LinPAC-2841 Series User Manual

Implement industry control with Linux Technique



Service and usage information for LP-2841 Series LinPAC

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1. Introduction

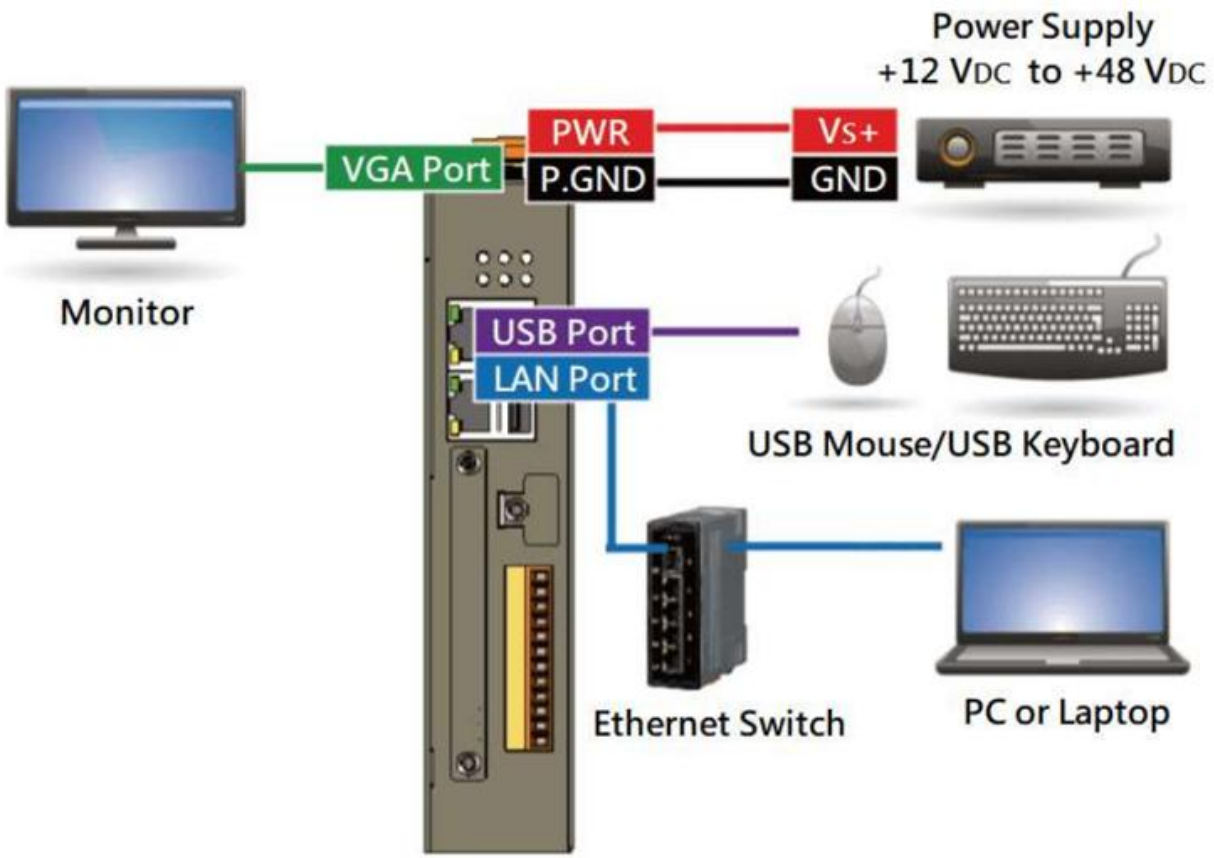


The LP-2841M are equipped a Quad-core ARM CPU(1.6 GHz) and running a Linux OS(kernel 5.4.x) operating system. The optional I/O expansion board, XV-board, provides high-protection I/O. Using the built-in Flash and microSD, the LP-2841M can save application program, image file and data.

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1.1 Features

- Quad-core ARM CPU(1.6 GHz) CPU
- 2 GB SRAM and 8 GB eMMC
- Linux kernel 5.4.70
- Hard Real-Time Capability
- 64-bit Hardware Serial Number for Software Protection
- I/O Expansion Bus
- 2 Ethernet Port(10/100/1000M)
- 3 Serial Ports (RS-232/485)
- Operating Temperature: -25 ~ +75°C



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1.2 Specifications

Models	LP-2841M
System Software	
OS	Linux Kernel 5.4.70
Embedded Service	SFTP/FTP server, Web server, SSH
SDK Provided	Standard LinPAC SDK for Linux by GNU C language
CPU Module	
CPU	Quad-core ARM CPU, 1.6 GHz/Core
SDRAM	2GB
eMMC	8GB eMMC
FRAM	16KB
Expansion Flash Memory	microSD socket with one 4 GB microSD card (support up to 32 GB microSDHC card)
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
LED Indicators	1 LED for Power, 1 LED for Running and 3 LEDs for user defined
Rotary Switch	Yes(0~9)
VGA & Communication Interface	
VGA	VGA x 1 (max. resolution up to 1280 x 1024)
USB 2.0(host)	2
Console Port	RS-232 (RxD, TxD and GND); Non-isolated
ttyO2	RS-485 (Data+, Data-); 2500 VDC isolated
ttyO4	RS-232 (RxD, TxD and GND); Non-isolated
ttyO5	RS-485 (Data+, Data-); 2500 VDC isolated
Ethernet Port	RJ-45 x 2, 10/100/1000 Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)
I/O Expansion Slots	
I/O Expansion Bus	Yes, one optional XV-board
COM Port Formats	
Speed	115.2 Kbps Max.
Data Bit	5, 6, 7, 8
Parity	None, Even, Odd, Space, Mark
Stop Bit	1, 1.5, 2
Pull High/Low Resistor	1kΩ default, 150kΩ (for RS-485)

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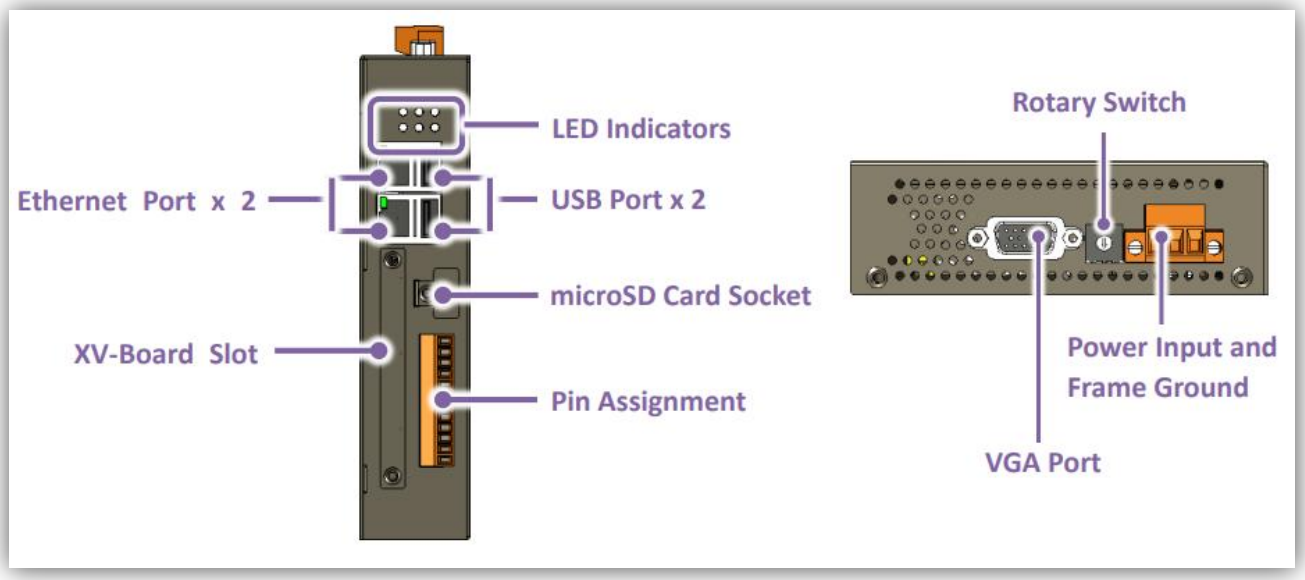
Models	LP-2841M
Software	
Protocol	ICMP, IPv4/v6, TCP, UDP, DHCP, BOOTP,SSH, FTP, SFTP, DNS, DDNS, SNMP V1/V2c/V3, HTTP, SMTP, ARP, PPPoE
Configuration method	Web, Serial Console, SSH Console
Management	SNMP MIB-II
Power Input	
Input Range	+12 ~ +48 VDC
Consumption	4.8 W
Mechanism	
Casing	Metal
Dimensions (W x L x H)	42 mm x 164 mm x 169 mm
Installation	DIN-Rail Mounting
Environment	
Operating Temperature	-25 ~ +75 °C
Storage Temperature	-40 ~ +80 °C
Humidity	10 ~ 90% RH, non-condensing

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2. Hardware Introduction

LP-2000 series module is equipped with several interfaces and peripherals that can be integrated with external systems. Here is an overview of the components and its descriptions.

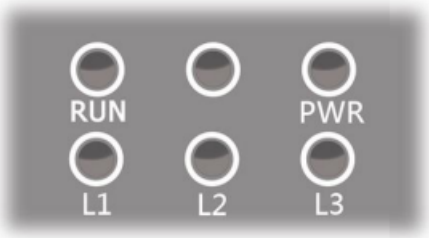
2.1 Hardware Feature



1. Ethernet Port

The LP-2841 contains two Ethernet port for use with network devices.

2. LED Indicators



LED Indicator	Color	Meaning
RUN	Green	Power on and OS is running
PWR	Red	Power is on.
L1	Green	User programmable LED indicator.
L2	Orange	
L3	Red	

3. USB Port

The LP-2841 contains two USB 2.0 port that allow support for the USB devices such as mouse, keyboard or two external USB hard drive.

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4. Rotary Switch

The Rotary Switch is an operating mode selector switch which provides functions to configure with the selection of operating mode and authorization control.

5. VGA Connector

A VGA connector is a 3-row 15-pin connector that can be used with a variety of supported VGA resolutions (max. resolution up to 1280x1024).

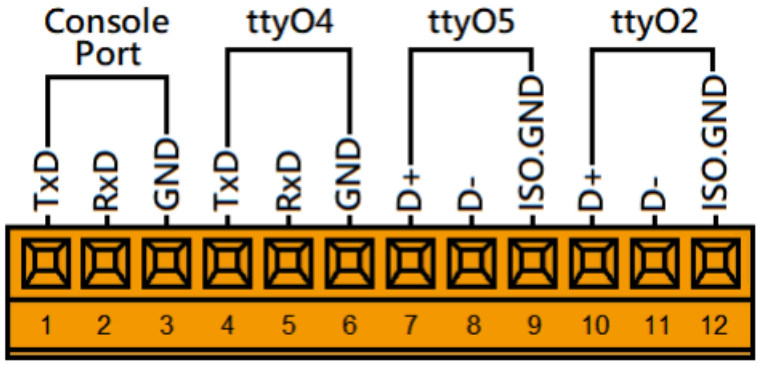
6. microSD Card Socket

The microSD card expansion slot is an interface that is used to access and download information on a microSD card to a LP-2841 and expand the memory up to 32 GB.

Please note:

- **The flash and microSD disk have a finite number of program-erase cycles. Important information should always be backed up on other media or storage device for long-term safekeeping.**
- **The Li-batteries can continually supply power to the 2 GB SRAM to retain the data for 10 years (It is recommended that batteries are changed each 5~7 year.)**

7. Serial Ports

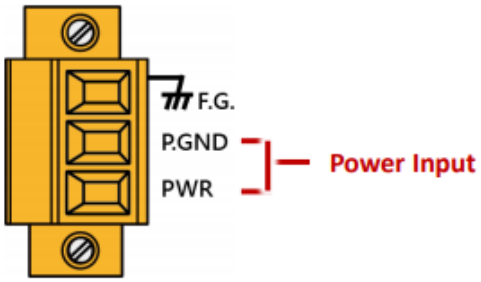


Device name	Definition in LP-2841 series SDK	Description	Default Baud rate
-	/dev/ttyO1 or COM1	Internal communication with the XV-board modules	115200
-	Console port	RS-232 (RxD, TxD and GND); Non-isolated	115200
ttyO4	/dev/ttyO4 or COM4	RS-232 (RxD, TxD and GND); Non-isolated	9600
ttyO5	/dev/ttyO5 or COM5	RS-485 (Data+, Data-); 2500 VDC isolated	9600
ttyO2	/dev/ttyO2 or COM2	RS-485 (Data+, Data-); 2500 VDC isolated	9600

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8. Power Input and Frame Ground

The LP-2841M has a terminal with 3pins, there are 2 pins for power input and a pin for frame ground as follows:



9. XV-Board (optional)

LP-2841 has one expansion I/O slots to expand the functions. For more detailed information about the XV-board specifications, please refer to Appendix A. XV-Board Modules.



Model: XV107



Model: XV107A

Type	Number of RS-232 and 485 ports	Number of slots	I-7K	XV-board
LP-2x4x	3	1	√	√

For more information about the I/O expansion modules that are compatible with the LP-2841, please refer to the following website links:

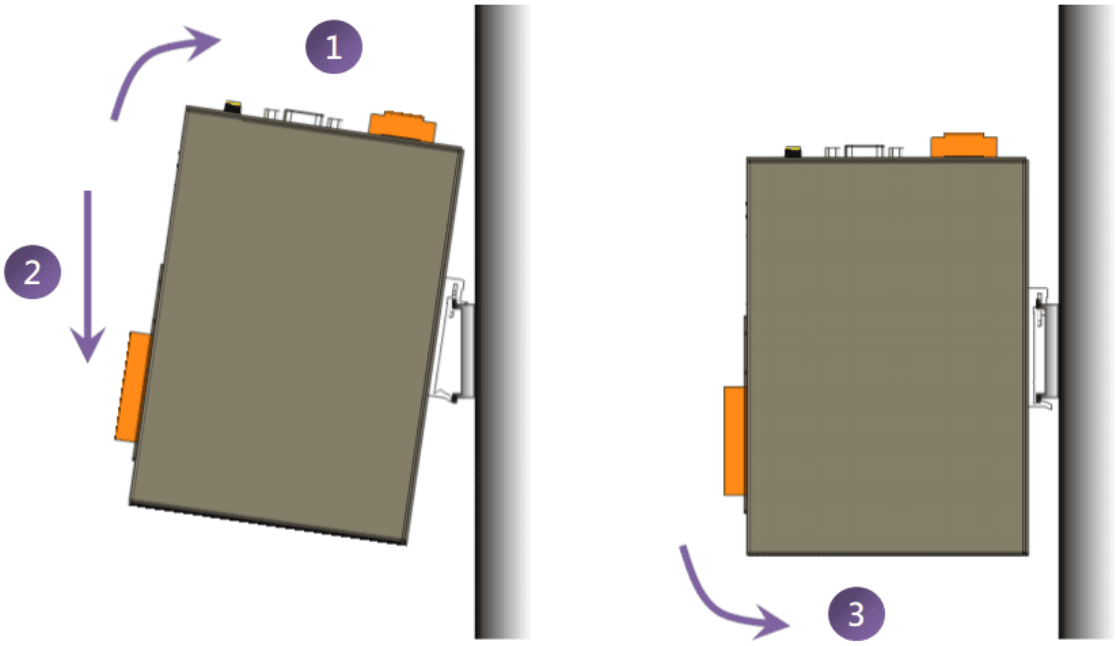
https://www.icpdas.com/en/product/guide+Remote_I_O_Module_and_Unit+PAC_%EF%BC%86amp;_Local_I_O_Modules+XV-board

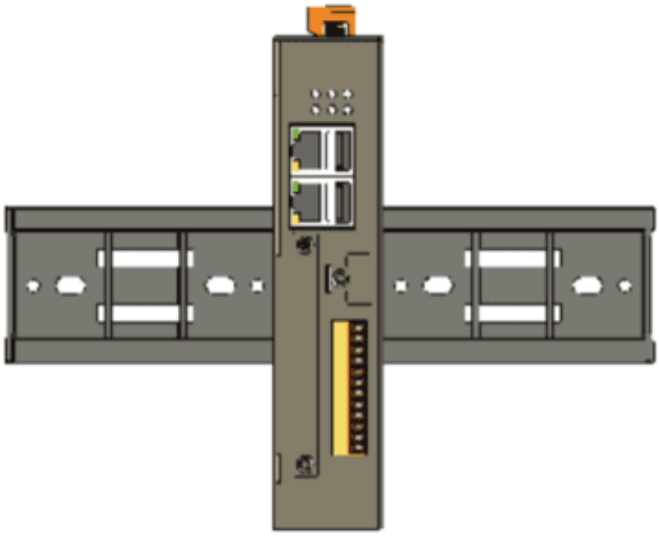
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2.2 Mounting the LP-2x4x

DIN-Rail mounting

The LP-2x41 has simple rail clips for mounting reliably on a standard 35 mm DIN-Rail.



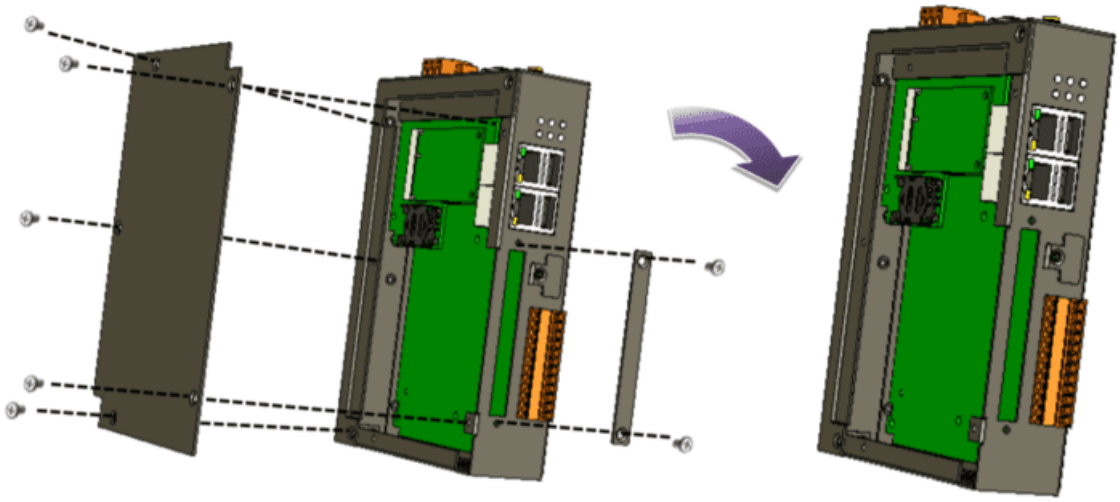


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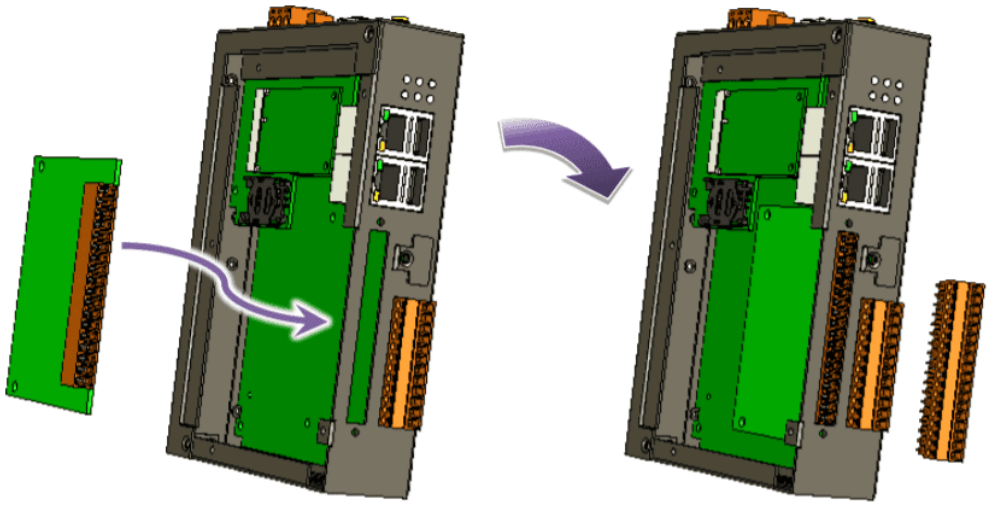
2.3 Installing the XV-Board

LP-2x4x has one expansion I/O slots to expand the functions. For more information about the I/O expansion modules that are compatible with the LP-2x4x, please refer to: http://www.icpdas.com/root/product/solutions/hmi_touch_monitor/touchpad/xv-board_selection.html

Step 1: Remove stripped screws and then remove the cover.

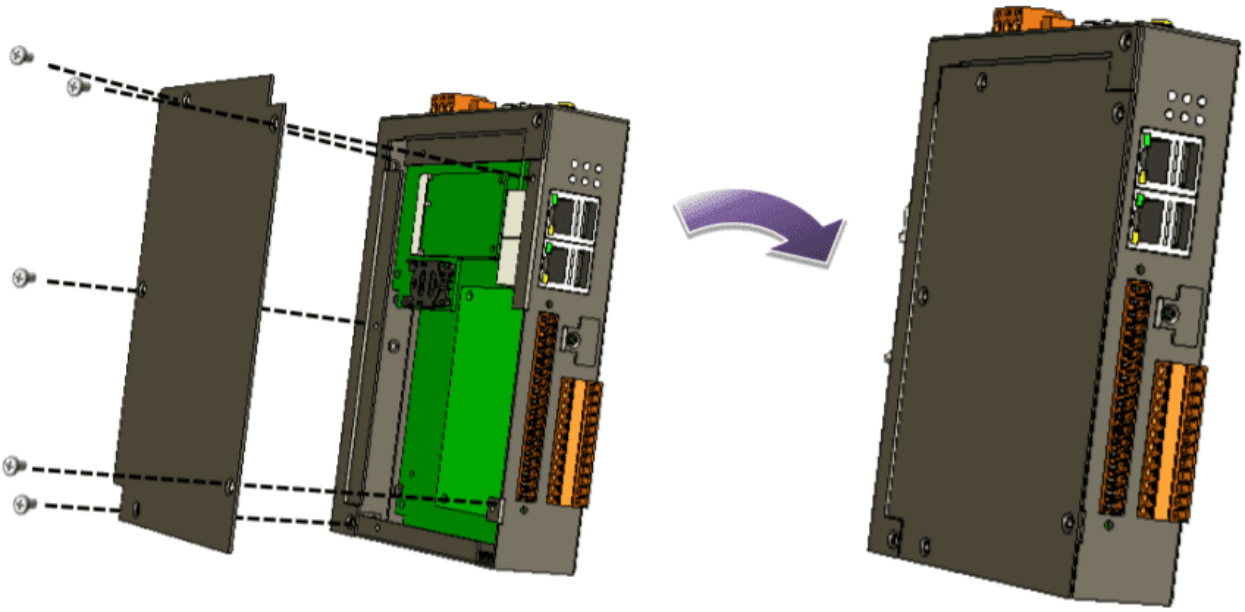


Step 2: Hold the XV-board vertically and align the socket, and then carefully press the XV-board onto the socket.

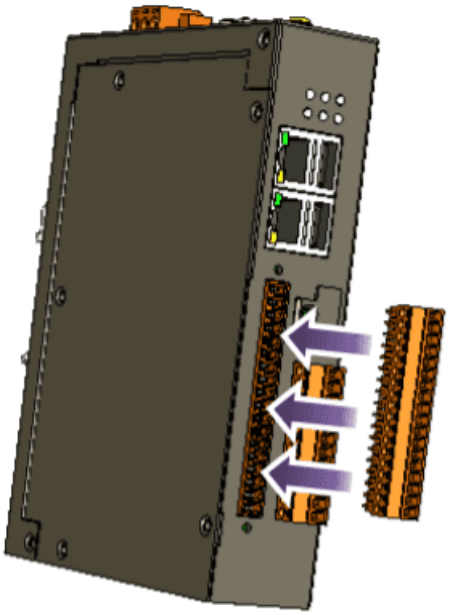


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Step 3: Close the cover and then fasten the screws.



Step 4: Insert the I/O terminal and then stick the I/O sticker.



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3. System Settings

3.1 WDT

To **Enable/Refresh/Disable WDT** working status, the process can be divided into two steps, which are described below:

1. To execute the SDK demo “lp2841-imx8mm-sdk/examples/common/wdt”, then press “Enter” to enable/refresh WDT or press “Esc” to disable WDT

```
root@icpdas:~# ./root/lp2841-imx8mm-sdk/examples/common/wdt
To enable LP-2841's WDT and time out is 8 secs.
Press Enter to refresh hardware watch dog (ESC to Disable)

Refresh watchdog timer

Refresh watchdog timer

Refresh watchdog timer
^[
root@icpdas:~#
```


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3.2 Execute Demo at Boot Time

User can refer to below steps to auto-execute demo “helloworld” at boot time.

1. Copy SDK demo “ lp2841-imx8mm-sdk/examples/common/helloworld” to “/usr/sbin”

2. 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 /lib/systemd/system/helloworld.service
```

```
[Unit]
Description=Run demo "helloworld" at boottime

[Service]
Type=oneshot
ExecStart=/usr/sbin/helloworld

[Install]
WantedBy=multi-user.target
```

3. Use “systemctl” command to add the script “helloworld.service” automatically.

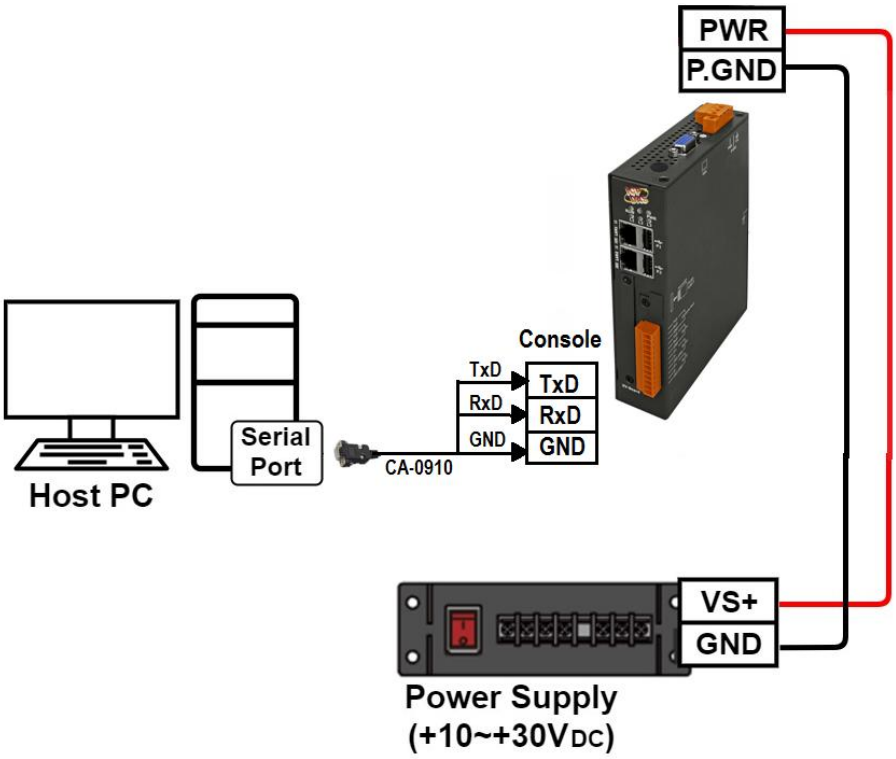
```
root@icpdas:~# systemctl enable helloworld.service
```

4. After setting the file, the LP-2841 will execute binary “helloworld” at boot time

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3.3 Remote Connection

3.3.1 Console Connection



1. Connect both the LP-2841 and your computer through the **"Console Port"**, and power the LP-2841 on.
2. Using the serial terminal software (ex Putty or others) and set the baud rate **"115200"** to connect to the device.
3. Type default ID- **"root"** and password- "**icpdas**" to login.

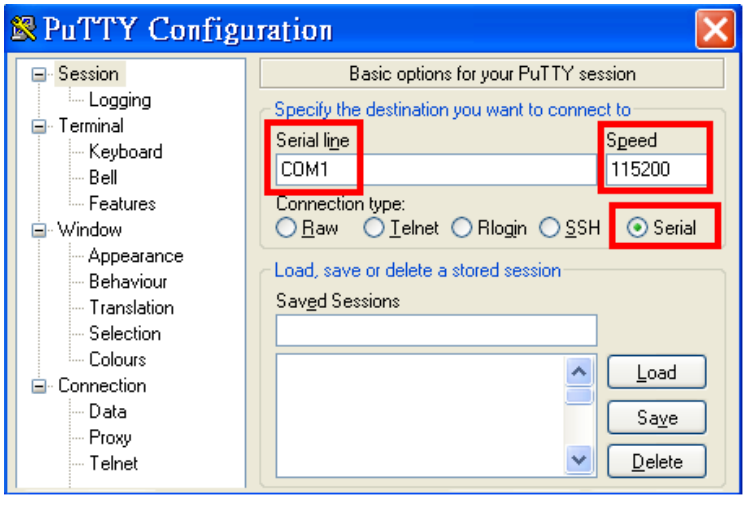


Fig 3-1 Console Connection

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3.3.2 Network Connection

1. After user follow step 5 “Console Connection” to connect to the device bash terminal, user can change the default network setting:

Interface	LAN1 (eth0)	LAN2 (eth1)
IP	DHCP	DHCP
User ID	root	
Password	icpdas	

2. If user want to use DHCP to set the network configuration, user can use the command “**vi**” to modify the configuration file “**/etc/network/interfaces**”.

3. Using the ‘**#**’ to mark the eth0/eth1’s default configuration and saving the file. Please refer to below Fig 3-2:

```
# loopback network interface
auto lo
iface lo inet loopback

# primary network interface
auto eth0 eth1
iface eth0 inet dhcp
#iface eth0 inet static
#address 192.168.0.1
#netmask 255.255.255.0

iface eth1 inet dhcp
#iface eth1 inet static
#address 192.168.0.2
#netmask 255.255.255.0
```

Fig. 3-2 DCHP/Static IP Setting

4. After saving the new network setting, user can use the command “**/etc/init.d/networking**” to enable the setting.

5. User can use the new network setting to connect to the device.

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3.4 Basic Linux Instructions

User can use below basic Linux command (Fig. 5-4) to control LP-2841:

Instruction	Function Description
ls	list the file information
cd	Change directory
mkdir	create the subdirectory
rm	delete file or directory
cp	copy file
mv	move or rename file or directory
pwd	show the current path
who	show the on-line users
chmod	change authority of file
uname	show the version of linux
ps	show the procedures that execute now
date	show date and time
netstat	show the state of network
ifconfig	show the ip and network mask
wget	get the file from the web link
ping	check to see if the host in the network is alive
passwd	change the password
vi	a programmers text editor
reboot	reboot the LP-2841

Fig. 3-3 Basic Command

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3.5 i-Talk Utility

User can use below the i-Talk utility (Fig. 3-4) to control LP-2841 or ICP DAS XV-Board and can be found in the path —**/usr/sbin/iTalk**. An overview of the i-Talk utility functions is given below:

Instruction	Function Description
setxvdo	Set digital output value to XV-Board
setxvao	Set analog output value to XV-Board
getxvdi	Get digital input value from XV-Board
getxvai	Get analog input value from XV-Board
getxvdo	Get digital output value from XV-Board
getxvao	Get analog output value from XV-Board
setmodbus	Set the modbus device
getmodbus	Get the status of modbus device
rsw	Get the rotary switch ID
led	Set LED(L1~L3)

Fig. 3-4 i-Talk Utility

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3.6 Systemd Support

The “**systemctl**” can be used to introspect and control the state of the "systemd" system and service manager. Please refer to below steps to start/stop/restart/enable/disable software.

1. Command “start”

   The command start services for starting (activate) one or more units specified on the command line.

```
root@icpdas:~# systemctl start helloworld.service
```

2. Command “stop”

   The command stop serves for stopping the service or (deactivate) one or more units specified on the command line.

```
root@icpdas:~# systemctl stop helloworld.service
```

3. Command “restart”

   The command restart serves for restarting the service in execution. Stop and then start one or more units specified on the command line. If the units are not running yet, they will be started.

```
root@icpdas:~# systemctl restart helloworld.service
```

4. Command “status”

   The command status serves to check the status of the service. Show the service information about one or more units, followed by the most recent log data from the journal. If no units are specified, it shows system status.

```
root@icpdas:~# systemctl status helloworld.service
```


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5. Command “enable”

The enable command serves for executing the service since the initialization if consists of one or more units or unit instances. This will create a set of links, as encoded in the [Install] sections of the indicated unit files. The system manager configuration is reloaded (in a way equivalent to daemon-reload), in order to ensure the changes are taken into account immediately.

```
root@icpdas:~# systemctl enable helloworld.service
```

6. Command “disable”

The disable command serves for withdrawing the service since the initialization of one or more units. This removes all links to the unit files backing the specified units from the unit configuration directory and hence undoes any changes made by enabling or link.

```
root@icpdas:~# systemctl disable helloworld.service
```


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3.7 SFTP

The LP-2841 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 refer to Fig. 3-5 and Fig. 3-6). For free download "WinSCP" software, user can visit https://winscp.net/eng/download.php

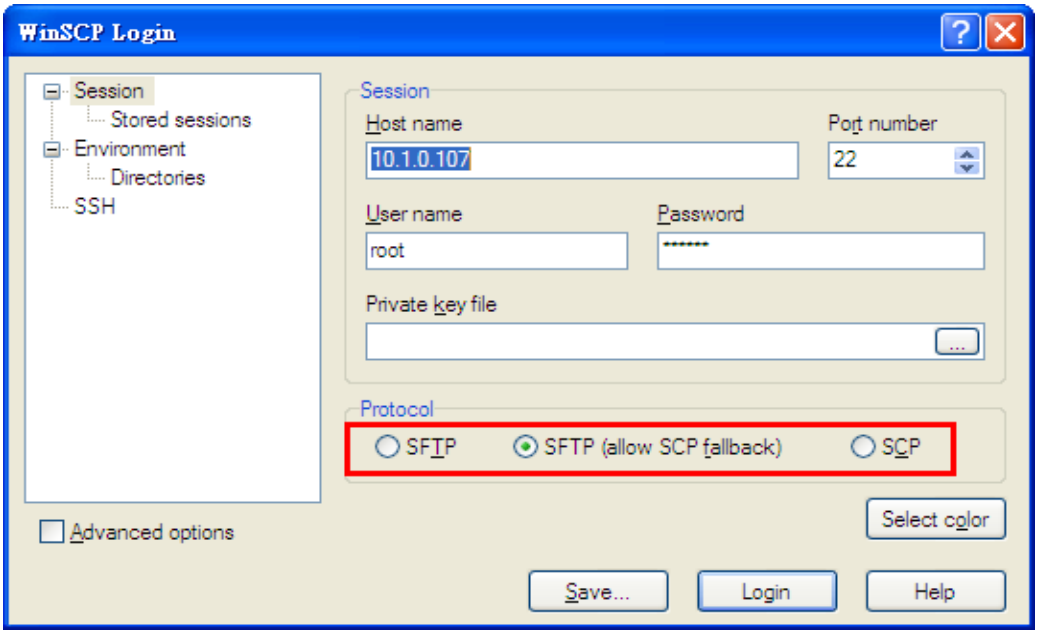


Fig. 3-5 WinSCP Login

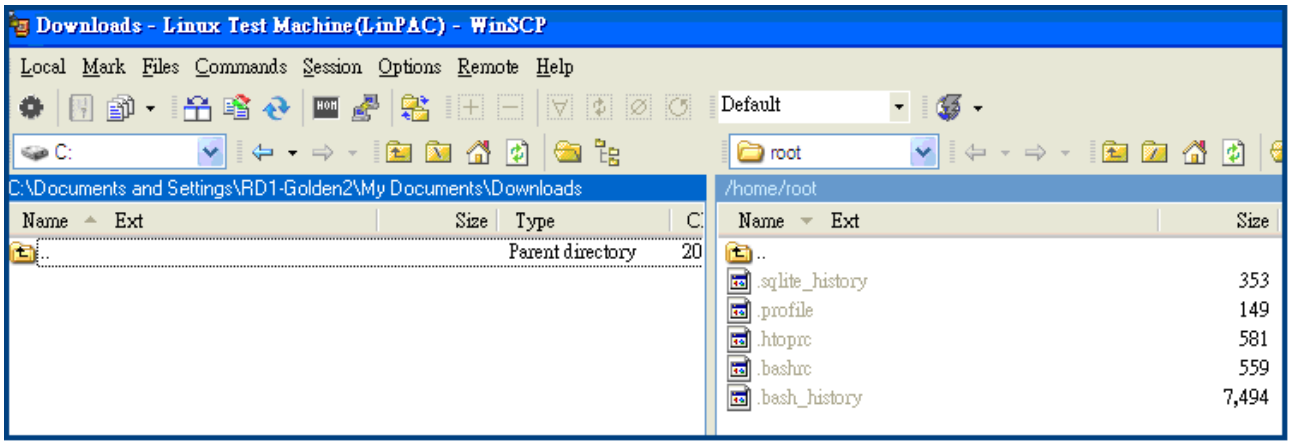


Fig. 3-6 WinSCP

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3.8 XFCE GUI Desktop

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. Now the LP-2841 Linux provides the XFCE package, after user type "**root**" and password "**icpdas**" to login, the local terminal would execute the XFCE Desktop.

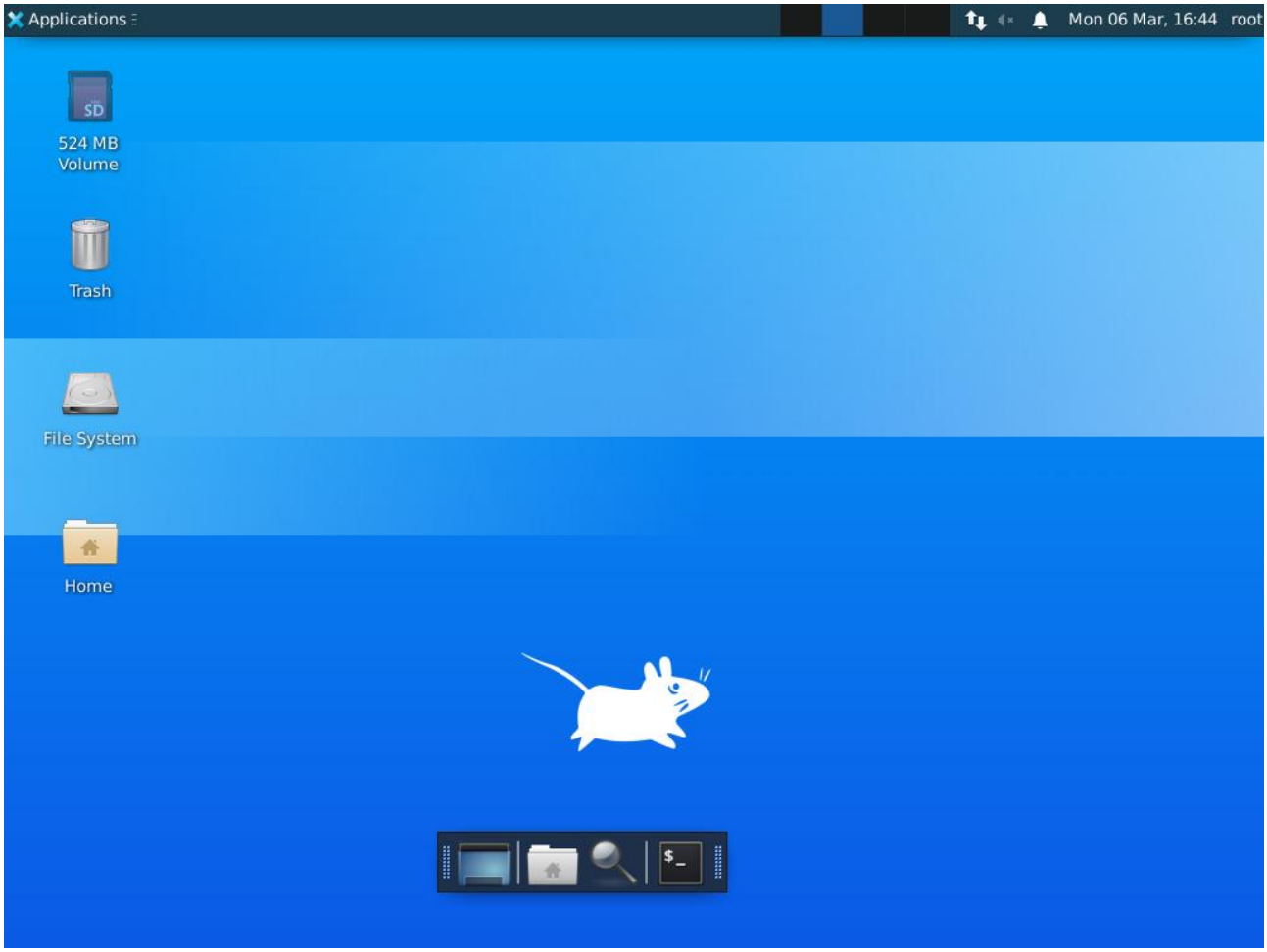


Fig. 3-7 XFCE Desktop

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3.9 Software Package Manager

The “**apt-get**” utility is the Ubuntu package manager used to download and install software packages from local package repositories or ones located in the Internet.

- To install a package run the following commands:

```
root@icpdas:~# apt-get  update
root@icpdas:~# apt-get  install  <package>
```

- To search available package run the following commands:

```
root@icpdas:~# apt-cache  search  <package name>
```


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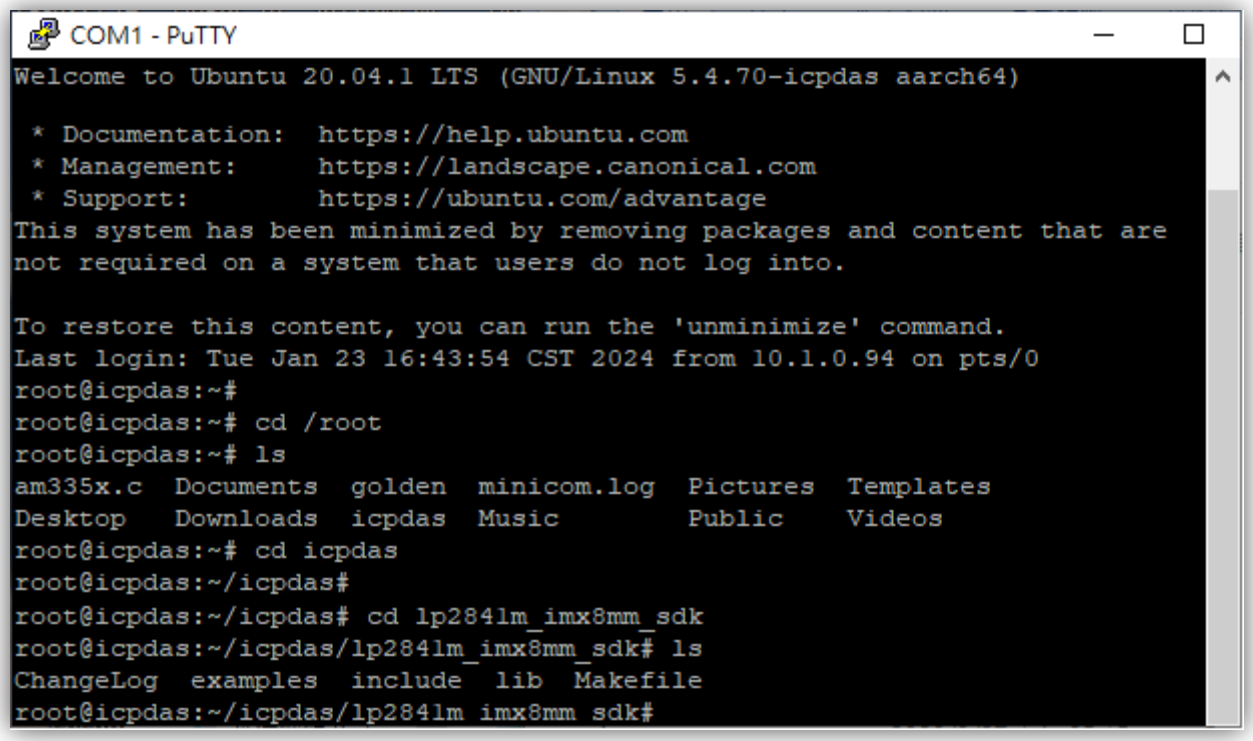
4. Your First Program

In this section, we will introduce how to compile the helloworld.c file to helloworld **executable file** and executes this on the LinPAC.

4.1 Download the LP-2841 SDK

1. To create a '**icpdas**' folder in root directory, change the root user by '**sudo**' or '**su**' command.

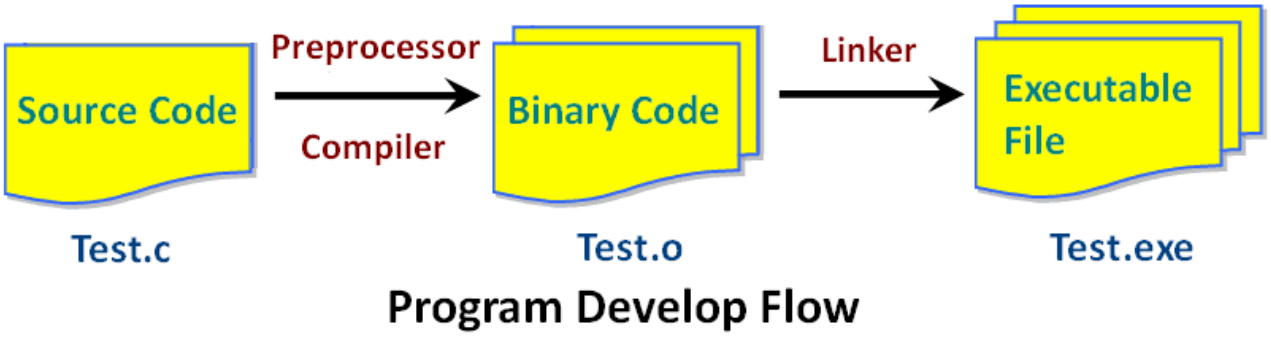
2. Download SDK on LP-2841M, and extract the **.tgz** file into to the root (/root/icpdas/) directory.
Download Path: https://www.icpdas.com/en/download/index.php?model=LP-2841M



The toolkit consists of the following items: Libraries, header, examples files, etc.
LP-2841M has built-in compiler tools, user just download SDK to the LP-2841M, then type '**make**' command.

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4.2 Compile and Execute the demo



Program Develop Flow

In this example, no ICP DAS modules are used. To create a demo program with C language that includes the following main steps:

Step	LP-2841M
1.	Find demo 'helloworld.c' in SDK Here is in the "lp8421_imx8mm_sdk/examples/common/helloworld.c"
2.	Compile the demo on LP-2841M directly # make
3.	Execute the application # ./helloworld

```
COM1 - PuTTY
root@icpdas:~/icpdas/lp2841m_imx8mm_sdk# cd examples/
root@icpdas:~/icpdas/lp2841m_imx8mm_sdk/examples# cd common
root@icpdas:~/icpdas/lp2841m_imx8mm_sdk/examples/common# ls
battery     echosvr     getsendreceive         led         rsw         timeout_int
battery.c   echosvr.c   getsendreceive_bin     led.c       rsw.c       timeout_int.c
buzzer      getexai     getsendreceive_bin.c   pacid       setexao     uart
buzzer.c    getexai.c   getsendreceive.c       pacid.c     setexao.c   uart.c
comtest     getexdi     helloworld             read_sn     setexdo     wdt
comtest.c   getexdi.c   helloworld.c           read_sn.c   setexdo.c   wdt.c
root@icpdas:~/icpdas/lp2841m_imx8mm_sdk/examples/common#
root@icpdas:~/icpdas/lp2841m_imx8mm_sdk/examples/common# ./helloworld
Hi ~ Welcome to ICP DAS LinPAC!
root@icpdas:~/icpdas/lp2841m_imx8mm_sdk/examples/common#
```

Note:

1) We recommend user to change user ID to become **root** by '**sudo**' or '**su**' command.

2) Linux 64-bit operating system lacks 32-bit support libraries. If your Linux PC is 64-bit OS, you must install 32-bit libraries on your system before you run the 32-bit version of the LinPAC SDK (Linux version).

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Appendix A. XV-Board Modules

The XV-board series are for LP-2000, LP-5000, WP-2000-CE7, WP-5000-CE7. One PAC can only plug only one XV-board. The

XV-board series have following common specification:

- DI channel is dry contact, sink type.
- DO channel is open collector, sink type.

DIO Expansion

Model	DI			DO	
	Channel	Type	Sink/Source	Channel	Sink/Source
XV107	8	Wet	Source	8	Sink
XV107A			Sink		Source
XV110	16	Dry/Wet	Sink/Source	-	-
XV111	-			16	Sink
XV111A					Source

Relay Output Expansion

Model	DI			Relay Output	
	Channel	Type	Sink/Source	Channel	Type
XV116	5	Wet	Sink/Source	2	Signal Relay
				4	Power Relay

Multi-Function Expansion

Model	AI	AO	DI			DO	
	Channel			Type	Sink/Source	Channel	Sink/Source
XV308	8	-	DI+DO=8	Dry/Wet	Source	DI+DO=8	Sink
XV310	4	5	4		Sink		Source

For more detailed information about these support modules, please refer to
http://www.icpdas.com/root/product/solutions/hmi_touch_monitor/touchpad/xv-board_selection.html

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Appendix B. Service Information Software Introduction

- **LinPAC-2841 Series Product Page:**

https://www.icpdas.com/en/download/show.php?num=8730&model=LP-2841M

- **LinPAC-2841 Series Document Download:**

https://www.icpdas.com/en/download/show.php?num=8730&model=LP-2841M

- **LinPAC-2841 Series Software Download:**

https://www.icpdas.com/en/download/index.php?model=LP-2841M

- **NS-205 and Power Supply's Product Page (optional):**

https://www.icpdas.com/en/product/NS-205

https://www.icpdas.com/en/product/guide+Accessories+Power Supplies+Power Supply

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