Matrix-510

Linux ARM9 Industry Box Computer

User Guide

Version 1.0

Artila

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1. Introduction

Matrix-510 is an ARM9-based Linux ready industrial computer. The key features are as follow:

- ARM920T ARM Thumb Processor with 200MIPS at 180MHz, Memory Management Unit
- 16-KByte Data Cache and 16-KByte Instruction Cache
- 64MB SDRAM, 16MB Flash on board
- Two 10/100Mbps Ethernet
- Two USB 2.0 full speed (12Mbps) Host Ports
- Multimedia Card Interface for SD memory card
- Five 3-in-1 RS-232/422/485 ports and three RS-232 ports
- 21 programmable Digital I/O port
- Audio Output
- 9 to 40VDC power input
- Pre-installed Standard Linux 2.6 OS
- GNU tool chain available on Artila FTP
- Optional DIN RAIL mounting adaptor

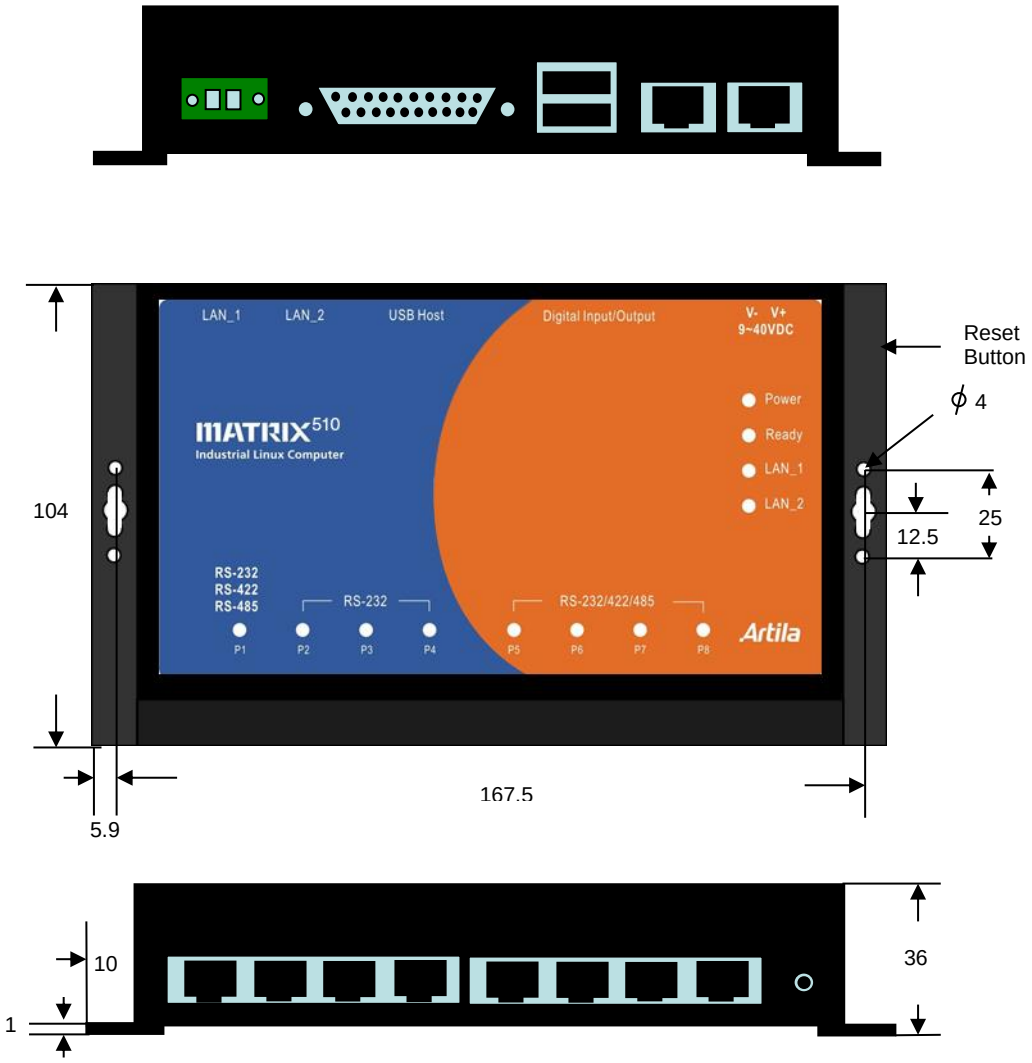
1.1 Packing List

- Matrix-510 Box Computer
- Wall mount bracket

1.2 Optional Accessory

- CB-RJ45F9-150 (91-R45F9-150): Serial Cable (RJ45 to DB9 Female, 150cm)
- CB-RJ2CON-100 (91-RJCON-100): Console Cable (RJ45 to DB9 Female, 100cm)
- DK-35A (36-DK35A-000): DIN RAIL Mounting Kit

2. Layout


LAN_1
LAN_2
USB Host
Digital Input/Output
V- V+
9~40VDC
MATRIX 510
Industrial Linux Computer
Power
Ready
LAN_1
LAN_2
RS-232
RS-422
RS-485
RS-232
RS-232/422/485
P1
P2
P3
P4
P5
P6
P7
P8
Artila
Reset
Button
ϕ 4
104
25
12.5
167.5
5.9
10
1
36

3. Pin Assignment and Definition

3.1 Reset Button

Press the “Reset” button to activate the hardware reset. You should only use this function if the software does not function properly.

3.2 Power LED

The Power LED will show solid green if power is properly applied.

3.3 Ready LED

The Ready LED will show solid green if Matrix-510 complete system boot up. If Ready LED is off during system boot up, please check if power input is correct. Turn off the power and restart Matrix-510 again. If Ready LED is still off, please contact the manufacture for technical support.

3.4 Link / Act LED

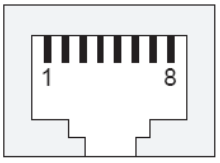
When Ethernet port are connected to the network, Link/Act will show solid green and if there is traffic is the Ethernet port, this LED will flash.

3.5 Serial Port LED

These eight dual color LEDs indicate the data traffic at the serial ports. When RXD line is high then Green light is ON and when TXD line is high, Yellow light is ON.

3.6 Ethernet Port

Pin No.	Signal
1	ETx+
2	ETx-
3	ERx+
6	ERx-

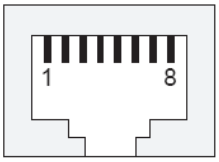


3.7 Serial Port

- **Port 1, 5, 6, 7, 8:** 3-in-1 RS-232 / 422 / 485
- **Port 2, 5, 6, 7, 8:** RS-232 with full modem control

> ☞ **Note**
>
> RS-232 / 422 / 485 is software selection.

Pin No.	RS-232	RS-422	RS-485
1	DSR	--	-
2	RTS	TXD+	DATA+
3	GND	GND	GND
4	TXD	TXD-	DATA-
5	RXD	RXD+	--
6	DCD	RXD-	-
7	CTS	-	-
8	DTR	-	-

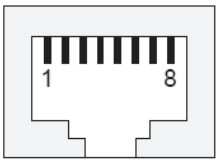


3.8 Serial Console Port

Serial console port share the connector with Serial port 3 but the pin definition as shown as follow:

Pin No.	RS-232
1	
2	TXD
3	GND
4	
5	
6	
7	RXD
8	

P3



The serial console port is disabled as factory default setting. To enable the serial console, you need to use the serial console cable and connect it to port 3. Use any terminal software such as hyper terminal and setting as follow:

Baud Rate: 115200

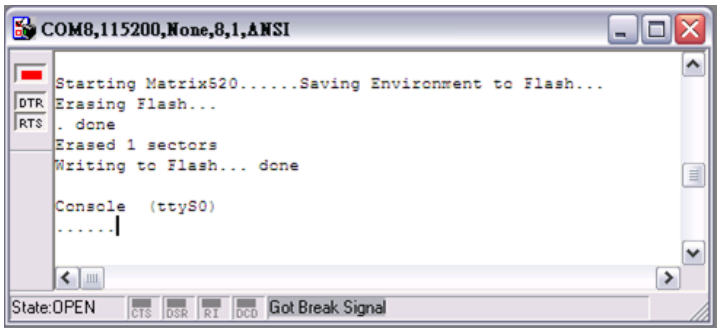
Data bits: 8

Parity: N

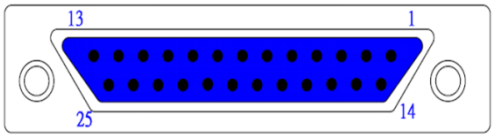
Stop bit: 1

Terminal type: ANSI

Right after powering on the system, keep typing $ continuously until you see the message as shown in the figure followed. Console (ttyS0) stands for console port ttyS0 is enabled. Repeat this procedure will disable the serial console and Screen will show “Console (null)”.



3.9 Digital I/O Port (DB25 Female)



Pin No.	RS-232	Pin No.	Function
1	DIO0	14	DIO13
2	DIO1	15	DIO14
3	DIO2	16	DIO15
4	DIO3	17	DIO16
5	DIO4	18	DIO17
6	DIO5	19	DIO18
7	DIO6	20	DIO19
8	DIO7	21	DIO20
9	DIO8	22	GND
10	DIO9	23	GND
11	DIO10	24	VCC3
12	DIO11	25	VCC5
13	DIO12		

☞ Note

1. VCC3: 3.3 VDC output
2. VCC5: 5 VDC output
3. GND: Digital Ground

3.10 Factory Default Settings

LAN 1 IP Address: 192.168.2.127

LAN 2 IP Address: DHCP

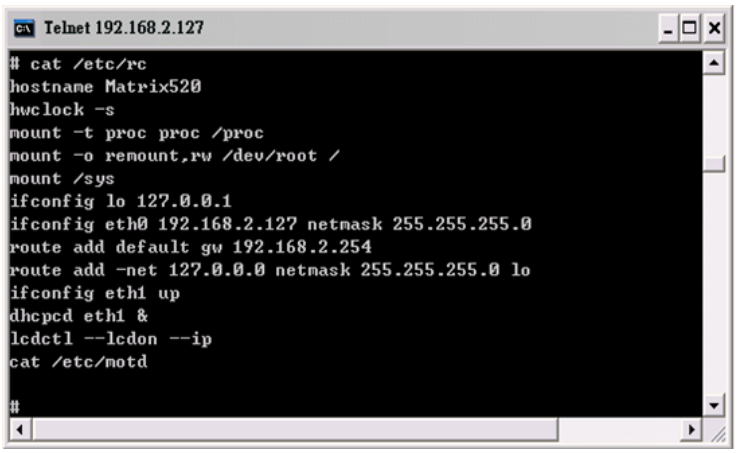
Login: guest

Password: guest

Supervisor: root (ssh supported)

Password: root

3.11 Network Settings



To configure the IP address, Netmask and Gateway setting, please modify /disk/etc/rc as following:

ifconfig eth0 192.168.2.127 netmask 255.255.255.0

For DHCP setting:

dhcpcd eth1 &

3.12 Wireless LAN Configuration

Matrix-510 supports wireless LAN by using USB WLAN adaptor which uses Ralink RT2570 (rt2570) /2571 (rt73) controller. Please refer to the website http://ralink.rapla.net for the supporting list of the USB WLAN adaptor.

To configure the wireless LAN setting, please use command:

modprobe rt73 or *modprobe rt2570*

ifconfig wlan0 up

iwconfig wlan0 essid XXXX key YYYYYYYY mode MMMM

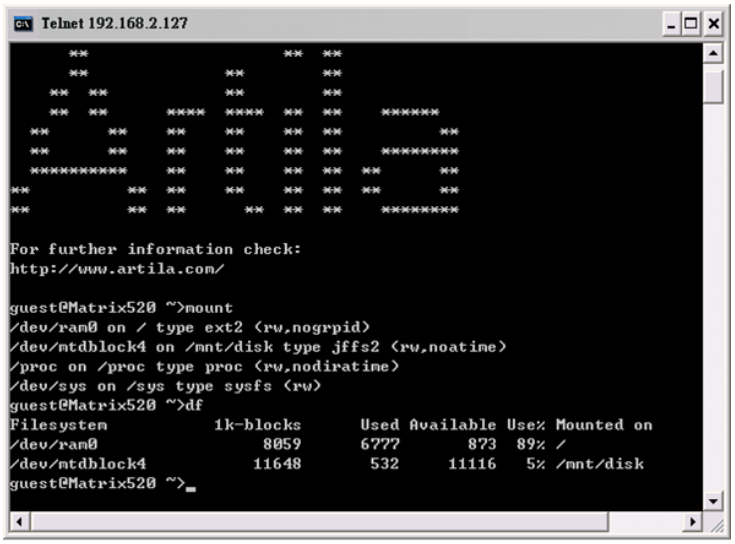
For infrastructure mode XXXX is the access point name and YYYYYYYY is the encryption key and MMMM should be *managed.*

For Ad-Hoc mode mode XXXX is the Matrix-510 device name and YYYYYYYY is the encryption key MMMM should be *ad-hoc*.

To configure the IP address use command

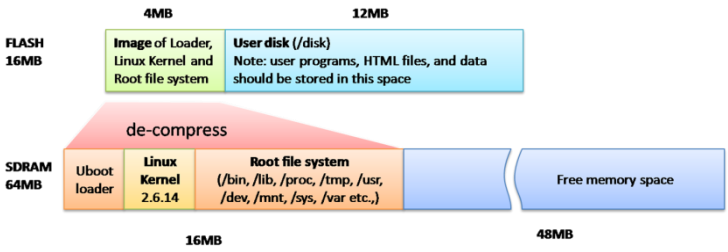
dhcpcd wlan0 & or *ifconfig wlan0 192.168.2.127 netmask 255.255.255.0*

3.13 File System



Matrix-510 configures the root file system as RAMDISK and the user disk (/disk) which includes /home and /etc directory are configured as Flash Disk. To find out the file system information, please use command /mount as show as above. In addition, use command /df to find out the disk space of the disk. The RAMDISK uses 8MB memory space to store the root file system and the user disk is about 11MB for user's program storage.

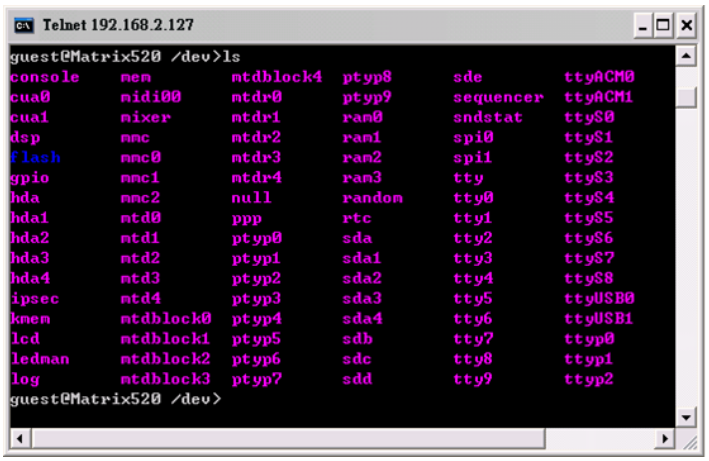
Therefore, user's program and utility software must be saved in the user disk space (/disk). Files saved to other directory will be loss after power off.



3.14 Devices List

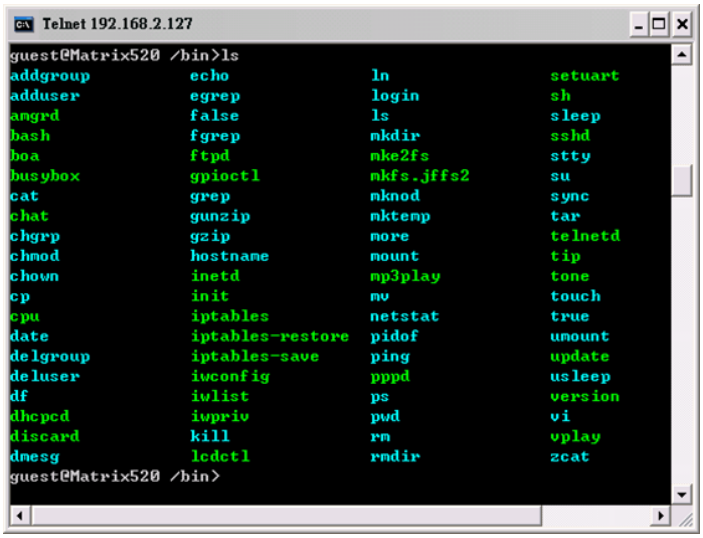
The supported devices are shown at /dev directory. Following list are most popular ones:

1. ttyS0: serial console port
2. ttyS1 to ttyS8: serial port 1 to port 8
3. mmc to mmc2: SD memory card
4. sda to sde: USB flash disk
5. ttyUSB0 to ttyUSB1: USB RS-232 adaptor (fdti_sio.ko)
6. rtc: Real Time Clock
7. gpio: General Purpose digital I/O
8. ttyACM0 and ttyACM1: USB Modem (CDC compliant)



3.15 Utility Software

Matrix-510 includes busybox utility collection and Artila utility software as follow:

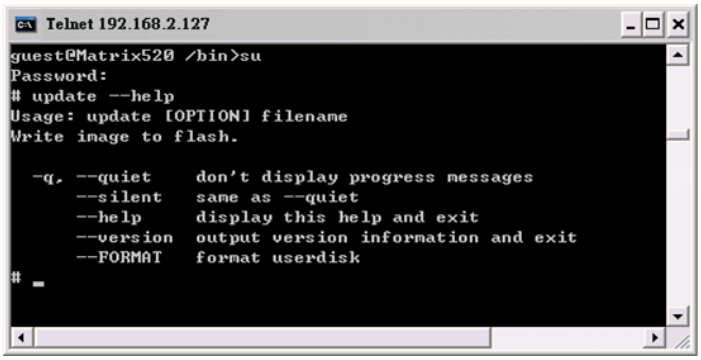


4. Artila Utility Software

The introduction of Artila utility software as follow:

4.1 update

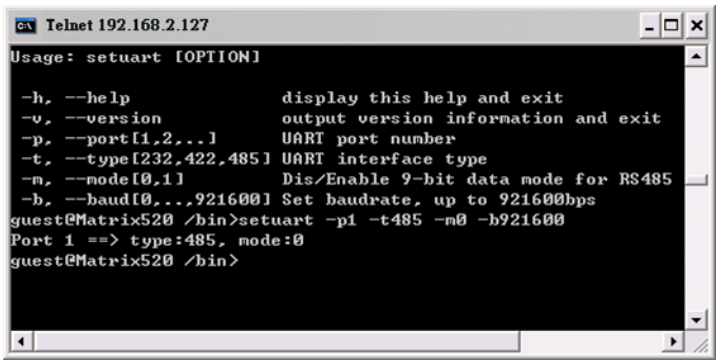
Update loader, kernel or root file system image. Also use ***update —FORMAT*** to format user disk. Type ***update—help*** to find the command usage.



Update can only operated under supervisor mode (password: root).

4.2 setuart

Configure serial port setting. An example show as followed to configure port 1 as RS-485 interface with baud rate 921600. Please note only port 1 support 9-bit data at RS-485.

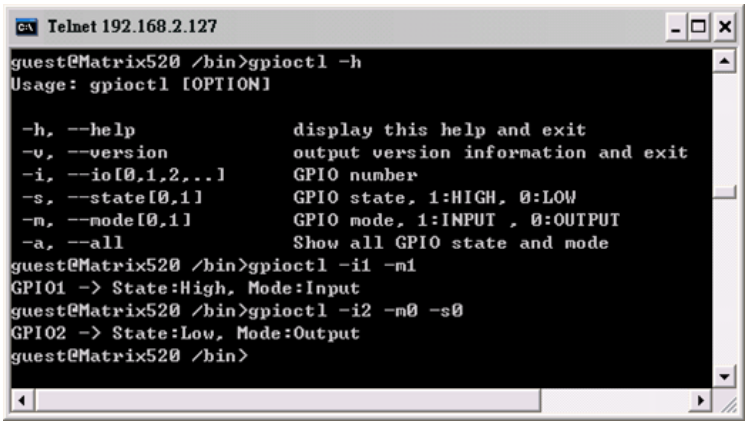


4.3 lcdctl

lcdctl is used to control the LCD display. Use lcdctl to display user message, please prepare 2x18 text message and save it as a file. Then use lcdctl filename to display the message on the LCD screen. Use *lcdctl —ip 0* to display the ip address of the network setting on the LCD screen. The parameter *time* is the refresh rate in second and use *lcdctl —cpu 0* to display the system loading information.

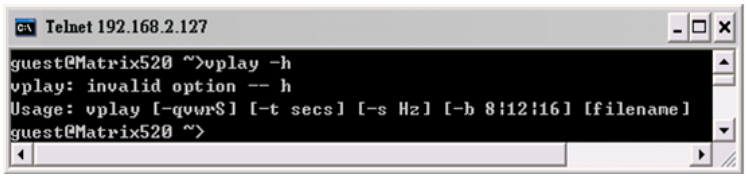
4.4 gpioctl

gpioctl is used to control the programmable digital I/O port located on the DB25 connector. Following example is to configure DIO1 as digital input and DIO2 as digital output with low output state.



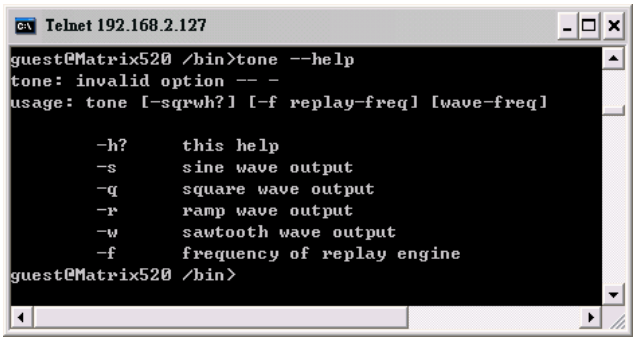
4.5 vplay

vplay is used to play audio file in wave format.



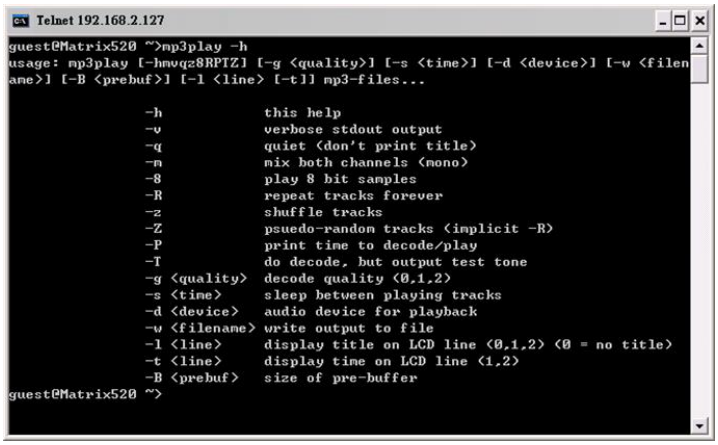
4.6 Tone

Audio output test program.



4.7 mp3play

mp3play is used to play MP3 format audio files.



4.8 How to Make More Utility Software

You might also find utility software available on Artila FTP under /Matrix 510/utility such as *ntpclient, ssh, scp, bluez* and *ssh-keygen*. If you want, you can ftp or copy the utility software to Matrix-510 user disk (/disk). Also you can use find the source code and use the GNU Toolchain to make the utility by yourself.

4.9 Mounting External Storage Memory

To find out the device name of the external memory device which plug into Matrix-510, you can use the command

/dmesg | grep sd

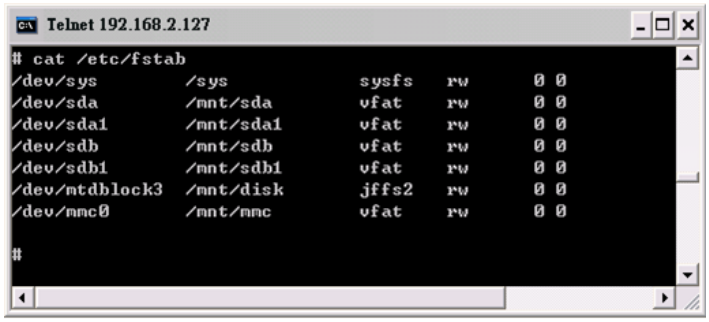
or

/dmesg | grep mmc

Type

mount /dev/sda1 to mount the USB disk and

mount /dev/mmc0 to mount SD card



4.10 Welcome Message

To modify the welcome message, user can use text edit to modify the /etc/motd.

4.11 Web Page Directory

The web pages are placed at /home/httpd and the boa.conf contains the boa web server settings. The home page name should be *index.html.*

4.12 Adjust the System Time

To adjust the RTC time, you can follow the command:

/date MMDDhhmmYYYY

where

MM=Month (01~12)

DD=Date (01~31)

hh=Hour

mm=minutes

YYYY= Year

/hwclock –w

To write the date information to RTC.

User can also use NTP client utility on Artila FTP to adjust the RTC time.

/ntpclient [time server ip]

4.13 SSH Console

Matrix-510 support SSH. If you use Linux computer, you can use SSH command to login Matrix-510.

The configuration of SSH and key are located at */etc/config/ssh*

The key generation program is available on Artila FTP: */matrix 510/utility/ssh_keygen*

User can copy this program to Matrix-510 to generate the key.

4.14 Install GNU Toolchain

Find a PC with Linux 2.6.X Kernel installed and login as a **root** user then copy the arm-linux-3.3.2.tar.gz to root directory of PC. Under root directory, type following command to install the Matrix-510 toolchain.

#tar zxvf arm-linux-3.3.2.tar.gz

4.15 Getting Started with the Hello Program

There are many example programs on Artila FTP. To compile the sample you can use the Make file to and type:

make

To compile and link the library. Once done, use ftp command

ftp 192.168.2.127

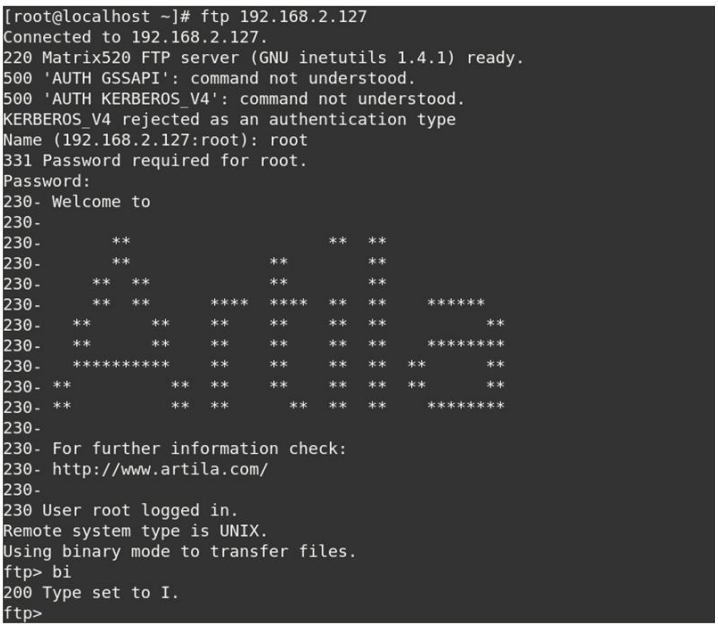
And bin command to set transfer mode to binary

ftp>bin

To transfer the execution file to Matrix-510 user disk (/disk) and use

chmod +x file.o

To change it to execution mode and

./file.o

to run the file.