

D-Robotics RDK Kit

This document serves as the user manual for the D-Robotics RDK Kit Super series, providing developers with usage instructions and development guidance for products such as the RDK S600. The content covers multiple aspects including hardware design, system customization, application development, and algorithm toolchains.

Product Introduction

The **RDK S600 Series** is a high-performance development kit featuring 560 TOPS of on-device AI inference capability and a 18-core ARM Cortex-A78AE processor. It supports six MIPI camera inputs, six USB 3.0 ports, and four PCIe 3.0 interfaces, fully meeting the requirements of various application scenarios.



Quick Start

1.1 Hardware Introduction

1.1 Developer Kit

Product Introduction

The D-Robotics RDK S600 Series Developer Kit is equipped with the S600 intelligent computing chip, with the BPU providing up to 560 TOPS of computing power. It is a development board designed for intelligent computing and robotics applications, featuring rich interfaces and extreme ease of use. Its unique heterogeneous design can simultaneously handle perception inference and real-time motion control needs, reducing the volume and complexity of the control system.

Key Specifications

Category	Specifications
CPU	• 18x Arm® Cortex®-A78AE CPU 2.0GHz
MCU	• 6x Arm® Cortex®-R52+ MCU (1× DCLS, 2× Split-Lock)
BPU	• 4x BPU Nash core provides up to 560 TOPS
Memory	• 32/64GB LPDDR5, 256-bit, up to 6400MT/s
Storage	• 64/256GB UFS 3.1 • M.2 Key M Connector for NVMe SSD
USB	• 6x USB 3.2 Gen 1x1 Type-A • 1x USB 2.0 Type-C (for flashing and debugging)
Network	• M.2 Key E Connector for Wi-Fi&BT Module • 2x 1GbE RJ45 Ports • 2x 10GbE RJ45 Ports • 1x 1GbE RJ45 Ports (MCU-Domain)
Display	• 1x HDMI
Expansion	• 2x Camera Expansion Connector • 1x MCU Port Expansion Connector
Connectors	• 1x 2-pin RTC Battery Connector • 1x 4-pin Fan Connector • 1x 12-pin Automotive Connector • 1x JTAG Debug Connector (for Main and MCU) • 1x 12-pin MCU-Domain CAN(5x) Connector • 1x 10-pin Main-Domain CAN(4x) Connector

Category	Specifications
	• 1x 10-pin MCU-Domain UART(2x) & Main-Domain UART(2x) Connector • 1x 10-pin PCM Connector • 2x 22-pin MIPI Connector
Power	• 12~28V • 4-pin Connector
Size	• 140mm x 123mm x 78mm

Model Description

Product Name	Model	Memory	Storage	Notes
RDK S600 32G	KS6X032064C	32GB LPDDR5	64GB UFS	Official Model
RDK S600 64G	KS6X064256C	64GB LPDDR5	256GB UFS	Official Model

FCC Compliance Notice

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, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

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

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 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.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

Interface Description

Interface Definition: [D-Robotics RDK S600 Connector Application Note V1P0.xlsx](#)

Main Board Power Interface (J1)

NOTE

The RDK S600 Developer Kit supports 12V-28V power supply, with a maximum current of 16A, using a 4-pin Microfit Connector.

D-Robotics provides a power adapter with a rated output voltage of 24V and a maximum output current of 8A.

699-Pin B2B Connector (J2)

The RDK S600 Developer Kit provides a 699-pin connector for connecting to the RDK S600 Compute Module.

NOTE

To use the 699-Pin B2B Connector, please contact FAE in advance for more detailed information.

JTAG Interface MCU&MAIN (J3)

The RDK S600 Developer Kit provides a 10-pin connector for JTAG debugging of the RDK S600 Compute Module's MCU.

Flash, Main&MCU Debug (J4)

The USB Type-C (J16) is used only for flashing and debugging. It is not a standard full-featured USB Type-C port and includes the following functions:

-

Debug Serial Port. Hardware-wise, two CH340 chips convert the debug serial ports of the Main domain and MCU domain of the compute module into USB interfaces. Users can use this interface for various debugging tasks. The first time you use this interface, you need to install the CH340 driver on your computer. You can search for the keyword CH340 serial

driver to download and install it. The parameters of the computer's serial tool need to be configured as follows:

- - o Baud rate: 921600
 - o Data bits: 8
 - o Parity: None
 - o Stop bits: 1
 - o Flow Control: None
-

USB Download Interface. The download interface provided by the RDK S600 development board is used for firmware download. For details, please refer to [1.2 System Flashing](#)

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NOTE

The USB Type-C port provided by the RDK S600 Developer Kit only supports Device mode.

M.2 Key E Interface (J5)

Default configuration for connecting a PCIe Wi-Fi and USB 2.0 BT module, also supports UART 4-wire BT modules. PCIe supports Gen3x1. Also provides SDIO interface, PCM audio interface, no LED or ALERT signals.

NOTE

1. If support for Wi-Fi/Bluetooth sleep/wake-up of the S600 is required, please contact D-Robotics engineers for support.
2. When the system is in light sleep and deep sleep modes, the VDD_AON_PERI_3V3 power supply remains on, with a maximum supply current of 750mA.

M.2 Key M Interface (J6)

Used for connecting a PCIe solid-state drive (SSD), supports Gen4x2, has an ALERT signal, no LED signal.

NOTE

Sleep/wake-up functionality is not supported.

NOTE

When the system is in light sleep and deep sleep modes, the VDD_PERI_3V3 power supply is turned off, with a maximum supply current of 700mA.

USB 3.0 Type-A Interface (J7/J8/J9)

The RDK S600 development board provides six USB 3.0 standard interfaces extended via PCIe, capable of supporting six USB peripherals simultaneously. Each USB 3.0 interface supports a maximum output power of 5V/1A.

NOTE

- The USB 3.0 interfaces provided by the RDK S600 development board only support Host mode.
- Pay attention to [USB 2.0 Camera Access Limitations](#).

HDMI Interface (J10)

The RDK S600 Developer Kit provides one HDMI display interface, supporting display modes up to 2k at 60 frames per second. Upon power-on, the developer kit outputs the Ubuntu graphical interface via the HDMI interface. With specific example programs, it also supports preview display of camera and video stream feeds.

MIPI Camera Interface (J11/J13)

The RDK S600 includes 2 camera expansion interfaces, which can be used to connect monocular or binocular cameras. Each MIPI camera interface provides 1 MIPI DPHY, 1 IIC, and 1 3.3V power supply. See [Interface Description](#) for MIPI camera interface signal definitions.

NOTE

- IIC level standard is 3.3V.
- Maximum current for the 3.3V supply is 1A.

Camera Expansion Interface (J12/J14)

The RDK S600 Developer Kit includes 2 camera expansion interfaces. The camera expansion interface uses an 80-pin board-to-board connector. Each camera expansion interface can provide the following functions. See [Interface Description](#) for camera expansion interface signal definitions.

- 2x D-PHY or configurable to 1x D-PHY + 1x C-PHY.
- 2x IIC interfaces.
- 4x PWM signals for camera triggering.
- 2x sensor error signals.
- 2x deserializer lock signals.
- 2x deserializer error signals.
- 2x deserializer PWRON signals.
- 2x POC EN signals.
- 2x POC INT signals.
- 12V power supply, max 2A.
- 3.3V power supply, max 1A.
- 1.8V power supply, max 50mA, used for signal pull-up/pull-down.

NOTE

The maximum power supply capability for 12V is 2A, please pay attention to the total power consumption of the sensors used.

MCU Expansion Interface (J15)

The RDK S600 Developer Kit includes an 80-Pin expansion interface, referred to as the MCU 80-Pin Connector.

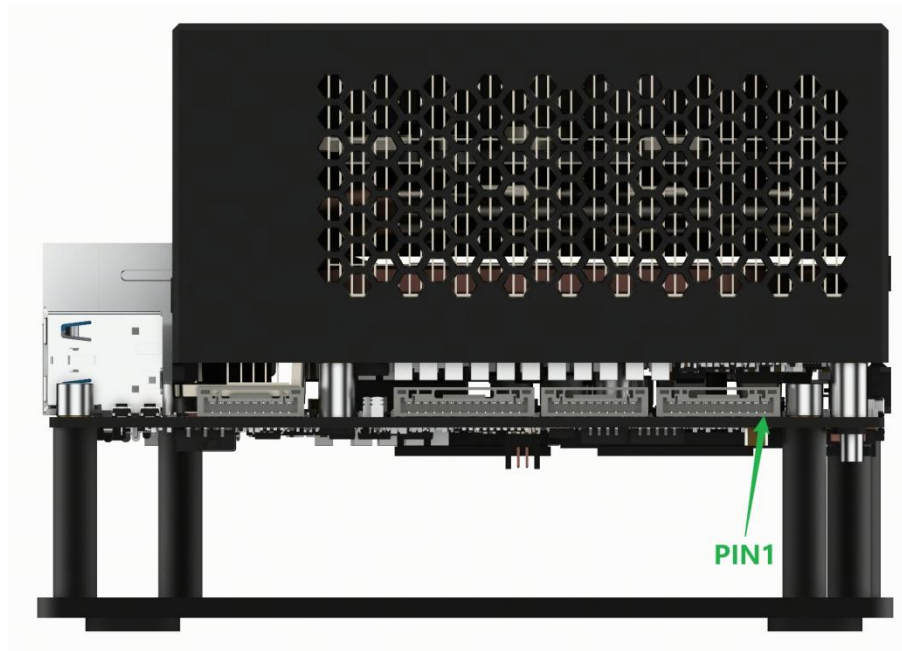
- Power signals: VDD_MCU_PERI_5V, VDD_MCU_PERI_3V3, VDDIO_MCU_3V3, VDDIO_MCU_1V8
- Communication interfaces:
 - o I2C13, configured with an equivalent 2.2K pull-up resistor on the mainboard.
 - o I2C14, configured with an equivalent 2.2K pull-up resistor on the mainboard.
 - o SPI4, SPI6, SPI8, SPI13.
- CAN interfaces: CAN1, CAN2, CAN3, CAN4, CAN10
- Other signals: GPIO, PWM, ADC, PPS signal

NOTE

1. The MCU 80-Pin Connector includes IOs with both 1.8V and 3.3V logic levels. For detailed information, please refer to [Interface Description](#).
2. When the system is in light sleep, the VDD_MCU_PERI_5V and VDD_MCU_PERI_3V3 power supplies remain on, with a maximum supply current of 1000mA each.
3. When the system is in deep sleep, the VDD_MCU_PERI_5V and VDD_MCU_PERI_3V3 power supplies are turned off.
4. VDDIO_MCU_3V3 and VDDIO_MCU_1V8 have a maximum supply current of 50mA each, suitable only for low-power applications such as level shifting, pull-up/down resistors, ADC voltage dividers, etc. When the system is in light sleep mode, VDDIO_MCU_3V3 and VDDIO_MCU_1V8 remain on. When the system is in deep sleep mode, VDDIO_MCU_3V3 and VDDIO_MCU_1V8 are turned off.

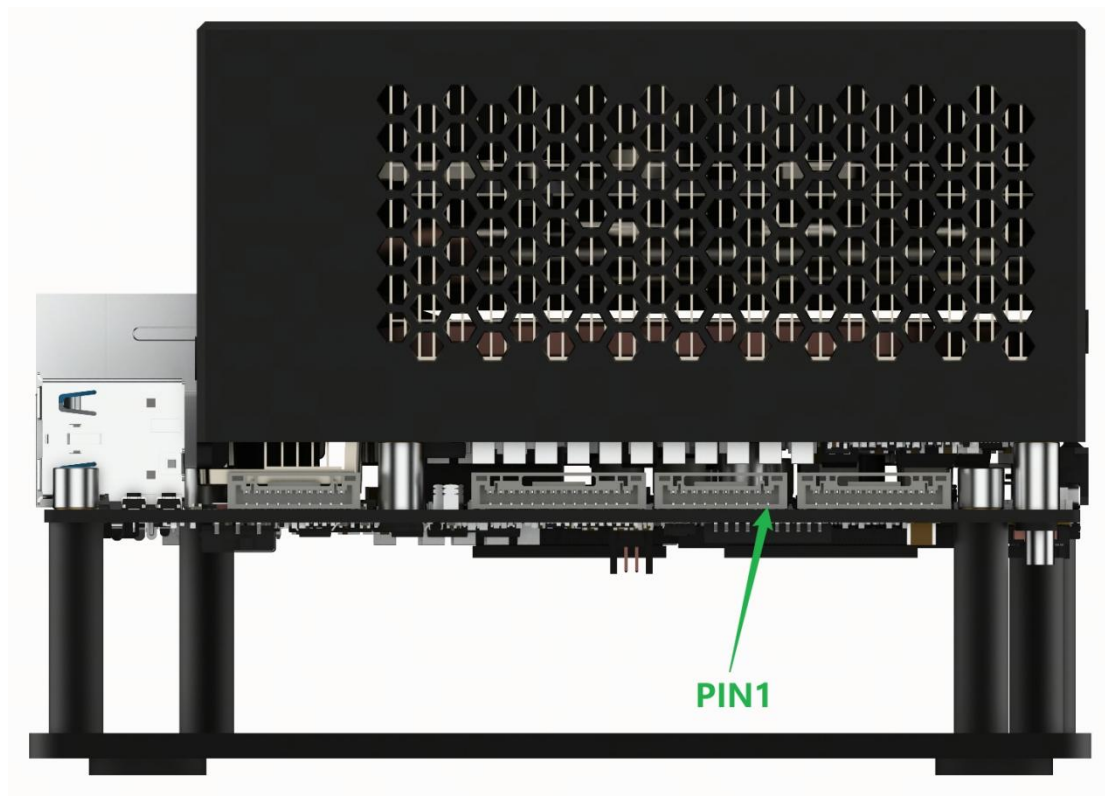
MCU-CAN Interface (J16)

The RDK S600 Developer Kit includes a CAN bus interface for the MCU domain. This interface uses a 12-pin latching connector, providing 5 MCU domain CAN interfaces. The 120 Ω termination resistor can be enabled or disabled using the SW6 switch. See [Interface Description](#) for MCU-CAN interface signal definitions.



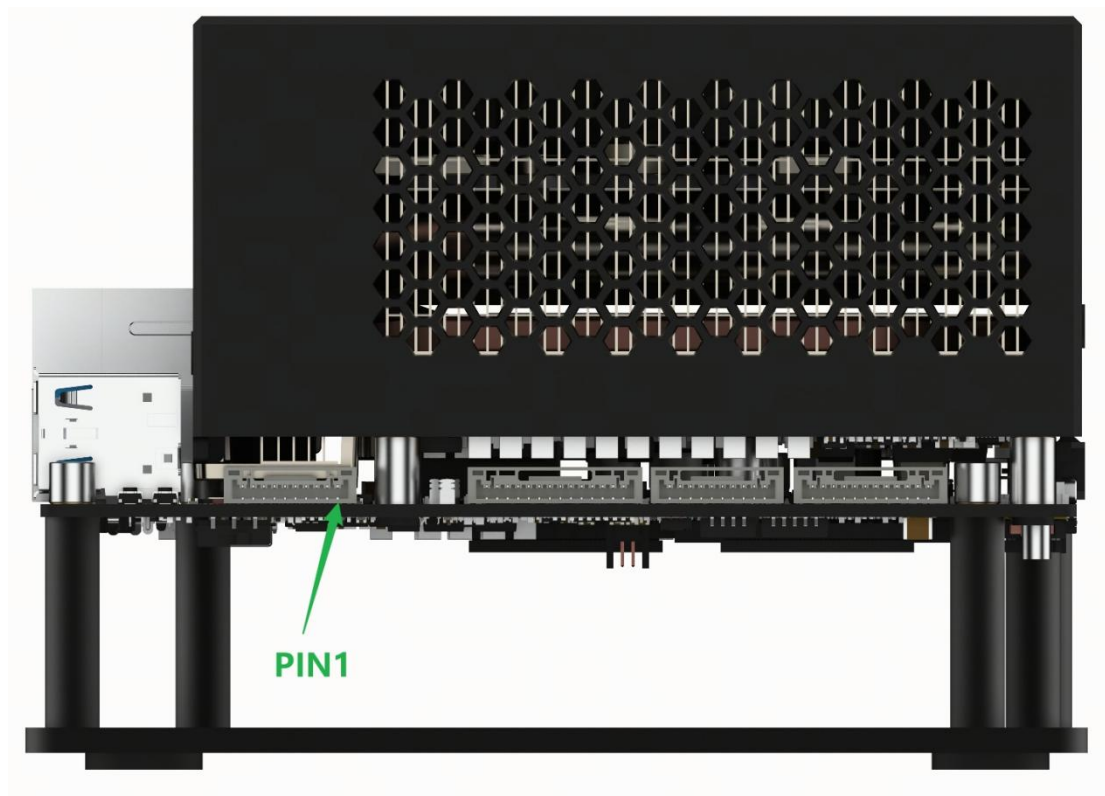
MAIN-CAN Interface (J17)

The RDK S600 Developer Kit includes a CAN bus interface for the MAIN domain. This interface uses a 10-pin latching connector, providing 4 MAIN domain CAN interfaces. The 120 Ω termination resistor can be enabled or disabled using the SW7 switch. See [Interface Description](#) for MAIN-CAN interface signal definitions.



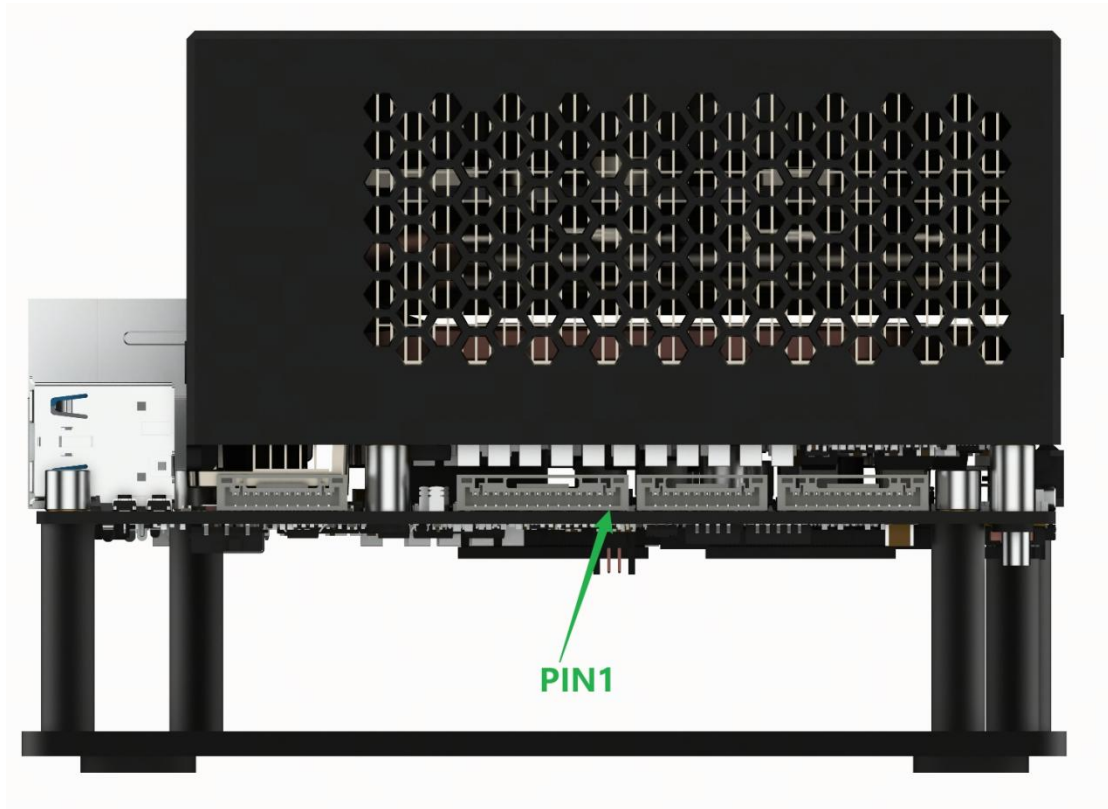
UART Interface MAIN&MCU (J18)

The RDK S600 Developer Kit includes a UART interface for the MAIN domain and MCU. This interface uses a 10-pin latching connector, providing 2 MCU domain and 2 MAIN domain UART interfaces. See [Interface Description](#) for UART interface signal definitions.



PCM+I2C Interface (J19)

This interface uses a 14-pin latching connector, providing 2 PCM and 1 I2C interfaces for connecting audio-related function daughter cards. See [Interface Description](#) for PCM audio interface signal definitions.



RTC Battery Interface (J20)

The RDK S600 Developer Kit includes a battery interface for connecting an external RTC battery.

Fan Interface (J21)

The FAN Connector is used to connect a cooling fan and supports fan speed control.

NOTE

The maximum supply current for 12V is 200mA. When the system is in light sleep and deep sleep modes, the VDD_PERI_12V power supply is turned off.

Main Board Function Interface (J22)

The RDK S600 Developer Kit main board has an Automatic EXT CTRL Connector 12-Pin connector, primarily for the following purposes:

- Extend the system operation LED and power indicator LED from the main board to the outside for easy observation of the main board's operating status.
- Extend the flash switch, sleep button, reset button, and power switch to the outside of the main board for convenient manual operation after final assembly.

NOTE

1. The green LED indicates whether the main board's small system has completed power-on. The orange LED indicates whether the MAIN domain system of the main board is operating normally.
2. The power supply of the Automatic EXT CTRL Connector 12-Pin interface is only allowed to connect circuits described in the functional description. Connecting high-power loads is prohibited.
3. When the system is in light sleep and deep sleep modes, the VDD_AON_PERI_5V and DCIN_CONN power supplies remain on, while the VDD_PERI_3V3 power supply is turned off. When connecting daughter boards, short-circuit protection circuits should be 预留 to prevent power supply abnormalities on the main board caused by short circuits in the external daughter board.
4. The maximum output currents for VDD_AON_PERI_5V, DCIN_CONN, and VDD_PERI_3V3 are 50mA, 5mA, and 100mA respectively.

2x 1GbE (U44)

Two Gigabit Ethernet interfaces, compatible with 1000BASE-T and 100BASE-T standards, supporting auto-negotiation speed switching.

Pos itio n	Ide nti fie r	Function Description	IP Configuration Method	Default IP Address
Low er	eth0	General-purpose Ethernet, user needs to configure IP	External DHCP assignment or manual static config	None
Up per	eth1	Management or dedicated communication interface, built-in static IP	Fixed static IP	192.168.1 27.10

2x 10GbE (U45)

This interface provides 2 10-Gigabit Ethernet ports.

1x 1GbE MCU (U80)

This interface is the MCU domain Gigabit Ethernet port.

Switch, Button, and LED Description

Indicator LEDs (D59/D60/D61)

Reference	Name	Off (State)	On (State)	Blinking (State)
D59	System LED	System abnormal	System abnormal	System running normally
D60	Power LED	Power off	Power on	-
D61	Flash LED	Normal boot mode	DFU flashing mode	-

Switches (SW2/SW3)

Reference	Name	OFF	ON	Notes
SW2	Flash Switch	Normal boot mode	DFU flashing mode	-
SW3	Power Switch	Power off	Power on	△ position is ON

DIP Switches (SW6/SW7)

Reference	Name	OFF	ON	Notes
SW6	MCU-CAN1 120Ω	OFF	ON	-
	MCU-CAN2 120Ω	OFF	ON	-
	MCU-CAN3 120Ω	OFF	ON	-
	MCU-CAN4 120Ω	OFF	ON	-
	MCU-CAN5 120Ω	OFF	ON	-
SW7	MAIN-CAN1 120Ω	OFF	ON	-
	MAIN-CAN2 120Ω	OFF	ON	-
	MAIN-CAN3 120Ω	OFF	ON	-
	MAIN-CAN4 120Ω	OFF	ON	-

BOOT (SW8)

NOTE

For SW8 DIP switch, set to 1 for ON, set to 0 for OFF.

Reference	D12	D13	Function
SW8	OFF	ON	System image boots from NVMe
	ON	OFF	-
	ON	ON	System image boots from UFS
	OFF	OFF	System image boots from UFS

Buttons (K1/K2)

Reference	Name	Description	Operation Method
K1	RST Button	Resets the S600 system	Pressing the button resets the system
K2	WAKE Button	Controls S600 system sleep or wake-up	Single-press button interrupt triggers sleep and wake-up functions

Connector Models

Connector	Connector Model	Manufacturer
J1	430450400	Molex
J2	2034560003	Molex
J3	356-110A0CMBB1	Shenzhen Guangdezhong Electronics Technology Co., Ltd.
J4	U262-161N-4BVC11	XKB Connectivity
J5	X1302WVS-67CE-LPV01	XKB Connectivity
J6	X1302WVS-67CM-LPV01	XKB Connectivity
J7/J8/J9	USB-303WSD-BRY	XUNPU
J10	A71-06H0-111N1	XKB Connectivity
J11/J13	AFC01-S22FCA-00	JS (Ju Shuo Electronics)
J12/J14	DY01-080S-B	KEL Corporation
J15	DY01-080S-B	KEL Corporation
J16	X1251WRS-12HF-LPSW	XKB Connectivity

Connector	Connector Model	Manufacturer
J17/J18	X1251WRS-10HF-LPS W	XKB Connectivity
J19	X1251WRS-14HF-LPS W	XKB Connectivity
J20	HDGC1002WV-S-2P	HDGC (Huade Gongchuang)
J21	470531000	Molex
J22	HX JN1.27-2X6 WZ H4.9	Hanxia
U44	LPJG17561BGNL	LINK-PP
U45	LPJM17012BHNL	LINK-PP
U80	LPJG4806FBNL	LINK-PP

1.2 Getting Started Configuration

Default Login Accounts

Before configuring the system, you need to log in first. The RDK S600 system provides two default accounts:

Standard user: username `sunrise`, password `sunrise`

Superuser (root): username `root`, password `root`

Connecting to Wi-Fi

- **Desktop**

- **Server**

Refer to the Ubuntu 24.04 Wi-Fi connection tutorial.

Enabling SSH Service

The current system version has the SSH login service enabled by default. You can use the following methods to turn the SSH service on or off.

- **Desktop**

- **Server**

For using SSH, please refer to [Remote Login - SSH Login](#).

Setting Login Mode

Automatic Login on Character Terminal

Modify the `serial-getty@ttyS0.service` file to set up password-less login as follows:

1. Open `serial-getty@ttyS0.service`

```
# Log in as root user
vim /usr/lib/systemd/system/serial-getty@ttyS0.service
# Log in as sunrise user
sudo vim /usr/lib/systemd/system/serial-getty@ttyS0.service
```

1. Change the line containing `ExecStart=--/sbin/agetty` to:

```
ExecStart=--/sbin/agetty -a root --keep-baud 921600,115200,38400,9600 %I $TERM
```

Parameter explanation: The `-a` parameter specifies the username for automatic login. `-o` `'-p -- \\u'` adds additional customization to the login process: preserves the current environment variables and displays the username in the login prompt.

1. After restarting, the user will be logged in automatically.

Automatic Login on Graphical Terminal

To be updated.

Setting Up Chinese Environment

1. Install the command packages:

```
sudo apt install language-pack-zh-hans language-pack-zh-hans-base fonts-wqy-microhei
```

- `language-pack-zh-hans`: Contains Chinese language translation files, allowing the system interface to display in Chinese.
- `language-pack-zh-hans-base`: Base language pack providing basic Chinese support.
- `fonts-wqy-microhei`: Installs Chinese fonts.

1. Open the terminal and enter the following command to open the language configuration file:

```
sudo vim /etc/default/locale
```

Add or modify the following content in the file:

```
LANG=zh_CN.UTF-8  
LANGUAGE=zh_CN:zh  
LC_ALL=zh_CN.UTF-8
```

1. Execute the following command to update the configuration:

```
fc-cache -fv  
source /etc/default/locale
```

Setting Up Chinese Input Method

After setting up the Chinese environment, the system's built-in input method is supported by default. Press the Super (Windows key) + Space key combination to switch between different input methods.

Setting Up RDK Studio

RDK Studio is an AI-native desktop workspace designed for robotics development. It integrates Moss conversation, project workspace, device connection, remote development, flashing, local models, and on-board agents into a single native window.

For the usage instructions of RDK Studio, please refer to the [RDK Studio User Manual](#).

NoMachine Configuration

NoMachine currently does not support apt download. You need to obtain the deb package from the official website.

Official NoMachine download URL: [NoMachine Download](#)

Download the installation package

After entering the official website, find the ARM64 version of the installation package suitable for RDK S600 and click Download.

ARM 64-bit



NoMachine for ARM RPM (aarch64)

Version: 9.0.188_11
Package size: 65.86 MB
Package type: RPM
MD5 signature: 6f8a7135c03bb2d3b3e563a33ea6bad5
For: Fedora 26/27/28/29/30/31/32/33/34, RHEL 7/8, OpenSUSE Tumbleweed

Download



NoMachine for ARM DEB (arm64)

Version: 9.0.188_11
Package size: 65.12 MB
Package type: DEB
MD5 signature: a895cee274347e8df83de1d66fdd2007
For: Ubuntu 14.04/16.04/18.04/20.04, Debian 8/9/10

Download



NoMachine for ARM TAR.GZ (aarch64)

Version: 9.0.188_11
Package size: 65.24 MB
Package type: TAR.GZ
MD5 signature: 18b24f6c6df2938eb9af8dbeb2add102
For: Ubuntu 14.04/16.04/18.04/20.04, Debian 8/9/10, Fedora 26/27/28/29/30/31/32/33/34, RHEL 7/8, OpenSUSE Tumbleweed

Download

Installation

```
sudo apt update; sudo apt upgrade -y // Ensure the current software is up to date
dpkg -i nomachine*_arm64.deb
```

Configuration and Startup

Configure the server to allow remote connections:

```
sudo systemctl start nxserver
```

Set NoMachine to start on boot:

```
sudo systemctl enable nxserver
```

Set EGL Capture to yes. This is a screen capture feature provided by NoMachine, mainly used to improve the remote desktop experience in specific display server environments:

```
sudo /etc/NX/nxserver --eglcapture yes
```

This command takes effect after a reboot. You can double-check with the following command; EGL Capture has been enabled indicates that the feature has been written to the configuration file.

```
if [ -f "/usr/lib/systemd/user/org.gnome.Shell@wayland.service" ] && grep -q  
"nxpreload.sh" "/usr/lib/systemd/user/org.gnome.Shell@wayland.service" && [ -f  
"/usr/share/applications/org.gnome.Shell.desktop" ] && grep -q "nxpreload.sh"  
"/usr/share/applications/org.gnome.Shell.desktop" && [ -f "/usr/NX/etc/node.cfg" ] &&  
grep -q "EnableEGLCapture 1" "/usr/NX/etc/node.cfg"; then echo "EGL Capture has been  
enabled"; else echo "Not enabled"; fi
```

Restart the NoMachine service:

```
sudo systemctl restart nxserver
```

Restart the S600

Due to NXServer configuration issues, connecting directly after performing the above operations will result in a black screen. A reboot is required before use.

For using NoMachine, please refer to [Remote Login - NoMachine Login](#).

User Management

Changing the username

Using the new username `usertest` as an example:

```
# Terminate all processes of the sunrise user
sudo pkill -u sunrise
# Rename the sunrise user to usertest
sudo usermod -l usertest sunrise
# Change the user's home directory to /home/usertest
sudo usermod -d /home/usertest -m usertest
# Change the user password
sudo passwd usertest
```

Finally, update the automatically logged-in username for the desktop service:

- `gdm`: RDK S100 default desktop service. Change `AutomaticLogin = sunrise` in the `/etc/gdm3/custom.conf` file to `AutomaticLogin = usertest`.
- `lightdm`: Change `autologin-user=sunrise` in the `/etc/lightdm/lightdm.conf.d/22-hobot-autologin.conf` file to `autologin-user=usertest`.

Adding a new user

Using the new user `usertest` as an example:

```
sudo useradd -U -m -d /home/usertest -k /etc/skel/ -s /bin/bash -G
disk,kmem,dialout,sudo,audio,video,render,i2c,lightdm,vpu,gdm,weston-launch,graphics,j
pu,ipu,vps,misc,gpio usertest
sudo passwd usertest
sudo cp -aRf /etc/skel/. /home/usertest
sudo chown -R usertest:usertest /home/usertest
```

You can also refer to the username change method to set the newly added user as the automatically logged-in user.