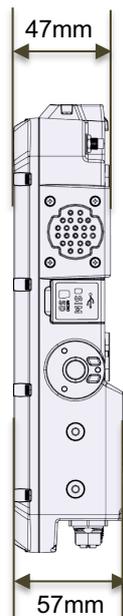
Dimension: 278 x 234 x 57 (mm) / 10.95 x 9.21 x 2.24 (in.) (W x H x D)

Weight: 3.2 kg/ 7.05 lbs.

Front View Dimension



Side View Dimension



Package List

Before you begin the installation or configuration process, make sure to inspect all the components and accessories. Contact your representative if there are any missing or damaged items.

Please verify the delivery of the contents upon receipt.

- VULCAN X vehicle mount computer (Model: VX-501)
- Quick start guide
- Touch screen protection film
- Accessory Box enclosed with one M12 cable with fork terminals (Length: 2 Meter)

NOTE:

- The packaging material provides optimal protection to your device. After unpacking, DO store the original packaging material in the event that you need to return for shipment.
- The protection film on the screen in the package is intended for you to increase the durability of the touch screen and protect it from scratching, etching, and damage. Designed with a low-tack adhesive, you can easily apply and remove the protection film while it is also engineered to be touch-sensitive and won't affect touch or swipe functions. It is recommended that you paste it onto the touch screen for protection.

Chapter 2. Hardware Installation

This chapter provides information for the installation and removal of M.2 storage and SIM card.



Please make sure the device is completely powered off and that the power status LED light is off when you install or remove the module or SIM card.

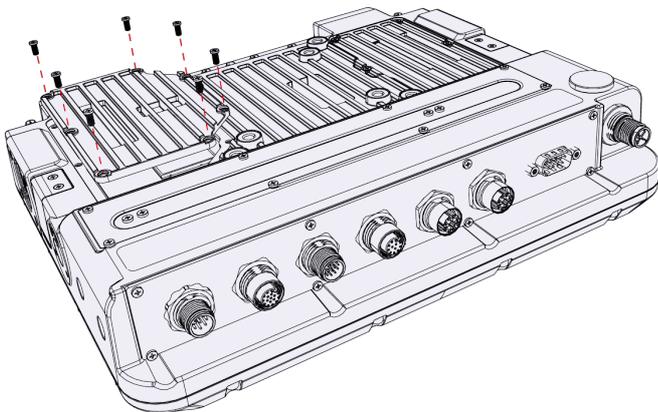
Storage Module

Prevention of EMI interference in this device is not guaranteed if the original components are replaced.

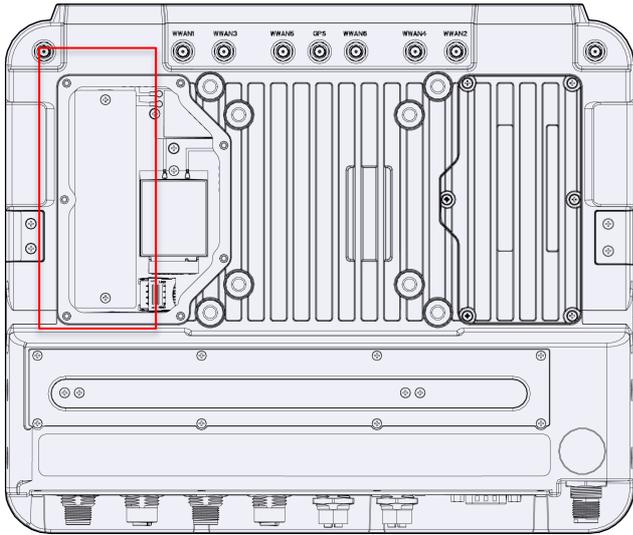
A single M.2 2280 module slot is available for memory expansion to up to 512GB.

Installing/Removing a Module

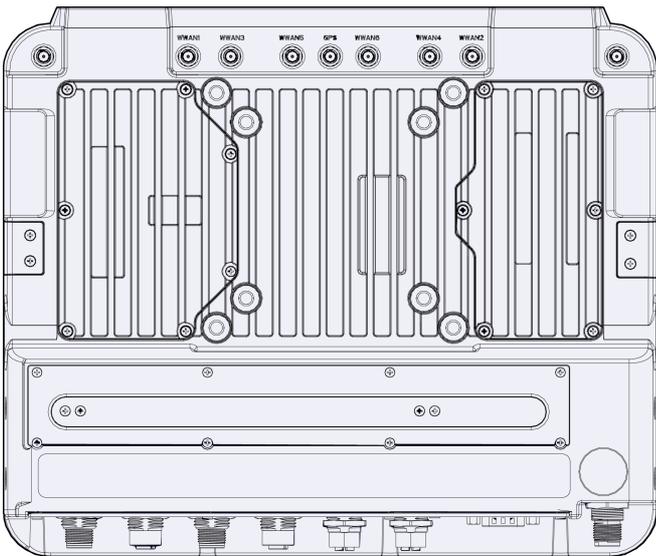
1. Shut down the system properly and disconnect the device from all power sources.
2. Un-mount the device from the mounting apparatus; make sure that the display surface is protected.
3. Remove the screws and the service cover.



4. Locate the M.2 module slot; see the following image.



5. Insert the M.2 module into the slot and then fasten the screws or loosen the screws to remove the card.
6. Replace the service cover.



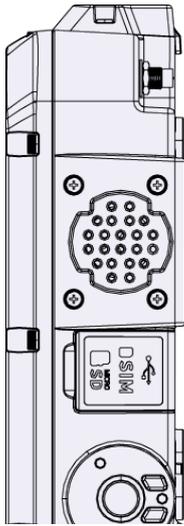
Installing/Removing the SIM card

If you have ordered VULCAN X with optional WWAN, you are able to leverage the device's dual micro SIM design for cellular and wireless connection with SIM1 slot accessible from the side cover and SIM 2 slot inside the cover of the back.

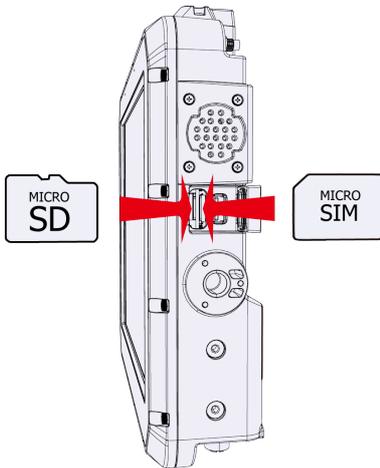
To select which SIM slot you want to use from the two options, please go to DashON. The default setting is SIM 1 slot. Please refer to instructions in the following for installing or removing your SIM cards.

SIM1 slot on the side

1. SIM1 design supports hot swap function that you can remove or install the SIM card without shutting down the system.
2. You can find micro SIM card, SD card, and USB icons on the side cover.



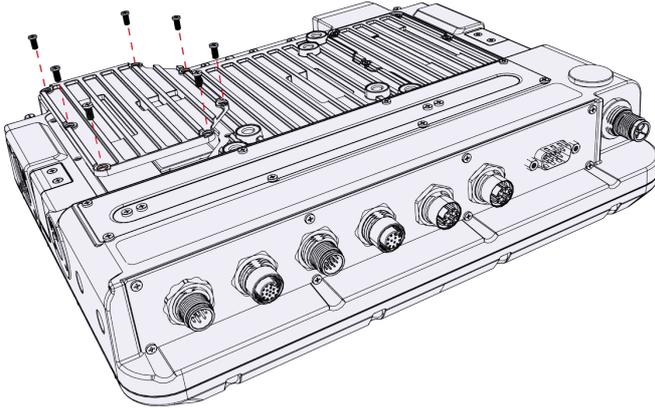
3. Open the cover; Insert your SIM card. Make sure the angled corner of the card is positioned correctly.



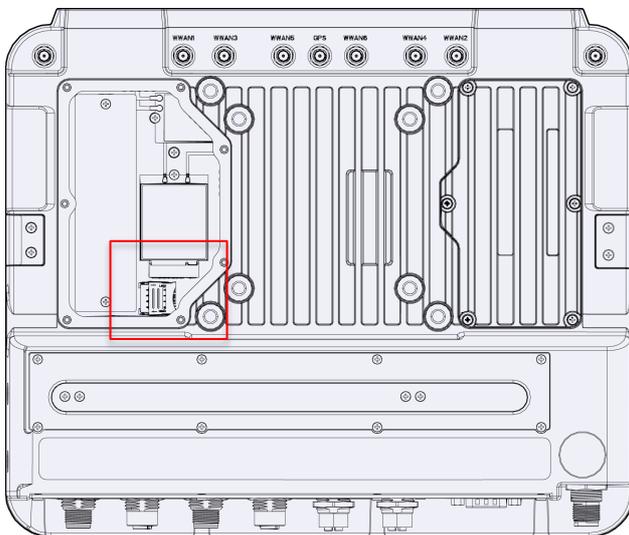
Before use, please check whether the waterproofing rubber is damaged or contaminated with a foreign object before closing the side cover. Please make sure to tightly close the side cover or will affect the waterproof function.

SIM2 slot at the back

1. Shut down the system properly and disconnect the device from all power sources.
2. Un-mount the device from the mounting apparatus; make sure that the display surface is protected.
3. Remove the screws and the service cover.



4. Once the service cover is removed, you can see the micro SIM card slot (SIM2).



5. To release the SIM card holder, slightly lift the front edge of the card holder and slide it backwards to open the cover.
6. Align and match your SIM card to the angled corner of the card holder.
7. Insert the SIM card into the card holder.
8. Close the cover of the card holder.

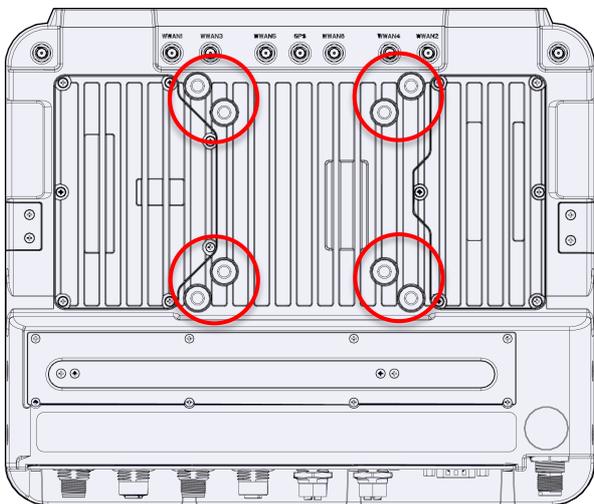
Chapter 3. Hardware Mounting



Make sure that only trained personnel perform the installation.

The VULCAN X supports a standard VESA version MIS-D, 75/100, C (75/100mm distance quadrate order, M5 thread, deepness 9mm) with four mounting holes on the back side of the device.

The recommended screw-in depth is 9mm and M5*Pitch 0.8mm bolt.



Notes: To prevent any damage or injury, make sure the mounting bracket is securely attached.

Chapter 4. Start up

Powering the System

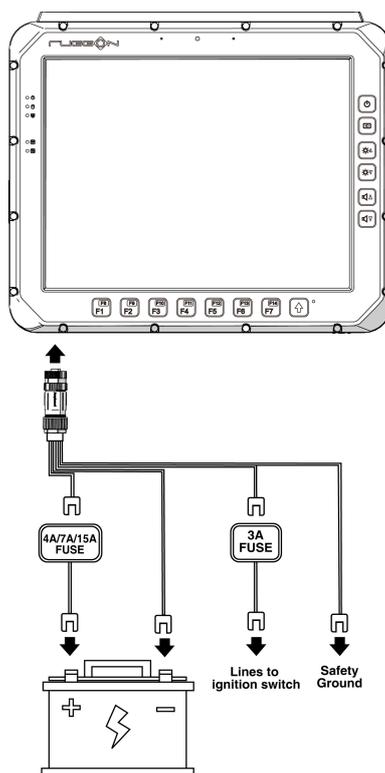
Installation Instructions

Fuses* are required in connecting the power cable and battery in series and add 3A fuse in ACC/ignition line to avoid the risks of wire damage and vehicle burning.

Notes:

- * 4A for 48VDC power input
- * 7A for 24VDC power input
- * 15A for 12VDC power input

Please refer to the diagram below for VULCAN X installation.



Power on the System

VULCAN X has two power modes for user preference, and you can activate them through DashON.

If VULCAN X is connected to vehicle battery, please enable its “ACC sense mode”.

If you want to use power adapter as power supply instead, please disable “ACC Input Detection”.

To turn on the system, please follow the instructions below:

When VULCAN X is connected to vehicle battery

- In “ACC sense mode,” no matter “Power button” is enabled or disabled; the system is only controlled by ACC sense.
 - Scenario: When the system is off, switch the ignition from off to on to turn on the system’s on/delay function.

- In “ACC sense mode,” with the “Power button” enabled, the system will only be controllable via its ACC or turn on/off buttons.
 - Scenario: When the system is off without under voltage protection(UVP) and ignition is on, press the power button to turn on the system.

When VULCAN X is connected to power adapter

The power source isn’t controlled by AAC/Ignition signals; please disable “ACC sense” mode in DashON.

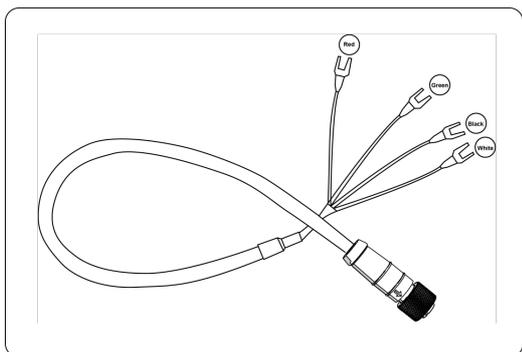
- In “Disable ACC sense mode,” with “Power button” enabled, the system will only be controllable via its turn on/off buttons.
 - Scenario: When the system is off and without under voltage protection (UVP), press the power button to turn on the system.

In “Disable ACC sense mode,” with the “Power button” disabled, the system will auto turn on with power source without UVP.

Connector Power

VULCAN X allows a wide range of DC power input from 9~60V via a M12 S-CODE 4-PIN power cord. You can start up VULCAN X via either car power cable or external power adapter.

Refer to the M12 S-CODE 4-PIN power cord and its wire definition in the following.



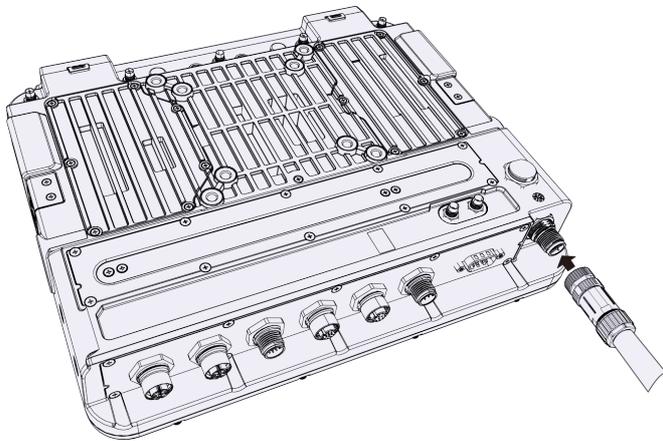
1. Use only power cables verified and supplied by RuggON to meet the specific requirements for voltage, current, low-temperature flexibility, UV resistance, oil resistance, etc.
2. Do not bend or kink the power supply cables and make sure they are securely protected against crushing and abrading.
3. Make sure power cables are correctly connected to the safety ground
4. Directly connect the power cable of VULCAN X to vehicle battery through appropriate fuse instead of sharing any power supply lines of other equipment to avoid interference.
5. To compensate the voltage drop of the power supply cable, make sure that it is left with adequate cross-section area for sufficient ampacity. .

The wire definition

Wire Color	Signal
RED	V+
BLACK	V-
GREEN	PE (Safety Ground)
WHITE	ACC/ Ignition

Power on through vehicle power cable

1. The bare wire lead cable allows you to directly wire 12V, 24V or 48V car power supply. Please follow the wire definition to connect it to your power source. Please refer to the installation diagram on page 23 to install the 4A, 7A or 15A fuse between the power cable and power source.
2. Plug the power cord into the power connector and adjust it to the right positioning. (Refer to power connector diagram on page 29)



3. VULCAN X is automatically turned on with ACC switched ON.

Power on through external power adapter

To power on VULCAN X, please connect red (V+) wire to white (ACC/ Ignition) wire. ACC ignition mode is not supported in such condition.



Make sure that all the power supplies are disconnected when you plug the power cord into the power connector.



Please press the power button to turn off the system. If you directly remove the power source, the system will consume internal battery instead and perform a graceful shutdown in one minute. It will reduce the battery life.

Internal Battery

If VULCAN X is disconnected from external power, the internal battery can keep it running up to 1 minute.

When power is restored, VULCAN X will continue its normal operation.

When VULCAN X is connected to external power, an internal charger will automatically charge the internal battery. If external power is off and the device has continued to run for 1 minute on its internal battery, please charge the internal battery for at least 7 minutes.

Limitation charge from internal battery

When vehicle power is unstable such as experiencing voltage drops, VULCAN X's internal battery can only keep its system's core computing logic running above -10°C while with below functions temporarily affected until the vehicle power is restored*1.

1. Type-C interface disabled
2. Turn off the COM1 power output
3. Backlight is forcibly turned dark*2
4. Mute speaker
5. Lowered WWAN TX power output*3
6. Defrost/ defog function disabled
7. CPU throttling *4

*1 If vehicle power is restored immediately after the device suffers from instant voltage drop, afore affected functions will get back to normal conditions.

*2 VULCAN X offers two backlight modes. Under normal mode, the backlight turns dark; under night mode, the backlight remains the same brightness.

*3 Lowered WWAN TX power output might result in abnormal signal interception

*4 Processor throttling might cause slow system performance

When the external power is in presence, an internal charger will automatically charge the internal battery. The ratio of the internal battery charged time against its discharged time is around 4 times. It means it takes 4 minutes to charge the battery after discharging the battery for 1 minute.

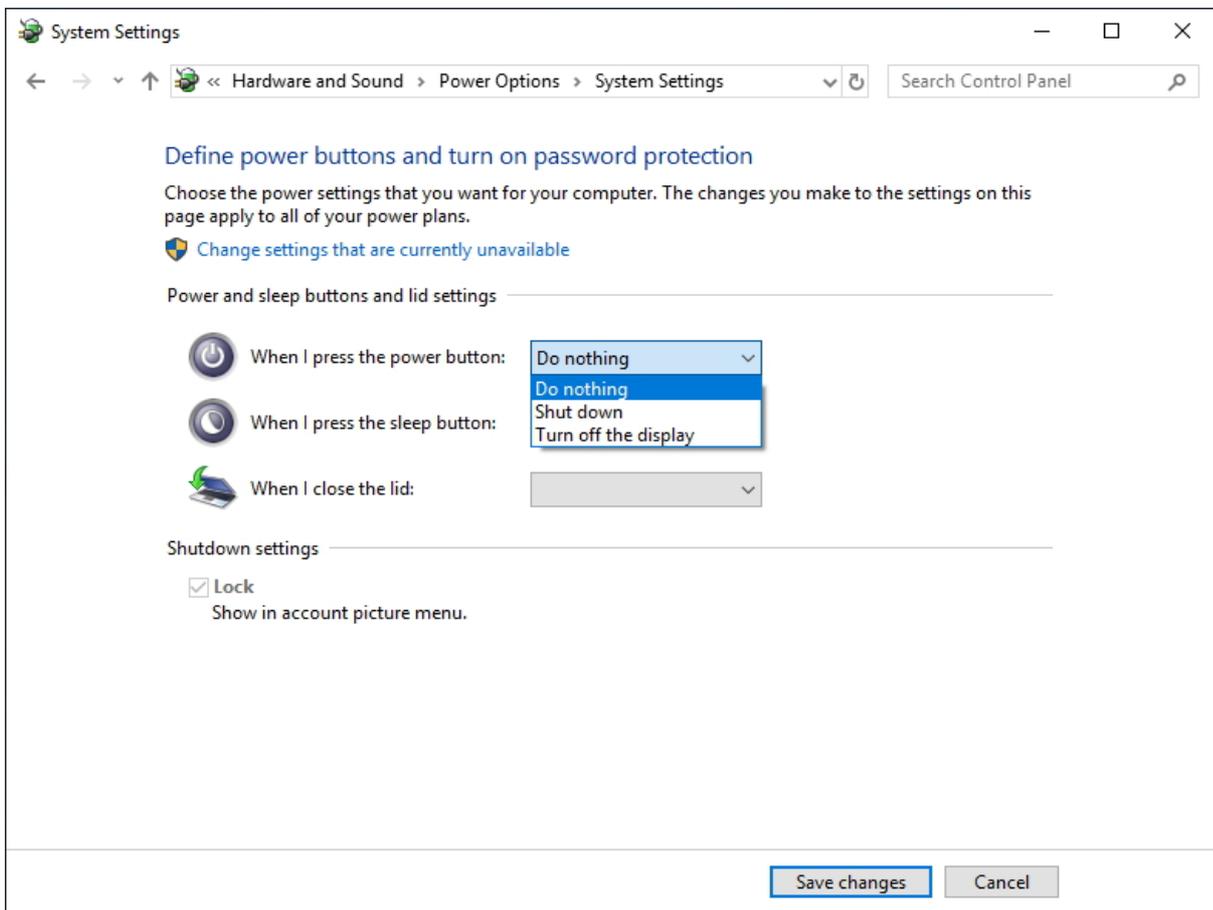
Powering Down the System

When VULCAN X is connected to vehicle battery

- When system is on, switch the ignition from on to off to turn off or delay off the system.
- When system is on and with “Power button” enabled*1, switch the ignition from on to off or press the power button to turn off the system.

*1 Power Button Define

Define the power and sleep buttons in Windows “System Settings”, lid settings (Do nothing/ Shut down/ Turn off the display) in the dropdown menu, select “Shut down” to powering down the system.



When VULCAN X is connected to power adapter

When system is on and with “Power button” enabled, press the power button to turn off the system.

Unexpected Power Outage

When VULCAN X is connected to vehicle battery

The system will follow your delay off setting, but will still perform a graceful shutdown up to one minute.

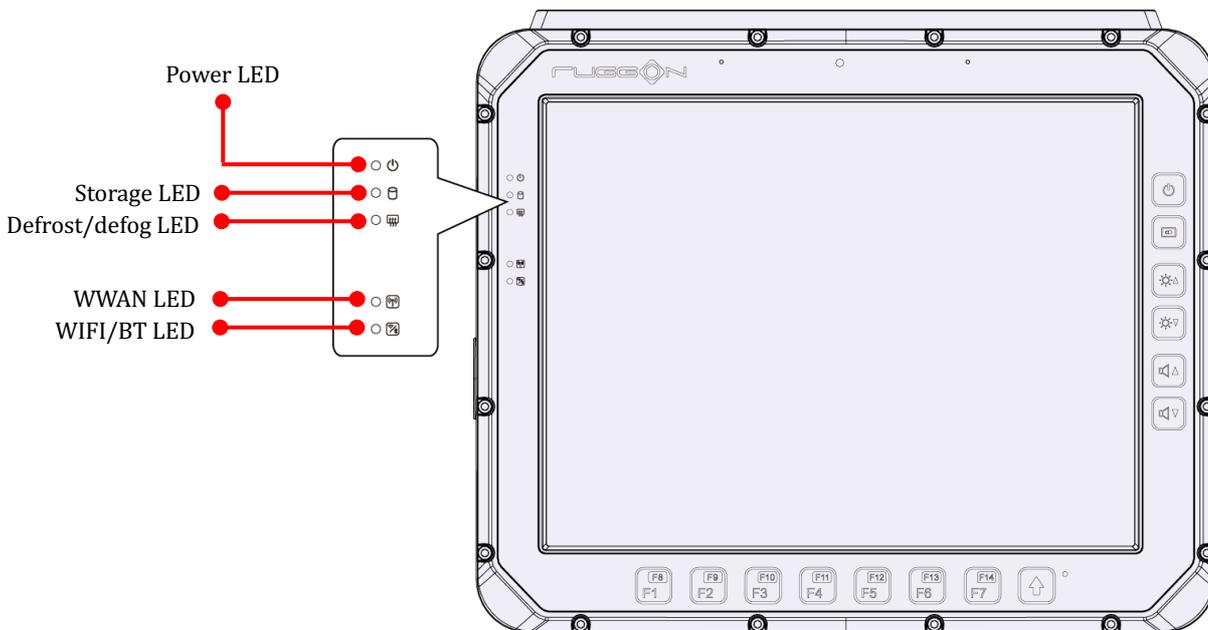
When VULCAN X is connected to power adapter

The system will consume internal battery instead and perform a graceful shutdown in one minute.

LED Status

The LEDs on VULCAN X are status indicators that show the operating status of your system. The status indicators can help pinpoint possible failed hardware components causing specific symptoms. Refer to the description below.

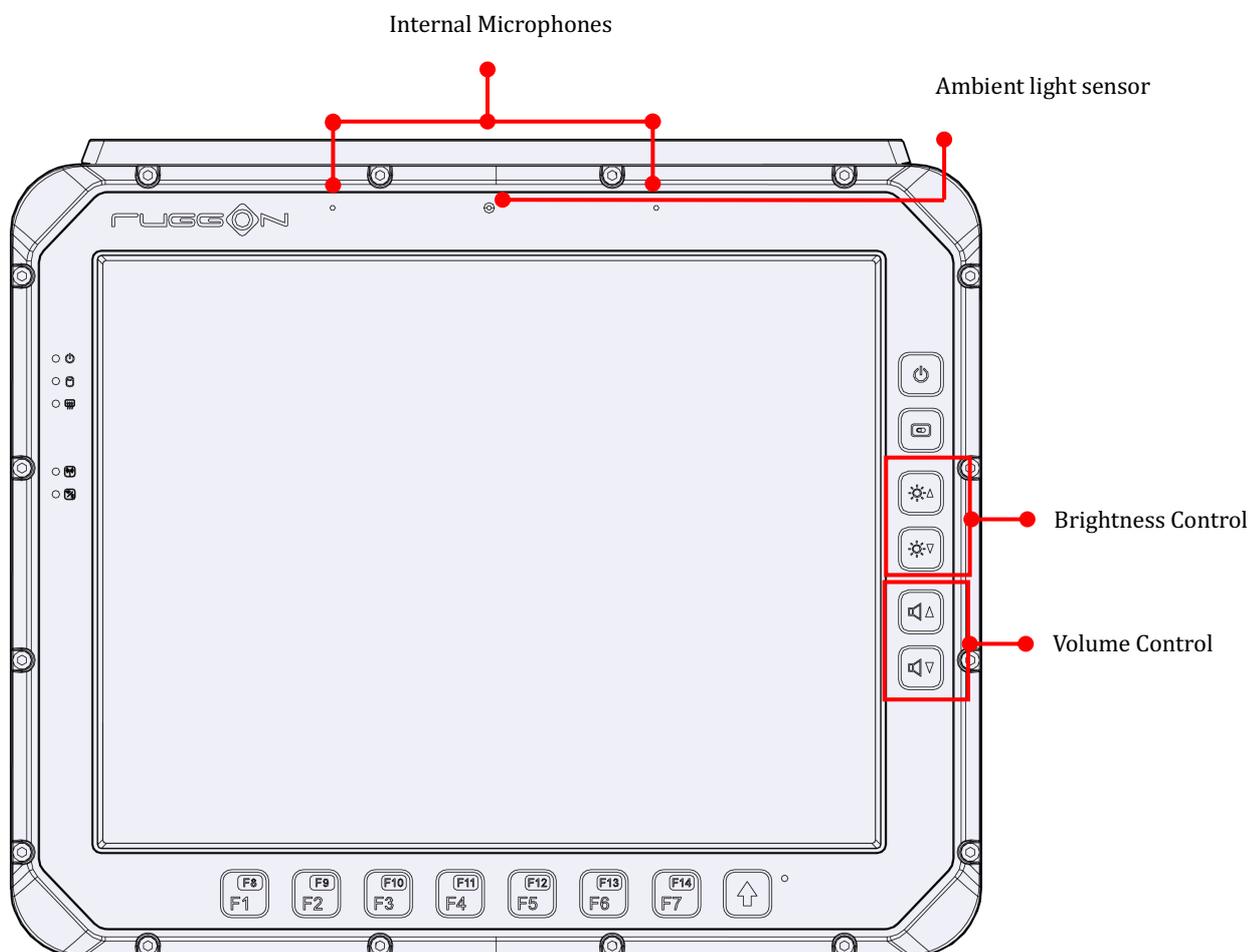
LED	Status	Description
Power	Blink Green	Power up
Power	Blink Yellow	Load BIOS
Power	Solid Green	System ready to use
Power	Blink Red	Vehicle battery abnormal
Storage	Blink Green	Normal operation
Defrost/ Defog	Solid Green	Function turn on/defrost function mark (defrost LED light will only be present for defrost versions)
WWAN	Solid Green	WWAN enabled
WIFI/ BT	Solid Green	WIFI/ BT enabled



Adjust the Speaker Volume

VULCAN X allows you to adjust volume through volume buttons; you can also adjust the volume levels using Windows.

- Press the  button to increase the volume.
- Press the  button to decrease the volume.



Auto-Brightness Adjustment

When you use VULCAN X, you may well encounter different lighting conditions that make it difficult to see the information on screen. VULCAN X's built-in the ambient light sensor on the front panel supports auto-dimming, which you can also disable to manually adjust the brightness; this setting can be done via DashON.

Manual Brightness Adjustment

VULCAN X also supports manual brightness adjustment; you can manually adjust the

brightness by pressing the  or  button.

Internal Microphone

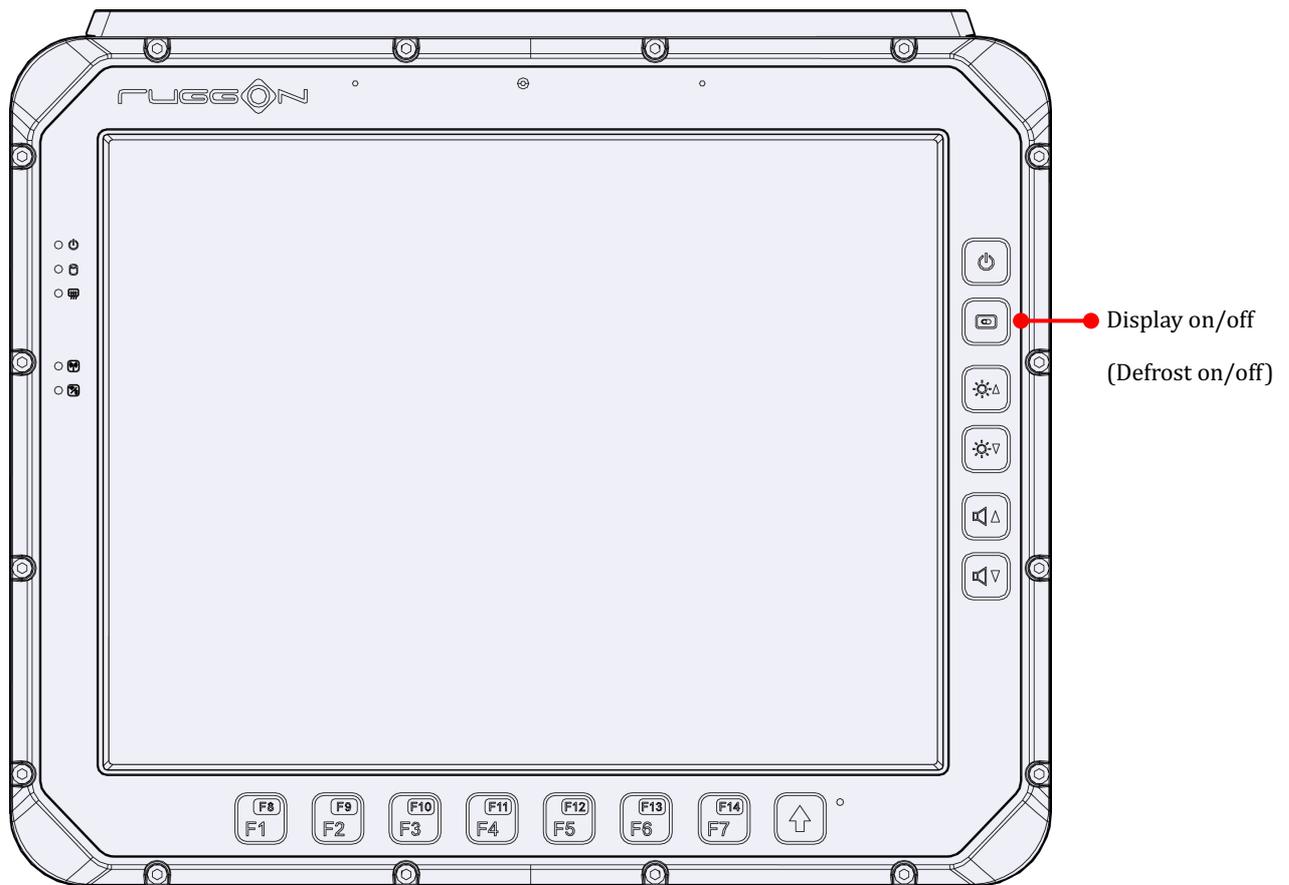
VULCAN X is equipped with an internal microphone, so you don't need an external one. In addition to the built-in speaker and microphones, you can plug external headsets in the audio jack.

Display on/off

To turn on/off the display, press the display button located on the right side of the device.

Defrost and Defog on/off (only available upon request)

In environments where an extreme temperature change occurs, the display can frost/fog up due to such a temperature change. To turn on the defrost function, press and hold the display button for at least 3 seconds. The device will begin to defrost or defog. The function will auto turn off or you can press the key 3 seconds if you no longer want to defrost/defog the device.



Programmable Buttons

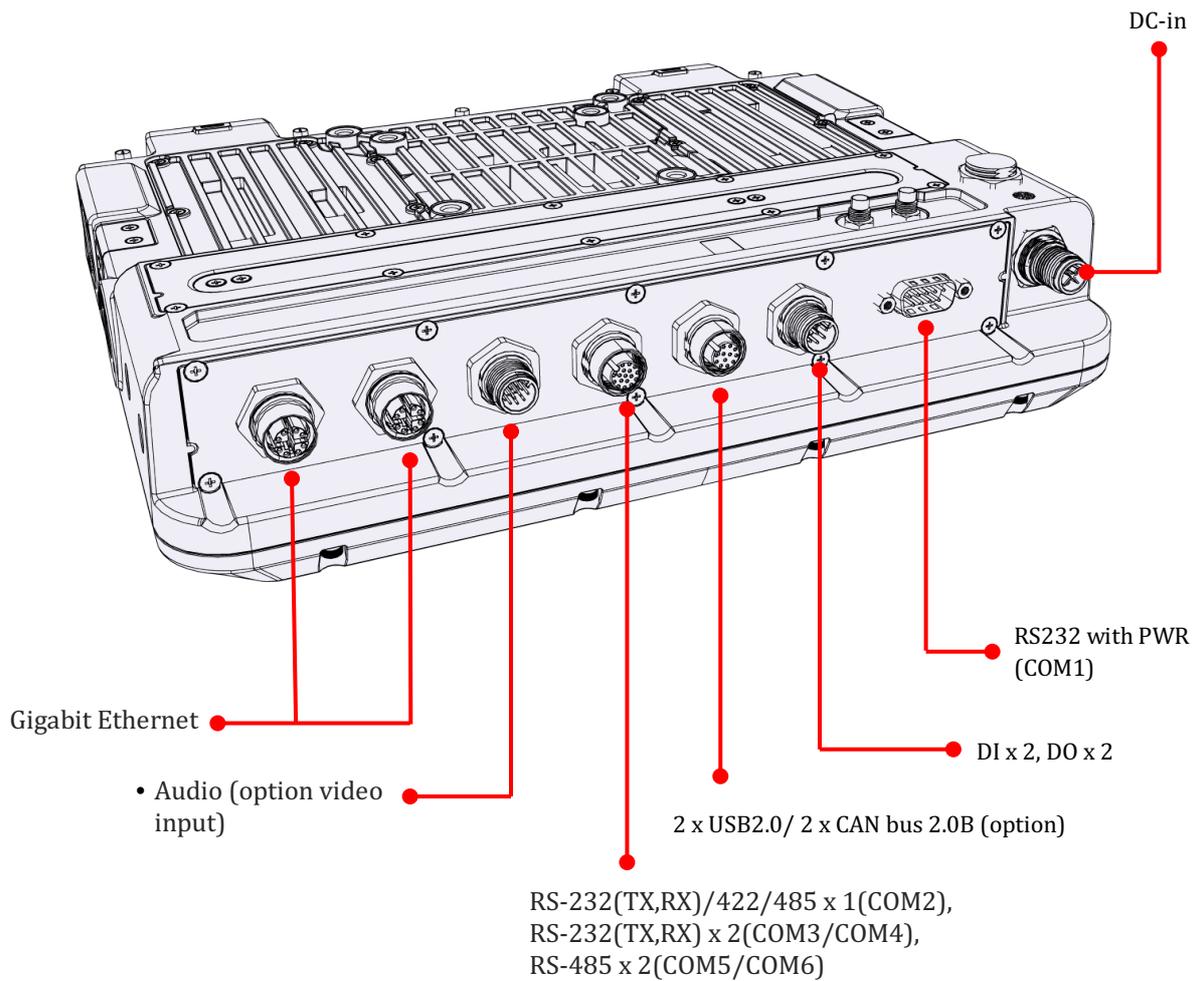
VULCAN X provides seven programmable buttons for default commands. You can configure the programmable buttons via DashON or keymap utility to different commands or keyboard shortcuts to better fit your work style.

Power Management

In addition to settings in Windows Control Panel, VULCAN X also provides DashON for configuration setting including power management and system setup. Please refer to Chapter 7 for configuration setting in DashON.

Chapter 5. Jumpers and Connectors

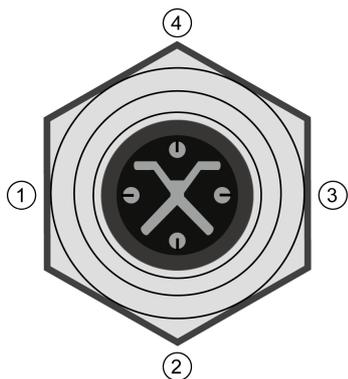
Bottom View



External Connectors Pin Assignments

Use this section as a reference for the pin assignments of the various ports available on the VULCAN X.

Power Connector

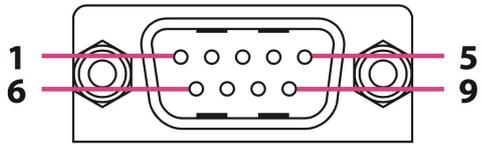


TYPE: M12 S-CODE 4-PIN male connector

Pin	Signal
1	V+
2	ACC
3	V-
4	PE (Safety Ground)

Note: Please refer to Power on through vehicle power cable on page 24 for connecting the external power cable to power source.

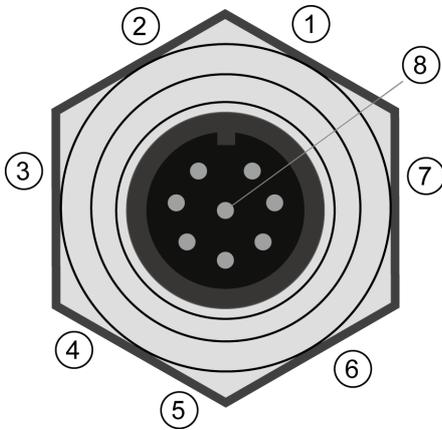
RS-232 Port (COM1)



TYPE: DSUB 9-PIN male connector

Pin	Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	PWR (0/5/12V@600mA , default 0V)

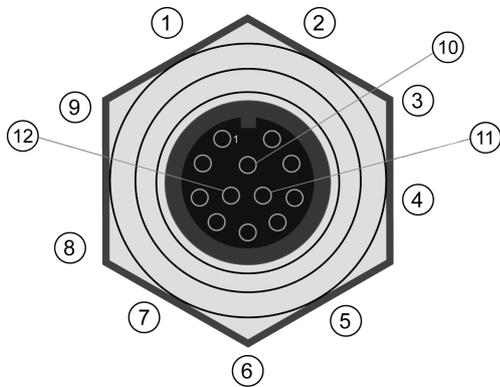
Digital I/O



TYPE: M12 A-CODE 8-PIN male connector

Pin	Signal
1	Do not use
2	Digital Output 0
3	Digital Output 1
4	Digital Input 0
5	Digital Input 1
6	Do not use
7	Digital I/O GND
8	NC

CAN bus Port and Dual USB

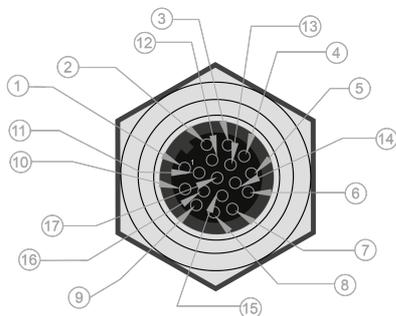


TYPE: M12 A-CODE 12-PIN female connector

Pin	Signal
1	USB Port1: 5V
2	USB Port1 DP
3	USB Port1 DN
4	GND for USB Port1 、 CAN 、 USB Port2
5	CAN Bus CAN_H (RAW CAN)
6	CAN Bus CAN_L (RAW CAN)
7	Isolation_GND *
8	CAN Bus Isolation_CAN_H (RAW CAN/ SAE J1939)
9	CAN Bus Isolation_CAN_L (RAW CAN/ SAE J1939)
10	USB Port2 5V
11	USB Port2 DP
12	USB Port2 DN

*Only with CAN Bus Signal Isolation

RS-232/422/485 Port (COM2~COM6)



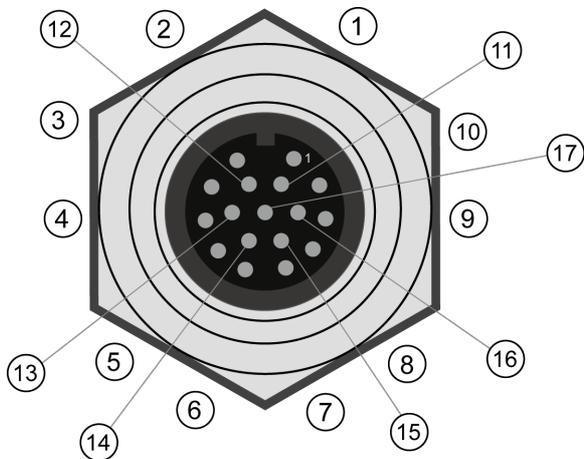
VULCAN X is equipped with 1 x RS-232(TX/RX)/422/485, 2 x RS-232(TX,RX) and 2 x RS-485. Refer to the pin definition of RS-232/422/485 Port in the following.

TYPE: M12 A-CODE 17-PIN female connector

Pin	Signal
1	COM2 RS232 DTR or RS422 RN
2	COM2 RS232 TXD or RS422 RP
3	COM2 RS232 DCD or RS422 TN or RS485 DN
4	COM2 RS232 RXD or RS422 TP or RS485 DP
5	COM3 RS232 RXD
6	COM3 RS232 TXD
7	COM4 RS232 RXD
8	COM4 RS232 TXD
9	COM5 RS485 DN
10	COM5 RS485 DP
11	GND
12	GND
13	GND
14	COM6 RS485 DN
15	GND
16	GND
17	COM6 RS485 DP

M12 A CODE 17-PIN connector to DSUB connector adapter cable is also available. Please contact your local sales representative for ordering information.

Video Capture/ Headset

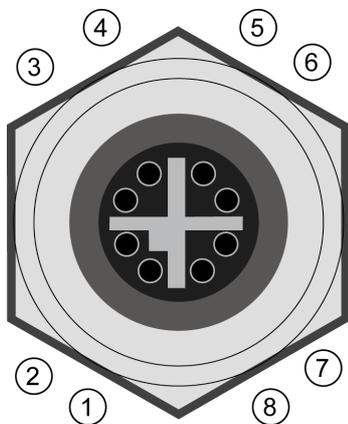


TYPE: M12 A-CODE17-PIN male connector

Pin	Signal
1	CH1 AUDIO
2	CH4 AUDIO
3	CH4 VIDEO
4	HEADPHONE_OUT_R
5	HEADPHONE_OUT_L
6	HEADPHONE_GND
7	HEADPHONE_MIC
8	CH2 VIDEO
9	CH2 AUDIO
10	CH1 VIDEO
11	CAPTURE CARD GND
12	CAPTURE CARD GND
13	HEADPHONE_DETECT*
14	HEADPHONE GND
15	CAPTURE CARD GND
16	CH3 AUDIO
17	CH3 VIDEO

*Please contact PIN13 (DETECT) wire and PIN14 (GND) wire in diverts audio to headset from the built-in speakers/microphone.

Ethernet Port



TYPE: M12 X-CODE 8-PIN female connector

Pin	Signal
1	DA+
2	DA-
3	DB+
4	DB-
5	DD+
6	DD-
7	DC-
8	DC+

Chapter 6. Key Mapping

Please refer to the following chart for programmable button key mapping.

Key Button	App Get Key (code 1)
F1	E0 55
F2	E0 56
F3	E0 57
F4	E0 6E
F5	E0 12
F6	E0 13
F7	E0 14
F8	E0 1B
F9	E0 1E
F10	E0 1F
F11	E0 23
F12	E0 25
F13	E0 26
F14	E0 27

Chapter 7. DashON Setting

You can use DashON to configure the device for your demo or test. We also provide the corresponding SDK for your application development. DashON will auto-run in background while the system turns on. This section is to brief you on what functions are included in DashON and how to set up based on Windows OS.

1. Device Information

It provides information of the system hardware, software, and firmware version.

2. Vehicle Status

This section is to demo how to read the vehicle information such as vehicle battery voltage, fuel, speed and so on while connecting with vehicle SAE J1939. We use a simulator to run the demo.

3. Communication Setting

This is to enable / disable Wi-Fi/BT/WWAN and configure the related setting.

4. System Status & Setting

This section contains the major configuration of the system device. Power management, wake up event, IO configuration, brightness and watchdog timer setting are included.

5. Location & Sensor

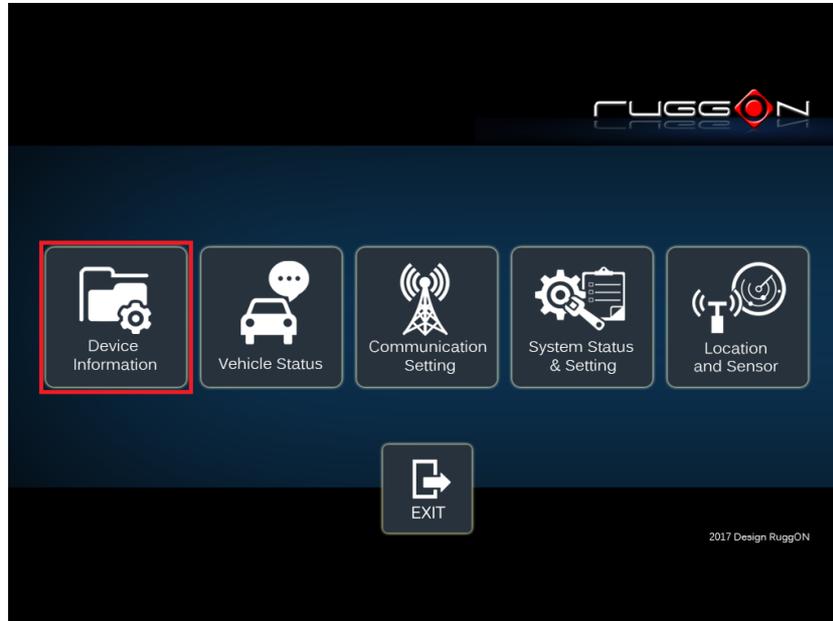
GPS module setting

Double click on the DashON icon if DashON is not running in background

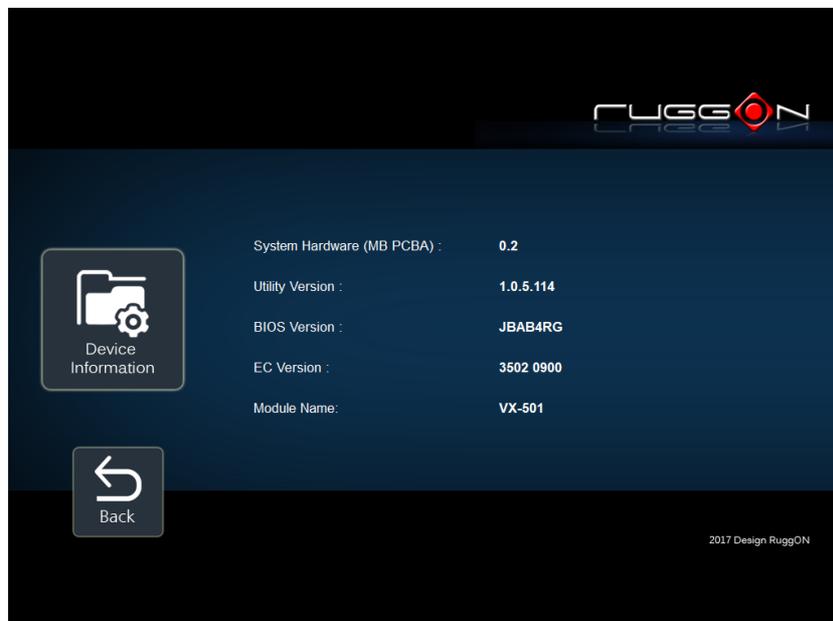


Device Information

Click on the “Device Information” icon



In device information, you can see the PCBA version, DashON utility version, BIOS version, EC version, and system model name.



Vehicle Status

Vehicle status shows some vehicle information from the simulator.

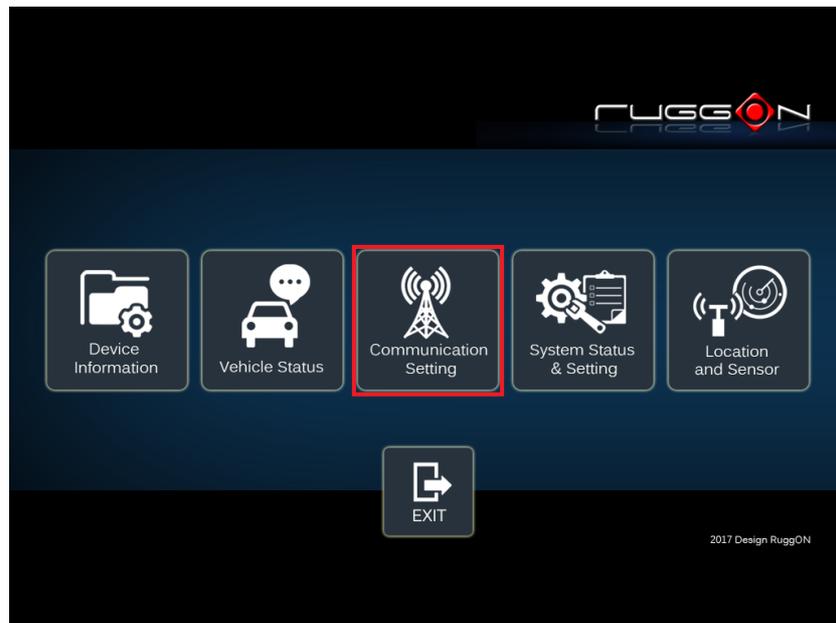


The related AT command is available upon request. Please contact local sales representatives or login to the support website.

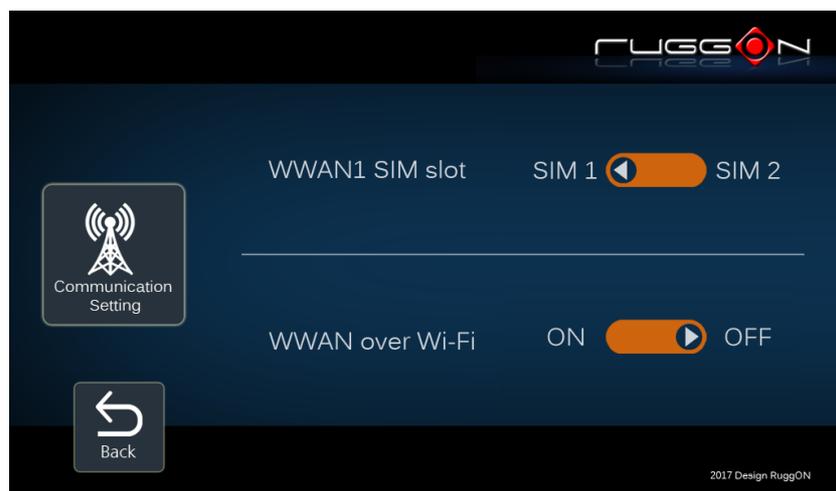


Communication Setting

Communication setting allows you to set the two major features including SIM slot selection and wireless priority via DashON utility. Please click on the “Communication Setting”



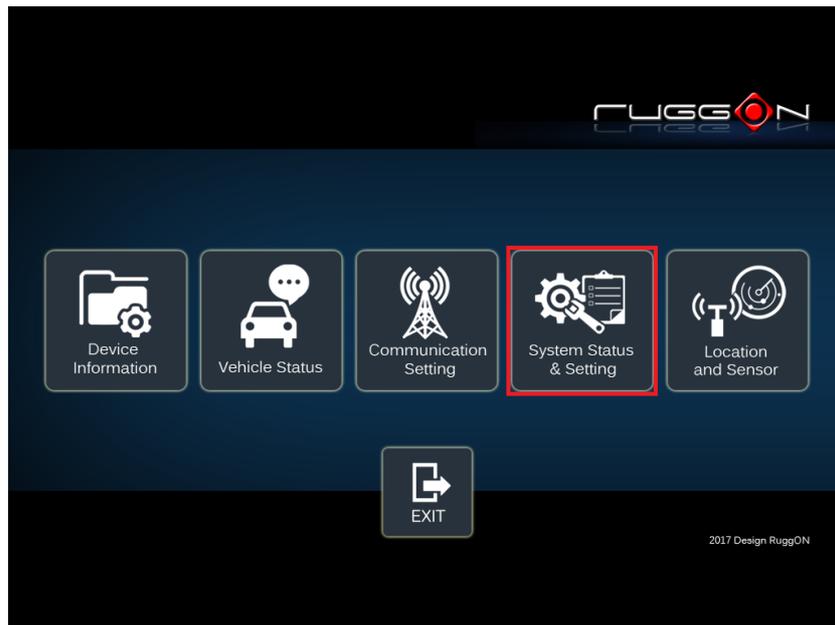
If WWAN module is present in the device, you can set the two features.



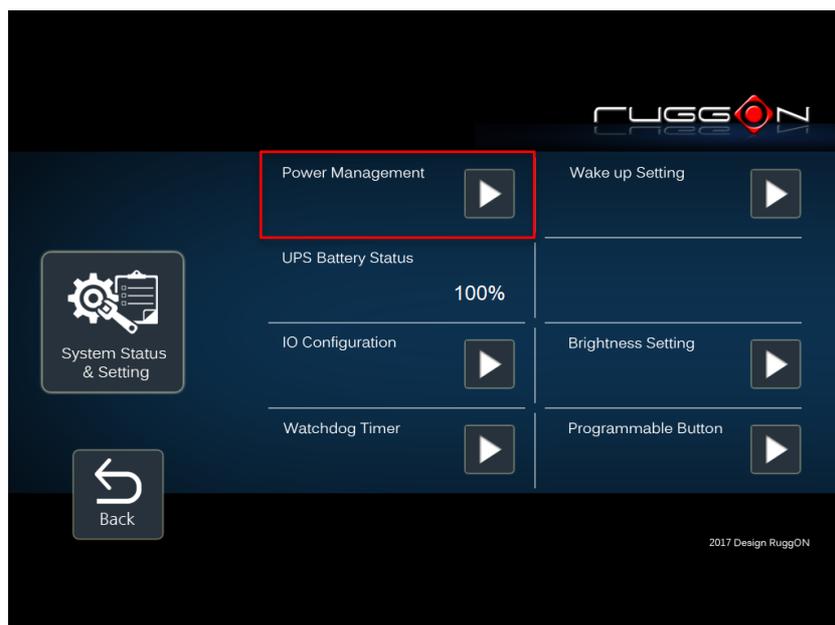
System Status & Setting

This section is to set and read the system status. It covers power management, internal battery, IO configuration, wake up event and so on.

Power Management Setup

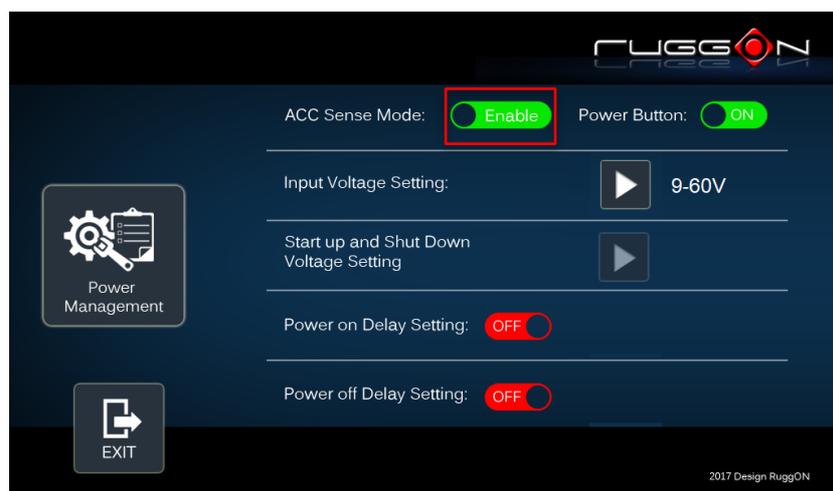


Please click on the “Power Management”



ACC Detection Setting

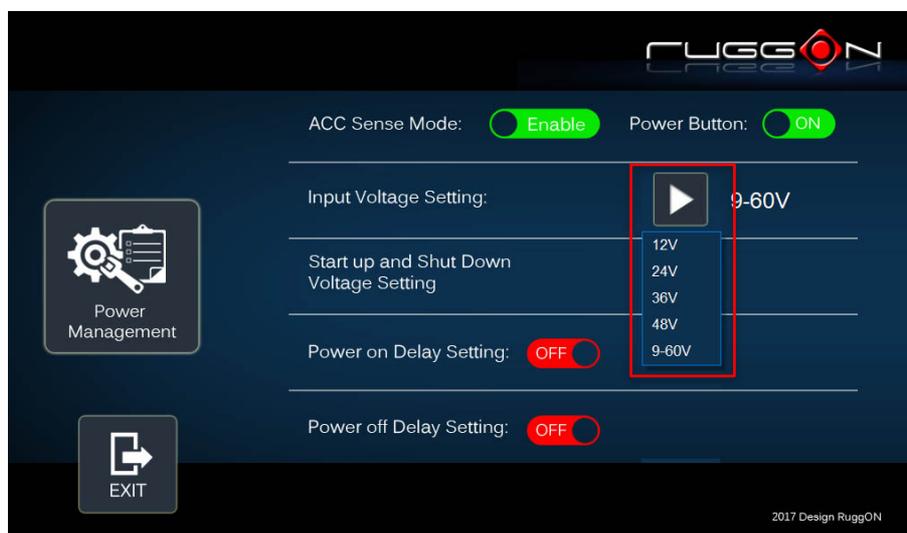
In VULCAN X design setting, it supports ACC sense. You can check its status from ACC status. Default is ACC mode enable.



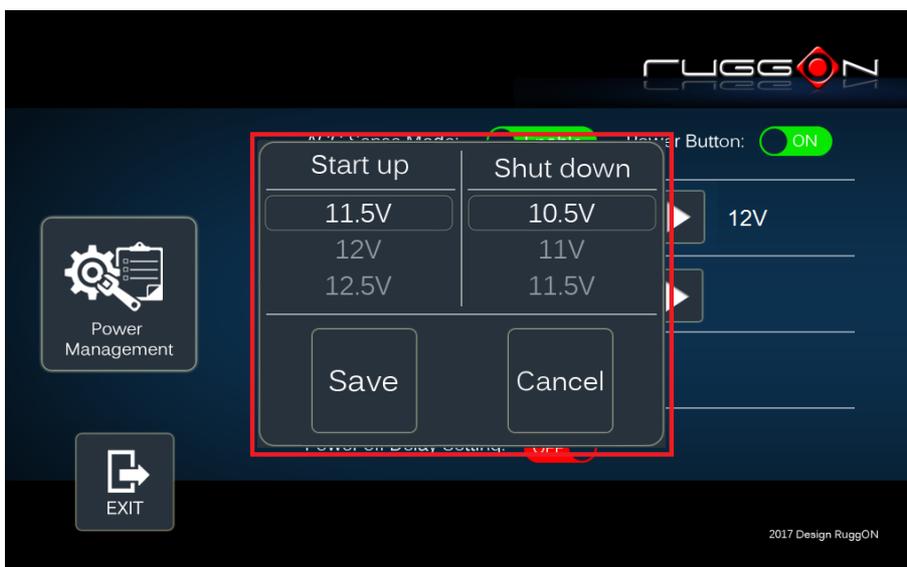
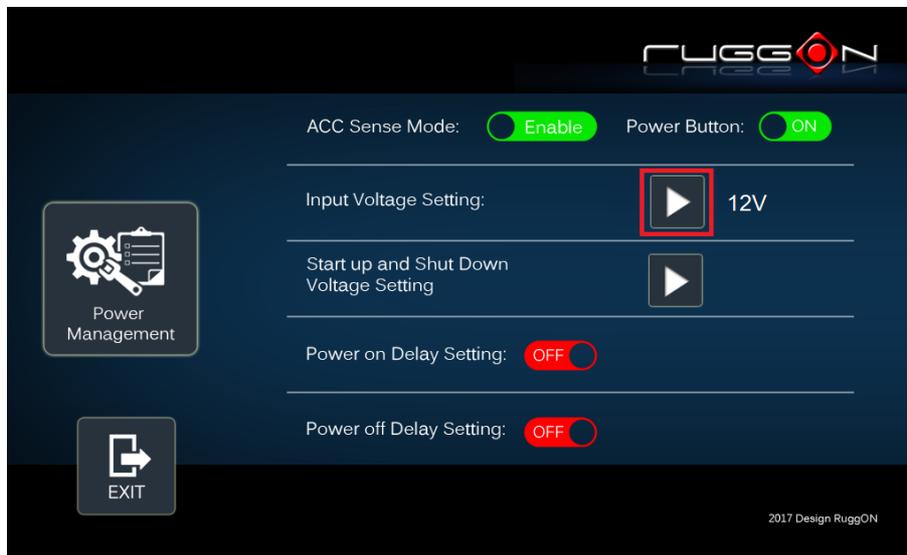
Input Voltage Setting

Click on the  to the input voltage selection.

You can select the power input voltage either 9~60V or 12V, 24V, 36V or 48V. If 9~60V is selected, it means the system can be powered on while the voltage ranges from 9~60V. Please note if you use a 19V power adapter, the input voltage must be selected to 9~60V.



If 12V, 24V, 36V or 48V is selected, you can also select the startup and shut down voltage setting.



If the above selection items do not meet your demand, please contact local sales representatives.

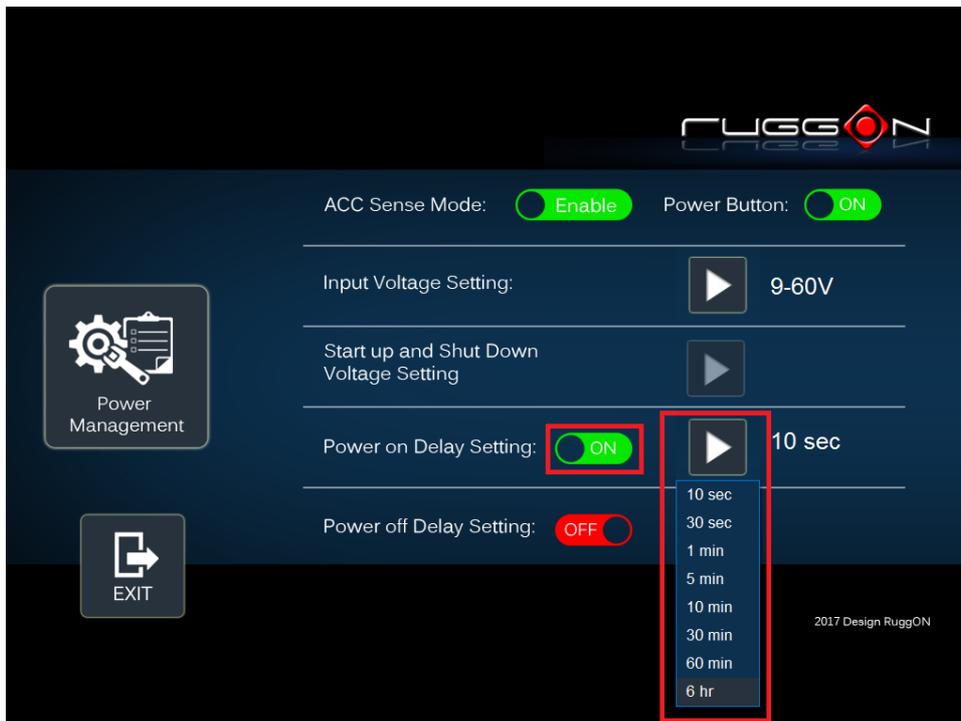
Power On/Off Delay Setting

Power on delay function enables you to power on the device after the ACC is on for a specified period of time. Enabled power off delay function lets the device remain on until the ACC is off for a specified period of time.

Power On Delay

You can set the system startup time after ACC is on.

Switch the  to , click on the , and you will see the selection list. Delay time can be set at 10sec/30sec/1min/5min/10min/30min/60min/6hr

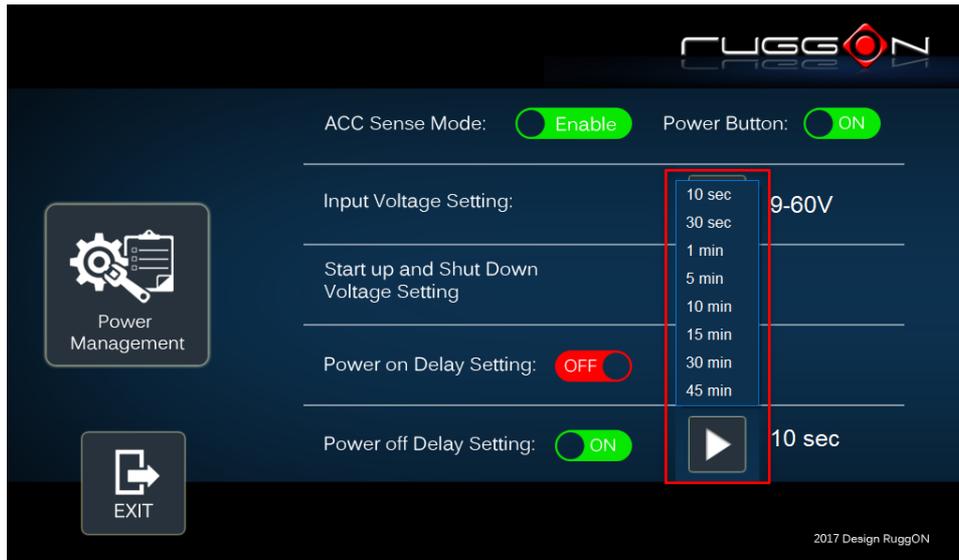


Power Off Delay

You can set the system shut down time after ACC is off.

Same as power on delay setting process; you can also set the power off delay.

Delay time can be set at 10sec/30sec/1min/5min/10min/15min/30min/45min

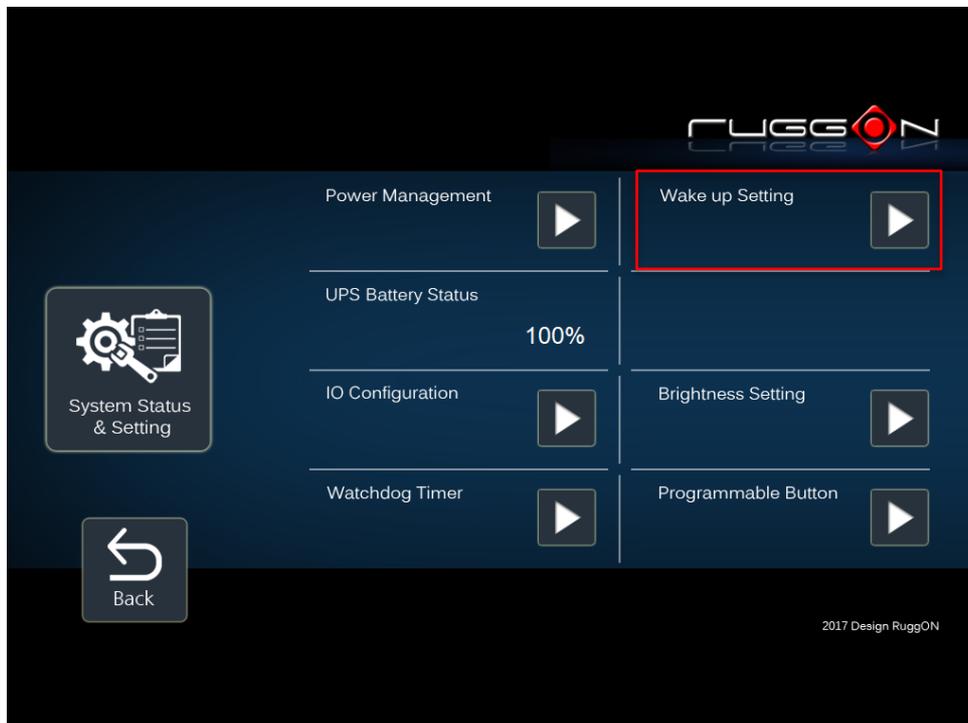


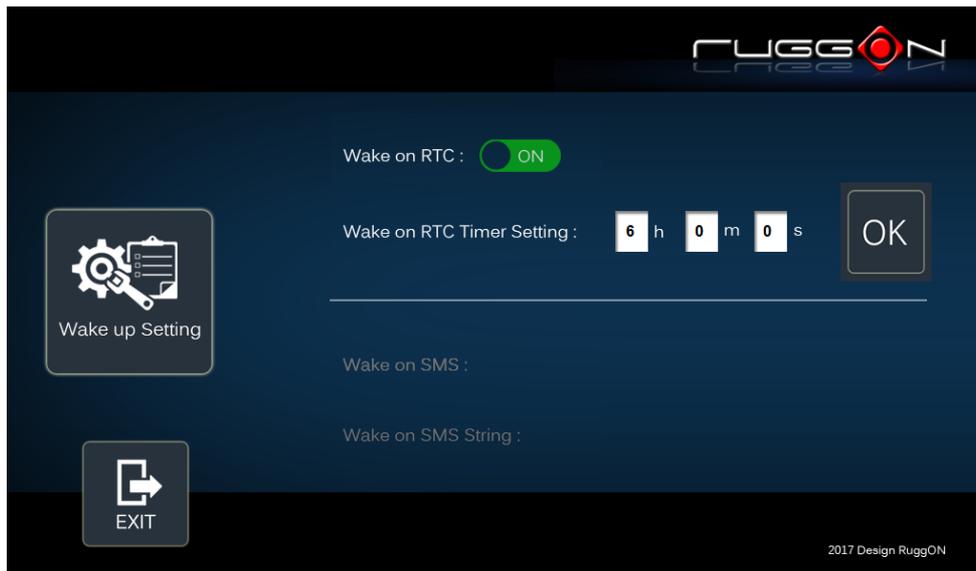
Wake up Setting

In addition to ACC sense, two wake-up events are able to power up the device. They belong to RTC wake up. Here is the setting method.

“System Status & Setting”-> “System Status & Setting” ->”Wake up Setting”

In Wake up setting, you can find “Wake on RTC” setting

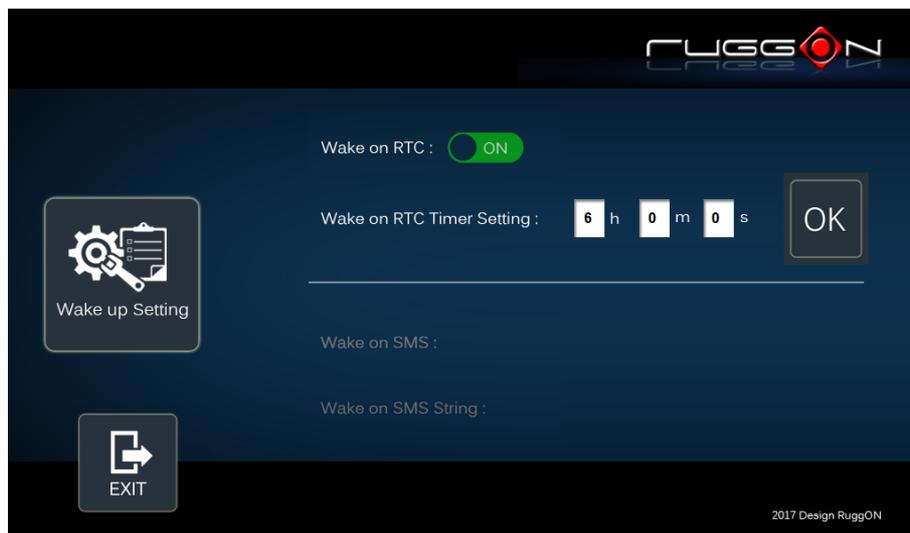




RTC wake up setting

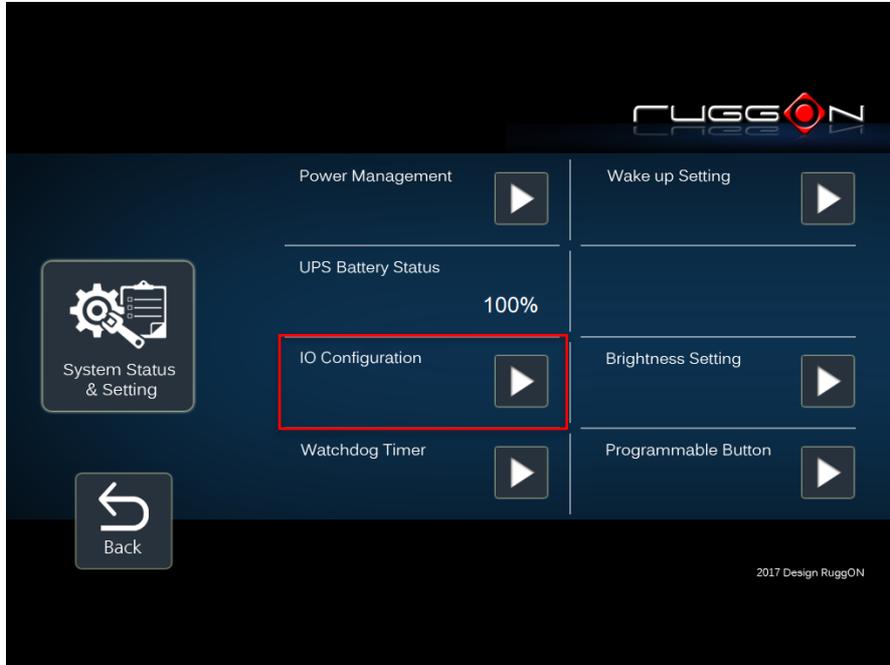
Click on the  to , you can find RTC timer setting to set the desired time to power up the system.

After you have finished with the setup, click on the “OK” to save the value. For example, if you set 06:00:00, it means the system will be powered up at 6 o'clock in the morning.



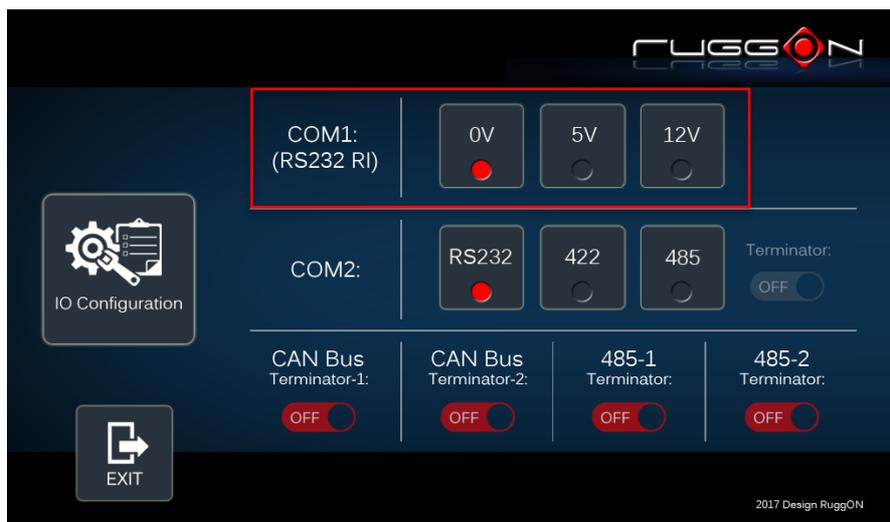
I/O Configuration

Please click on the I/O Configuration



COM1 Setting

RS232 (COM1) supports 5V or 12V power output for users to easily connect with barcode scanner or other equipment. The maximum current is up to 600mA.

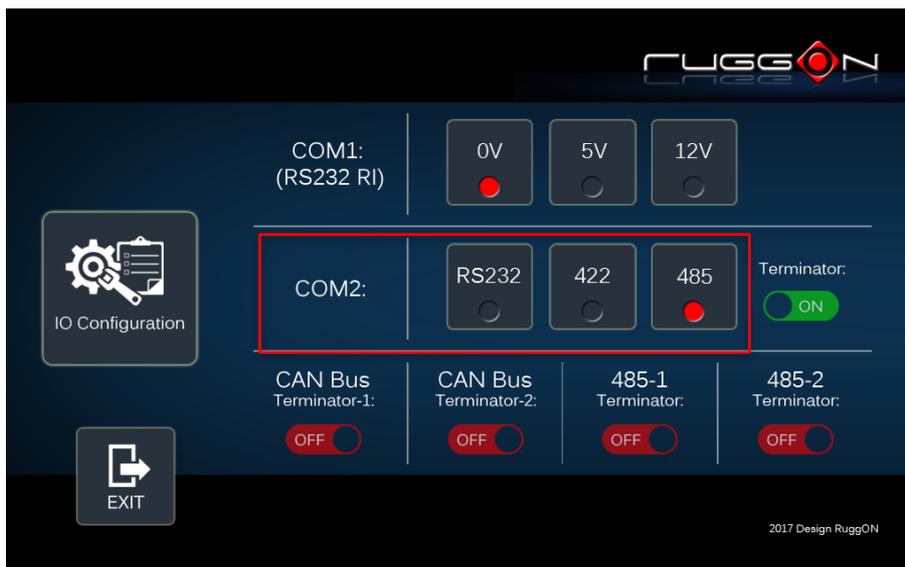


If you don't need the power output, just select 0V output to avoid the equipment damage. Please note if system power source is from internal battery (no DC input available), COM1

will stop supplying the power output.

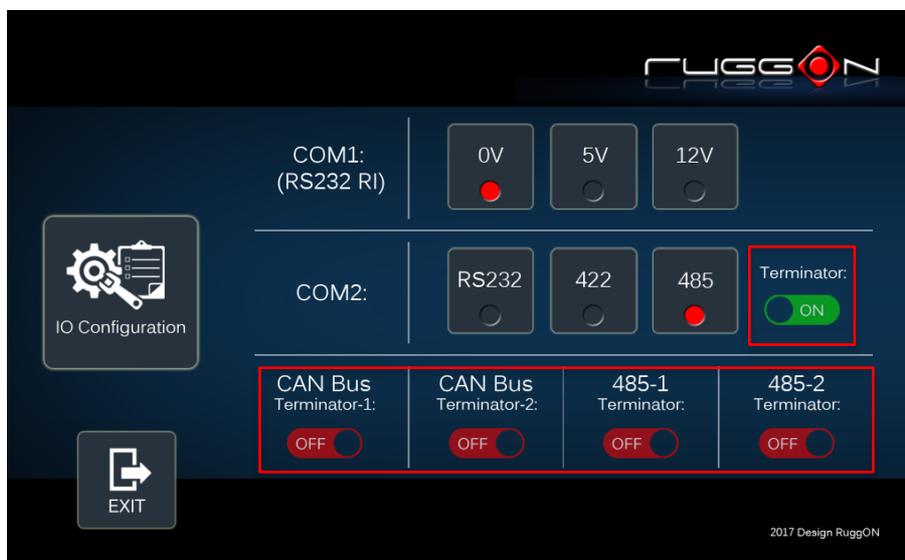
COM2 Setting

The COM2 includes RS-232, RS-422 and RS-485 signals. Please select your required items and connect the cable converter to the system. Please refer to the pin out description for correct connection.



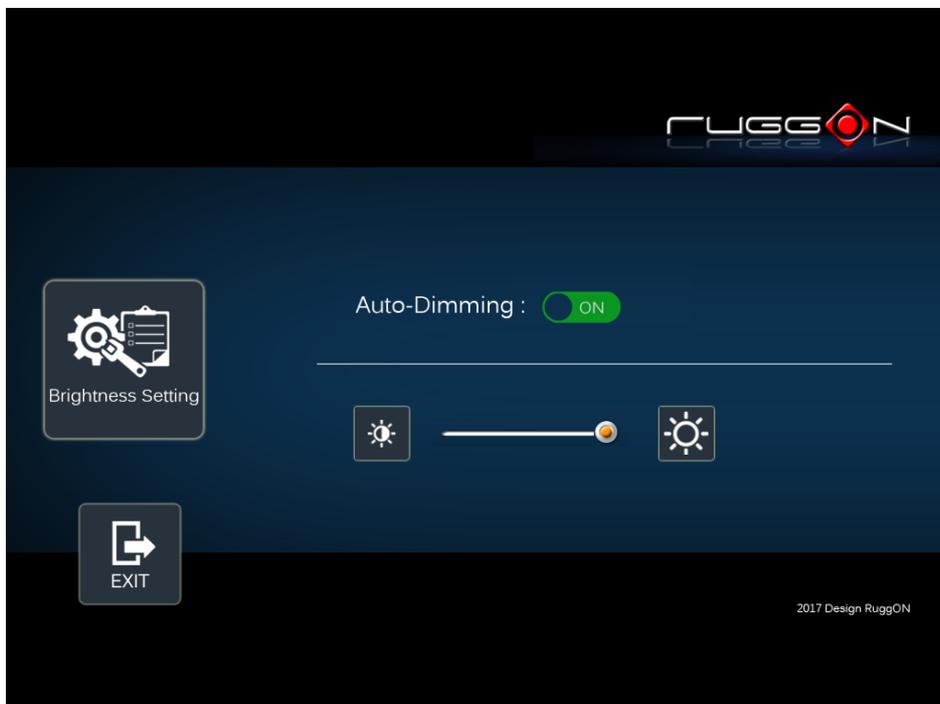
Termination Switch

VULCAN X provides a solution for connecting and disconnecting the RS-422/485 and CAN bus termination resistor in multiprotocol applications. This solution eliminates for manual jumperslike.



Brightness Setting

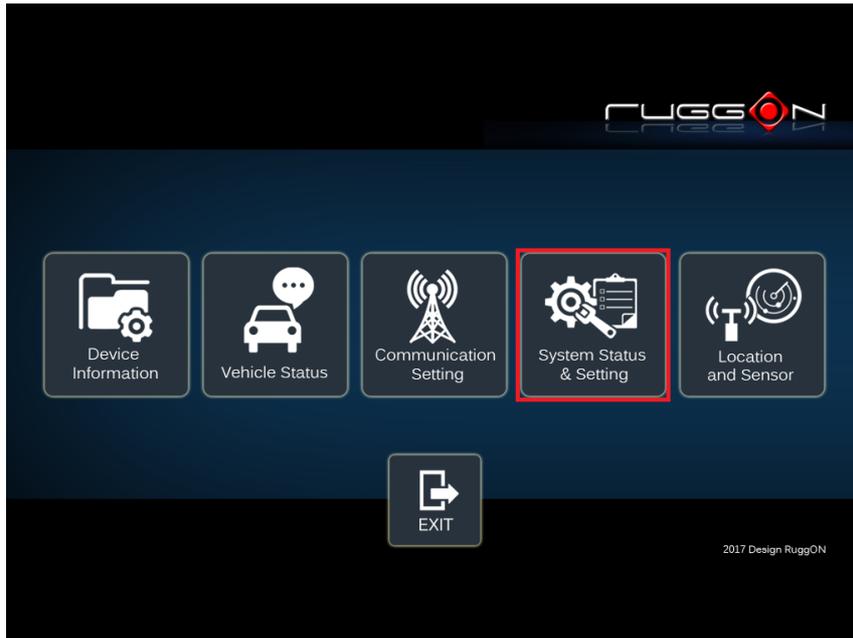
Brightness adjustment is to optimize the operation of the backlight LEDs under a variety of daylight conditions. VULCAN X supports auto-dimming and manually adjusts the brightness. If auto-dimming is enabled, the brightness is auto adjusted along with the changes of environmental light. You can also manually change the display brightness via programmable buttons or the bar adjustment in DashON. For programmable button setting, please see “Programmable Button “section. VULCAN X’s display brightness is set to automatic adjustment. You can also turn off “Auto-Dimming” and drag the scroll bar to adjust display brightness.



Watchdog Timer

This section is about the timer setting of watchdog and the simulation of watchdog functions. When the system is hanging due to some reasons, you are able to reboot the system automatically after the set time frame.

Double click on the DashON icon, and then click on the 4th icon “System Status & Setting”.



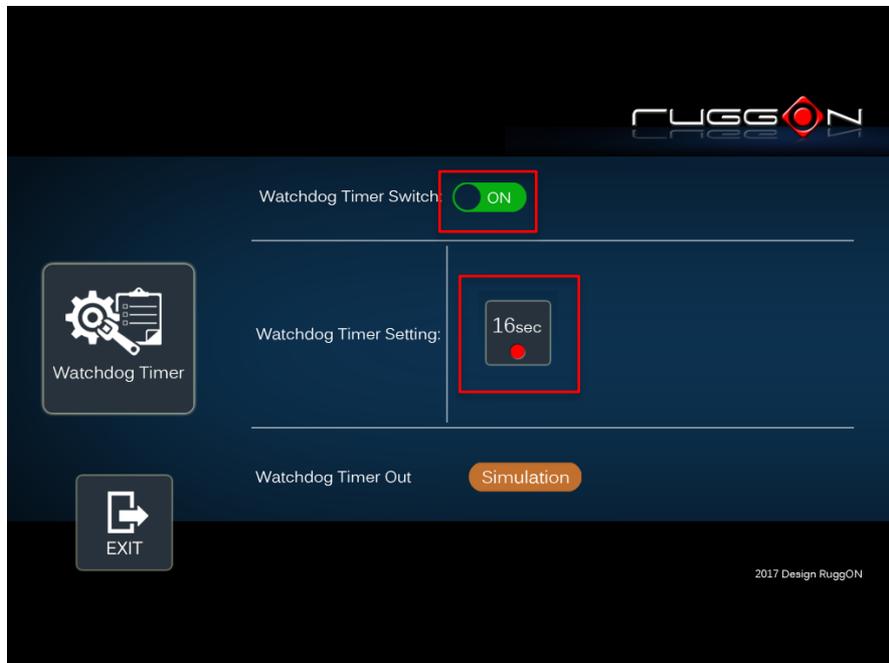
Click on the “Watchdog Timer”



Select the timer setting.



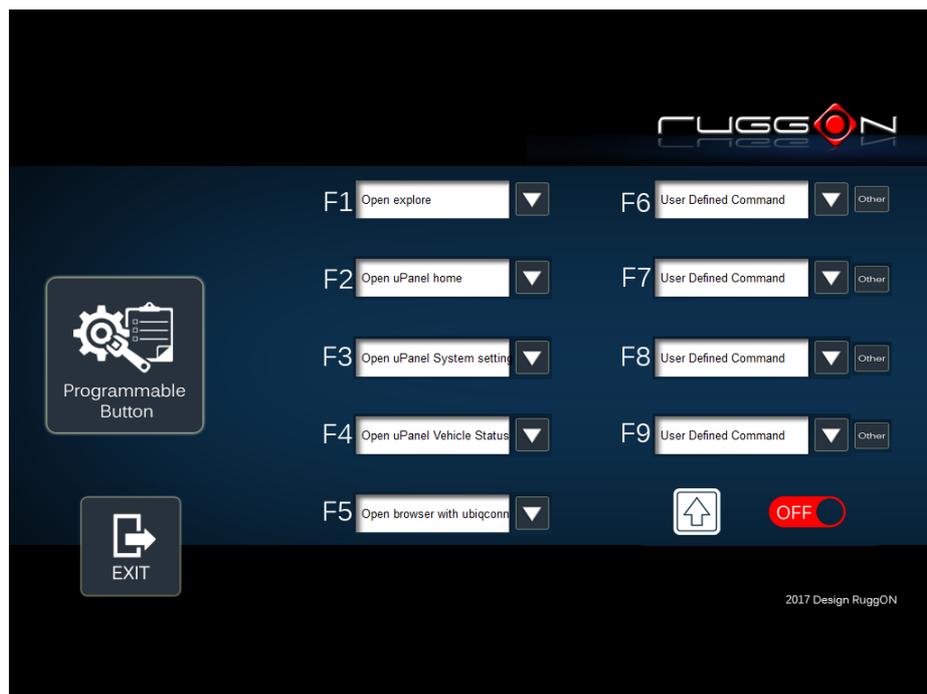
Turn on the watchdog switch.



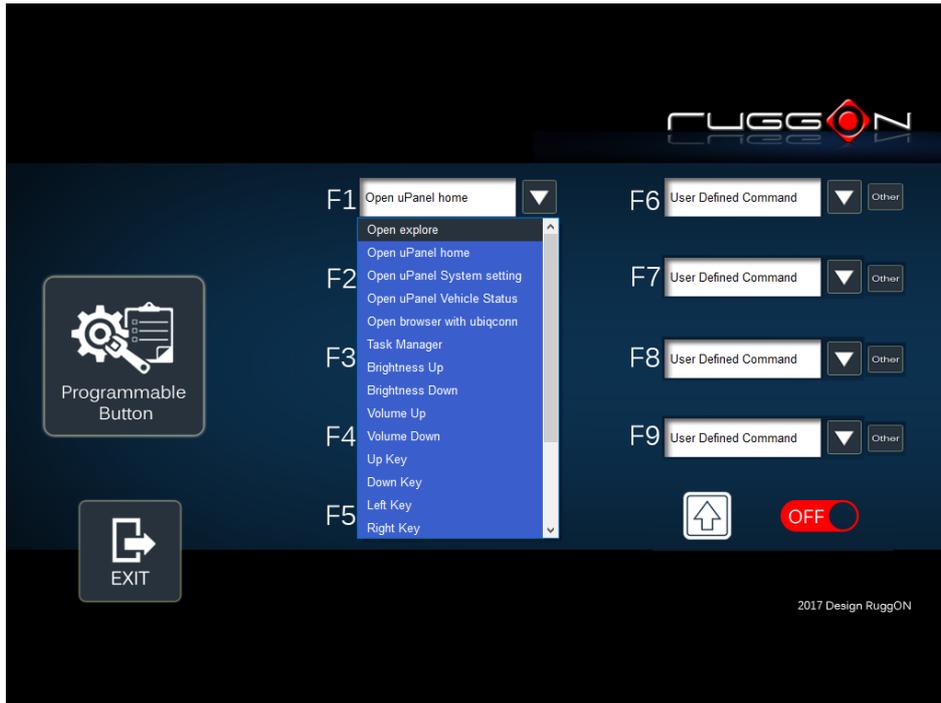
If you'd like to test if watchdog timer is enabled and working, please click on the "simulation" icon. The "simulation" is to simulate the system on hang and reboot it after the set time frame.

Programmable Button

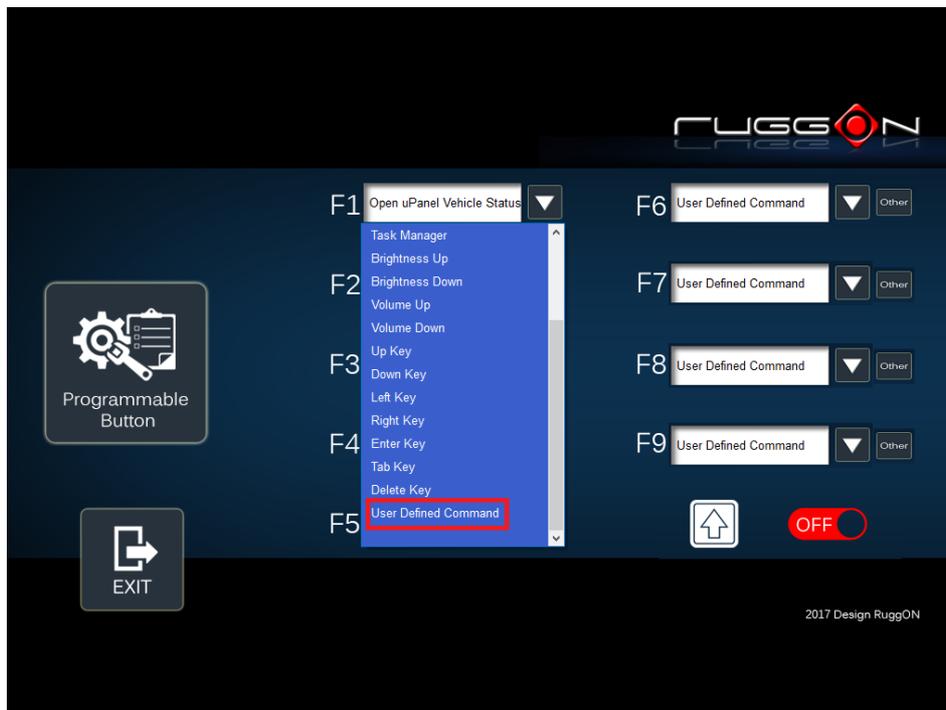
Programmable buttons can be set to different functions per user's definition.



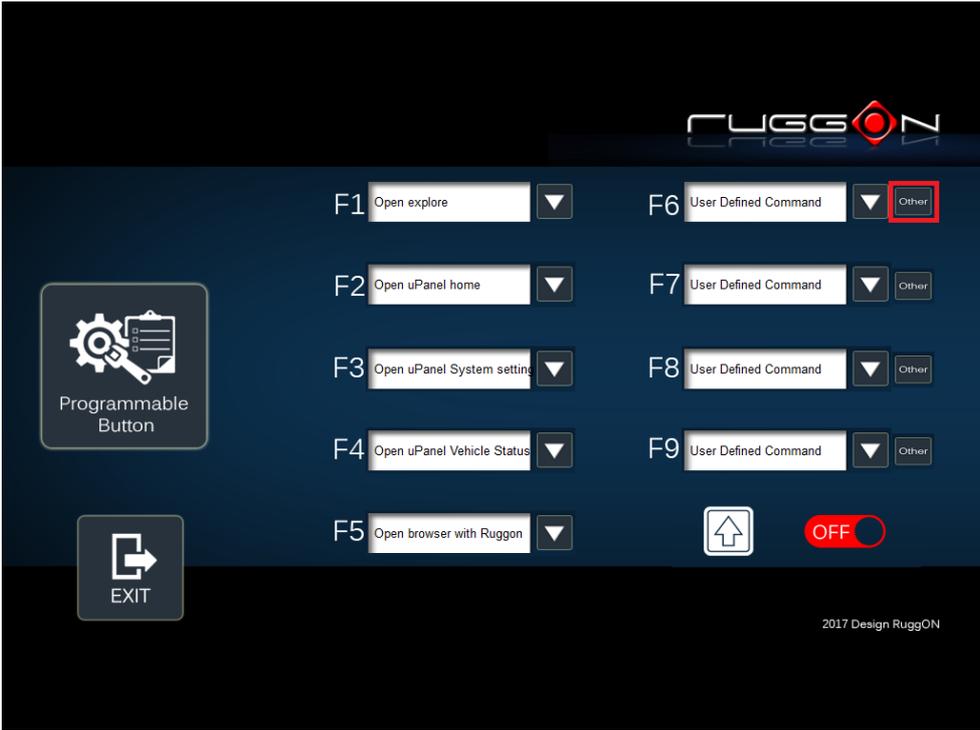
Select which function key button you want to set and then click on the  to select the function from the list.



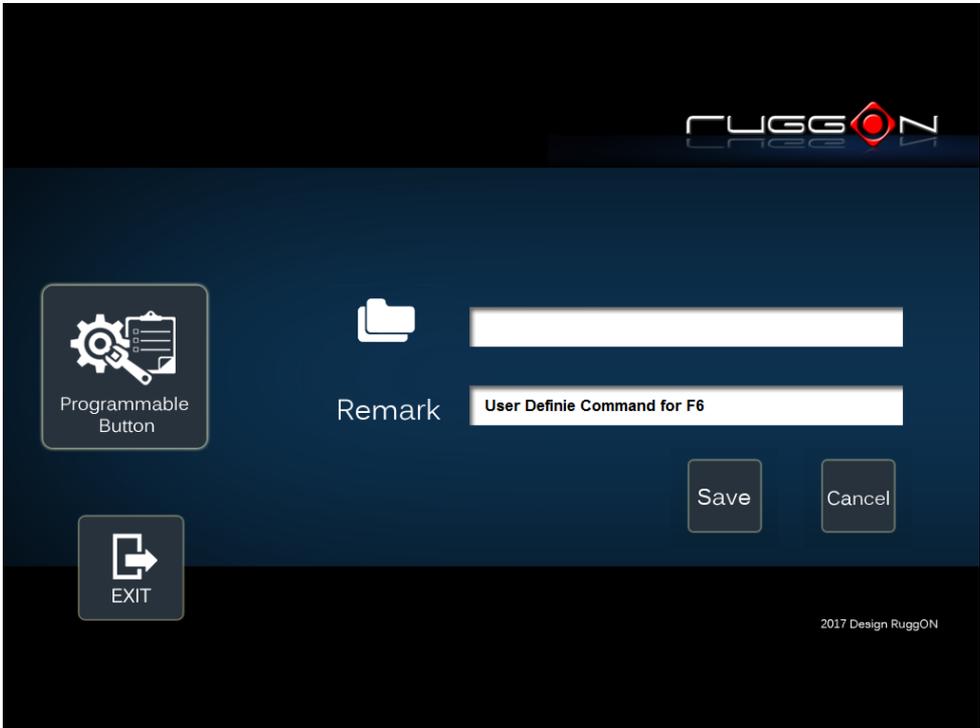
User can also define the keystrokes for function keys by selecting the “User Defined Command” from the list.



Click on the “Other”



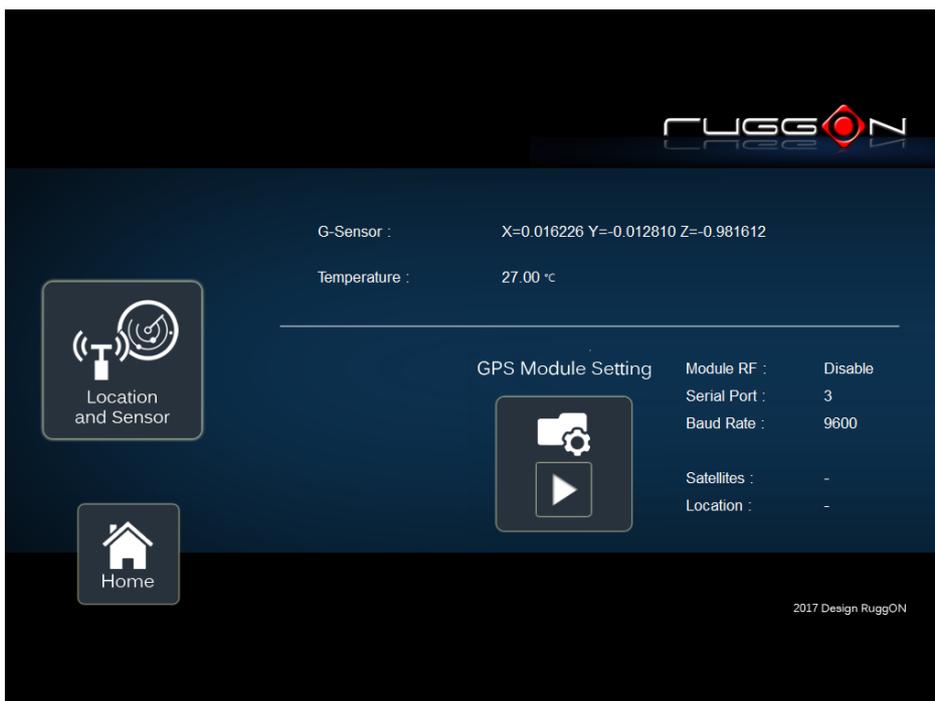
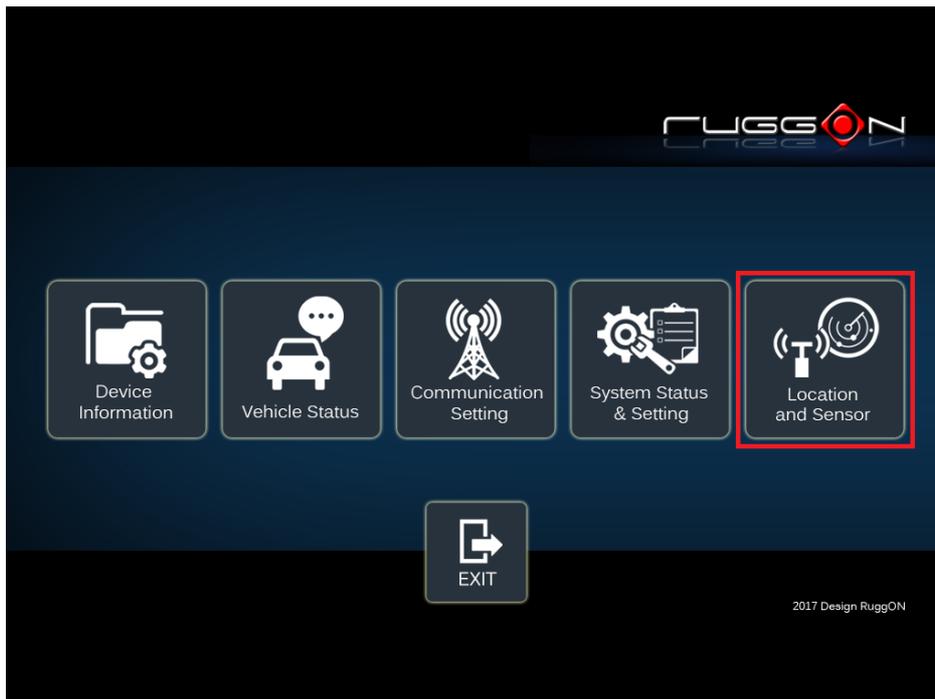
Click on the folder icon to find the program files and then click on the “Save” to save the setting.



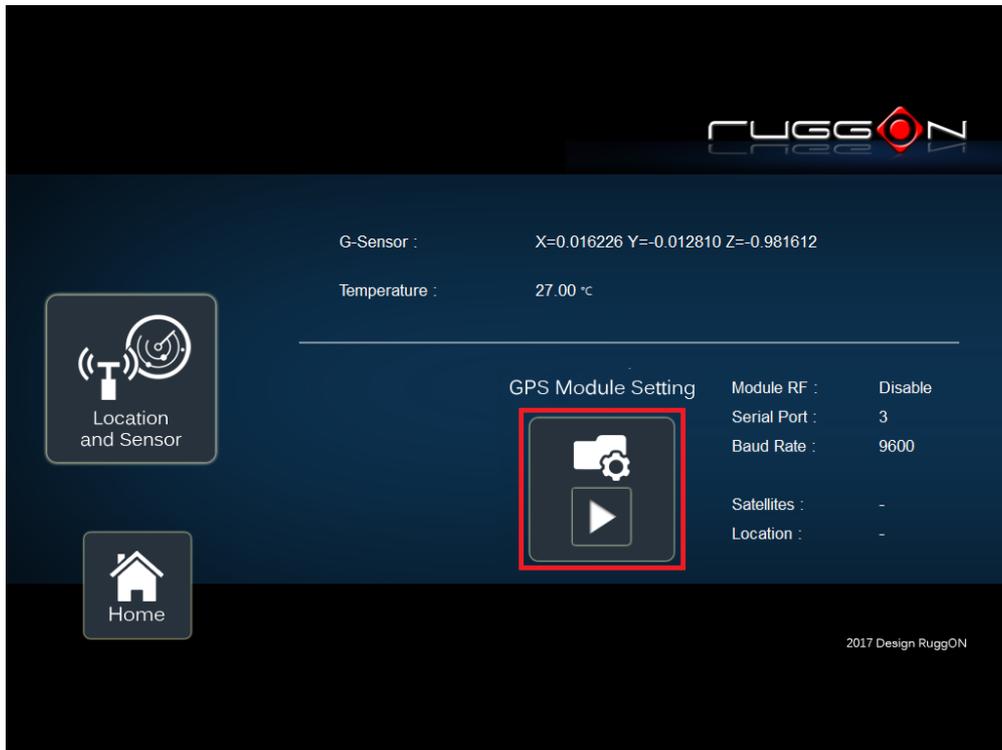
Location and Sensor

VULCAN X provides the GPS receiver and G-Sensor built-in. DashON provides both setting and information and also links to the Google map locations for demo applications. You can also use the general freeware GPS viewer to set GPS setting.

Click on the “Location and Sensor”



DashON includes the GPS receiver setting information, click on  to set the GPS.



After click on , you will see the module On/ Off setting screen.



The default GPS receiver is enabled in VULCAN X. If want to disable the receiver, switch

“Module RF” to .



APPENDIX A External Cable Pin

Definition

External power cable wiring

External cable connector type: M12 S-CODE 4-PIN female connector to fork terminals (D:6.4mm, W:10.7mm)

Wire Color	Signal
RED	V+
BLACK	V-
GREEN	PE (Safety Ground)
WHITE	ACC/ Ignition

Digital I/O

External cable connector type: M12 A-CODE 8-PIN female connector to DB9 female connector

DB9 connector pin definition

Pin	Signal
1	Do not use
2	Digital Output 0
3	Digital Output 1
4	Digital Input 0
5	Digital Input 1
6	Do not use
7	Digital I/O GND
8	NC
9	NC

CAN bus Port and Dual USB

External cable connector type: M12 A-CODE 12-PIN male connector to DB9 female or USB type A connector

DB9 connector pin definition

Pin	Signal
1	CAN Bus CAN_H
2	CAN Bus CAN_L
3	GND for USB Port1 、 CAN 、 USB Port2
4	NC
5	NC
6	NC
7	Isolation_GND *
8	CAN Bus Isolation_CAN_H
9	CAN Bus Isolation_CAN_L

RS-232/422/485 Port (COM2~COM6)

External cable connector type: M12 A-CODE 17-PIN male connector to DB9 male connector

DB9 connector pin definition

Pin	Signal (RS232/422/485 COM2)
1	COM2 RS232 DCD or RS422 TN or RS485 DN (PIN3)
2	COM2 RS232 RXD or RS422 TP or RS485 DP (PIN4)
3	COM2 RS232 TXD or RS422 RP (PIN2)
4	COM2 RS232 DTR or RS422 RN (PIN1)
5	GND (PIN12)
6	NC
7	NC
8	NC
9	NC

Pin	Signal (RS232 COM3)
1	NC
2	COM3 RS232 RXD (PIN5)
3	COM3 RS232 TXD (PIN6)
4	NC
5	GND (PIN13)
6	NC
7	NC
8	NC
9	NC

Pin	Signal (RS232 COM4)
1	NC
2	COM4 RS232 RXD (PIN7)
3	COM4 RS232 TXD (PIN8)
4	NC
5	GND (PIN15)
6	NC
7	NC
8	NC
9	NC

Pin	Signal (RS485 COM5)
1	COM5 RS485 DN (PIN9)
2	COM5 RS485 DP (PIN10)
3	NC
4	NC
5	GND (PIN11)
6	NC
7	NC
8	NC
9	NC

Pin	Signal (RS485 COM6)
1	COM6 RS485 DN (PIN14)
2	COM6 RS485 DP (PIN17)
3	NC
4	NC
5	GND (PIN16)
6	NC
7	NC
8	NC
9	NC

APPENDIX B Programmable Button

Key Mapping for Linux

How to set up the hard button key mapping

1. Under Linux original environment, these key scan codes are not included in kernel mapping table, it need load these scan codes during system start up
2. Linux provides one command to load specified scan code to mapping table, commend syntax is as below:

```
SETKEYCODES(8)    System Manager's
Manual            SETKEYCODES(8)
```

NAME

`setkeycodes` - load kernel scancode-to-keycode mapping table entries

SYNOPSIS

```
setkeycodes scancode keycode ...
```

DESCRIPTION

The `setkeycodes` command reads its arguments two at a time, each pair of arguments consisting of a scancode (given in hexadecimal) and a keycode (given in decimal). For each such pair, it tells the kernel keyboard driver to map the specified scancode to the specified keycode.

This command is useful only for people with slightly unusual keyboards, that have a few keys which produce scancodes that the kernel does not recognize.

THEORY

The usual PC keyboard produces a series of scancodes for each key press and key release. (Scancodes are shown by **showkey**, see `showkey(1)`) The kernel parses this stream of scancodes, and converts it to a stream of keycodes (key press/release events). (Keycodes are shown by **showkey**.)

Apart from a few scancodes with special meaning, and apart from the sequence produced by the Pause key, and apart from shiftstate related scancodes, and apart from the key up/down bit, the stream of scancodes consists of unescaped scancodes `xx` (7 bits) and escaped scancodes `e0 xx` (8+7 bits). To these scancodes or scancode pairs, a corresponding keycode can be assigned (in the range 1-127). For example, if you have a Macro key that produces `e0 6f` according to `showkey(1)`, the command

```
setkeycodes e06f 112
```

will assign the keycode 112 to it, and then `loadkeys(1)` can be used to define the function of this key.

Some older kernels might hardwire a low scancode range to the equivalent keycodes; `setkeycodes` will fail when you try to remap these.

For example, we can set F1, F2 scancode by following steps:

1. Look for current available keycodes to assign the hard buttons
`xmodmap -pke`
you can select 247, 248 keycodes which are available
2. Set hard button F1, F2 scancode by the command
`sudo setkeycodes e055 247`
`sudo setkeycodes e056 248`
3. Now you can execute below command to get hard button keycode
`sudo showkey`