LX-8000/9000 Series
User Manual

V1.1.3 Dec. 2025



LX-9171/LX-9371/LX-9771
LX-9181/LX-9381/LX-9781



LX-8031/8131/LX-8331/LX-8731

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1. Introduction

This chapter provides an overview of the LX-8000/9000 and its components, and introduces the fundamental concepts for user familiar with the LX-8000/9000.



The LX-8000/9000 are Linux OS based PACs that combine computing, I/O, and operator interface into a single unit, and provide the perfect solution for integrating HMI, data acquisition and control in an individual PAC.

It is equipped with an x86 CPU, 0/1/3/7 I/O expansion slots and a variety of connectives including dual Gigabit Ethernet, VGA, USB port, RS-232 and RS-485 interface. Local I/O slots are available to use I-8K/9K and I-87K/97K series I/O modules and remote I/O expansions are available to use our Ethernet I/O modules and RS-485 I/O modules.

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1.1. Features

The LX-8000/9000 offers the most comprehensive configuration and remote system upgrade solutions to meet specific application requirements. The following list shows the hardware and software features designed to simplify installation, configuration and application.

- Powerful CPU Module
  - x86 CPU (1 GHz, dual-core) for LX-8031/8131/8331/8731
  - E3845 (1.91 GHz, 64-bit quad core) for LX-9181/9381/9781
  - E3827 (1.75 GHz, 64-bit dual core) for LX-9171/ 9371/9771

- Linux OS
  - Linux Kernel 3.2 for LX-8x31 series
  - Linux Kernel 4.14 for LX-9x71/9x81 series

- Memory Size:
  - SDRAM (2 GB DDR3) for LX-8x31/9x71 series
  - SDRAM (4 GB DDR3) for LX-9x81 series
  - Flash (32 GB SSD)
  - The device features a built-in CF slot for an optional CF card.

- 64-bit Hardware Serial Number

- Rich I/O Expansion Ability
  - RS-232/RS-485
  - USB

- Redundant Power Input
- Operating Temperature：
  - -25 °C to +60 °C for LX-9x81 series
  - -25 °C to +75 °C for LX-8x31/9x71 series

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1.2. Specifications

The table below summarizes the specifications of LX-8x31 series.

Models	LX-8031	LX-8131	LX-8331	LX-8731
OS	Linux OS with kernel 3.2			
Embedded Service	SFTP server, Web server, SSH			
SDK Provided	Standard LinPAC SDK for Linux by GNU C language			
CPU Module				
CPU	x86 CPU, 1 GHz, dual-core			
SDRAM	2 GB DDR3			
MRAM, Non-volatile Memory	512 KB (retain memory without battery support)			
Flash	32 GB			
EEPROM	16 KB; Data Retention: 40 years; 1,000,000 erase/write cycles			
CF Card	Built-in CF slot for optional CF card (up to 32 GB)			
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year			
64-bit Hardware Serial Number	Yes, for software copy protection			
Dual Watchdog Timers	Yes (0.8 second)			
Rotary Switch	Yes (0 to 9)			
DIP Switch	No	Yes (8 bits)		
Programmable LED Indicator	3 (Run, L1 and L2)			
VGA & Communication Ports				
VGA Resolution	1600 x 1200, 1024 x 768, 800 x 600, 640 x 480			
Dual Ethernet Port	RJ-45 x 2, 10/100/1000 Base-T (Auto-negotiating, Auto MDI/MDI-X, LED indicators)			
USB 2.0	4			
ttySA0	RS-232 (RxD, TxD and GND); non-isolated	Internal communication with high profile I-87K series modules in slots		

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Console	RS-232 (RxD, TxD and GND); non-isolated			
ttyS0	RS-485 (Data+, Data-) with internal self-tuner ASIC; 3000 V_{DC} isolated			
ttyS1	RS-232/RS-485 (RxD, TxD, CTS, RTS and GND for RS-232, Data+ and Data- for RS-485); non-isolated			
ttyS34	RS-232 (RxD, TxD, CTS, RTS, DSR, DTR, CD, RI and GND); non-isolated			
I/O Expansion Slots				
Number of I/O slots	0	1	3	7
Supported I/O modules	-	I-8K and I-87K series I/O Modules		
Mechanical				
Dimensions (W x L x H), unit: mm	137x132x125	169 x 132 x 125	231 x 132 x 125	355 x 132 x 125
Installation	DIN-Rail or Wall Mounting			
Environmental				
Operating Temperature	-25 °C to +75 °C			
Storage Temperature	-30 °C to + 80 °C			
Ambient Relative Humidity	10 % to 90 % RH (non-condensing)			
Power				
Input Range	+10 V_{DC} to +30 V_{DC}			
Redundant Power Inputs	Yes, with one power relay (1 A @ 24 V_{DC}) for alarm			
Isolation	1 kV			
Capacity	2.2 A, 5 V supply to CPU and backplane, 20W in total	3.7 A, 5 V supply to CPU and backplane, 1.3 A, 5 V supply to I/O expansion slots, 20 W in total	3.8 A, 5 V supply to CPU and backplane, 3.2 A, 5 V supply to I/O expansion slots, 35 W in total	4.0 A, 5 V supply to CPU and backplane, 3.0 A, 5 V supply to I/O expansion slots, 35 W in total
Consumption	12W (0.5 A @ 24 VDC)	16.6 W (0.69 A @ 24 VDC)	16.8 W (0.7 A @ 24 VDC)	18 W (0.75 A @ 24 VDC)

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The table below summarizes the specifications of LX-9x71.

Models	LX-9171	LX-9371	LX-9771
System Software			
OS	Linux OS with kernel 4.14		
Embedded Service	SFTP server, Web server, SSH		
SDK Provided	Standard LinPAC SDK for Linux by GNU C language		
CPU Module			
CPU	E3827 (1.75 GHz, 64-bit dual core)		
SDRAM	2 GB DDR3		
MRAM	512 KB		
Flash(SSD)	mSATA slot with one 32 GB SSD		
EEPROM	16 KB		
Memory Expansion	Built-in CF slot for optional CF card (up to 32 GB)		
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year		
64-bit Hardware Serial Number	Yes, for software copy protection		
Dual Watchdog Timers	Yes (0.8 second)		
Programmable LED Indicator	3 (Run, L1, L2)		
Rotary Switch	Yes (0 ~ 9)		
VGA/HDMI Communication Ports			
VGA Resolution	1280 x 1024 to 1920 x 1080 (16 : 9) /640 x 480 to 1024 x 768 (4 : 3)		
HDMI Resolution	1280 x 1024 to 1920 x 1080 (16 : 9) /640 x 480 to 1024 x 768 (4 : 3)		
Ethernet Port	RJ-45 x 2, 10/100/1000M Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)		
USB 2.0	4		
ttySA0	Internal communication with the I-97K series modules in slots		
Console	RS-232/485 (RxD, TxD and GND for RS-232; Data+, Data- for RS-485); 3000 V_{DC} isolated		
ttyS0	RS-485 (Data+, Data-); 3000 V_{DC} isolated		
ttyS1	RS-232/485 (RxD, TxD, CTS, RTS and GND for RS-232; Data+, Data- for RS-485); 3000 V_{DC} isolated		
ttyS34	RS-232 (RxD, TxD, CTS, RTS, DSR, DTR, CD, RI and GND); 3000 V_{DC}		

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	isolated		
I/O Expansion Slot	1	3	7
Supported I/O modules	I-9K and I-97K series I/O Modules		
Mechanical			
Dimensions (W x H x D, unit: mm)	239 x 164 x 133	300 x 164 x 133	422 x 164 x 133
Installation	Wall mounting /DIN-rail mounting		
Environmental			
Operating Temperature	-25 °C to +75 °C		
Storage Temperature	-30 °C to +80 °C		
Ambient Relative Humidity	10 % to 90 % RH (non-condensing)		
Power			
Input Range	+10 V_{DC} to +30 V_{DC}		
Isolation	1 kV		
Redundant Power Inputs	Yes, with one power relay (1 A @ 24 V_{DC}) for alarm		
Capacity	3.7 A, 5 V supply to CPU and backplane, 3.3 A, 5 V supply to I/O expansion slots, 35 W in total	3.8 A, 5 V supply to CPU and backplane, 3.2 A, 5 V supply to I/O expansion slots, 35 W in total	4.0 A, 5 V supply to CPU and backplane, 3.0 A, 5 V supply to I/O expansion slots, 35 W in total
Consumption	16.6 W (0.69 A @ 24 V_{DC})	16.8 W (0.7 A @ 24 V_{DC})	18 W (0.75 A @ 24 V_{DC})

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The table below summarizes the specifications of LX-9x81 series.

Models	LX-9181	LX-9381	LX-9781
System Software			
OS	Linux OS with kernel 4.14		
Embedded Service	SFTP server, Web server, SSH		
SDK Provided	Standard LinPAC SDK for Linux by GNU C language		
CPU Module			
CPU	E3845 (1.91 GHz, 64-bit quad core)		
SDRAM	4 GB DDR3		
MRAM	512 KB		
Flash(SSD)	mSATA slot with one 32 GB SSD		
EEPROM	16 KB		
Memory Expansion	Built-in CF slot for optional CF card (up to 32 GB)		
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year		
64-bit Hardware Serial Number	Yes, for software copy protection		
Dual Watchdog Timers	Yes (0.8 second)		
Programmable LED Indicator	3 (Run, L1, L2)		
Rotary Switch	Yes (0 ~ 9)		
VGA/HDMI Communication Ports			
VGA Resolution	1280 x 1024 to 1920 x 1080 (16 : 9) /640 x 480 to 1024 x 768 (4 : 3)		
HDMI Resolution	1280 x 1024 to 1920 x 1080 (16 : 9) /640 x 480 to 1024 x 768 (4 : 3)		
Ethernet Port	RJ-45 x 2, 10/100/1000M Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)		
USB 2.0	4		
ttySA0	Internal communication with the I-97K series modules in slots		
Console	RS-232/485 (RxD, TxD and GND for RS-232; Data+, Data- for RS-485); 3000 V_{DC} isolated		
ttyS0	RS-485 (Data+, Data-); 3000 V_{DC} isolated		
ttyS1	RS-232/485 (RxD, TxD, CTS, RTS and GND for RS-232; Data+, Data- for RS-485); 3000 V_{DC} isolated		
ttyS34	RS-232 (RxD, TxD, CTS, RTS, DSR, DTR, CD, RI and GND); 3000 V_{DC}		

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	isolated		
I/O Expansion Slot	1	3	7
Supported I/O modules	I-9K and I-97K series I/O Modules		
Mechanical			
Dimensions (W x H x D, unit: mm)	239 x 164 x 133	300 x 164 x 133	422 x 164 x 133
Installation	Wall mounting / DIN-rail mounting		
Environmental			
Operating Temperature	-25 °C to +60 °C		
Storage Temperature	-30 °C to +80 °C		
Ambient Relative Humidity	10 % to 90 % RH (non-condensing)		
Power			
Input Range	+10 V_{DC} to +30 V_{DC}		
Isolation	1 kV		
Redundant Power Inputs	Yes, with one power relay (1 A @ 24 V_{DC}) for alarm		
Capacity	4.1 A, 5 V supply to CPU and backplane, 2.5 A, 5 V supply to I/O expansion slots, 33 W in total	4.2 A, 5 V supply to CPU and backplane, 2.4 A, 5 V supply to I/O expansion slots, 33 W in total	4.4 A, 5 V supply to CPU and backplane, 2.2 A, 5 V supply to I/O expansion slots, 33 W in total
Consumption	18.5 W (0.77 A @ 24 V_{DC}))	18.7 W (0.78 A @ 24 V_{DC})	20.4 W (0.85 A @ 24 V_{DC})

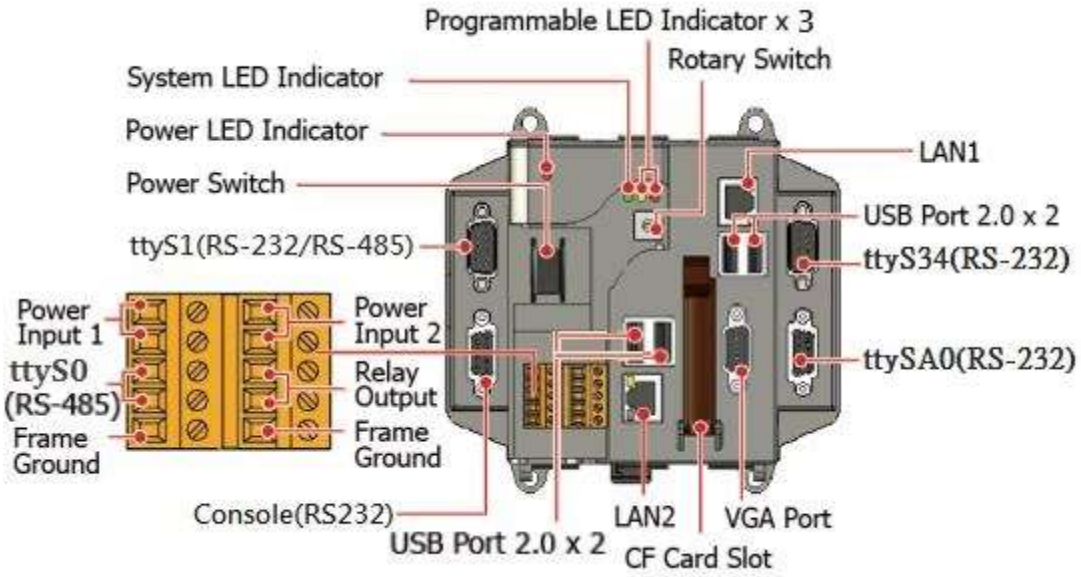
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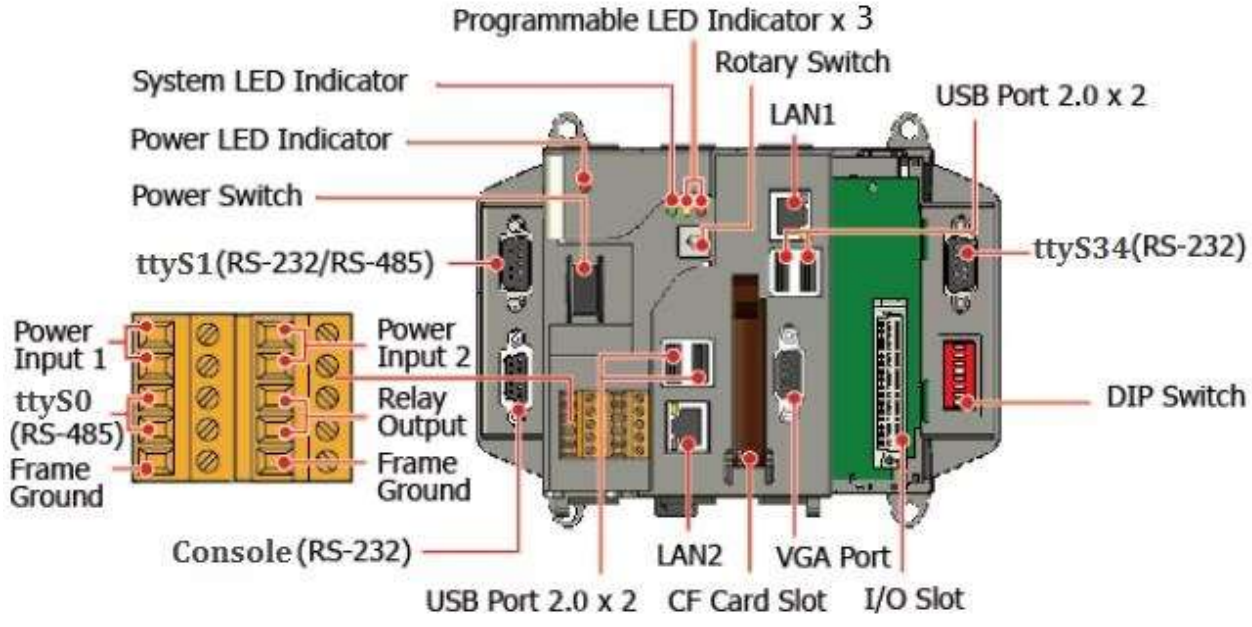
1.3. Overview

The LX-8000/9000 Series modules are equipped with several interfaces and peripherals that can be integrated with external systems. Here is an overview of the components and its descriptions.

LX-8031



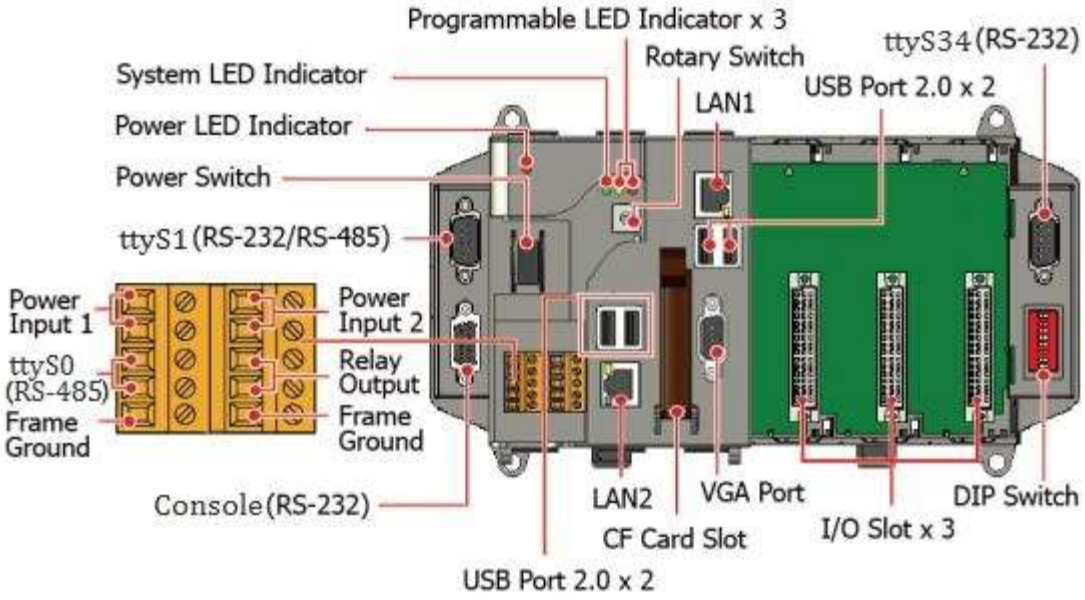
LX-8131



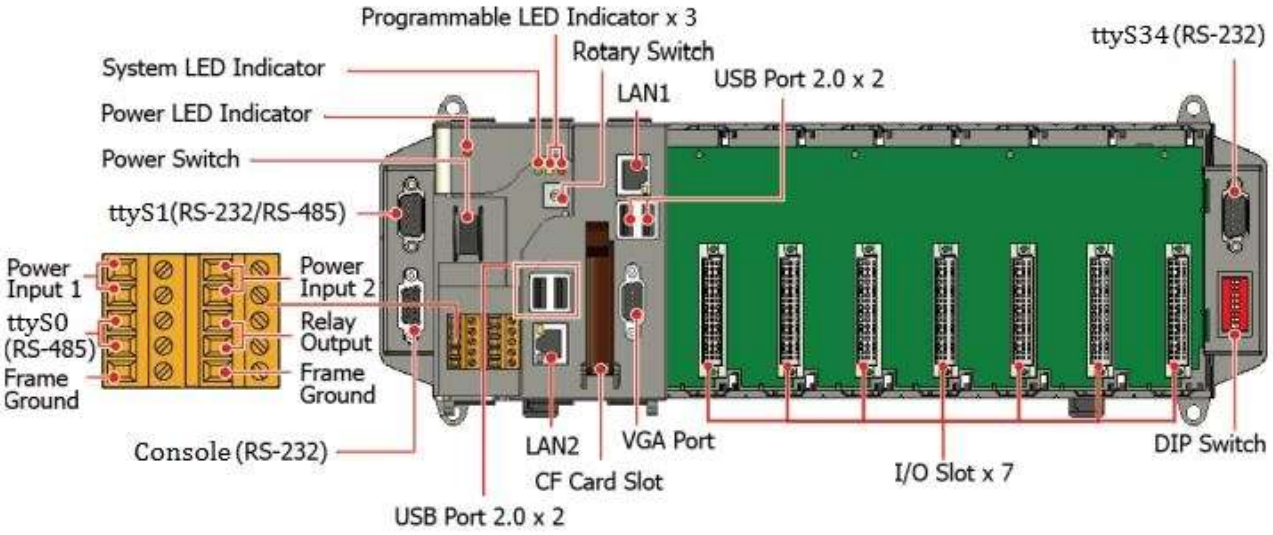
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LX-8331



LX-8731

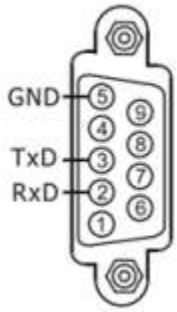


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● **ttySA0 (RS-232)** **(for LX-8031 only)**

The ttySA0 port is a 9-pins RS-232 connector. The details of the ttySA0 port specifications are shown to the side.



Note: 16C550 compatible

Port Type: Male

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 5, 6, 7, 8

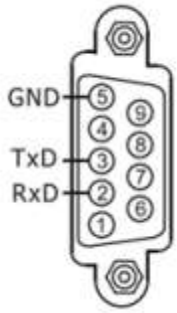
Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

Stop Bits: 1, 2

FIFO: 128 bytes

● **Console (RS-232)**

The Console port is a 9-pins RS-232 connector. The details of the Console port specifications are shown to the side.



Note: 16C550 compatible

Port Type: Female

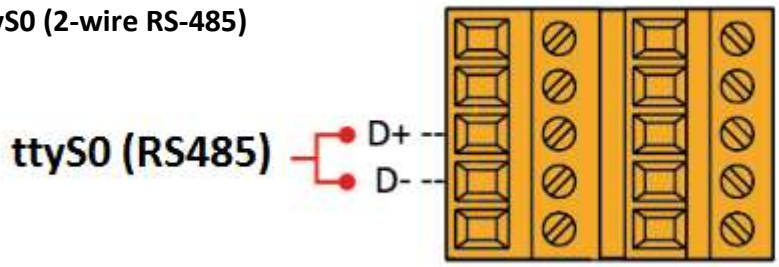
Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 7, 8

Parity: None, Even, Odd Stop Bits: 1

FIFO: 1 byte

●**ttyS0 (2-wire RS-485)**



Note: 16C550 compatible

Port Type: Terminals

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 5, 6, 7, 8

Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

Stop Bits: 1, 2

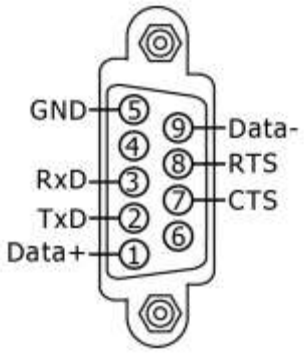
FIFO: 128 bytes

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● ttyS1 (RS-232/RS-485)

The ttyS1 port is a 9-pins RS-232/RS-485 connector. The details of the ttyS1 port specifications are shown to the side.



Note: 16C550 compatible

Port Type: Male

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 5, 6, 7, 8

Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

ttyS1 can be configured as either RS-232 or RS-485, that only can select one at a time and its configuration depends on the pin connections as follows:

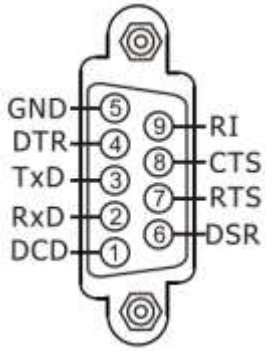
- RS-232 (RXD, TXD, CTS, RTS and GND)

- RS-485 (Data+ and Data-)

There is no software configuration or hardware jumper needed.

● ttyS34 (RS-232)

The ttyS34 port is a 9-pins RS-232 connector. The details of the ttyS34 port specifications are shown to the side.



Note: 16C550 compatible

Port Type: Male

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 5, 6, 7, 8

Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

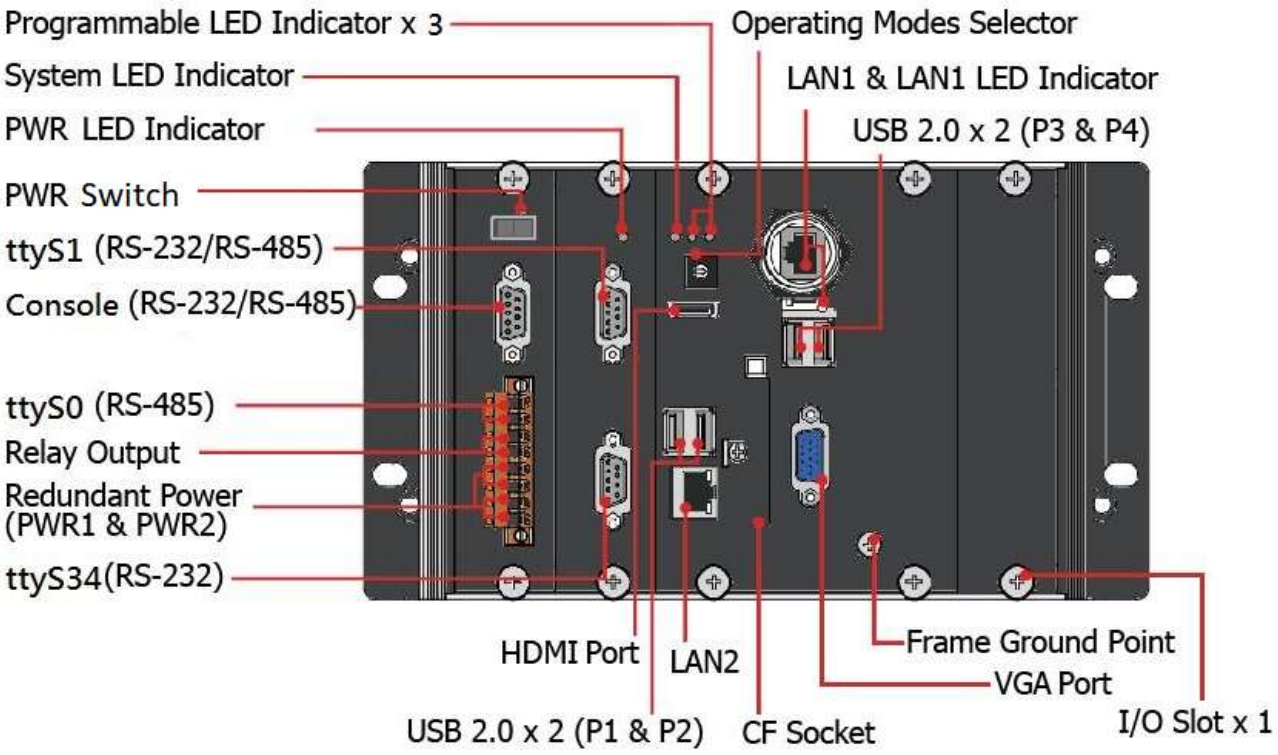
Stop Bits: 1, 2

FIFO: 16 bytes

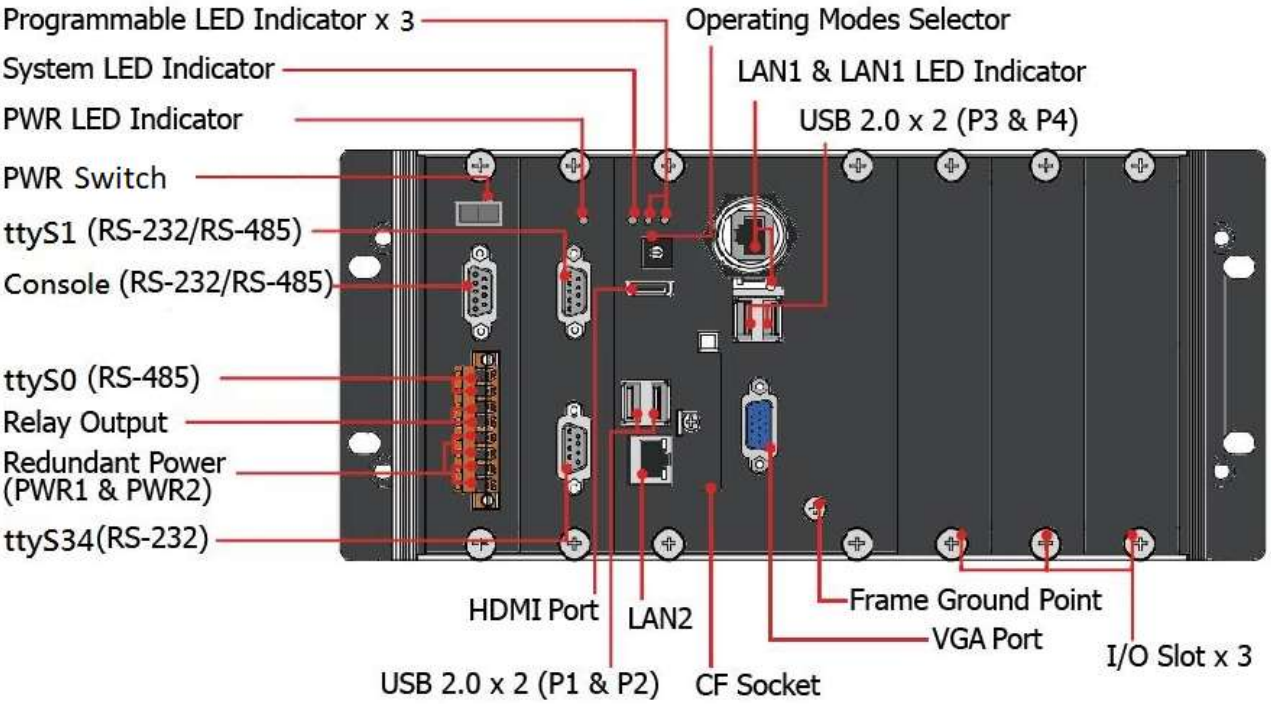
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LX-9171/LX-9181

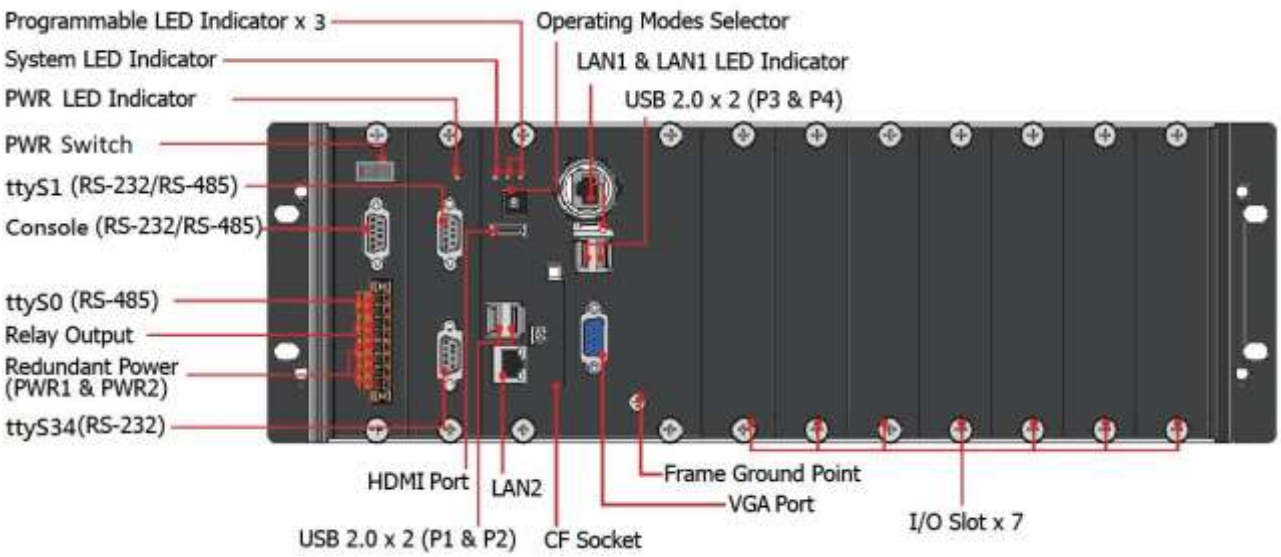


LX-9371/LX-9381



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● **Console (RS-232/RS-485)**

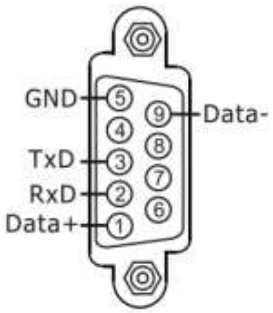
The Console port is a 9-pins RS-232/RS-485 connector that can be configured as either RS-232 or RS-485, that only can select one at a time and its configuration depends on the pin connections as follows:

RS-232 (RXD, TXD and GND)

RS-485 (Data+ and Data-)

There is no software configuration or hardware jumper needed.

The details of the Console port specifications are shown to the side.



Note: 16C550 compatible

Port Type: Male

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 5, 6, 7, 8

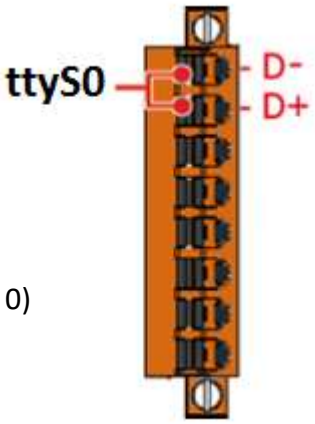
Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

Stop Bits: 1, 2

FIFO: 64 bytes

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● **ttyS0 (2-wire RS-485)**

Note: 16C550 compatible

Port Type: Terminals

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 5, 6, 7, 8 Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

Stop Bits: 1, 2

FIFO: 128 bytes

● **ttyS1 (RS-232/RS-485)**

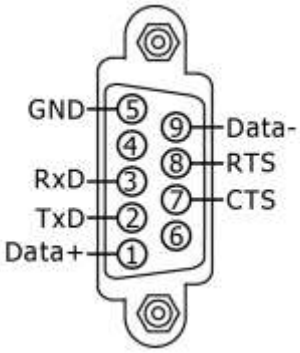
The ttyS1 port is a 9-pins RS-232/RS-485 connector that can be configured as either RS-232 or RS-485, that only can select one at a time and its configuration depends on the pin connections as follows:

RS-232 (RXD, TXD, RTS, CTS and GND)

RS-485 (Data+ and Data-)

There is no software configuration or hardware jumper needed.

The details of the ttyS1 port specifications are shown to the side.



Note: 16C550 compatible

Port Type: Male

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

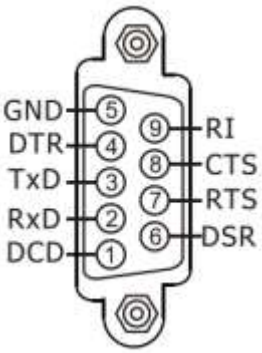
Data Bits: 5, 6, 7, 8 Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

Stop Bits: 1, 2

FIFO: 128 bytes

● **ttyS34 (RS-232)**

The ttyS34 port is a 9-pins RS-232 connector. The details of the ttyS34 port specifications are shown to the side.



Note: 16C550 compatible

Port Type: Male

Baud Rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

Data Bits: 5, 6, 7, 8 Parity: None, Even, Odd, Mark (Always 1), Space (Always 0)

Stop Bits: 1, 2

FIFO: 128 bytes

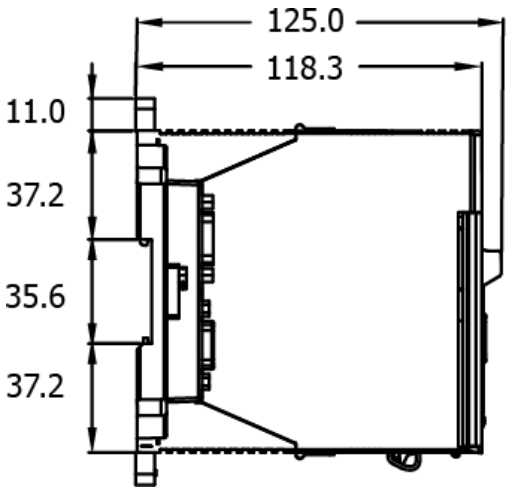
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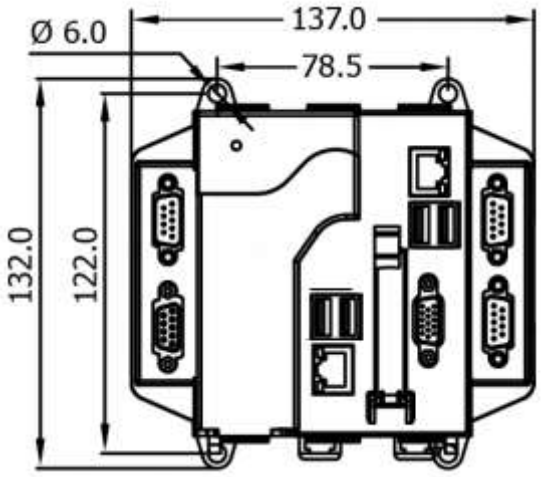
1.4. LX-8000 Series Dimensions

The diagrams below provide the dimensions of the LX-8000 to use in defining your enclosure specifications. Remember to leave room for potential expansion if you are using other components in your system.

The height dimension is the same for all LX-8000. The width depending on your choose of I/O expansion slots. All dimensions are in millimeters.



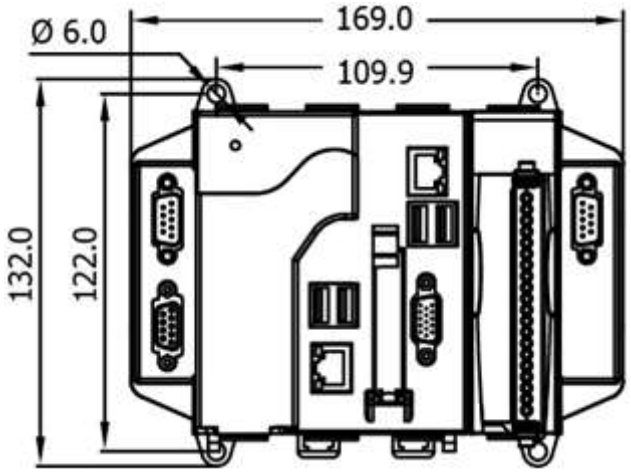
LX-8031



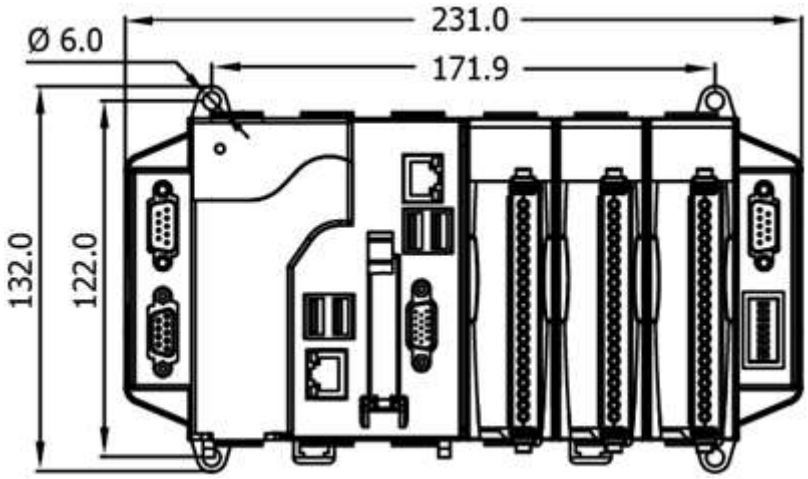
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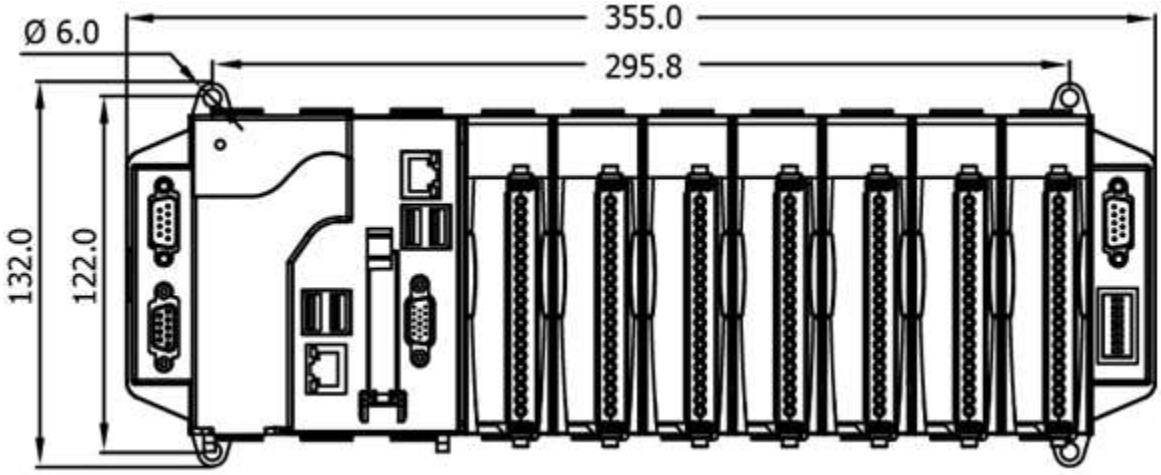
LX-8131



LX-8331



LX-8731



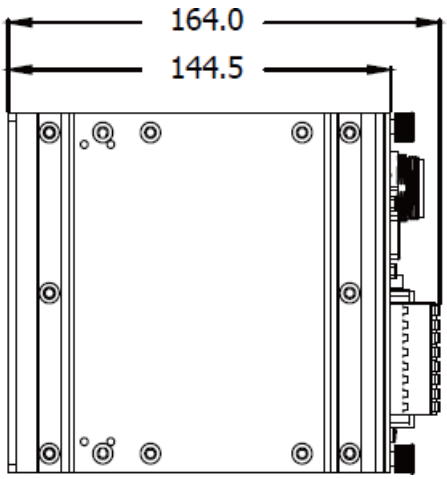
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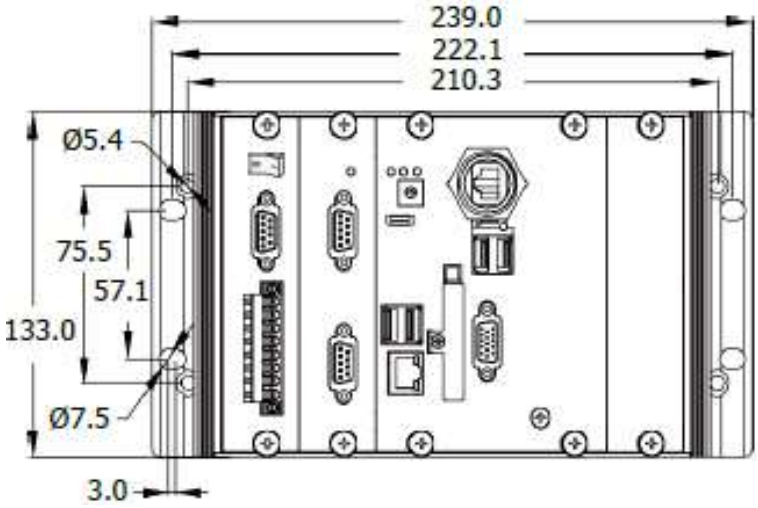
1.5. LX-9000 Series Dimensions

The diagrams below provide the dimensions of the LX-9000 to use in defining your enclosure specifications. Remember to leave room for potential expansion if you are using other components in your system.

The height dimension is the same for all LX-9000. The width depending on your choose of I/O expansion slots. All dimensions are in millimeters.



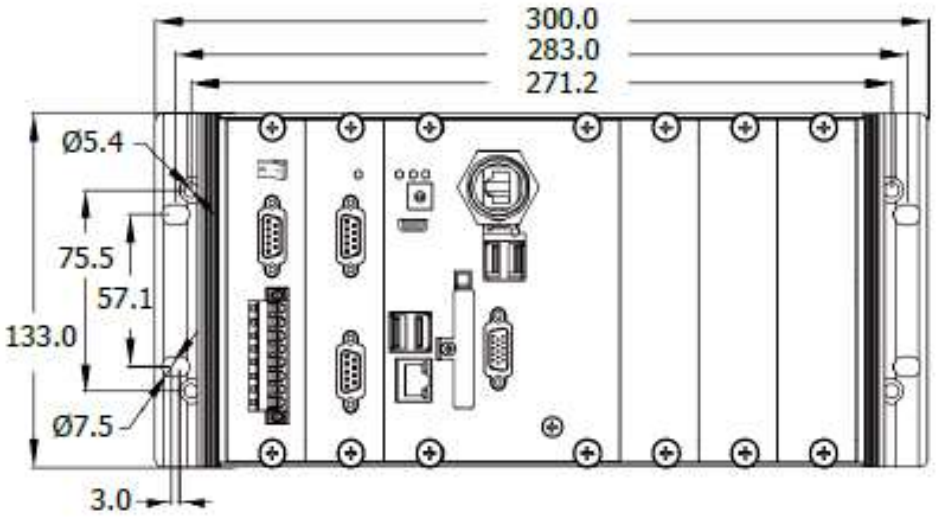
LX-9171/LX-9181



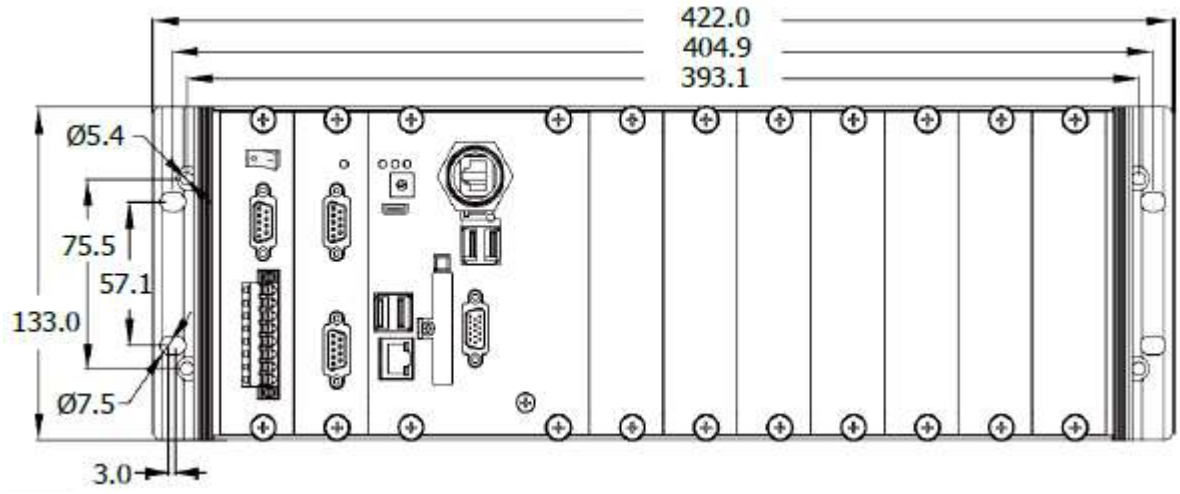
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LX-9371/LX-9381



LX-9771/LX-9781



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2. LX-8000/9000 Getting Started

This chapter provides a guided tour of the LX-8000/9000 installation and configuration that describes the steps needed to download, install, configure, and run the basic procedures for user working with the LX-8000/9000 for the first time.

Before starting any task, please check the package contents. If any of the following package contents are missing or damaged, contact your dealer, distributor.

- LX-8x31 Series



LX-8x31



CF Card



Screw Driver
(1C016) 2.4 mm



Quick Start
(This Document)

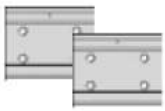
- LX-9x71/LX-9x81 Series



LX-9000



CF Card



44 mm DIN-Rail
Clip x 2



Quick Start
(This Document)



RJ-45
WaterProof Connector



Screw Driver
(1C016) 2.4 mm



M3x6L Screw * 8

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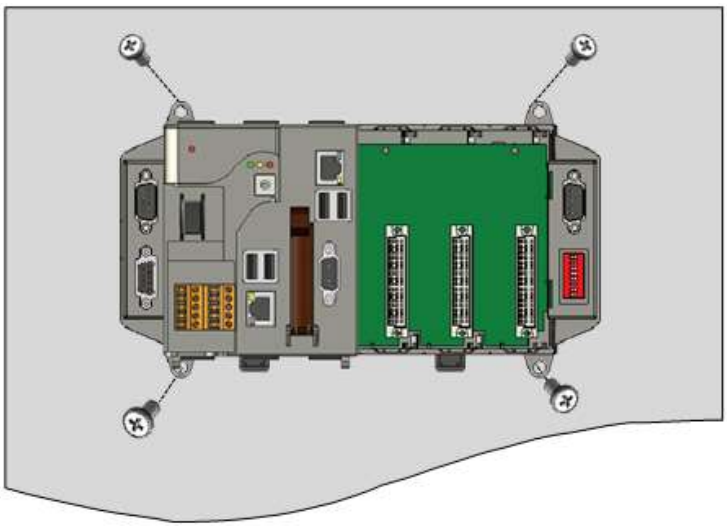
2.1. Mounting the LX-8000

The LX-8000 can be mounted either directly to a wall/panel, or onto a standard 35mm DIN rail.

Wall/Panel mounting

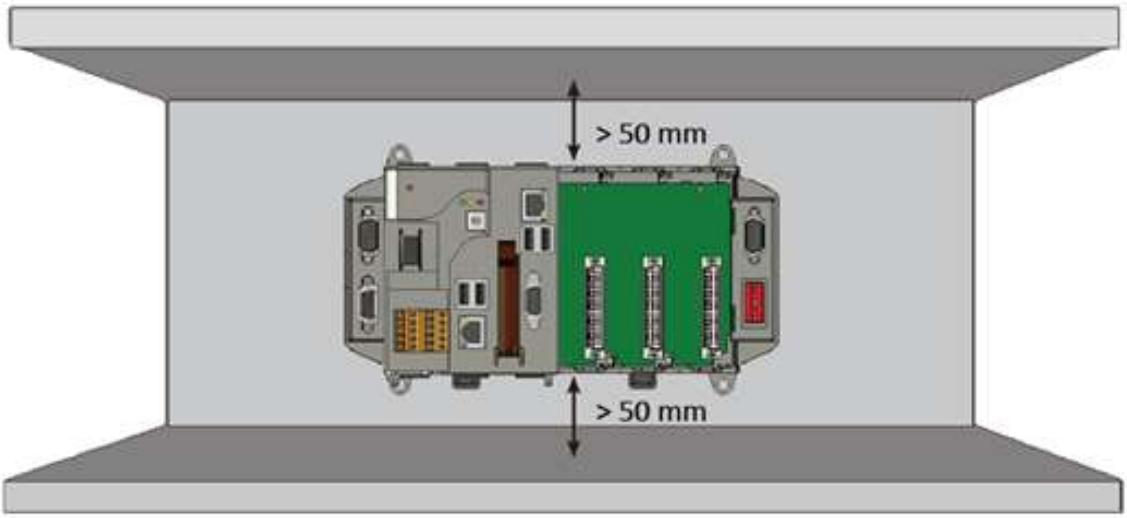
Step 1: Install the four mounting screws into the 4 keyhole mounting holes

Step 2: Fasten the screws securely



Tips & Warnings

There must be a minimum clearance of 50mm between the LX-8000 and the top and bottom side of the enclosure panel.

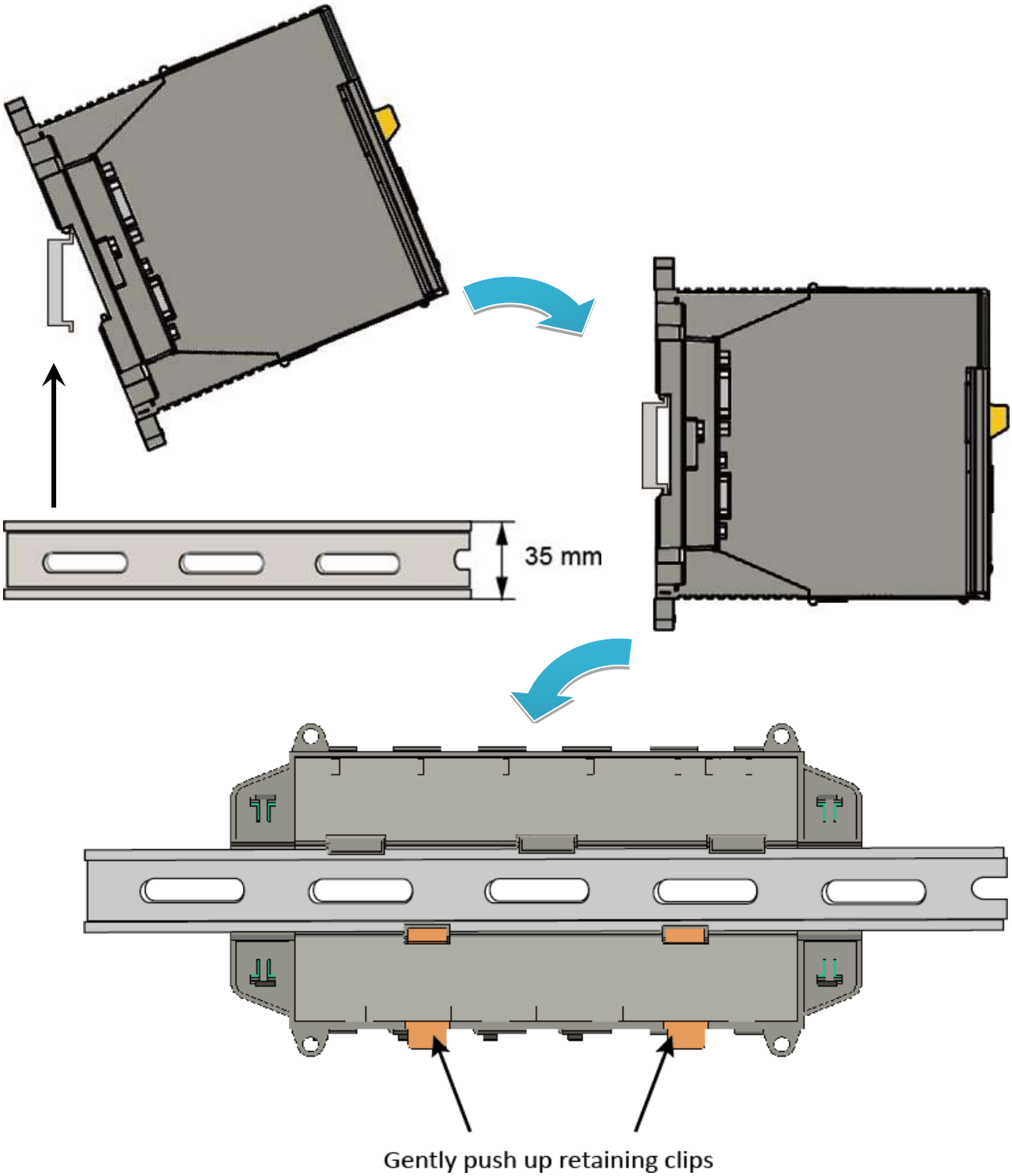


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Step 1: Hook upper tab over upper flange of DIN rail

Step 2: Tilt the module toward DIN rail until it snaps securely to DIN rail

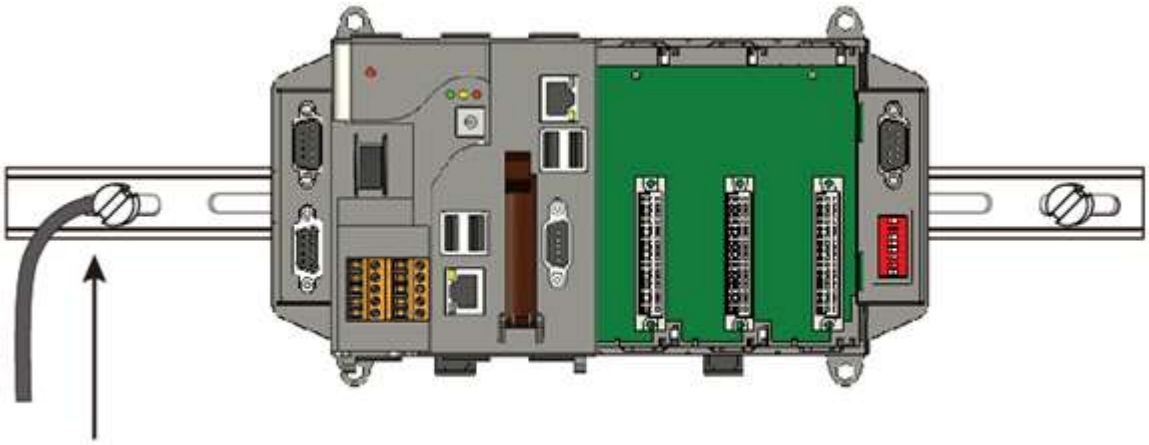


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Tips & Warnings

A good common ground reference (earth ground) is essential for proper operation of the LX-8000. One side of all control circuits, power circuits and the ground lead must be properly connected to earth ground by either installing a ground rod in close proximity to the enclosure or by connecting to the incoming power system ground. There must be a single-point ground (i.e. copper bus bar) for all devices in the enclosure that require an earth ground.



Connect the ground lead to the ground screw

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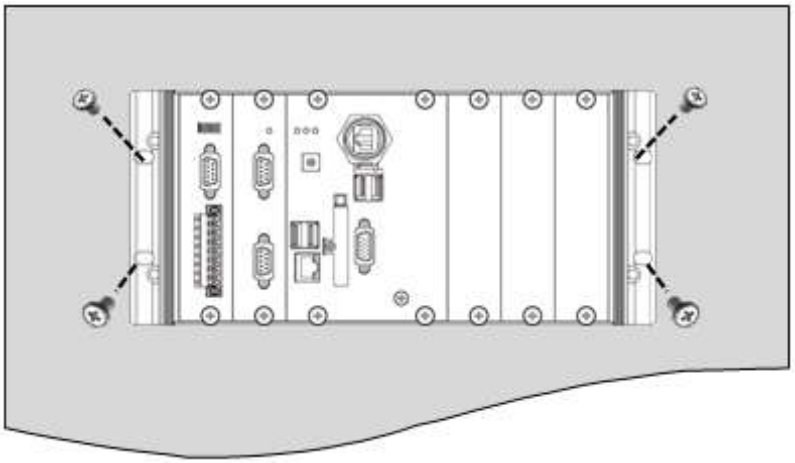
2.2. Mounting the LX-9000

The LX-9000 can be mounted either directly to a wall/panel, or onto a stainless 35mm DIN rail.

Wall/Panel mounting

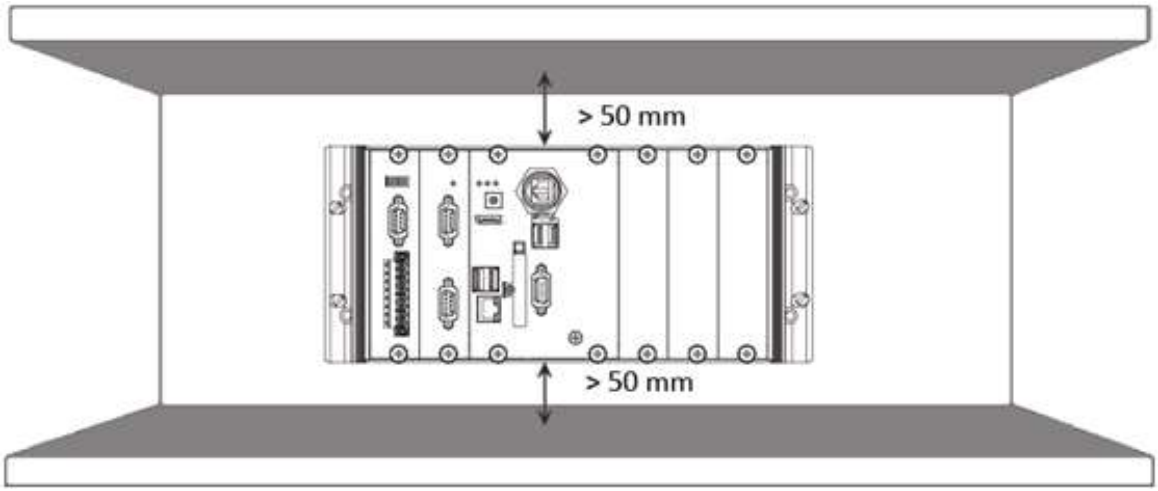
Step 1: Install the four mounting screws into the 4 keyhole mounting holes

Step 2: Fasten the screws securely



Tips & Warnings

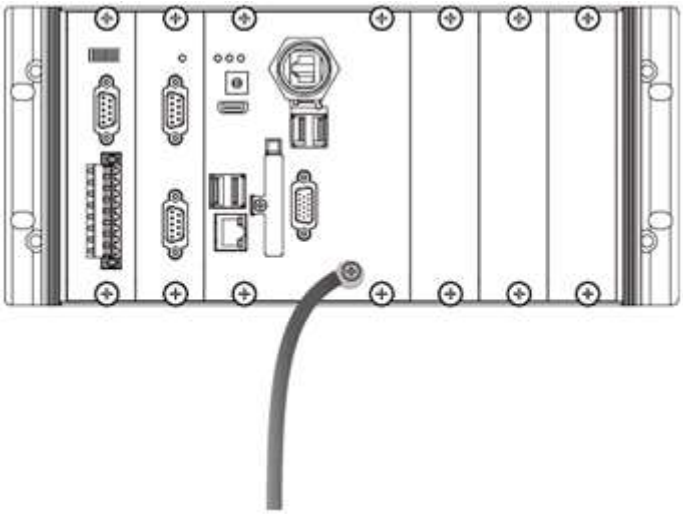
There must be a minimum clearance of 50mm between the LX-9000 and the top and bottom side of the enclosure panel.



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Step 3: Connect the ground lead to the frame ground point

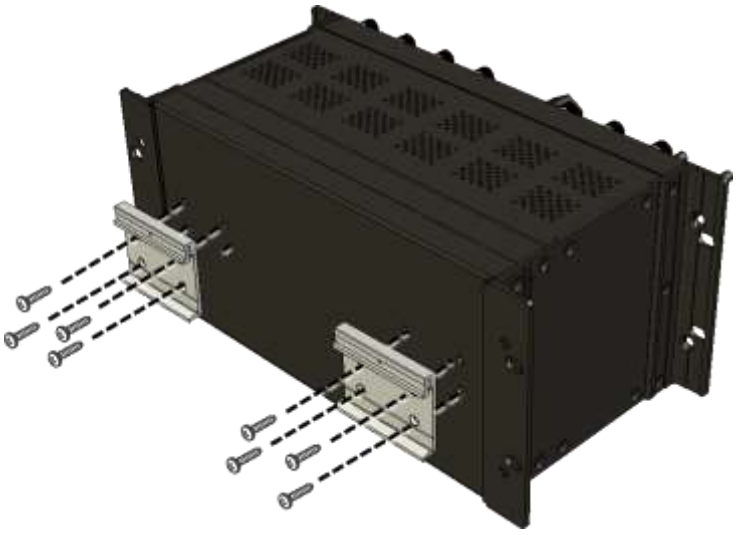


Tips & Warnings

A good common ground reference (earth ground) is essential for proper operation of the LX-9000. One side of all control circuits, power circuits and the ground lead must be properly connected to earth ground by either installing a ground rod in close proximity to the enclosure or by connecting to the incoming power system ground. There must be a single-point ground (i.e. copper bus bar) for all devices in the enclosure that require an earth ground.

DIN Rail mounting

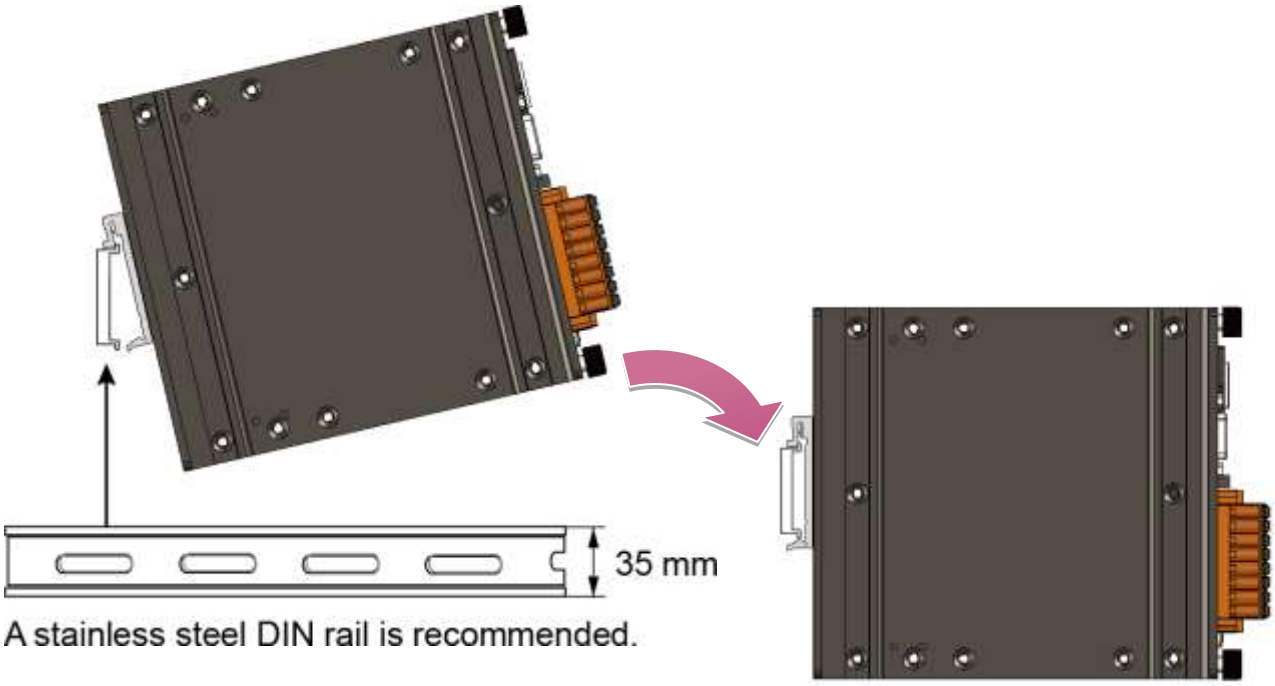
Step 1: Fasten the DIN rail clip to the LX-9000



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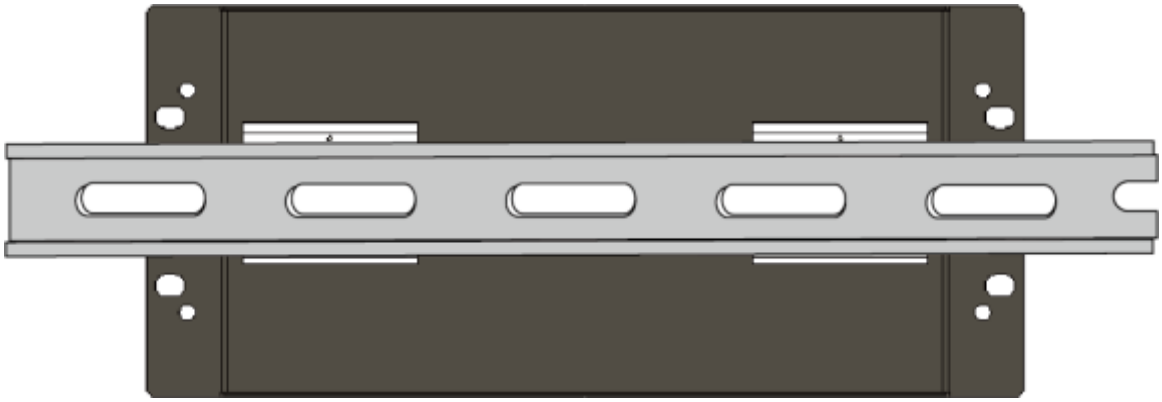
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Step 2: Clip the device onto a stainless DIN rail



Tips & Warnings

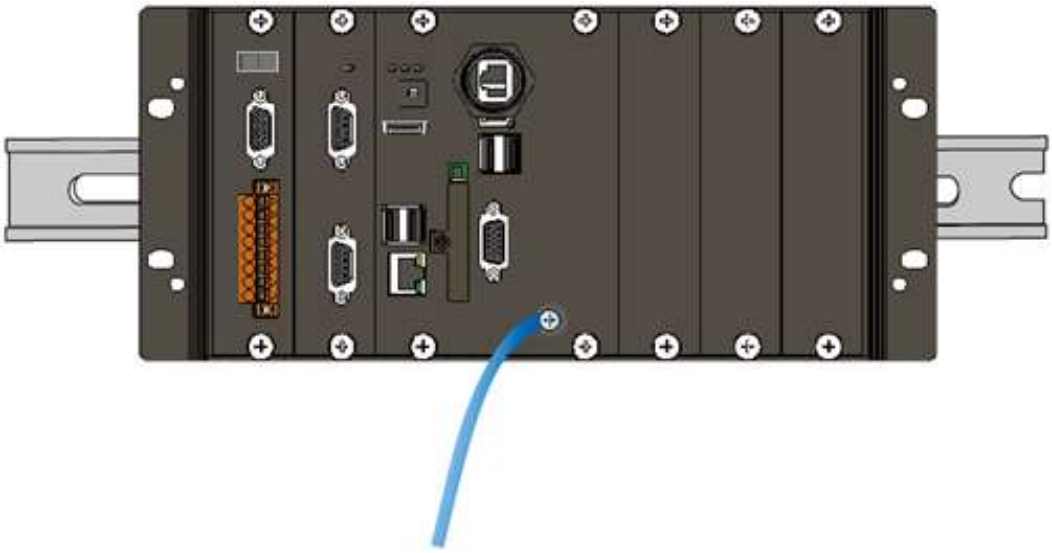
For DIN rail mounting, it is strongly recommended that only a stainless steel DIN rail be used to support the weight of LX-9000 system, providing stability and preventing LX-9000 from leaning



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Step 3: Connect the ground lead to the frame ground point



Tips & Warnings

A good common ground reference (earth ground) is essential for proper operation of the LX-9000. One side of all control circuits, power circuits and the ground lead must be properly connected to earth ground by either installing a ground rod in close proximity to the enclosure or by connecting to the incoming power system ground. There must be a single-point ground (i.e. copper bus bar) for all devices in the enclosure that require an earth ground.

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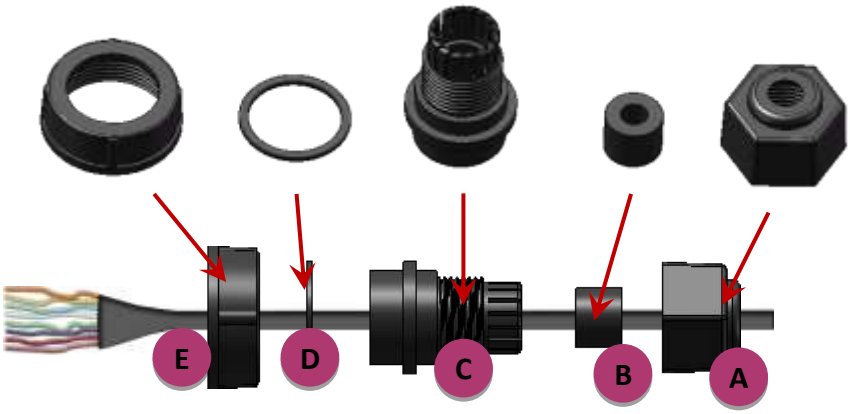
2.3. Installing the RJ-45 waterproof connector assembly

The LX-9000 series is equipped with an RJ-45 waterproof connector to withstand contaminant in dusty environment.

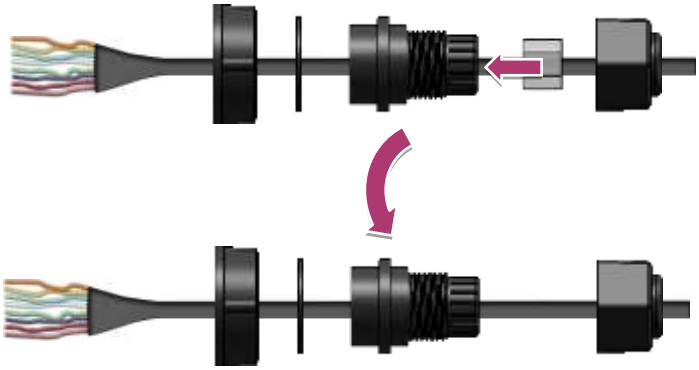
Step 1: Remove the RJ-45 connector from the RJ-45 cable



Step 2: Feed the end of the RJ-45 cable through the (A) sealing nut, (B) rubber sealing insert, (C) clamping ring, (D) panel gasket and (E) cable gland base



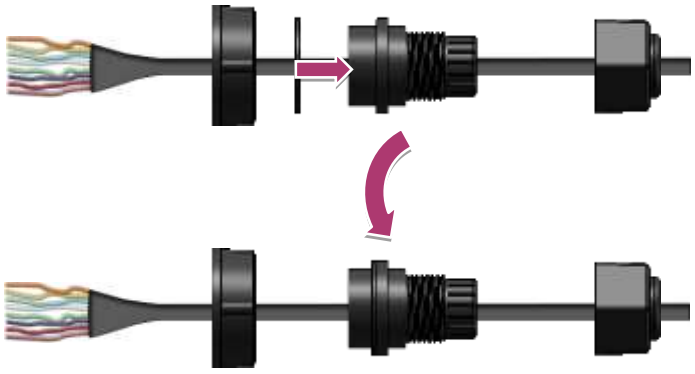
Step 3: Wrap the (C) clamping ring around the (B) rubber sealing insert



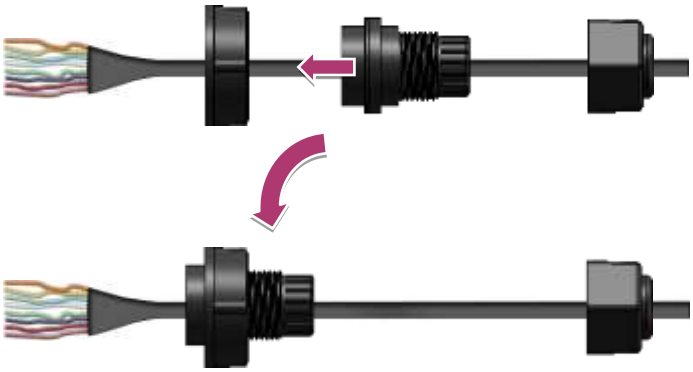
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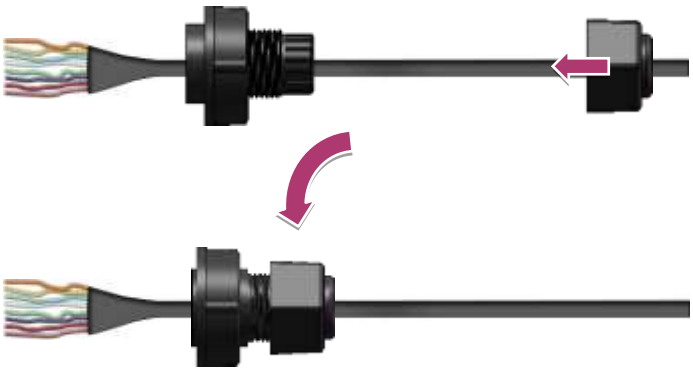
Step 4: Insert the (D) panel gasket into the (C) clamping ring



Step 5: Seat the (C) clamping ring and (D) panel gasket in the (E) cable gland base



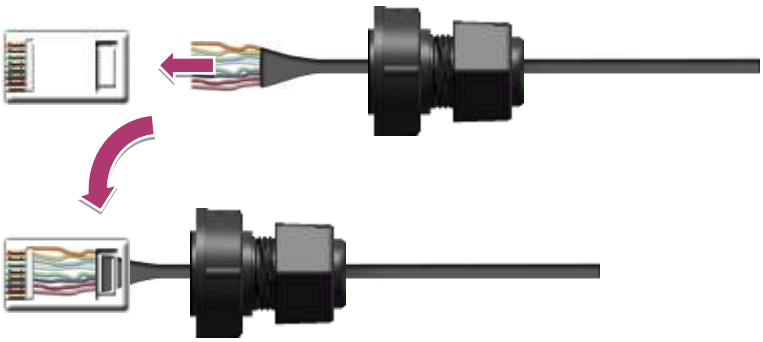
Step 6: Push the (E) sealing nut forward and Hand-tighten it to seal the assembly



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Step 7: Insert the RJ-45 cable into the RJ-45 connector



Step 8: Push the RJ-45 waterproof connector assembly forward



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2.4. Deploying a Basic LX-8000/9000 System

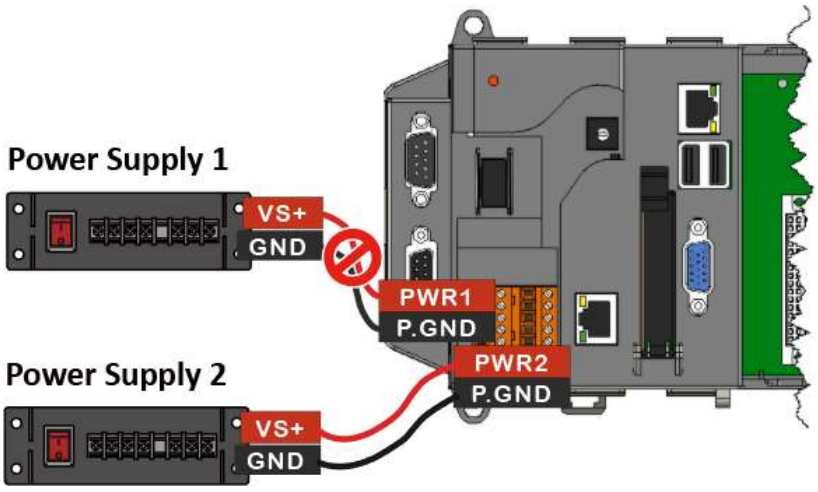
The LX-8000/9000 provides a variety of communication interface to suit a range of application. Here is a simple application for using theLX-8000/9000.

Step 1: Connect the positive terminal (+) of the power supply to the terminal PWR1/2 and the negative terminal (-) of the power supply to the P.GND

Tips & Warnings

1. The input range of power supply is +10 to +30 V_{DC}.
2. The LX-8000/9000 have two power inputs that can be connected simultaneously to the two independent power sources. If one power source fails, the other source takes over automatically. Redundant power input help assure non-stop operation of the LX-8000/9000.

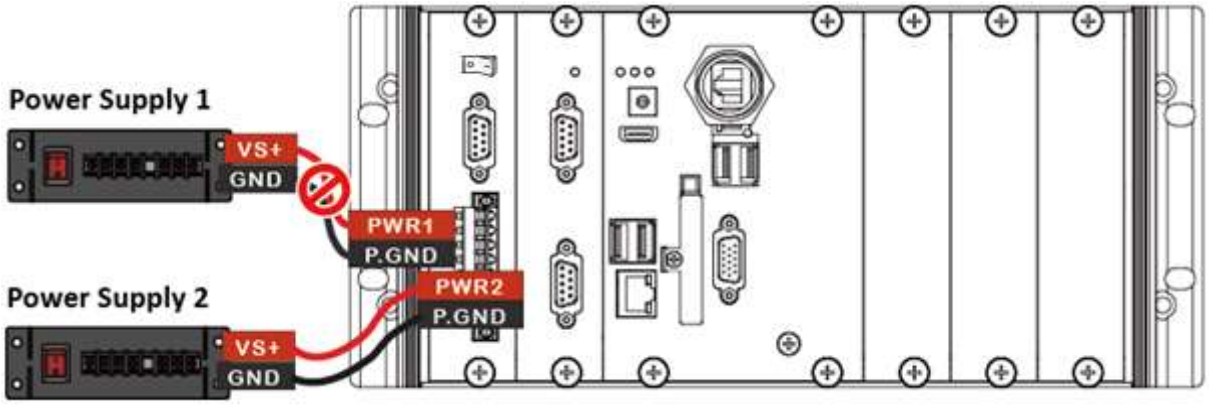
- LX-8000



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- LX-9000

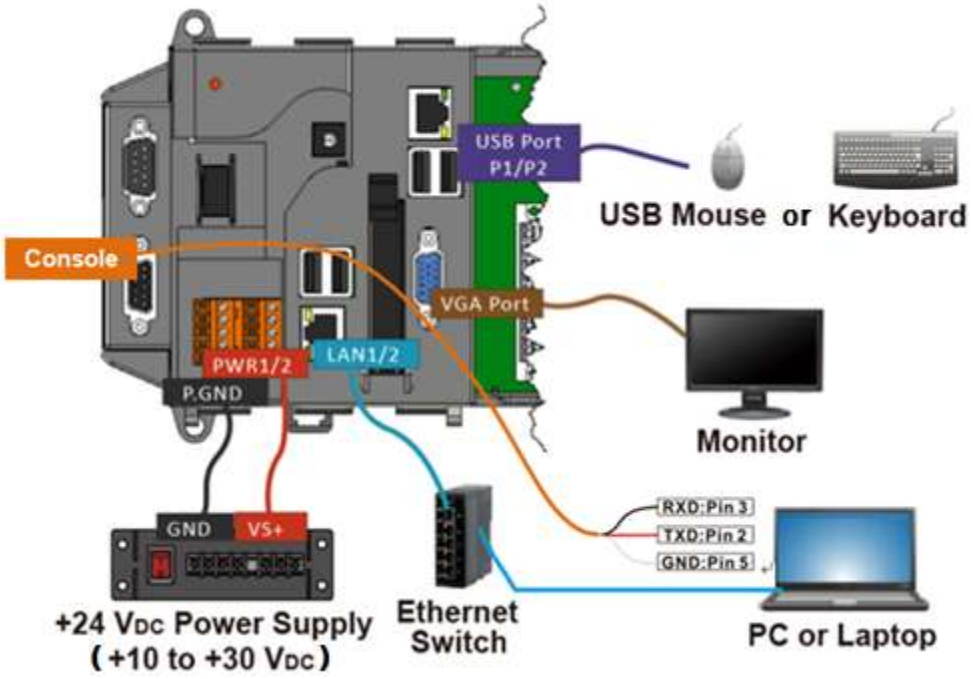


Step 2: Connect the USB mouse or the USB keyboard to the USB port

Step 3: Connect the monitor to the VGA port

Step 4: Connect to PC or the laptop to the LAN port via an Ethernet switch

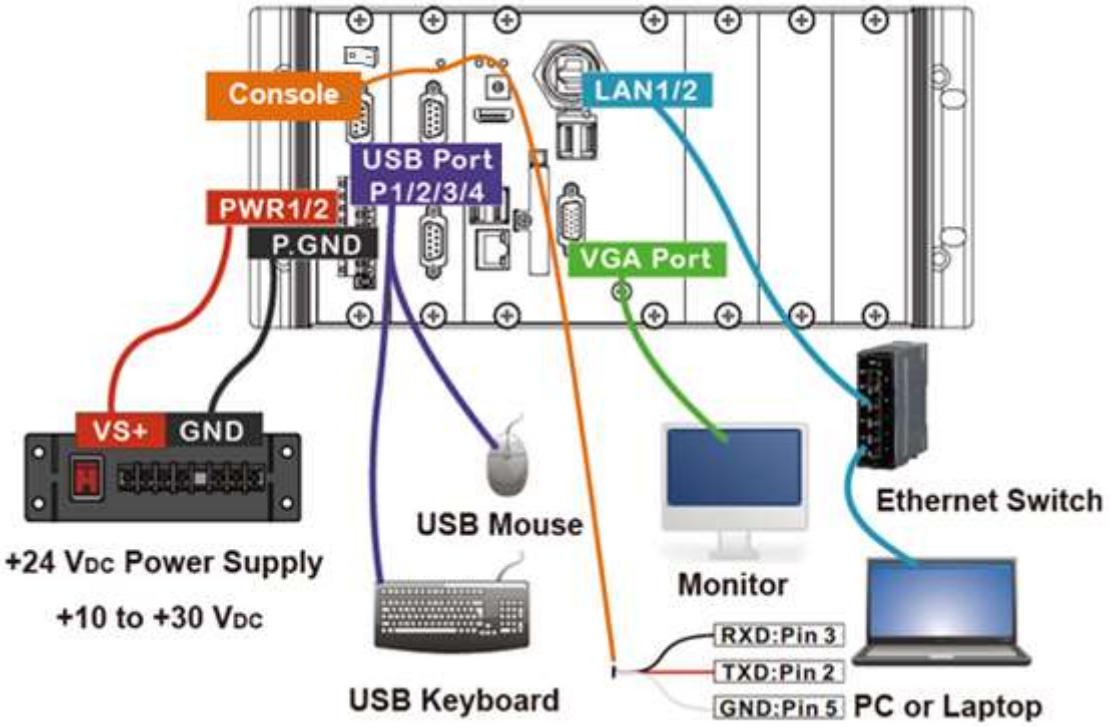
- LX-8000



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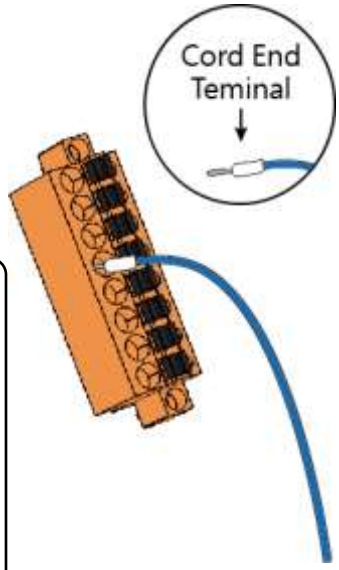
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- LX-9000



Tips & Warnings

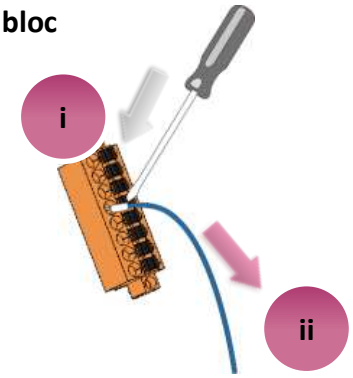
The metal part of the cord end terminal on the wire can be direct wired to the terminal.



Remove the wiring from the terminal bloc

i. Use the screwdriver to push the black clip in

ii. Remove the wiring



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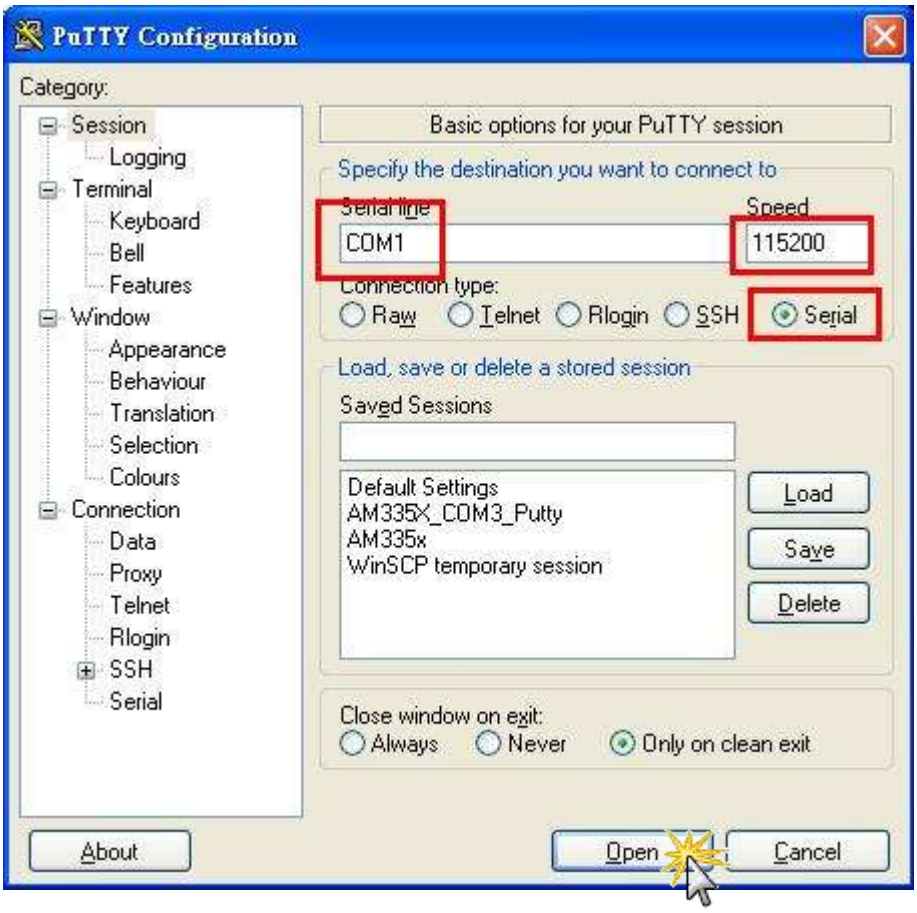
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2.5. Console Port Connection

The LX-8000/9000 support remote connection from the “Console” port without internet. The user can follow below steps to connect to the LX-8000/9000.

Step 1: User can choose the software (Putty or others) through the “Console” to connect the LX-8000/9000.

Step 2: If user chose the “Console”, user can set the baud rate “115200” to connect the device.



Step 3: After user connect to the LX-8000/9000 from the “Console” port, user can input default ID “root” and password “icpdas” to login.

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2.6. LAN1/LAN2 Network Configuration

If user login LX-8000/9000 with Console port successful. User can use “ifconfig” command to get the IP address of LAN1/LAN2.

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2.6.1. Set Static IP

The LAN 1/2 of factory setting use DHCP. If user wants to set the static IP address, user can refer to below steps:

Step 1: Using the linux command “vi” to modify the file “/etc/network/interfaces”.

Step2: Using the ‘#’ to mark the default configuration.

Step3: Set static IP by your own environment.



Step4: After user save the file and use “reboot” command to reset device, user can use the new network configuration on LX-8000/9000.

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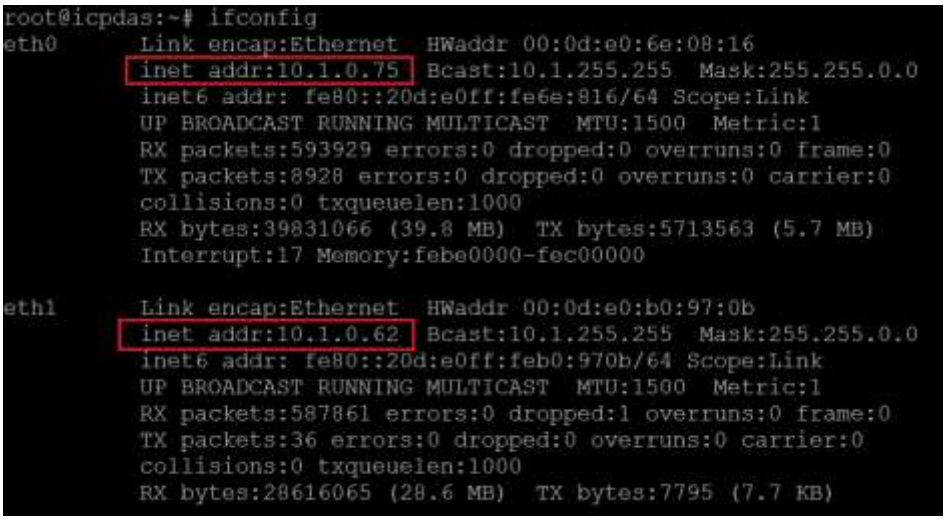
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2.7. LAN1/LAN2 Network Connection

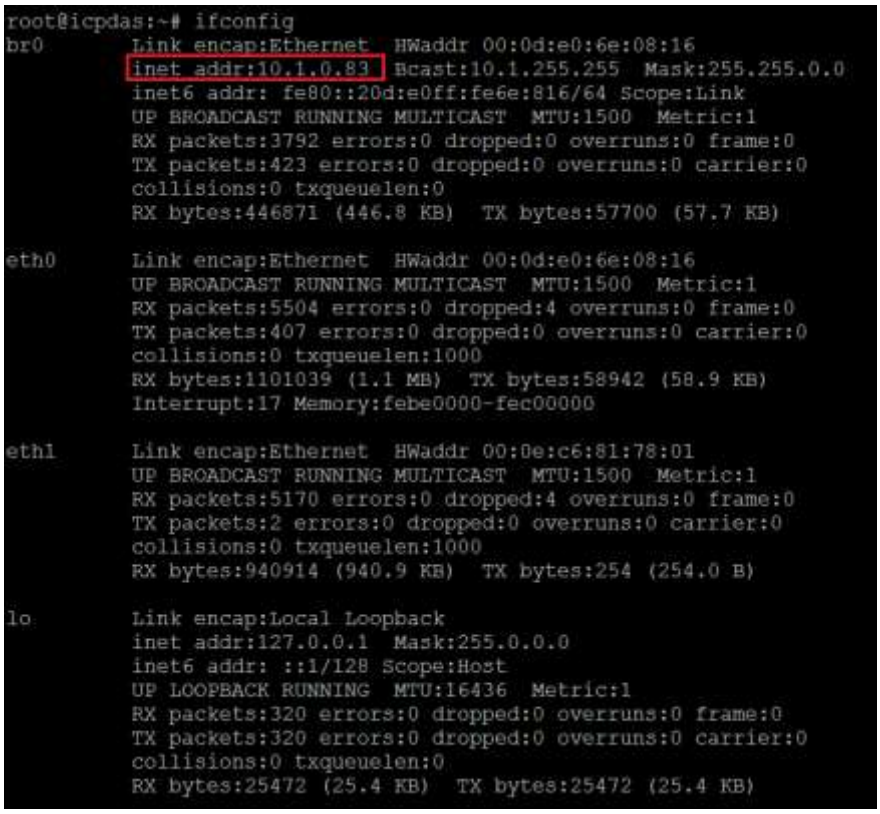
If user login LX-8000/9000 with Console port successful.

The user can use “ifconfig” command to get the IP address of LAN1/LAN2 and connect the LX-8000/9000 with the SSH client software (Putty or others).

Step 1: Using “ifconfig” to check the IP address of LAN1/2.



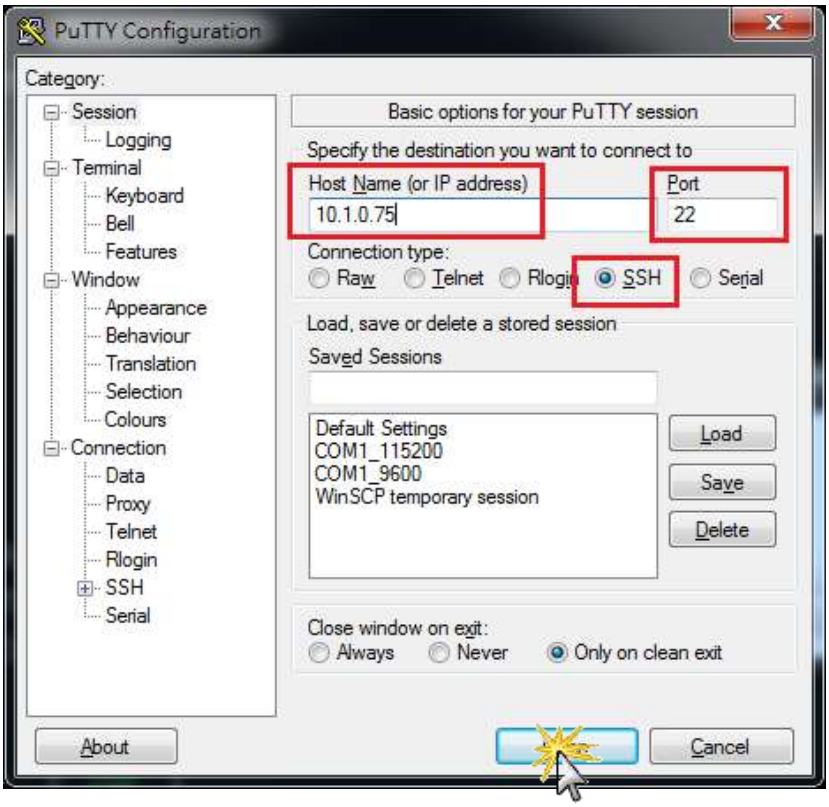
If User used bridge interface with RSTP, Using “ifconfig” to check IP address of br0



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Step 2: User can use SSH client software (Putty or others) to connect the LX-8000/9000.



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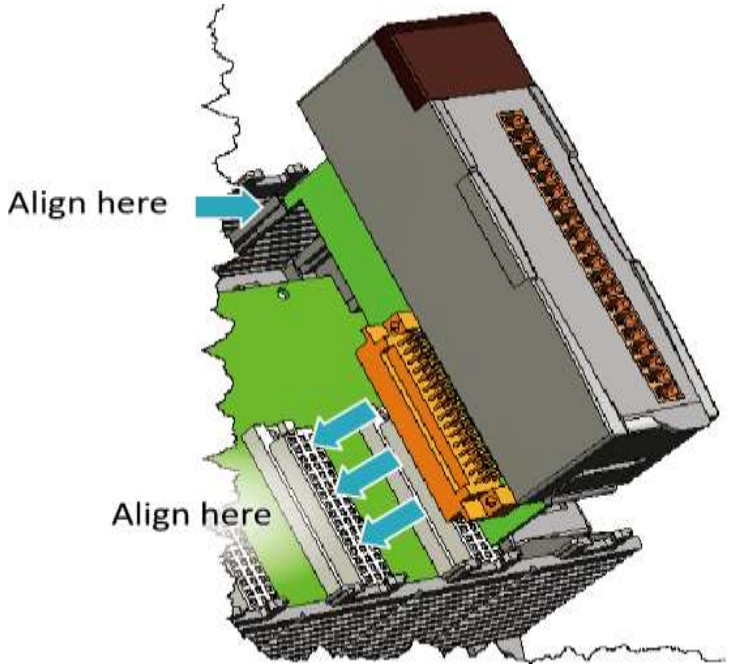
2.8. Inserting the I/O Modules

LX-9000 has 1/3/7 I/O expansion slots to support I-9K and I-97K series I/O modules. LX-8000 also has 1/3/7 I/O expansion slots to support I-8K and I-87K series I/O modules.

Before choosing the right I/O modules, you first need to know the I/O expansion capacities in order to choose the best expansion module for achieving maximal efficiency. For more information about the I/O expansion modules that are compatible with the LX-8000/9000, please refer to:
http://www.icpdas.com/products/PAC/winpac/io_support_list.htm

- LX-8000 Series

Step 1: Align circuit card with slot and press firmly to seat module into connector



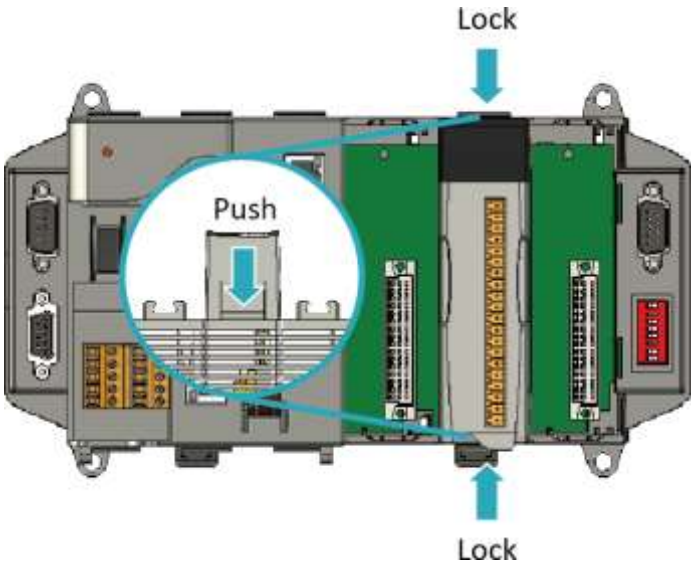
Tips & Warnings

It is recommended that the power to the LX-8000 is switched off when wring the I/O module which are plugging in the LX-8000 slots.

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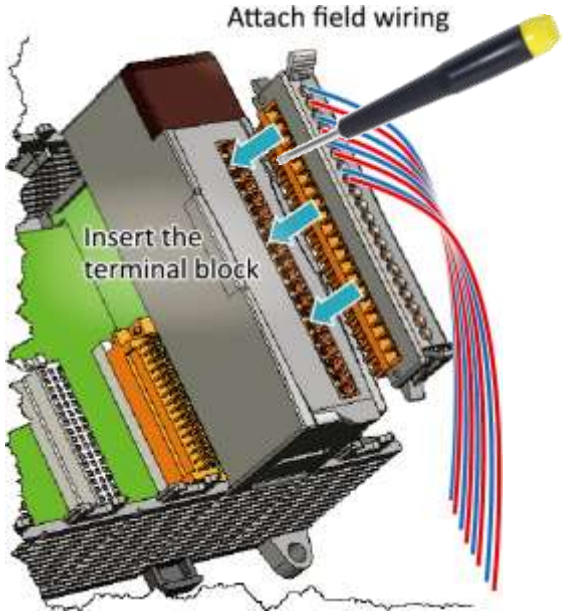
Step 2: Pull top and bottom locking tabs toward module face. Click indicates lock is engaged



Step 3: Attach field wiring using the terminal block, and then insert the terminal block

All I/O Web Page include the I/O module specifications, pin assignments and wiring connections.

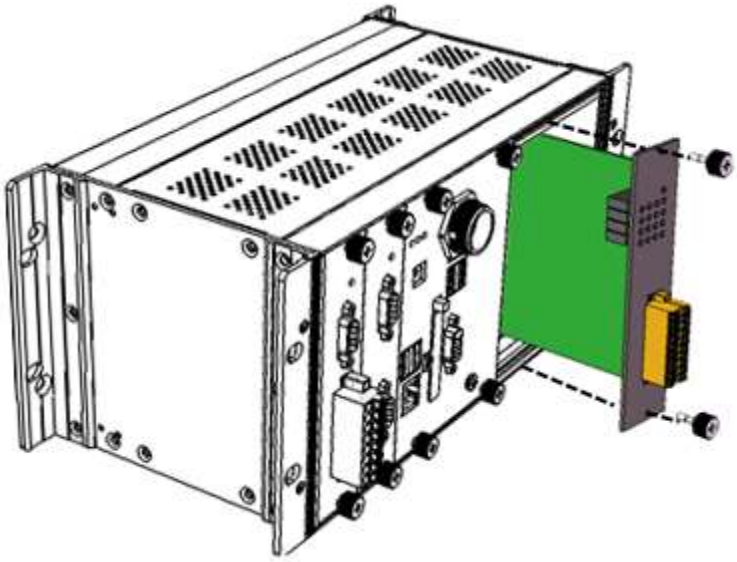
For example, Pin Assignments and Wiring connections for the I-87054W module are as follows:
http://www.icpdas.com/root/product/solutions/remote_io/rs-485/i-8k_i-87k/i-87054w.html



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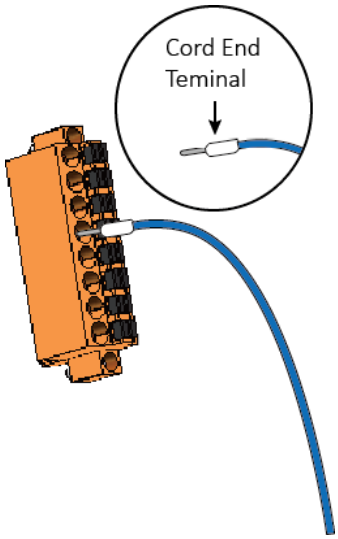
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Step 1: Insert the I/O module



Step 2: Wiring connection

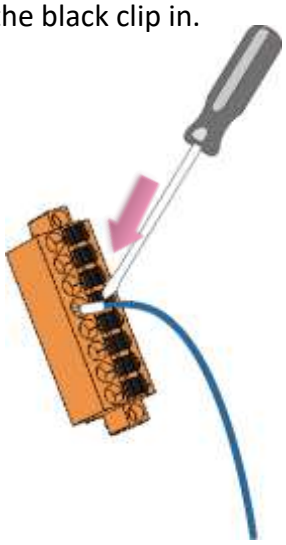
The metal part of the cord end terminal on the wire can be direct wired to the terminal of LX-9000.



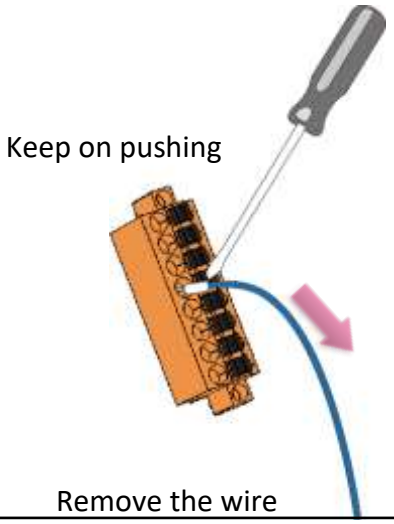
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1. Use screwdriver to push the black clip in.



2. Remove the wiring from the terminal block



Tips & Warnings

If you do not expand the I/O module full, please keep the top case of the unused slot to protect the backplane from dirt, dust and damage from foreign objects.

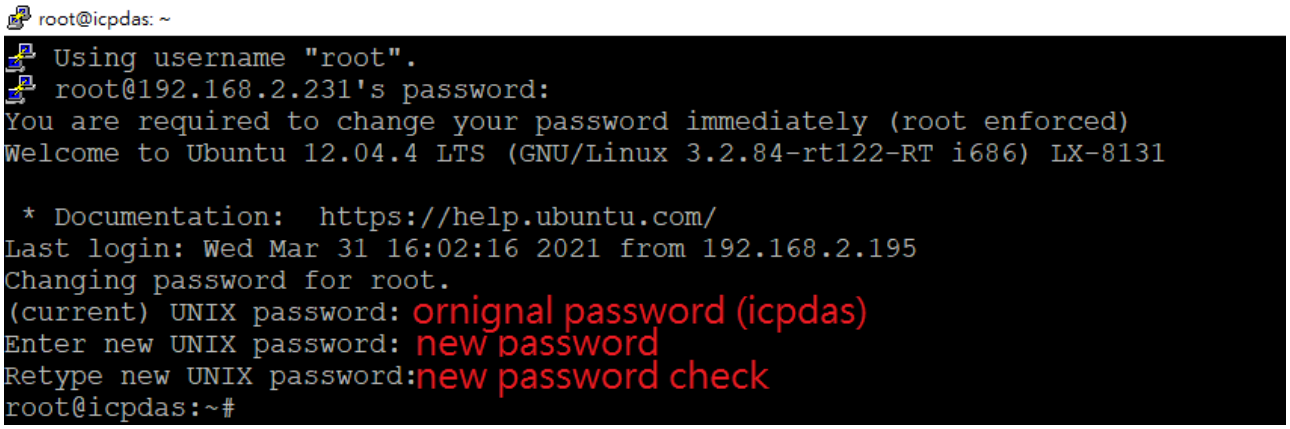
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2.9. Change password at first login

LX-8000 has two account “root” & “icpdas”, user need change password when first login in.

In LX-8000 LinPAC, you can use button “F10” to select USB disk boot device when you power on



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2.10. Recovering factory OS from USB disk to Flash

If user wants to recover factory OS for LX-8000/9000, please using below steps to recover flash's Linux OS:

In LX-8000 LinPAC, you can use button "F10" to select USB disk boot device when you power on

Step 1: You can download the OS image from the following URLs, then use the tool **HDDRawCopy (please download it from the internet) to write the OS image to a USB drive(with a capacity of at least 16 GB).**

LX-8000: https://www.icpdas.com/tw/download/show.php?num=6760&model=LX-8031
LX-9000: https://www.icpdas.com/tw/download/show.php?num=6761&model=LX-9171
Then select OS image file to download.

Step 2: Boot up LX-8000/9000 with USB disk OS. Please refer to below command to check the recovery directory in "/root" directory

Notice: For the LX-8X31 PAC, the BIOS settings must be modified; otherwise, the default configuration will not detect the USB drive during boot. The system will only detect the USB drive after entering the OS, causing USB-boot failure.

Enter the BIOS and adjust the settings using the path below:
BIOS → Advanced → USB Configuration → Legacy USB Support
Set this option to **Enable** so the system can detect and boot from the USB OS.

- LX-8x31

```
root@icpdas:/root# ls
Desktop  OS-install
root@icpdas:/root#
```

- LX-9x71/9x81

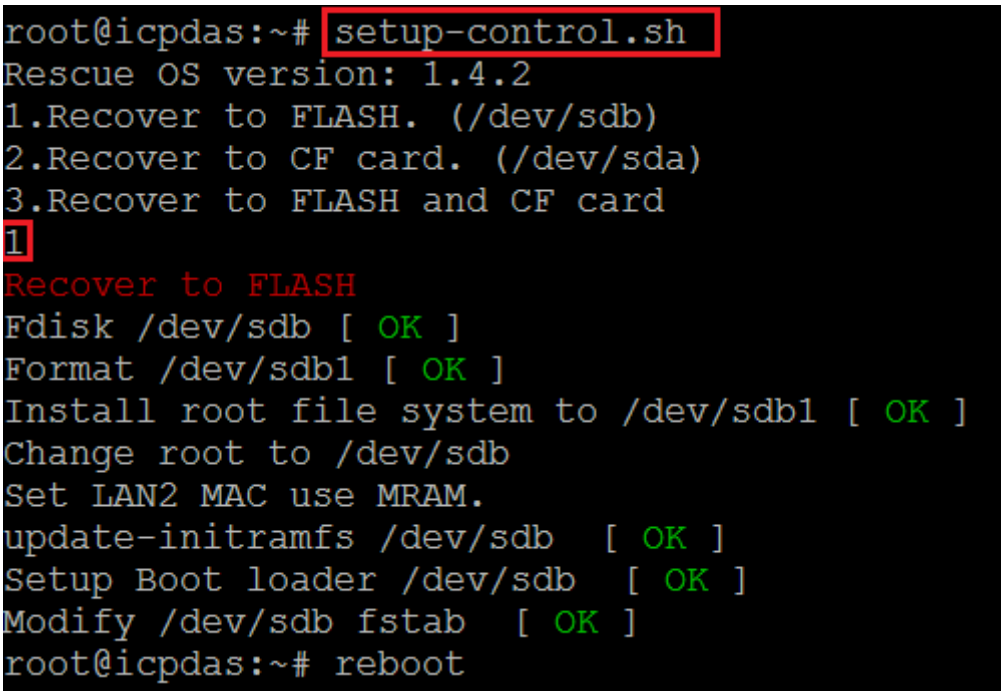
```
root@icpdas:~# ls
Desktop  OS-install_9x7x_9x8x
root@icpdas:~#
```


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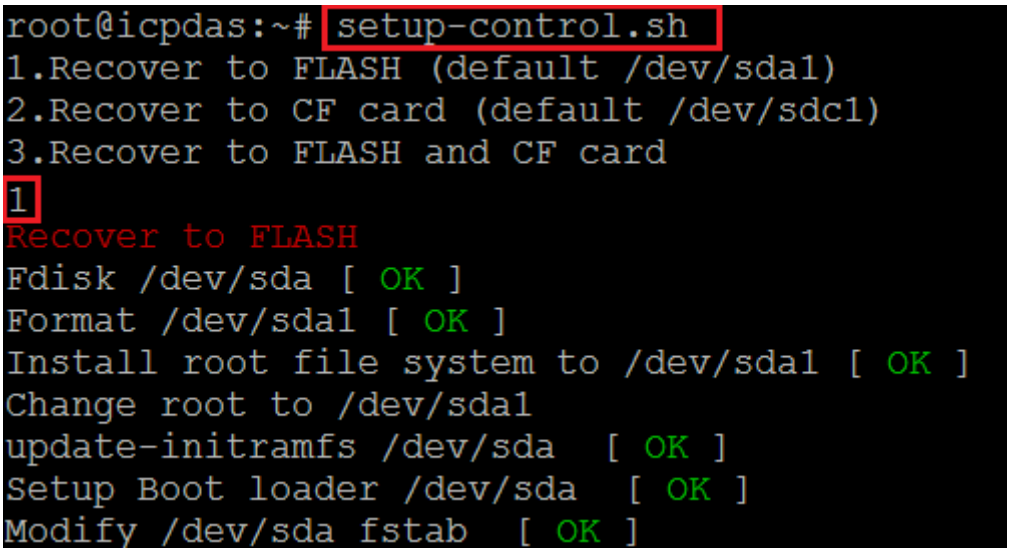
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Step 3: Executing the command “setup-control.sh” and choose option ‘1’ to recover the factory Linux OS to flash disk in LX-8000/9000.

- LX-8x31



- LX-9x71/9x81



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2.11. Update USB disk recover file version

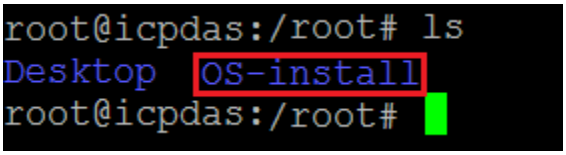
User can follow below steps to update recover file to recent version.

In LX-8000 LinPAC, you can use button “F10” to select USB disk boot device when you power on

- LX-8x31

1. Boot up with USB disk and download recover file by below link.
   https://www.icpdas.com/en/download/show.php?num=989&model=LX-8031
   Please download “LX-8000 OS rootfs” option.

2. Delete old recover file (data folder “OS-install”) and unzip downloaded file.



3. Executing the command “setup-control.sh” and choose option ‘1’ to recover the factory Linux OS to flash disk.

Notice:

If your OS version is under 1.4.1, and you want to update OS to recently version.

You could find that command “setup-control.sh” does not exist.

Use below two commands to solve this issue.

rm -f /usr/local/sbin/setup-control.sh

ln -s /root/OS-install/setup-control.sh /usr/local/sbin/setup-control.sh

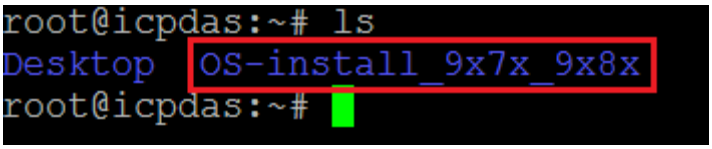
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- LX-9x71/9x81

1. Boot up with USB disk and download recover file by below link.
   https://www.icpdas.com/en/download/show.php?num=1194&model=LX-9171
   Please download “LX-9000 OS rootfs” option.

2. Delete old recover file (data folder “OS-install_9x7x_9x8x”) and unzip downloaded file.



3. Executing the command “setup-control.sh” and choose option ‘1’ to recover the factory Linux OS to flash disk.

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3. Instructions for LX-8000/9000

This chapter provides a brief introduction of the LX-8000/9000 service tools and its benefits.

There are several tools and utilities built-in and designed for use with LX-8000/9000.
Some of these are pre-installed on LX-8000/9000 and can work directly on LX-8000/9000, and some of these are supporting tools and can help you to manage the LX-8000/9000 remotely on a PC.

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3.1. Basic Linux Command

The Linux basic command can be used to set Linux OS or get system information in the LX-8000/9000.



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3.1.1. Linux Command “ls”

ls: list the file information -> (like dir in DOS)

Parameter：

(1) -l：list detailed information of file

```
root@icpdas:/# ls -l
total 100
drwxr-xr-x     2    root root 4096     Mar 21 03:56  bin
drwxr-xr-x     3    root root 4096     Apr  8 08:41  boot
drwxrwxr-x     2    root root 4096     Jan  5 09:02  cdrom
drwxr-xr-x     19   root root 6640     Apr  10 18:05 dev
drwxr-xr-x     136 root root  12288    Apr  10 14:13 etc
drwxr-xr-x     3    root root 4096     Apr  13 2016  home
…ignore below message ….

root@icpdas:/#
```

(2) -a：list all files including hidden files

```
root@icpdas:/# ls -a
.      boot    etc          lib          mnt     root    tmp
..     cdrom   home         lost+found   opt     run     srv     usr
bin    devinitrd.imgmedia   proc         sbin    sys     var

root@icpdas:/#
```


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3.1.2. Linux Command “cd”

cd directory: Change directory -> (like cd in DOS)

Parameter：

(1) **..**：move to the upper directory

```
root@icpdas:/tmp# cd ..
root@icpdas:/#
```

(2) ~：move back to the root directory

```
root@icpdas:/# cd ~
root@icpdas:~#
```

(3) /：divided sign

```
root@icpdas:~# cd /tmp
root@icpdas:/tmp#
```


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3.1.3. Linux Command “mkdir”

mkdir: create the subdirectory -> (like md in DOS)

mkdir –parameter subdirectory

```
root@icpdas:/tmp# mkdir mytest
root@icpdas:/tmp# ls mytest
mytest
root@icpdas:/tmp#
```


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3.1.4. Linux Command “rm”

rm: delete file or directory -> (like del or deltree in DOS)

rm -parameter file (or directory)

Parameter：

(1) i: it will show the warning message when deleting

```
root@icpdas:/tmp# rm -i test.log
rm: remove regular file 'test.log'? y
root@icpdas:/tmp#
```

(2) r: delete directory despite that it isn’t empty

```
root@icpdas:/tmp# rm -r mytest/
root@icpdas:/tmp#
```

(3) f: it will not show a warning message when deleting (Example: rm -f test.exe)

```
root@icpdas:/tmp# rm -f test.log
root@icpdas:/tmp#
```


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3.1.5. Linux Command “cp”

cp: copy file -> (like copy in DOS)

cp –parameter source destination

```
root@icpdas:/tmp# cp /root/test.log /tmp/test.log
root@icpdas:/tmp# ls test.log
test.log
root@icpdas:/tmp#
```


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3.1.6. Linux Command “mv”

mv: move or rename file or directory -> (like move or ren in DOS)

mv -parameter source file (or directory) destination file (or directory)

```
root@icpdas:/tmp# mv /root/test.log /tmp/mytest.log
root@icpdas:/tmp# ls mytest.log
mytest.log
root@icpdas:/tmp#
```


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3.1.7. Linux Command “pwd”

pwd: show the current path

```
root@icpdas:/tmp# pwd
/tmp
root@icpdas:/tmp#
```


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3.1.8. Linux Command “chmod”

chmod: change authority of file

chmod ??? file -> ??? means owner: group: all users

For example：

7 5 4 -> 111(read, write, execute) 101(read, write, execute) 100(read, write, execute)

The first number 7: **owner** can read and write and execute files

The second number 5: **group** can only read and execute files

The third number 4: **all users** can only read files

```
root@icpdas:/tmp# chmod 754 test.log
root@icpdas:/tmp# ls -al test.log
-rwxr-xr-- 1 root root 7 Apr 11 10:34 test.log
root@icpdas:/tmp#
```


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3.1.9. Linux Command “uname”

uname: show the version of Linux kernel

```
root@icpdas:/tmp# uname -a
Linux icpdas 4.14.12-rt10 #2 SMP PREEMPT RT Mon Jan 29 11:21:09 CST 2018 i686 i686
i686 GNU/Linux
root@icpdas:/tmp#
```


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3.1.10. Linux Command “ps”

ps: show the procedures that execute now

```
root@icpdas:/tmp# ps -a
  PID TTY          STAT     TIME COMMAND
 1346 ttySX4       Ss+      0:00 /sbin/agetty 115200 ttySX4 vt220
 1347 tty1         Ss+      0:00 /sbin/agetty --noclear 115200 tty1 linux
 1607 pts/3        Ss       0:01 -bash
 3655 pts/4        Ss       0:00 -bash
 4134 pts/5        Ss       0:00 -bash
 4442 pts/4        S+       0:00 vim slot.c
 5052 pts/3        S+       0:00 vim test.c
 5159 pts/5        R+       0:00 ps a
…ignore below message ….

root@icpdas:/#
```


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3.1.11. Linux Command “date”

date: show date and time

```
root@icpdas:/tmp# date
Tue Apr 11 10:49:24 CST 2017
root@icpdas:/tmp#
```


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3.1.12. Linux Command “netstat”

netstat: show the state of network

Parameter [-a]: list all states

```
root@icpdas:/tmp# netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:gpsd          *:*                     LISTEN
tcp        0      0 localhost:mysql         *:*                     LISTEN
tcp        0      0 *:ssh                   *:*                     LISTEN
tcp        0      0 10.1.0.26:ssh           10.1.0.3:3874           ESTABLISHED
…ignore below message ….

root@icpdas:/#
```


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3.1.13. Linux Command “ifconfig”

ifconfig: show the ip and network mask (like ipconfig in DOS)

```
root@icpdas:/tmp# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:90:fb:5b:58:7f
          inet addr:10.1.0.7  Bcast:10.1.255.255  Mask:255.255.0.0
          inet6 addr: fe80::290:fbff:fe5b:587f/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1413820 errors:0 dropped:0 overruns:0 frame:0
          TX packets:18223 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:139319074 (139.3 MB)  TX bytes:2141346 (2.1 MB)
          Memory:b0600000-b067ffff

eth1      Link encap:Ethernet  HWaddr 00:00:00:00:00:03
          inet addr:10.1.0.26  Bcast:10.1.255.255  Mask:255.255.0.0
          inet6 addr: fe80::200:ff:fe00:3/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1383704 errors:0 dropped:0 overruns:0 frame:0
          TX packets:122 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:108598342 (108.5 MB)  TX bytes:15709 (15.7 KB)
          Interrupt:17 Memory:b0700000-b0720000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:7 errors:0 dropped:0 overruns:0 frame:0
          TX packets:7 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:387 (387.0 B)  TX bytes:387 (387.0 B)

root@icpdas:/tmp#
```


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3.1.14. Linux Command “wget”

wget: get the file from the web link.

```
root@icpdas:# wget http://ftp.icpdas.com/pub/cd/lx-series/napdos/lx-series/sdk/linpac_x86_sdk.tgz
--2017-04-11 10:54:27--  http://ftp.icpdas.com/pub/cd/lx-series/napdos/lx-series/sdk/linpac_x86_sdk.tgz
Resolving ftp.icpdas.com (ftp.icpdas.com)... xx.xx.xx.xx
Connecting to ftp.icpdas.com (ftp.icpdas.com)|xx.xx.xx.xx|:xx... connected.
HTTP request sent, awaiting response... 200 OK
Length: 248598 (243K) [application/pdf]
Saving to: ‘linpac_x86_sdk.tgz’

linpac_x86_sdk.tgz 100%[=========================>] 242.77K  --.-KB/s  in 0.02s

2017-04-11 10:54:27 (10.8 MB/s) - ‘linpac_x86_sdk.tgz’ saved [248598/248598]

root@icpdas:#
```


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3.1.15. Linux Command “ping”

ping: check to see if the host in the network is alive

ping IPAddress (Example: ping 192.168.0.1)

```
root@icpdas:/tmp# ping www.google.com
PING www.google.com (216.58.200.36) 56(84) bytes of data.
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=6 ttl=53 time=8.89 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=7 ttl=53 time=8.69 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=8 ttl=53 time=8.54 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=9 ttl=53 time=18.6 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=10 ttl=53 time=8.46 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=11 ttl=53 time=18.6 ms
^C
--- www.google.com ping statistics ---
11 packets transmitted, 6 received, 45% packet loss, time 10046ms
rtt min/avg/max/mdev = 8.465/11.973/18.632/4.705 ms
root@icpdas:/tmp#
```


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3.1.16. Linux Command “clear”

clear: clear the screen

```
root@icpdas:/tmp# ping www.google.com
PING www.google.com (216.58.200.36) 56(84) bytes of data.
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=6 ttl=53 time=8.89 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=7 ttl=53 time=8.69 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=8 ttl=53 time=8.54 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=9 ttl=53 time=18.6 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=10 ttl=53 time=8.46 ms
64 bytes from tsa01s08-in-f4.1e100.net (216.58.200.36): icmp_seq=11 ttl=53 time=18.6 ms
^C
--- www.google.com ping statistics ---
11 packets transmitted, 6 received, 45% packet loss, time 10046ms
rtt min/avg/max/mdev = 8.465/11.973/18.632/4.705 ms
root@icpdas:/tmp#clear
```


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3.1.17. Linux Command “passwd”

passwd: change the password

passwd ??? －＞ ??? means the users that you want to change password

```
root@icpdas:/tmp# passwd root
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
root@icpdas:/tmp#
```


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3.1.18. Linux Command “update-rc.d”

update-rc.d: install and remove System-V style init script links

(1) update-rc.d [-n] name defaults(Example : update-rc.d hello defaults)

```
root@icpdas:~# update-rc.d hello defaults
```

(2) update-rc.d [-n] [-f] name remove(Example : update-rc.d –f hello remove)

```
root@icpdas:~# update-rc.d –f hello remove
```


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3.1.19. Linux Command “reboot”

reboot: reboot the LinPAC

```
root@icpdas:~# reboot
```


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3.2. i-Talk Utility

The **i-Talk utility** can make the convenient for users to access the modules and hardware in the LX-8000/9000.

Instruction	Function Description
getlist	List all module name in the LX-8000/9000
setdo	Set digital output value to 8k module
setao	Set analog output value to 8k module
getdi	Get digital input value from 8k module
getai	Get analog input value from 8k module
setexdo	Set digital output value to 7k/87k module
setexao	Set analog output value to 7k/87k module
getexdi	Get digital input value from 7k/87k module
getexai	Get analog input value from 7k/87k module
setport	Set port value by offset to a module
getport	Get port value by offset from a module
setsend	Send string from LinPAC COM port
getreceive	Receive string from LinPAC COM port
getsendreceive	Send/Receive string from LinPAC COM port
read_sn	Get Hardware Serial Number of LX-8000/9000
rotary_id	Get Rotary Switch ID of LX-8000/9000
ttyS1-config	Set ttyS1 communication mode(LX-8x31 only)
iztconfig	Zigbee protocol communicate, Use ZT-USBC commute with ZT-2000 series device

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led	Set all led indicator status
led_single	Set one led indicator status
icpdas_pps	GPS time synchronization (with I-8211w module)
LINPAC_SDK	Get currently LinPAC SDK version
OS_version	Get your LinPAC OS version
qualcomm_rst	Install I-8213W-4GC/4GE driver
wvdial-on	Connect to Internet by I-8213W-3GWA/4GC/4GE
wvdial-off	Disconnected from the network

- ZT-USBC introduce

http://www.icpdas.com/root/product/solutions/industrial_wireless_communication/wireless_solutions/zt-usb.html

- ZT-2000 series introduce

http://www.icpdas.com/root/product/solutions/industrial_wireless_communication/wireless_solutions/wireless_selection.html

- I-8211w introduce

http://www.icpdas.com/root/product/solutions/remote_io/rs-485/i-8k_i-87k/i-8211w.html

- I-8213W-3GWA introduce

http://m2m.icpdas.com/i-8212w-3GWA.html

- I-8213W-4GC/4GE introduce

http://m2m.icpdas.com/i8213w-4G-Series.html

Below Table lists the demos that show how to use the I-talk utility. In the demo, the **I-8024** (AO Module) 、**I-8017H** (AI Module) and **I-8055** (DIO Module) are all used and they are plugged into the slots 1、2 and 3 of the LinPAC separately.

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Instruction	Demo
getlist	**Command:** getlist → getlist **Description**: List all module names in the LX-8000/9000 Series.
setdo	**Command:** setdo [slot] [data] → setdo 3 3 **Description**: Set i-8055 channel 1 and 2 on.
setao	**Command:** setao [slot] [channel] [data] → setao 1 0 2.2 **Description**: Set i-8024 channel 0 output 2.2V.
getdi	**Command:** getdi [slot] [type] → getdi 3 8 **Description**: Get the 8 bits DI value from i-8055.
getai	**Command:** getai [slot] [channel] [gain] [mode] → getdi 2 0 0 0 **Description**: Get the AI value from i-8017HW.
setexdo	**Command:** (1) setexdo [slot] 1 [data] → setexdo 2 1 55 (2) setexdo [slot] [comport] [data] [baudrate] [address] → setexdo 0 3 55 9600 2 **Description**: (1)Set the dec digital output value to the module at slot 2 at COM1.

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	(2)Set the dec digital output value to the module at slot 0 at COM3.
setexao	**Command:** (1) setexao [slot] 1 [value] [channel] → setexao 2 1 6.7 5 (2)setexao [slot] [comport] [value] [channel] [baudrate] [address] → setexao 0 3 6.7 5 9600 2 **Description**: (1)Set channel 5 analog value 6.7 to the module at slot 2. (2)Set channel 5 analog value 6.7 to the module at COM3.
getexdi	**Command:** (1)getexdi [slot] 1 → getexdi 2 1 (2)getexdi [slot] [comport] [baudrate] [address] → getexdi 0 3 9600 2 **Description**: (1)Get the dec digital input value from the module at slot 2. (2)Get the dec digital input value from the module at COM3.
getexai	**Command:** (1)getexai [slot] 1 [channel] → getexai 2 1 5 (2)getexai [slot] [comport] [channel] [baudrate] [address] → getexai 0 3 5 9600 2 **Description**: (1)Get channel 5 analog value from the module at slot 2. (2)Get channel 5 analog value from the module at COM3.
read_sn	**Command:** read_sn → read_sn **Description**: Show the serial number.

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rotary_id	**Command:** rotary_id → rotary_id **Description**: Read rotary switch ID of LX-8000/9000
ttyS1-config (LX-8x31 only)	**Command:** ttyS1-config → ttyS1-config **Description**: Setting the serial port ttyS1(RS232 or RS485) of LX-8x31
iztconfig	**Command:** iztconfig → iztconfig **Description**: Using ZT-USBC communicate with ZT-2000 series 1.Loaded ftdi_sio driver first #modprobe ftdi_sio 2.Add ZT-USBC device id # echo "1b5c 0210" > /sys/bus/usb-serial/drivers/ftdi_sio/new_id
led	**Command:** led → led **Description**: Print a menu to set all led indicator
led_single	**Command:** led_single [led] [status] → led_single 0 1 **Description**: Set “Run” led indicator status to “ON”
icpdas_pps	**Command:** Icpdas_pps → icpdas_pps **Description**: Execute GPS time synchronization. (with I-8211w module)

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	Add in /etc/rc.local will execute automatically.
LINPAC_SDK	**Command:** LINPAC_SDK → LINPAC_SDK **Description**: Get currently LinPAC SDK version
OS_version	**Command:** OS_version → OS_version **Description**: Read LinPAC OS version
qualcomm_rst	**Command:** qualcomm_rst → qualcomm_rst **Description**: Install I-8213W-4GC, I-8213W-4GE driver
wvdial-on	**Command:** wvdial-on → wvdial-on **Description**: Connect to Internet by I-8213W-3GWA/4GC/4GE
wvdial-off	**Command:** wvdial-off → wvdial-off **Description**: Disconnected from the network

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3.3. LX-8000/9000 SDK

LX-8000/9000 SDK consists of the following major items.

- LinPAC SDK library files
- LinPAC SDK include files
- Demo files

From https://www.icpdas.com/en/download/show.php?num=904&model=LX-9371, you can download the latest version of LX-8000/9000 SDK. And then follows the below steps in order to get the development toolkit which has been provided by ICP DAS for the easy application of the LX-8000/9000 embedded controller platform.

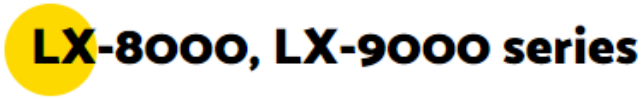
(1)User can connect to LX-8000/9000 through communication port (**Console**, **LAN1**, **LAN2)** by using **"putty"** software (refer to "CH2.LX-8000/9000 Getting Started").

(2)After connecting to LX-8000/9000, user could type "wget" command to get the latest version of LX-8000/9000 SDK.

Tips & Warnings



Please check the network can connect to the ICP DAS official website.



Related Resources

I-8K/I-87K Software Support of LinPAC

I-9K/I-97K Software Support of LinPAC

FILE NAME	VERSION	FILE DATE	SIZE	NOTE	
LinPAC x86 SDK	0.8.16	2021-08-02	1.1 MB	For LX-8000 and LX-9000 series	

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(2) To type “**tar zxf linpac_x86_sdk.tgz**” to decompress tar file and type “make” to compile demo code.

```
root@icpdas:~# tar zxf linpac_x86_sdk.tgz
root@icpdas:~# ls linpac_x86_sdk
linpac_x86_sdk
root@icpdas:~# cd linpac_x86_sdk/
root@icpdas:~/linpac_x86_sdk# make
```

Once user decompresses the SDK file, user can find the files for the library and demo in the following paths.

The libPAC_x86.a path is “**LinPAC_X86_SDK/lib**".

The include files path is “**LinPAC_X86_SDK/include**”.

The LX-8000/9000 demo path is “**LinPAC_X86_SDK/examples/lx-series**”.

The LP-8x81/8x81-Atom demo path is “**LinPAC_X86_SDK/examples/lp-8x81**”.

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4. Your First LX-8000/9000 Program

This chapter provides a guided tour that describes the steps needed to set-up a development environment, download, install, configure for user programming with the LX-8000/9000. The default LX-8000/9000 support below development tools:

Default Development Tools

Linux OS is a mature embedded operating system which supports rapid development. Standard development tools are list as follows which are highly integrated, with comprehensive support for developing applications of LX-8000/9000.

- Scripts Language (shell script, perl, python and php)
- Standard C language and GNU gcc compiler

LX-8000/9000 SDKs

The x86 LinPAC SDK is a Software Development Kit (SDK) that contains C header files, C libraries. The LX-8000/9000 SDK is classified by development tools that can be downloaded from the web link "http://ftp.icpdas.com/pub/cd/lx-series/napdos/lx-series/sdk/linpac_x86_sdk.tgz" or use command "**LINPAC_SDK**" to get the latest version of LX-8000/9000 SDK.

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4.1. Your First LX-8000/9000 Program with C Language

In this section, we will introduce how to compile the helloworld.c to helloworld and executes this file on the LX-8000/9000 Series. In this example, no ICP DAS modules are used. To create a demo program with C that includes the following main steps:

1. Find demo “helloworld.c” in SDK
2. Compile and Execute the demo on LX-8000/9000
3. Execute the application on LX-8000/9000 at boot time

All main steps will be described in the following subsection.

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4.1.1. Find Demo “helloworld.c” in SDK

The x86 LinPAC SDK had added the demo “helloworld.c”. User can follow below steps to find the demo in SDK.

1. Download SDK

Please refer to “CH3.3 LX-8000/9000 SDK” steps to get SDK

2. Find the demo in SDK

Using command “cd” move to demo’s directory.

3.Use “vi” command to modify/create demo “helloworld.c” in SDK

```
root@icpdas:~# cd LinPAC_X86_SDK/examples/lx-series/common/
root@icpdas:/tmp/LinPAC_X86_SDK/examples/lx-series/common# ls helloworld*
helloworld    helloworld.c
root@icpdas:/tmp/LinPAC_X86_SDK/examples/lx-series/common#vi helloworld.c
```


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4.1.2. Compile/Execute Demo “helloworld”

User can refer to below steps to compile and execute demo “helloworld”.

1. Add script to SDK Makefile

User can refer to the SDK Makefile (LinPAC_X86_SDK/examples/lx-series/common/Makefile) that we had added the script for demo “helloworld.c”.

2. Type “make helloworld” command to compile demo “helloworld.c”

3. Execute binary file “helloworld”

```
root@icpdas:/tmp/LinPAC_X86_SDK/examples/lx-series/common# make helloworld
gcc -I. -I../../../include      -c -o helloworld.o helloworld.c
gcc -I. -I../../../include -o helloworld helloworld.o ../../../lib/libPAC_x86.a -lm
rm -f helloworld.o
root@icpdas:/tmp/LinPAC_X86_SDK/examples/lx-series/common# ./helloworld
Hi ~ Welcome to x86 LinPAC
root@icpdas:/tmp/LinPAC_X86_SDK/examples/lx-series/common#
```


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4.1.3. Execute Demo at Boot Time

User can refer to below steps to auto-execute demo “helloworld” at boot time in LX-8000/9000.

1. Create script file in “/etc/init.d”

User can use “vi” command to create the script file in “/etc/init.d” and add below script language to the file.

```
root@icpdas:~# vi /etc/init.d/hello
```

```
#!/bin/sh

### BEGIN INIT INFO
# Provides: ICP DAS
# Required-Start:
# Required-Stop:
# Should-Start:
# Should-Stop:
# Default-Start: 2 3 4 5
# Default-Stop: 0 1 6
# Short-Description: Start and stop hello
# Description: hello
### END INIT INFO

helloworld > /tmp/test.log
```

2. Use “update-rc.d” command to add the script “hello” automatically.

```
root@icpdas:~# chmod +x /etc/init.d/hello
root@icpdas:~# update-rc.d hello defaults
```

3. After setting the file, the LX-8000/9000 will execute binary “helloworld” at boot time

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5. Application for LX-8000/9000

In this chapter, ICP DAS provides extra module supported and instructions to enhance LX-8000/9000 functionality and affinity.

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5.1. Advanced Package Tool

“apt-get” command is a management system for software packages on the Linux OS of LX-8000/9000.

- To install a package run the following commands:

```
apt-get update
apt-get install <package>
```

- To search available package run the following commands:

```
apt-cache search <package name>
```

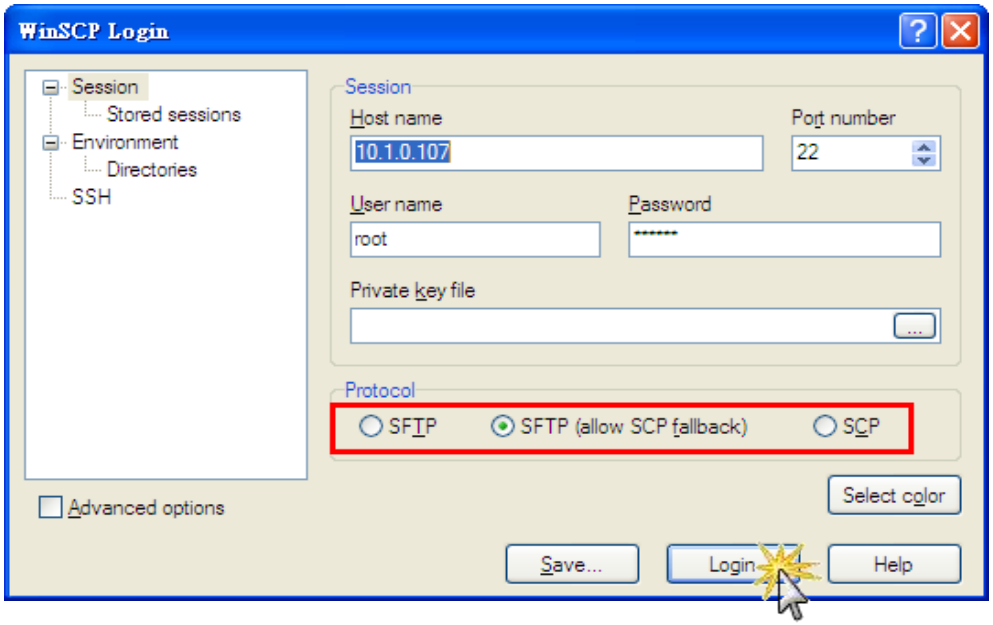

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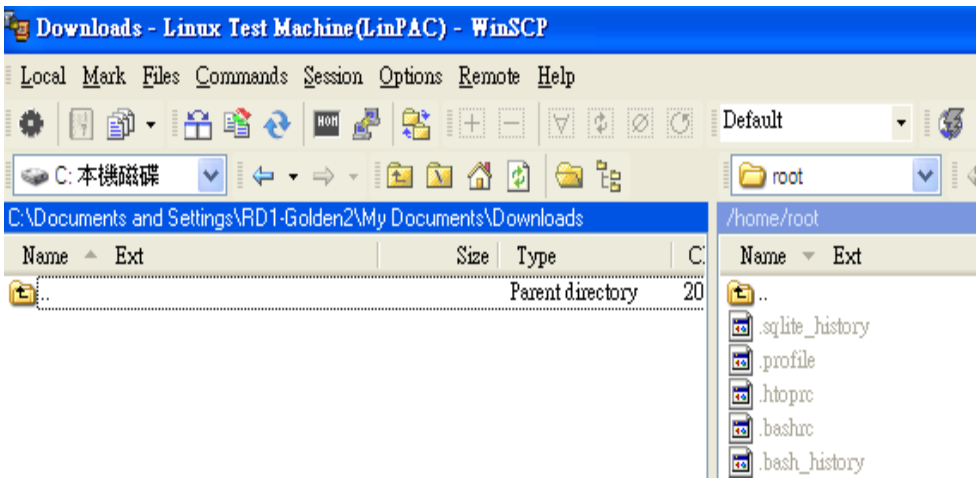
5.2. SFTP (secure file transfer program)

The LX-8000/9000 series had supported SFTP(or SCP), user can transfer the file from Windows(or Linux). For examples, using Windows Program “WinSCP” to access the device over network, please follow below steps:

1. Choosing the “SFTP” or “SCP” protocol and type IP address, default ID (root) and password (icpdas) to login



2. Drag and drop file



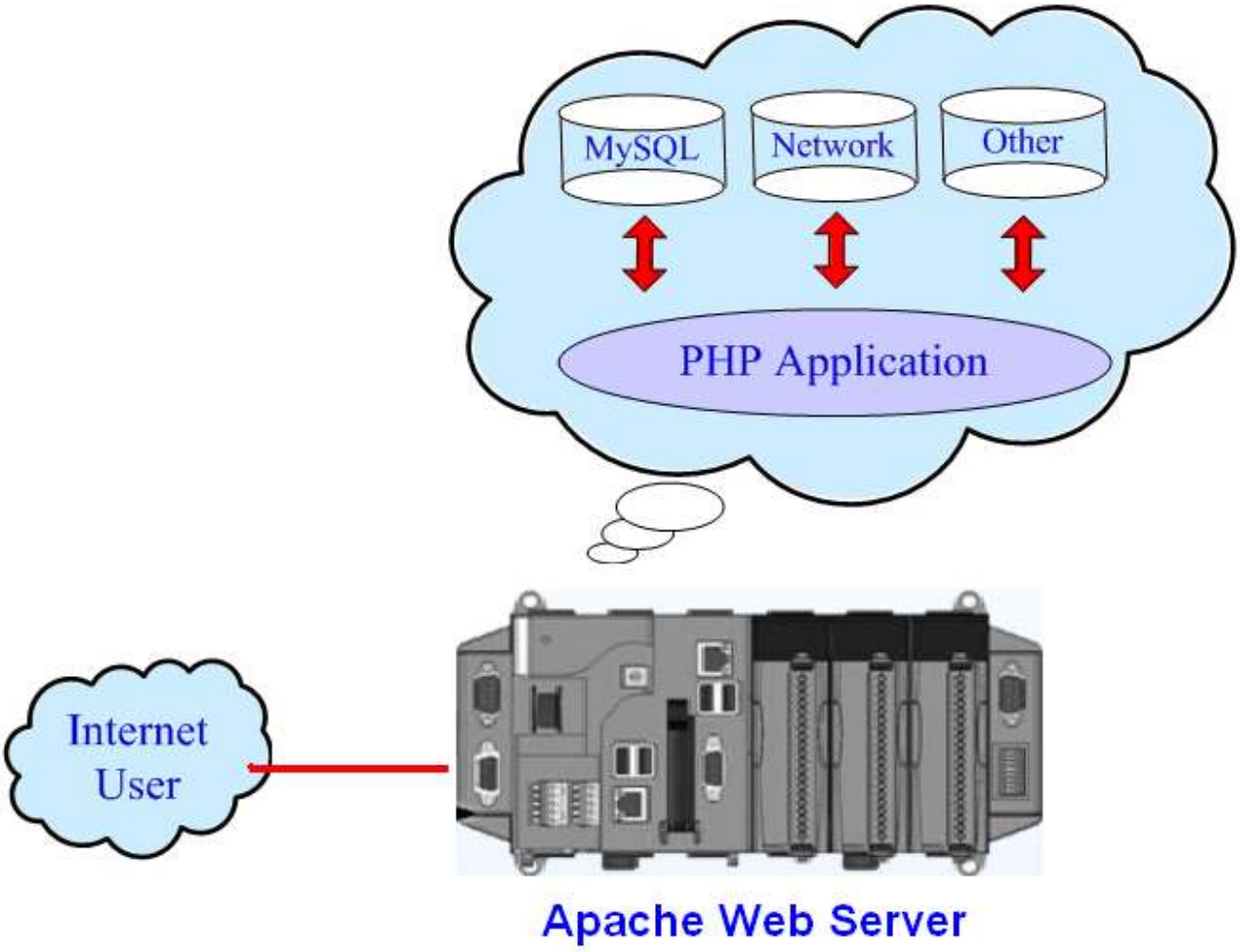
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5.3. LAMP

The LAMP (Linux + Apache + PHP + MySQL) server has been built in the Linux OS of LX-8000/9000. As a solution stack, LAMP is suitable for building dynamic web sites and web applications.

MySQL default account is ‘root’ and password is ‘root’

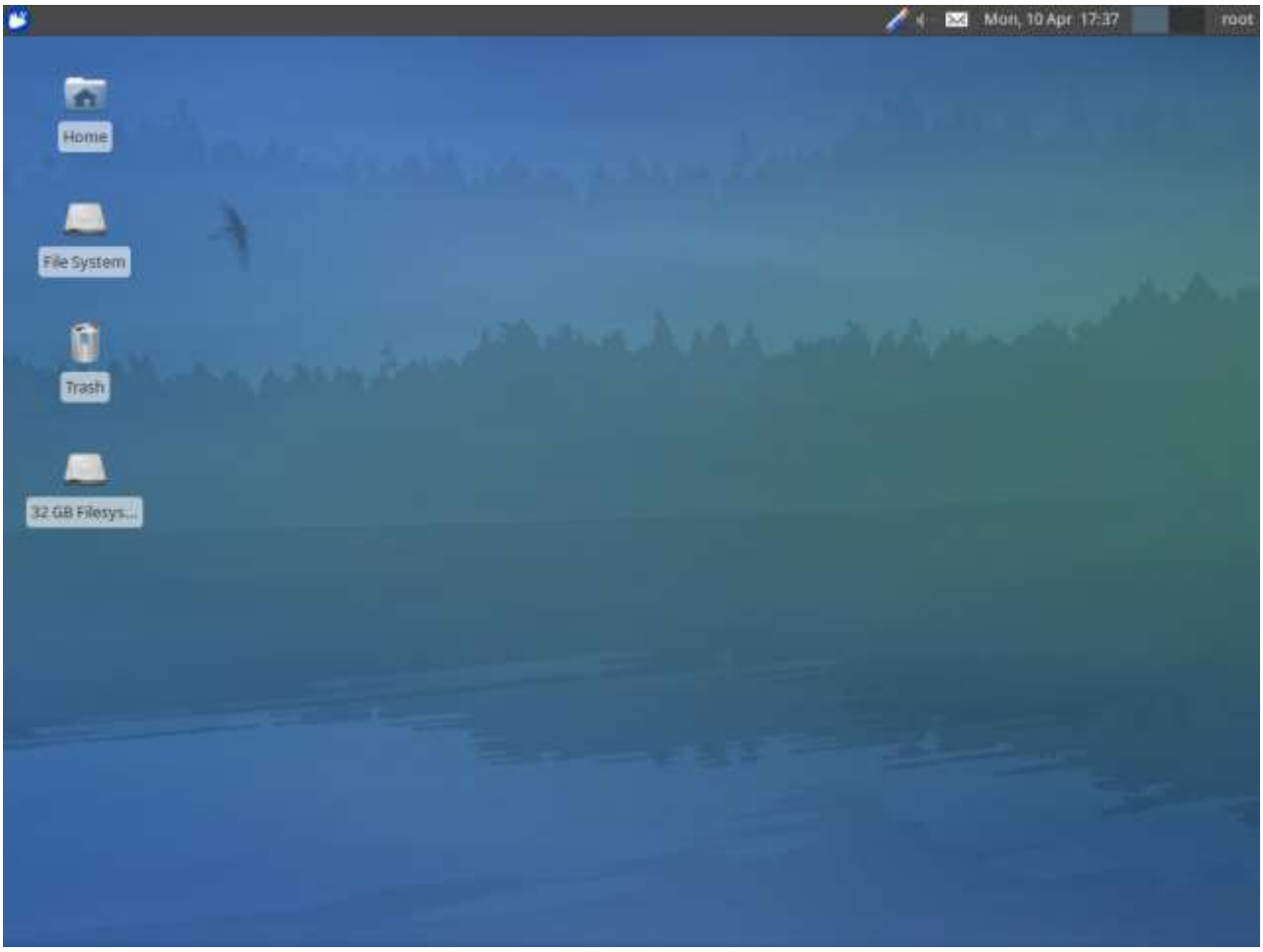


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5.4. XFCE (secure file transfer program)

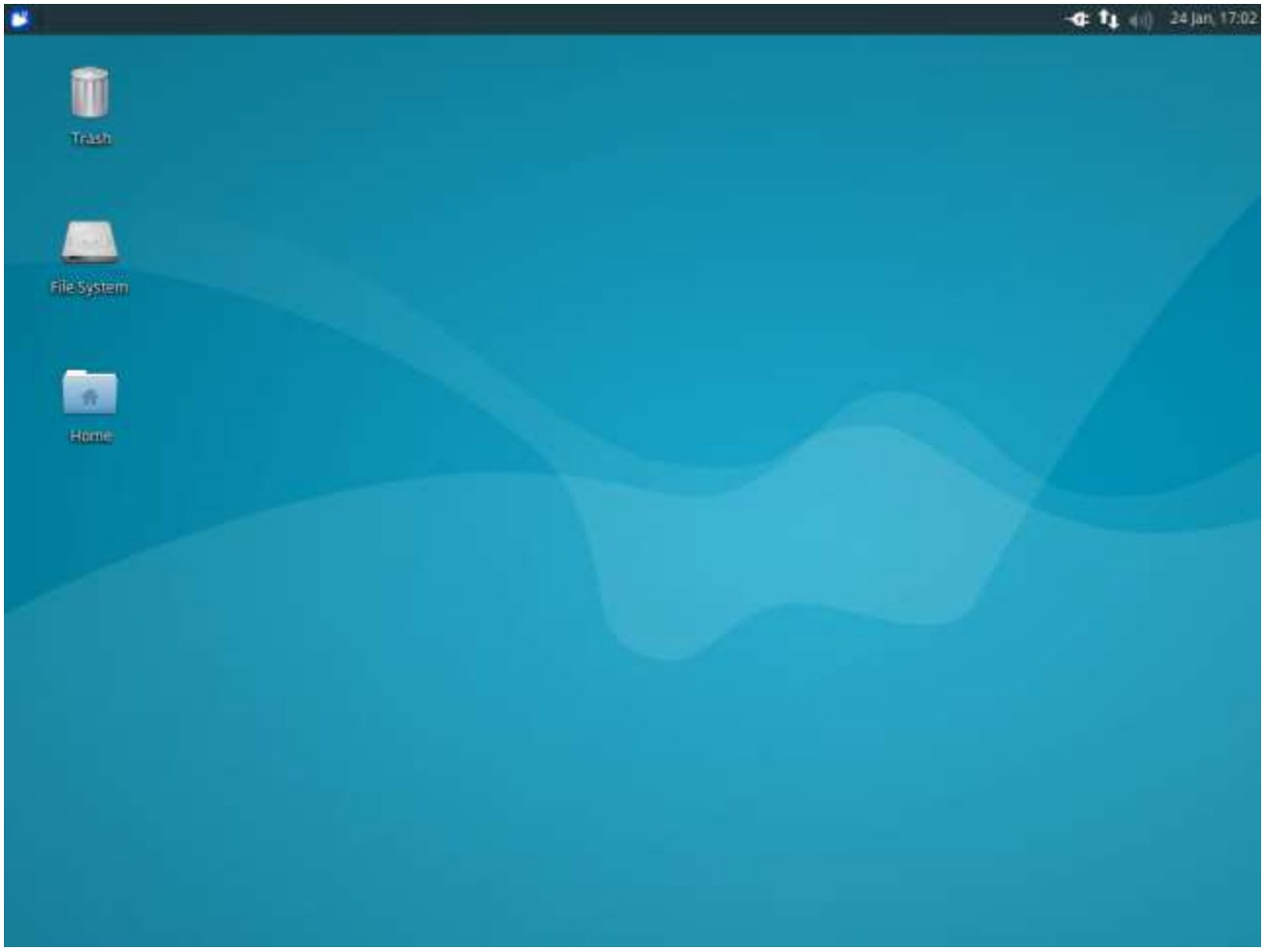
XFCE is a lightweight desktop environment for UNIX-like operating systems. It aims to be fast and low on system resources, while still being visually appealing and user friendly. The LX-8000/9000 series support the XFCE package, after user type “root” and password “icpdas” to login, the local terminal would execute the XFCE Desktop.



LX-8x31 XFCE Desktop screen shot

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LX-9x71 & LX-9x81 XFCE Desktop screen shot

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5.5. Network redundancy

Network redundancy is a communications pathway that has additional links to connect all nodes in case one link goes down. We have two ways to support network redundancy.

1. Enable Bridge Interface with RSTP

User can create a network bridge interface with RSTP protocol to make dual LAN redundant mechanism.

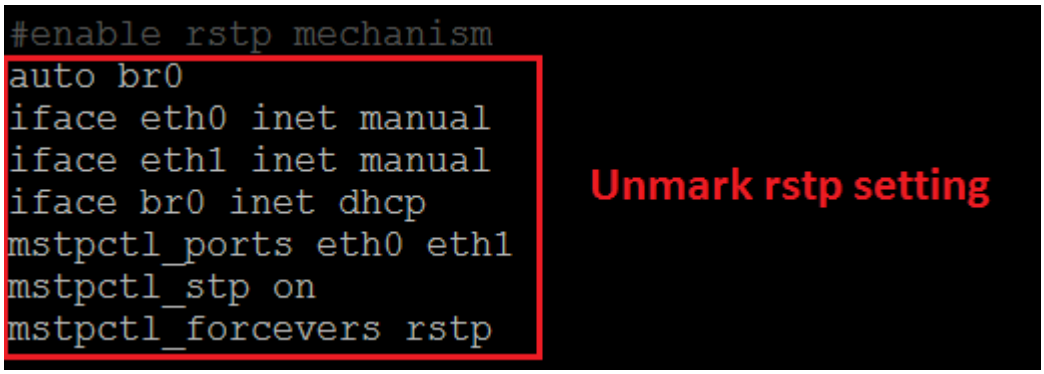
If one of your LX-8000/9000 PAC device LAN port is stops working, bridge will use another LAN port to continue working.

This mechanism makes sure your network environment much stronger.

User can follow below steps to enable bridge interface with RSTP protocol.

Step 1: Using the linux command "vi" to modify the file "/etc/network/interfaces".

Step 2: Unmark rstp mechanism like below



Step 3: After user save the file and use "reboot" command to reset device, user can use the new network configuration on LX-8000/9000.

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2. Linux Network Bonding mode 1

Linux network bonding is a creation of a single bonded interface by combining 2 or more Ethernet interfaces. The mode 1 setting is active backup, like network redundant.
In this section, you can follow below steps to configure linux bonding easier.

If you use LX-9x71/9x81, check your OS version by command “OS_version”. OS support linux bonding when version greater or equal to 1.1.1.

Step1: Unmark linux bonding example in /etc/network/interfaces and mark other setting.

```
# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
iface lo inet loopback
#================================
#Linux bonding example
auto eth0
iface eth0 inet manual
bond-master bond0

# eth1 ditto, thus creating a 2-link bond.
auto eth1
iface eth1 inet manual
bond-master bond0

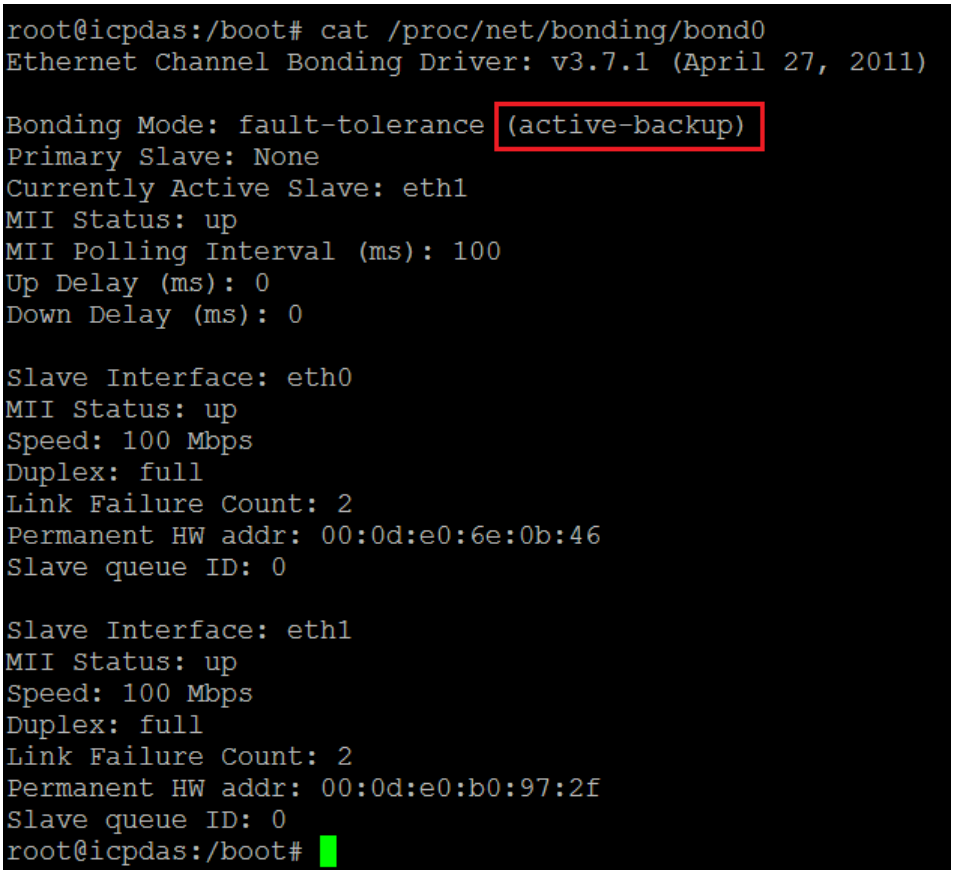
# bond0 is the bonding NIC and can be used like any other normal NIC.
# bond0 is configured using static network information.
auto bond0
iface bond0 inet static
address 10.1.118.15
gateway 10.1.0.254
netmask 255.255.0.0
bond-mode 1
bond-miimon 100
bond-slaves none
#================================
```

Step2: reboot to make configure work.

Step3: Check linux bonding status.

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Step4: Use “ifconfig” to get your interface “bond0” information.

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6. Additional Support

In this chapter, ICP DAS provides extra module supported and instructions to enhance LX-8000/9000 functionality and affinity.

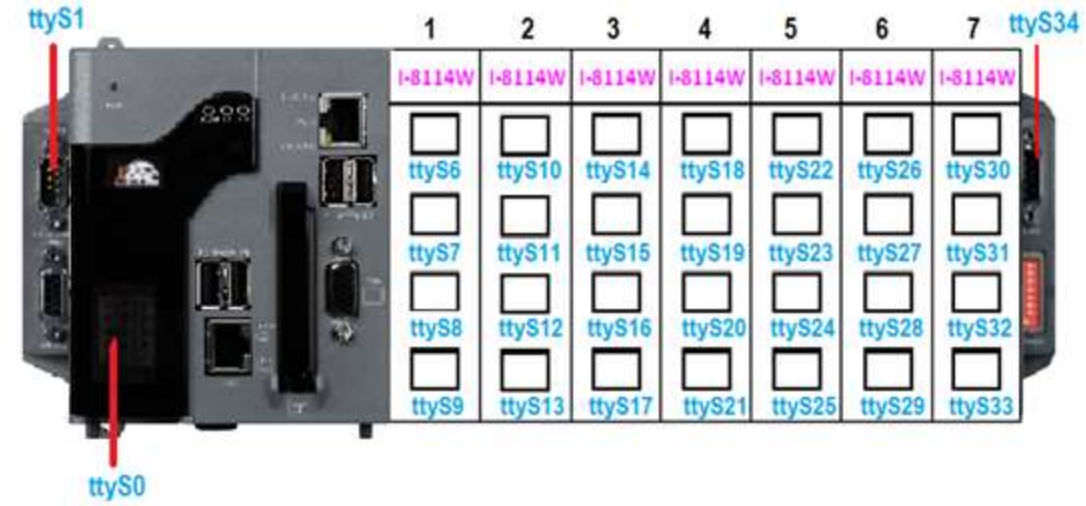
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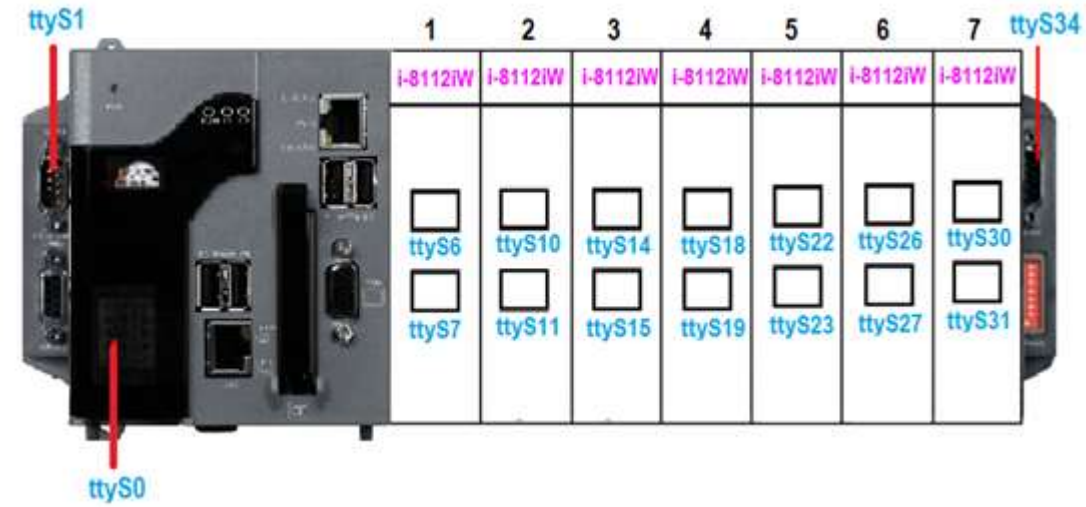
6.1. N-Port Modules Support

N-port communication modules provide two or four serial ports and can be inserted into the slot of an LX-8000/9000 embedded controller. In this way, additional serial ports can be used on the LX-8000/9000 embedded controller. The LX-8000/9000 embedded controller is a multi-tasking uint, meaning that all the serial ports can be controlled simultaneously. The number of each serial port on the N-Port Serial modules(two or four serial ports) are presented in below figures:

- LX-8000 N-Port Modules support (I-8114W, I-8112iW, etc.)



LX-8000 and Serial Module (4-Ports)

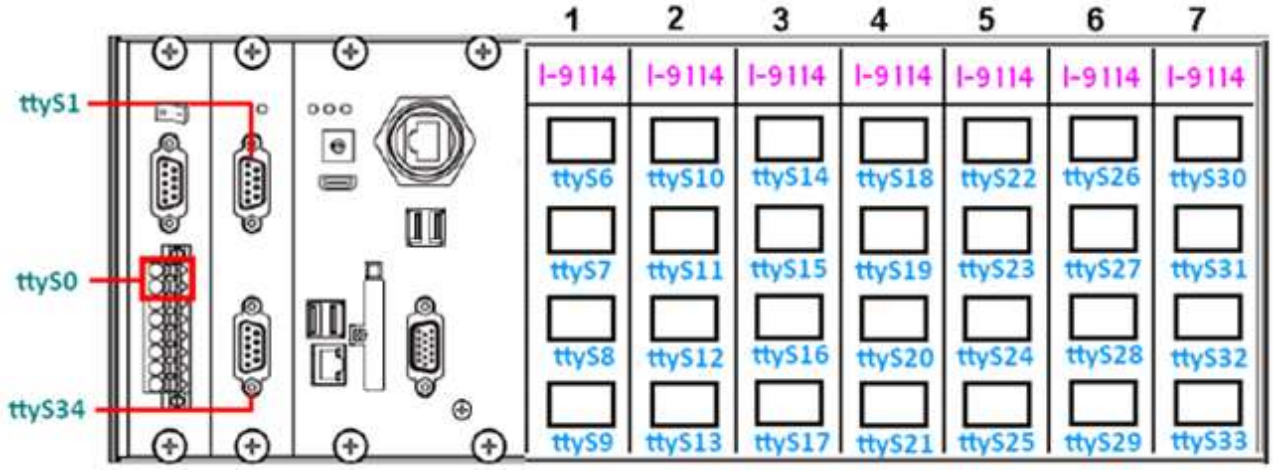


LX-8000 and Serial Module (2-Ports)

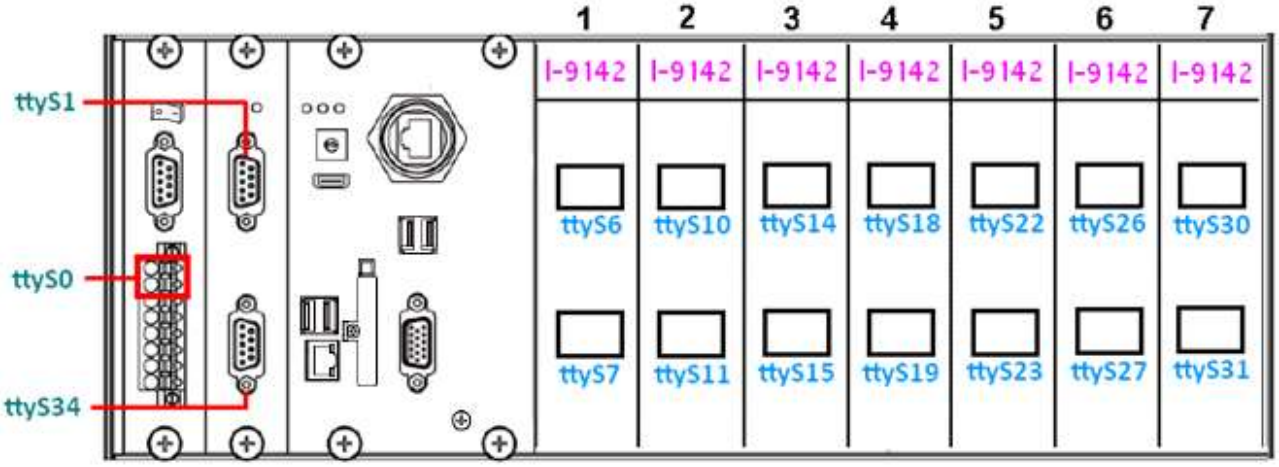
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- LX-9000 N-Port Modules support (I-9114W, I-9144iW, i-9142W, etc.)



LX-9000 and Serial Module (4-Ports)



LX-9000 and Serial Module (2-Ports)

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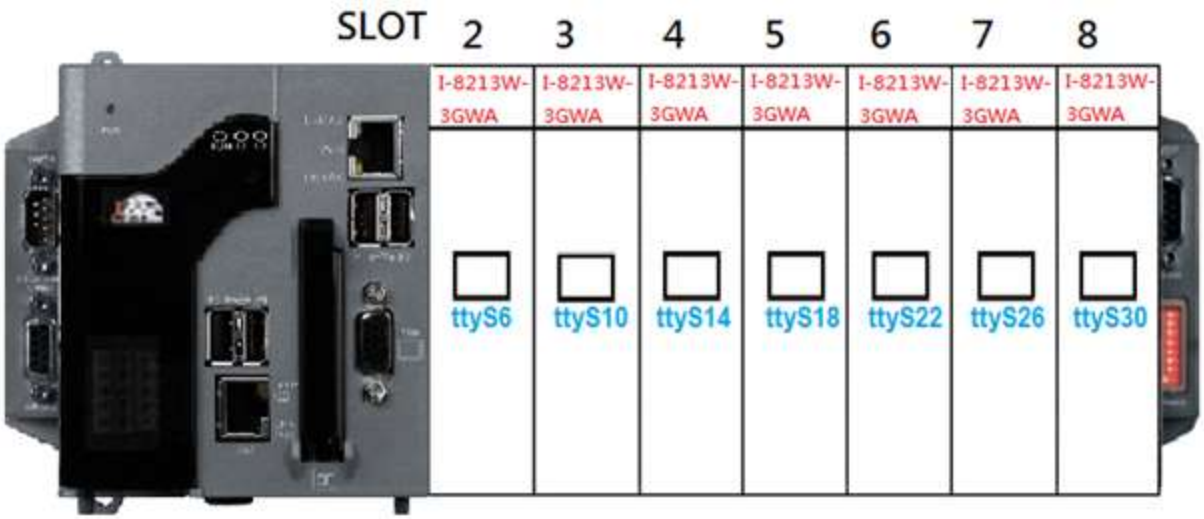
6.2. 3G/4G Module Support

Below three products only support LX-8x31 PAC, not support LX-9000 PAC.

LX-8000 can support 3G/4G system by I-8213W-3GWA, I-8213W-4GC, I-8213W-4GE device. Customer can follow below steps to enable 3G/4G system.

- I-8213W-3GWA (Product page: http://m2m.icpdas.com/i-8212w-3GWA.html)

1. Check I-8213W-3GWA 3G system device file name.



I-8213W-3GWA 3G system device file name

2. Profile setting

Set device file name and other setting by your own sim card.

```
[Dialer Defaults]
Modem = /dev/ttyS6
Stupid Mode = 1
Modem Type = Analog Modem
Baud = 115200
ISDN = 0
Username = guest
Password = 5678
Init1 = ATZ
Init2 = AT+CPIN?

[Dialer pin]
Init2 = AT+CPIN=1234

[Dialer conn]
Phone = *99***1#
Dial Command = ATDT
Init2 = ATE
Init3 = ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
Init4 = AT+CGDCONT=1,"IP","INTERNET"
```

I-8213W-3GWA file name on slot 2

APN setting

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3. Use command “wvdial-on” to dial-up connection.

   #wvdial-on

4. Check your IP setting

```
root@icpdas:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0d:e0:6e:0b:46
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Interrupt:17 Memory:febe0000-fec00000

eth1      Link encap:Ethernet  HWaddr 00:0d:e0:b0:61:02
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:1564 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1564 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:125188 (125.1 KB)  TX bytes:125188 (125.1 KB)

ppp0      Link encap:Point-to-Point Protocol
          inet addr:10.201.109.250  P-t-P:10.201.109.250  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:20 errors:0 dropped:0 overruns:0 frame:0
          TX packets:26 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
          RX bytes:1703 (1.7 KB)  TX bytes:1348 (1.3 KB)
```

5. Ping google DNS to test

```
root@icpdas:~# ping -c 4 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_req=1 ttl=53 time=1265 ms
64 bytes from 8.8.8.8: icmp_req=2 ttl=53 time=265 ms
64 bytes from 8.8.8.8: icmp_req=3 ttl=53 time=57.6 ms
64 bytes from 8.8.8.8: icmp_req=4 ttl=53 time=55.9 ms

--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3008ms
rtt min/avg/max/mdev = 55.905/411.067/1265.149/500.420 ms, pipe 2
```

6. Use command “wvdial-off” to disconnecting internet.

   #wvdial-off

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- I-8213W-4GC/4GE (Product page http://m2m.icpdas.com/i8213w-4G-Series.html)

1. Install driver

   # qualcomm_rst

2. Check I-8213W-4GC/4GE 3G/4G system device file name.

   #dmesg | grep ttyUSB3

```
root@icpdas:~# dmesg | grep ttyUSB3
[   56.384995] usb 1-3: GSM modem (1-port) converter now attached to ttyUSB3
```

3. Profile setting

   Set device file name and other setting by your own sim card.

```
[Dialer Defaults]
Modem = /dev/ttyUSB3
Stupid Mode = 1
Modem Type = Analog Modem
Baud = 115200
ISDN = 0
Username = guest
Password = 5678
Init1 = ATZ
Init2 = AT+CPIN?

[Dialer pin]
Init2 = AT+CPIN=1234

[Dialer conn]
Phone = *99***1#
Dial Command = ATDT
Init2 = ATE
Init3 = ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
Init4 = AT+CGDCONT=1,"IP","INTERNET"
```

I-8213W-4GC/4GE device file name

APN setting

4. Use command “wvdial-on” to dial-up connection.

   #wvdial-on

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5. Check your IP setting

```
root@icpdas:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0d:e0:6e:0b:46
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Interrupt:17 Memory:febe0000-fec00000

eth1      Link encap:Ethernet  HWaddr 00:0d:e0:b0:61:02
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:540 errors:0 dropped:0 overruns:0 frame:0
          TX packets:540 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:49202 (49.2 KB)  TX bytes:49202 (49.2 KB)

ppp0      Link encap:Point-to-Point Protocol
          inet addr:10.201.16.117  P-t-P:10.64.64.64  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:22 errors:0 dropped:0 overruns:0 frame:0
          TX packets:23 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
          RX bytes:1765 (1.7 KB)  TX bytes:1190 (1.1 KB)
```

6. Ping google DNS to test

```
root@icpdas:~# ping -c 4 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_req=1 ttl=53 time=1130 ms
64 bytes from 8.8.8.8: icmp_req=2 ttl=53 time=281 ms
64 bytes from 8.8.8.8: icmp_req=3 ttl=53 time=280 ms
64 bytes from 8.8.8.8: icmp_req=4 ttl=53 time=278 ms

--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3009ms
rtt min/avg/max/mdev = 278.988/492.677/1130.032/367.978 ms, pipe 2
```

7. Use command “wvdial-off” to disconnecting internet.

   #wvdial-off

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7. LX-8000/9000 Internet Service

The internet service provided by ICP DAS will be satisfied and it includes Technical Support, Driver Update, OS_Image, LinPAC_SDK and User's Manual Download etc. Users can refer to the following web site to get more information:

1. ICP DAS Web Site :

http://www.icpdas.com/

2. LX-8x31/9x71/9x81 Product Page:

https://www.icpdas.com/en/product/guide+PACs+Linux__PACs+LX-8000
https://www.icpdas.com/en/product/guide+PACs+Linux__PACs+LX-9000

3. E-mail for Technical Support: service@icpdas.com

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Appendix

A. I-8K Modules and I-87K Modules

This chapter provides a brief overview of the different between I-8K series modules and I-87K series modules.

I-8K and I-87K modules provide the option to expand the local I/O to expansion I/O slots and the bus type for the modules can be either parallel (high profile I-8K series) or serial (high profile I-87K series).

The different between I-8K series modules and I-87K series modules are as follows.

Item	I-8K Series	I-87K Series
Microprocessor	No	Yes (8051)
Communication Interface	Parallel Bus	Serial Bus
Communication Speed	Fast	Slow
Latched DI Function	No	Yes
Counter Input (for digital input modules)	No	Yes (100 Hz)
Power-on Value	No	Yes
Safe Value	No	Yes
Programmable Slew-Rate for AO modules	No	Yes

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B. I-9K Modules and I-97K Modules

This chapter provides a brief overview of the different between I-9K series modules and I-97K series modules.

There are two types of I/O modules provided for supporting LX-9000. One is high communication speed I-9K series modules with parallel interface; the other is I-97K series modules with serial interface. The differences between the two series are listed as follows:

The differences between the I-9K and I-97K series I/O modules are as follows.

Item	I-9K Series	I-97K Series
Communication Interface	Parallel Bus	Serial Bus
Protocol	-	DCON
Communication Speed	Fast	Slow
DI with latched function	-	Y
DI with counter input	-	Y (100 Hz)
Power on value	-	Y
Safe Value	-	Y
Programmable slew-rate for AO module	-	Y

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C. Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
V1.1.3	Dec. 2025	Restoring the OS from the CF card has been changed to restoring the OS from a USB hard drive.
V1.1.2	Qct. 2021	Remove audio description. Add LX-8000 how to boot with CF OS.
V1.1.1	Mar. 2021	The first login to change the password instructions
V1.1.0	Apr. 2020	Add “Update CF card backup file version” section
V1.0.9	Sep. 2019	Add HDMI port information.
V1.0.8	Jul. 2019	Change command “LINPAC_SDK” download path.
V1.0.7	Mar. 2019	Add chapter 6.2 for 3G/4G modules
V1.0.6	Jul. 2018	Add chapter 6 for N-Port serial modules
V1.0.5	Jun. 2018	Add network redundancy
V1.0.4	Jan. 2018	Updating specifications. Add COM port pin assignment. Add LAN port redundant mechanism.
V1.0.3	Jan. 2018	Adding the product information of LX-8031
V1.0.2	Dec. 2017	Updating the product information of LX-9x81.
V1.0.1	Nov. 2017	Adding the product information of LX-8x71.
V1.0.0	Apr. 2017	Initial issue

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