

M-508 Quick Installation Guide

Overview

M-508 is a Linux ready Single Board Computer featuring four serial ports, 10/100 Mbps Ethernet, USB port and SD socket for flash disk expansion. The pre-install Linux OS and GNU tool chain make M-508 ready for your application development.

Features

1. ARM920T ARM Thumb Processor with 200MIPS at 180MHz, Memory Management Unit
2. 16-KByte Data Cache and 16-KByte Instruction Cache
3. 64MB SDRAM, 32MB Flash on board
4. 512KB non-volatile FRAM (M-508T only)
5. One 10/100 Mbps Ethernet
6. Two USB 2.0 full speed (12 Mbps) Host Ports
7. Multimedia Card Interface for SD memory card
8. Four RS-232/485 ports software selectable
9. Port 4 also supports RS-422
10. 32 General Purpose DIO
11. +5VDC power input
12. Pre-installed Standard Linux 2.6.14 OS
13. GNU tool chain available in Artila CD

Packing List

M-508 is shipped with following items

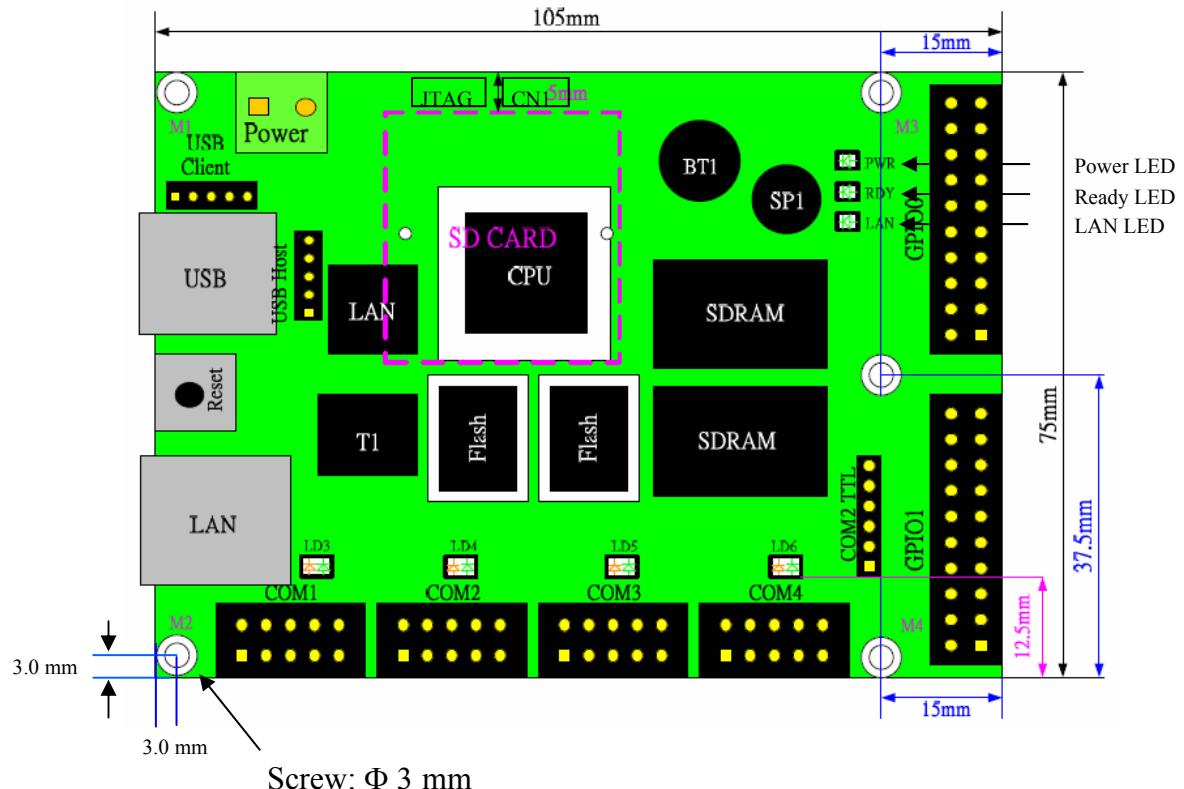
1. M-508
2. CB-F10M9-20 10-pin header to DB9 male cable x4
3. Artila CD includes Tool Chain, Installation guide and example programs



Optional Accessory

1. CB-F9F9-150: DB9 Female serial console Cable

M-508 Layout



Power LED (PWR)

Power LED will keep solid green when power is applied.

Ready LED (RDY)

After Power ON, M-508 will decompress the kernel and root file system to RAMDISK. Once system is boot up, the Ready LED will show solid green. The Ready LED will be turned off after M-508 received “halt” command.

Link/Act (LAN)

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

Serial Port LED (LD3~LD6)

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

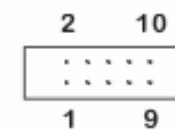
Debug LED (LD1~2)

The debug LEDs are located near LAN LED and are used for system boot debug. If system are correctly boot, they are switch off.

Serial Port

The serial port pin assignment is shown as follow:

| PIN | RS-232 | RS-485 | RS-422 ** |
|-----|--------|--------|-----------|
| 1 | DCD * | --- | Tx- |
| 2 | DSR * | --- | --- |
| 3 | Rx | --- | Tx+ |
| 4 | RTS | --- | --- |
| 5 | Tx | Data+ | Rx+ |
| 6 | CTS | --- | --- |
| 7 | DTR * | Data- | Rx- |
| 8 | --- | --- | --- |
| 9 | GND | GND | GND |
| 10 | --- | --- | --- |



* Port 2 only ** Port 4 only

Port 1/3: RS-232/422 (software selection)

RS-232: RXD,TXD,RTS,CTS,GND

RS-422: TXD+, TXD-,RXD+,RXD-,GND

Port 2: RS-232/422 (software selection)

RS-232: RXD,TXD,RTS,CTS,DSR,DTR,DCD,GND

RS-422: TXD+, TXD-,RXD+,RXD-,GND

Port 4: RS-232/422/485 (software selection)

RS-232: RXD,TXD,RTS,CTS,GND

RS-422: TXD+, TXD-,RXD+,RXD-,GND

RS-485: Data+, Data-, GND

Serial Console Port:

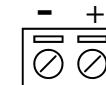
Serial console port is used for accessing M-508 using RS-232. At factory, serial console port is disabled because serial console port shares the Port 3 connector with the pin definition as shown:

| Pin | RS-232 |
|-----|--------|
| 1 | |
| 2 | TXD |
| 3 | GND |
| 4 | |
| 5 | |
| 6 | |
| 7 | RXD |
| 8 | |

User need to prepare or order a serial console cable (CB-F9F9-100) and enable the serial console port as described in [Enable Serial Console port](#) section.

Power Connector

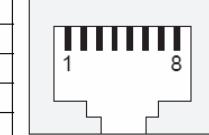
Connect the +5VDC power line to M-508. If the power is properly supply, the power LED will show a solid green color.



Please check the power voltage and polarity before connecting it

Ethernet Port

| Pin | Signal |
|-----|--------|
| 1 | ETx+ |
| 2 | ETx- |
| 3 | ERx+ |
| 6 | ERx- |



The Ethernet Port uses RJ45 connector

SD Socket

The SD socket is compatible with SD memory card specification version 1.0. The SD Socket is located in the back panel of the PCB.

USB Port

The USB port is a USB2.0 high speed host port. It can be used to expand the hardware function of M-508 and exchange file and data between PC. Currently the hardware support by M-508 USB is shown as follow:

1. USB Storage Device
2. USB to Wireless LAN Adaptor (Ralink RT2571)
3. USB to Modem (CDC compliant)
4. USB Camera

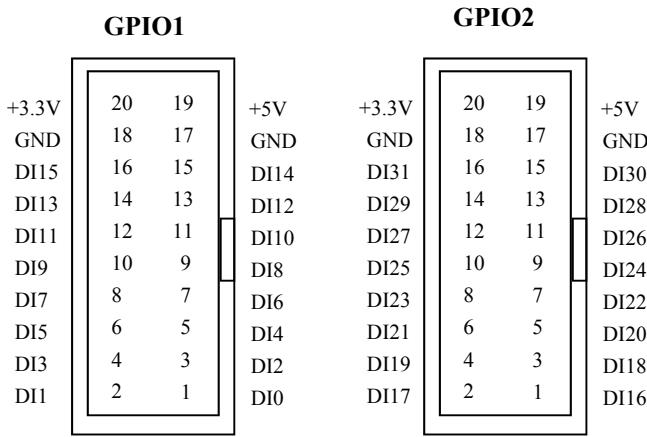
Contact Artila if you find your hardware is not shown on the list.

Reset Button

Press the “Reset” button to activate the hardware reset. Please always use “reboot” command to reset M-508. You should only use this function if the software reboot does not function properly.

General Purpose IO (GPIO)

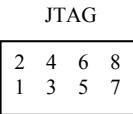
GPIO signals are housed in a 20-pin box connector, GPIO1 and GPIO2. Each of the connector includes 16 channels of GPIO. The pin definition is as shown following:



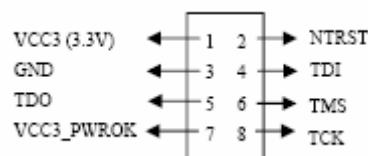
The signal level of GPIO is CMOS level and pitch of the pin header is 2.54 mm. Each of the DIO pin can be programmed as digital input or digital output.

CN1 JTAG Header

JTAG header is located near power connector and it is a 2x4 2.0 mm pin header and the pin definition is shown as follow:

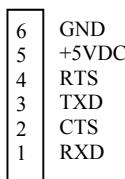


Definition



COM2 TTL Header

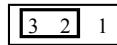
COM2 TTL is a CMOS/TTL signal pin connector and it is connected to UART of port 2 and its definition is as shown below



This connector allows user to design an internal Modem to work with M-508.

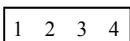
JP2 Boot manager selection

JP2 is boot selection jumper near CN1. Set to position 2-3 always. Change the setting will cause incorrectly boot up.



USB Client connector (J3)

USB client port is reserved for future enhancement. This function is disabled by software.

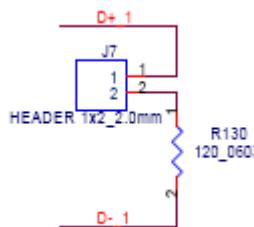


Pin definition is as follow:

1. Data +
2. Data -
3. Host_detect
4. GND

RS-485 terminator jumper (J5,J7,J8,J9)

Short the jumper will enable the 120 ohm terminator as shown below



Factory Default Settings

LAN 1 IP Address: 192.168.2.127
 Login: guest
 Password: guest
 Supervisor: root (use ssh to login)
 Password: root
 Serial Console: Disabled

Network Settings

```
# cat rc
hostname M508
hwclock -s
mount -t proc proc /proc
mount -o remount,rw /dev/root /
mount /sys
mount -t jffs2 /dev/mtdblock5 /mnt/disk-1
ifconfig lo 127.0.0.1
ifconfig eth0 192.168.2.127 netmask 255.255.255.0
route add default gw 192.168.2.254
route add -net 127.0.0.0 netmask 255.255.255.0 lo
sram
cat /etc/motd
```

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 &`

Wireless LAN Configuration

M-508 supports wireless LAN by using USB WLAN adaptor which uses Ralink RT2571 (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`

`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 M-508 host 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`

File System

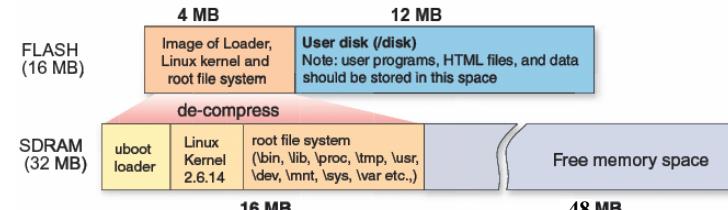
```
# ls
bin      disk      lib      proc      tmp
default  etc       lost+found sbin      usr
dev      home      mnt      sys       var
#
```

M-508 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 shown as below. In addition, use command `/df` to find out the disk space of the disk. The RAMDISK uses 8MB SDRAM space to store the root file system and 8MB for uboot loader and Linux Kernel Therefore it is about 16MB free SDRAM for user application software. The image of Linux kernel and root file system is stored in the flash memory and it uses about 4MB flash memory space and the rest of 12MB flash memory is designed for user flash disk to store user's program.

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

```
# mount
/dev/ram0 on / type ext2 (rw,nogrp)
/dev/mtdblock4 on /mnt/disk type jffs2 (rw,noatime)
/proc on /proc type proc (rw,nodiratime)
/dev/sys on /sys type sysfs (rw)
/dev/mtdblock5 on /mnt/disk-1 type jffs2 (rw,noatime)
/dev/mtdblock6 on /mnt/sram type ext2 (rw,nogrp)
# df
Filesystem      1k-blocks    Used   Available Use% Mounted on
/dev/ram0        8059     6257     1393  82% /
/dev/mtdblock4   11648     636     11012  5% /mnt/disk
/dev/mtdblock5   16384     644     15740  4% /mnt/disk-1
/dev/mtdblock6   499      13      461   3% /mnt/sram
#
```

The second flash memory is configured as disk-1 and its available space is 15MB. In addition, M-508T is equipped with 512KB FRAM and it is configured as **sram**



Devices list

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

1. ttyS0: serial console port
2. ttyS1 to ttyS4: serial port 1 to port 4
3. mmc to mmc2: SD memory card
4. sda to sde: USB flash disk
5. ttyUSB0 to ttyUSB1: USB RS-232 adaptor (`fdt_i_sio.ko`)
6. rtc: Real Time Clock
7. gpio: General Purpose digital I/O
8. ttyACM0 and ttyACM1: USB Modem (CDC compliant)

```
# cd /dev
# ls
console      mixer      mtdblock4  ptyp1      sda4      tty6      ttyp2
cu0          mmc       mtdblock5  ptyp2      sdb      tty7      ttyp3
cu1          mmc0      mtdblock6  ptyp3      sdb1      tty8      ttyp4
cu2          mmc1      mtdblock7  ptyp4      sdc      tty9      ttyp5
cu3          mmc2      mtdblock8  ptyp5      sdc1      ttyACM0  ttyp6
cu4          mmc3      mtdblock9  ptyp6      sdd      ttyACM1  ttyp7
cu5          mmc4      mtdr0      ptyp7      sdd1      tty80     ttyp8
cu6          mmc5      mtdr1      ptyp8      sde      tty81     ttyp9
cu7          mmc6      mtdr2      ptyp9      sequencer  tty82  urandom
cu8          mmc7      mtdr3      ram0      sndstat   tty83     video0
cu9          mmc8      mtdr4      ram1      spi0      tty84     video1
cu10         mmc9      mtdr5      ram2      spi1      tty85     watchdog
cu11         mmc10     mtdr6      ram3      tty      tty86     zero
cu12         mmc11     mtdr7      random   tty0      tty87
cu13         mmc12     mtdr8      rtc      tty1      tty88
cu14         mmc13     mtdr9      sda      tty2      tty89
cu15         mmc14     mtdblock0  null     sda1      tty3      ttyUSB1
cu16         mmc15     mtdblock1  null     sda2      tty4      tty80
cu17         mmc16     mtdblock2  ppp      sda2     tty5      tty81
cu18         mmc17     mtdblock3  ptyp0    sda3      tty6      tty82
#
```

Utility Software:

M-508 includes busybox utility collection and Artila utility software as follow:

```
# ls /bin
addgroup      crontab      ftpd      ls      ps      telnetd
adduser      date      gpiotcl      mkdir      rm      tip
angrd      delgroup      grep      mke2fs      rmdir      touch
bash      deluser      gunzip      mkfs.jffs2  sep      true
boa      df      gzip      mknod      sed      umount
boa_indexer  dhcpcd      hostname      mktemp      setuart  update
busybox      dhystone     inetd      more      sh      usleep
cat      discard      init      mount      sleep      version
chat      dmmsg      iptables      netstat      snmpd      vi
chgrp      echo      iwgetconfig  netstat      sram      zcat
chmod      egrep      iwlist      pidof      stty      ssid
chown      erase      iwpriv      ping      su      sync
cp      false      kill      pppd      tar
cpu      fgrep      ln      login      ps
cron      ftp      login      ps
# ls /sbin
adjtimex      ifdown      lsmod      makedevs      start-stop-daemon
getty      ifup      insmod      modprobe      sulogin
halt      klog      rmmod      reboot      syslogd
hwclock      lsmod      route
ifconfig      #
#
```

Artila Utility Software:

The introduction of Artila utility software as follow:

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

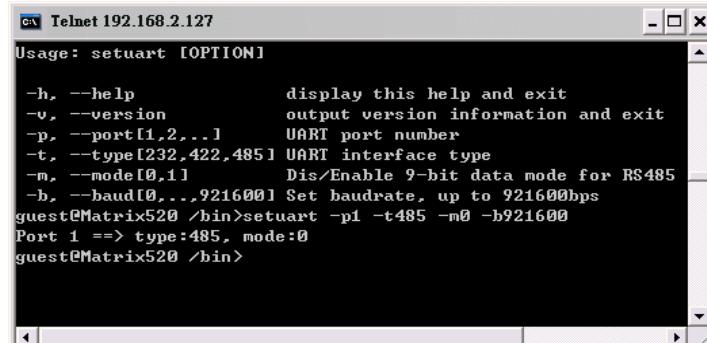


```
# Telnet 192.168.2.127
# update --help
Usage: update [OPTION] filename
Write image to flash.

-q, --quiet      don't display progress messages
--silent        same as --quiet
--help          display this help and exit
--version       output version information and exit
--FORMAT        format userdisk
#
```

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

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



```
# 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>
```

How to make more utility software

You might also find utility software available on Artila CD under /Matrix and iPAC/utility such as *ntpclient*, *ssh*, *scp*, *bluez* and *ssh-keygen*. If you want, you can ftp or copy the utility software to M-508 user disk (/disk). Also you can use find the source code and use the GNU Tool Chain to make the utility by yourself.

Mounting External Storage Memory

To find out the device name of the external memory device which plug into M-508, 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

```
# cat /etc/fstab
/dev/sys    /sys      sysfs   rw    0 0
/dev/sda   /mnt/sda  vfat    rw    0 0
/dev/sda1  /mnt/sda1 vfat    rw    0 0
/dev/sdb   /mnt/sdb  vfat    rw    0 0
/dev/sdb1  /mnt/sdb1 vfat    rw    0 0
/dev/mtdblock3 /mnt/disk jffs2   rw    0 0
/dev/mmc0   /mnt/mmc  vfat    rw    0 0

#
```

Welcome Message

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

SSH Console

M-508 support SSH. If you use Linux computer, you can use SSH command to login M-508. The configuration of SSH and key are located at /etc/config/ssh

The key generation program is available at Artila CD

/matrix and ipac /utility/ssh_keygen

User can copy this program to M-508 to generate the key

```
[root@localhost ~]# ssh 192.168.2.127
The authenticity of host '192.168.2.127 (192.168.2.127)' can't be established.
RSA key fingerprint is ba:4b:2d:ae:04:07:bd:c6:5c:4f:8a:43:4b:24:ee:9f.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.2.127' (RSA) to the list of known hosts.
root@192.168.2.127's password:
Welcome to

**
**
**
**
**** **** **** ****
** ** ** ** ** **
** ** ** ** ** ****
** ** ** ** ** ****
***** * * * * * *
** ** ** ** ** ** *
** ** ** ** ** ** *
** ** ** ** ** ** *
** ** ** ** ** ** *
** ** ** ** ** ** *
For further information check:
http://www.artila.com/
root@Matrix520 />
```

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**

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 in Artila CD to adjust the RTC time.

/ntpclient [time server ip]

Install GNU Tool Chain

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 M-508 Tool Chain

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

Getting started the Hello program

There are many example programs in Artila CD. 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 M-508 user disk (/disk) and use
chmod +x file.o

Change it to execution mode and

./file.o

to run the file

```
[root@localhost ~]# ftp 192.168.2.127
Connected to 192.168.2.127.
220 Matrix520 FTP server (GNU inetutils 1.4.1) ready.
500 'AUTH GSSAPI': command not understood.
500 'AUTH KERBEROS_V4': command not understood.
KERBEROS_V4 rejected as an authentication type
Name (192.168.2.127:root): root
331 Password required for root.
Password:
230- Welcome to
230-
230-   **          **  **
230-   **          **  **
230-   **  **        **  **
230-   **  **        **** ****  **  **  ****
230-   **  **        **  **  **  **  **  **
230-   **  **        *  *  *  *  *  *  *  *  *
230-   ***** * * * * * *  *  *  *  *  *  *
230-   **  **        *  *  *  *  *  *  *  *  *
230-   **  **        *  *  *  *  *  *  *  *  *
230-   **  **        *  *  *  *  *  *  *  *  *
230-
230- For further information check:
230- http://www.artila.com/
230-
230 User root logged in.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> bi
200 Type set to I.
ftp>
```

Enable Serial Console Port

The serial console port is disabled as factory default setting. To enable the serial console, you need to use the serial console cable (CB-RJ2CON-100) and connect it to port 3. Use any terminal software such as hyper terminal and setting as follow:

Baud Rate: 115200

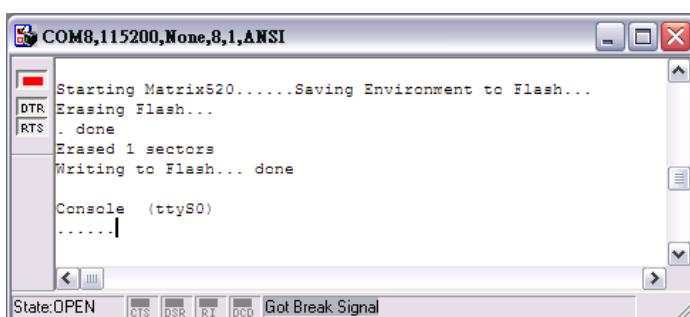
Data bits: 8

Parity: N

Stop bit: 1

Terminal type: ANSI

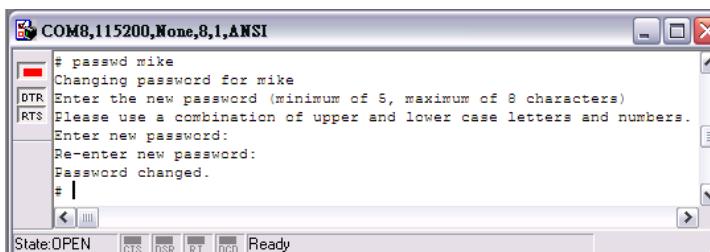
Once system is power on, you will see “Starting M-508....”, Keep typing \$\$\$\$ to turn on the serial console function. If the serial console is enabled, you will see “Console (ttyS0)” as follow. Repeat this procedure will disable the serial console and Screen will show “Console (null)”



Frequently Asked Question

1. *Forgot password:*

If you forgot the password for login, please use serial console to modify the password



2. *Rest M-508 to factory default setting*

The factory default setting is available at **/default** directory. User can copy the default setting to **/etc** and **/home** directories manually or format the user disk to set M-508 to factory default setting.

Performing disk format will erase all the files in user disk. Therefore please backup the files you need in USBDISK first before format the disk. Use command:

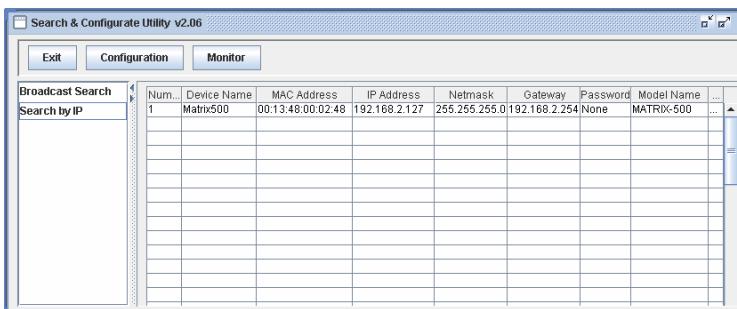
/update —FORMAT

To format disk.

3. *Forgot the IP address*

If you forgot the M-508 IP address, you can use the Java Manager available in Artila CD to search the IP address of M-508

Or use serial console port to find out the IP address by



#ifconfig

