

# **Matrix-700**

## **Linux Cortex-A5 Industry Box Computer**

### **User Guide**

Version 1.0.3



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## Document Amendment History

Revision	Date	Remark
V 1.0	June 2016	Initial released
V1.01	Aug. 2016	Appendix Setuart, How to configure USB dongle, Installation Toolchain, Webmin, and Restore to default.
V1.02	Nov. 2016	Update Kernel version. Add Webmin link information.
V1.03	Dec. 2016	Update Kernel version.



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# 1. Product Overview

## 1.1 Introduction

Matrix-700 is a Cortex-A5 based industrial embedded Linux computer. The Matrix-700 is especially suitable for 24/7/365 non-stop running for unmanned application environment. The Matrix-700's Linux system is 95% similar to a generic Debian-based Linux platform (e.g. Ubuntu).

## 1.2 Features

- Cortex-A5 Processor 536MHz with ARMv7 set
- 512MB LPDDR2 RAM, 8GB eMMC Flash
- One Gigabit and one 10/100Mbps Ethernet ports
- Two USB 2.0 high speed (480Mbps) Host ports
- Four software configurable RS-232/485 serial ports
- One USB client port
- One microSD socket
- 9 to 48VDC power input
- Pre-installed Linux kernel 4.4.XX and file system
- GNU toolchain available on Artila self-maintained repository
- Optional DIN RAIL mounting adaptor

## 1.3 Packing List

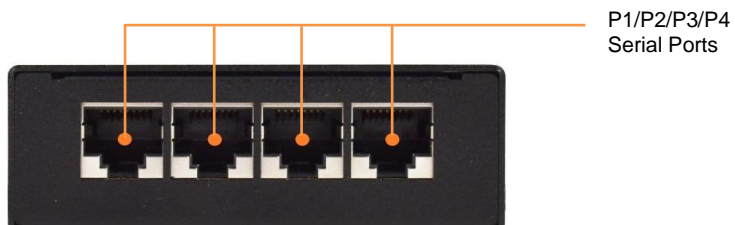
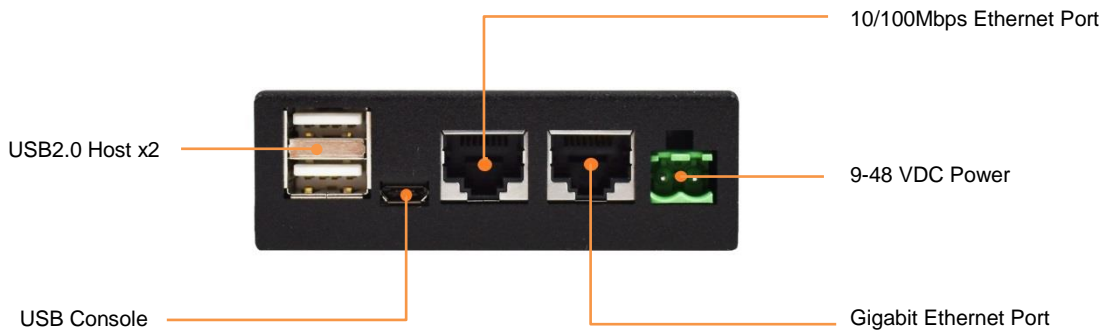
- Matrix-700 Box Computer

## 1.4 Optional Accessory

- 91-R45F9-150: Serial Cable (RJ45 to DB9 Female, 150cm)
- DK-35A: DIN RAIL Mounting Kit
- PWR-12V-1A: 110~240VAC to 12VDC 1A Power Adaptor

## 2. Hardware Introduction

### 2.1 Layout

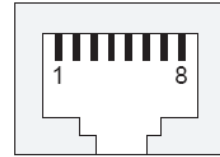




## 2.2 Serial Port

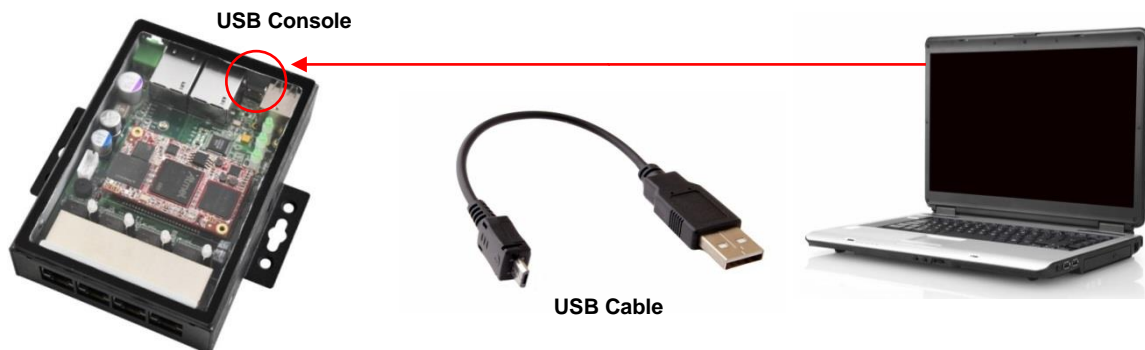
The Matrix-700 provides four RJ45 connectors for its four serial ports. Each serial port can be configured as RS-232 or RS-485 by software. The Matrix-700's RS-485 supports automatic direction control (by hardware). The detailed pin assignment information is shown below:

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



## 2.3 Hardware connection

- Micro-USB connector
- Support USB power source
- USB client as serial console



## 3. Getting Start to Use Matrix-700

### 3.1 Power on the Matrix-700

The Matrix-700 can be powered via its terminal block (9-48VDC), and/or via its micro-USB connector (5VDC). After power on:

- The Matrix-700 will beep once and the P4 LED will lit up (yellow).
- Then the ready LED (green) will flash four times.
- Then all LEDs will be off for about 25 seconds while loading the Linux kernel.
- Then the ready LED will turn on again, which means the Matrix-700 is ready to use.

### 3.2 Access the USB Serial Console Shell

The Matrix-700 supports USB serial console shell. Please prepare an USB to micro-USB cable to connect the Matrix-700 to your computer. After boot-up, the Matrix-700 automatically emulates an USB CDC/ACM compatible serial device, the serial communication parameters are: 115200, N81, VT100.

Plug the USB cable to your computer, there should be a newly installed serial port. The identifier name of the serial port varies depending on your computer's operation system and the number of the serial port already installed on your computer.

- On Linux system, the serial port name looks like ttyACM0, ttyACM1, etc.
- On OSX system, the serial port name looks like tty.usbmodem1421, tty.usbmodem1422, etc.
- On Windows system, the serial port name looks like COM3, COM4, etc.

Use your preferred serial terminal programs to access the Matrix-700's USB serial console, e.g. putty for Windows computers, and minicom for Linux/OSX computers.

#### Note

1. For Linux, Mac OSX and Windows 10 computers, the CDC/ACM serial driver is already built-in and will be activated automatically.
2. For Windows 7/XP computers, it may need to install the CDC/ACM serial driver manually. Users can download the CDC/ACM driver from Artila web site.  
(<http://www.artila.com/download/A5D35/Linux/toolchain/linux-cdc-acm.inf>).

## 4. Network Interface Settings

The Matrix-700 comes with two Ethernet ports, the default network settings are shown below:

Ethernet Type	Port Label	Port mapping	IP mode	IP address
Gigabit	GLAN	eth0	dynamic	assigned by DHCP server
10/100Mbit	LAN	eth1	static	192.168.2.127

You may need to modify the Matrix-700's network settings to meet your LAN environment. The configuration file path is `/etc/network/interfaces`. Save the configuration file, and use **ifdown** and **ifup** command to ON/OFF the specific network interface a couple times to activate the network settings.

```
[root@Matrix700 ~]# cat /etc/network/interfaces
# /etc/network/interfaces -- configuration file for ifup(8), ifdown(8)

# The loopback interface
auto lo
iface lo inet loopback

# Wired or wireless interfaces
# Gigabit
auto eth0
iface eth0 inet dhcp

# 10/100M
auto eth1
iface eth1 inet static
    address 192.168.2.127
    netmask 255.255.255.0
    network 192.168.2.0
    #gateway 192.168.2.1

[root@Matrix700 ~]#
```

The following screen capture shows the eth0 of the Matrix-700 got a valid IP: 192.168.1.64.

```
[root@Matrix700 ~]# ifdown eth0
[root@Matrix700 ~]# ifup eth0
udhcpd (v1.23.2)
started Sending discover...
Sending select for 192.168.1.64...
Lease of 192.168.1.64 obtained, lease time 86400
/etc/udhcpd.d/50default: Adding DNS 208.67.220.220
/etc/udhcpd.d/50default: Adding DNS 208.67.222.222

[root@Matrix700 ~]#
```

## 5. Access the SSH Console Shell

Most Linux/OSX computers come with built-in SSH client utility. For Windows users, it is highly recommended to use putty as an SSH client.

```
$ ssh root@192.168.1.64
The authenticity of host '192.168.1.64 (192.168.1.64)' can't be established.
ECDSA key fingerprint is SHA256:gQQ9QzBGV0F0fZCmP5qLxioRkbPlRqJDlnLuklLZVhQ.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.1.64' (ECDSA) to the list of known hosts.
root@192.168.1.64's
password:
Last login: Fri May 6 20:47:14 2016 from 192.168.1.54 Welcome to

      **                ** **
      **                **   **
      ** **            **   **
      ** **          ****  **** ** **   ****
**      **      **   **   ** **      **
**      **      **   **   ** **      ****
*****          **   **   ** ** ** ** **
**          ** **   **   ** ** ** ** **
**          ** **   **   ** ** **   ****

For further information check:
http://www.artila.com/

[root@Matrix700 ~]#
```

## 6. Check the Linux Kernel Version

```
[root@Matrix700 ~]# uname -a
Linux Matrix700 3.18.34-yocto-standard #1 Tue May 24 21:14:06 CST 2016 ar
mv7l GNU/Linux

[root@Matrix700 ~]# uname -r
3.18.34-yocto-standard

[root@Matrix700 ~]# uname -v
#1 Tue May 24 21:14:06 CST 2016
```

## 7. File System Information

The Matrix-700 comes with 8GB on-board EMMC Flash memory, which contains boot loader (uBoot), Linux kernel, root file system and user disk (/home).

```
[root@Matrix700 ~]# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0             179:0    0   7.3G  0 disk
`--mmcblk0p1       179:1    0   7.3G  0 part /
mtdblock0           31:0    0   8.3M  0 disk
mtdblock1           31:1    0   8.2M  0 disk
mtdblock2           31:2    0   7.7M  0 disk
mtdblock3           31:3    0   7.7M  0 disk
mtdblock4           31:4    0   7.6M  0 disk
mtdblock5           31:5    0   3.9M  0 disk

[root@Matrix700 ~]#
```

```
[root@Matrix700 /]# ls -F
bin/  dev/  home/  lost+found/  mnt/  run/  sys/  usr/
boot/  etc/  lib/  media/  proc/  sbin/  tmp@  var/

[root@Matrix700 /]#
```

```
[root@Matrix700 ~]# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       7.1G  252M  6.5G   4% /
devtmpfs        251M    0  251M   0% /dev
tmpfs           251M   72K  251M   1% /run
tmpfs           251M  104K  251M   1% /var/volatile

[root@Matrix700 ~]#
```

## 8. Serial Port Settings

The Matrix-700 comes with four RS-232/485 serial ports. The port mapping info is listed below:

- Port 1 → /dev/ttyS1
- Port 2 → /dev/ttyS2
- Port 3 → /dev/ttyS3
- Port 4 → /dev/ttyS4

The serial port's default operation mode is RS-232. Please use the built-in **setuart** utility to show/change serial port's operation mode.

### ⚠ Caution

The serial port's mode will go back to RS-232 mode after system reboot.

Configure serial port setting. An example show as followed to configure port1 as RS-485 or RS-232 interface with baud 115200 or baud 9600.

```
[root@Matrix700 ~]#setuart -h
Artila utility: setuart
Usage: setuart [OPTION]

-h          display this help and exit
-v          print version number and exit
-p          uart port number
-t          uart interface type [232,485]
-b          set baudrate, up to 921600bps

Examples:
  setuart -p 1                display port 1 type and baudrate
  setuart -p 1 -t 485 -b 115200  set port 1 type RS-485 and baud to 115
200
  setuart -p 1 -t 232 -b 9600   set port 1 type to RS-232 and baud to
9600
```

## 9. System Time and Real-time Clock

### 9.1 Adjust the System Time by Date Command

Matrix-700 supports standard **date** command to adjust the Linux system time manually. A typical usage is: **date MMDDhhmmYYYY**.

```
[root@Matrix700 ~]#date 050717132016
Sat May 7 17:13:00 UTC 2016

[root@Matrix700 ~]#
```

### 9.2 Adjust the RTC Time by hwclock Command

If users want to adjust the Matrix-700's on-board Real-time clock (RTC), please follow the steps shown below:

- First, to adjust the system time by using **date** or **ntpclient** command.
- Then use the **hwclock** command to synchronize the system time to the RTC. A typical usage is: **hwclock -w**.

```
[root@Matrix700 ~]#hwclock
Thu May 26 15:31:49 2016 0.000000 seconds

[root@Matrix700 ~]#date
Thu May 26 15:32:00 UTC 2016

[root@Matrix700 ~]#hwclock -w

[root@Matrix700 ~]#
```

### 9.3 Using NTP (Network Time Protocol)

Matrix-700 comes with pre-activated ntpd daemon. The NTP configuration file path is **/etc/ntp.conf**. The default NTP settings is shown below:

```
[root@Matrix700 ~]#cat /etc/ntp.conf
# This is the most basic ntp configuration file
# The driftfile must remain in a place specific to this
# machine - it records the machine specific clock error
driftfile /var/lib/ntp/drift
# This should be a server that is close (in IP terms)
# to the machine. Add other servers as required.
# Unless you un-comment the line below ntpd will sync
# only against the local system clock.
#
# server time.server.example.com
#
# Using local hardware clock as fallback
# Disable this when using ntpd -q -g -x as ntpdate or it will sync to itse
lf
server 127.127.1.0
fudge 127.127.1.0 stratum 14
# Defining a default security setting
restrict default
```



- If you just want to synchronise network time server, the configuration file is shown below:

```
[root@Matrix700 ~]# cat /etc/ntp.conf
# This is the most basic ntp configuration file
# The driftfile must remain in a place specific to this
# machine - it records the machine specific clock error
driftfile /var/lib/ntp/drift
# This should be a server that is close (in IP terms)
# to the machine.  Add other servers as required.
# Unless you un-comment the line below ntpd will sync
# only against the local system clock.
#
# server time.server.example.com
#
# Using local hardware clock as fallback
# Disable this when using ntpd -q -g -x as ntpdate or it will sync to itse
lf
#server 127.127.1.0
#fudge 127.127.1.0 stratum 14
server 0.pool.ntp.org prefer
server 1.pool.ntp.org
server 2.pool.ntp.org
server 3.pool.ntp.org
# Defining a default security setting
restrict default
```

- Restart the ntpd service: execute **/etc/init.d/ntp restart**
- Stop the ntpd service: execute **/etc/init.d/ntp stop**
- Disable the ntpd service on boot-up: execute **rm /etc/rc5.d/S20ntp**. For more details, please follow the link: <http://www.pool.ntp.org/>

## 10. Insert Kernel Modules

Users can use command **lsmod** to list all installed kernel modules.

```
[root@Matrix700 ~]# lsmod
Module                Size  Used by
usb_f_mass_storage    26778  2
usb_f_acm              4036  2
u_serial              7534  3 usb_f_acm
libcomposite          33729  12 usb_f_acm,usb_f_mass_storage
nfsd                  287575  11
auth_rpcgss           49151  1 nfsd
oid_registry          2189  1 auth_rpcgss
exportfs              3309  1 nfsd
nfs_acl               2274  1 nfsd
lockd                 71884  1 nfsd
grace                 2364  2 nfsd,lockd
sunrpc               208345  12 nfsd,auth_rpcgss,lockd,nfs_acl
atmel_usba_udc        12929  0
udc_core              5977  2 atmel_usba_udc,libcomposite

[root@Matrix700 ~]#
```

To load additional kernel modules during the system boot-up, you can modify the file: **/etc/modules**.

```
[root@Matrix700 ~]# cat /etc/modules
atmel_usba_udc
#g_serial
#mt7601Usta

[root@Matrix700 ~]#
```

## 11. Install Software Package

The Matrix-700 supports standard **apt** (Advanced Package Tool) package management utility. With this utility, users can easily install, upgrade, remove software packages. Artila provides a self-maintained software repository. The apt configuration file path is **/etc/apt/sources.list**.

```
[root@Matrix700 ~]#ls /etc/apt
apt.conf apt.conf.d preferences.d sources.list sources.list.d

[root@Matrix700 ~]#cat /etc/apt/sources.list
deb http://www.artila.com/download/deb/Matrix700 Matrix700 main
deb http://www.artila.com/download/deb/cortexa5hf-vfp cortexa5hf-vfp ma
in
deb http://www.artila.com/download/deb/all all main
```

Commonly used apt commands are listed below:

- apt-get install <package> to install package
- apt-get remove <package> to remove package
- apt-cache search <package> to search package
- apt-get update to update the package list
- apt-get upgrade to upgrade installed packages

## 12. Mount an SD Card

The Matrix-700 comes with a MicroSD socket. If an MicroSD card is inserted, you can use **lsblk** command to find the device identifier name. And then use **mount** command to mount the SD card to a folder.

Before SD Insertion

```
[root@Matrix700 ~]# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0             179:0    0  7.3G  0 disk
├─mmcblk0p1         179:1    0  7.3G  0 part /
mtdblock0           31:0    0   8.3M  0 disk
mtdblock1           31:1    0   8.2M  0 disk
mtdblock2           31:2    0   7.7M  0 disk
mtdblock3           31:3    0   7.7M  0 disk
mtdblock4           31:4    0   7.6M  0 disk
mtdblock5           31:5    0   3.9M  0 disk
```

After SD Insertion

```
[root@Matrix700 ~]# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0             179:0    0  7.3G  0 disk
├─mmcblk0p1         179:1    0  7.3G  0 part /
└─mmcblk1           179:24   0   1.9G  0 disk
mtdblock0           31:0    0   8.3M  0 disk
mtdblock1           31:1    0   8.2M  0 disk
mtdblock2           31:2    0   7.7M  0 disk
mtdblock3           31:3    0   7.7M  0 disk
mtdblock4           31:4    0   7.6M  0 disk
mtdblock5           31:5    0   3.9M  0 disk
```

Mount mmcblk1 to /media.

```
[root@Matrix700 ~]# mount /dev/mmcblk1 /media
[root@Matrix700 ~]# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0             179:0    0  7.3G  0 disk
├─mmcblk0p1         179:1    0  7.3G  0 part /
└─mmcblk1           179:24   0   1.9G  0 disk /media
mtdblock0           31:0    0   8.3M  0 disk
mtdblock1           31:1    0   8.2M  0 disk
mtdblock2           31:2    0   7.7M  0 disk
mtdblock3           31:3    0   7.7M  0 disk
mtdblock4           31:4    0   7.6M  0 disk
mtdblock5           31:5    0   3.9M  0 disk
```

Unmount /media.

```
[root@Matrix700 ~]# umount /media
```

## 13. Mount a USB Drive

The Matrix-700 comes with two USB host ports which support generic USB drives. If a USB drive is inserted, you can use **lsblk** command to find the device identifier name. And then use **mount** command to mount the USB drive to a folder.

Before USB drive Insertion

```
[root@Matrix700 ~]# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
mmcblk0             179:0    0   7.3G  0 disk
`-mmcblk0p1         179:1    0   7.3G  0 part /
mtdblock0           31:0    0   8.3M  0 disk
mtdblock1           31:1    0   8.2M  0 disk
mtdblock2           31:2    0   7.7M  0 disk
mtdblock3           31:3    0   7.7M  0 disk
mtdblock4           31:4    0   7.6M  0 disk
mtdblock5           31:5    0   3.9M  0 disk
```

After USB drive Insertion

```
[root@Matrix700 ~]# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda                  8:0      1  14.5G  0 disk
`-sda1               8:1      1  14.5G  0 part
mmcblk0             179:0    0   7.3G  0 disk
`-mmcblk0p1         179:1    0   7.3G  0 part /
mtdblock0           31:0    0   8.3M  0 disk
mtdblock1           31:1    0   8.2M  0 disk
mtdblock2           31:2    0   7.7M  0 disk
mtdblock3           31:3    0   7.7M  0 disk
mtdblock4           31:4    0   7.6M  0 disk
mtdblock5           31:5    0   3.9M  0 disk
```

Mount sda1 to /media.

```
[root@Matrix700 ~]# mount /dev/sda1 /media
[root@Matrix700 ~]# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda                  8:0      1  14.5G  0 disk
`-sda1               8:1      1  14.5G  0 part /media
mmcblk0             179:0    0   7.3G  0 disk
`-mmcblk0p1         179:1    0   7.3G  0 part /
mtdblock0           31:0    0   8.3M  0 disk
mtdblock1           31:1    0   8.2M  0 disk
mtdblock2           31:2    0   7.7M  0 disk
mtdblock3           31:3    0   7.7M  0 disk
mtdblock4           31:4    0   7.6M  0 disk
mtdblock5           31:5    0   3.9M  0 disk
```

Unmount /media.

```
[root@Matrix700 ~]# umount /media
```

## 14. Web Server Settings

### 14.1 Nginx Web Server

The Matrix-700 comes with pre-installed **nginx** web server. The configuration file is **/etc/nginx/nginx.conf**.



### 14.2 Root Web Page Directory

The default root web page directory path is **/var/www/localhost/html**. This path can be changed by modifying the above configuration file.

```
[root@Matrix700 ~]#ls /var/www/localhost/html
50x.html  index.html

[root@Matrix700 ~]#
```

## 15. Auto-start a Program after System Boot-up

To automatically start a program after system boot-up, please edit a shell script to execute the program, and put that script file to the folder: **/etc/rc5.d**.

```
[root@Matrix700 ~]#ls /etc/rc5.d
S01networking S12rpcbind      S20atd          S20syslog  S99readyled
S99usb gadget
S02dbus-1     S15mountnfs.sh S20hwclock.sh  S90crond   S99rmnologin.sh
  S99webmin
S09sshd      S19nfscommon   S20nfsserver   S92nginx   S99stop-bootlogd

[root@Matrix700 ~]#
```





## 17. Re-boot the Matrix-700

To re-boot the Matrix-700, use the **reboot** command.

```
[root@Matrix700 ~]# reboot  
Broadcast message from root@Matrix700 (ttyGS0) (Sun May 8 15:51:47 2016):  
The system is going down for reboot NOW!
```

## 18. User Application Development

### 18.1 Install the C/C++ Cross Compilation Toolchain

The following instructions are based on **64-bit** Ubuntu Linux environment.

**Step 1:** Download the toolchain installation script from Artila's website, the URL is:

```
$ wget http://www.artila.com/download/deb/sdk/poky-glibc-x86_64-artila-full-cmdline-cortexa5hf-vfp-toolchain-2.0.2.sh
```

**Step 2:** Execute the toolchain installation script.

```
$ sh poky-glibc-x86_64-artila-full-cmdline-cortexa5hf-vfp-toolchain-2.0.2.sh
```

**Step 3:** Source the environment file setup script.

```
$ source /opt/poky/2.0.2/environment-setup-cortexa5hf-vfp-poky-linux-gnueabi
```

```
$ wget http://www.artila.com/download/deb/sdk/poky-glibc-x86_64-artila-full-cmdline-cortexa5hf-vfp-toolchain-2.0.2.sh
--2016-06-02 10:44:34-- http://www.artila.com/download/deb/sdk/poky-glibc-x86_64-artila-full-cmdline-cortexa5hf-vfp-toolchain-2.0.2.sh
Resolving www.artila.com (www.artila.com)... 50.87.93.43
Connecting to www.artila.com (www.artila.com)|50.87.93.43|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 552225625 (527M) [application/x-sh]
Saving to: 'poky-glibc-x86_64-artila-full-cmdline-cortexa5hf-vfp-toolchain-2.0.2.sh'

$ sh poky-glibc-x86_64-artila-full-cmdline-cortexa5hf-vfp-toolchain-2.0.2.sh
Poky (Yocto Project Reference Distro) SDK installer version 2.0.2
=====
Enter target directory for SDK (default: /opt/poky/2.0.2):
The directory "/opt/poky/2.0.2" already contains a SDK for this architecture.
If you continue, existing files will be overwritten! Proceed[y/N]? y
[sudo] password for uj:
Extracting SDK.....done
.....done
Setting it up...done
SDK has been successfully set up and is ready to be used.
Each time you wish to use the SDK in a new shell session, you need to source the environment setup script e.g.
$ . /opt/poky/2.0.2/environment-setup-cortexa5hf-vfp-poky-linux-gnueabi

$ source /opt/poky/2.0.2/environment-setup-cortexa5hf-vfp-poky-linux-gnueabi

$
```

## 18.2 Use the C Cross Compilation Toolchain

**Step 1:** Use `$CC` command to compile the C source file.

**Step 2:** Use `scp` command to upload the compiled file to the Matrix-700.

```
dir: ~
$ cat hello.c
#include <stdio.h>

int main(){
printf("Hello World!\n");
return 0;
}

dir: ~
$ $CC -o hello_c hello.c

dir: ~
$ scp hello_c root@192.168.1.70:/home/root
root@192.168.1.70's password:
hello_c                               100% 9800      9.6KB/s   00:00

dir: ~
$
```

## 18.3 Use the C++ Cross Compilation Toolchain

**Step 1:** Use `$CXX` command to compile the C++ source file.

**Step 2:** Use `scp` command to upload the compiled file to the Matrix-700.

```
dir: ~
$ cat hello.cpp
#include <iostream>
using namespace std;
int main() {
cout << "Hello! World!\n";
return 0;
}

dir: ~
$ $CXX -o hello_cpp hello.cpp

dir: ~
$ scp hello_cpp root@192.168.1.70:/home/root
root@192.168.1.70's password:
hello_cpp                               100%  11KB  10.9KB/s   00:00

dir: ~
$
```

## 18.4 Use Native C Compilation Toolchain

User application can also be developed on the Matrix-700 directly. By default, gcc toolchain is pre-installed on the Matrix-700.

Use the **gcc** command to build a C source file.

```
[root@Matrix700 ~]# cat hello.c
#include <stdio.h>
int main()
{
    printf("Hello World!\n");
}

[root@Matrix700 ~]# gcc -o hello hello.c

[root@Matrix700 ~]# ./hello
Hello World!

[root@Matrix700 ~]#
```

## 18.5 Install Native C++ Compilation Toolchain

Users can also install C++ toolchain via apt-get. Two packages are needed to build a C++ source file, the **g++** package and the **g++-symlinks** package.

```
[root@Matrix700 ~]# apt-get update
[root@Matrix700 ~]# apt-get install g++-symlinks g++
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  g++ g++-symlinks
0 upgraded, 2 newly installed, 0 to remove and 63 not upgraded.
Need to get 222 kB of archives.
After this operation, 0 B of additional disk space will be used.
WARNING: The following packages cannot be authenticated!
  g++ g++-symlinks
Install these packages without verification? [y/N] y
Get:1 http://www.artila.com/download/deb/cortexa5hf-vfp/ cortexa5hf-vfp
/main g++
  armel 5.2.0-r0 [221 kB]
Get:2 http://www.artila.com/download/deb/cortexa5hf-vfp/ cortexa5hf-vfp
/main g++
  -symlinks armel 5.2.0-r0 [780 B]
Fetched 222 kB in 1s (178 kB/s)
Selecting previously unselected package g++.
(Reading database ... 10440 files and directories currently installed.)
Preparing to unpack ../g++_5.2.0-r0_armel.deb ...
Unpacking g++ (5.2.0-r0) ...
Selecting previously unselected package g++-symlinks.
Preparing to unpack ../g++-symlinks_5.2.0-r0_armel.deb ...
Unpacking g++-symlinks (5.2.0-r0) ...
Setting up g++ (5.2.0-r0) ...
Setting up g++-symlinks (5.2.0-r0) ...
[root@Matrix700 ~]#
```

## 18.6 Use Native C++ Compilation Toolchain

Use **g++** command to build a C++ source file.

```
[root@Matrix700 ~]# cat hello.cpp
#include <iostream>
using namespace std;
int main() {
cout << "Hello World!\n";
return 0;
}
[root@Matrix700 ~]# g++ -o hello_cpp hello.cpp
[root@Matrix700 ~]# ./hello_cpp
Hello World!
[root@Matrix700 ~]#
```

## 18.7 Use the Python Interpreter

The Matrix-700 comes with pre-built Python 2.7 interpreter.

```
[root@Matrix700 ~]# python
Python 2.7.9 (default, May 23 2016, 16:12:48)
[GCC 5.2.0] on linux2
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

The Matrix-700 also supports **pip**.

```
[root@Matrix700 ~]# pip list
You are using pip version 7.1.0, however version 8.1.2 is available.
You should consider upgrading via the 'pip install --upgrade pip' command.
bottle (0.12.9)
Flask (0.10.1)
itsdangerous (0.24)
Jinja2 (2.8)
MarkupSafe (0.23)
pip (7.1.0)
pyserial (3.0.1)
setuptools (21.0.0)
uWSGI (2.0.13.1)
Werkzeug (0.11.10)
wheel (0.29.0)
```

## APPENDIX

### A. How to Configure WiFi USB Dongle

```
## install driver
apt-get install kernel-module-rtl8192cu

## modify interface configure (/etc/network/interfaces)
# Wireless interfaces
auto wlan0
iface wlan0 inet dhcp
    wireless_mode managed
    wireless_essid Artila
    #wpa-driver wext
    wpa-driver nl80211
    wpa-conf /etc/wpa_supplicant.conf

## modify wpa_supplicant.conf (/etc/wpa_supplicant.conf)
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=0
update_config=1
ap_scan=1

network={
    ssid="Artila"
    key_mgmt=NONE
    wep_key0=ABCABCABC
}

## restart networking or reboot
/etc/init.d/networking restart
```

### B. Webmin for Matrix-700

Category	Function name	Webmin function name
<b>User Manager</b>	User List	System/Users and Groups
<b>System Manager</b>	Network Interface	Networking/Network Configuration/Network Interfaces
	DNS	Networking/Network Configuration/Hostname and DNS Client
	Login Message	NA
	Bootup and Shutdown	System/Bootup and Shutdown
	Running Process	System/Running Processes
	Disk Manager	System/Disk and Network Filesystems
	System Information	NA

<https://192.168.2.127:10000>

Username: admin

Password: admin

▪ **Root (System)**

Path: System

▪ **User Manager**

Path: System/User and Groups

Username	User ID	Group	Real name	Home directory	Shell
root	0	root	root	/home/root	/bin/sh
daemon	1	daemon	daemon	/usr/sbin	/bin/sh
bin	2	bin	bin	/bin	/bin/sh
sys	3	sys	sys	/dev	/bin/sh
sync	4	nogroup	sync	/bin	/bin/sync
games	5	games	games	/usr/games	/bin/sh
man	6	man	man	/var/cache/man	/bin/sh
lp	7	lp	lp	/var/spool/lpd	/bin/sh
mail	8	mail	mail	/var/mail	/bin/sh
news	9	news	news	/var/spool/news	/bin/sh
uucp	10	uucp	uucp	/var/spool/uucp	/bin/sh
proxy	13	proxy	proxy	/bin	/bin/sh
www-data	33	www-data	www-data	/var/www	/bin/sh
backup	34	backup	backup	/var/backups	/bin/sh
list	38	list	Mailing List Manager	/var/list	/bin/sh
irc	39	irc	irc	/var/run/ircd	/bin/sh
gnats	41	gnats	Gnats Bug-Reporting System (admin)	/var/lib/gnats	/bin/sh
nobody	65534	nogroup	nobody	/nonexistent	/bin/sh
messagebus	999	messagebus		/var/lib/dbus	/bin/false
rpc	998	rpc		/	/bin/false
rpcuser	997	rpcuser		/var/lib/nfs	/bin/false
www	996	www		/var/www/localhost	/bin/sh
sshd	995	sshd		/var/run/sshd	/bin/false
guest	1000	guest		/home/guest	/bin/sh
dauid	1001	dauid		/home/dauid	/bin/sh

▪ **System Manager**

Path: System/Network Configuration





## ▪ Running Process

Path: System/Runing processing

ID	Owner	Started	Command
1	root	11:43	init [5]
114	root	11:43	lib/udev/udev-d
369	root	11:43	lib/udev/udev-d
290	root	11:43	udhcpd -R -b -p /var/run/udhcpd.eth0.pid -i eth0
299	messagebus	11:43	usr/bin/dbus-daemon --system
310	root	11:43	usr/sbin/sshd
322	rpe	11:43	usr/sbin/rpebind
336	root	11:43	usr/sbin/atd -f
350	root	11:43	sbin/syslogd
352	root	11:43	sbin/klogd
357	root	11:43	nginx: master process /usr/sbin/nginx
359	www-data	11:43	nginx: worker process
388	root	11:43	usr/sbin/crond
403	root	11:43	-sh
404	root	11:43	sbin/getty 38400 tty1
405	root	11:43	sbin/getty -L ttyGS0 115200 vt100
548	root	14:33	usr/bin/perl /usr/lib/webmin/webmin/miniserv.pl /etc/webmin/miniserv.conf
598	root	14:40	[usr/lib/webmin] <defunct>
599	root	14:40	usr/lib/webmin/webmin/proc/index_tree.cgi
606	root	14:40	sh -c ps --cols 2048 -eo user:80,ruser:80,rgroup:80,pid,ppid,pcpu,...
607	root	14:40	ps --cols 2048 -eo user:80,ruser:80,rgroup:80,pid,ppid,pcpu,vsz,ni ...
4	root	11:43	[kthreadd]
3	root	11:43	[ksoftirqd/0]
5	root	11:43	[kworker/0:0H]
6	root	11:43	[kworker/u2:0]
7	root	11:43	[khelper]
8	root	11:43	[kdevtmpfs]
9	root	11:43	[perf]
10	root	11:43	[writeback]
11	root	11:43	[crypto]

## ▪ Disk and Network Filesystems

Path: System/ Disk and Network Filesystems

Mounted as	Type	Location	Used	In use?	Saved?
/ (Root filesystem)	Unknown Type	/dev/root	20%	Yes	Yes
/media	Unknown Type	SD-Card device 1 partition 1		No	Yes
/mnt/sda1	Unknown Type	SCSI device A partition 1		No	Yes
/sys/kernel/config	CONFIGFS	none		Yes	No

## Setup Eclipse IDE

- Download Eclipse IDE for C/C++ Developers (Luna) from <http://www.eclipse.org/downloads>.
- Select **"Install New Software"** from **"Help"** menu.
- Add **"Luna - <http://download.eclipse.org/releases/luna>"**.
- Select the **Linux Tools** LTTng Tracer Control, Linux Tools LTTng Userspace Analysis, and LTTng Kernel Filesystem Analysis from "Linux Tools". If these selections do not appear in the list, that means the items are already installed.
- Expand the box next to **"Mobile and Device Development"** and select the following boxes.

Again, if any of the following items are not available for selection, that means the items are already installed:

- C/C++ Remote Launch (Requires RSE Remote System Explorer)
- Remote System Explorer End-user Runtime
- Remote System Explorer User Actions

- Target Management Terminal (Core SDK)
- TCF Remote System Explorer add-in
- TCF Target Explorer
- Expand the box next to "**Programming Languages**" and select the C/C++ Autotools Support and C/C++ Development Tools boxes. For Luna, these items do not appear on the list as they are already installed.
- Complete the installation and restart the Eclipse IDE

### Install the Eclipse Yocto Plug-in

- In Eclipse, select "**Install New Software**" from the "**Help**" menu.
- Add URL "<http://downloads.yoctoproject.org/releases/eclipse-plugin/2.0/luna>" and provide a meaningful name.
- Select Yocto Project ADT Plug-in, Yocto Project Bitbake Commander Plug-in, and Yocto Project Documentation plug-in.
- Complete the installation and restart the Eclipse IDE.

### Configuring the Cross-Compiler Options

- Choose "**Preferences**" from the "**Window**" menu to display the Preferences Dialog.
- Click "**Yocto Project ADT**" to display the configuration screen.
- Selecting the Toolchain Type: Standalone pre-built toolchain.
- Point to the Toolchain: `/opt/poky/2.0.2`.
- Specify the Sysroot Location: `/opt/poky/2.0.2/sysroots`.
- Select the Target Architecture: `cortexa5hf-vfp-poky-linux-gnueabi`.

### Example: Creating a Hello World Project

- Select "**Project**" from the "**File -> New**" menu.
- Double click C/C++.
- Double click C Project to create the project.
- Expand **Yocto Project ADT Autotools Project**.
- Select **Hello World ANSI C Autotools Project**. This is an Autotools-based project based on a Yocto template.
- Put a name in the Project name: field. Do not use hyphens as part of the name.
- Click "**Next**".
- Add information in the Author and Copyright notice fields.
- Click "**Finish**".
- Right-click in the navigation pane and select "**Reconfigure Project**" from the pop-up menu. This selection reconfigures the project by running `autogen.sh` in the workspace for your project.
- To build the project select "**Build Project**" from the "**Project**" menu.

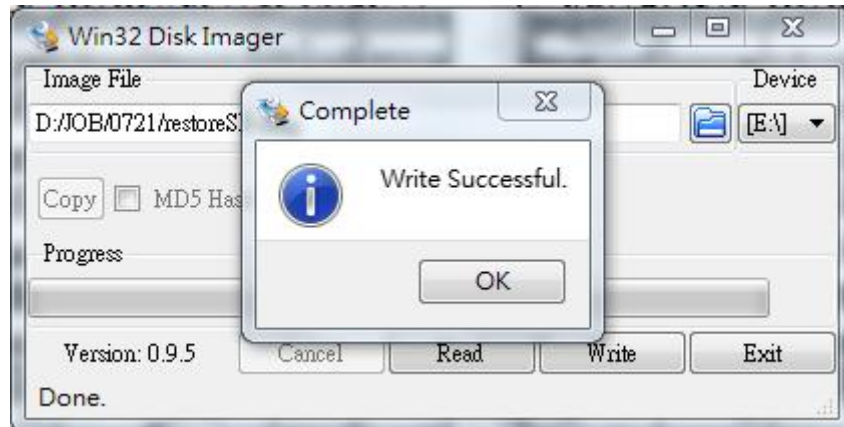
### C. Restore to Default

1. Create a bootable SD

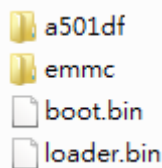
Please prepare a micro SD card (8GB capacity is recommend) and a SD card adapter.

## 1.1 For Windows

- 1.1.1. Download 'win32diskimager' from <https://sourceforge.net/projects/win32diskimager/>
- 1.1.2. Image and Document are downloaded from [http://www.artila.com/download/A5D35/Linux/image/restore\\_700](http://www.artila.com/download/A5D35/Linux/image/restore_700)
- 1.1.3. Load 'win32diskimager' and browse for the image file, 'restoreSD.img', selecting it.



- 1.1.4. Next, set the drive letter for the Device and click Write to begin reimaging.



## 1.2 For Linux

Using 'dd' command , for example,

```
sudo dd bs=1m if=<image file>.img of=/dev/<disk#>
```

```
sudo dd bs=1m if=restoreSD.img of=/dev/sdc
```

2. Insert bootable SD to Matrix-700 and power-up it, then entrance the root directory. (User: root / Password: root)
3. Execute 'restore' command. If the command can't be found, just install it from our repository.

For example:

```
apt-get update
```

```
[root@Matrix700 ~]#apt-get update
Ign http://www.artila.com Matrix700 InRelease
Ign http://www.artila.com cortexa5hf-vfp InRelease
Ign http://www.artila.com all InRelease
Ign http://www.artila.com Matrix700 Release.gpg
Ign http://www.artila.com cortexa5hf-vfp Release.gpg
Ign http://www.artila.com all Release.gpg
Ign http://www.artila.com Matrix700 Release
```

```
Ign http://www.artila.com cortexa5hf-vfp Release
Ign http://www.artila.com all Release
Get:1 http://www.artila.com Matrix700/main armel Packages [441 kB]
Get:2 http://www.artila.com cortexa5hf-vfp/main armel Packages [2200 kB]
Get:3 http://www.artila.com all/main armel Packages [38.1 kB]
Ign http://www.artila.com Matrix700/main Translation-en
Ign http://www.artila.com cortexa5hf-vfp/main Translation-en
Ign http://www.artila.com all/main Translation-en
Fetched 2679 kB in 16s (167 kB/s)
Reading package lists... Done
```

#### apt-get install restore

```
[root@Matrix700 ~]#apt-get install restore
Reading package lists... Done
Building dependency tree... Done
restore is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

4. The process of restore won't be finished until the ready LED is always ON. The estimated time for restore progress that take around 10 minutes.