

Matrix-522

Linux ARM9 Industry Box Computer

User Guide

Version 1.1



Table of Contents

1.	Introduction	1
1.1	Packing List.....	1
1.2	Optional Accessory	1
2.	Layout	2
3.	Pin Assignment and Definition.....	3
3.1	Reset Button	3
3.2	Power LED	3
3.3	Ready LED.....	3
3.4	Link / Act LED	3
3.5	Serial / CAN Port LED.....	3
3.6	Ethernet Port	3
3.7	Serial Ports.....	3
3.8	Serial Port (DB9 Male)	4
3.9	CAN Port (DB9 Male).....	4
3.10	Serial Console Port	4
3.11	Digital I/O Port (DB25 Female)	5
3.12	Factory Default Settings.....	5
3.13	Power on and System Boot up	6
3.14	Inittab and Run Levels	6
3.15	Default Started Service	6
3.16	Network Settings	7
3.17	Insert Kernel Module.....	7
3.18	File System	8
3.19	Devices List.....	8
3.20	Utility Software	8
3.21	Mounting External Storage Memory	9
3.22	Welcome Message	9
3.23	Web Page Directory.....	10
3.24	Adjust the System Time	10
3.25	SSH Console.....	10

3.26	Putty Console Software	10
3.27	ipkg Package Software Management	11
3.28	SocketCAN.....	11
3.29	libsocketcan	11
3.30	Configure CAN	12
3.31	CANOpen.....	13
3.32	Install GNU Toolchain	13
3.33	Getting Started with the Hello Program	14
3.34	Auto Start Program on Boot.....	14
4.	Artila Utility Software	15
4.1	update	15
4.2	setuart	15
4.3	setconsole	15
4.4	version.....	16
4.5	gpioctl.....	16
5.	Loader Menu	17
6.	Frequently Asked Question.....	18
6.1	Forgot Password.....	18
6.2	Forgot the IP Address	18
6.3	System Fail to Boot.....	18
7.	System Recovery	19
7.1	Update Image.....	19
7.2	Make Filesystem	19
7.3	Recovery Env.....	19
7.4	Show Info	19
7.5	Reboot.....	19
7.6	Update Image Starts	20
7.7	Update Image Completes	20
7.8	Make Files System Starts	20
8.	Appendix.....	21
8.1	Utility Collection.....	21
8.2	ipkg Software Package Management	21

1. Introduction

Matrix-522 is an ARM9-based Linux ready industrial computer. The key features are as follow:

- ARM926EJ-S ARM Thumb Processor 400MHz w/MMU
- 32-KByte Data Cache and 32-KByte Instruction Cache
- 64MB SDRAM, 256MB NAND Flash on board
- Two 10/100 Mbps Ethernet
- Two USB 2.0 full speed (12 Mbps) Host Ports, one USB device port
- Multimedia Card Interface for Micro SD memory card
- Two 3-in-1 RS-232/422/485 ports
- Two 2500 Vrms fully isolated CAN 2.0A/2.0B ports
- 21 programmable Digital I/O port
- 9 to 40VDC power input
- Pre-installed Standard Linux 2.6.29 OS
- GNU tool chain available on Artila FTP
- Support SocketCAN and CANopen Library
- Optional DIN RAIL mounting adaptor

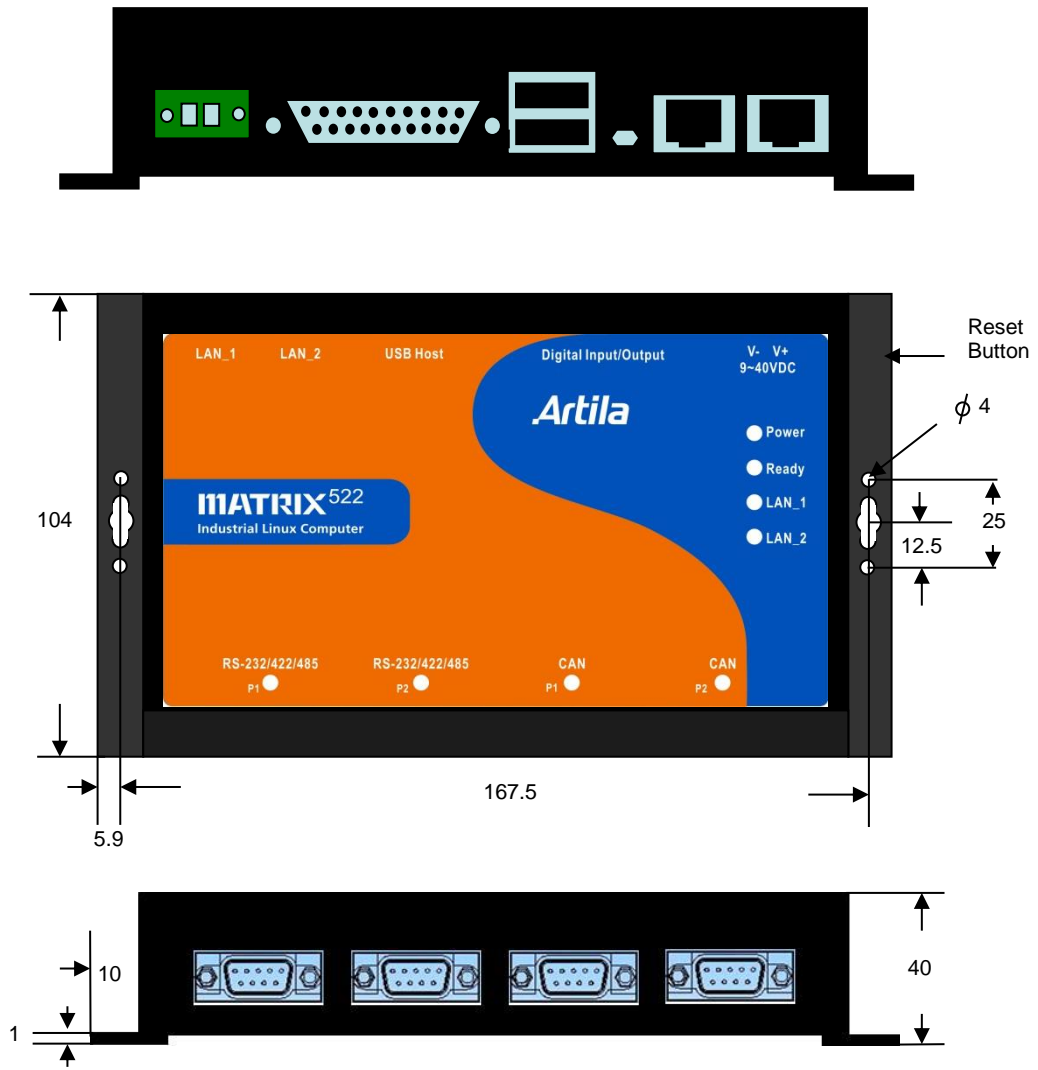
1.1 Packing List

- Matrix-522 Box Computer
- Wall mount bracket

1.2 Optional Accessory

- CBL-F10M9-20 (91-0P9M9-001): Console Cable (10Pin Header to DB9 Male, 20cm)
- DK-35A (36-DK35A-000): DIN RAIL Mounting Kit

2. Layout



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-522 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-522 again. If Ready LED is still off, please contact the manufacture for technical support.

3.4 Link / Act LED

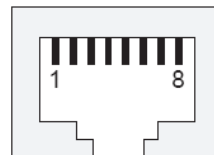
When Ethernet port are connected to the network, Link/Act will show solid green and if there is traffic is the Ethernet port, this LED will flash.

3.5 Serial / CAN Port LED

The dual color LEDs indicate the data traffic at the serial bus and CAN bus. 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 Ports

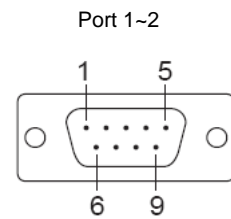
Port 1~2: 3-in-1 Software Configurable
RS-232/422/485

Note

- Only Port 2 has full modem signals DSR, DTR, DCD.

3.8 Serial Port (DB9 Male)

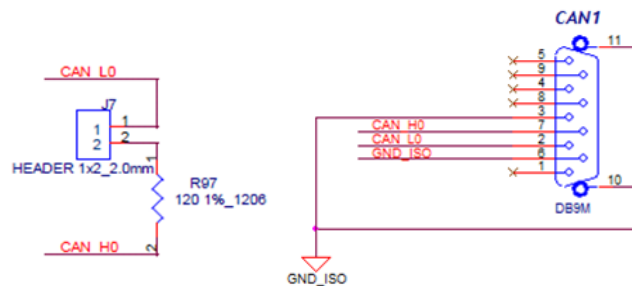
Pin No.	RS-232	RS-422	RS-485
1	DCD*	TXD-	-
2	RXD	TXD+	-
3	TXD	RXD+	DATA+
4	DTR*	RXD-	DATA-
5	GND	GND	GND
6	DSR*	-	-
7	RTS	-	-
8	CTS	-	-
9	-	-	-



Note: * Port 2 only

3.9 CAN Port (DB9 Male)

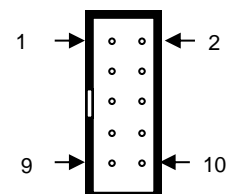
Matrix-522 features two 2500 Vrms fully isolated CAN ports. A 120 Ohm terminator is applied between CAN_H and CAN_L that can be disabled by removing jumper J7 and J8. A shielding ground is available at Pin 3 of the DB9 connector.



3.10 Serial Console Port

Serial console port is located inside the box at CON1. You need to use console cable (91-0P9M9-001) to access it.

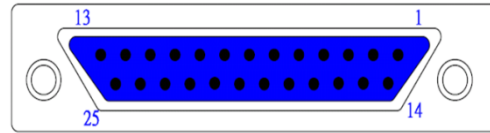
Serial Console RS-232			
1	N/C	2	N/C
3	RXD	4	N/C
5	TXD	6	N/C
7	N/C	8	N/C
9	GND	10	N/C



To use the serial console port, you need to open the metal case of Matrix-522 and the CON1 connector is near the reset button and LEDs. User can also redirect the serial console port to any one of the serial port by command **/setconsole**. Please use `setconsole —help` for the usage.

3.11 Digital I/O Port (DB25 Female)

Pin No.	Function	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

3.12 Factory Default Settings

LAN 1 IP Address: 192.168.2.127

LAN 2 IP Address: 192.168.3.127

Login: root or guest (telnet guest only)

Password: root or guest (telnet guest only)

Serial Console Port:

Baud rate: 115200

Data format: 8 Bits, No Parity, 1 Stop bit (N,8,1)

Flow Control: None

Terminal type: VT100

3.13 Power on and System Boot up

Once Matrix-522 is correctly power on, it will start boot Linux kernel and mount file system. You can use Ethernet and telnet and login Matrix-522. Once kernel loaded, it will find */sbin/init* and execute it. The initialization configuration is at */etc/inittab*. Once boot up, you can use telnet to login Matrix-522.



3.14 Inittab and Run Levels

Inittab contains information of system initialization. The system initialization script */etc/rcS.d* runs first then the run level 5 */etc/rc5.d*. Matrix-522 uses run level for system setup and the default run level is number 5. Please refer to introduction to linux (<http://tille.garrels.be/training/tldp/>) for information about run level.

Following is the run levels setting:

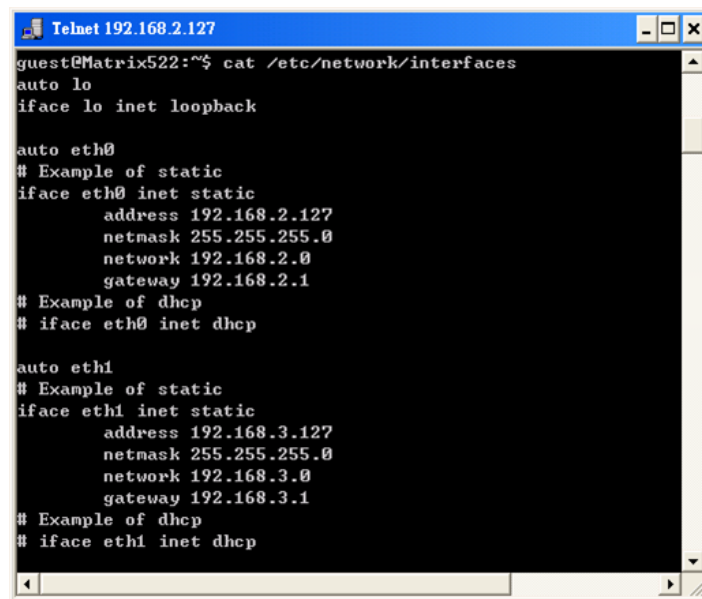
- Run level 0: halt
- Run level 1 is single user (login and service are disabled)
- Run level 2~5 are multiple users
- Run level 6 is reboot

Please refer to loader menu section for selection of run level.

3.15 Default Started Service

1. amgrd (Artila broadcast search daemon)
2. ssh (secured shell) with sftp
3. syslog/klogd (system and kernel log)
4. telnet server (disable root with */etc/securetty*)
5. ftp server (vsftp)
6. web server (lighttpd)
7. Ready LED (debug LED for internal use)

3.16 Network Settings



```

Telnet 192.168.2.127
guest@Matrix522:~$ cat /etc/network/interfaces
auto lo
iface lo inet loopback

auto eth0
# Example of static
iface eth0 inet static
    address 192.168.2.127
    netmask 255.255.255.0
    network 192.168.2.0
    gateway 192.168.2.1
# Example of dhcp
# iface eth0 inet dhcp

auto eth1
# Example of static
iface eth1 inet static
    address 192.168.3.127
    netmask 255.255.255.0
    network 192.168.3.0
    gateway 192.168.3.1
# Example of dhcp
# iface eth1 inet dhcp

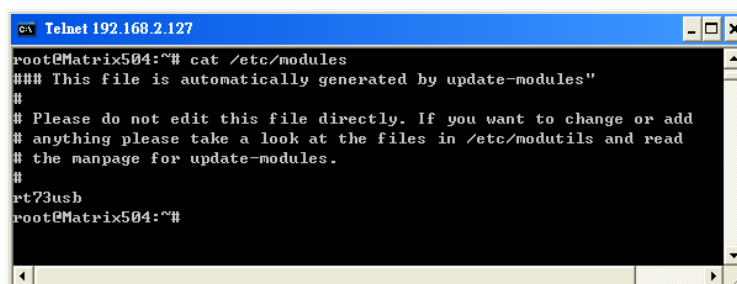
```

3.17 Insert Kernel Module

To insert kernel module while system boot up, please use *vi* to edit */etc/modules* to add module to load e.g.

rt73usb

To load the USB WLAN adaptor.



```

Telnet 192.168.2.127
root@Matrix504:~# cat /etc/modules
### This file is automatically generated by update-modules"
#
# Please do not edit this file directly. If you want to change or add
# anything please take a look at the files in /etc/modutils and read
# the manpage for update-modules.
#
rt73usb
root@Matrix504:~#

```

Use *vi* editing tool to edit the */etc/network/interfaces* for network setting. The default setting is static IP 192.168.2.127. Matrix-522 also supports Wireless LAN. Use

wireless_essid XXX

wireless_key YYY

To add SSID and WEP key if necessary. XXX is SSID and YYY is WEP Key.

Matrix-522 supports popular USB WLAN adaptor. Please contact Artila for the most update driver support.

3.18 File System

```

Telnet 192.168.2.127
root@Matrix504:/# ls
bin    etc    lib    proc   sys    usr
dev    home  media sbin   tmp    var
root@Matrix504:/# cd home
root@Matrix504:/home# ls
guest  root
root@Matrix504:/home# cd /media
root@Matrix504:/media# ls
disk  mmc  sda1  sdb1
root@Matrix504:/media#

```

The 256MB NAND Flash memory of Matrix-522 contains Boot loader (uBoot), Linux Kernel, Root File System and user disk (/home). The file system and disk space are shown as follow:

```

Telnet 192.168.2.127
root@Matrix504:/media# mount
rootfs on / type rootfs (rw)
ubi0:rootfs on / type ubifs (rw)
proc on /proc type proc (rw)
sysfs on /sys type sysfs (rw)
ramfs on /dev type ramfs (rw)
devpts on /dev/pts type devpts (rw,gid=5,mode=620)
usbfs on /proc/bus/usb type usbfs (rw)
tmpfs on /var/volatile type tmpfs (rw,size=6144k)
root@Matrix504:/media# df
Filesystem      1K-blocks      Used Available Use% Mounted on
ubi0:rootfs    114716         8256   106460    7% /
tmpfs           6144            56     6088    1% /var/volatile
root@Matrix504:/media#

```

3.19 Devices List

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

1. ttyS0: serial console port
2. ttyS1 to ttyS2: serial port 1 to port 2
3. sda to sdb: USB flash disk
4. ttyUSB0 to ttyUSB1: USB RS-232 adaptor (fdt_i_sio.ko)
5. rtc: Real Time Clock
6. gpio: General Purpose digital I/O
7. ttyACM0 and ttyACM1: USB Modem (CDC compliant)
8. mmc: SD driver

Note

- can0 and can1 are network devices under SocketCAN.

3.20 Utility Software

Matrix-522 includes busybox utility collection and Artila utility software and there are placed at:

/sbin

/bin

/usr/bin

/use/sbin

Please refer to Appendix for the utility collection list.

```

Telnet 192.168.2.127
root@Matrix504:/sbin# ls
arp                init               lsusb              setconsole
depmod             init.sysvinit     makedevs          shutdown
depmod.26         insmod            mkdosfs           shutdown.sysvinit
fdisk              iwconfig          mkfs.minix        start-stop-daemon
fsck               iugetid           mkfs.vfat         sulogin
fsck.minix         iulist            mkswap            swapoff
getty              iupriv            modprobe          swapon
halt               iwspys            pivot_root        switch_root
halt.sysvinit     killall5          poweroff          sysctl
hotplug           klogd             reboot            sysctl.procps
hwclock           ldconfig          reboot.sysvinit   syslogd
ifconfig          logread           rmdir             telinit
ifdown            lsetup            route             udhcpc
ifup              lsmod             runlevel

root@Matrix504:/sbin# cd /bin
root@Matrix504:/bin# ls
addgroup           dmesg              mktemp            sh
adduser            echo                more              sleep
bash               egrep               mount             stty
bashbug            false              mount.util-linux  su
busybox            fgrep               mountpoint        sync
cat                grep               mv                tar
chattr             gunzip             netstat           touch
chgrp              gzip               pidof             true
chmod              hostname           pidof.sysvinit   umount
chown              ip                 ping              umount.util-linux
cp                 kill                ps                 uname
cpio               kill.procps        ps.procps         usleep
date               ln                  pwd               vi
dd                 login              rm                 zcat
delgroup           ls                  rmdir
deluser            mkdir              run-parts
df                 mknod              sed

```

3.21 Mounting External Storage Memory

To find out the device name of the external memory device which plug into Matrix-522, you can use the command:

```
dmesg | grep sd
```

```
dmesg | grep mmc
```

To find out the device type (sda, sdb or mmc).

And use

```
mount/dev/sda1
```

```
mount/dev/mmc
```

to mount the USB disk or SD card and folder is local at

```
media/sda1 or /mnt/sda1
```

```

Telnet 192.168.2.127
root@Matrix504:~# cat /etc/fstab
# stock fstab - you probably want to override this with a machine specific one

rootfs                /                    auto                defaults            1 1
proc                  /proc                proc                defaults            0 0
devpts                /dev/pts             devpts              mode=0620,gid=5    0 0
ushfs                 /proc/bus/usb        ushfs               defaults            0 0
tmpfs                 /var/volatile        tmpfs               defaults,size=6M   0 0

# mount dev
/dev/sda1              /media/sda1          auto                defaults,sync,noauto 0 0
/dev/sda               /media/sda1          auto                defaults,sync,noauto 0 0
/dev/sdb1              /media/sdb1          auto                defaults,sync,noauto 0 0
/dev/sdb               /media/sdb1          auto                defaults,sync,noauto 0 0
root@Matrix504:~#

```

3.22 Welcome Message

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

3.23 Web Page Directory

The web pages are placed at */usr/www* and the */etc/lighttpd.conf* contains the lighttpd web server settings. The home page name should be *index.html*.

3.24 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.

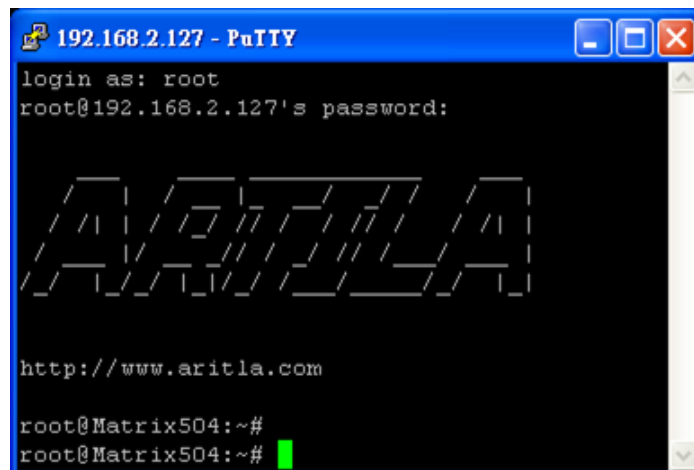
```
ntpclient [time server ip]
```

3.25 SSH Console

Matrix-522 supports SSH. If you use Linux computer, you can use SSH command to login Matrix-522.

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

The key generation program is available at */usr/bin*.



3.26 Putty Console Software

For Windows user, you can download the putty software at

<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html> to use SSH to login Matrix-522.

3.27 ipkg Package Software Management

ipkg is a light software package utility. It can be used to install, upgrade and remove the software package for Matrix-522. Currently user can use ipkg to install the software package from Artilla FTP. You can find the configuration at *ipkg.conf*.

When Matrix-522 is connected to network and issue command:

ipkg update

To update the package list and use

ipkg install

To install software package and

ipkg remove

To remove software

ipkg list

To list available software

ipkg list_installed

To list software installed

Please refer to Appendix for more about *ipkg*.

3.28 SocketCAN

Matrix-522 supports SocketCAN which implements a standard network interface for CAN protocols for Linux. Unlike other CAN implementation for Linux based on character devices, SocketCAN uses Berkeley socket API, the Linux network stack and implements CAN device drivers as network interfaces.

The CAN socket API has been designed as similar as possible to the TCP/IP protocols to allow programmers, familiar with network programming, to easily learn how to use CAN sockets.

Please refer to the document:

\Example\CanBus\socketcan\socketCAN.txt on Artilla FTP for the SocketCAN API.

3.29 libsocketcan

The libsocketcan library allows you to control some basic functions in socketcan from userspace.

Please refer to:

\Example\CanBus\libsocketcan for the examples program for libsocketcan.

3.30 Configure CAN

To configure CAN device, you can use utility programs:

```
/canconfig
/candump
/canecho
/cansend
/cansequence
```

User can also use *ip* command to configure CAN e.g.

```
/ip link set can0 down
/ip link set can0 type can bitrate 250000
/ip link set can0 up
/ip -details link show can0
```

The boot up CAN bit rate setting is at */etc/can_config*

Format: [can port]: [bit rate]

0:250000

1:250000

Bit rate: 10K~ 1M

```
Telnet 192.168.2.127
root@Matrix522:~# ifconfig
can0    Link encap:UNSPEC HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
-00
UP RUNNING NOARP MTU:16 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:10
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
Interrupt:30

can1    Link encap:UNSPEC HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
-00
UP RUNNING NOARP MTU:16 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:10
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
Interrupt:80

eth0    Link encap:Ethernet HWaddr 00:13:48:00:00:78
inet addr:192.168.2.127 Bcast:192.168.2.255 Mask:255.255.255.0
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:472 errors:0 dropped:0 overruns:0 frame:0
TX packets:94 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:43873 (42.8 KiB) TX bytes:7776 (7.5 KiB)
Interrupt:21 Base address:0x4000

eth1    Link encap:Ethernet HWaddr 00:13:48:00:00:01
inet addr:192.168.3.127 Bcast:192.168.3.255 Mask:255.255.255.0
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:108 Base address:0x000

lo      Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 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:0
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
```

```
Telnet 192.168.2.127
root@Matrix522:~# ip -details link show can0
2: can0: <NOARP,UP,LOWER_UP,ECHO> ntu 16 qdisc pfifo_fast state UNKNOWN qlen 10
link/can
can state ERROR-ACTIVE (herr-counter tx 0 rx 0) restart-ns 0
bitrate 250000 sample-point 0.875
tq 250 prop-seg 6 phase-seg1 7 phase-seg2 2 sjw 1
sja1000: tseg1 1..16 tseg2 1..8 sjw 1..4 brp 1..64 brp-inc 1
clock 12000000
root@Matrix522:~#
```

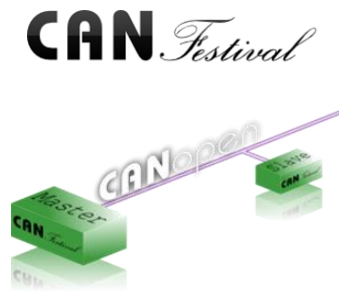

3.31 CANOpen

The Artilla FTP also includes CanFestival 3 open source for CANOpen.

Please refer to:

example\CanBus\canfestival

and <http://www.canfestival.org> for Canfestival.



3.32 Install GNU Toolchain

Find a PC with Linux OS installed as followed:

Fedora 7, ubuntu 7.04, OpenSUSE 10.2, Mandriva 2008, Debian 5.0, Centos (RedHat) 5 and above.

Login as a root user then copy the arm-linux-4.3.2.tar.gz to root directory of PC. Under root directory, type following command to install the Matrix-522 Toolchain:

```
#tar -xvfj arm-linux-4.3.3.tar.bz2
```

The toolchain file name are:

arm-linux-gnueabi-gcc

arm-linux-gnueabi-g++

arm-linux-gnueabi-strip

Version: gcc 4.3.3, glibc 2.9, binutils 2.18

For Windows user, please download the toolchain from CodeSourcery at

<http://www.codesourcery.com/sgpp/lite/arm/portal/package4547/public/arm-none-linux-gnueabi/arm-2009q1-203-arm-none-linux-gnueabi.exe>

The toolchain file name are:

arm-none-linux-gnueabi-gcc

arm-none-linux-gnueabi-g++

arm-none-linux-gnueabi-strip

Version: gcc 4.3.3, glibc 2.8, binutils 2.19

3.33 Getting Started with the Hello Program

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

```
make
```

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

```
ftp 192.168.2.127
```

Then login with password. Use bin command to set transfer mode to binary

```
ftp>bin
```

To transfer the execution file to Matrix-522 user disk (/home/guest) and use

```
chmod +x file.o
```

To change it to execution mode and

```
./file.o
```

to run the program.

3.34 Auto Start Program on Boot

To start a program on boot, you can use **/etc/rc.local**.

For example to use **vi** to edit **rc.local**

```
hello &
```

```
exit 0
```

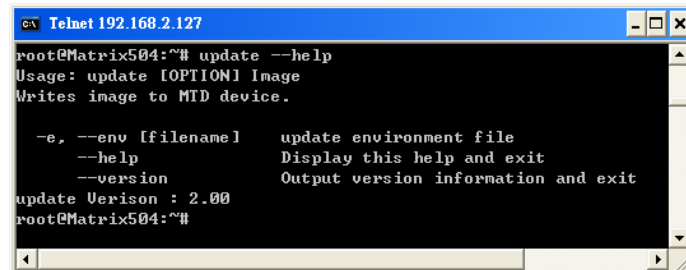
Hello will be executed after system boot up. **rc.local** has the similar function as **/etc/rc** in Matrix-522.

4. Artila Utility Software

The introduction of Artila utility software as follow:

4.1 update

Update loader, environment file and kernel image. Type **update--help** to find the command usage.



```

Telnet 192.168.2.127
root@Matrix504:~# update --help
Usage: update [OPTION] Image
Writes image to MTD device.

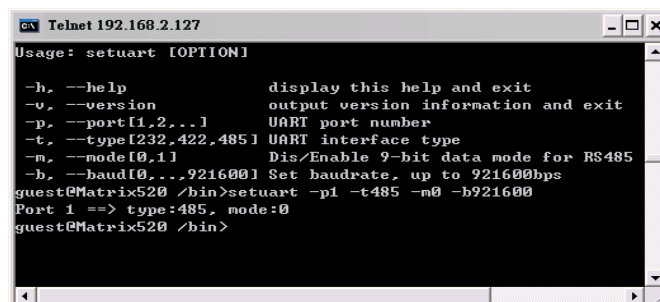
  -e, --env [filename]  update environment file
  --help                Display this help and exit
  --version             Output version information and exit
update Verison : 2.00
root@Matrix504:~#

```

Update can only operate under supervisor mode (password: root). Please use command **su** and login as 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.



```

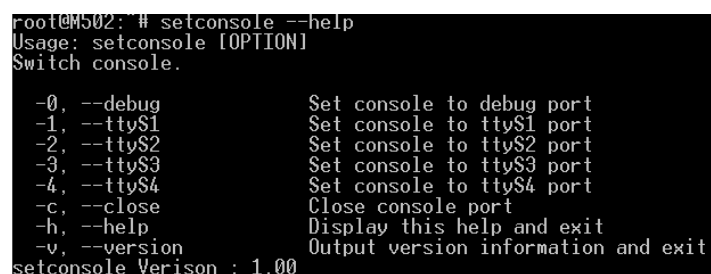
Telnet 192.168.2.127
Usage: setuart [OPTION]

  -h, --help            display this help and exit
  -v, --version         output version information and exit
  -p, --port [1,2,..]  UART port number
  -t, --type [232,422,485] UART interface type
  -m, --mode [0,1]     Dis/Enable 9-bit data mode for RS485
  -b, --baud [0,..,921600] Set baudrate, up to 921600bps
guest@Matrix520 /bin>setuart -p1 -t485 -m0 -b921600
Port 1 ==> type:485, mode:0
guest@Matrix520 /bin>

```

4.3 setconsole

Unlike Matrix-510 which shares the serial console port with the serial port 3, Matrix-522 uses dedicated pins for serial console (debug port). **setconsole** command allows user to redirect the serial console port to any one of the four serial port of Matrix-522. Therefore user can avoid opening the metal case to access the serial console.



```

root@M502:~# setconsole --help
Usage: setconsole [OPTION]
Switch console.

  -0, --debug          Set console to debug port
  -1, --ttyS1         Set console to ttyS1 port
  -2, --ttyS2         Set console to ttyS2 port
  -3, --ttyS3         Set console to ttyS3 port
  -4, --ttyS4         Set console to ttyS4 port
  -c, --close          Close console port
  -h, --help          Display this help and exit
  -v, --version       Output version information and exit
setconsole Verison : 1.00

```


5. Loader Menu

Loader menu helps user to select the run level of system boot up. User need to use serial console to enter loader menu. Please configure the serial port of terminal as follow:

Baud Rate: 115200
 Data bits: 8
 Parity: N
 Stop bit: 1
 Flow Control: None
 Terminal type: VT100

Once power up Matrix-522, please repeatedly keying "@" and you will see the loader menu appear as follow:

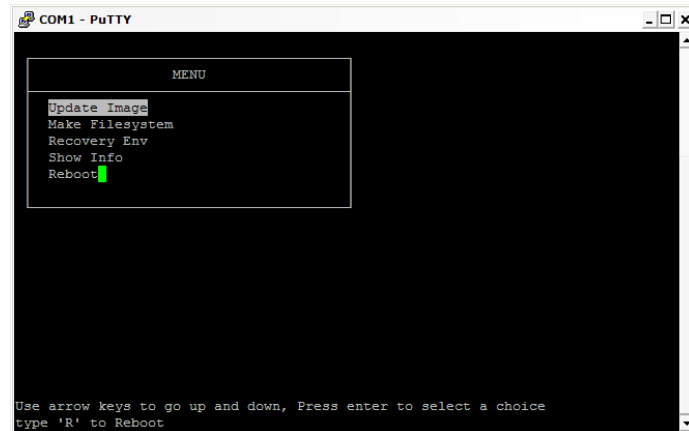
```
Starting M502.....
*****
          Artila Loader Version 2.0.9
          DRAM:64M NAND:128M
*****
G: Loader TFTP      L: Loader  Serial
K: Kernel TFTP     S: Kernel  Serial
F: Filesys TFTP    T: Filesys Serial
E: Env. Upgrade    M: Ethernet Setting
A: Dataflash Booting U: Runlevel
C: Switch Console  R: Reset
*****
```

If you miss the timing, please power on again the Matrix-522 and do it again. Select U will prompt the run level selection message. Run level 0 is halt, run level 1 is single user (disable login and service). Run level 2~5 are multiple users and run level 6 is reboot. To view the run level configuration, please check:

/etc/inittab

7. System Recovery

If NAND Flash file system does fail, DataFlash file system will automatically boot up and a Console Menu at console port will appear as follow:



7.1 Update Image

This option can recover the loader, kernel and file system by using an USB disk. The USB disk contains the images files with the path as follow:

Loader: ***m522/m522.alf***

Kernel: ***m522/m522K***

File system: ***m522/m522R***

The files are available on Artila FTP. Please prepare an USB disk and copy the image files to it before choosing this option.

7.2 Make Filesystem

This option is used to create customized file system. Before using this function, you need to copy the folder of ***mkimage522*** on Artila FTP to an USB disk. This function will create a new file system image for users and they can use it to duplicate the customized file system to other Matrix-522.

7.3 Recovery Env.

The option will recover the environment files as default setting. Use this function only when the NAND file system crash.

7.4 Show Info

Show the version information of Matrix-522.

7.5 Reboot

Reboot the NAND flash file system.

7.6 Update Image Starts

```

COM1 - PuTTY

Loader PATH      : matrix504/matrix504.alf      [OK]
Kernel PATH      : matrix504/MATRIX504K       [OK]
Filesystem PATH  : matrix504/MATRIX504R       [OK]

Update
Refresh
Return

Use arrow keys to go up and down, Press enter to select a choice
type 'R' to Reboot

```

7.7 Update Image Completes

```

COM1 - PuTTY

Use arrow keys to go up and down, Press enter to select a choice
type 'R' to Reboot

Updating Loader 128 Kibyte @ 20000 -- 100% complete.
The update will be effective at next boot.

Updating Kernel 128 Kibyte @ 260000 -- 100% complete.
The update will be effective at next boot.

Updating Filesystem 128 Kibyte @ 7ce0000 -- 100% complete.
The update will be effective at next boot.

Done.
Type Enter to return.

```

7.8 Make Files System Starts

```

COM1 - PuTTY

UBI tools PATH : mkimage504/mkimage      [OK]

Make
Refresh
Return

Use arrow keys to go up and down, Press enter to select a choice
type 'R' to Reboot

```

Note

1. Use Arrow keys up and down to selection the functions.
2. Use Arrow keys left and right to go to higher or lower levels of menu screen.
3. To force system go into DataFlash booting, repeatedly keying "!" (Shift +1) right after Matrix-522 power on.

8. Appendix

8.1 Utility Collection

- busybox v1.14.2: tiny utility collection
- sysvinit v2.86: standard Linux initialization
- util-linux-mount/umount v2.12r: support long file name
- ssh v4.6p1: support sftp server
- usbutils v0.7: USB id program
- lighttpd v 1.7: web server
- wget v1.9.1: used in ipkg software
- iptables v1.3.8: IP routing
- ipkg v.0.99.163: software package management
- procps v3.2.7: support webmin process management
- vsftpd v2.0.5: ftp server
- bash v3.2: GNU shell
- wireless_tools v29: wireless LAN utility
- ppp v2.4.3: ppp dial up utility
- psmics v22.2: procps supplement
- Canutils 4.0.6
- artila utility v.1.1: handy utility added by Artila

You can find more utility on Artila FTP and use ipkg to install the utility.

8.2 ipkg Software Package Management

Matrix-522 uses **ipkg** to manage the software installation, upgrade and removal. Artila will continuously add the kernel module and utility on Artila FTP, user can install these software from Artila FTP. In addition user can also setup your FTP server to update the software you want.

How to setup ipkg via internet

enable DHCP

```
$ udhcpc eth0
```

make sure your network environment can access internet

```
$ ping www.artila.com
```

modify **/etc/ipkg.conf**

add the following two lines

```
src/gz arm http://www.artila.com/download/ipkgs/9G20/utility/
```

```
src/gz kernel http://www.artila.com/download/ipkgs/9G20/modules/
```

comment out other package source

save and quit

execute ipkg update

```
$ ipkg update
```

examples of package installation

```
$ ipkg install pythoncore
```

```
$ ipkg install pythonpyserial
```

How to setup ipkg via USB disk

You can also copy the Utility and module folder from Artilla FTP to a USB disk, then use USB disk to install the software by changing the **ipkg.conf**

```
src/gz usb_arm ftp://root:root@127.0.0.1/media/sda1/Utility
```

```
src/gz usb_kernel ftp://root:root@127.0.0.1/media/sda1/modules
```

Make sure the USB disk is correctly mounted, now use command:

```
ipkg update
```

To update the package list and use

```
ipkg install webmin
```

To install webmin. Webmin is a web-based interface to system administration.

To start webmin, go to **/etc/webmin** and type

```
start webmin
```

Then you can use browser to visit Matrix-522 port 10000.

http: //192.168.2.127 : 10000



The webmin for Matrix-522 provides following modules:

- Webmin: webmin configuration
- System: system boot, process and log management
- Server: Apache and SSH server configuration
- Network: network configuration
- Hardware: RTC setting
- Others: File manager, upload and download

Remember to use command:

depmod -a /lib/modules/2.6.29.4/modules.dep

To update the dependency list if new kernel module were added.