

Software Guide

LP-5231 LinPAC

Implement industry control with Linux Technique

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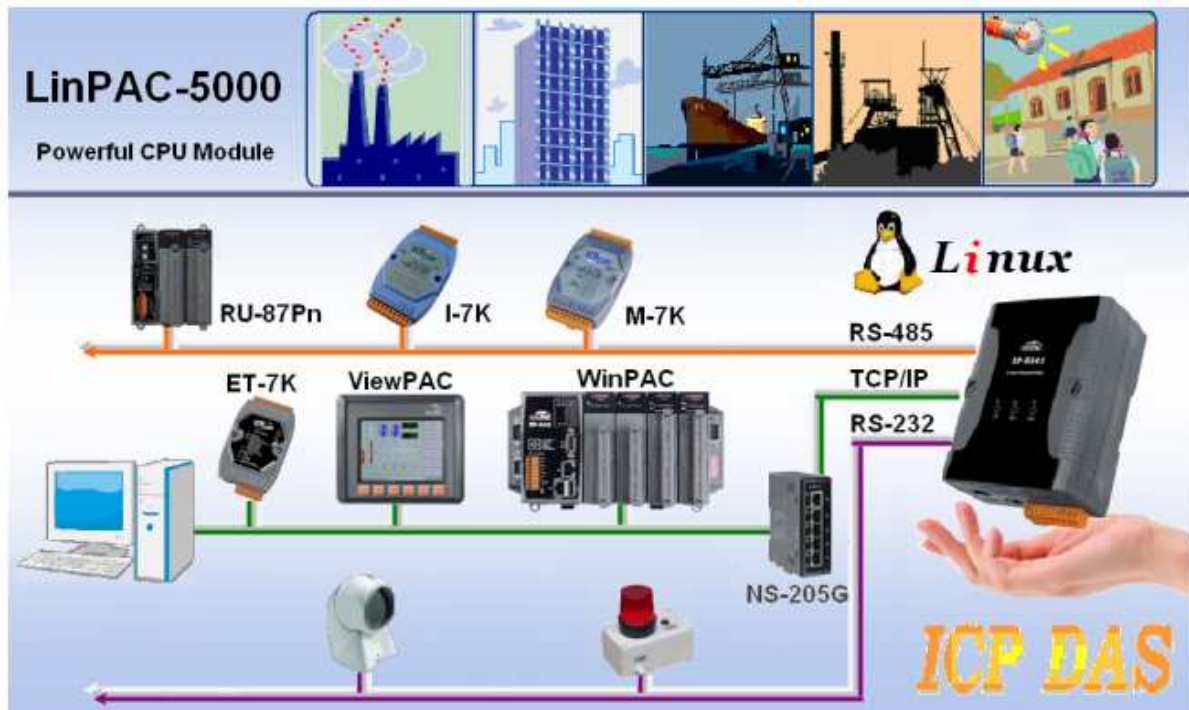
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1. Introduction



The LP-5231 is a new generation LinPAC from ICP DAS and is equipped with a powerful CPU module running on the open operating system, various connectivity (Ethernet, micro SD and serial port) and communication interfaces. Compared with the previous generation LP-5000 series, not only the CPU performance is higher but also more features are improved such as 256 MB flash, 512 MB DDR3 memory, unique 64-bit hardware serial number, and real-time clock, etc. These make the LP-5231 becoming one of the most powerful system.

This LinPAC is designed to add Ethernet and Internet connectivity to any RS-232 and RS-422/485, and to eliminate the cable length limitation of legacy serial communication, coupled with a large built-in RAM buffer, allows for fast transmission and prevents congestion of serial data on the network. Built-in powerful 720 MHz ARM-based processor offers excellent performance at low power consumption. The preloaded high-performance operating system is open, flexible, scalable and allows user to easily add or remove application/service from configuration mechanism.

1.1 Packing List

The package includes the following items:

- One LinPAC-5231 hardware module
- One software utility CD
- One RS-232 console/download cable, CA-0903
- One Quick Start Guide

Note: If any of these items are missed or damaged, contact the local distributors for more information. Save the shipping materials and cartons in case you want to ship in the future.

1.2 Features

- AM3352, 720 MHz CPU
- 512 MB SRAM and 256 MB Flash
- Linux kernel 3.2.14
- Hard Real-Time Capability
- 64-bit Hardware Serial Number for Software Protection
- I/O Expansion Bus
- 10/100/1000M Ethernet Port
- 4 Serial Ports (RS-232/485)
- Operating Temperature: -25 ~ +75°C

1.3 Specifications

Models	LP-5231
OS	Linux Kernel 3.2.14



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Embedded Service	SFTP server, Web server, SSH
SDK Provided	Standard LinPAC SDK for Linux by GNU C language
CPU Module	
CPU	32-bit RISC, 720Mhz
SDRAM	512MB
Flash	256MB
FRAM	64KB
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	2 LED for Power and Running; 2 LED for user defined
Rotary Switch	Yes(0~9)
VGA & Communication Interface	
VGA	Yes. Resolution: 640 × 480, 800 × 600, 1024 × 768, 1280 × 720
USB 2.0(host)	1
Console Port	RS-232 (RxD, TxD and GND); Non-isolated
ttyO4	RS-232 (RxD, TxD and GND); Non-isolated
ttyO2	RS-485 (Data+, Data-); Non-isolated
ttyO5	RS-485 (Data+, Data-); 2500 VDC isolated
Ethernet Port	10/100 Base-TX, RJ-45 port (Auto-negotiating, Auto MDI/MDI-X, LED indicators), PoE (IEEE 802.3af, Class 1)
I/O Expansion Slots	
I/O Expansion Bus	Yes, one optional XV-board
COM Port Formats	
Speed	921.6 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)
Software	
OS	Linux Kernel 3.2.14
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



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Power Input	
Input Range	+12 ~ +48 VDC
Consumption	4.8 W
Mechanism	
Flammability	Fire Retardant Materials (UL94-V0 Level)
Dimension (W x H x D)	91 mm x 132 mm x 52 mm
Installation	DIN-Rail
Environment	
Operating Temperature	-25 ~ +75 °C
Storage Temperature	-40 ~ +80 °C
Humidity	5 ~ 90% RH, non-condensing

1.4 Ordering Information

LP-5231	PAC with Linux(kernel 3.2.14) and one LAN port (RoHS)
----------------	---

1.5 Option Accessories

XV-Board	Add-on I/O Expansion Board
GPSU06U-6 CR	24 VDC/0.25 A, 6 W Power Supply
MDR-20-24 CR	24 VDC/1 A, 24 W Power Supply with DIN-R
DIN-KA52F-48 CR	48V/0.52A, 25 W Power Supply with DIN-Rail Mounting (RoHS, for NS-205PSE)
CA-0903	9-Pin Female D-Sub and RS-232 Connector Cable, 30 cm Cable
CA-0910	9-Pin Female D-Sub and 3-wire RS-232 Cable, 1 m Cable
NS-205 CR	Unmanaged 5-port Industrial Ethernet Switch (RoHS)
NS-205PSE CR	Unmanaged Ethernet Switch with 4 PoE Ports and 1 RJ-45 Uplink (RoHS)



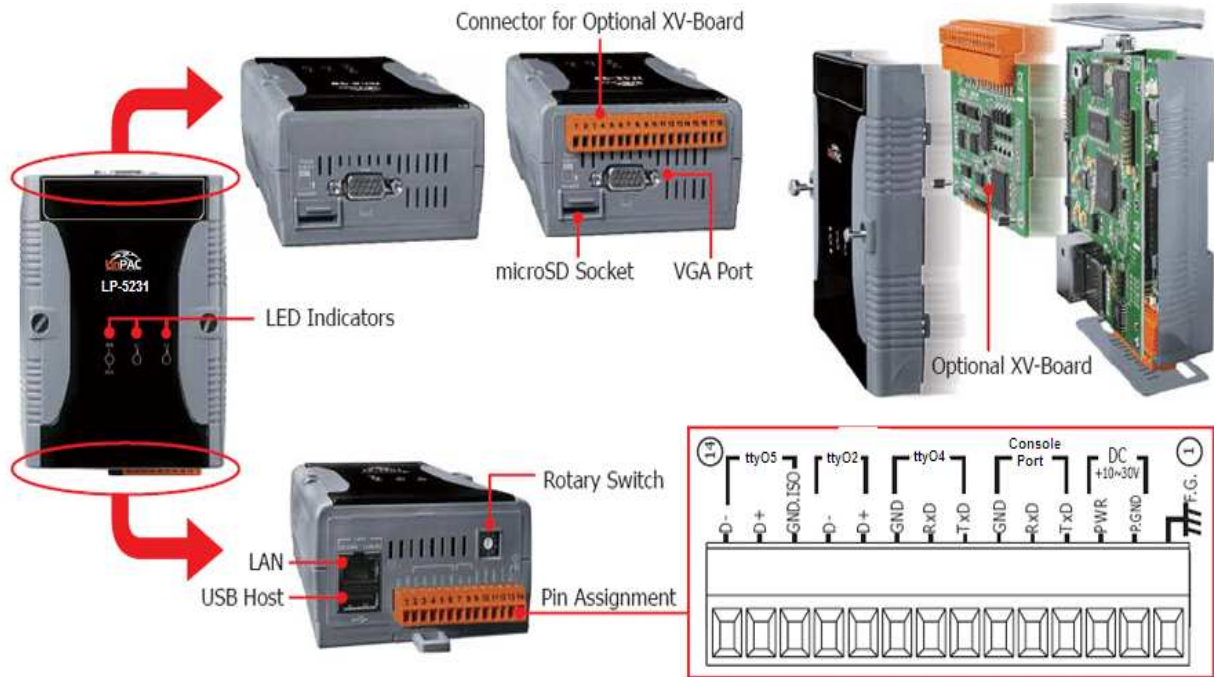
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2. Hardware Introduction

2.1 Hardware Feature



1. 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.

2. LED Indicators

The LP-5231 contains four LED indicators. Please refer table 2-1:

LED Indicators	Color	Meaning
PWR	Red	Power is on
RUN	Green	OS is running
L1	Green/Red	User programmable LED
L2	Green/Red	User programmable LED

Table 2-1



3. USB Ports

The LP-5231 contains one USB ports that allow support for the USB devices such as mouse, keyboard or an external USB hard drive.

4. Ethernet Ports

The LP-5231 contains one Ethernet port for use with network devices.

5. Serial Ports

Please refer to Fig 2-1.

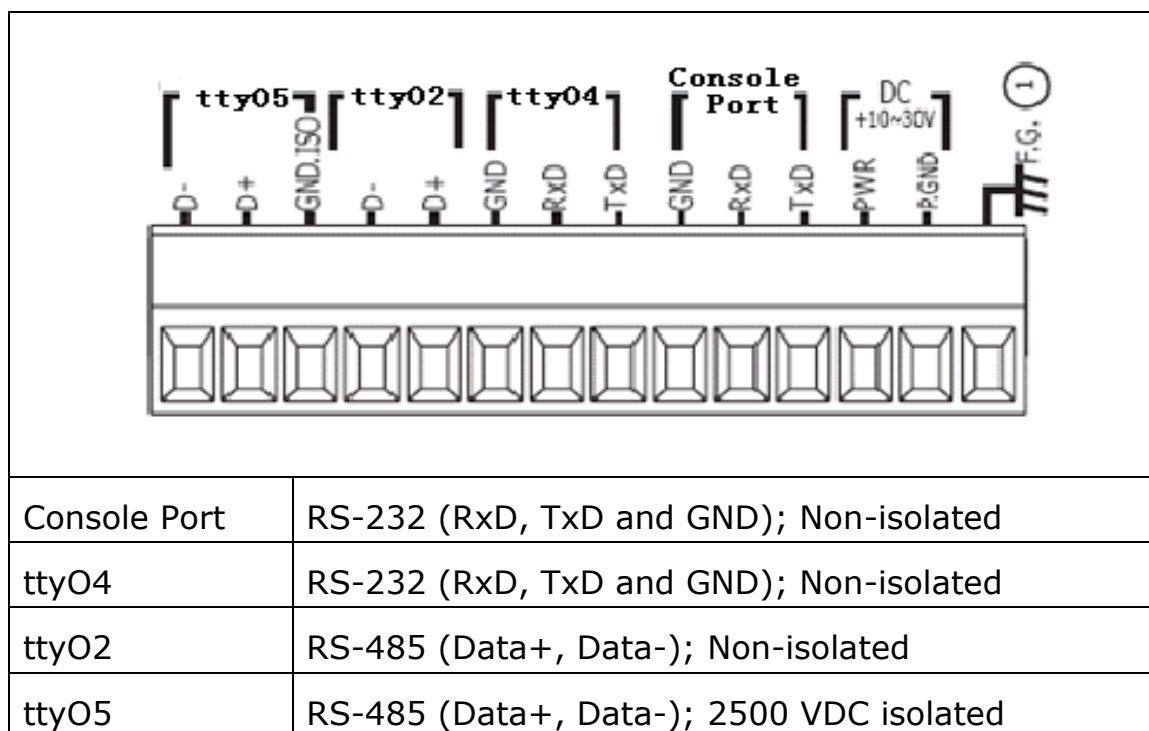


Fig 2-1 Serial Ports

6. SD Card Slot

The SD card expansion slot is an interface that is used to access and download information on a SD card to a LP-5231.

7. VGA Connector

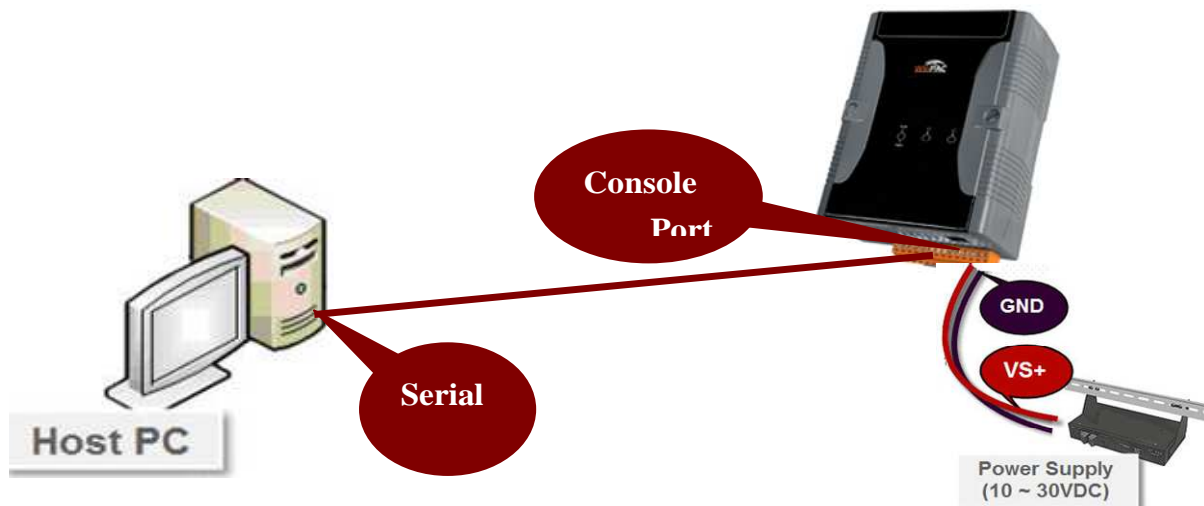
A VGA connector is a 3-row 15-pin connector that can be used with a variety of supported VGA resolutions(640 x 480 、 800 x 600 、 1024 x 768 、 1280 x 720).



3. Software Introduction

3.1 Remote Connection

3.1.1 Console Connection



1. Connect both the LP-5231 and your computer through the **"Console Port"**, and power the LP-5231 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"** to login.



Fig 3-1 Console Connection



3.1.2 Network Connection

1. After user follow step 4 "Console Connection" to connect to the device bash terminal, user can change the default network setting:

IP	192.168.255.1
Netmask	255.255.255.0
Gateway	192.168.255.254
User ID	root
Password	(no Password)

2. Please refer to Fig 3-2 or Fig 3-3 to set the network configuration:

```
LP-5000:~# ipv4set static 10.1.0.107 255.255.0.0 10.1.0.254  
ipv4set static ... OK
```

Fig 3-2 Static IP

```
LP-5000:~# ipv4set dhcp  
ipv4set dhcp ... OK
```

Fig 3-3 Dynamic IP

3. User can use the Putty(or other ssh client software) to connect to the LP-5231:

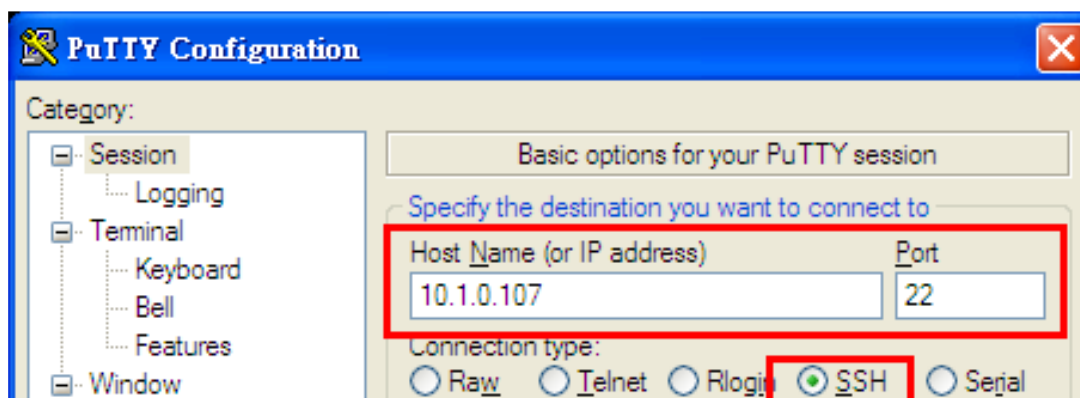


Fig 3-4 SSH Connection



3.2 Basic Linux Instructions

User can use below basic Linux command(table 3-1) to control LP-5231:

Instruction	Function Discription
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-5231

Table 3-1 Basic Command



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3.3 i-Talk Utility

User can use below the i-Talk utility(table 3-2) to control LP-5231 or ICP DAS XV-Board:

Instruction	Function Discription
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
ipv4set	Set network configuration

Table 3-2 i-Talk Utility



3.4 Systemd Utility “systemctl”

“Systemd” is a system and service manager for Linux operating systems. User can start/stop/enable/disable software service by using systemd utility “systemctl”. Please refer to below steps to start/stop/enable/disable software.

```
LP-5000:~# systemctl start shmio.service
LP-5000:~#
LP-5000:~# ps | grep shmioserver
10877 root      10564 S      /usr/sbin/shmioserver -d
10880 root           2116 S      grep shmioserver
```

Fig 3-5 startup software

```
LP-5000:~# systemctl stop shmio.service
LP-5000:~#
LP-5000:~# ps | grep shmioserver
10885 root           2116 S      grep shmioserver
```

Fig 3-6 stop software

```
LP-5000:~# systemctl enable shmio.service
ln -s '/lib/systemd/system/shmio.service' '/etc/systemd/system/multi-user.target.wants/shmio.service'
LP-5000:~#
LP-5000:~# systemctl disable shmio.service
rm '/etc/systemd/system/multi-user.target.wants/shmio.service'
```

Fig 3-7 Enable/Disable software



3.5 SFTP

The LP-5231 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 3-8 · Fig 3-9).

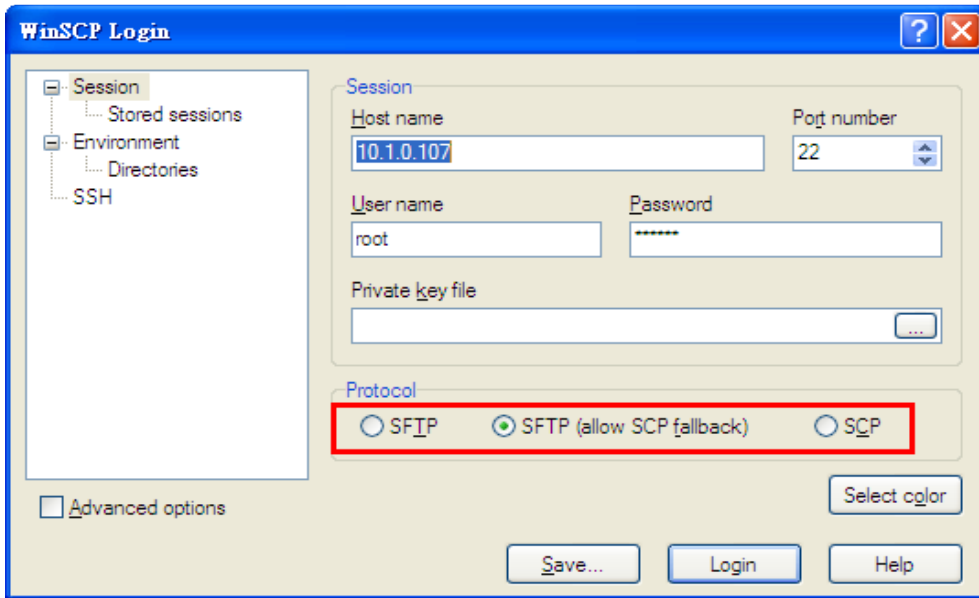


Fig 3-8 WinSCP Login

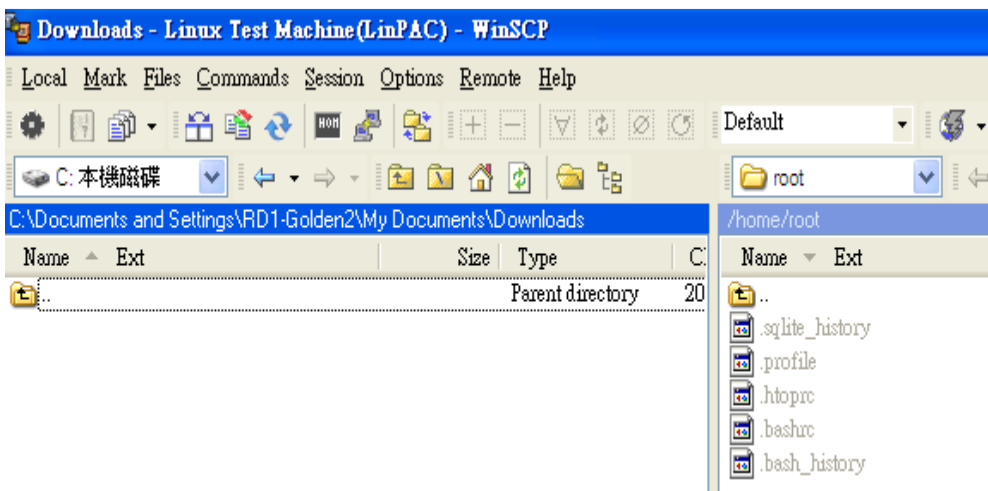


Fig 3-9 WinSCP



3.6 Web Server

The web server daemon "lighttpd" has been built in the LP-5231 and it will be started automatically at boot time. The default path of web page in the **"/www/pages"**. If user want to change the web page's path, user can use command "vi" to modify the configuration file **"/etc/lighttpd.conf"** of daemon "lighttpd". Besides, User can use systemd utility "systemctl" to enable/disable daemon "lighttpd" at boot time, please refer to below steps:

```
LP-5000:~# vi /etc/lighttpd.conf
```

Fig 3-10 configuration file

```
LP-5000:~# systemctl enable lighttpd.service  
ln -s '/lib/systemd/system/lighttpd.service' '/etc/systemd/system/multi-user.target.wants/lighttpd.service'
```

Fig 3-11 enable "lighttpd" service

```
LP-5000:~# systemctl disable lighttpd.service  
rm '/etc/systemd/system/multi-user.target.wants/lighttpd.service'
```

Fig 3-12 disable "lighttpd" service



3.7 Share Memory I/O for XV-Board

User can use the command "shmioserver" and "shmioclient" to control the XV-Board.

User can refer to below steps:

- Step 1: Enable share memory server

```
LP-5000:~# systemctl start shmio.service
```

Fig 3-13 shmioserver

- Step 2: Using client command to control XV-Board. For example, using "shmioclient" to enable XV-116 DO(address 0x0001).

```
LP-5000:~# shmioclient b o 1 1  
I/O Board is XV-116 ( DI*5, DO*6, )  
bit read back = 1
```

Fig 3-14 shmioclient



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 Angstrom Linux provides the XFCE package, after user type "root" to login, the local terminal would execute the XFCE Desktop.

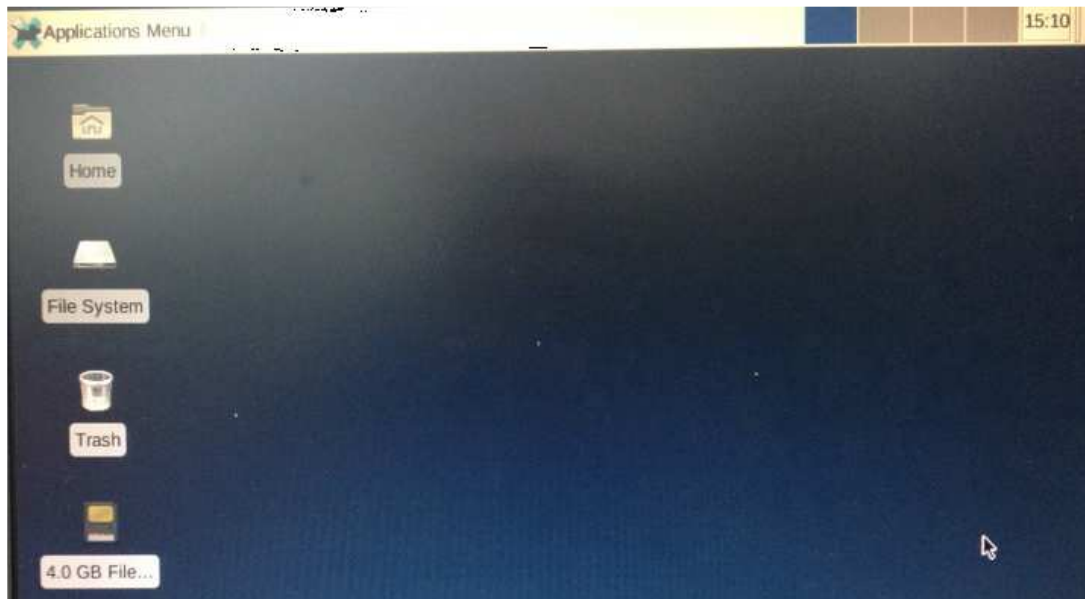


Fig 3-15 XFCE Desktop



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3.9 OPKG Package Manager

The “opkg” utility is a lightweight package manager used to download and install OpenWrt packages from local package repositories or ones located in the Internet.

- To install a package run the following commands:

```
opkg update  
opkg install <package>
```

- To search available package run the following commands:

```
opkg list – will display only Package name — Version — Description  
opkg info – will display all available information.
```

- The OPKG configuration files(*.conf) in the directory “**/etc/opkg/**”.

```
/etc/opkg/arch.conf  
/etc/opkg/noarch-feed.conf  
/etc/opkg/base-feed.conf  
/etc/opkg/perl-feed.conf  
/etc/opkg/beaglebone-feed.conf  
/etc/opkg/python-feed.conf  
/etc/opkg/debug-feed.conf  
/etc/opkg/sdk-feed.conf  
/etc/opkg/gstreamer-feed.conf
```



Appendix A. Service Information

- **LinPAC-5231 Product Page:**

<http://www.icpdas.com/root/product/solutions/pac/linpac/lp-52xx.html>

- **LinPAC-5231 Document Download:**

http://ftp.icpdas.com.tw/pub/cd/linpac/napdos/lp-5000/lp-52xx/lp-5231/user_manual/

- **LinPAC-5231 Software Download:**

http://www.icpdas.com/root/product/solutions/pac/linpac/linpac-5000_download.html

- **NS-205 and DP-665 Product Page (optional):**

<http://www.icpdas.com/products/Switch/industrial/ns-205.htm>

http://www.icpdas.com/products/Accessories/power_supply/dp-665.htm



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