UC-7400 Series

User's Manual

www.moxa.com/product

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UC-7400 Series
User's Manual

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1

Introduction

Welcome to MOXA UC-7400 Series RISC-based Communication Platforms. UC 7400 Series features powerful eight RS-232/422/485 serial ports, dual 10/100 Mbps Ethernet, PCMCIA, CompactFlash interface for wireless LAN communication and flash disk expansion, making it ideal for your embedded applications.

The following topics are covered in this chapter:

- **Overview**
- **Package Checklist**
- **Product Features**
- **Product Specifications**
- **Hardware Block Diagram**
- **Panel Layout**
- **LED Indicators**
- **Connector Descriptions**
  - Power Connector
  - Grounding UC-7400

Overview

UC-7400 Series RISC-based Communication Platforms are ideal for your embedded applications. UC-7400 Series comes with eight RS-232/422/485 serial ports, dual 10/100 Mbps Ethernet, PCMCIA, CompactFlash interface for wireless LAN communication and flash disk expansion.

UC-7400 Series is built with Intel XScale IXP-422 266Mhz RISC CPU. Unlike the X86 CPU that uses CISC design, the IXP-422's RISC design architecture and modern semiconductor technology provides UC-7400 the powerful computing engine and communication function without generating the heating problem. The built-in 32MB NOR Flash ROM and 128MB SDRAM give you enough capacity to make your applications on UC-7400 Series. With its dual LAN built in the IXP-422, UC-7400 is an ideal communication platform for the demand of Network Security. The wireless expansion via PCMCIA rests your worries about the complicated wire connection to Ethernet. UC-7400 Series is equipped with eight RS-232/422/485 serial ports for various device connections.

The pre-installed Linux provides an open software operation system for your software program development. Therefore, the written software for the desktop PCs can be easily ported to UC-7400 platform by using GNU cross complier without needing to modify software code. The device drivers, such as PCMCIA Wireless LAN module and KeyPAD, LCM and Buzzer control, are also included in UC-7400. The Operation System, device drivers and your software can be stored in the Flash memory of UC-7400.

Package Checklist

There are two models available for UC-7400 Series:

UC-7410-LX RISC-based Universal Communicator with 8 Serial Ports, Dual Ethernet, Linux OS

UC-7420-LX RISC-based Universal Communicator with 8 Serial Ports, Dual Ethernet, PCMCIA, Compact Flash, Linux OS

UC-7400 Series products are shipped with the following items:

- 1 UC-7410 or UC-7420
- Wall-Mounting Kit
- DK-35A DIN-Rail Mounting Kit (35 mm)
- UC-7400 User's Manual
- UC-7400 Documents & Software CD-ROM
- Serial port cable: CBL-RJ45M9-150 RJ45 (8-pin) to DB9 (Male) cable, 150 cm
- Console port cable: CBL-RJ45F9-150 RJ45 (8-pin) to DB9 (Female) cable, 150 cm
- Power Adapter
- Product Warranty Booklet

NOTE: *Notify your sales representative if any of the above items is missing or damaged.*

Product Features

UC-7400 Series products enjoy the following features:

- Intel XScale IXP-422 266MHz Processor
- On-board 128MB RAM, 32MB Flash ROM
- Eight RS-232/422/485 serial ports
- Dual 10/100 Mbps Ethernet
- PCMCIA/CompactFlash expansion (UC-7420 only)
- LCM display and Keypad for HMI
- Linux-Ready communicaation platform
- DIN-Rail or wall mounting installation
- Robust fanless design

Product Specifications

Hardware Specifications

	UC-7410	UC-7420
CPU	Intel XScale IXP-422 266Mhz	
DRAM	128MB	
Flash	32MB	
LAN	Two 10/100 Mbps	
Serial Port	Eight RS-232/422/485 ports	
Data bits	5,6,7,8	
Stop bits	1,1.5,2	
Parity	none, even, odd, space, mark	
Serial Console/PPP	RS-232 x 1, RJ-45	
USB Host*	N/A	USB 2.0 x 2
USB client*	USB 1.1	USB 1.1
PCMCIA	N/A	One PCMCIA type I/II socket
CompactFlash	N/A	One CompactFlash type I/II socket
LCM	128 x 64 dots	
LED	Serial X 8, PPP X 1, PWR X 1, Ready X 1, LAN 10/100 X 2	
Keypad	5	
Power input	12-48V	
Dimension	197 x 125 x 44mm	
Operating temperature	-10~60℃ (LCM needs to be above -10℃ to work properly)	
Storage temperature	-20~85℃	
Regulatory Approvals	CE, FCC Class A, TÜV, UL	

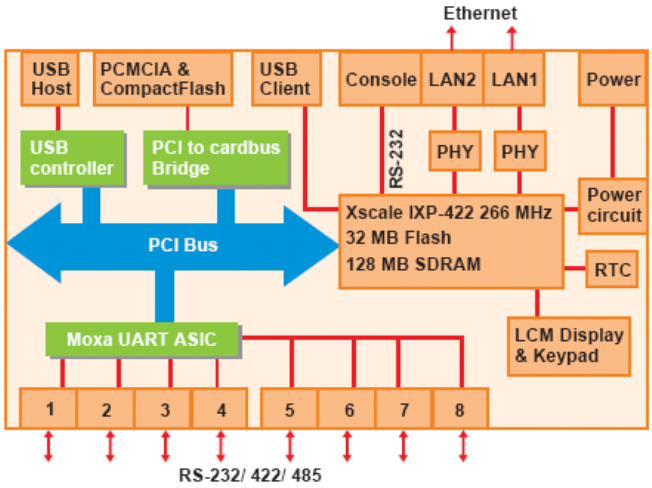
* Note:

1. USB host play the role as PC.

2. USB Client play the role as USB device.

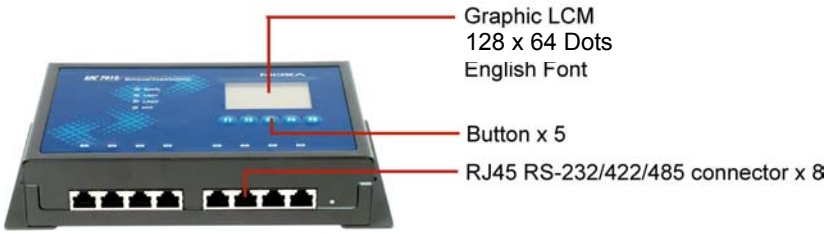
3. UC-7420/10 V1.0's USB function is reserve for future upgrade use.

Hardware Block Diagram



Panel Layout

UC-7410/7420 Front View



UC-7420 Back View

UC-7410 Back View

Installing an UC-7400

Wall or Cabinet

The two metal brackets included with UC-7400 Series Universal Communicator can be used to attach the UC-7400 to a wall, or the inside of a cabinet. Using two screws per bracket, first attach the brackets to the bottom of the UC-7400 (Fig. a). Next, use two screws per bracket to attach the UC-7400 to a wall or cabinet (Fig. b).

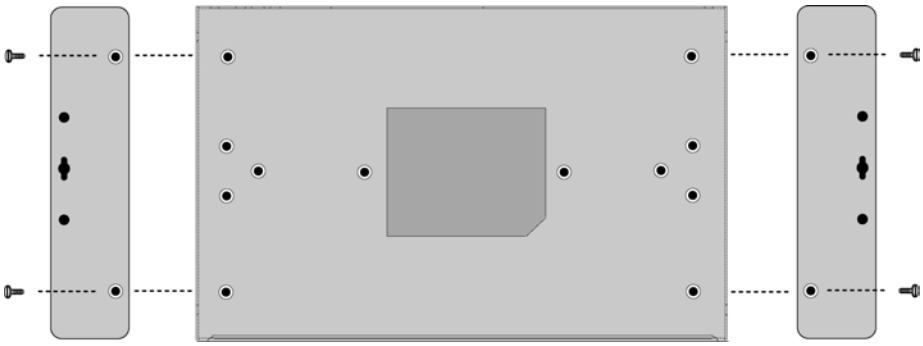


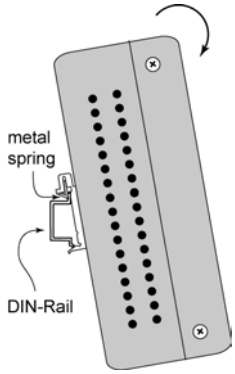
Figure a. UC-7400 Series Universal Communicator—Wall Mounting Brackets (bottom view)

Figure b. UC-7400 Series Universal Communicator—Wall Mounting Brackets (top view)

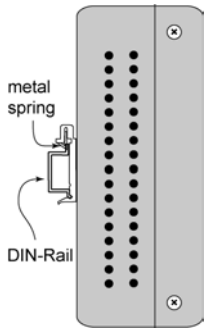
DIN-Rail Mounting

The aluminum DIN-Rail attachment plate is including in the package. If you need to reattach the DIN-Rail attachment plate to UC-7400, make sure the stiff metal spring is situated towards the top, as shown in the figures below.

1. Insert the top of the DIN-Rail into the slot just below the stiff metal spring.



2. The DIN-Rail attachment unit will snap into place as shown below.



3. To remove UC-7400 from the DIN-Rail, simply reverse Steps 1 and 2 above.

LED Indicators

The top panels of UC-7400 Series has 12 LED Indicators, as described in the following table.

LED Name	LED Color	LED Function
Ready	Green	Lit indicates that OS has booted up and is ready.
	off	Power is off, or power error condition exists.
LAN 1	yellow	10 Mbps Ethernet connection.
	green	100 Mbps Ethernet connection.
	off	Ethernet cable is disconnected, or has a short.
LAN 2	yellow	10 Mbps Ethernet connection.
	green	100 Mbps Ethernet connection.
	off	Ethernet cable is disconnected, or has a short.
Console	yellow	Console port is receiving data.
	green	Console port is transmitting data.
	off	No data is being transmitted or received through the serial port.
P1-P8	yellow	Serial port is receiving data.
	green	Serial port is transmitting data.
	off	No data is being transmitted or received through the serial port.

Connector Descriptions

Power Connector

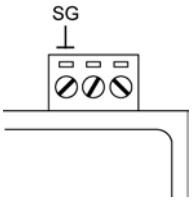
Connect the 12-48 VDC power line with UC-7400's terminal block. If the power is properly supplied, the Ready LED will show a solid green color when the OS is ready.

Grounding UC-7400

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.

ATTENTION

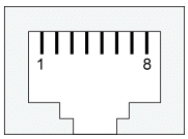
This product is intended to be mounted to a well-grounded mounting surface such as a metal panel.



SG: The *Shielded Ground* (sometimes called *Protected Ground*) contact is the left most contact of the 3-pin power terminal block connector when viewed from the angle shown here. Connect the SG wire to an appropriate grounded metal surface.

Ethernet Port

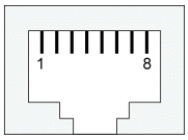
LAN 1 and LAN 2 ports are RJ45 connectors for 10/100 Mbps Ethernet ports.



Pin	Signal
1	ETx+
2	ETx-
3	ERx+
4	
5	
6	ERx-
7	
8	

Serial Port

P1 to P8 ports are RJ45 connectors, and can be configured as RS-232/422/485 by software. The pin assignments are described in the following table:



RS-232		RS-422		RS-485	
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	DSR	1		1	
2	RTS	2	TXD+	2	
3	GND	3	GND	3	GND
4	TXD	4	TXD-	4	
5	RXD	5	RXD+	5	Data+
6	DCD	6	RXD-	6	Data-
7	CTS	7		7	
8	DTR	8		8	

PCMCIA

The PCMCIA slot supports CardBus (Card-32) Card and 16-bit (PCMCIA 2.1/JEIDA 4.2) Card standard. It supports +3.3V, +5V, and +12V at 120mA working voltage.

Currently, Wireless LAN card expansion is optional accessory. Using the Wireless LAN card provided by Moxa, you can enjoy the Wireless LAN communication.

CompactFlash

UC-7420 provides one CompactFlash slot that supports CompactFlash type I/II card expansion. Currently, Moxa provides CompactFlash disk for plug & play expansion, and you can expand the flash disk using CompactFlash available from the computer stores. The CompactFlash will be mounted at

/mnt/hda

Console Port

The console port is a RJ45 RS-232 port. It is designed for serial console, and can be used to connect to V90 or GPRS modem via PPP feature. The pin definition is the same as Serial Port (P1 to P8).

Reset Button

Press "RESET" button will activate a hardware reset function. We do not recommend you to use this function unless the software function does not work properly. To reset a Linux system, always use the software reboot to protect the data in progress.

LCM & Keypad

UC-7400 Series has the LCM to display texts and five buttons for you to configure as you wish. You can refer to the Moxa Device API for your programming.

The LCM can display 16 columns and 8 rows of text with ASCII code starting from 0x20 to 0x7F.

The five KeyPad buttons from F1 to F5 can be defined by your applications.

USB

The USB 2.0 Host and USB 1.1 client are reserved for future enhancement. Currently, UC-7420/10 do not support any USB device driver.

Real Time Clock

UC-7400's real time clock is powered by a lithium battery. We strongly recommend that you should not replace the lithium battery without the presence of Moxa's support. If you need a battery change, contact Moxa RMA service team for RMA service.

ATTENTION

There is risk of explosion if the battery is replaced by an incorrect type.

2

Getting Started

This chapter includes information about how to connect UC-7400 and start operations. The following topics are covered:

- **Powering on UC-7400**
- **Connecting UC-7400 to a PC**
- **Configuring the Ethernet Interface**
- **Configuring the Wireless LAN Interface**
- **Developing Your Applications**
  - Installing UC-7400 Tool Chain
  - Compiling and Running Hello.c
  - Uploading “Hello” to UC-7400

Powering on UC-7400

Connect the SG wire to the Shielded Contact located at the upper right corner of the UC-7400. And then power on UC-7400 with connecting the power adaptor. It takes about 30 seconds for the system to boot up. Once the system is ready, the Ready LED will light on, and the Network's address setting will appear on the LCM display.

Connecting UC-7400 to a PC

There are two ways to connect UC-7400 to a PC. One is via the serial console port, and the other is via Telnet. Serial console port provides console terminal function.

If you wish to use the serial console port, the settings are as follows:

Baud rate	115200 bps
Parity	None
Data bits	8
Stop bits:	1
Flow Control	None

ATTENTION

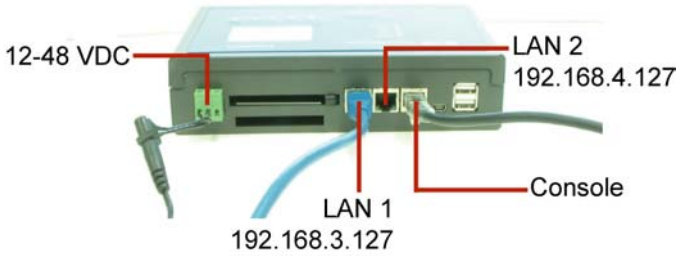
Remember to choose your terminal type as "VT100" mode.

Use CBL-RJ45F9-150 in the package to connect the serial console port.

All of the following pictures are captured from console terminal.

If you wish to use Telnet, the factory default LAN port settings are as follows. We recommend you to use a cross-over Ethernet cable to connect your PC at the beginning.

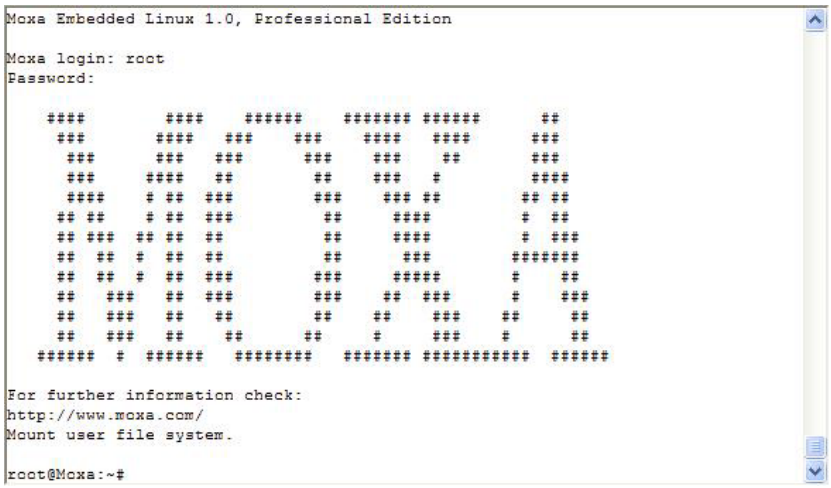
	Default IP Address	**Netmask**
LAN 1	192.168.3.127	255.255.255.0
LAN 2	192.168.4.127	255.255.255.0



Once the UC-7400 is powered on, and the Ready LED is light on, a window will appear on your PC, asking you for the login name and the password, as shown below:

Login: root

Password: root



Configuring the Ethernet Interface

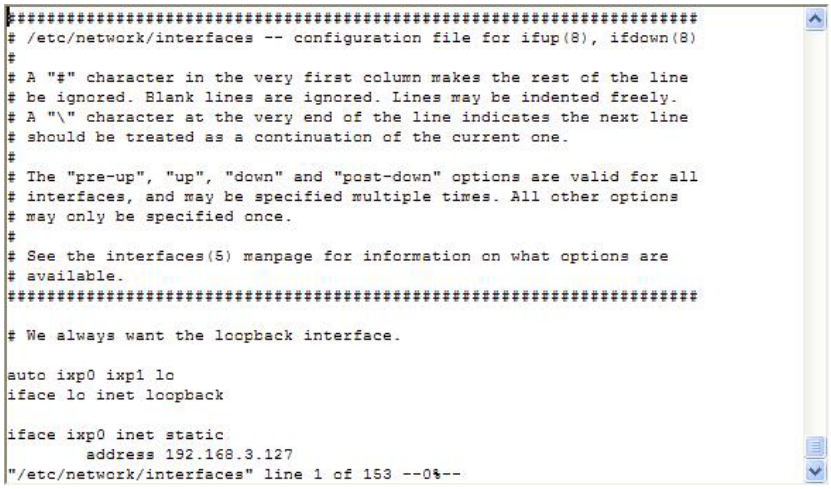
Using console cable in the beginning to configure the Network settings, edit the file **interfaces** by the following command.

#ifdown –a

//Disable LAN1/LAN2 interface fisrt, before you reconfigure the LAN settings. LAN 1 = ixp0, LAN = ixp1, Wireless LAN = wlan//

#vi /etc/network/interfaces

//check the LAN interface first//



After the boot setting of LAN interface has been modified, use can the following commands to active the LAN settings immediately.

#sync ; ifup -a

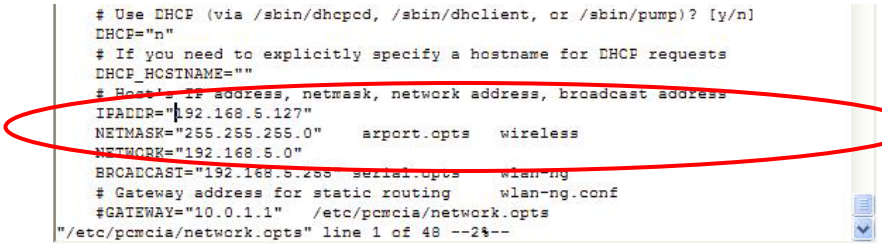
Configuring the Wireless LAN Interface

1. Unplug the PCMCIA Wireless LAN card first.
2. Configure the Wireless LAN card's default IP setting profile.

   (Default IP address is 192.168.5.127, netmask 255.255.255.0)

   Edit **network.opts** by the following command to edit Wireless LAN's default setting.

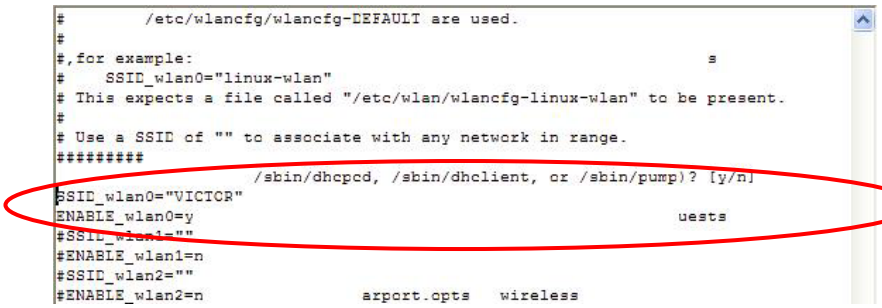
   #vi /etc/pcmcia/network.opts



3. Configure the Wireless LAN card's default SSID setting profile.

   (Default SSID is "VICTOR")

   #vi /etc/wlan/wlan.conf



   // Consult your network administrator for SSID required in your wireless network. For example, *SSID_waln0="any", Enable_wlan0=y*//

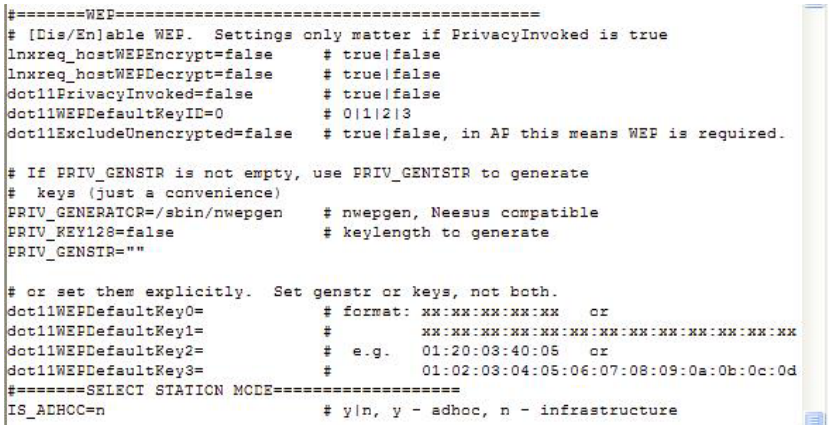
4. Duplicate the configuration profile to a new profile.

   #cp /etc/wlan/wlancfg-VICTOR /etc/wlan/wlancfg-any

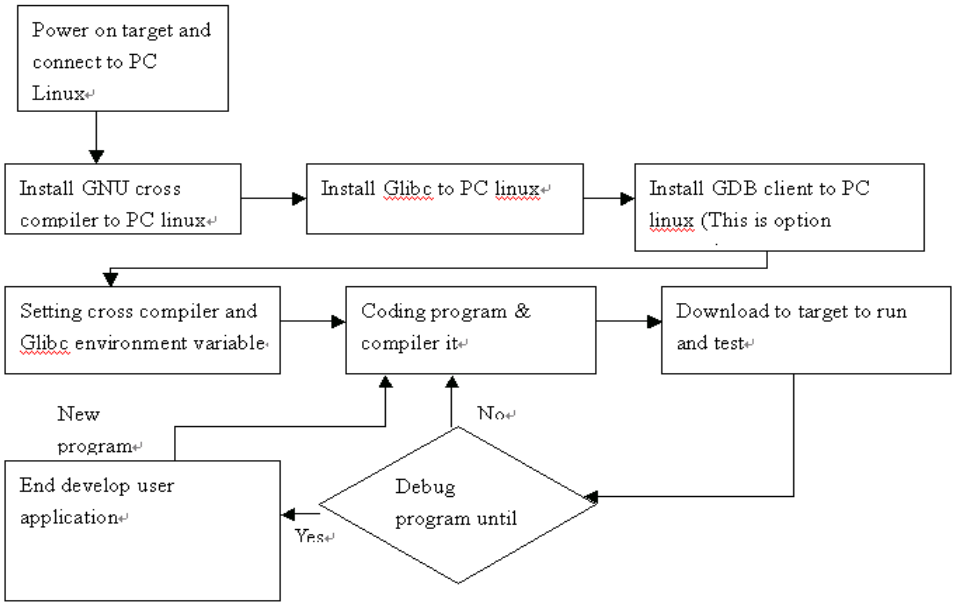
   // Copy configuration profile "VICTOR" to new configuration profile "any"//

5. Configure WEP setting, if WEP is required in your wireless network.

   #vi /etc/wlan/wlancfg-any



Developing Your Applications



Installing UC-7400 Tool Chain

The PC must have the Linux Operation System pre-installed to install the UC-7400 GNU Tool Chain. Redhat 7.3/8.0, or Linux Kernel 2.4.18 and compatible version are recommended. The Tool Chain will need about 400MB hard disk space in your PC. Make sure this space is available on your PC. The UC-7400 Tool Chain is located in the UC-7400 CD. To install, insert the CD into your PC and use the following command:

#mount /dev/cdrom /mnt/cdrom

and then

#rpm –ivh /mnt/cdrom/mxscaleeb-3.3.2-1.386.rpm.

Wait for a few minutes, and the Tool Chain will automatically be installed to your PC.

Compiling and Running Hello.c

The path of the Tool Chain is

PATH=/usr/local/mxscaleb/bin:$PATH

The UC-7400 CD also includes several example programs. Here we use **Hello.c** as an example to show you how to complie and run your applications.

Use the following commands on your PC:

 # cd /tmp/
 # mkdir example
 # cp –r /mnt/cdrom/example/* /tmp/example

And then go to the **Hello** subdirectory and us the following command:

#make

And then the **Hello.c** will be compiled.

```
[root@localhost hello]# make
/usr/local/mxscaleb/bin/mxscaleb-gcc -o hello-release hello.c
/usr/local/mxscaleb/bin/mxscaleb-strip -s hello-release
/usr/local/mxscaleb/bin/mxscaleb-gcc -ggdb -o hello-debug hello.c
[root@localhost hello]# _
```

Finally, execute the file, and **hello-release** and **hello-debug** will be generated.

Uploading “Hello” to UC-7400

You can use FTP to upload **hello-release** to UC-7400 by using the command:

At PC site:

#ftp 192.168.3.127
ftp> put ./hello-release

At UC-7400 site:

 # chmod +x hello-release
#/hello-release

And then you will see **Hello** appear.

```
root@Moxa:~# ./hello-release
Hello
```

ATTENTION

Be careful to calculate the usage of User File System in Flash Memory (Flash ROM). Using the following command

#df –h

If the flash memory is full, your network may not work properly after system reboot and you can not save the data in Flash ROM any more. When the flash memory is full and already reboot, the only way is using console cable to terminal into UC7400 and kill some files for creating more free memory space.

3

Software Package

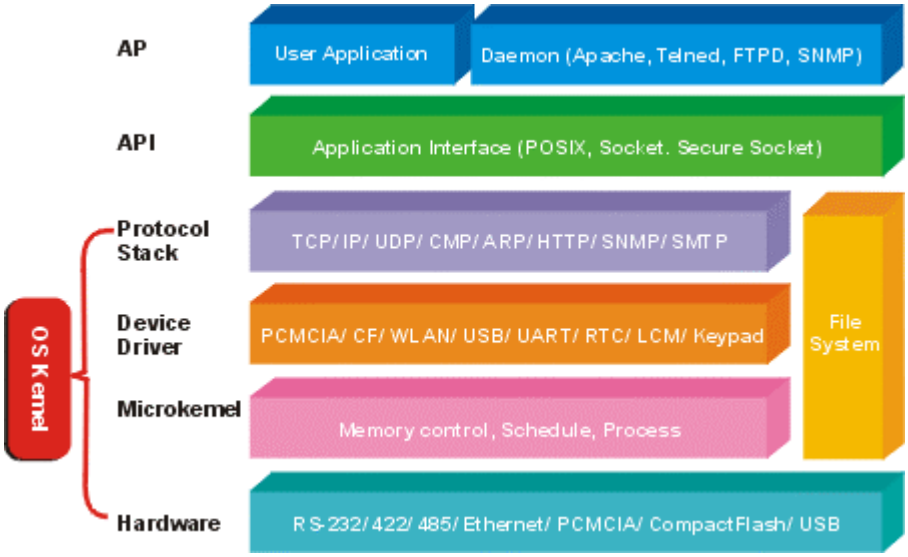
This chapter includes information about the software for UC-7400 Series.

The following topics are covered:

- **Software Architecture of UC-7400**
- **Software Package of UC-7400**

The pre-installed Linux Operation System in UC-7400 follows the standard Linux architecture, making programs pursuant to the POSIX standard easy to be ported to UC-7400 by using the GNU Tool Chain provided by Moxa. In addition to the Standard POSIX API, the device drivers for LCM, buzzer and KeyPad controls, PCMCIA/CompactFlash, UART, and Wireless LAN card are also included in the UC-7400 Linux system.

Software Architecture of UC-7400



Software Package of UC-7400

Boot Loader: Redboot (V1.92)

OS:

Kernel: MontaVista embedded Linux 2.4.18

Protocol Stack:
TCP, UDP, IPv4, FTP, SNMP V1/V3, ICMP, ARP, DHCP, HTTP, PPP, PPPoE, CHAP, PAP, SNMP, NTP, SSH 1.0/2.0, SSL

File System
JFFS2/VFAT/Ext2/NFS
Bash: OS shell command
Busybox: Linux normal command utility collection

Utility
tinylogin: login and user manager utility
telnet: telnet client program
ftp: FTP client program
smtpclient: email utility
scp: Secure file transfer Client Program

Daemon
pppd: dial in/out over serial port daemon
snmpd: snmpd agent daemon
telnetd: telnet server daemon
inetd: TCP server manager program
ftpd: ftp server daemon
apache: web server daemon
sshd: secure shell server
nfs-user-server: network file system server

Tool Chain:
Gcc (V3.3.2) – C/C++ PC Cross Compiler
GDB (V3.2.1) – Source Level Debug Server
Glibc (V2.2.5) – POSIX standard

Device Driver:
PCMCIA & Card Bus/CF Card /Wireless Card Bus /UART/RTC/LCM/KeyPad

4

Configuring UC-7400

This chapter includes information about how to configure UC-7400 Series.

The following topics are covered in this chapter:

- **How to Enable and Disable Daemons**
- **How to Add Your Web Page**
- **How to Backup User's File System From UC-7400 to a PC**
- **How to Recover the File System**
- **How to Duplicate User's File System**
- **How to Auto Start User's Applications When System Boots Up**
- **How to Check the Version of Kernel and File System**

How to Enable and Disable Daemons

The following daemons are enabled when UC-7400 boots up for the first time.

snmpd

telnetd

inetd

ftpd

sshd

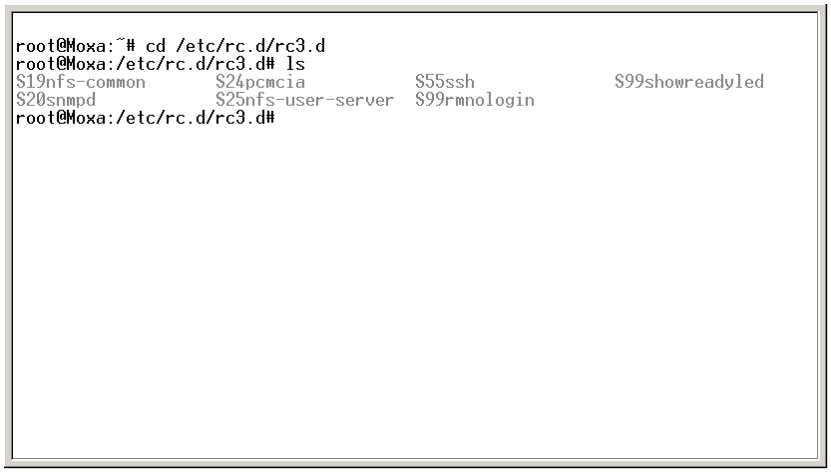
apache

NFS (Network File System) Server

To enable or disable the settings, follow the procedures described below:

For checking current enabled daemons:
#cd /etc/rc.d/rc3.d
#ls

Then you will find the enabled daemons.



For adding a daemon:
#ln –s ../init.d/snmpd S20snmpd

While ***SxxRUNFILE*** stands for

S: start the run file.
xx: a number between 00-99. The smaller number has higher priority.
RUNFILE: is the file name.

For removing the daemon, you can remove the run file from ***/etc/rc.d/rc3.d*** by using the following command:

#rm /etc/rc.d/rc3.d/S20snmpd

How to Add Your Web Page

To add your web page, place your home page at the following directory:

/var/www/html

To view the default sample pages please visit:

http://192.168.3.127 or http://192.168.4.127

How to Backup User's File System from UC-7400 to a PC

To enable the RAM disk, follow the command below:

#upramdisk

And then use the backup file system utility provided by Moxa:

#backupfs /mnt/ramdisk/usrdisk-backup

Or backup to CF card by the following command:

#backupfs /mnt/hda/usrdisk-backup

Then the file system will be backuped, and you can use ftp commands to transfer the ***usrdisk-backup*** to the FTP server on PC.

How to Recover the File System

UC-7400 Series uses JFFS2 (Journalling Flash File System 2) file system to prevent the system from crashing.JFFS2 is a file system in same format as JFFS. One difference is JFFS2 compresses files. By compressing files, maximum use of capacity is possible.

However, if system failure occurs, users still can use UC-7400 CD-ROM to recover the file system to default settings. When your user file system crashes, UC-7400 will detect the failure, and use the internal mini file system to boot up, allowing you to recover the file system.

ATTENTION

When you need to "Load Factory Default", console the CBL-RJ45F9-150 to console port and following the instructions.

Step1: ***#rm /etc/inittab***

// It's the easiest way to jump into Mini file system when any situation you need to "Load Factory Default".//

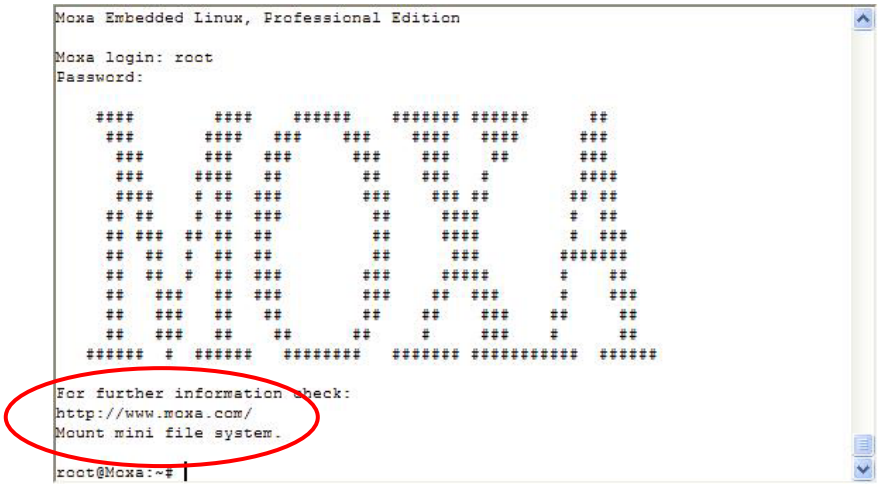
Step2: Press "Reset" button or Power-off then Power-on.

// System hardware reboot.//

Step3: Login: ***root***

Password: ***root***

After you can see the following picture, it also means you are in the mini file system.



Recover file system procedures.

1. Prepare a PC with FTP Server software. And put UC-7400's default file system in the directory that FTP Server can provide download service. You can find the default file system in the UC-7400 CD-ROM. (***CD-ROM://usrfilesystem / moxa_rc7000_usrdisk-1.0.0***)

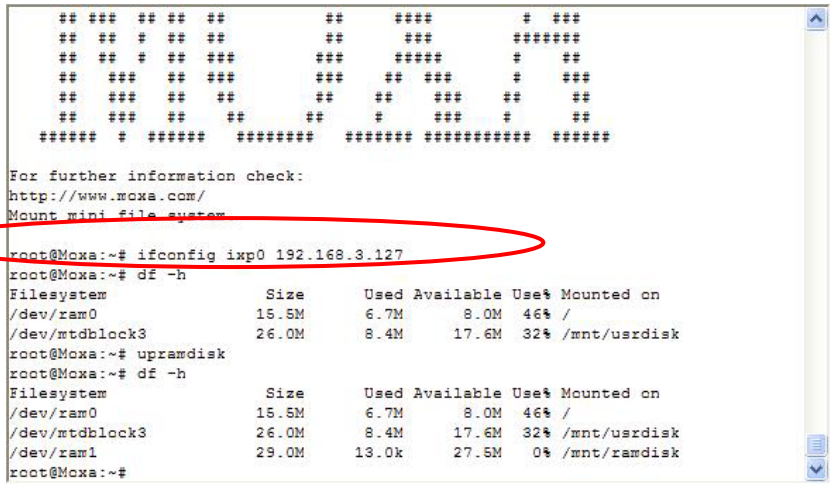
2. Use Console Terminal in UC-7400 to configure LAN1's IP address to suitable for you network.

   #ifconfig ixp0 192.168.3.127

   //Configure LAN1's IP address to 192.168.3.254. Whenever you reboot UC-7400, mini file system, this IP address will go back to factory default 192.168.3.127 again.//

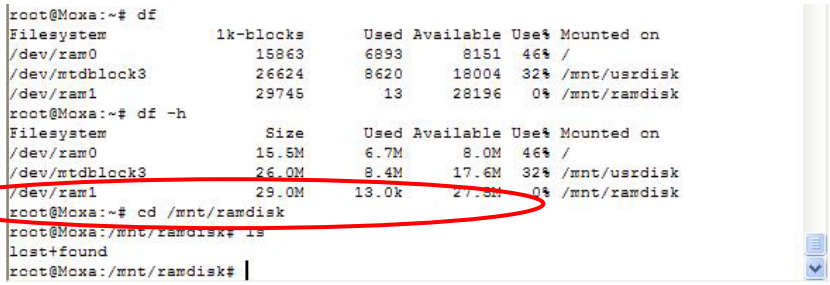
3. Use ***upramdisk*** command to have a 27 MB ramdisk.

   #upramdisk



4. Change directory to ramdisk

   #cd /mnt/ramdisk



5. Use Console Terminal in UC-7400 to establish a FTP connection to your PC with FTP Server.

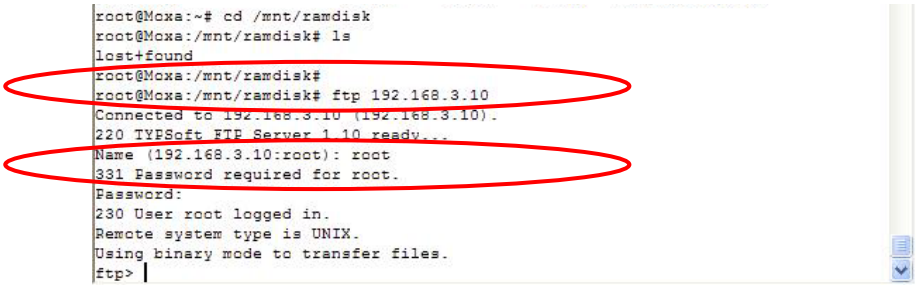
   #ftp 192.168.3.10

   //Connect to PC's IP address 192.168.3.10.//

6. Login your FTP Server to download file. (Follow picture is an example. The real account name and password are depends on your FTP server.)

   Name: root

   Password: root

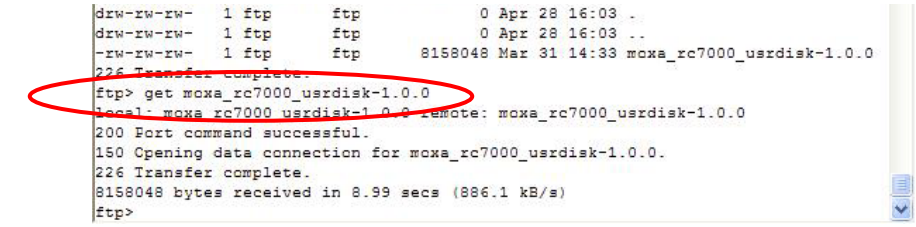


   //Connect to PC's IP address 192.168.3.10.//

7. Download file system from FTP server.

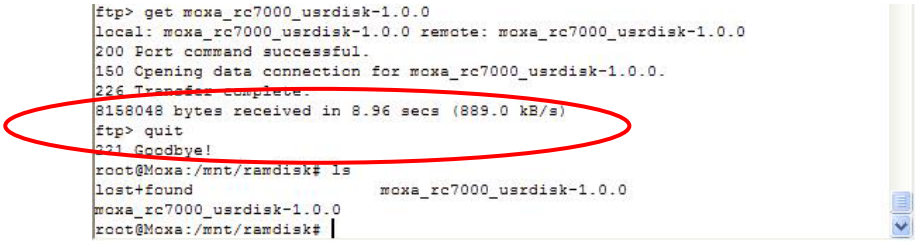
   ftp> bin

   ftp> get moxa_rc7000_usrdisk-1.0.0



8. Quit Ftp and go back to UC-7400's console terminal.

   ftp> quit



9. Build user file system. Wait a few minutes for the file system to build up, and then reboot the system with the default user file system.

#bf moxa_rc7000_usrdisk-1.0.0

```
150 Opening data connection for moxa_rc7000_usrdisk-1.0.0.
226 Transfer complete.
8158048 bytes received in 8.96 secs (889.0 kB/s)
ftp> quit
221 Goodbye!
root@Moxa:/mnt/ramdisk# ls
lost+found                  moxa_rc7000_usrdisk-1.0.0
moxa_rc7000_usrdisk-1.0.0
root@Moxa:/mnt/ramdisk# bf moxa_rc7000_usrdisk-1.0.0
Format user file system disk !!!
Erase Total 208 Units
Performing Flash Erase of length 131072 at offset 0x2e0000
```

After file system re-build process finished.

#reboot

```
root@Moxa:/mnt/ramdisk# bf moxa_rc7000_usrdisk-1.0.0
Format user file system disk !!!
Erase Total 208 Units
Performing Flash Erase of length 131072 at offset 0x19e0000 done
Format OK. Now make the user file system disk.
Please wait...
Sync file system.
Make user file system disk OK. Please restart system.
root@Moxa:/mnt/ramdisk# reboot

Broadcast message from root (ttyS1) Mon Feb 28 07:05:42 2000...

The system is going down for reboot NOW !!
root@Moxa:/mnt/ramdisk#
```

After system reboot, you will see the “factory default file system”.

```
Moxa Embedded Linux 1.0, Professional Edition

Moxa login: root
Password:

    ####        ####    ######    ####### ######      ##
     ###       ####   ###    ###    ####   ####      ###
      ###      ###   ###      ###    ###    ##       ###
      ###     ####   ##        ##    ###   #         ####
      ####    # ##  ###        ###    ### ##        ## ##
     ## ##    # ##  ###         ##     ####         #  ##
     ## ###  ## ##  ##          ##     ####         #  ###
     ##  ##  #  ##  ##          ##      ###        #######
     ##  ##  #  ##  ###        ###     #####       #    ##
     ##   ###   ##  ###        ###    ##  ###      #    ###
     ##   ###   ##   ##        ##    ##    ###    ##     ##
     ##   ###   ##    ##      ##     #     ###    #      ##
   ######  #  ######   ########   ####### ###########  ######

For further information check:
http://www.moxa.com/
Mount user file system.

root@Moxa:~#
```

How to Duplicate User's File System to more UC-7400

For some of the applications, you may need to "ghost" 1 UC-7400's file system and duplicate to the other UC-7400s. Follow the recommend procedure to do this.

1. Back up user file system to a PC. (Refer to the previous topic "**How to Backup User's File System from UC-7400 to a PC**".)
2. Use the backup file system to download to the other UC-7400 and then get into mini file system and rebuild. (Refer to the previous topic "**How to Recover the File System**")

How to Auto Start User's Applications When the System Boots Up

Edit the **/etc/rc.d/rc.local** and add your application program, e.g.

/ap-directory/ap-program &

How to Check the Version of Kernel and File System

To check the version of kernel and file system, use the command below:

For checking kernel's version

#kversion

For checking the file system

#fsversion

5

UC-7400 Device API

This chapter includes information about UC-7400 Series' Device API.

This chapter will introduce the APIs for the following functions:

- **LCM**
- **KeyPad**
- **RTC (Real Time Clock)**
- **Buzzer**
- **UART Interface**

Since UC-7400 provides a standard Linux OS environment, therefore, it supports the POSIX standard APIs. In addition, Moxa Device APIs are available for programmers to control the hardware, which is not defined by POSIX, such as LCM, KeyPad, RS-232/422/485 configuration.

LCM

LCM APIs support text mode display control, as well as ASCII code from 0x20 to 0x7F. The LCM's size is 16 colums x 8 rows. The device node is located at ***/dev/lcm***. The argument of the LCM control APIs has the structure described as below:

```
typedef struct lcm_xy {
   int    x;     // column value, the arrange is 0 - 15
   int    y;     // raw value, the arrange is 0 - 7
} lcm_xy_t;
```

1. Function: LCM_GOTO_XY

   int ioctl(fd, IOCTL_LCM_GOTO_XY, lcm_xy_t *pos);

   Description: move cursor to ***pos*** position.

2. Function: LCM_CLS

   int ioctl(fd, IOCTL_LCM_CLS, NULL);

   Description: clear the LCM screen.

3. Function: LCM_CLEAN_LINE

   int ioctl(fd, IOCTL_LCM_CLEAN_LINE, NULL);

   Description: clean the row where the cursor is located and move the cursor to the 0 column of this row.

4. Function: LCM_GET_XY

   int ioctl(fd, IOCTL_LCM_GET_XY, lcm_xy_t *pos);

   Description: get the current cursor position.

5. Function: LCM_BACK_LIGHT_ON

   int ioctl(fd, IOCTL_LCM_BACK_LIGHT_ON, NULL);

   Description: turn on LCM back light.

6. Function: LCM_BACK_LIGHT_OFF

   int ioctl(fd, IOCTL_LCM_BACK_LIGHT_OFF, NULL);

   Description: turn off LCM back light.

7. Function: LCM_AUTO_SCROLL_ON

   int ioctl(fd, IOCTL_ LCM_AUTO_SCROLL_ON, NULL);

   Description: auto scroll the LCM when the text reaches the last line on the screen.

8. Function: LCM_AUTO_SCROLL_OFF

   int ioctl(fd, IOCTL_ LCM_AUTO_SCROLL_OFF, NULL);

   Description: when text reaches the end of the LCM screen, the cursor will move to (0,0) (column, row) and stop scrolling the screen.

KeyPad

The device node is located at **/dev/keypad**. The key value is defined on <moxadevice.h.>

```
#define KEY0        0
#define KEY1        1
#define KEY2        2
#define KEY3        3
#define KEY4        4
```

1. Function: KEYPAD_HAS_PRESS

   int ioctl(fd, IOCTL_KEYPAD_HAS_PRESS, int *number);

   Description: check if any key has been pressed, and how many keys have been queued in the KEYPAD buffer. When the keypad device is open and a keypad is pressed, the buzzer will beep once, and the key will be stored in the KEYPAD buffer. Up to 31 keys can be stored in the buffer. If the buffer is full, and more keys are being pressed, the latest key will be ignored, and there would be no beep sound. The KEYPAD_HAS_PRESS will return the argument, which is the number of keys stored in the buffer.

2. Function: KEYPAD_GET_KEY

   int ioctl(fd, IOCTL_KEYPAD_GET_KEY, int *key);

   Description: get the key value from the KEYPAD buffer. It will read one key at one time, and the return argument will show the key value.

RTC (Real Time Clock)

The device node is located at **/dev/rtc**. UC-7400 supports Linux standard simple RTC control. Users must include <linux/rtc.h>.

1. Function: RTC_RD_TIME

   int ioctl(fd, RTC_RD_TIME, struct rtc_time *time);

   Description: read time information from RTC.

2. Function: RTC_SET_TIME

   int ioctl(fd, RTC_SET_TIME, struct rtc_time *time);

   Description: set RTC time.

Buzzer

The device node is located at **/dev/console**. UC-7400 supports Linux standard buzzer control. Also, UC-7400's buzzer is running at fixed frequency 100 Hz. Users must include <sys/kd.h>.

1. Function: KDMKTONE

   ioctl(fd, KDMKTONE, unsigned int arg);

   Description: buzzer will keep beeping according to the argument.

UART Interface

The normal tty device node is located at **/dev/ttyM0…ttyM7**, and modem tty device node is located at **/dev/cum0 … cum7**. UC-7400 Series supports Linux standard termios control. Moxa UART Device API supports the configuration of ttyM0 to ttyM7 as RS-232/422/485. Users must include **<moxadevice.h>**.

```
#define RS232_MODE              0
#define RS485_2WIRE_MODE        1
#define RS422_MODE              2
#define RS485_4WIRE_MODE        3
```

1. Function: MOXA_SET_OP_MODE

   int ioctl(fd, MOXA_SET_OP_MODE, &mode)

   Description: set the interface mode.

2. Function: MOXA_GET_OP_MODE

   int ioctl(fd, MOXA_GET_OP_MODE, &mode)

   Description: get the interface mode.

A

System Commands

busybox (V0.60.4): Linux normal command utility collection

File manager

1. cp – copy file
2. ls – list file
3. ln – make symbolic link file
4. mount – mount and check file system
5. rm – delete file
6. chmod – change file owner & group & user
7. chown – change file owner
8. chgrp – change file group
9. sync – sync file system, let system file buffer be saved to hardware
10. mv – move file
11. touch – touch file, change date
12. pwd – display now file directly
13. df – list now file system space
14. mkdir – make new directory
15. rmdir – delete directory

Editor

1. cat – dump file context
2. grep – search string on file
3. egrep – search string on file
4. cut – get string on file
5. find – find file where are there
6. more – dump file by one page
7. sed – search string on file
8. tail – get string on file
9. test – test file exist or not
10. sleep – sleep
11. echo – echo string

Network

1. ping – ping to test network
2. route – routing table manager
3. netstat – display network status
4. ifconfig – set network ip address
5. rpc.nfsd, rpc.mountd – NFS server daemon

Process

1. kill – kill process
2. ps – display now running process
3. modprobe – load module
4. insmod – load module
5. rmmod – remote module
6. lnmod – list loaded module

Other

1. dmesg – dump kernel log message
2. stty – to set serial port
3. yes – out a string repeatedly untilled
4. zcat – dump .gz file context
5. mknod – make device node
6. basename – strip directory and suffix from filenames
7. false – do nothing, unsuccessfully
8. free – display system memory usage
9. dirname – strip non-directory suffix from file name
10. date – print or set the system date and time
11. env – run a program in a modified environment
12. expr – evaluate expressions
13. head – output the first part of files
14. id – print real and effective UIDs and GIDs
15. klogd – kernel log daemon
16. syslogd – Linux system logging utilities
17. uname – print system information
18. xargs – build and execute command lines from standard input
19. mkfifo – make FIFOs (named pipes)
20. wc – print the number of bytes, words, and lines in files
21. which – shows the full path of (shell) commands
22. tr – translate or delete characters
23. true – do nothing, successfully
24. uniq – remove duplicate lines from a sorted file

MOXA special utility

1. backupfs – backup file system
2. bf – built the file system
3. kversion – show kernel version
4. fsversion – show the file system version
5. upramdisk – mount ramdisk
6. downramdisk – unmount ramdisk

tinylogin (V0.80): login and user management utility

1. adduser – add new user
2. addgroup – add new group
3. deluser – delete user
4. delgroup – delete group
5. login – for terminal login by TCP or serial
6. su – change to superiors user
7. passwd – change password
8. getty – over serial port terminal program

`

B

Flash Memory Map

Address	Size	Contents
0x00000000~0x0005FFFF	384KB	Boot Loader
0x00060000~0x0015FFFF	1MB	Kernel object code
0x00160000~0x0055FFFF	4MB	Moxa Mini file system
0x00560000~0x01F5FFFF	26MB	User file system (JFFS2)
0x01F60000~0x01FBFFFF	384KB	Not used
0x01FC0000~0x01FDFFFF	128KB	Boot Loader configuration
0x01FE0000~0x01FFFFFF	128KB	Boot Loader directory

```
root@Moxa:/proc# cat mtd
dev:    size   erasesize  name
mtd0: 00060000 00020000 "RedBoot"
mtd1: 00100000 00020000 "zImage"
mtd2: 00400000 00020000 "mxdisk"
mtd3: 01a00000 00020000 "usrdisk"
mtd4: 00060000 00020000 "unallocated space"
mtd5: 00002000 00020000 "RedBoot config"
mtd6: 00020000 00020000 "FIS directory"
root@Moxa:/proc#
```

ATTENTION

UC-7400 will boot from user file system when system is booting up. If the system cannot boot from user file system, UC-7400 will boot up by using internal mini file system the mini file system only enables network and CompactFlash, allowing users to recover the user file system.

C

Service Information

This appendix shows you how to contact Moxa for information about this and other products, and how to report problems.

In this appendix, we cover the following topics.

- **MOXA Internet Services**
- **Problem Report Form**
- **Product Return Procedure**

MOXA Internet Services

Customer satisfaction is our number one concern, and to ensure that customers receive the full benefit of our products, Moxa Internet Services has been set up to provide technical support, driver updates, product information, and user's manual updates.

The following services are provided

E-mail for technical support ..... support@moxa.com.tw

World Wide Web (WWW) Site for product information:

..... http://www.moxa.com

Problem Report Form

MOXA UC-7400 Series

Customer name:	
Company:	
Tel:	**Fax:**
Email:	**Date:**

1. **Moxa Product:** ☐ UC-7410 ☐ UC-7420
2. **Serial Number:** _____

Problem Description: Please describe the symptoms of the problem as clearly as possible, including any error messages you see. A clearly written description of the problem will allow us to reproduce the symptoms, and expedite the repair of your product.

Product Return Procedure

For product repair, exchange, or refund, the customer must:

- Provide evidence of original purchase.
- Obtain a Product Return Agreement (PRA) from the sales representative or dealer.
- Fill out the Problem Report Form (PRF). Include as much detail as possible for a shorter product repair time.
- Carefully pack the product in an anti-static package, and send it, pre-paid, to the dealer. The PRA should be visible on the outside of the package, and include a description of the problem, along with the return address and telephone number of a technical contact.