Chipsee

Industrial PC

Angstrom OS on AM335X User Manual

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Angstrom OS

Chipsee Angstrom OS User Manual

This manual provides users with a fast guide of Chipsee Industrial Computer (Abbreviated as IPC) about Angstrom OS development. Through this manual, users can quickly understand the hardware resources; users can debug Angstrom OS via serial and Internet.

Revision	Date	Author	Description
V1.0	2021-12-09	Randy	Initial Version

SUPPORTED BOARDS:

> *CS80480T050 CS10600T070 CS10768T097*

PREBUILT FILES PACKAGE:

Prebuilt files for the various industrial PCs can be found in the OS Downloads.
Below are the links to the prebuilt files for each industrial PC model.

- CS80480T050
- CS10600T070
- CS10768T097

System Features

Feature	Comment
System	Angstrom 2012

Preparation

You will need to prepare the following items before you can start using the Prebuilt Files Package to re-flash the system.

- Power Supply Unit (PSU) with the appropriate voltages, as follows:

  > - Products with 5" display panel require 6V to 36V PSU
  > - Products with 7" to 10.1" display panel and larger require 6V to 42V PSU

- USB to serial cable for debugging Chipsee Industrial Embedded Computers (Chipsee IPC)
- TF Card to create a bootable storage for re-flashing the system. Use the prebuilt files link above to re-flash the system.

Hardware Requirements

- Chipsee Industrial PC
- PSU according to the instructions above
- USB-to-serial or other serial cable for debugging
- TF Card (at least 4GB) and card reader
- USB A-A cable (used only if the hardware configured as OTG)
- Windows 7 PC

Software Requirements

- Angstrom OS Prebuilt Files Package (from the link above)

> **Note**
>
> In this documentation, all the commands are executed with `root` user privileges.

Getting Started and Tests

DIP Switch Configuration

Set the boot DIP switch, as shown on the figure below, to boot the system from the external SD Card.

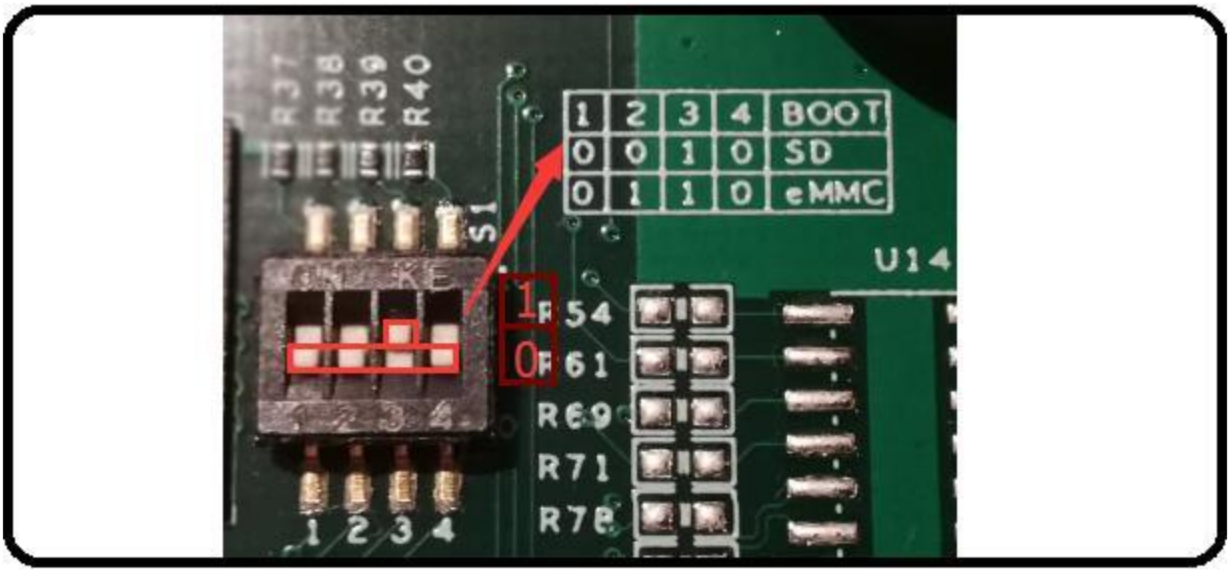

Figure 826: Boot Mode Setup

Downloading Images

Chipsee IPC supports booting from an integrated eMMC or an external TF Card (also known as the micro SD card). Booting from the external TF Card allows flashing the system OS.

> **Note**
>
> The operator should use the prebuilt file we provided in the CD to test the hardware before re-flashing the system.

Prebuilt Files Package

You can get the Prebuilt Files Package for each model from links mentioned at the beginning of this documentation. You can also get the Prebuilt Files Package from the DVD in /Angstrom/Prebuilds folder. However, it may be outdated so always compare the versions (the last number in the filename is the release date).

The prebuilt package has the following content:

Contents	Comment
boot/imx6ulipc.dtb	TF Card boot dtb file

Contents	Comment
boot/u-boot.imx	TF Card boot bootloader
boot/zImage	TF Card boot kernel file
filesystem/rootfs-emmc-flasher.tar.bz2	TF Card boot rootFS
mksdcard.sh	Shell tools to make bootable TF Card
README	Simple guidelines
S1.jpg	Boot Switch Config Figure
emmc-flash/emmc/rootfs.tar.gz	RootFS in target eMMC
emmc-flash/emmc/u-boot.imx	Bootloader in target eMMC
emmc-flash/emmc/zImage	Kernel file in target eMMC
emmc-flash/emmc/imx6ul-eisd.dtb	dtb file in target eMMC
emmc-flash/mkemmc.sh	Shell tools to download images

Table 277 Prebuilt Files Package

Note

The default `zImage` and `imx6q-sabresd.dtb` files support *'keep the logo from uboot to kernel'* but do not support framebuffer. Chipsee provides `zImage_framebuffer` and `imx6q-eisd.dtb_framebuffer` file versions that support the framebuffer function but do not support the *'keep the logo from uboot kernel'* feature. If you need the framebufer, just rename these two files to `zImage` and `imx6q-eisd.dtb`.

How to make a bootable SD card

The Prebuilt Files Package has a shell tool that can help create a bootable SD card using a Linux platform (such as desktop PC or Virtual Machine running Ubuntu 14.04 distribution). Use the SD Card to download the bootable system image onto the Linux platform and follow the steps below to create a bootable SD card:

1. Copy the Prebuilt Files Package to a Linux environment (such as Ubuntu 14.04).
2. Insert the SD card into your computer. If you are using virtual machines, please ensure the SD card is mounted to the Linux operating system.
3. **Confirm the SD card mount point, `/dev/sdX` (e.g., `/dev/sdc` or `/dev/sdb`, be sure to use the right one). In a Linux system, you can use the command below to find out what X is.**

    ```
    $ sudo fdisk –l
    ```

4. Copy the `prebuilt-angstrom-XXXXXX.tar.gz` to somewhere(such as $HOME).
5. **Extract the** `prebuilt-angstrom-XXXXXX.tar.gz`

    ```
    $ tar -xzvf prebuilt-angstrom-XXXXXX.tar.gz
    ```

6. **Go to the folder**

    ```
    $ cd ~/prebuilt-angstrom-XXXXXX
    ```

7. **Use the following command to flash the Angstrom OS to the SD card**

    ```
    $ sudo ./mksdcard.sh --device /dev/sd<?>
    ```

    Note

    - sd<?> means the SD card mount point, (e.g., `/dev/sdc` or `/dev/sdb`) in Ubuntu system.
    - The recommended SD card should be Sandisk Class4 level SD card or above.

8. The bootable SD Card is now ready. Power OFF the industrial PC and insert the SD Card.
9. Set the DIP switch to uSD BOOT mode. (refer to DIP Switch Configuration above)
10. Connect the industrial PC to PC via COM1. Power ON the IPC.

11. After 20 minutes, if the LED on industrial PC stays lit, flashing is completed. Using COM1, you can also find this message **>>>>>>> eMMC Flashing Completed <<<<<<<** which indicates that the system image was downloaded correctly to the eMMC.
12. Power OFF the IPC and set the DIP switch to eMMC BOOT mode. (refer to DIP Switch Configuration above)

How to flash Linux to eMMC

The Prebuilt Files Package has a shell tool that can help create a bootable SD card using a Linux platform (such as desktop PC or Virtual Machine running Ubuntu 14.04 distribution). Follow the steps below to create a bootable SD card:

1. Copy the Prebuilt Files Package to a Linux environment (such as Ubuntu 14.04).
2. Insert the SD card into your computer. If you are using virtual machines, please ensure the SD card is mounted to the Linux operating system.
3. **Confirm the SD card mount point, `/dev/sdX` (e.g., `/dev/sdc` or `/dev/sdb`, be sure to use the right one). In a Linux system, you can use the command below to find out what** X **is.**

   ```
   $ sudo fdisk –l
   ```

4. Copy the prebuilt file `prebuilt-som-v3-csxxxxxtxx-v3-ezsdk-emmc-yyyymmdd.tar.gz` to somewhere(such as $HOME).
5. **Extract the prebuilt file** `prebuilt-som-v3-csxxxxxtxx-v3-ezsdk-emmc-yyyymmdd.tar.gz`

   ```
   $ tar -xzvf prebuilt-som-v3-csxxxxxtxx-v3-ezsdk-emmc-yyyymmdd.tar.gz
   ```

6. **Go to the folder** `prebuilt-som-v3-csxxxxxtxx-v3-ezsdk-emmc-yyyymmdd`

   ```
   $ cd ~/prebuilt-som-v3-csxxxxxtxx-v3-ezsdk-emmc-yyyymmdd
   ```

7. **Use the following command to flash the Angstrom OS to the SD card**

   ```
   $ sudo ./mksdcard.sh --device  /dev/sd<?>
   ```

   Note

   - sd<?> means the SD card mount point, (e.g., `/dev/sdc` or `/dev/sdb`) in Ubuntu system.
   - The recommended SD card should be Sandisk Class4 level SD card or above.

8. The bootable SD Card is now ready. Power OFF the industrial PC and insert the SD Card.
9. Set the DIP switch to SD BOOT mode. (refer to DIP Switch Configuration above)
10. Connect the industrial PC to PC via COM1. Power ON the IPC.

11. After 20 minutes, if the LED on industrial PC stays lit, flashing is completed. Using COM1, you can also find this message **>>>>>>> eMMC Flashing Completed <<<<<<<** which indicates that the system image was downloaded correctly to the eMMC.
12. Remove the SD card and Power OFF the IPC.
13. Set the DIP switch to eMMC BOOT mode (refer to DIP Switch Configuration above) and Power ON the IPC.

Start Angstrom OS

The first time you start Angstrom OS on the industrial PC will take a little time. But after the first time, Angstrom OS will start quickly. When the Angstrom OS starts up, you will see the Chipsee Logo on the LCD screen. It is a successful start if you see the Angstrom OS desktop such as the one shown in the figure below:

Figure 827: Angstrom OS start-up screen

Tests

Touch screen and buzzer test

Click on the screen, the mouse arrow stays in a position that triggers the buzzer sounds, indicating that touch and buzzer work properly.
After working for some time, the resistive touch screen may not be accurate. The user must run a touch screen calibration test.
Firstly delete the file `/etc/pointercal.xinput` using the command below.

```
$ sudo rm /etc/pointercal.xinput
```

Click on the System–>Administration–>Calibrate Touchscreen app on desktop to recalibrate.

Reboot the system. You will see the calibrate app upon boot up before you access the system. Just calibrate, the result will be saved.

The buzzer will sound when the screen is touched, if you want to disable it, you can do this:

- **On capacitive touchscreen:**

  ```
  # echo 0 > /sys/devices/ocp.3/44e0b000.i2c/i2c-0/0-0038/buzopen
  ```

- **On resistive touchscreen:**

  ```
  # echo 1 > /sys/devices/ocp.3/44e0d000.tscadc/tsc/buzopen
  ```

  where:

  - 0 = disable
  - 1 = enable

Audio IO test

Start the terminal, then use the `mplayer` command to play an audio file.

```
# mplayer FILENAME  //such as: mplayer ~/Music/test.mp3
```

Serial test

There are four serial ports on the Chipsee IPC: 2 X RS232 and 2 X RS485. The COM1(RS232) is used as the debug serial port. Users can communicate with the OS via COM1. Refer to the table below for the available serial device nodes.

Ports	Device Node
COM1(RS232, Debug)	/dev/ttyO0
COM2(RS232)	/dev/ttyO1
COM3(RS485)	/dev/ttyO2
COM4(RS485)	/dev/ttyO4

Table 278 Serial Ports Nodes on the System

1. **Run a serial test:**
    - Install **SecureCRT** or **Putty** software on a Windows 7 PC and use it to perform the serial port testing.
    - Connect keyboard and mouse to the IPC. Then press **Ctrl+Alt+F1 (or F3~F6)** to get into **tty1(tty3~tty6)**. Enter username: :substitution-code: `|user|`, no password.

> **Note**
>
> Notes: The system is not QtE by default, follow the steps in the CD(Angstrom/Documents/Qt-Angstrom) to set the environment. The QtE in Angstrom OS is not working well, by now user only can use mouse for the Qt apps.

- Launch the **ChipseeTest** app by using the commands below.

```
# cd chipsee
# ./ChipseeTest -qws
```

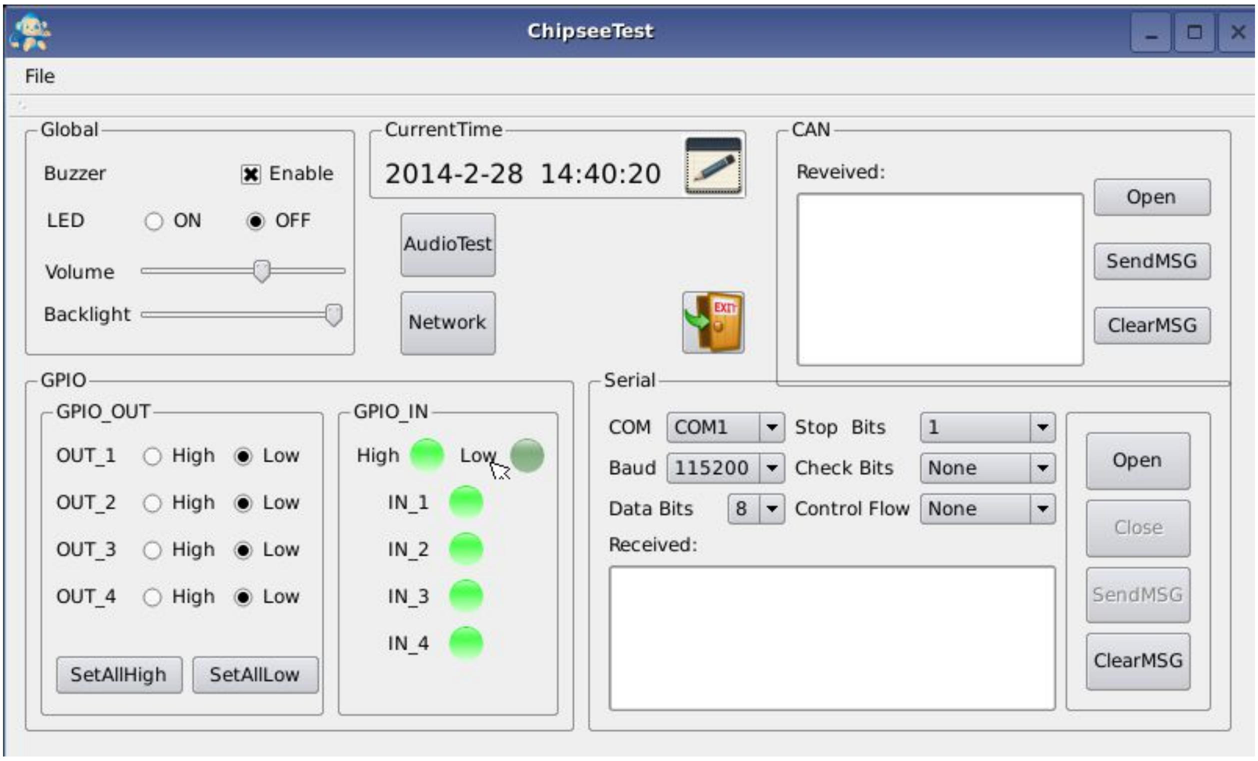

Figure 828: ChipseeTest

2. **If you want to use COM1 as a normal serial port, you can re-configure the port by following these steps:**

    - Open and edit the `uEnv.txt` file which can be found in the boot partition with any text editor.

```
bootargs=console=tty00,115200n8 root=/dev/mmcblk0p2
```

    - At the end of the file, edit this line `bootargs=console=tty00,115200n8 root=/dev/mmcblk0p2` to

```
bootargs=root=/dev/mmcblk0p2
```

    - This will change ttyO0 (COM1) to ttyO1, ttyO2 or ttyO4(RS232_2, RS485_1 and RS485_2) and makes it possible to use all the four serial ports as normal serial ports.
    - Stop the service in Angstrom.

```
# systemctl disable serial-getty@tty00.service
# systemctl stop serial-getty@tty00.service
```

Now you can use the COM1 as normal serial port.

1. **If you want to use COM1 as debug serial port, you have to edit the `uEnv.txt` file which you can find in the boot partition. And start the service by running this command:**

```
# systemctl start serial-getty@ttyO0.service
```

2. **From the ChipseeTest app, search for the serial area then configure the following settings, as shown on the figure below.**

    - set Com to COM2
    - set Baud to 115200
    - click on the **Open** button
    - It will send the string *Succeed in sending message!!!* every two seconds through the serial port to the Windows 7 PC.
    - Click on the **SendMSG** button to send the string *Succeed in sending message-manual!!!*.
    - Every two seconds, it will read the received buffer and show the result to the received area.

GPIO test

There are (4) four input and (4) four output pins. LOW is 0V, HIGH is 5V.
The GPIO input terminals connect to the GPIO output terminals, respectively. IN1-4 corresponds to OUT1-4.
As a result, if you set the GPIO_OUT area, you will see the GPIO_IN region change as well.
You can control the LED light on the industrial PC by setting the LED **ON** or **OFF**.

GPIO	GPIO In System
OUT1	gpio49
OUT2	gpio50
OUT3	gpio51
OUT4	gpio52
IN1	gpio53
IN2	gpio54
IN3	gpio55
IN4	gpio56
USER_LED	gpio19

Table 279 GPIO Nodes on the System

You can read and write the GPIO by following the steps below. For this example, we are going to use **gpio49** (OUT1).

- **Use this command to export gpio.**

```
# echo 49 > /sys/class/gpio/export
```

- **Use this command to check if the directory** `/sys/class/gpio/gpio49/` **exist before writing to it**

```
# find /sys/class/gpio/gpio49/
```

- **Use this command to write gpio**

```
# echo 1 > /sys/class/gpio/gpio49/value
```

- **Use this command to read gpio**

```
# cat /sys/class/gpio/gpio49/value
```

Network

To view the network information on the industrial PC, follow these steps:

- Click on the **Network** tab, then click the **Ifconfig** button to view the network information on the industrial PC.
- Click on the **Refresh** button to restart the network service which will take five or six seconds to finish.

The figure below is an illustration of the network information on the industrial PC.

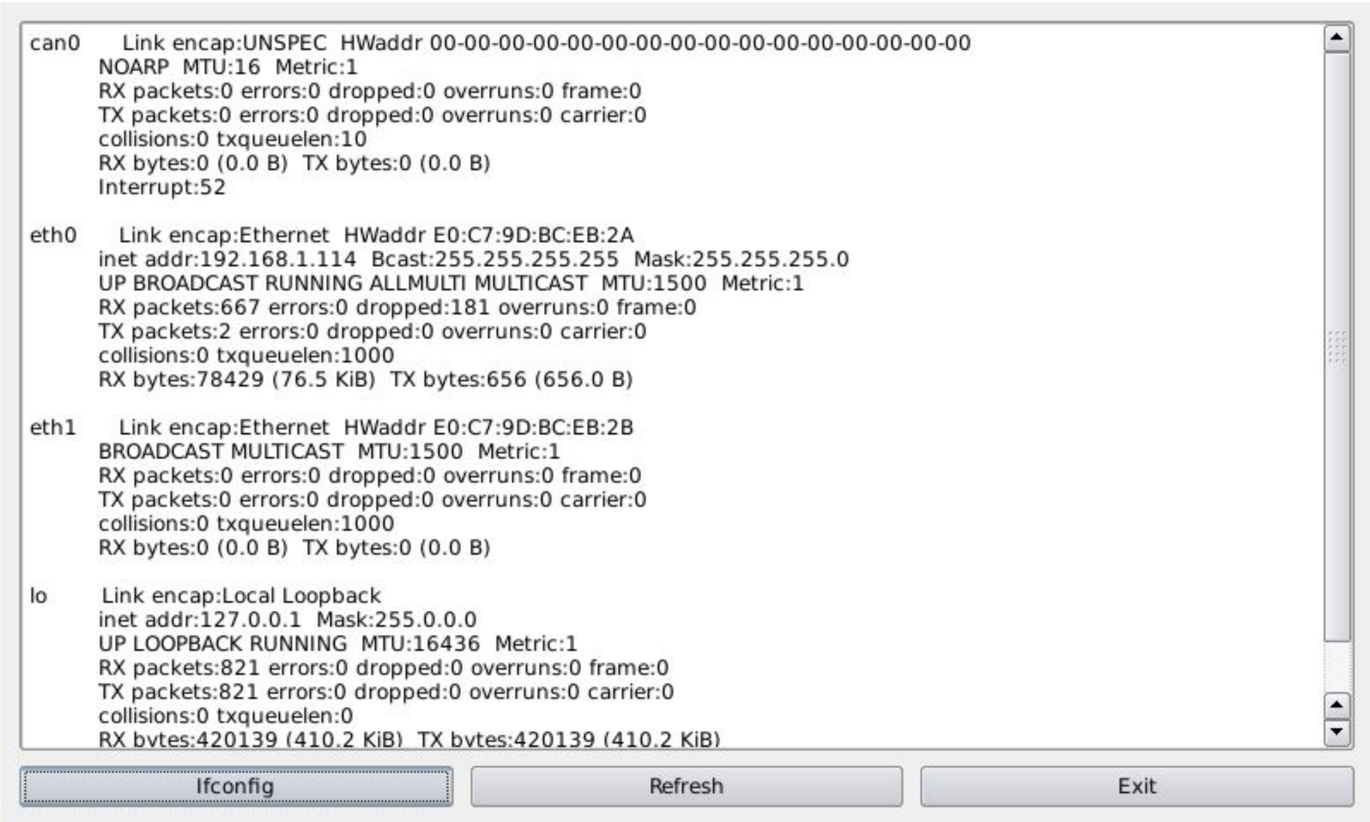

Figure 829: View Network Information

Date and Time

Click the **Edit** icon at the time display area to set the time and date, as shown on the figure below.

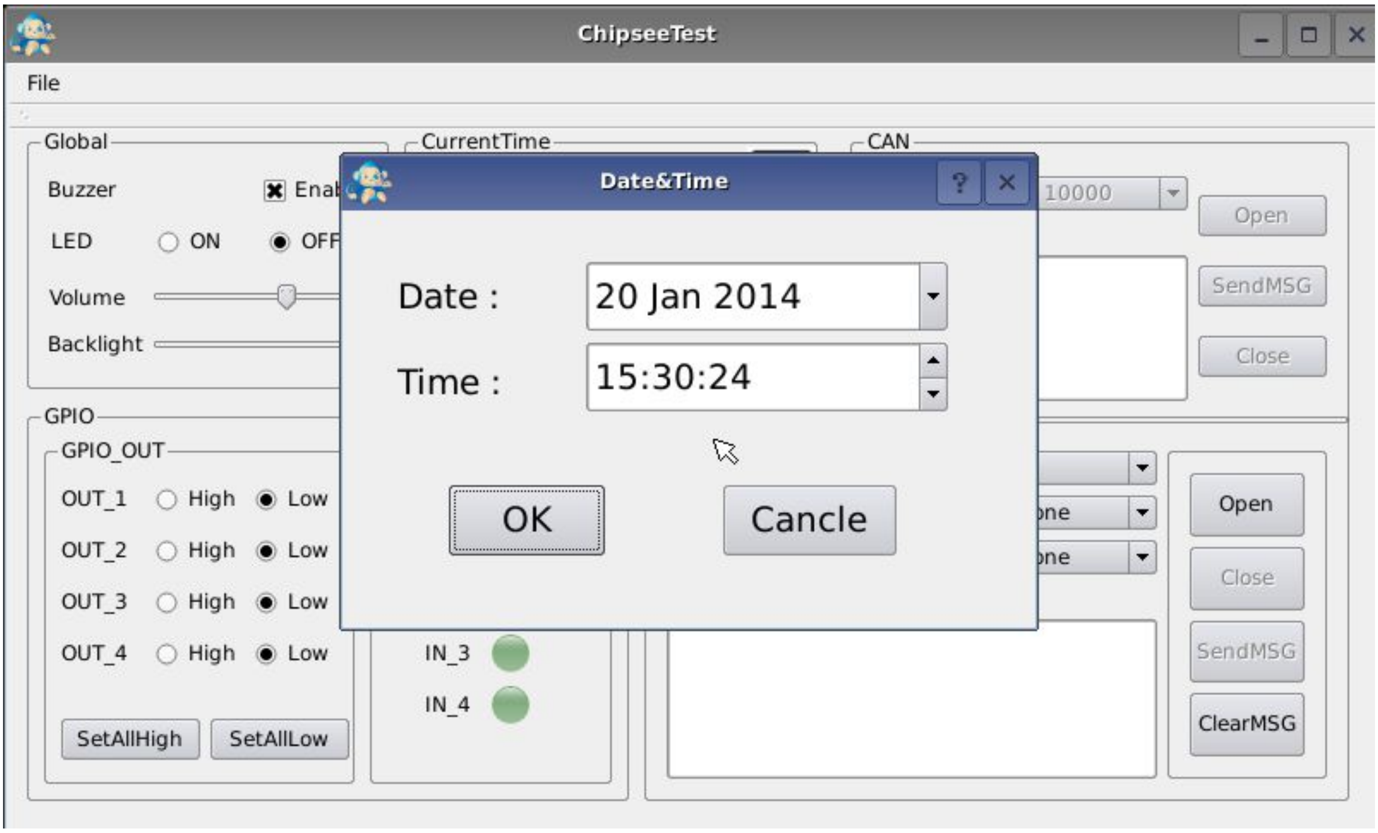

Figure 830: Set Date and Time

- **Check the system time**

```
# date
```

- **Set the system time**

```
# date –s "2014-03-15 10:30:30"
```

- **Check RTC**

```
# hwclock
```

- **Write RTC**

```
# hwclock -w
```

- **Modify the time zone to a different timezone, such as China**

```
# ln -sf /usr/share/zoneinfo/Asia/Hong_Kong /etc/localtime
```

Backlight

Modify this file `/sys/class/backlight/backlight` to adjust the screen brightness.
Brightness ranges from 0 to 100 where 0 means no backlight, and 100 is the MAX brightness value.
For example, you can adjust the screen brightness using this command:

```
# echo 50 > /sys/class/backlight/backlight.10/Brightness
```

USB device test

- **USB-WiFi**

a. The Angstrom OS supports USB-WiFi module. If you want to use the USB-Wifi module in the system, you need to edit the `/var/lib/connman/wifi.config` file.

b. Modify the router, the login name, and password in the config file, as shown in the code-block below.

```
Type = wifi
Name = chipsee  //router’s name
Security = AES  //security mode
Passphrase = 1234567890 //password
```

a. Save and reboot. The system will automatically connect to the WiFi the next time you start.

- **USB-Webcam**

a. The Angstrom OS supports USB-Camera. If you want to use the USB webcam, you need to connect the webcam to the IPC before power ON.

b. Then choose Application–>Sound&Video–>Cheese Webcam Booth to take pictures.

Modify OS Start up Logo

Chipsee® provides a software to change the OS boot up logo. The software `ChipSee_LOGO_MOD_EN.exe` is provided on the CD for a product.
To change the logo, follow these steps:

1. **Open the software:** `Chipsee_LOGO_MOD_EN.exe` **in Windows**

Figure 831: Chipsee OS Boot-up Logo Modify Software

2. **Click the first Browse button. Select the picture file you want to use as the logo.**

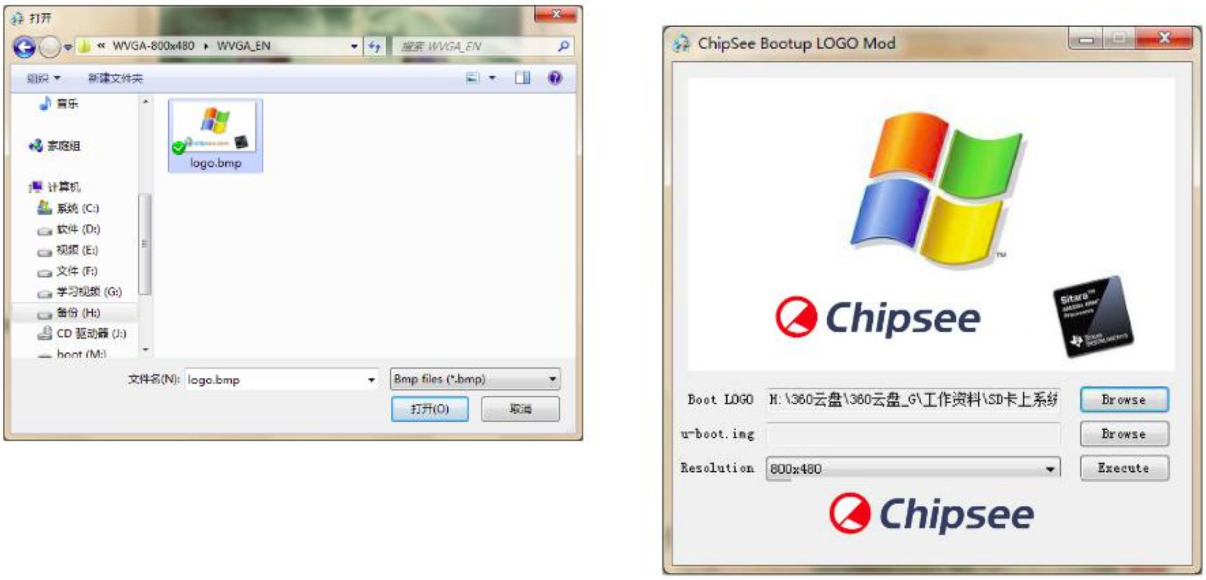

Figure 832: Choose the Logo you want

3. **Click the second Browse button. Select the** `u-boot.img` **file you want to use.**

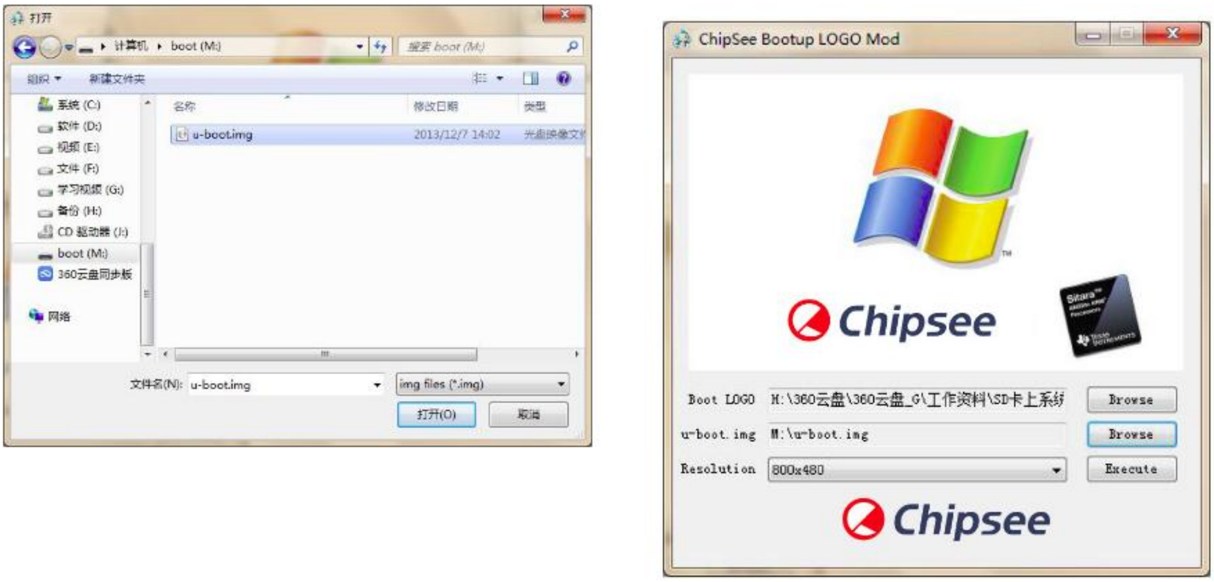

Figure 833: Choose the u-boot.img file

4. **Choose the correct resolution for your product, then click Execute.**

Figure 834: Change the Logo successful

5. Insert the SD card into the IPC. Power ON the IPC and the Logo will be replaced.

Angstrom OS debug

In this section, we will discover how to view the Angstrom system via the serial port on a Windows 7 PC.
Also, we will discover how to debug using NFS on a Ubuntu Linux PC.

View Angstrom system via the serial port

Install the **SecureCRT** or **Putty** software on a Windows 7 PC to view the Angstrom system via the serial ports.
Follow these steps to view Angstrom system via the serial port:

- Connect COM1 on the industrial PC board to Windows 7 PC.
- Open the **SecureCRT** or **Putty** software on the Windows 7 PC.
- Power ON the industrial PC. You will see the serial output information as shown on the figure below.
- When the system is fully booted, you can communicate with it by logging in with these details: user= root and password= empty.

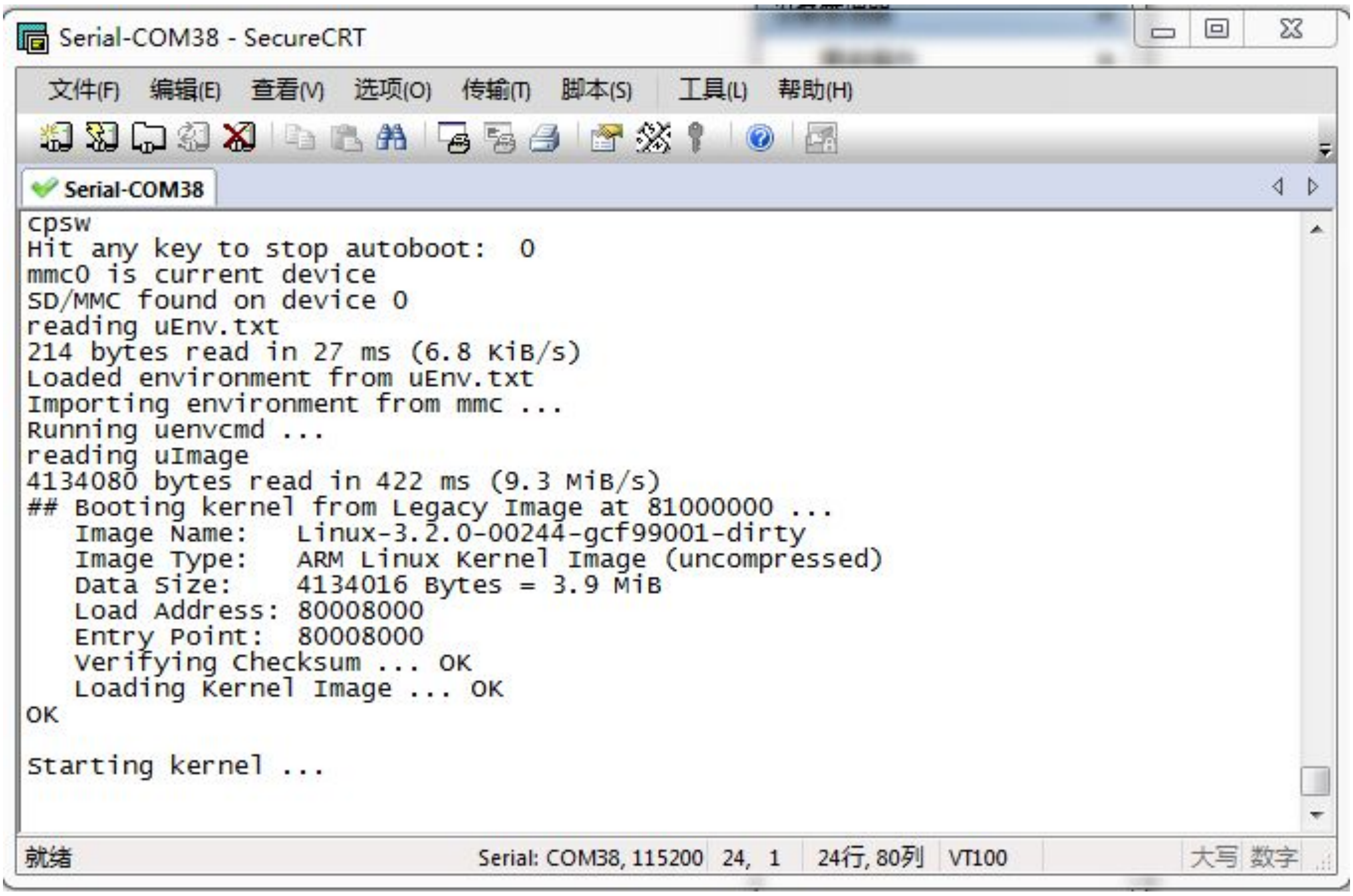

Figure 835: Serial output information

Debug via NFS

1. **Install NFS on Ubuntu Linux PC.**

```
$ sudo apt-get install nfs-kernel-server
```

2. **Configure the file `/etc/exports`, by adding this line at the end of the file.**

```
/qtprojects *(rw, sync, insecure, no_subtree_check)
```

> **Note**
>
> - `/qtprojects`: the shared folder in Ubuntu system
> - `*`: allows all other PC to get access to this system
> - `rw`: means this folder can be read and write by NFS client
> - `sync`: synchronous write memory and hard disk
> - `insecure`: sent message through the port above 1024
> - `no_subtree_check`: no check the parent directory permissions

3. **Restart NFS service.**

```
$ sudo /etc/init.d/portmap restart
$ sudo /etc/init.d/nfs-kernel-server restart
```

4. **Test**

```
$ showmount -e
```

or mount the shared folder to `/mnt`:

```
$ sudo mount -t nfs –o nolock localhost:/qtprojects /mnt
```

Use the command `df` to check out the result, then umount.

```
$ df -h
$ sudo umount /mnt
```

5. **Mount NFS on the industrial PC running Angstrom OS.**

Create the `nfsdir` directory

```
# mkdir /nfsdir
```

Mount the folder `/qtprojects` on the Ubuntu Linux PC to `/nfsdir` on the industrial PC.

```
# mount –t nfs :/qtprojects /nfsdir
```

If you have an executable program like **SerialTest** under folder `/qtprojects`, you can run it directly on the industrial PC.

```
# /nfsdir/SerialTest
```

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