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NRU-52S Quick Installation Guide

Warning

- Only qualified service personnel should install and service this product to avoid injury.
- Observe all ESD procedures during installation to avoid damaging the equipment.

1 Preparing tools

Unpack the equipment and make sure the following tools are available and delivered contents are correct before you begin the installation procedure.

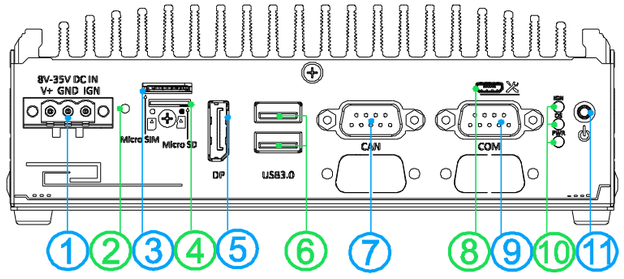
1-1. User-provided tools

- Anti-static wrist wrap

1-2. Packing List

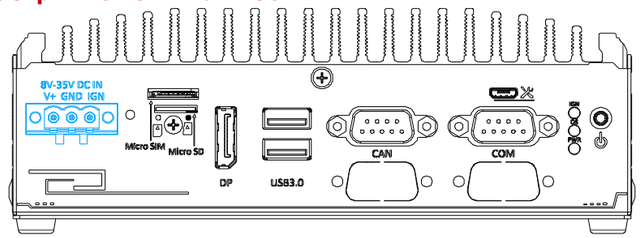
Item	Description	Quantity
01	NRU-52S system	1
02	3-pin pluggable terminal block	1

2 NRU-52S Front Panel



No.	Item	Description
1	3-pin terminal block (DC/ ignition control)	Compatible with DC power input from 8~35V, the terminal block is also used for ignition signal input
2	Force recovery button	Use for system recovery or system reflash purposes
3	Micro SIM slot	Couple with M.2 B key for LTE/ 5G NR
4	MicroSD slot	Front accessible MicroSD slot for easy data access
5	DisplayPort output	The DisplayPort is a high-resolution graphics output supporting up to 3840 x 2160 @ 30Hz
6	USB 3.1 Gen1 port	USB 3.1 Gen1 port, up to 5 Gbit/s data transfer bandwidth
7	CAN bus port	Compatible with both industrial and in-vehicle applications, it supports CAN2.0A and CAN2.0B up to 1Mbps
8	micro-USB port	The micro-USB port is reserved for system reflash purposes
9	COM port	For communicating with external devices
10	System status LED	Three system LEDs, ignition control (IGN), (OS), and power (PWR)
11	Power button	Use this button to turn on or shutdown the system

3 3-pin DC Terminal Block

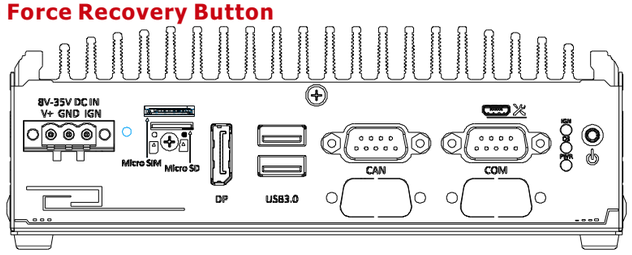


The system allows an 8 to 35V DC power input from via a 3-pin pluggable terminal block. The screw clamping mechanism is a reliable way to wire DC power. In addition to DC power, this terminal block also accepts ignition signal input (IGN).

Warning

Please make sure the voltage of DC power is correct before you connect it to the system. Supplying a voltage over 35V will damage the system.

4 Force Recovery Button

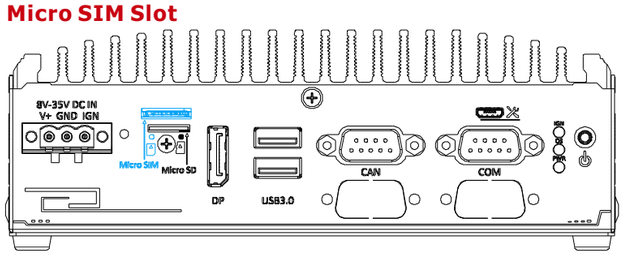


The force recovery button is reserved for engineering or system reflash purposes.

Please follow the below steps to boot NRU-52S into recovery mode for reflash:

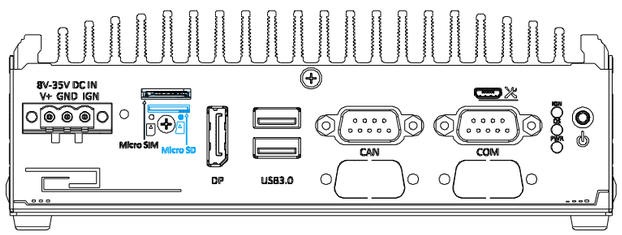
1. Make sure the ignition power mode is set to 0.
2. Make sure the system has powered down.
3. Press and hold down the force recovery button.
4. Simultaneously press the power button.
5. After 5 seconds, release the force recovery button.
6. The NRU-52S has booted into force recovery mode and can be reflashed via the microUSB cable.

5 Micro SIM Slot



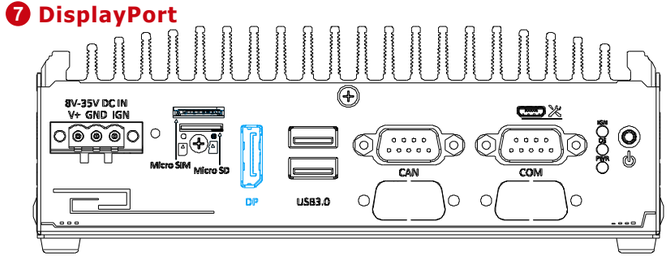
The Micro SIM slot can be coupled with the M.2 B key and five antenna holes for 4G LTE or 5G NR module expansion.

6 MicroSD Slot



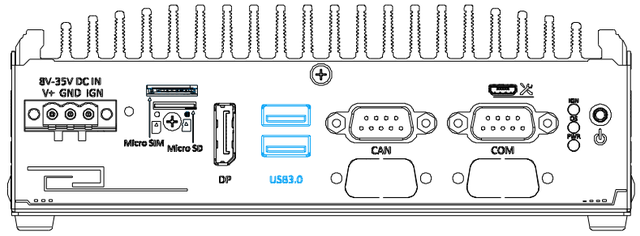
Compatible with standard MicroSD card, the front-accessible slot allows for easy data storage access or swap the MicroSD card.

7 DisplayPort



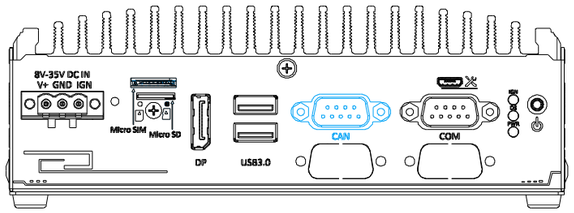
The system has a DisplayPort (DP) output which is a digital display interface that mainly connect video source and carry audio to a display device. When connecting a DP, it can deliver up to 4K UHD (3840 x 2160 @ 30Hz) in resolution. The system is designed to support active DP adapter/ cable from NVIDIA's recommended display adapters. You may refer to NVIDIA's page to find more information: (https://nvidia.custhelp.com/app/answers/detail/a_id/4449/~/nvidia-recommended-display-adapter)

8 USB3. 1 Gen1



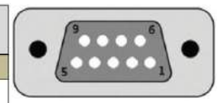
The system offers two USB3.1 Gen1(SuperSpeed USB) ports on its front panel. They are backward compatible with USB 2.0, USB 1.1 and USB 1.0 devices.

CAN bus Port

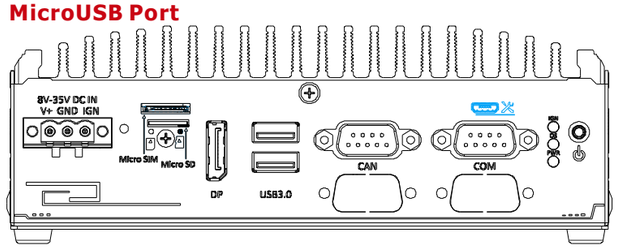


CAN bus is a robust industrial bus with a pair of differential signals and is commonly used in various industrial and in-vehicles applications. The system is equipped with a CAN bus DB9 port that is compatible with both industrial and in-vehicle applications. The CAN bus port supports CAN2.0A and CAN2.0B up to 1Mbps.

Pin No.	Definition	I/O	Description
1	GND	-	GND
2	Reserved	-	Reserved pin. Keep unconnected
3	CAN_H	I/O	CAN Bus High-level voltage
4	Reserved	-	Reserved pin. Keep unconnected
5	CAN_L	I/O	CAN Bus Low-level voltage
6	Reserved	-	Reserved pin. Keep unconnected
7	Reserved	-	Reserved pin. Keep unconnected
8	Reserved	-	Reserved pin. Keep unconnected
9	Reserved	-	Reserved pin. Keep unconnected

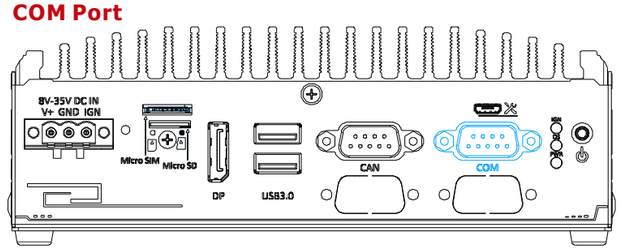


⑩ MicroUSB Port



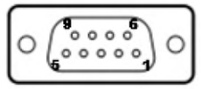
Reserved for system maintenance only.

⑪ COM Port



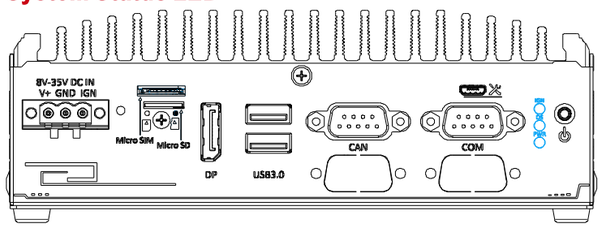
The COM port is a hardware configurable RS-232/ RS-422/ RS-485 port. By default, the port is set up as an RS-232 port. To set up the port for RS-422/ 485 operations, please refer to the user manual.

COM Port Definition



Pin#	RS-232 Mode	RS-422 Mode	RS-485 Mode (Two-wire 485)
1			
2	RX	TXD+	TXD+/RXD+
3	TX	RXD+	
4		RXD-	
5	GND	GND	GND
6			
7			
8		TXD-	TXD-/RXD-
9			

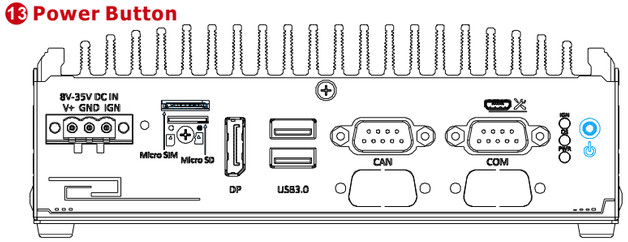
⑫ System Status LED



There are three LED indicators on the front panel: IGN, OS and PWR. The descriptions of these LEDs are listed in the following table.

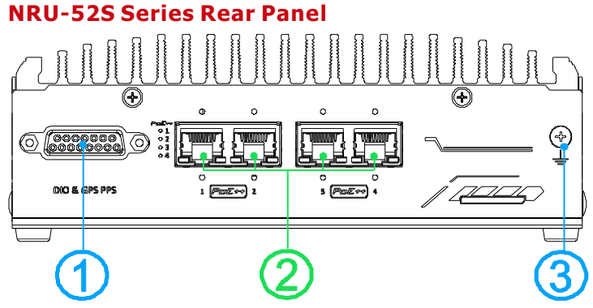
Indicator	Color	Description
IGN	Yellow	Ignition power control, lit when IGN signal is applied.
OS	Red	Lit when Xavier NX is powered on, and booted into device tree
PWR	Green	Power indicator, lit when the PCBA is powered on

⑬ Power Button



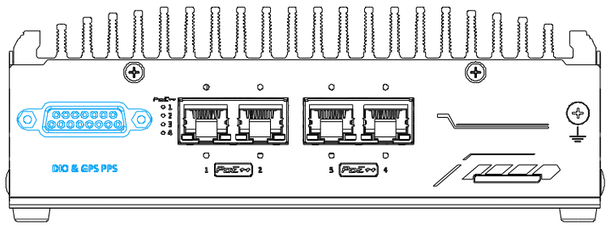
The power button is a non-latched switch for ATX mode on/off operation. Press to turn on the system, PWR LED should light up and to turn off, you can either issue a shutdown command in the OS, or just press the power button. In case of system halts, you can press and hold the power button for 5 seconds to force-shutdown the system. Please note that there is a 5 seconds interval between two on/off operations (i.e. once turning off the system, you will need to wait for 5 seconds to initiate another power-on operation).

⑮ NRU-52S Series Rear Panel



No.	Item	Description
1	DIO & GPS PPS port	The DIO port provides 1x GPS PPS input, 3-CH isolated DI and 4-CH isolated DO
2	Gigabit PoE++ ports	Gigabit PoE++ port can provide both data and electric power to devices.
3	Grounding point	Chassis grounding point

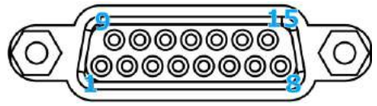
16 DIO & GPS PPS Port



The DO is followed by open-drain design, i.e., the output voltage is decided by the external power source. We recommend to design the external power source between 5V to 24V. The DI treat 0 to 1.5V voltage input as 0, and treat 5 to 40V voltage input as 1. In Linux, each GPIO is mapped to a virtual folder. And the PPS0 is defined in our official device tree. Please refer to the following table for information on wiring and programming the isolated DIO channels.

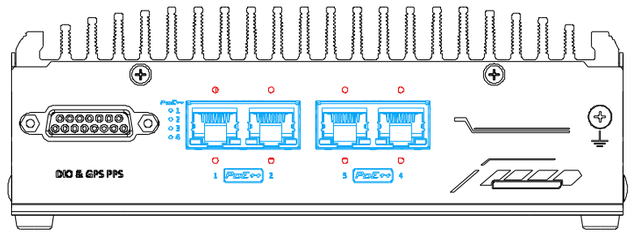
Set DO Value
The following example takes DO0 as an example. The GPIO number for DO0 is
446
sudo -s
# Set DO0 to 0
echo 446 > /sys/class/gpio/export # SOM_GPO0
echo out > /sys/class/gpio/gpio446/direction
echo 0 > /sys/class/gpio/gpio446/value
Set DO0 to 1
echo 446 > /sys/class/gpio/export # SOM_GPO0
echo out > /sys/class/gpio/gpio446/direction
echo 1 > /sys/class/gpio/gpio446/value
Read DI Value
The following example takes DI3 as an example. The GPIO number of DI3 is
441
cat /sys/class/gpio/gpio441/value

DIO & GPS PPS Pin Definition



Pin No.	Definition	I/O	GPIO in Linux	Description
1	DI0_H	I	pps0_H	GPS PPS input
2	DI1_H	I	gpio443	Digital input channel 1
3	DI1_L	I		Digital input channel 1
4	DO_GND	O		
5	DO0	O	gpio446	Digital output channel 0
6	DO1	O	gpio447	Digital output channel 1
7	DO_GND	O		Digital output GND
8	VDD			
9	DI0_L	O	pps0_L	GPS PPS input
10	DI2_H	O	gpio444	Digital input channel 2
11	DI3_H	O	gpio441	Digital input channel 3
12	DO_GND			Digital output GND
13	DO2	O	gpio448	Digital output channel 2
14	DO3	O	gpio445	Digital output channel 3
15	DI2_L, DI3_L	I	-	Digital input channel 2/ 3

17 IEEE 802.3at Power over Ethernet Port



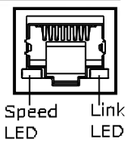
The Gigabit PoE ++ port supply power and data on a standard CAT-5 or better Ethernet cable. Acting as a PSE (Power Sourcing Equipment), compliant with IEEE 802.3bt, it has a total power budget of 144W while each port can deliver up to 90W to a Powered Device (PD). PoE automatically detects and determine if the connected device is PoE PD or not before supplying power, making it compatible with standard Ethernet devices as well. There are screw-lock holes (indicated in red) for each port to ensure cables are tightly secured.

Active/Link LED

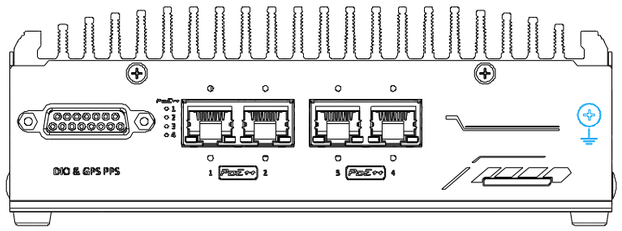
LED Color	Status	Description
Orange	Off	Ethernet port is disconnected
	On	Ethernet port is connected and no data transmission
	Flashing	Ethernet port is connected and data is transmitting/receiving

Speed LED

LED Color	Status	Description
Orange	Off	10 Mbps
	Off	100 Mbps
	Orange	1000 Mbps



18 Grounding Point



The system offers EMI protection with an isolated PCB design. If you are powering the NRU-52S using an isolated power supply, please make sure the chassis grounding point is connected.

Initialization

sudo -s
echo 446 > /sys/class/gpio/export # SOM_GPO0
echo out > /sys/class/gpio/gpio446/direction
echo 0 > /sys/class/gpio/gpio446/value
echo 447 > /sys/class/gpio/export # SOM_GPO1
echo out > /sys/class/gpio/gpio447/direction
echo 0 > /sys/class/gpio/gpio447/value
echo 448 > /sys/class/gpio/export # SOM_GPO2
echo out > /sys/class/gpio/gpio448/direction
echo 0 > /sys/class/gpio/gpio448/value
echo 445 > /sys/class/gpio/export # SOM_GPO3
echo out > /sys/class/gpio/gpio445/direction
echo 0 > /sys/class/gpio/gpio445/value
echo 443 > /sys/class/gpio/export # SOM_GPI1
echo in > /sys/class/gpio/gpio443/direction
echo 444 > /sys/class/gpio/export # SOM_GPI2
echo in > /sys/class/gpio/gpio444/direction
echo 441 > /sys/class/gpio/export # SOM_GPI3
echo in > /sys/class/gpio/gpio441/direction