pcDuino OS

Installation Guide

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HISTORY

Version	Date	Description	Author
0.1	3/08/2013	Initial specification draft	Lifeng Zhao
0.2	4/05/2013	Added for new kernel and OS release Fix the incorrect descriptions of the kernel update procedure for the previous OS updates.	Lifeng Zhao
0.3	4/09/2013	Fix the incorrect commands for write a bootable SD card on MacOS	Lifeng Zhao

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1. Overview

This guide gives the detailed instructions on how to reinstall the operating system to the on board flash storage of pcDuino. We also show how to create a bootable Ubuntu OS on the SD card. Ubuntu is pre-installed in pcDuino's on board flash at production. But there are times that you want to upgrade the pre-installed Ubuntu or install the new Android OS to pcDuino.

The following are top and bottom views of pcDuino.
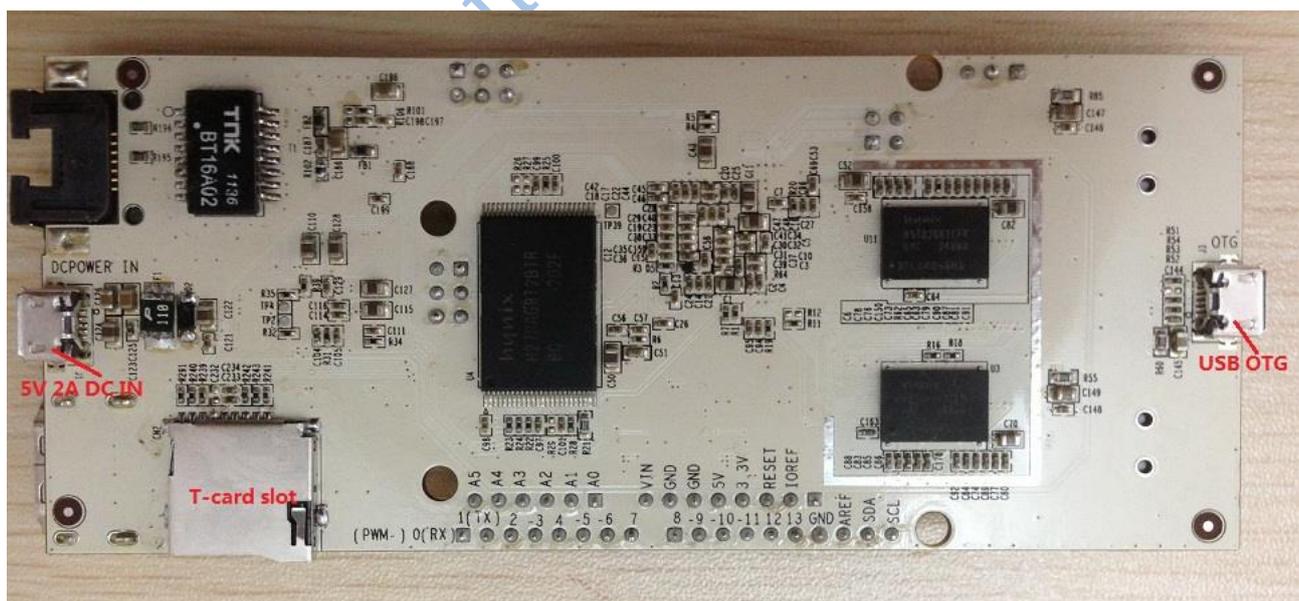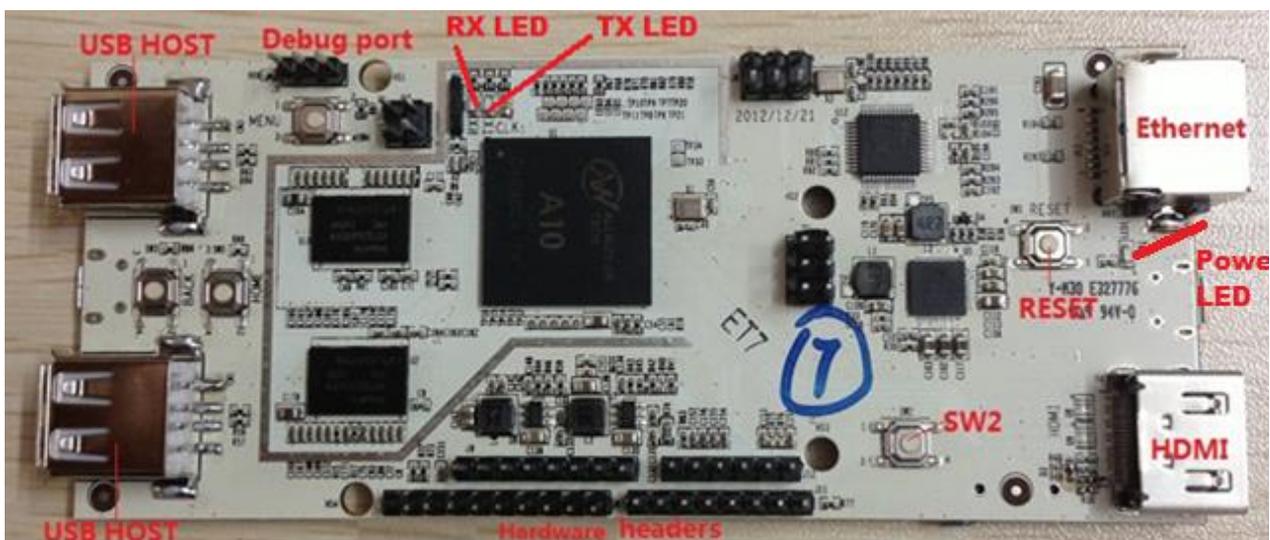
There are three status LEDs on the board. These are Power, TX, and RX LEDs respectively. It is important to take a look at these LEDs when you do troubleshooting or perform the OS updates on flash. The following table shows how these LEDs look like when you perform various tasks on one well performed board.

LED status on typical working board

	Power LED	TX LED	RX LED
Board boot-up	On	Off	Off
Board boot up to Ubuntu	On	On	On
Good working board	On	On	On

LED status when burn image (dated April 4th.,2013) to the board

	Power LED	TX LED	RX LED
Linux kernel is burning to flash	On	Blink Slowly	Off
Linux kernel burning is complete	On	Off	Off
Linux kernel burning is failed	On	Blink rapid	Off
Linux kernel is updated, wait for Ubuntu update	On	Blink slowly	On
Ubuntu image is burning to flash	On	Blink rapid	On
Ubuntu image burning is complete	On	Blink slowly	Blink slowly
Ubuntu image burning is failed	On	Blink rapid	Blink rapid

LED status when burn image (dated before April 1st., 2013) to the board

	Power LED	TX LED	RX LED
Linux kernel is burning to flash	On	Off	Off
Linux kernel burning is complete	On	Off	Off
Linux kernel burning is failed	On	Off	Off
Linux kernel is updated, wait for Ubuntu update	On	Blink slowly	On
Ubuntu image is burning to flash	On	Blink rapid	On
Ubuntu image burning is complete	On	Blink slowly	Blink slowly
Ubuntu image burning is failed	On	Blink rapid	Blink rapid

Cautions: the OS installation and status LED act differently for old and latest OS releases. So please be careful if you work with the OS releases dated before April 1st., 2013 that are treated as old releases. It is highly recommended that you apply the latest release instead of the old one though.

2. Required hardware for all samples in this user guide

pcDuino board
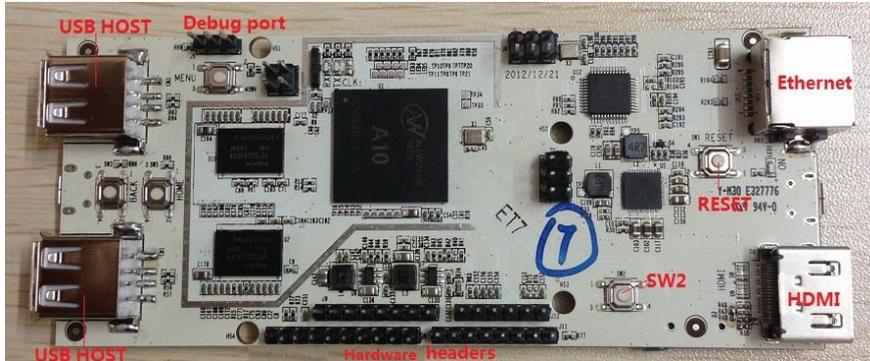
micro-USB port power adaptor (5V, 2000mA)

Display with HDMI port

HDMI cable

USB keyboard (must)

USB Hub and USB mouse (optional but strongly recommended)

micro-SD card and card reader

Note:

Before run the following samples, Connect pcDuino with the devices correctly:

USB host port => USB hub => keyboard & mouse

HDMI port => HDMI cable => HDMI display

3. Required software in this user guide

PhonixCard: a free tool that can create the production card for OS installation. This tool will create one hidden disk partition in your card that you couldn't format directly in your Windows PC.

Note: before using a micro-SD card to create the production card, please backup all the files on this card. After installation, you need use PhonixCard to recover the micro-SD card for normal use.

Win32DiskWriter: a Window PC free software that could be used to create bootable SD card for Ubuntu. It is used to copy the raw OS image file to the SD card. It is the same as dd in Linux or Mac OS.

dd: a free software in Linux or Mac OS that could be used to create bootable SD card for Ubuntu. It is used to copy the raw OS image file to the SD card.

Cautions: Never use this tool to write to your hard disk, it may destroy your hard disk entirely.

LiveSuit: a free tool that can upgrade firmware by USB device. To use this tool, you must install two USB drivers. You can download the tool and drivers from internet and read the user manual.

Note: LiveSuit is not very stable on Windows Vista or Windows 7, and it does not work well on 64 bits CPU. So this tool is not recommended. Please use **PhonixCard** for production and firmware upgrade as your first choice.

Hyper terminal: with the hyper-terminal tool, you can type the command in the linux shell of the device when the device is connected to the PC with USB serial cable. SecureCRT is the recommended tool.

4. Install Ubuntu on pcDuino

Warning: Be sure to copy your valuable (or invaluable) assets from the board before you apply the new OS images.

This chapter is separated into two parts, the first part discusses how to install a new Ubuntu OS to the NAND flash with micro-SD card and the second part describes how to create bootable micro-SD card for Ubuntu.

4.1 Steps to burn the Linux Kernel and Ubuntu image to NAND flash

The complete installation of the Ubuntu OS needs install both Linux kernel and Ubuntu image. The process is separated into two steps. The first step is to update Linux kernel and the second is to install Ubuntu.

Step 1: Install Linux kernel

a) Download the Linux kernel and Ubuntu image files for pcDuino

The download page is:

http://www.pcduino.com/?page_id=14

If burning the old kernel dated before April 1st., 2013, please follow the instructions below:

Find the Ubuntu link in this page and download it. Unzip it and get two files like these:

- a10_kernel_xxx.img
- Ubuntu.zip

The first file is used in kernel upgrade, and the second one is used to update Ubuntu in step 2.

For OS dated after April 1st., 2013, the release is separated into kernel and Ubuntu.

Find the image files for kernel in the download page. There are two different files available. Please use the LiveSuite or Phonexcard with file downloaded from the link (https://s3.amazonaws.com/pcduino/Images/a10_kernel_livesuit_20130403.img). Or you could use the Win32DiskImager in Windows PC or dd in Linux to write the file (https://s3.amazonaws.com/pcduino/Images/a10_kernel_disk32imager_20130403.7z, unzipped it first) to SD card. These files are different so please be careful to use correct file for the corresponding tools.

Note: we provide two files simply because there are people prefer using one tool than the other. If it makes you confuse, my apologies.

b) Download the Phonenix Card software

The download page is:

http://www.pcduino.com/?page_id=14

Find the "Phonenix Card" link under Tools in this page and download it. Unzip it to a new folder with default name PhoenixCardV306_20120302.

c) Write Linux Kernel to TF card

    i.   Plug your micro-SD card to your PC, run "PhoenixCard.exe". You will see something like this:
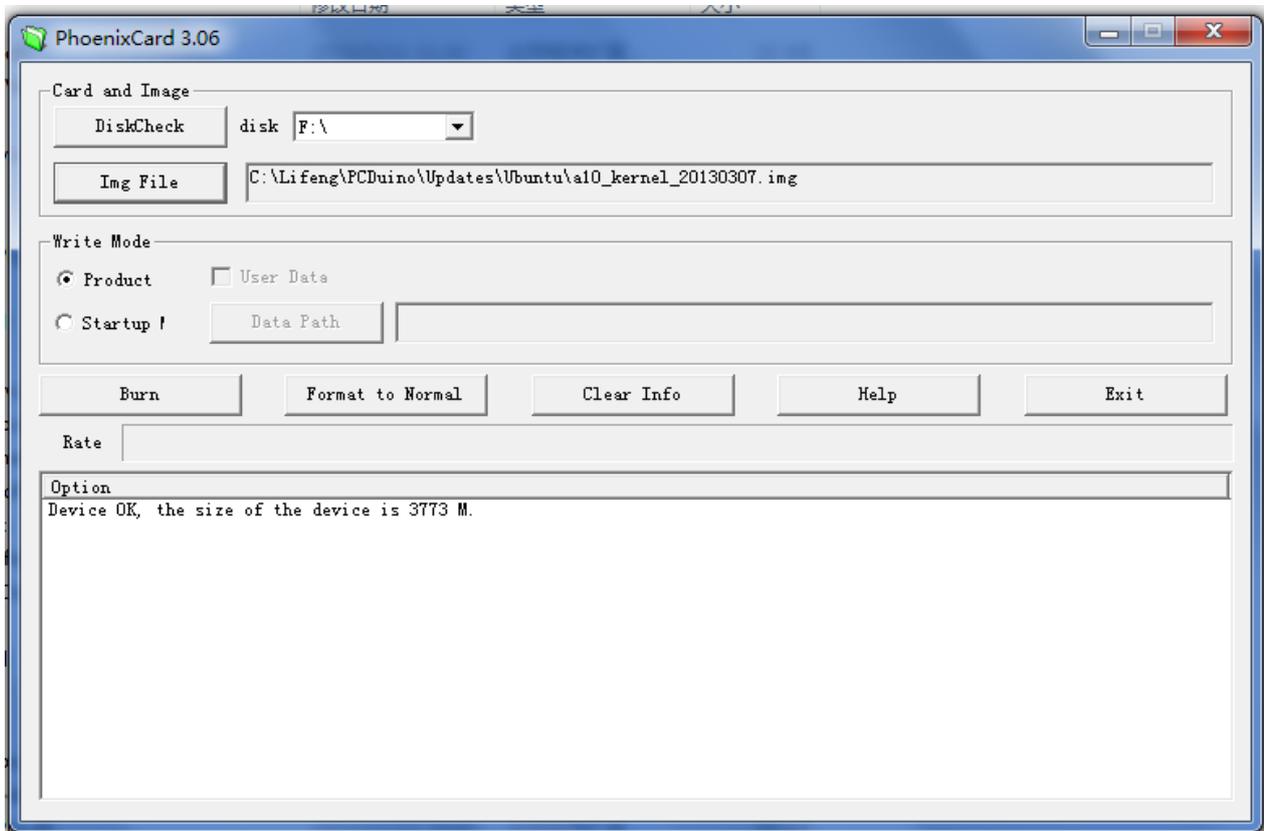
    ii.   Choose the Linux kernel image file a10_kernel_xxx.img that you've downloaded and write it to micro-SD card
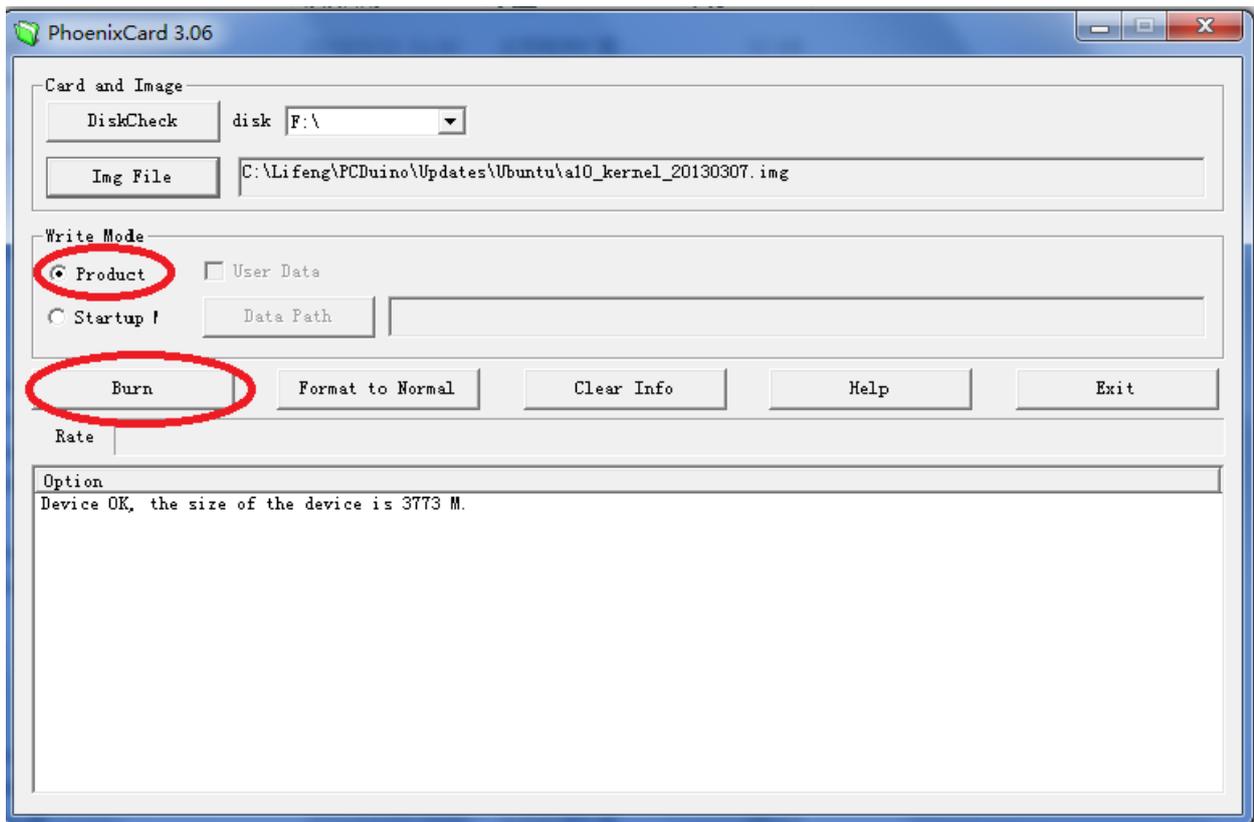
After a few minutes, the TF card is ready to use to burn the kernel to the flash in pcDuino.

d) **Burn the Linux Kernel to internal flash from micro-SD card**

The RX and TX LEDs are shown differently in the old and new kernel updates. If you update the old kernel dated before April 1st.,2013,

a) Plug the micro-SD card to the pcDuino, power on the board, and then wait for one minute

b) Eject the TF card and reset the device. If you see the RX LED stays on, and the TX LED is blinking, the kernel is updated successfully.

 Or, if you update the kernel dated after April 1st., 2013,

a) Plug the micro-SD card to the pcDuino, power on the board, the TX LED starts blink slowly while RX LED stays off when kernel is burning.

b) Wait till the TX LED turns off. It indicates the kernel is burning successfully. Please eject the TF card and continue to the following steps. Otherwise,

c) If the TX LED blink rapid, the kernel is failed to burn to flash. Please eject the TF card and check if the kernel image file is correct.

e) **Restore the micro-SD card created in step 1, c)**

The micro-SD card is specially created in step 1, c) to allow it to be recognized by the ROMBOOT of the board. To avoid the unexpected update of the kernel, use the PhoenixCard to restore it to normal and clean card

i. Plug your micro-SD card to your PC, run PhoenixCard.exe.

ii. Select the micro-SD card in the disk scroll window, and choose "Format to Normal" to restore the card.
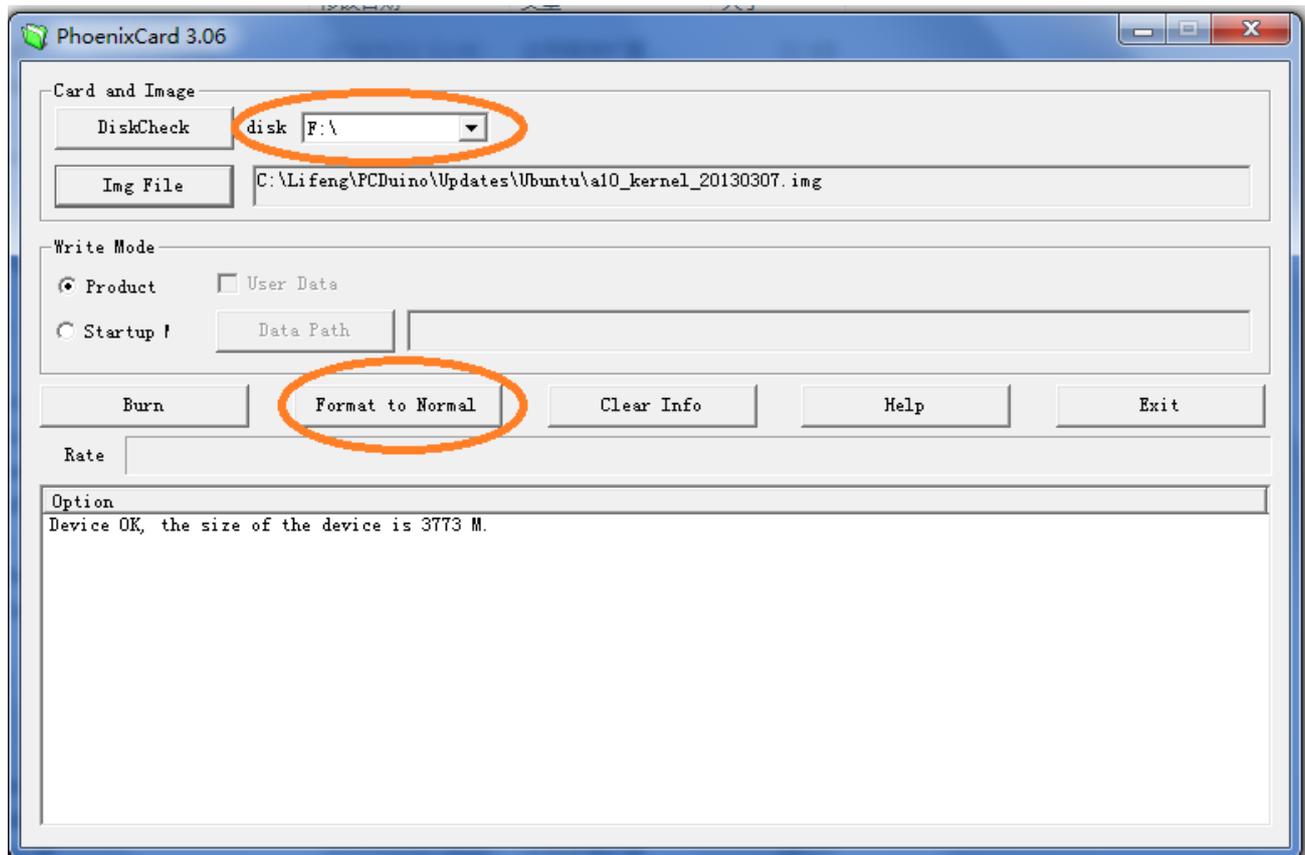
Burn the kernel in Linux PC

a) Insert the micro-SD card to Linux PC or pcDuino, the card will be mounted automatically. To continue, un-mount all the partitions on the card. For example,

If the SD has two partitions:
```
$ sudo umount /dev/mmcblk0p1
$ sudo umount /dev/mmcblk0p2
```

b) Then burn the downloaded and unzipped image file (a10_kernel_disk32imager_20130403.img) to the micro-SD card with the following command:
```
$ sudo dd if=/udisk/a10_kernel_disk32imager_20130403.img of=/dev/mmcblk0 bs=1M
$ sudo sync
```

The of=/dev/mmcblk0 points to the micro-SD card.
Cautions: Don't use "of=/dev/xxx" to point to your hard disk. It will destroy the contents in your hard disk.

Now the micro-SD card is ready for use to burn the OS image to internal flash.

c) Burn the OS image to internal flash from micro-SD card

    i.   Plug the micro-SD card to the pcDuino, power on the board, and then wait for one minute

    ii.   Eject the TF card and reset the device. If you see the RX LED stays on, and the TX LED is blinking, the kernel is updated successfully

Burn the kernel in MAC OS PC

a)   Open the terminal in MacOS, insert the micro-SD card, the card will be mounted automatically. To continue, un-mount all the partitions on the card. For example,

    If the SD has two partitions:

```
$ sudo umount /dev/disk1s1
$ sudo umount /dev/disk1s2
```

    If the SD card is failed to umount, you can use the following script to force umount:

```
$ sudo diskutil umount force /dev/disk1s1
$ sudo diskutil umount force /dev/disk1s2
```

b)   Then burn the downloaded and unzipped image file (a10_kernel_disk32imager_20130403.img) to the micro-SD card with the following command:

```
$ sudo dd if=/udisk/a10_kernel_disk32imager_20130403.img of=/dev/disk1 bs=1m
```

The of=/dev/disk1 points to the micro-SD card. After this command is complete, your Mac PC will pop up the message "can't identify the SD card" that indicates the file system in your card is unknown to Mac PC now.

Cautions: Don't use "of=/dev/xxx" to point to your hard disk. It will destroy the contents in your hard disk.

Now the micro-SD card is ready for use to burn the OS image to internal flash.

c)   Burn the OS image to internal flash from micro-SD card

    i.   Plug the micro-SD card to the pcDuino, power on the board, and then wait for one minute

    ii.   Eject the TF card and reset the device. If you see the RX LED stays on, and the TX LED is blinking, the kernel is updated successfully

Step 2: Install Ubuntu

a)   Unzip the Ubuntu.zip file obtained in Step 1, a)

If you use image file dated after April 1st, 2013, please unzip it to get two files as follows:
-    Update.sh: shell script for Ubuntu update
-    Ubuntu_xxx.img: image file for Ubuntu

Or, if you use image file dated before April 1st. , 2012, please unzip it to get three files like these:
-    Update.sh: shell script for Ubuntu update
-    Ubuntu_xxx.img: image file for Ubuntu
-    *.tgz (released on March 2013) or *.fex (released on Feb. 2013) file depending on the version that you are using

b)   Copy the three files unzipped in Step 2 , a) to micro-SD card or USB flash disk

c)   Burn the Ubuntu to internal flash

Plug the micro-SD card or USB flash disk to pcDuino and power on the device. If the TX LED starts to blink fast and RX LED always stays on, it indicates the Ubuntu is being burned to internal flash. Wait until both TX LED and RX LED blink slowly. It indicates that the Ubuntu is burned to internal flash successfully. Otherwise, if both TX LED and RX LED blink very fast, the Ubuntu is failed to burn to flash. If so, please make sure that you have all three files unzipped in step 2, a) in your disk and redo this step. This step usually takes around 10 minutes so be patient.

4.2 Steps to create SD bootable Ubuntu

In order to create a bootable micro-SD for Ubuntu OS, please use micro-SD card that is at least 4GB.

Under Windows:

1. **Download the SD bootable Ubuntu image for pcDuino**

The download link is:

http://www.pcduino.com/?page_id=14

Find the link for SD bootable Ubuntu image, download it, unzip it if needed, and get one file with .img extension.

2. **Download the Win32DiskImager software**

The download page is:

http://www.pcduino.com/?page_id=14

Find the Win32DiskImager link under Tools in this page and download it. Unzip it to a new folder with default name win32diskimager-v0.7-binary.

3. **Write SD bootable Ubuntu image to micro-SD card**

(a) Plug your micro-SD card to your PC, run "Win32DiskImager". You will see something like this:
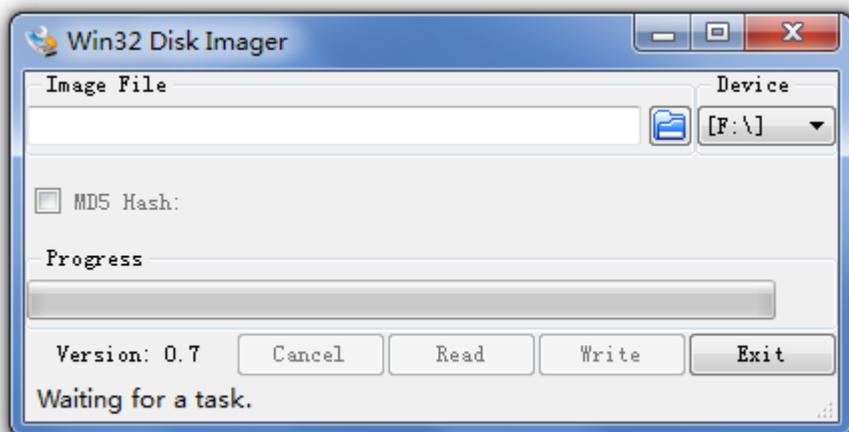
(b) Choose the SD bootable Ubuntu image file ubuntu_mmc_xxx.img that you've downloaded and write it to micro-SD card
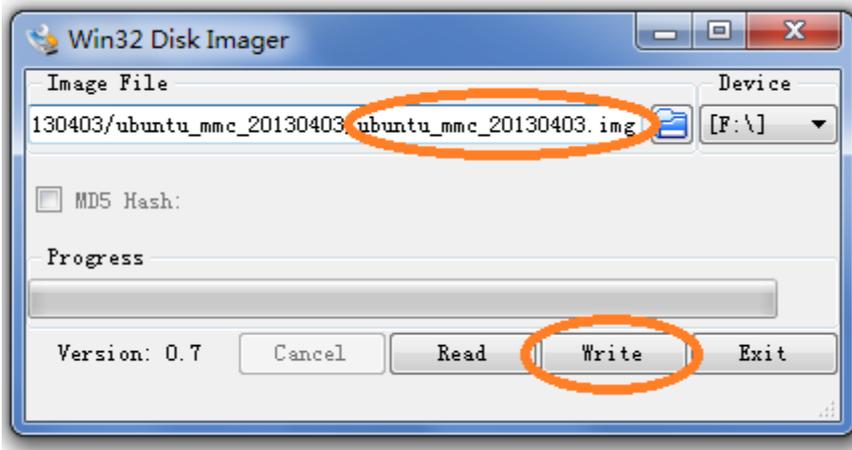
After a few minutes, when the progress bar reach 100%, the TF card is ready to use to bootup the pcDuino.

Under Linux:

1. Download the SD bootable Ubuntu image for pcDuino

The download link is:

http://www.pcduino.com/?page_id=14

Find the link for SD bootable Ubuntu image, download it, unzip it if needed, and get one file named like ubuntu_mmc_xxx.img.

2. Write SD bootable Ubuntu image to micro-SD card

a) Insert the micro-SD card to Linux PC or pcDuino, the card will be mounted automatically. To continue, un-mount all the partitions on the card. For example,

  If the SD has two partitions:
```
$ sudo umount /dev/mmcblk0p1
$ sudo umount /dev/mmcblk0p2
```

b) Then burn the downloaded and unzipped SD bootable image file (ubuntu_mmc_xxx.img) to the micro-SD card with the following command:
```
$ sudo dd if=/udisk/ubuntu_mmc_xxx.img of=/dev/mmcblk0 bs=1M
$ sudo sync
```

  The of=/dev/mmcblk0 points to the micro-SD card.
  Cautious: don't use "of=/dev/xxx" to point to your hard disk. It will destroy the contents in your hard disk.

  Now the micro-SD card is ready for use to boot up the pcDuino.

Under MacOS:

1. Download the SD bootable Ubuntu image for pcDuino

The download link is:

http://www.pcduino.com/?page_id=14

Find the link for SD bootable Ubuntu image, download it, unzip it if needed, and get one file named like ubuntu_mmc_xxx.img.

2. Write SD bootable Ubuntu image to micro-SD card

a) Open the terminal in MacOS, insert the micro-SD card, the card will be mounted automatically. To continue, un-mount all the partitions on the card. For example,

If the SD has two partitions:
```
$ sudo umount /dev/disk1s1
$ sudo umount /dev/disk1s2
```
If the SD card is failed to umount, you can use the following script to force umount:
```
$ sudo diskutil umount force /dev/disk1s1
$ sudo diskutil umount force /dev/disk1s2
```

b) Then burn the downloaded and unzipped image file (ubuntu_mmc_xxx.img) to the micro-SD card with the following command:
```
$ sudo dd if=/udisk/ ubuntu_mmc_xxx.img of=/dev/disk1 bs=1m
```

The of=/dev/disk1 points to the micro-SD card.

Cautions: Don't use "of=/dev/xxx" to point to your hard disk. It will destroy the contents in your hard disk.

Now the micro-SD card is ready for use to boot up the pcDuino board.

5. Install Android on pcDuino

Steps to install the Android to flash with micro-SD card (RECOMMEND)

1. Download the Android operating system for pcDuino

The download link is:

http://www.pcduino.com/?page_id=14

Find the link for Android image, download it and get one file with .img extension.

Cautions: You could use Livesuite or Phonenix card with this file. Please don't use Win32DiskImager or dd with this file, it isn't raw image file so it won't work with these tools.

2. Download the Phonenix Card software

The download page is:

http://www.pcduino.com/?page_id=14

Find the "Phonenix Card" link under Tools in this page and download it. Unzip it to a new folder with default name PhoenixCardV306_20120302.

3. Write pcDuino Android image to micro-SD card

(c) Plug your micro-SD card to your PC, run "PhoenixCard.exe". You will see something like this:

Doc Title	pcDunio OS Installation Guide	Number	WMSBB121219
		Version	0.3
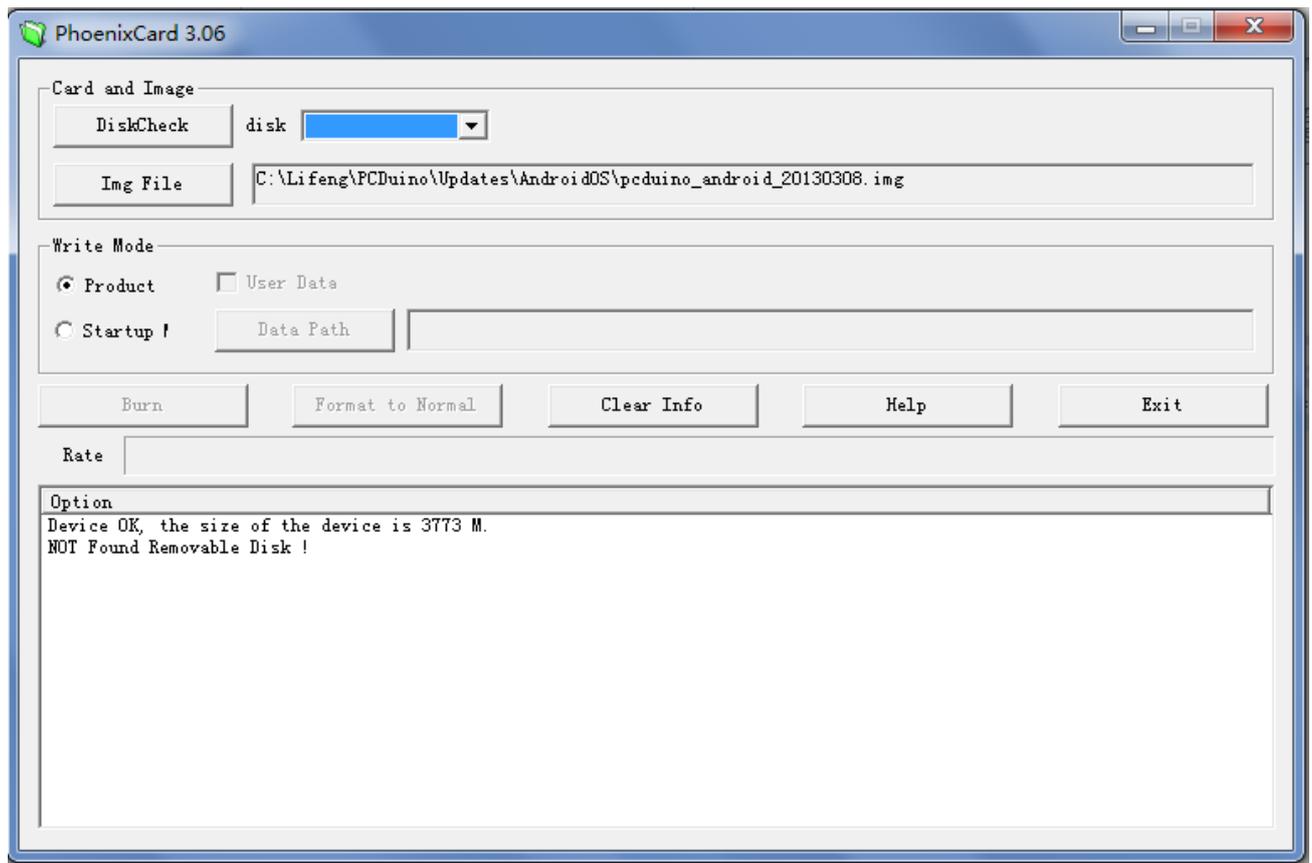
(d) Choose the Android image file pcduino_Android_ xxx.img that you've downloaded and write it to the micro-SD card
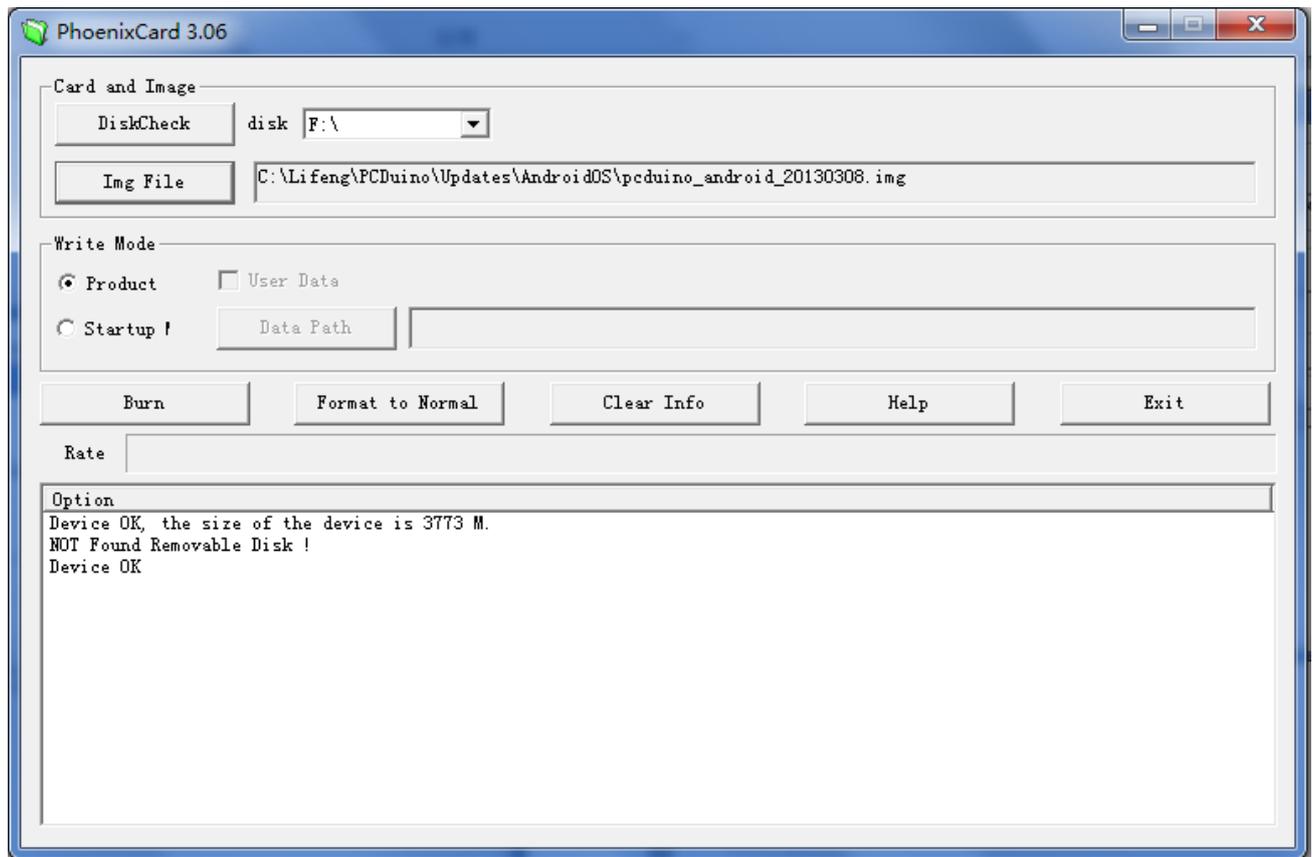
After a few minutes, the micro-SD card is ready to use.

4. **Burn the OS image to internal flash from micro-SD card**
   a) Plug the micro-SD card to the pcDuino and then power on the board. Wait for about four minutes
   b) Eject the micro-SD card and reset the device

* We have a catch in step (a). We don't have any LED to indicate when the boot image is burned completely unless you connect the hyper terminal to pcDuino, so please wait for four minutes patiently. Moreover, please eject the TF card before resetting the device. Otherwise, it will start to burn the OS image again if the TF card is inserted.

5. **Restore the micro-SD card created in step 3**

The micro-SD card is specially created in step 3 to allow it to be recognized by the ROMBOOT of the board. To avoid the unexpected update of the Android OS, use the PhoenixCard to restore it to normal and clean card

(e) Plug your micro-SD card to your PC, run "PhoenixCard.exe".

(f) Select the micro-SD card in the disk scroll window, and choose "Format to Normal" to restore the card.
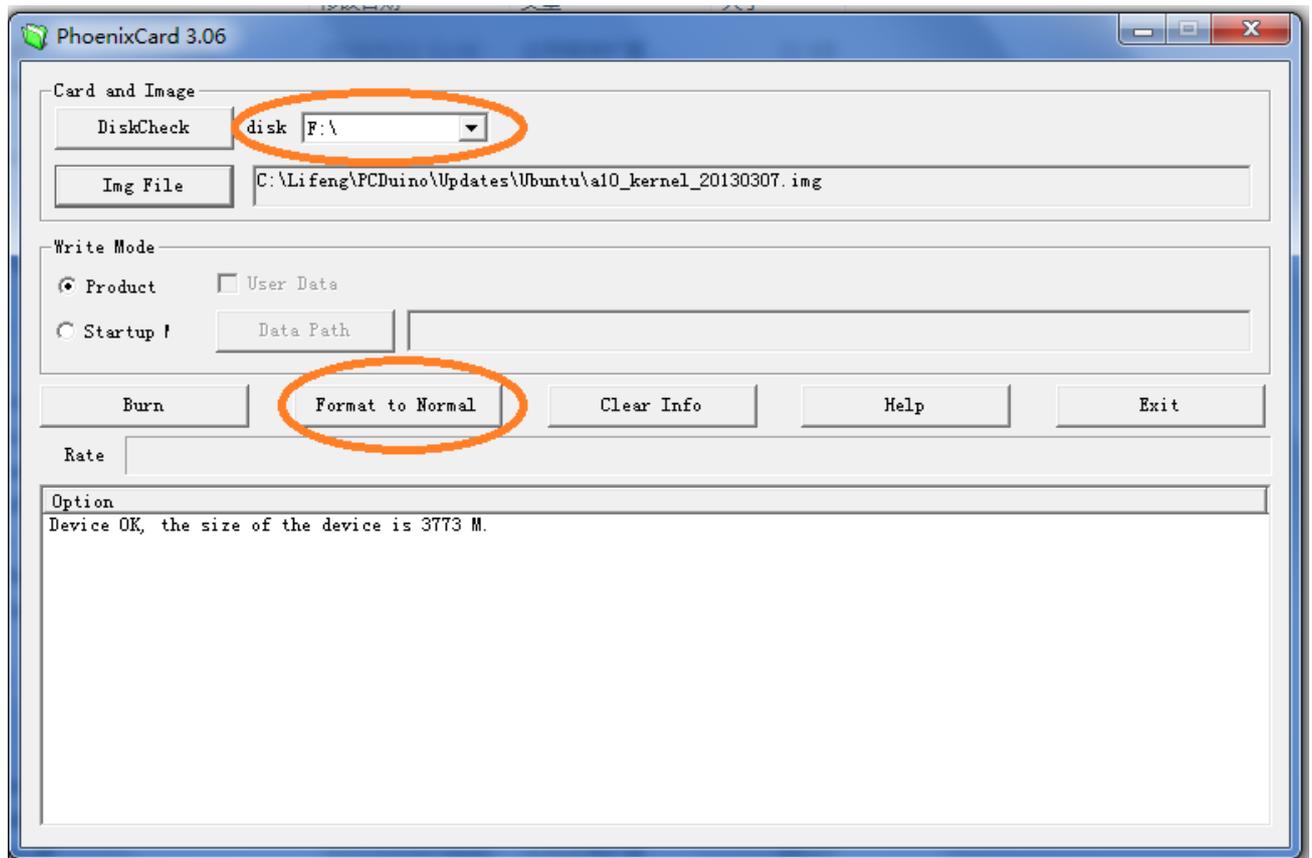
Doc Title	pcDunio OS Installation Guide	**Number**	WMSBB121219
		Version	0.3

6. Steps to update software from USB disk

Over time, we will have the bug fix or provide new features to pcDuino board. Most of the time, users do not need to update the whole operating system. Instead, we could add software patch to accomplish this. The procedure is simply like these:

1. Copy update package to USB disk (for example: update.sh, update.tgz)
2. Power on pcDuino board
3. Plugin the USB disk to USB host port
4. Open a terminal after login to Ubuntu
5. Run commands to update the package
   $ cd /media/*/
   $ bash ./update.sh

Note:

 If the USB disk has more than one partition, enter the whole path which the partition including update package is mounted, for example "cd /media/Volumn". If you don't know which partition to choose, open "File Manager" to check it.

   The name of update script (update.sh) and update package (update.tgz) may be different for the individual purpose.