Software Application Guide
ECB20 Single Board Computer



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1.Overview

This article focuses on how to test and use the functions provided by the ECB20 series single-board computers of Ebyte. If users need to transplant and adapt specific functions on this basis, please also refer to the "ECK20_Software_Development_Guide". The "Software Development Guide" will be used to refer to this document in the following text. This article can be used as a preliminary evaluation guide, and can also be used as a test guide for general system development.

1.1. Software Resources

ECB20 is equipped with an operating system built on the Linux 5.10.9 kernel. The development materials come with the cross-compilation tool chain required for embedded Linux system development, U-boot 2020.04 source code, source code of the Linux kernel and various driver modules, as well as various development and debugging tools for Windows desktop environment and Linux desktop environment, application development samples, etc.

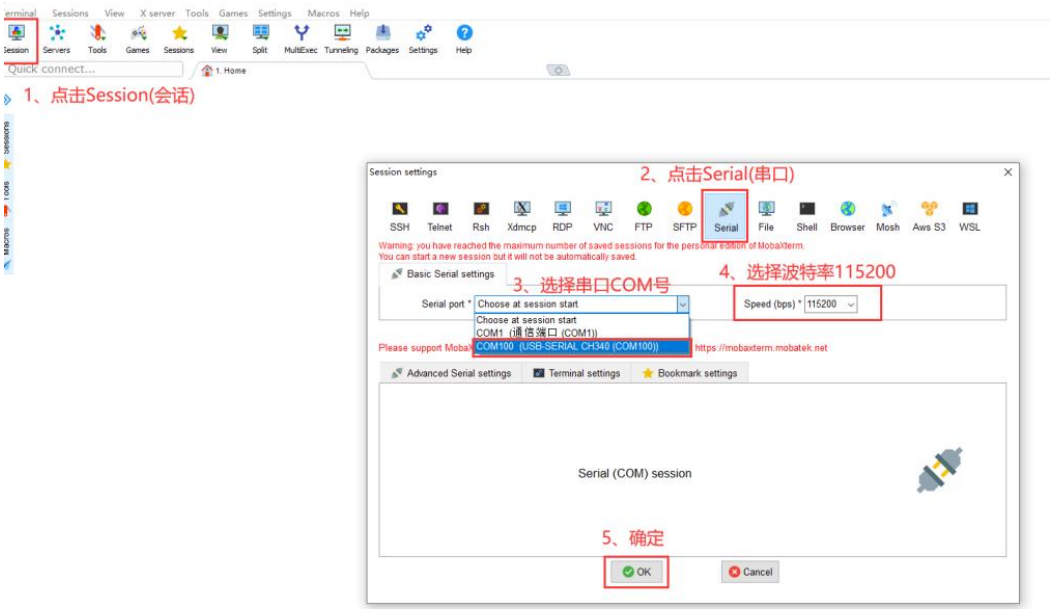
2. Preparation before use

2.1. Serial port software installation

Before using the serial port, you need to install the CH340 serial port driver and MobaXterm serial port terminal. For specific installation and usage methods, see the Software Development Guide.

After connecting the serial port, install MobaXterm and configure it to open the serial port as follows.

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2.2. Setting the DIP switch

The single board computer base supports four boot modes, namely USB (Download), TF/SD card, eMMC and NAND boot modes.

SW								
D1	D2	D3	D4	D5	D6	D7	D8	BOOT DEVICE
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	USB
ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	MicroSD
ON	OFF	ON	OFF	OFF	ON	ON	OFF	EMMC
ON	OFF	OFF	OFF	ON	OFF	OFF	ON	NAND

3. Quick Start

3.1. Image Burning

Please refer to Chapter 2 to configure the DIP switch to boot from the SD card and make the corresponding SD boot card.

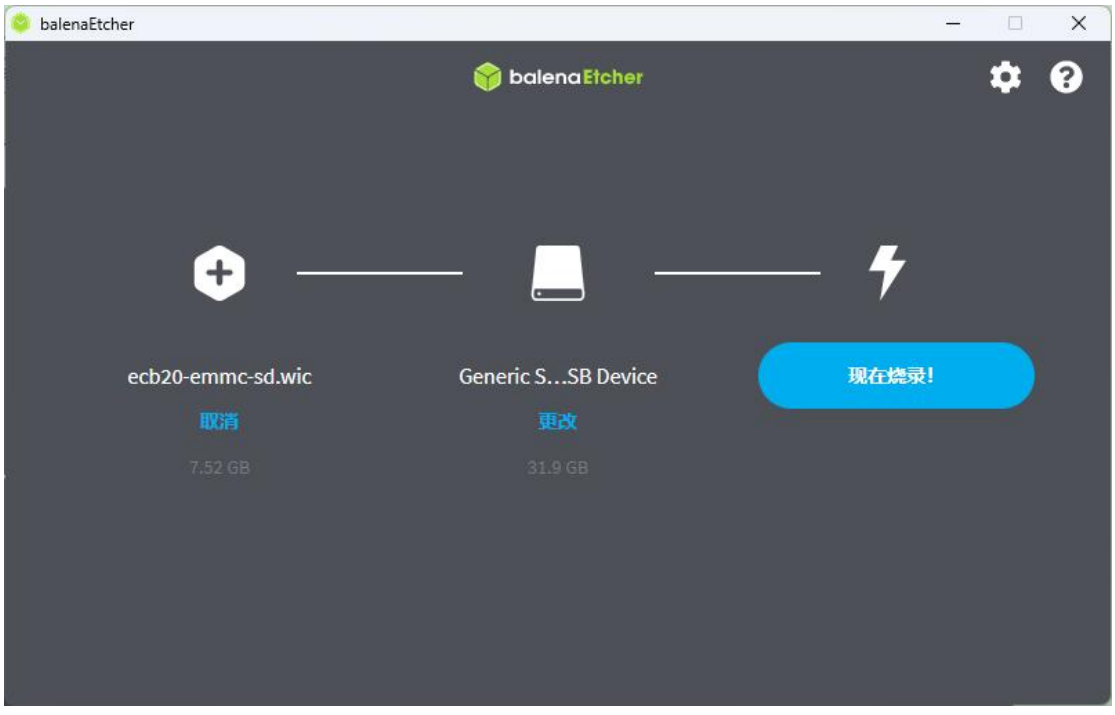
Here is a brief description of how to make an SD card:

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Use a third-party image burning tool to write the corresponding wic image file in 02_Images/ to the SD card. A burning tool is already included in 04_Tools/: balenaEtcher-Portable-1.18.11.exe.



Select Burn from File and select the wic file created previously.



Select the target disk and click Burn Now to start burning. Wait for the burning to complete and then remove the device to use the SD card as the boot device.

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The SD card slot is located on the back of the single-board computer and is marked as TF card.

3.2. Power on

In order to facilitate user operation and debugging, our company's ECB20 series single-board computers have reserved a debugging serial port. Users can find the serial port location through the silk screen on the bottom board.

After the single board computer starts, the serial terminal prints the running information of U-Boot and the kernel, as shown below.

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```
U-Boot 2020.04-g93edef74 (Nov 07 2024 - 13:17:39 +0800)

CPU:   i.MX6ULL rev1.1 792 MHz (running at 396 MHz)
CPU:   Industrial temperature grade (-40C to 105C) at 38C
Reset cause: POR
Model: EBYTE i.MX6 ULL EVK Board
Board: ebyte I.MX6ULL
DRAM:  512 MiB
MMC:   FSL_SDHC: 0, FSL_SDHC: 1
Loading Environment from MMC... OK
[*]-Video Link 0 (1024 x 600)
       [0] lcdif@21c8000, video
In:    serial
Out:   serial
Err:   serial
switch to partitions #0, OK
mmc1(part 0) is current device
flash target is MMC:1
Net:
Warning: ethernet@20b4000 (eth1) using random MAC address - 8e:73:ad:0f:da:a0
eth1: ethernet@20b4000 [PRIME]
Fastboot: Normal
Normal Boot
Hit any key to stop autoboot:  0
WARNING: Could not determine tee to use
switch to partitions #0, OK
mmc1(part 0) is current device
switch to partitions #0, OK
mmc1(part 0) is current device
8467992 bytes read in 275 ms (29.4 MiB/s)
Booting from mmc ...
33591 bytes read in 18 ms (1.8 MiB/s)
Kernel image @ 0x80800000 [ 0x000000 - 0x813618 ]
## Flattened Device Tree blob at 83000000
   Booting using the fdt blob at 0x83000000
   Using Device Tree in place at 83000000, end 8300b336
Modify /soc/bus@2200000/epdc@228c000:status disabled
ft_system_setup for mx6

Starting kernel ...

[    0.000000] Booting Linux on physical CPU 0x0
```

When the temperature exceeds the limit, u-boot will not boot the kernel to ensure its own safety. Please pay attention to the usage environment.

4. Quick Experience

This chapter will conduct tests according to functional modules and provide a preliminary way to use the functions.

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4.1. CPU

4.1.1. View CPU information

Run the following command to view CPU information.

```
[root@EBYTE-IMX6UL ~ ]# cat /sys/devices/soc0/soc_id
i.MX6ULL
[root@EBYTE-IMX6UL ~ ]# cat /proc/cpuinfo
processor : 0
model name: ARMv7 Processor rev 5 (v7l)
BogoMIPS: 96.00
Features: half thumb fastmult vfp edsp neon vfpv3 tls vfpv4 idiva idivt vfpd32 lpae
CPU implementer : 0x41
CPU architecture: 7
CPU variant: 0x0
CPU part: 0xc07
CPU revision: 5

Hardware: Freescale i.MX6 Ultralite (Device Tree)
Revision: 0000
Serial: 162a49d768e2b9fc
```

soc_id: indicates that this is an i.MX6ULL chip

processor: The number of the logical processing core in the system. For a multi-core processor, it can be a physical core or a virtualized logical core using hyperthreading technology.

model name: the name and number of the CPU

BogoMIPS: A rough estimate of the number of instructions per second that the CPU runs when the system kernel is booted (MillionInstructions Per Second)

Features: instruction functions supported by the CPU

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4.1.2. Check CPU usage

Use the following command to check CPU usage

```
[root@EBYTE-IMX6UL ~ ]# top
top - 10:48:34 up 2 min, 1 user, load average: 0.52, 0.45, 0.18
Tasks: 77 total, 1 running, 76 sleeping, 0 stopped, 0 zombie
%Cpu0 : 0.7/3.3 4[ ]
GiB Mem : 28.0/0.5 [ ]
GiB Swap: 0.0/0.0 [ ]

 PID USER PR NI VIRT RES %CPU %MEM TIME+ S COMMAND
   1 root 20 0 3.2m 1.6m 0.0 0.3 0:05.81 S init
 115 root 20 0 3.2m 0.4m 0.0 0.1 0:00.06 S `- /sbin/syslog+
 119 root 20 0 3.2m 0.4m 0.0 0.1 0:00.05 S `- /sbin/klogd +
 130 root 20 0 14.1m 1.8m 0.0 0.4 0:01.10 S `- /sbin/udevd +
 163 dbus 20 0 3.1m 0.1m 0.0 0.0 0:00.00 S `- dbus-daemon +
 167 root 20 0 2.1m 1.2m 0.0 0.3 0:00.04 S `- /usr/sbin/rp+
 180 dhcpcd 20 0 2.3m 1.7m 0.0 0.3 0:00.03 S `- dhcpcd: [man+
 181 root 20 0 2.6m 1.9m 0.0 0.4 0:00.08 S `- dhcpcd: +
 198 dhcpcd 20 0 2.6m 0.3m 0.0 0.1 0:00.00 S `- dhcp+
 206 dhcpcd 20 0 2.6m 0.3m 0.0 0.1 0:00.00 S `- dhcp+
 182 dhcpcd 20 0 2.2m 0.2m 0.0 0.0 0:00.00 S `- dhcpcd: +
 183 dhcpcd 20 0 2.2m 0.2m 0.0 0.0 0:00.00 S `- dhcpcd: +
 226 root 20 0 7.4m 2.5m 0.0 0.5 0:00.11 S `- /usr/sbin/nt+
 231 root 20 0 2.5m 0.1m 0.0 0.0 0:00.00 S `- /usr/sbin/dr+
 238 root 20 0 2.3m 1.4m 0.0 0.3 0:00.00 S `- rpc.statd
 251 root 20 0 169.5m 55.7m 1.3 11.4 0:10.30 S `- /usr/local/D+
 254 root 20 0 2.7m 0.2m 0.0 0.0 0:00.00 S `- /usr/sbin/co+
```


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Tasks: Indicates that there are a total of 77 processes in the current system, one is running, 76 are in sleep state, there are no stopped processes and no zombie processes.

%Cpu*: indicates the working status of CPU*. Since IMX6ULL is a single-core CPU, there is only one line of Cpu0 here. The 0.7 in front indicates the percentage currently being used by the process, and 3.3 is the percentage when the process is idle.

GiB Mem and GiB Swap: indicate the system's memory usage and total size, in G.

Regarding the process list, the information of each column is as follows:

Column Name	explain
PID	Process ID. Each process in the system has a unique PID.
USER	The user to which the process belongs.
PR	The priority of the process. A lower value means a higher priority.
NI	The nice value of the process, used to adjust the priority of the process.
VIRT	The amount of virtual memory used by the process.
RES	The actual physical memory (resident memory) used by the process.
%CPU	The percentage of CPU used by the process.
%MEM	The percentage of physical memory used by the process.
TIME+	The total time the process has been running.
S	Process state: For example, S for "sleeping" state, R for "running" state, and Z for "zombie" state.
COMMAND	The startup command or executable program name of the process.

4.1.3. Check CPU temperature

Use the following command to view the current CPU temperature:

```
[root@EBYTE-IMX6UL ~ ]# cat /sys/class/thermal/thermal_zone0/temp
54725
```

For the returned value, we divide it by 1000 to get the actual temperature. Here, 54725 is returned, so the actual temperature is 54.7°C.

4.2. Memory

4.2.1. Memory information

Use the following command to view memory information:

```
[root@EBYTE-IMX6UL ~ ]# cat /proc/meminfo
MemTotal: 498920 kB
MemFree: 320260 kB
MemAvailable: 361232 kB
```


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Buffers: 3764 kB

Cached: 39400 kB

SwapCached: 0 kB

Active: 11196 kB

Inactive: 71720 kB

Active(anon): 132 kB

Inactive(anon): 39816 kB

Active(file): 11064 kB

Inactive(file): 31904 kB

Unevictable: 0 kB

Mlocked: 0 kB

HighTotal: 0 kB

HighFree: 0 kB

LowTotal: 498920 kB

LowFree: 320260 kB

SwapTotal: 0 kB

SwapFree: 0 kB

Dirty: 0 kB

Writeback: 0 kB

AnonPages: 39804 kB

Mapped: 25148 kB

Shmem: 200 kB

KReclaimable: 9792 kB

Slab: 21164 kB

SReclaimable: 9792 kB

SUnreclaim: 11372 kB

KernelStack: 592 kB

PageTables: 576 kB

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```
NFS_Unstable: 0 kB
Bounce: 0 kB
WritebackTmp: 0 kB
CommitLimit: 249460 kB
Committed_AS: 70092 kB
VmallocTotal: 1556480 kB
VmallocUsed: 2088 kB
VmallocChunk: 0 kB
Percpu: 104 kB
CmaTotal: 131072 kB
CmaFree: 64924 kB
```

MemTotal: Total memory. The value shown here is 498788 kB, which means that the system has a total of about 487 MB of physical memory available. Since the conversion method here is 1024, and the conventional sales process generally uses 1000, the size here can also be regarded as 510.76MB. In addition, some memory is reserved for other uses, so the size here is also normal.

MemFree: The amount of free memory. The value displayed here is 369352 kB, which means that there are about 360 MB of free memory in the current system and it is not being used.

MemAvailable: The amount of available memory. The value shown here is 396952 kB, which represents the total amount of memory currently available to the system, including cached memory and free memory.

Buffers: Buffer usage. The value shown here is 0 kB, which means that the system is not currently using any memory as buffers.

Cached: The amount of cached memory. The value shown here is 39208 kB, which indicates the amount of memory currently used by the system for caching.

SwapCached: The amount of memory that is swap cached. The value shown here is 0 kB, which means that there is currently no memory cached in the swap space.

Active: The amount of active memory. The value shown here is 8576 kB, which indicates the amount of memory currently in use.

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4.2.2. Memory Test

Use the following command to get the memory size available for testing:

```
[root@EBYTE-IMX6UL ~ ]# free -m
              total used free shared buff/cache available
Mem: 487 87 379 0 20 388
Swap: 0 0 0
```

The maximum memory size that can be used for testing here is 388MB, but considering the stable operation of other subsequent programs, the following memory test is performed using 350MB as an example:

```
[root@EBYTE-IMX6UL ~ ]# memtester 350M 1
memtester version 4.5.0 (32-bit)
Copyright (C) 2001-2020 Charles Cazabon.
Licensed under the GNU General Public License version 2 (only).

pagesize is 4096
pagesizemask is 0xfffff000
want 350MB (367001600 bytes)
got 350MB (367001600 bytes), trying mlock ...locked.
Loop 1/1:
  Stuck Address : ok
  Random Value : ok
  Compare XOR : ok
  Compare SUB : ok
  Compare MUL : ok
  Compare DIV : ok
  Compare OR : ok
  Compare AND : ok
```


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```
Sequential Increment: ok

Solid Bits : ok

Block Sequential : ok

Checkerboard: ok

Bit Spread : ok

Bit Flip : ok

Walking Ones : ok

Walking Zeroes : ok

8-bit Writes : ok

16-bit Writes : ok


Done.
```

You can see that all the test items here are in the `ok` state, which means the test passed and there are no obvious errors in the memory.

4.3. eMMC Test

4.3.1. View eMMC information

Use the following command to obtain the eMMC device capacity and partition status table:

```
[root@EBYTE-IMX6UL ~ ]# fdisk -l /dev/mmcblk1

Disk /dev/mmcblk1: 7.28 GiB, 7818182656 bytes, 15269888 sectors

Units: sectors of 1 * 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disklabel type: dos

Disk identifier: 0x25951234


Device Boot Start End Sectors Size Id Type
```


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```
/dev/mmcblk1p1 * 10240 81919 71680 35M ef EFI (FAT-12/16/32)
/dev/mmcblk1p2 81920 15269887 15187968 7.2G 83 Linux
```

Here, the eMMC is divided into two partitions. The p1 partition is used to store the kernel and device tree, which is the EFI partition. The p2 partition is used to store the Linux file system. You can get the partition type through the following command:

```
lsblk -f
NAME FSTYPE FSVER LABEL UUID FSAVAIL FSUSE% MOUNTPOINTS
mmcblk1p1 vfat FAT32 boot FCFE-9291 25.6M 26% /boot
`-mmcblk1
mmcblk1p2 ext4 1.0 root e39f8131-958c-466f-88c4-e5b1342aaba2 6.4G 5% /
`-mmcblk1
mmcblk1boot0
mmcblk1boot1
```

4.3.2. eMMC read and write

You can use the following command to test the eMMC read and write performance:

```
[root@EBYTE-IMX6UL ~ ]# dd if=/dev/zero of=test.bin bs=1M count=100 conv=fsync
100+0 records in
100+0 records out
104857600 bytes (105 MB, 100 MiB) copied, 2.91373 s, 36.0 MB/s
[root@EBYTE-IMX6UL ~ ]# echo 3 > /proc/sys/vm/drop_caches
[root@EBYTE-IMX6UL ~ ]# dd if=test.bin of=/dev/null bs=1M
100+0 records in
100+0 records out
104857600 bytes (105 MB, 100 MiB) copied, 1.80595 s, 58.1 MB/s
```

According to the above content, we can know that the current single board computer's write speed is 36.0MB/s and the read speed is 58.1MB/s.

At the same time, the above `echo 3 > /proc/sys/vm/drop_caches` is to eliminate the influence of

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system cache and obtain the actual reading speed.

4.4.Watchdog

Use the following command to view the on-chip watchdog configuration information:

```
[root@EBYTE-IMX6UL ~ ]# wdctl
Device: /dev/watchdog0
Identity: imx2+ watchdog [version 0]
Timeout: 60 seconds
Pre-timeout: 0 seconds
FLAG DESCRIPTION STATUS BOOT-STATUS
KEEPALIVEPING Keep alive ping reply 1 0
MAGICCLOSE Supports magic close char 0 0
PRETIMEOUT Pretimeout (in seconds) 0 0
SETTIMEOUT Set timeout (in seconds) 0 0
```

Use the following command to configure the watchdog timeout to 5 seconds and restart the single board computer after the timeout:

```
[root@EBYTE-IMX6UL ~ ]# wdctl -s 5
Timeout has been set to 5 seconds.
Device: /dev/watchdog0
Identity: imx2+ watchdog [version 0]
Timeout: 5 seconds
Pre-timeout: 0 seconds
FLAG DESCRIPTION STATUS BOOT-STATUS
KEEPALIVEPING Keep alive ping reply 1 0
MAGICCLOSE Supports magic close char 0 0
PRETIMEOUT Pretimeout (in seconds) 0 0
SETTIMEOUT Set timeout (in seconds) 0 0
```


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```
[root@EBYTE-IMX6UL ~ ]# cat > /dev/watchdog



U-Boot 2020.04-g93edef74 (Nov 15 2024 - 10:23:36 +0800)

CPU: i.MX6ULL rev1.1 792 MHz (running at 396 MHz)
CPU: Industrial temperature grade (-40C to 105C) at 51C
Reset cause: POR
Model: EBYTE i.MX6 ULL EVK Board
```

During this process, the system will automatically reboot after a little more than 5 seconds.

4.5. Power Management

This chapter demonstrates the Suspend function of Linux power management, which allows the development board to sleep and be awakened by external events.

The Linux kernel provides multiple suspend modes. The following are supported on the ECB20 series single board computers:

```
[root@EBYTE-IMX6UL ~ ]# cat /sys/power/state
freeze standby mem
```

In user space, write "freeze", "standby" and "mem" to the "/sys/power/state" file respectively to enter the hibernation mode. In the current configuration, the user can wake up after hibernation by inserting or removing an SD card.

```
[root@EBYTE-IMX6UL ~ ]# echo freeze > /sys/power/state
[root@EBYTE-IMX6UL ~ ]# echo standby > /sys/power/state
[root@EBYTE-IMX6UL ~ ]# echo mem > /sys/power/state
```

4.6. RTC

The Linux system is divided into system clock (software clock) and RTC clock (hardware clock).

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The system clock will disappear when the power is off, and the RTC clock will run for a long time if a battery is installed. If you need to use an external RTC clock, please install the ML2032 (3V rechargeable) or CR2032 (3V non-rechargeable) battery into the RTC button battery holder, which is marked as `BAT` on the single board computer.

1. Set the current time:

```
[root@EBYTE-IMX6UL ~ ]# date -s "2010-10-10 10:10:10"
Sun Oct 10 10:10:10 CST 2010
```

2. Write the system time to the RTC and check whether it is written:

```
[root@EBYTE-IMX6UL ~ ]# hwclock -w
[root@EBYTE-IMX6UL ~ ]# hwclock
Sun Oct 10 10:10:15 2010 0.000000 seconds
```

3. Shut down the device, unplug the power supply, wait for a while, then power on again to check the RTC time:

```
[root@EBYTE-IMX6UL ~ ]# hwclock
Sun Oct 10 10:11:24 2010 0.000000 seconds
```

4.7.ETH

The current single board computer has two network ports, one of which can be used to connect to the network during the uboot stage.

usenet-toolsIn the toolkitifconfigTo manually configure the network, first go throughifconfigThe command to view network device information is as follows:

```
[root@EBYTE-IMX6UL ~ ]# ifconfig
eth0 Link encap:Ethernet HWaddr 4E:42:0B:5A:EE:7F
        inet addr:192.168.1.135 Bcast:192.168.1.255 Mask:255.255.255.0
        inet6 addr: fe80::b5d8:8dc:ad0f:c06c/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
        RX packets:66 errors:0 dropped:0 overruns:0 frame:0
```


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```
        TX packets:63 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:8089 (7.8 KiB) TX bytes:5782 (5.6 KiB)

eth1 Link encap:Ethernet HWaddr 8E:78:EB:6D:85:D7
        UP BROADCAST MULTICAST MTU:1500 Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)

lo Link encap:Local Loopback
        inet addr:127.0.0.1 Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING MTU:65536 Metric:1
        RX packets:134 errors:0 dropped:0 overruns:0 frame:0
        TX packets:134 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:9936 (9.7 KiB) TX bytes:9936 (9.7 KiB)
```

The current root file system is configured with automatic DHCP, but users can also manually obtain an IP address by using `udhcpc`, or manually configure a static IP.

4.7.1. Automatic acquisition

```
[root@EBYTE-IMX6UL ~ ]# udhcpc -i eth0
udhcpc: started, v1.35.0
udhcpc: broadcasting discover
udhcpc: broadcasting select for 192.168.1.135, server 192.168.1.1
udhcpc: lease of 192.168.1.135 obtained from 192.168.1.1, lease time 7200
```


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```
deleting routers
adding dns 114.114.114.114
adding dns 61.139.2.69
```

For users who do not use the eth0 network port, be sure not to omit the `-i eth0` parameter here.

4.7.2. Manual Configuration

The following is a method to manually configure the IP address 192.168.1.253 for eth0. The command is as follows:

```
[root@EBYTE-IMX6UL ~ ]# ifconfig eth0 192.168.0.253 netmask 255.255.255.0 up
[root@EBYTE-IMX6UL ~ ]# ifconfig
eth0 Link encap:Ethernet HWaddr 4E:42:0B:5A:EE:7F
        inet addr:192.168.0.253 Bcast:192.168.0.255 Mask:255.255.255.0
        UP BROADCAST MULTICAST MTU:1500 Metric:1
        RX packets:118 errors:0 dropped:0 overruns:0 frame:0
        TX packets:92 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:13846 (13.5 KiB) TX bytes:8610 (8.4 KiB)
```

4.8. show

The ECB20-6Y28A series supports both HDMI and LCD display solutions, while the ECB20-6Y28C series does not support HDMI.

HDMI display: Since the i.MX6ULL chip itself does not have an HDMI-related controller, HDMI converts RGB signals into HDMI signals for output through the display conversion chip SII9022A, supporting a maximum resolution of 1280x720@60fps.

LCD display: LCD uses our company's ECA10-7LCD24R1006CT-C touch screen, which supports up to RGB888 mode.

4.8.1. Toggle Display

Since HDMI and LCD screens share the same pin signal clock and support different resolutions,

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they cannot be used at the same time. Users need to modify the device tree file before use to switch to use HDMI or LCD screen.

The user can choose to use HDMI or LCD screen by setting the value of `#define USE_HDMI_PHY 0` in the device tree to 1 or 0. The following shows the configuration for using LCD:

```
$ head arch/arm/boot/dts/ebyte-imx6ull-base.dtsi
// SPDX-License-Identifier: (GPL-2.0 OR MIT)
//
// Copyright (C) 2016 Freescale Semiconductor, Inc.


/dts-v1/;


#include "imx6ull.dtsi"
#include <dt-bindings/phy/jlsemi-dt-phy.h>


#define USE_HDMI_PHY 0
```

After the user has compiled the corresponding device tree file supported by HDMI, replace the original `/boot/ebyte-imx6ull-emmc.dtb` file and restart the system.

4.8.2. Resolution View

Users can view the currently supported resolution and timing through the following command:

```
[root@EBYTE-IMX6UL ~ ]# fbset


mode "1024x600-60"
    # D: 51.201 MHz, H: 38.096 kHz, V: 59.993 Hz
    geometry 1024 600 1024 600 32
    timings 19531 136 160 21 12 24 2
    accel false
    rgba 8/16,8/8,8/0,0/0
```


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```
endmode
```

Listed here are the parameters corresponding to the LCD screen.

4.8.3. Interface display

Currently, the SDK supports the use of Qt display interface, and its backend uses linux-framebuffer. For specific usage, please refer to the document "imx6ull_buildroot_QT_Development.pdf".

4.9. touch

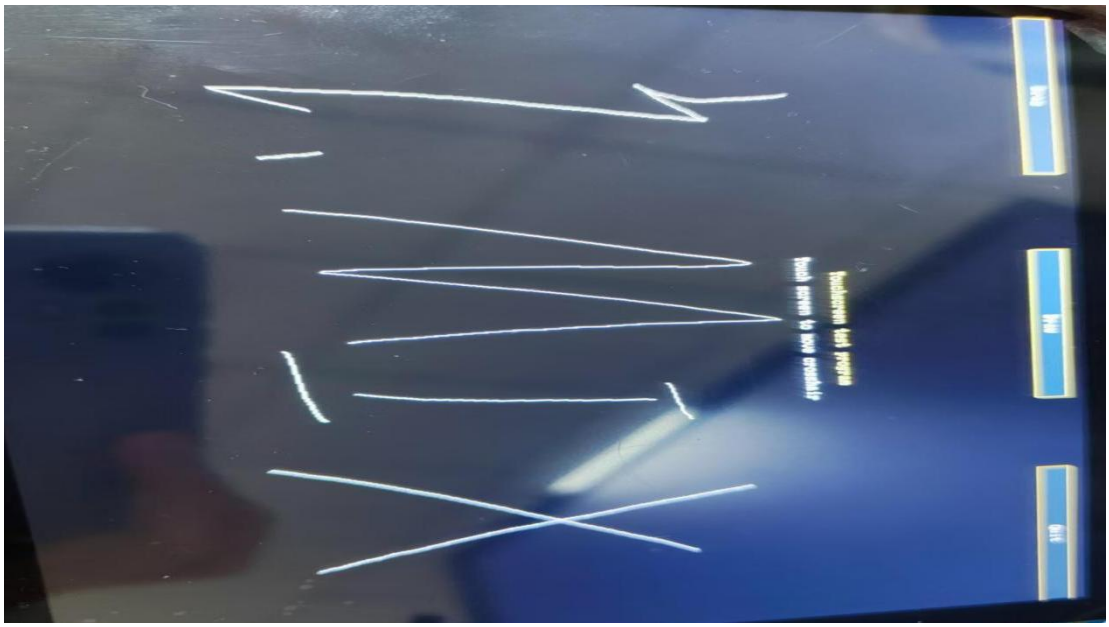
The current single board computer can be used in conjunction with our company's ECA10-7LCD24R1006CT-C touch screen. Users can test the touch screen function through the following command:

```
[root@EBYTE-IMX6UL ~ ]# ts_test
1731667110.548002: 537 18 255
1731667110.590616: 537 18 0
1731667111.345283: 134 171 255
1731667111.461220: 134 171 255
1731667111.472784: 135 173 255
1731667111.484220: 137 177 255
1731667111.495950: 139 184 255
1731667111.506942: 141 193 255
1731667111.514330: 142 200 255
1731667111.525705: 143 206 255
1731667111.537399: 144 210 255
1731667111.548039: 144 214 255
1731667111.558878: 145 215 255
1731667111.569677: 145 217 255
1731667111.581670: 145 219 255
```


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```
1731667111.589180: 145 220 255
```

When you click on the touch screen, the current coordinate position will be printed from the debug serial port in real time.



4.10.TF card

The silk-screen information of the SD card holder is TF Card.

4.10.1. View TF card information

You can view the current TF card status information through the following command:

```
[root@EBYTE-IMX6UL ~ ]# mount -t debugfs debugfs /sys/kernel/debug/
[root@EBYTE-IMX6UL ~ ]# cat /sys/kernel/debug/mmc0/ios
clock: 132000000 Hz
VDD: 21 (3.3 ~ 3.4 V)
bus mode: 2 (push-pull)
chip select: 0 (don't care)
power mode: 2 (on)
bus width: 2 (4 bits)
timing spec: 6 (sd uhs SDR104)
signal voltage: 1 (1.80 V)
```


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```
driver type: 0 (driver type B)
```

It can be found that the current SD card works in SDR104 mode, with an operating voltage of 1.8V, an operating frequency of 132MHz, and uses 4 data lines for communication.

```
[root@EBYTE-IMX6UL ~ ]# fdisk -l /dev/mmcblk0
Disk /dev/mmcblk0: 29.72 GiB, 31914983424 bytes, 62333952 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x303d75c4

Device Boot Start End Sectors Size Id Type
/dev/mmcblk0p1 2048 62333951 62331904 29.7G 83 Linux
```

It can be found that currently only one partition is allocated to the SD card, and the total size of the SD card is 29.72 GiB.

4.10.2. Test TF card speed

Test the SD card read and write speed through the following command:

```
[root@EBYTE-IMX6UL ~ ]# mount /dev/mmcblk0p1 /mnt/
[root@EBYTE-IMX6UL ~ ]# dd if=/dev/zero of=/mnt/test.bin bs=10M count=10 conv=fsync
10+0 records in
10+0 records out
104857600 bytes (105 MB, 100 MiB) copied, 4.33329 s, 24.2 MB/s
[root@EBYTE-IMX6UL ~ ]# echo 3 > /proc/sys/vm/drop_caches
[root@EBYTE-IMX6UL ~ ]# dd if=/mnt/test.bin of=/dev/zero bs=10M
10+0 records in
10+0 records out
```


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```
104857600 bytes (105 MB, 100 MiB) copied, 1.94783 s, 53.8 MB/s

[root@EBYTE-IMX6UL ~ ]#
```

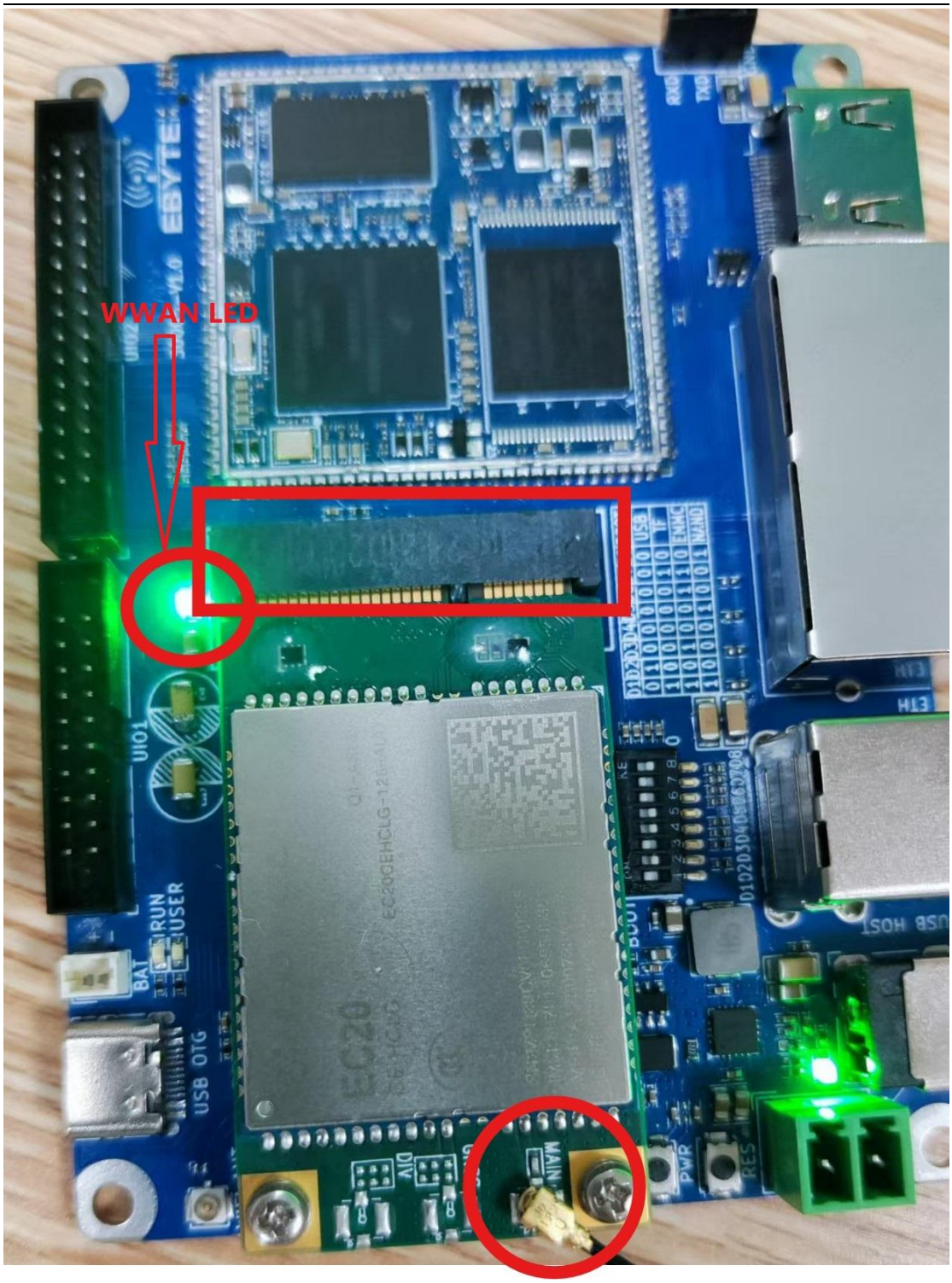
The reading speed here does not reach the theoretical 108MB/s due to the limitation of the chip itself, but it is normal as long as it exceeds 50MB/s.

4.11.4G module

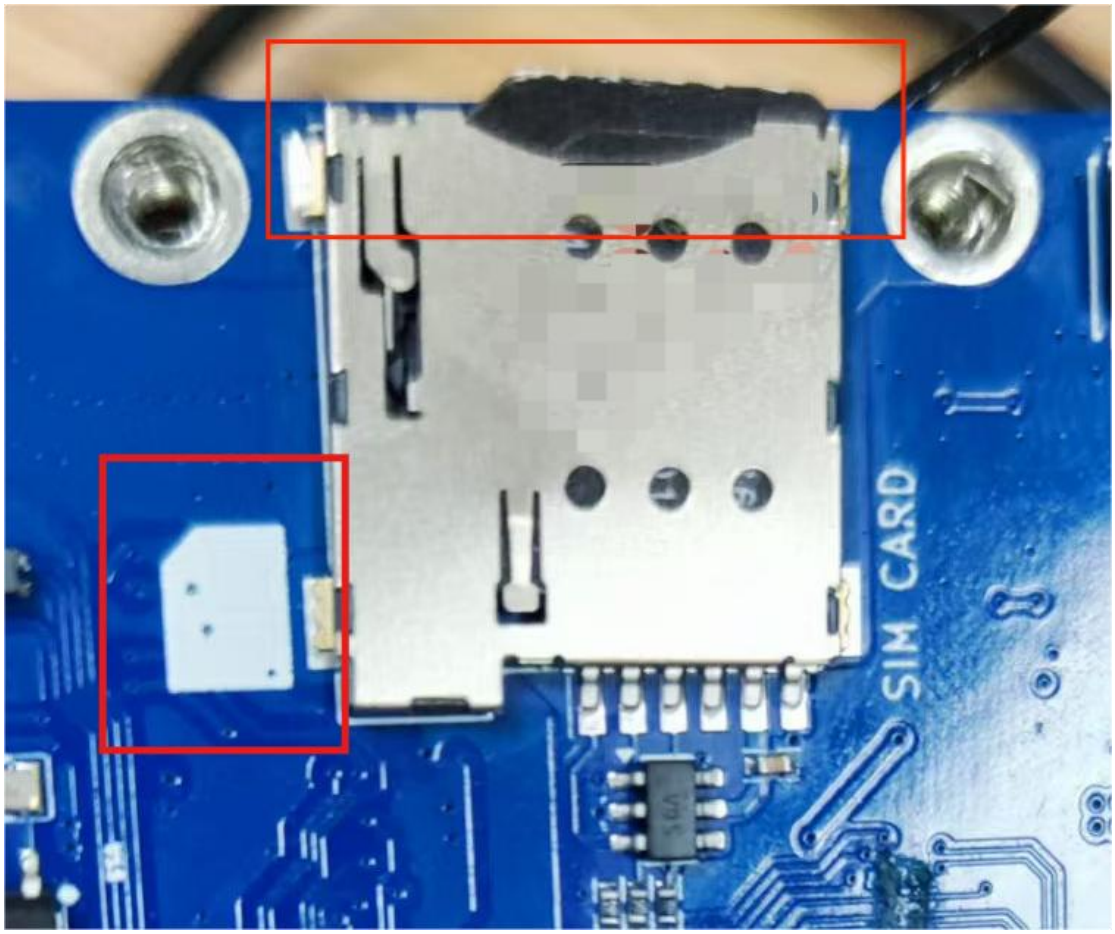
The ECB20-6Y28A series single-board computers have a reserved 4G module interface, but the ECB20-6Y28C series does not support it. It can support the installation of some Quectel 4G modules. Please purchase the corresponding modules online by yourself. Please note that you need to buy an antenna when purchasing. The module alone cannot work properly! (Note: Quectel has many models of 4G modules. The one we have tested is EC20CEHCLGR06A08M1G_AUD. Different modules have different functions, such as different supported operators. Some modules do not support IoT cards, etc. Please consult the seller for details). Please test other models of modules by yourself. Theoretically, the drivers are the same. If you need them, please contact Quectel technical support). Insert the EC20 4G module into the 4G module interface and tighten the screws. Ensure that the 4G module is connected to the socket interface. Please use the original antenna and connect the antenna to the MAIN interface of the 4G module.

Then correctly insert the 4G card (). After the system starts, the WWAN LED next to the 4G module interface will flash green. The module insertion status is as shown below:

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Use the following method to connect to the network and test the network connectivity:

```
[root@EBYTE-IMX6UL ~ ]# quectel-CM &
[1] 293
[root@EBYTE-IMX6UL ~ ]# [11-15_16:07:19:302] QConnectManager_Linux_V1.6.4
[11-15_16:07:19:312] Find /sys/bus/usb/devices/1-1.4 idVendor=0x2c7c idProduct=0x125, bus=0x001, dev=0x004
[11-15_16:07:19:314] Auto find qmichannel = /dev/cdc-wdm0
[11-15_16:07:19:315] Auto find usbnet_adapter = wwan0
[11-15_16:07:19:315] netcard driver = qmi_wwan, driver version = 5.10.9-g90918d460d17-dirty
[11-15_16:07:19:316] Modem works in QMI mode
[11-15_16:07:19:336] cdc_wdm_fd = 7
[11-15_16:07:20:338] QmiWwanInit message timeout
[11-15_16:07:21:437] Get clientWDS = 7
```


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```
[11-15_16:07:21:469] Get clientDMS = 1

[11-15_16:07:21:501] Get clientNAS = 2

[11-15_16:07:21:533] Get clientUIM = 1

[11-15_16:07:21:565] Get clientWDA = 1

[11-15_16:07:21:597] requestBaseBandVersion EC20CEHCLGR06A08M1G_AUD

[11-15_16:07:21:725] requestGetSIMStatus SIMStatus: SIM_READY

[11-15_16:07:21:757] requestGetProfile[1] ///0/IPV4V6

[11-15_16:07:21:789] requestRegistrationState2 MCC: 460, MNC: 0, PS: Attached,
DataCap: LTE

[11-15_16:07:21:821] requestQueryDataCall IPv4ConnectionStatus: DISCONNECTED

[11-15_16:07:21:822] ifconfig wwan0 0.0.0.0

[11-15_16:07:21:864] ifconfig wwan0 down

[11-15_16:07:21:949] requestSetupDataCall WdsConnectionIPv4Handle: 0x86da2050

[11-15_16:07:22:077] ifconfig wwan0 up

[11-15_16:07:22:135] busybox udhcpc -f -n -q -t 5 -i wwan0

udhcpc: started, v1.35.0

udhcpc: broadcasting discover

udhcpc: broadcasting discover

udhcpc: broadcasting discover

udhcpc: broadcasting discover

udhcpc: broadcasting discover

udhcpc: no lease, failing

[11-15_16:07:37:737] File:ql_raw_ip_mode_check Line:137 udhcpc fail to get ip address,
try next:

[11-15_16:07:37:737] ifconfig wwan0 down

[11-15_16:07:37:766] echo Y > /sys/class/net/wwan0/qmi/raw_ip

[11-15_16:07:37:766] ifconfig wwan0 up

[11-15_16:07:37:815] busybox udhcpc -f -n -q -t 5 -i wwan0
```


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```
udhcpc: started, v1.35.0
udhcpc: broadcasting discover
udhcpc: broadcasting select for 10.146.176.134, server 10.146.176.133
udhcpc: lease of 10.146.176.134 obtained from 10.146.176.133, lease time 7200
[11-15_16:07:38:208] deleting routers
[11-15_16:07:38:341] adding dns 223.87.253.100
[11-15_16:07:38:342] adding dns 223.87.253.253

[root@EBYTE-IMX6UL ~ ]# ifconfig wwan0
wwan0 Link encap:UNSPEC HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
      inet addr:10.146.176.134 PtP:10.146.176.134 Mask:255.255.255.252
      UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1500 Metric:1
      RX packets:8 errors:0 dropped:0 overruns:0 frame:0
      TX packets:49 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:1068 (1.0 KiB) TX bytes:7164 (6.9 KiB)

[root@EBYTE-IMX6UL ~ ]# ping -I wwan0 120.27.154.119 -c 4
PING 120.27.154.119 (120.27.154.119): 56 data bytes
64 bytes from 120.27.154.119: seq=0 ttl=115 time=275.483 ms
64 bytes from 120.27.154.119: seq=1 ttl=115 time=74.656 ms
64 bytes from 120.27.154.119: seq=2 ttl=115 time=78.312 ms
64 bytes from 120.27.154.119: seq=3 ttl=115 time=77.678 ms

--- 120.27.154.119 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max = 74.656/126.532/275.483 ms
```


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4.12.USB

4.12.1. OTG

There is a USB-OTG interface on the single board computer. When you connect a USB device through a typec to USB connector, it will be automatically mounted, such as a mouse or a USB flash drive. At the same time, users can also configure it as a slave mode. This chapter mainly describes how to test the slave function of OTG. The host function is the same as the USB HOST interface.

Connect the PC to the OTG interface of the single-board computer and use the following command to share the EFI partition to the PC:

```
modprobe g_mass_storage file=/dev/mmcblk1p1 removable=1
```

After sharing, you can view the following files on your computer:



4.12.2. HOST

This section verifies the feasibility of the USB Host driver through related commands or hot plugging and USB HUB, and realizes the functions of reading and writing U disk and USB enumeration.

After inserting the USB driveYou can use the following command to search for storage devices.

```
[root@EBYTE-IMX6UL ~ ]# lsblk
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS
sda 8:0 1 28.7G 0 disk
`-sda1 8:1 1 28.7G 0 part /media/usb0
mmcblk1 179:0 0 7.3G 0 disk
|-mmcblk1p1 179:1 0 35M 0 part /boot
```


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```
`-mmcblk1p2 179:2 0 7.2G 0 part /
mmcblk1boot0 179:8 0 4M 1 disk
mmcblk1boot1 179:16 0 4M 1 disk
```

You can see that there is an additional sda device here, and its first partition sda1 is mounted to the `/media/usb0` directory.

Entering this directory, you can find the files in the USB flash drive, and you can test the read and write performance of the current USB flash drive through the following command:

```
[root@EBYTE-IMX6UL ~ ]# dd if=/dev/zero of=/media/usb0/dd.bin bs=10M count=2 conv=fsync
2+0 records in
2+0 records out
20971520 bytes (21 MB, 20 MiB) copied, 36.4012 s, 576 kB/s
[root@EBYTE-IMX6UL ~ ]# echo 3 > /proc/sys/vm/drop_caches
[root@EBYTE-IMX6UL ~ ]# dd of=/dev/zero if=/media/usb0/dd.bin bs=10M
2+0 records in
2+0 records out
20971520 bytes (21 MB, 20 MiB) copied, 0.799956 s, 26.2 MB/s
```

It can be seen that the reading speed of the USB flash drive at this time is 26.2MB/s, which is in line with the normal reading speed of a USB 2.0 USB flash drive.

4.13.WIFI module

The ECB20-6Y28A series single board computers provide basic WIFI functions through our company's E103-RTL8811CU module. The ECB20-6Y28C series does not have this function by default and needs to be expanded through the USB interface.

4.13.1. STA mode

Use the following command to scan the list of nearby available Wi-Fi networks:

```
[root@EBYTE-IMX6UL ~ ]# iw dev wlan0 scan | grep SSID
        SSID: TP-LINK_8BF6
```


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```
SSID: zhendu

SSID: TEST_ZW

SSID: TP-LINK_\xef\xbc\x88\xe7\xa1\xac\xe4\xbb\xb6\xe7\xbb\x84)

SSID: B05_2.4G_\xe6\x89\x93\xe5\x8d\xb0\xe6\x9c\xba

SSID: B05_5G_1

SSID: \xe5\xa4\xa7\xe5\x8e\x85\xe7\xbd\x91\xe7\xbb\x9cD-5G

SSID: ChinaNet-F2FH_5G
```

Here we take TP-LINK_8BF6 as an example to connect to WIFI and use:

1. Configure network connections and view configuration information:

```
[root@EBYTE-IMX6UL ~ ]# wpa_passphrase TP-LINK_8BF6 EC12345678 >>
/etc/wpa_supplicant.conf
[root@EBYTE-IMX6UL ~ ]# cat /etc/wpa_supplicant.conf
ctrl_interface=/var/run/wpa_supplicant
ap_scan=1


network={
 key_mgmt=NONE
}
network={
        ssid="TP-LINK_8BF6"
        #psk="EC12345678"
        psk=9c26e18d1d12d9542f596ad7e4004d5c7c8cf1c157b90f06d10cc3fe2ba1cbbc
}
```

2. Connect to the network:

```
[root@EBYTE-IMX6UL ~ ]# wpa_supplicant -B -i wlan0 -c /etc/wpa_supplicant.conf
Successfully initialized wpa_supplicant
rfkill: Cannot open RFKILL control device
```


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```
[root@EBYTE-IMX6UL ~ ]# udhcpc -i wlan0
udhcpc: started, v1.35.0
udhcpc: broadcasting discover
udhcpc: broadcasting select for 192.168.1.156, server 192.168.1.1
udhcpc: lease of 192.168.1.156 obtained from 192.168.1.1, lease time 7200
deleting routers
adding dns 114.114.114.114
adding dns 61.139.2.69
[root@EBYTE-IMX6UL ~ ]# ifconfig wlan0
wlan0 Link encap:Ethernet HWaddr E0:54:E9:60:57:39
      inet addr:192.168.1.156 Bcast:192.168.1.255 Mask:255.255.255.0
      inet6 addr: fe80::e17b:f9aa:351:b769/64 Scope:Link
      UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
      RX packets:1111 errors:0 dropped:0 overruns:0 frame:0
      TX packets:45 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:993561 (970.2 KiB) TX bytes:6830 (6.6 KiB)
```

3. Test network connection:

```
[root@EBYTE-IMX6UL ~ ]# ping -I wlan0 120.27.154.119 -c 4
PING 120.27.154.119 (120.27.154.119): 56 data bytes
64 bytes from 120.27.154.119: seq=0 ttl=113 time=320.330 ms
64 bytes from 120.27.154.119: seq=1 ttl=113 time=351.853 ms
64 bytes from 120.27.154.119: seq=2 ttl=113 time=325.947 ms
64 bytes from 120.27.154.119: seq=3 ttl=113 time=316.699 ms

--- 120.27.154.119 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
```


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```
round-trip min/avg/max = 316.699/328.707/351.853 ms
```

4.13.2. AP Mode

When using a single-board computer as a WiFi hotspot, it is necessary to assign IP, routing and other network parameters to each terminal (such as a mobile phone) that accesses the hotspot.

In the process of creating the WiFi hotspot function, we need the following programs to work together: hostapd, dnsmasq. At the same time, in order to access the external network, we also need to use the iptables program to configure the network routing table.

4.13.2.1. Configuring the DHCP Server

We use dnsmasq as the DHCP server. First, create the corresponding configuration file `/etc/dnsmasq.conf`:

```
interface=wlan0 # Set to wlan0, specify which interface to assign the IP address on
dhcp-range=192.168.10.50,192.168.10.150,12h # DHCP range: 192.168.1.50 to 192.168.1.150, lease time is 12 hours
dhcp-option=3,192.168.10.1 # Set the gateway (i.e. router address)
dhcp-option=6,192.168.10.1 # Set the DNS server address (usually set to the router address)
bind-interfaces # Prevent dnsmasq from starting on other interfaces
```

After the configuration is complete, enable the DHCP server function:

```
[root@EBYTE-IMX6UL ~ ]# ifconfig wlan0 192.168.10.1 up
[root@EBYTE-IMX6UL ~ ]# dnsmasq -C /etc/dnsmasq.conf
```

4.13.2.2. Configuring AP Functions

Use hostapd to configure and convert the wifi module to AP function. Users need to pay attention to the following:

Modify the hostapd configuration file `/etc/hostapd.conf`. The following is a simple example:

```
interface=wlan0
driver=nl80211
# mode Wi-Fi (a = IEEE 802.11a, b = IEEE 802.11b, g = IEEE 802.11g)
hw_mode=g
```


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```
ssid=EBYTE
channel=7
wmm_enabled=0
macaddr_acl=0
# Wi-Fi closed, need an authentication
auth_algs=1
ignore_broadcast_ssid=0
wpa=2
wpa_passphrase=12345678
wpa_key_mgmt=WPA-PSK
wpa_pairwise=TKIP
rsn_pairwise=CCMP
```

A wireless Wi-Fi hotspot with SSID EBYTE, PASSWD 12345678 and encryption method WPA2 is configured here.

After modifying the configuration file, use the following command to enable the AP function:

```
[root@EBYTE-IMX6UL ~ ]# hostapd -B /etc/hostapd.conf
rfkill: Cannot open RFKILL control device
[906.106438] RTW: assoc success
[906.109976] IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready
[906.129412] RTW: set group key camid:0, addr:e0:54:e9:60:57:39, kid:1, type:AES
wlan0: interface state UNINITIALIZED->ENABLED
wlan0: AP-ENABLED
```

At this time, you can find the corresponding wifi network on your mobile phone, but after connecting, you will find that you cannot access the external network. The user needs to perform the next step to configure network forwarding.

4.13.2.3. Configuring Network Forwarding

Use the following command to configure network forwarding so that the device connected to wlan0 can access the network through eth0 of the single board computer.

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```
[root@EBYTE-IMX6UL ~ ]# echo 1 > /proc/sys/net/ipv4/ip_forward
[root@EBYTE-IMX6UL ~ ]# iptables -t nat -A POSTROUTING -s 192.168.10.1/24 -o eth0 -j MASQUERADE
```

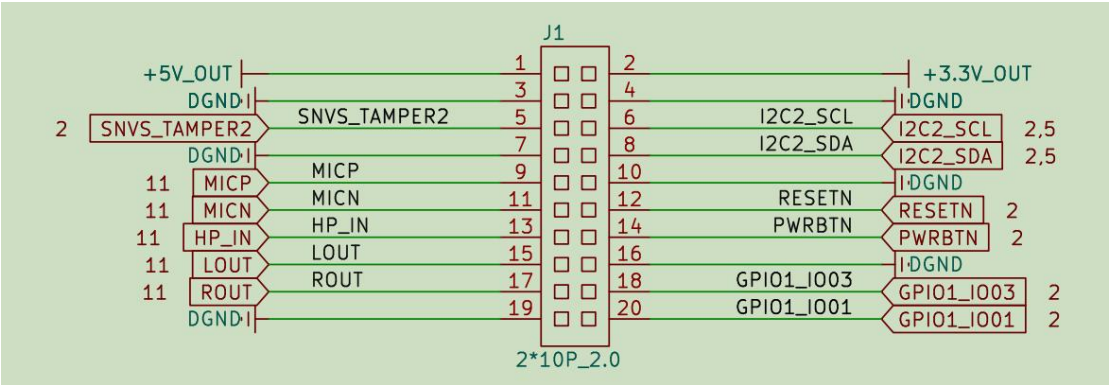
4.13.2.4. Device Management View

You can view the devices connected to wlan0 by using the following command:

```
[root@EBYTE-IMX6UL ~ ]# arp -i wlan0 -a
? (192.168.10.135) at 1e:92:47:fe:fc:99 [ether] on wlan0
[root@EBYTE-IMX6UL ~ ]# iw dev wlan0 station dump
Station 1e:92:47:fe:fc:99 (on wlan0)
        inactive time: 110 ms
        signal: -61 dBm
        current time: 1731664035416 ms
```

4.14. Audio

The single-board computer provides audio function through ES8316. The ECB20-6Y28A series single-board computer does not have a headphone jack by default, but is located at the UIO1 expansion pin header:



You can use the following command to view the functions supported by the current codec:

```
[root@EBYTE-IMX6UL ~ ]# aplay -D hw:0,0 --dump-hw-params /dev/zero
Playing raw data '/dev/zero' : Unsigned 8 bit, Rate 8000 Hz, Mono
HW Params of device "hw:0,0":
```


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```
----------
ACCESS: MMAP_INTERLEAVED RW_INTERLEAVED
FORMAT: S16_LE S24_LE
SUBFORMAT: STD
SAMPLE_BITS: [16 32]
FRAME_BITS: [16 64]
CHANNELS: [1 2]
RATE: [16000 48000]
PERIOD_TIME: (333 1024000]
PERIOD_SIZE: [16 16384]
PERIOD_BYTES: [128 65532]
PERIODS: [2 255]
BUFFER_TIME: (666 2048000]
BUFFER_SIZE: [32 32768]
BUFFER_BYTES: [128 65536]
TICK_TIME: ALL
----------
aplay: set_params:1352: Sample format non available
Available formats:
- S16_LE
- S24_LE
```

After the user has connected the extension by himself, he can use the following command to test the audio output function:

```
speaker-test -c 2


speaker-test 1.2.6
```


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```
Playback device is default
Stream parameters are 48000Hz, S16_LE, 2 channels
Using 16 octaves of pink noise
Rate set to 48000Hz (requested 48000Hz)
Buffer size range from 64 to 16384
Period size range from 32 to 8192
Using max buffer size 16384
Periods = 4
was set period_size = 4096
was set buffer_size = 16384
0 - Front Left
1 - Front Right
Time per period = 5.636287
0 - Front Left
1 - Front Right
Time per period = 5.973515
0 - Front Left
1 - Front Right
```

Use the following command to record a 5-second audio:

```
[root@EBYTE-IMX6UL ~ ]# arecord -f S16_LE -r 48000 record.wav -c 2 -vv -d 5
Recording WAVE 'record.wav' : Signed 16 bit Little Endian, Rate 48000 Hz, Stereo
Plug PCM: Hardware PCM card 0 'ES8316' device 0 subdevice 0
Its setup is:
  stream : CAPTURE
  access : RW_INTERLEAVED
  format : S16_LE
  subformat : STD
```


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```
channels : 2
rate : 48000
exact rate : 48000 (48000/1)
msbits : 16
buffer_size : 16384
period_size : 4096
period_time : 85333
tstamp_mode : NONE
tstamp_type : MONOTONIC
period_step : 1
avail_min : 4096
period_event : 0
start_threshold : 1
stop_threshold : 16384
silence_threshold: 0
silence_size : 0
boundary : 1073741824
appl_ptr : 0
hw_ptr : 0
######## + | 29%
```

4.15.led

The Linux system provides an independent subsystem to facilitate the operation of LED devices from user space. This subsystem provides operation interfaces for LED devices in the form of files. These interfaces are located in the /sys/class/leds directory. In the hardware resource list, we have listed all the LEDs on the development board. Next, we test the LED by reading and writing sysfs commands.

The following commands are all common commands and are also common methods for controlling LEDs.

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View all LEDs configured in the current system

```
ls /sys/class/leds/
```

View the current status of the user LED

```
cat /sys/class/leds/user/brightness
```

Control the user LED to light up

```
echo 1 > /sys/class/leds/user/brightness
```

Restore the LED to off

```
echo 0 > /sys/class/leds/user/brightness
```

Check the working status of the peripherals according to which the user LED supports breathing and flashing

```
cat /sys/class/leds/user/trigger
```

Control the user LED to flash according to the working status of mmc1

```
echo mmc1 > /sys/class/leds/user/trigger
```

Test whether the LED flashes according to the working status of mmc1. Use the following method to make the LED light up for a short time when writing data until the writing is completed.

```
dd if=/dev/zero of=test.bin bs=1M count=10 conv=fsync
```

4.16.button

There are two buttons on the single board computer: RES and PWR, which correspond to the reset function and the power on/off function respectively. In the current configuration, we have disabled the short-press shutdown function of the PWR button, but retained the long-press forced shutdown function.

4.16.1. Reset

When the RES button is pressed, the system will restart immediately.

```
[root@EBYTE-IMX6UL ~ ]# memtester 100M 1
```


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```
memtester version 4.5.0 (32-bit)
Copyright (C) 2001-2020 Charles Cazabon.
Licensed under the GNU General Public License version 2 (only).


pagesize is 4096
pagesizemask is 0xfffff000
want 100MB (104857600 bytes)
got 100MB (104857600 bytes), trying mlock ...locked.
Loop 1/1:
  Stuck Address : testing 3


U-Boot 2020.04-g93edef74 (Nov 15 2024 - 10:23:36 +0800)


CPU: i.MX6ULL rev1.1 792 MHz (running at 396 MHz)
CPU: Industrial temperature grade (-40C to 105C) at 54C
Reset cause: POR
Model: EBYTE i.MX6 ULL EVK Board
Board: ebyte i.MX6ULL
DRAM: 512 MiB
MMC: FSL_SDHC: 0, FSL_SDHC: 1
Loading Environment from MMC... OK
```

From the above log information, we can see that the system is still executing memtester, but immediately enters the u-boot information printing. This is the time for me to press the RES button.

4.16.2. power supply

The power button is used to power on the system after it is turned off, or to long-press it to force a shutdown. After the system is turned off, the system cannot be restarted by RES reset, and must be started using the PWR button.

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```
Sent SIGTERM to all processes

Sent SIGKILL to all processes

Requesting system power off

[23.793078] cfg80211: failed to load regulatory.db

[ 23.822778] imx-sdma 20ec000.sdma: loaded firmware 3.6

[23.830381] RTW: stop cmd thread during rtw_dev_shutdown

[23.860818] RTW: cmd thread is stopped during rtw_dev_shutdown

[23.877776] ci_hdrc ci_hdrc.1: remove, state 1

[23.882310] usb usb1: USB disconnect, device number 1

[23.887567] usb 1-1: USB disconnect, device number 2

[23.892604] usb 1-1.1: USB disconnect, device number 3

[23.974794] usb 1-1.3: USB disconnect, device number 4

[24.003973] RTW: rtw_ndev_uninit(wlan0) if1

[24.093790] RTW: rtw_dev_unload: driver not in IPS

[24.105650] ci_hdrc ci_hdrc.1: USB bus 1 deregistered

[24.137017] reboot: Power down



U-Boot 2020.04-g93edef74 (Nov 15 2024 - 10:23:36 +0800)


CPU: i.MX6ULL rev1.1 792 MHz (running at 396 MHz)

CPU: Industrial temperature grade (-40C to 105C) at 49C

Reset cause: POR

Model: EBYTE i.MX6 ULL EVK Board

Board: ebyte i.MX6ULL

DRAM: 512 MiB

MMC: FSL_SDHC: 0, FSL_SDHC: 1

Loading Environment from MMC... OK
```


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The above log information is the process from system shutdown to restarting by pressing the PWR button.

5. References

- Linux kernel open source community:https://www.kernel.org/
- NXP Development Community:https://community.nxp.com
- IMX6ULL date-sheet
- Buildroot-manual: https://buildroot.org/downloads/manual/manual.html
- imx-yocto-lf5.10.9_1.0.0

6. Revision Notes

Revision Notes Table

Version	Modifications	Modification time	prepared by	Proofreading	Approval
V1.0	First Draft	24-11-11	Wlq	HSL	WFX
V1.1	Added chapter Quick Start, corrected spelling errors	24-12-12	Wlq	HSL	WFX
V1.2	Added ECB20-6Y28C series	25-03-05	Wlq	LqCy	WFX

7. About us

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