IAC-A5D3x-Kit Linux Function Specification And Test Manual

Version No.: 2.0

2014/10/08

Catalogue

Version Updates

Version	Hardware Platform	Description	Date	Revisor
1.0	IAC-A5D3x-Kit	Launched	2014-02-09	yao
2.0	IAC-A5D3x-Kit	Add EBI Test, support SAMA5D36 2-ch Ethernet port test	2014-10-08	WWX

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Preface

This manual mainly introduce about the test method and the

illustration for each connector in the kernel file system.

Please read the following manuals carefully before testing the board.

IAC-A5D3x-Kit Linux User Manual and *IAC-A5D3x-Kit Hardware*

Manual

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Ⅰ. Preparation

Please read ***IAC-A5D3x-Kit Linux User Manual. pdf*** carefully. According to this manual, do setting and connect to the development board. After connecting well, boot the system, enter into the file system of the board, as shown. Type login user [root], then you could enter into [shell]interface:

```
y 312, idx 188
UBIFS DBG (pid 1): mount_ubifs: dead watermark:        2048
UBIFS DBG (pid 1): mount_ubifs: dark watermark:        6144
UBIFS DBG (pid 1): mount_ubifs: LEB overhead:          2656
UBIFS DBG (pid 1): mount_ubifs: max. dark space:       11089920 (10830 KiB, 10 MiB
)
UBIFS DBG (pid 1): mount_ubifs: maximum bud bytes:     8388608 (8192 KiB, 8 MiB)
UBIFS DBG (pid 1): mount_ubifs: BG commit bud bytes:   6815744 (6656 KiB, 6 MiB)
UBIFS DBG (pid 1): mount_ubifs: current bud bytes      182272 (178 KiB, 0 MiB)
UBIFS DBG (pid 1): mount_ubifs: max. seq. number:      35533
UBIFS DBG (pid 1): mount_ubifs: commit number:         9
VFS: Mounted root (ubifs filesystem) readonly on device 0:11.
devtmpfs: mounted
Freeing init memory: 156K
UBIFS: completing deferred recovery
UBIFS DBG (pid 545): ubifs_bg_thread: background thread "ubifs_bgt0_0" started,
PID 545
UBIFS: deferred recovery completed
Starting logging: OK
Starting user init: OK
Populating /dev using udev: IPv6: ADDRCONF(NETDEV_UP): eth0: link is not ready
udevd[568]: starting version 182
at91_can f000c000.can: can0: writing AT91_BR: 0x00200561
done
Starting portmap: done
Initializing random number generator... done.
Starting network...
Starting vsftpd: OK
Starting telnetd: OK

Welcome to IAC-A5D3x-V2.x
sama5d3x login: macb f0028000.ethernet: eth0: link up (100/Full)
IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
IPv6: eth0: IPv6 duplicate address fe80::1034:56ff:fe78:9076 detected!

Welcome to IAC-A5D3x-V2.x
sama5d3x login: root
[root@sama5d3x /root]#
```

Test programs locates at [/usr/local/board_test]directory, enter into this directory, the subsequent tests all could be finished in this directory.

[root@sama5d3x /root]# cd /usr/local/board_test/

[root@sama5d3x board_test]# ls

```
[root@sama5d3x board_test]# ls
adc_test                hotelcalifornia.mp3     serial_test
alpu_test               key_test                vedio
buzzer_test             pwm_test                watchdog_feed_test
can_test                qt                      watchdog_notfeed_test
gpio_test               rtc_test
[root@sama5d3x board_test]#
```

Ⅱ. Mainboard Test

1.1. Buzzer Test

IAC-A5D3x-Kit use [PIO_PE20] to control the buzzer on the base board, when the PIN level is [high], the buzzer does work; when the level is [low], the buzzer dose not work.

Test Principle:

The Buzzer will continue buzzing for 1 second.

Test Process & Test Result:

Run buzzer test program [buzzer_test]

[root@sama5d3x board_test]# ./buzzer_test

```
[root@sama5d3x board_test]# ./buzzer_test
IAC-A5D3x-v2.x Buzzer Start Testing ...
Buzzer Test OK.
[root@sama5d3x board_test]# █
```

After executing, it will buzz.

Device Node:

/dev/sama5d3x-buzzer

Test Code:

CD/Test Code/ buzzer_test/buzzer_test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

Driver Code:

linux-at91-3.6.9/drivers/misc/atmel_buzzer_sama5.c

The Kernel Options:

Device Drivers --->

    Misc devices --->

        <*> Atmel SAMA5D3X Buzzer support

FAQ:

Debug UART shows:

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```
[root@sama5d3x board_test]# ./buzzer_test
IAC-A5D3x-v2.x Buzzer Start Testing ...
open buzzer device /dev/sama5d3x-buzzer error!
buzzer_test.c   main    25
[root@sama5d3x board_test]#
```

Note : The last column of the printed information shows the error of the file ,function, column of the file.

Please check the following items:

①. Whether the [/dev] directory has the [sama5d3x-buzzer] node

②. Whether the kernel configuration select the [<*>Atmel sama5d3x buzzer driver support]option

③. Whether the tree file enables the [buzzer]node.

1.2. GPIO Test

Test ISI connector (J22) PIN[ISI_D2, ISI_D3, ISI_D8, MAIN_CLK, ISI_PCK], the above 5 PINS could be multiplex with the gpio.

Test Principle:

[gpio_test 0] test the status when [gpio]pin do not connect to the external device, set all pins to low level, then set all pins to high level. After setting, you could get the level status to compare immediately. If they are no difference, it means the GPIO test is ok!

[gpio_test 1] read the external level signal directly, the user could compare the read level value with the connected level value to confirm whether the [GPIO] is ok.

Test Process & Test Result:

Run[GPIO]Test Program [gpio_test]

[root@sama5d3x board_test]# ./gpio_test

It shows the following message:

```
[root@sama5d3x board_test]# ./gpio_test
Invalid arguments!
Usage: ./gpio_test [0,1]
 0  -- gpio test.
 1  -- get gpio level.
[root@sama5d3x board_test]#
```

Illustration:[gpio_test 0] set [GPIO] high level and low level, then obtain [GPIO] level status.

[gpio_test 1]obtain [GPIO] level.

[GPIO] without external signal, execute [gpio_test 0]

[root@sama5d3x board_test]# ./gpio_test 0

```
[root@sama5d3x board_test]# ./gpio_test 0
IAC-A5D3x-v2.x Gpio Start Testing ...
set gpio 'ISI_D2' level '0'
get gpio 'ISI_D2' level '0'
set gpio 'ISI_D3' level '0'
get gpio 'ISI_D3' level '0'
set gpio 'ISI_D8' level '0'
get gpio 'ISI_D8' level '0'
set gpio 'MAIN_CLK' level '0'
get gpio 'MAIN_CLK' level '0'
set gpio 'ISI_PCK' level '0'
get gpio 'ISI_PCK' level '0'
set gpio 'ISI_D2' level '1'
get gpio 'ISI_D2' level '1'
set gpio 'ISI_D3' level '1'
get gpio 'ISI_D3' level '1'
set gpio 'ISI_D8' level '1'
get gpio 'ISI_D8' level '1'
set gpio 'MAIN_CLK' level '1'
get gpio 'MAIN_CLK' level '1'
set gpio 'ISI_PCK' level '1'
get gpio 'ISI_PCK' level '1'
Gpio Test OK!
```

As the above picture shown, you could set each [GPIO] to low level, then set them to high level, after setting, you could obtain this [GPIO] level status. When the setting level and the obtained level are same, the [GPIO] function is ok.

[GPIO] with external signal, run [gpio_test 1].

[root@sama5d3x board_test]# ./gpio_test 1

```
[root@sama5d3x board_test]# ./gpio_test 1
IAC-A5D3x-v2.x Gpio Start Testing ...
get gpio 'ISI_D2' level '1'
get gpio 'ISI_D2' level '1'
get gpio 'ISI_D3' level '1'
get gpio 'ISI_D3' level '1'
get gpio 'ISI_D8' level '1'
get gpio 'ISI_D8' level '1'
get gpio 'MAIN_CLK' level '1'
get gpio 'MAIN_CLK' level '1'
get gpio 'ISI_PCK' level '1'
get gpio 'ISI_PCK' level '1'
[root@sama5d3x board_test]#
```

As the above picture shown, obtain each [GPIO] level status, the user could change the [GPIO] signal which is actually connected, to confirm whether [GPIO] is ok.

Device Node:

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/dev/sama5d3x-gpio

Test Code:

CD/Test Code/ gpio_test/gpio_test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

Driver Code:

linux-at91-3.6.9/drivers/misc/atmel_gpio_sama5.c

The Kernel Options

Device Drivers --->

    Misc devices --->

        <*> Atmel SAMA5D3X Gpio support

FAQ

The debug UART shows:

```
[root@sama5d3x board_test]# ./gpio_test 0
IAC-A5D3X-v2.x Gpio Start Testing ...
open gpio device /dev/sama5d3x-gpio error!
gpio_test.c     main    245
[root@sama5d3x board_test]# ./gpio_test 1
IAC-A5D3X-v2.x Gpio Start Testing ...
open gpio device /dev/sama5d3x-gpio error!
gpio_test.c     main    245
[root@sama5d3x board_test]#
```

Please check the following items:

①. Whether there is [/dev/sama5d3x-gpio] node in [/dev]directory.

② Whether the kernel configuration has selected [<*> Atmel SAMA5D3X Gpio support] options.

③Whether Device tree file enabled [usr_gpios]node.

1.3. PWM Test

CPU owns one PWM controller, this controller has 4-ch PWM, each channel has two output outputs: [PWML]and [PWMH], this two signals polarity are opposite.

There are six signals in this three channel user [PWM0,PWM1,PWM3] in IAC-A5D3X-KIT core board.

Channel-0 [PWML and PWMH] were brought out into the J22 [ISI_D5 and ISI_D4] on base board;

Channel-1 [PWML and PWMH] were brought out into the J22 [ISI_D7 and ISI_D6] on base board;

Channel-3 [PWMH] is connected to LED blue light （D13）.

Test Principle:

This test is for the channel-0,channel-1,channel-3, set cycle for channel-0, channel-1,channel-3 to 1s, duty ratio is 50%. Polarity is low level(It means the initial level is low). After starting 5s, close PWM function.

Test Process & Test Result:

Execute [pwm]test program [pwm_test].

[root@sama5d3x board_test]# ./pwm_test

```
[root@sama5d3x board_test]# ./pwm_test
IAC-A5D3x-v2.x Pwm Start Testing ...
Pwm Test OK!
```

In test process, you could check from the oscilloscope, it will output the duty ratio :50% from J22 (ISI_D4 and ISI_D6). The cycle is 1s square wave. The blue indicator D13 will flash every other 1s.

Device Node:

/dev/sama5d3x-pwm

Test Code:

CD/Test Code/ pwm_test/pwm_test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/misc/atmel_pwm_sama5.c

The Kernel Options:

Device Drivers --->

> Misc devices --->

> <*> Atmel SAMA5D3X PWM support

F&Q

The debug UART prints information:

```
[root@sama5d3x board_test]# ./pwm_test
IAC-A5D3x-v2.x Pwm Start Testing ...
open pwm device /dev/sama5d3x-pwm error! errno = -1
pwm_test.c     main    174
```

Please check the following items:

①. Whether there is [/dev/sama5d3x-pwm] node in [/dev]directory.

②. Whether the kernel configuration has selected [<*> Atmel SAMA5D3X PWM support]option.

③. Whether the device tree file enabled [gpio] node.

1.4. RTC Test

IAC-A5D3x-Kit development board uses the I2C0 to connect the DS3231 on base board as the external hardware clock. Please make sure that it has been installed the battery before testing.

Here , we provide two test methods:

①.Use file system command to test.

②.Use test program to test.

Test Principle:

Method ①: Use [rtc_test] test program to test, set the hardware clock at first, then read setting time, then print it to confirm whether the [rtc] read and [rtc] set are same. The default setting time for [rtc_test] is [2014.-12-11,11:11:11].

☆ Note: This method is just for testing whether the time is correct when reading and setting. If you want to test the RTC accuracy, please refer to method ②!

Method②: Set the system time by [date]tool which the file system owns. Then use [hwclock]tool to set the system time into the hardware clock chip. Then set the system time.

Test Process & Test Result:

Method①: Execute [rtc] test program [rtc_test].

[root@sama5d3x board_test]# ./rtc_test

```
[root@sama5d3x board_test]# ./rtc_test
IAC-A5D3x-V2.x RTC Start Testing ...
now set date/time is 2014-12-11, 11:11:11.
now read date/time is 2014-12-11, 11:11:11.
Test Success.
```

As the above picture shown, the read date is same as the set date, it means the RTC read and RTC set is correct.

Method②:

Execute [date] command on board, you could check the current system clock.

[root@sama5d3x board_test]# date

```
[root@sama5d3x board_test]# date
Sat Jan  1 03:16:22 UTC 2000
```

Use[date]command to set system clock, such as, set the time as the current PC time.

[root@sama5d3x board_test]# date 021015592014   /*Month Day Hour Minute Year*/

```
[root@sama5d3x board_test]# date 021015592014
Mon Feb 10 15:59:00 UTC 2014
```

Use [hwclock]command to set the system time into hardware clock chip.

[root@sama5d3x board_test]# hwclock -w

Use [date]and [hwclock] command to check the system and hardware clock, whether it is set successfully.

```
[root@sama5d3x board_test]# date
Mon Feb 10 15:59:28 UTC 2014
[root@sama5d3x board_test]# hwclock
Thu Dec 11 11:12:48 2014   -0.092592 seconds
[root@sama5d3x board_test]#
```

Then power down, then power on, check the system and hardware clock again, whether the time is saved, whether the time walks accurately.

```
welcome to IAC-A5D3x-V2.x
sama5d3x login: root
[root@sama5d3x /root]# date
Mon Feb 10 16:01:17 UTC 2014
[root@sama5d3x /root]# hwclock
Mon Feb 10 16:01:26 2014   -0.557641 seconds
[root@sama5d3x /root]#
```

Compare it with the PC time, there is no error. If you need time accuracy for long time testing, you could test the clock error by power down and power on by testing several days, weeks or months.

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This development board has been tested for one month before launching, the clock error will not exceed 2s.

For the delivered board, it should be tested over 24 hours. The clock error will not exceed 1s.

Device Node:

/dev/rtc

/dev/rtc0

Remark: RTC is the soft link for RTC0, anyone is ok.

Test Code:

CD/Test Code/ rtc_test/rtc_test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

ds1338 driver: linux-at91-3.6.9/drivers/rtc/rtc-ds1307.c

i2c0 driver: linux-at91-3.6.9/drivers/i2c/busses/i2c-gpio.c

The Kernel Options:

I2c0:

Device Drivers --->

I2C support   --->

[*]   Enable compatibility bits for old user-space

< *>   I2C device interface

< >   I2C bus multiplexing support

[*]   Autoselect pertinent helper modules

I2C Hardware Bus support   --->   <*> GPIO-based bitbanging I2C

[ ]   I2C Core debugging messages

[ ]   I2C Algorithm debugging messages

[ ]   I2C Bus debugging messages

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rtc:

Device Drivers --->

[*] Real Time Clock   --->

[*]   Set system time from RTC on startup and resume

(rtc0)   RTC used to set the system time

[ ]   RTC debug support

*** RTC interfaces ***

[*]   /sys/class/rtc/rtcN (sysfs)

[*]   /proc/driver/rtc (procfs for rtc0)

[*]   /dev/rtcN (character devices)

[ ]   RTC UIE emulation on dev interface

<*>   Dallas/Maxim DS1307/37/38/39/40, ST M41T00, EPSON RX-8025

FAQ:

Phenomenon: Time could not be saved; Time deviates heavily; Can not check the hardware clock.

The debug UART prints information:

```
[root@sama5d3x board_test]# ./rtc_test
IAC-A5D3x-v2.x RTC Start Testing ...
open dev /dev/rtc failed.
rtc_test.c      main    83
[root@sama5d3x board_test]#
```

Please check the following items:

①. It has been installed the battery on the BT1 on base board. The battery has the electricity.

②.Whether there is [/dev/rtc] and [/dev/rtc0] in [/dev]directory.

③.Whether the kernel configuration option has been configured.

④. Whether Device tree file enabled [i2c0]node and [i2c0]device tree child node [ds1338].

1.5. Serial Port Test

There are 5-ch serial port on the IAC-A5D3X-KIT development kit. Include 1-ch is used as

debug port (J3). The other 4-ch could be regarded as RS232. Include COM1(J4)and COM2(j6) could multiplex with the RS485.COM0 and COM3 are on the J5.

Test Principle:

The serial port will transmit character data [Comx RS232 test string!] every other 1s. Include [x] is the actual test serial port number. Then use the multithreading method, block to read serial data, then print.

Test program also provides the test program for the RS485 telecommunication between COM1 and COM2. When testing RS485, you should connect the [Signal A] and [Signal B] for the 2-ch RS485 at first (Connect J_485A2 and J_485A1 ;Connect J_485B2 and J_485B1).

232 Serial Port Test Process & Test Result:

When testing the serial port , the PC mainframe needs two serial ports on it.

① One serial port on PC is to connect the debug port, it is used for interaction.

②. One serial port on PC is to connect the under testing serial port, it is used for transmit and receive data.

If there is only one serial port on your PC mainframe, the serial port on PC should connect to the under testing serial port. Then use the network cable to connect the development board, log in the development system as the debug UART by [telnet].

The default IP address [192.168.1.126] on development board ,click [Start] button on PC, then select [Run].Input [cmd], Click [Confirm].
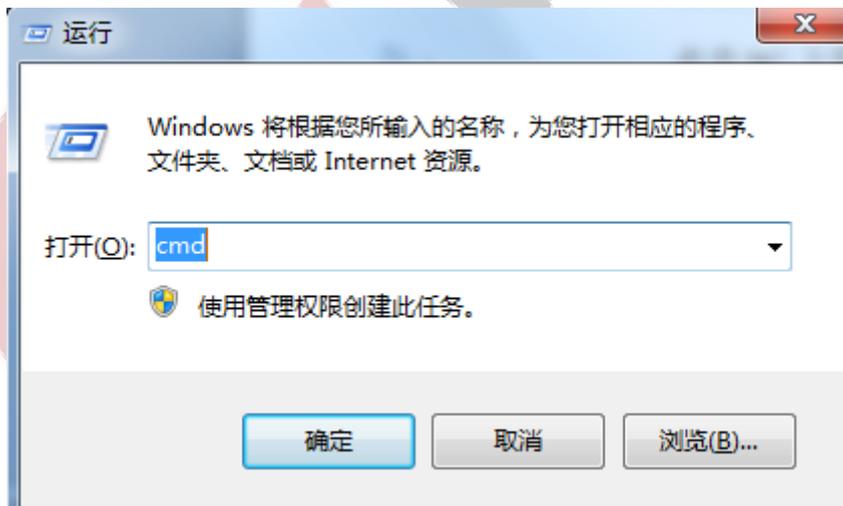
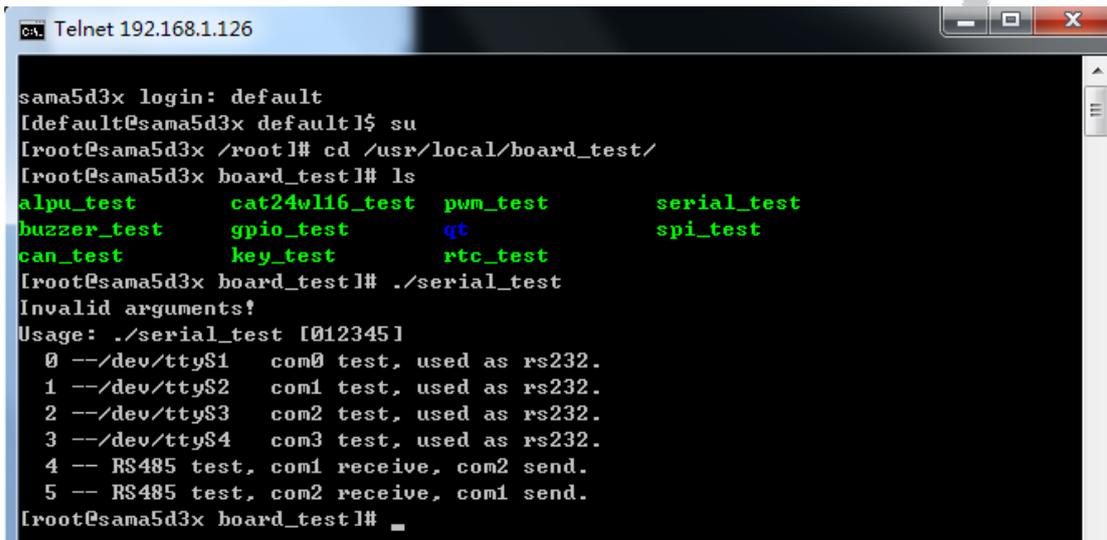Input [telent 192.168.1.126] in running window.

At first, log in by user [default], then use [su] command to switch into [root] user. Or it appears the permission problem when executing the test program.

The relation for the board 's serial ports ,plug-in components and device node are as follows:

com0 -> J5 -> /dev/ttyS1

com1 -> J4 -> /dev/ttyS2

com2 -> J6 -> /dev/ttyS3

com3 -> J5 -> /dev/ttyS4

According to the above corresponding relation, select the serial port which need to be tested. Connect it to the serial port on the PC mainframe.

Open the serial debugging assistant in CD.
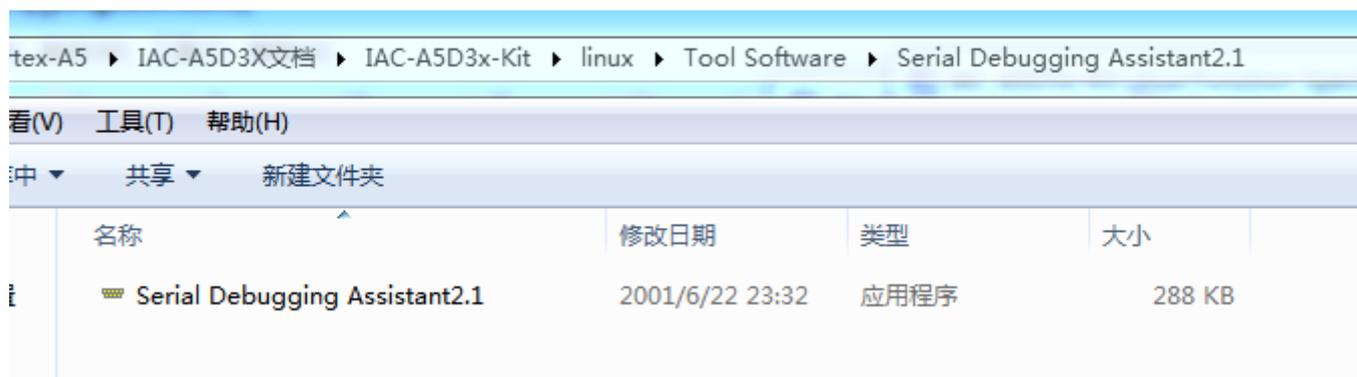
You will find out it when you open it. Open it, it hints as follows: [Not detect such serial port]
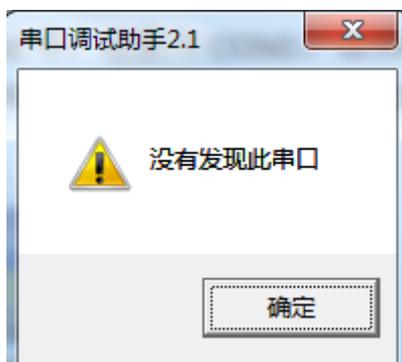
It means the COM1 on PC mainframe has been occupied. Turn off the terminal, then open it.

Set serial attribution, serial port is corresponding to PC COM number. Here COM1, Baud Rate:115200, Data Bit: 8-bit, Stop bit: 1-bit, Parity Bit :NONE.

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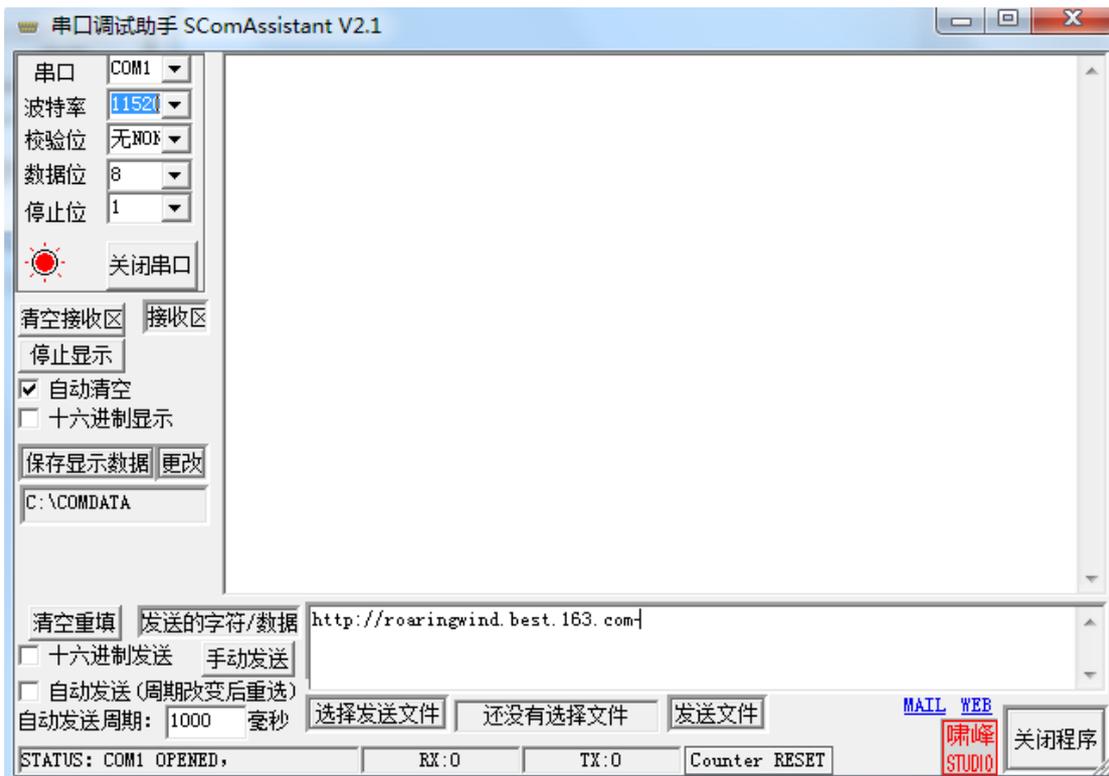
After connecting the serial port well, we could start to test.

You could use [serial_test 0~3] to test [COM0,COM1,COM2,COM3] respectively.

Here, we introduce [COM0], the test method for other serial ports are same.

[root@sama5d3x board_test]# ./serial_test 0

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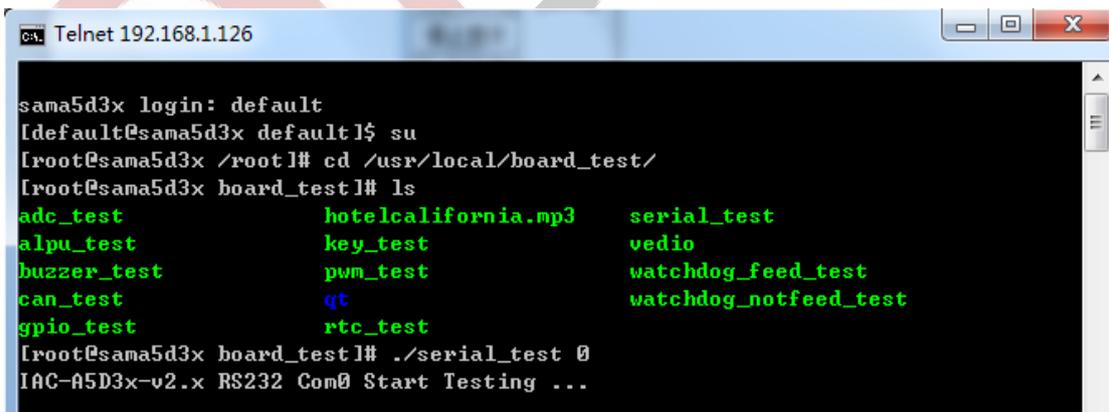
After running, the serial debugging assistant will show the received data.
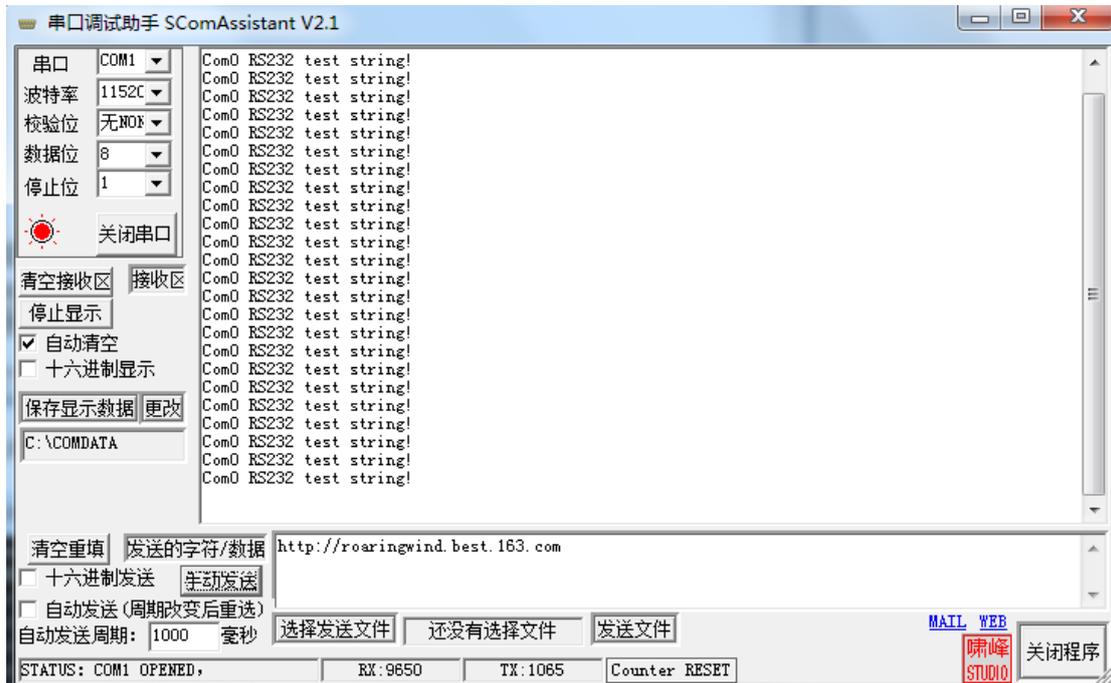
Click [Send] on serial debugging assistant, it will show the received data on [telnet]interface.
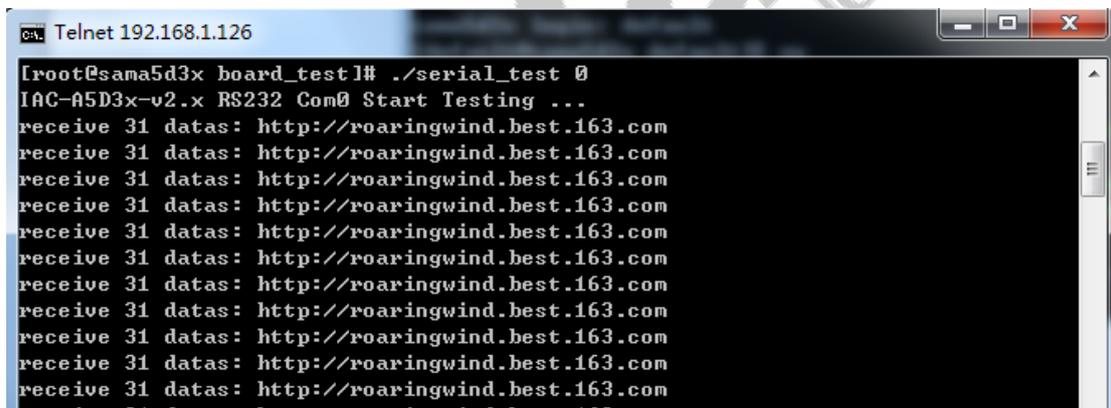
[Telnet] and Serial Debugging Assistant could receive the data, and the data is no error. It means the serial port function is ok.

After testing COM0, exit the program by [Ctrl+C], continue to test the other serial ports.

RS485 Test Process & Test Result:

Connect Signal A and Signal B on RS485 (Connect J_485A2 and J_485A1; Connect J_485B2 and J_485B1), here we use 2 pieces of 2.0mm pitch Dupont cable to connect.

Close serial debugging assistant, telnet COM, connect the serial port on PC to debug port (J3)

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on development board.

```
[root@sama5d3x board_test]# ./serial_test
Invalid arguments!
Usage: ./serial_test [012345]
  0 --/dev/ttyS1   com0 test, used as rs232.
  1 --/dev/ttyS2   com1 test, used as rs232.
  2 --/dev/ttyS3   com2 test, used as rs232.
  3 --/dev/ttyS4   com3 test, used as rs232.
  4 -- RS485 test, com1 receive, com2 send.
  5 -- RS485 test, com2 receive, com1 send.
[root@sama5d3x board_test]#
```

Illustration:

[serial_test 4] test [RS485 1] receiving ,[RS485 2] transmitting.

[serial_test 5]test [RS485 2] receiving, [RS485 1] transmitting.

```
[root@sama5d3x board_test]# ./serial_test 4
IAC-A5D3x-v2.x RS485 Start Testing: Com2 send, Com1 receive...
receive 26 datas: this is com2 test datas!

receive 26 datas: this is com2 test datas!

receive 26 datas: this is com2 test datas!

receive 26 datas: this is com2 test datas!


[root@sama5d3x board_test]# ./serial_test 5
IAC-A5D3x-v2.x RS485 Start Testing: Com1 send, Com2 receive...
receive 26 datas: this is com1 test datas!

receive 26 datas: this is com1 test datas!

receive 26 datas: this is com1 test datas!

receive 26 datas: this is com1 test datas!
```

As the above picture shown: The [RS485 1]and [RS485 2] could receive data, it means RS485 could communication normally.

Device Node:

/dev/ttyS1

/dev/ttyS2

/dev/ttyS3

/dev/ttyS4

Test Code:

CD/Test Code/serial _test/ serial _test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3mb.dtsi

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/tty/serial/atmel_serial.c

The Kernel Options:

Device Drivers --->

      Character devices   --->

         Serial drivers   --->

           [*] AT91 / AT32 on-chip serial port support

              [*]   Support for console on AT91 / AT32 serial port

              [*]   Support DMA transfers on AT91 / AT32 serial port

FAQ:

The debug UART prints the information as follows:

```
[root@sama5d3x board_test]# ./serial_test 0
IAC-A5D3x-v2.x RS232 Com0 Start Testing ...
open serial device /dev/ttyS1 error!
serial_test.c    RS232_test       312
RS232 Test Failed.
[root@sama5d3x board_test]#
```

If the serial communication is abnormal or could not communication, please check the following items:

①. Whether the connection cable is ok.

②. Whether the configuration for the serial debugging software on PC is ok.

③. Whether the serial hardware and test program node is corresponding.

④. Whether the [ttyS1,ttyS2,ttyS3,ttyS4] setting node in [/dev]directory is existing.

⑤. Whether the kernel configuration has been selected.

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1.6. Button Test

The IAC-A5D3x-Kit development board has configured 8*8 keyboard interface(J23). It could be multiplexed with IO port, the specific information, you could refer to the Hardware Manual.

By default, it has been set all pins for this interface as the input pin. Level fluctuation for each pin will result in the system matter, simulate the button matter.

Test Principle:

Test program block reading system matter, all pin on J23 will be initialized to pull- up.

Connect any pin to the low level on development board by connection cable, it will result in the system matter.   This program like pressing a button, the test program will read this matter then print it.

Remove it from low level, it seems as releasing button, it will result in the system matter. The program will read then print it.

Test Process & Test Result:

The relation between each Pin on J23 to button name, as follows:

Button Name	PIN	PIN	Button Name
KEY_Y6	EBI_A8	EBI_A9	KEY_Y7
KEY_Y4	PIO_E14	PIO_E15	KEY_Y5
KEY_Y2	PIO_E12	PIO_E13	KEY_Y3
KEY_Y0	PIO_E10	PIO_E11	KEY_Y1
KEY_X6	PIO_E29	PIO_E17	KEY_X7
KEY_X4	PIO_E16	PIO_E25	KEY_X5
KEY_X2	PIO_B18	PIO_D16	KEY_X3
KEY_X0	PIO_C10	PIO_C11	KEY_X1

Execute button test program [key_test].

[root@sama5d3x board_test]# ./key_test

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```
[root@sama5d3x board_test]# ./key_test
IAC-A5D3x-v2.x Key Start Testing ...
Watting for key event ...
```

Connect any pin from J23 to low level, then remove it, check the printed information from debugging terminal.

```
KEY_Y7 press down
KEY_Y7 release up
KEY_Y6 press down
KEY_Y6 release up
KEY_Y5 press down
KEY_Y5 release up
KEY_Y4 press down
KEY_Y4 release up
KEY_Y3 press down
KEY_Y3 release up
KEY_Y2 press down
KEY_Y2 release up
KEY_Y1 press down
KEY_Y1 release up
KEY_Y0 press down
KEY_Y0 release up
KEY_X7 press down
KEY_X7 release up
KEY_X6 press down
KEY_X6 release up
KEY_X5 press down
KEY_X5 release up
KEY_X4 press down
KEY_X4 release up
KEY_X3 press down
KEY_X3 release up
KEY_X2 press down
KEY_X2 release up
KEY_X1 press down
KEY_X1 release up
KEY_X0 press down
KEY_X0 release up
```

[KEY_**] is corresponding to the current operating pin,[press down] means the printed information when we connect to the low level,[release up] means the printed information when we remove low level.

Device Node:

/dev/input/event1

Test Code:

CD/Test Code/ key _test/key_test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

Driver Code:

linux-at91-3.6.9/drivers/input/keyboard /gpio_keys.c

The Kernel Options:

Device Drivers --->

Input device support   --->

Generic input layer   --->

<*>   Event interface

<*> Keyboards --->

<*>   GPIO Buttons

F&Q:

①.If there is any problem as shown, please ensure that whether there is device node [/dev/input/event1], kernel configuration option and device node [gpio_keys].

```
[root@sama5d3x board_test]# ./key_test
IAC-A5D3x-v2.x Key Start Testing ...
open gpio device /dev/input/event1 error! errno = -1
key_test.c       main      31
[root@sama5d3x board_test]#
```

② .When connecting to the low level, no relative matters be printed. Please make sure that the current level is low level, and the pin has been contacted well.

③. If there appears same matters , the shaking time may be too long. Please make sure the quick connection and low level removing.

1.7. SPI Test

The development board has brought out SPI interface (J26), it has two selection chips, it could connect to 2-ch SPI device.

2-ch SPI rate is 1MHz by default. If you need more higher rate, you need to modify the node attitude for [sama5_spi0][sama5_spi1]in device tree.

Both 2-ch SPI use the common driver [spidev], the driver achieve the basic operation for the device data reading and writing. If you need to use it, you just need to compile the application program according to the external device timing sequence.

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Test Principle:

Because we did not connect to the SPI peripheral device, test program is just used for testing some simple writing data for the SPI interface. It will transmit [0x55] data every other 1s. You could measure the waveform by the oscilloscope.

If it refers to the [spi] half duplex writing operation and full duplex writing operation, you could refer to this source code.

Test Process & Test Result:

Run test program[spi_test].

[root@sama5d3x board_test]# ./spi_test

```
[root@sama5d3x board_test]# ./spi_test
Invalid arguments!
Usage: ./spi_test [03]
 0 --/dev/spidev32765.0   test spi SPI1_NCS0
 3 --/dev/spidev32765.3   test spi SPI1_NCS3
[root@sama5d3x board_test]#
```

Illustration: [spi_test 0] test NCS0 chip-selection channel.
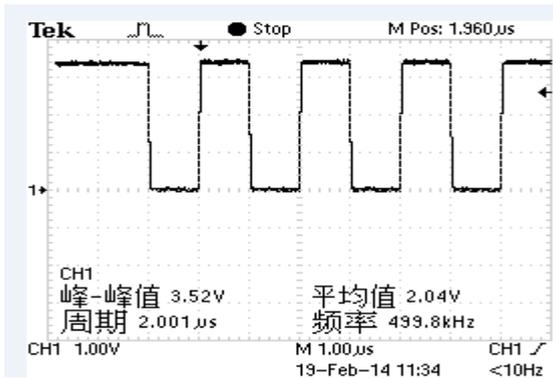
[spi_test 3] test NCS3 chip-selection channel.

[root@sama5d3x board_test]# ./spi_test 0

```
[root@sama5d3x board_test]# ./spi_test 0
IAC-A5D3x-v2.x Spi 0 Start Testing ...
```

[root@sama5d3x board_test]# ./spi_test 1

```
[root@sama5d3x board_test]# ./spi_test 1
IAC-A5D3x-v2.x Spi 1 Start Testing ...
```

Use oscilloscope to measure [SPI1_MOSI] signal waveform.

Device Node:

SPI1_NCS0：/dev/spidev32765.0

SPI1_NCS1：/dev/spidev32765.3

Test Code:

CD/ Test Code/ spi _test/spi_test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3mb.dtsi

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/spi/spidev.c

linux-at91-3.6.9/drivers/spi/spi_atmel.c

The Kernel Options:

Device Drivers --->

      SPI support   --->

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<*>Atmel SPI Controller   --->

<*>   User mode SPI device driver support

FAQ:

The Debug UART prints the following information:

```
[root@sama5d3x board_test]# ./spi_test 0
IAC-A5D3x-v2.x Spi 0 Start Testing ...
open spi device /dev/spidev32765.0 error!
spi_test.c       main    193
[root@sama5d3x board_test]# ./spi_test 1
IAC-A5D3x-v2.x Spi 1 Start Testing ...
open spi device /dev/spidev32765.3 error!
spi_test.c       main    193
[root@sama5d3x board_test]#
```

Please check the following three items:

①.Whether there is any current channel 's device node in [/dev]directory.

②.Whether the kernel configuration option has been selected.

③.Whether the device tree node is existing.

   SPI could not transmit, please check the following two items:

①. Whether the maximum transmit speed could meet your demand.

②. Whether the application program could meet the requirement for opposite device timing sequence.

1.8. I2C Test

   The development board has 2-ch I2C interface, including ,I2C0 connect to the clock chip DS3231 on base board;I2C1 connect to the ALPU encryption chip on core board, and bring it out into the J20 on base board for connecting the external device.

   2-ch I2C could support [i2c-dev]model, it could compile the corresponding application program to achieve the communication according to the peripheral device's timing requirement. The underlying driver only achieve the level control for the under transmitting data.

Test Principle:

①.i2c0 Test:

I2c-0 connects to RTC, so we just need to test RTC, please refer to the chapter 1.4.

②. I2c-1 connects to the hardware encryption chip alpu, so testing i2c-1 means testing [ALPU].

ALPU could judge test result ,through transmitting data to encryption chip, then get the encrypted data from encryption chip, compare to the data which the software has been encrypted.

When I2c-1 connect to the peripheral devices, you could refer to the test program to modify.

Test Process & Test Result:

 [alpu] Test:

Execute [alpu]test program [alpu_test]:

[root@sama5d3x board_test]# ./alpu_test

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```
[root@sama5d3x board_test]# ./alpu_test

Alpu-M Encryption Test Success!!!


Error_code : 0
========================ALPU-M IC Encryption========================
 Tx Data : 0x62 0x84 0x57 0x38 0x74 0xed 0x55 0xc6
 Rx Data : 0xf3 0x42 0x84 0x80 0x15 0xcb 0xaf 0x43 0x74 0xc2
 Ex Data : 0xf3 0x42 0x84 0x80 0x15 0xcb 0xaf 0x43

====================================================================

Alpu-M Encryption Test Success!!!


Error_code : 0
========================ALPU-M IC Encryption========================
 Tx Data : 0x8d 0xcf 0xea 0x14 0x24 0x9c 0x f 0x58
 Rx Data : 0x65 0xf1 0xd1 0x86 0x 0 0xc6 0x4e 0xf4 0x52 0xab
 Ex Data : 0x65 0xf1 0xd1 0x86 0x 0 0xc6 0x4e 0xf4

====================================================================

Alpu-M Encryption Test Success!!!


Error_code : 0
========================ALPU-M IC Encryption========================
 Tx Data : 0x83 0xb3 0x10 0x41 0xbe 0xb2 0xe2 0x23
 Rx Data : 0xb8 0xa1 0x19 0x8a 0x50 0xcf 0x c 0x18 0x71 0x66
 Ex Data : 0xb8 0xa1 0x19 0x8a 0x50 0xcf 0x c 0x18

====================================================================

Alpu-M Encryption Test Success!!!


Error_code : 0
========================ALPU-M IC Encryption========================
 Tx Data : 0x5d 0xc0 0x5e 0xe4 0x46 0x4d 0x45 0x52
 Rx Data : 0xad 0xfc 0x91 0xb4 0x62 0x7b 0x5f 0x46 0xa2 0x52
 Ex Data : 0xad 0xfc 0x91 0xb4 0x62 0x7b 0x5f 0x46

====================================================================

Alpu-M Encryption Test Success!!!


Error_code : 0
========================ALPU-M IC Encryption========================
 Tx Data : 0x 0 0x14 0xb6 0xa9 0xc7 0xf2 0x6e 0xae
 Rx Data : 0x2d 0xc8 0x20 0xab 0x b 0x48 0xfb 0xf1 0x 7 0x4a
 Ex Data : 0x2d 0xc8 0x20 0xab 0x b 0x48 0xfb 0xf1
```

```
====================================================================
Alpu-M Encryption Test Success!!!


Error_code : 0
=======================ALPU-M IC Encryption=======================
 Tx Data : 0xbd 0x d 0xf8 0xa8 0x5b 0xc9 0x11 0xdb
 Rx Data : 0x29 0x9a 0xbd 0xd6 0x6e 0x97 0x3e 0x7b 0x42 0xdb
 Ex Data : 0x29 0x9a 0xbd 0xd6 0x6e 0x97 0x3e 0x7b

====================================================================
Alpu-M Encryption Test Success!!!


Error_code : 0
=======================ALPU-M IC Encryption=======================
 Tx Data : 0x6e 0x26 0xec 0xfe 0x8c 0x54 0x31 0xbb
 Rx Data : 0x61 0x 3 0x7a 0xb5 0xa8 0x55 0xfa 0x3e 0x91 0xbb
 Ex Data : 0x61 0x 3 0x7a 0xb5 0xa8 0x55 0xfa 0x3e

====================================================================
Alpu-M Encryption Test Success!!!


Error_code : 0
=======================ALPU-M IC Encryption=======================
 Tx Data : 0x1f 0x92 0xc4 0xe9 0xdf 0x87 0xe0 0xc3
 Rx Data : 0xf7 0x7c 0xce 0x19 0x29 0x1b 0x36 0x2e 0xe0 0xc3
 Ex Data : 0xf7 0x7c 0xce 0x19 0x29 0x1b 0x36 0x2e

====================================================================
Alpu-M Encryption Test Success!!!


Error_code : 0
=======================ALPU-M IC Encryption=======================
 Tx Data : 0xd3 0xc4 0xb6 0x e 0xfb 0x43 0xb4 0x29
 Rx Data : 0x14 0xdd 0x6d 0x16 0x56 0x6b 0xf1 0xb0 0x49 0xe9
 Ex Data : 0x14 0xdd 0x6d 0x16 0x56 0x6b 0xf1 0xb0

====================================================================
Alpu-M Encryption Test Success!!!


Error_code : 0
=======================ALPU-M IC Encryption=======================
 Tx Data : 0x1d 0x2d 0xd9 0x c 0x9d 0x3e 0x44 0xae
 Rx Data : 0xe0 0x17 0xee 0x64 0xb0 0x62 0x 0 0xb4 0x9a 0x78
 Ex Data : 0xe0 0x17 0xee 0x64 0xb0 0x62 0x 0 0xb4

====================================================================
```

Device Node:

/dev/i2c-1

/dev/i2c-0

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Test Code:

CD/Test Code/ i2c_test/eeprom_test/cat24wl16_test.c

CD/Test Code/ i2c_test/alpu_test/alpu_test.c

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/i2c/busses/i2c-gpio.c

linux-at91-3.6.9/drivers/i2c/i2c-dev.c

The Kernel Options:

Device Drivers --->

    <*> I2C support   --->

        [*]   Enable compatibility bits for old user-space

        <*>   I2C device interface

        [*]   Autoselect pertinent helper modules

          I2C Hardware Bus support   --->

            <*> GPIO-based bitbanging I2C

FAQ:

The Debug UART prints information as follows:

```
[root@sama5d3x board_test]# ./alpu_test
open at91_i2c failed ...
[root@sama5d3x board_test]#
```

Please check the following items:

①.Whether there is device node [i2c-1] in [/dev]directory.

②.Whether the kernel configuration option has been selected.

③.Whether the device node has been configured.

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1.9.USB Test

There are 3-ch USB port on IAC-A5D3X-Kit, includes 1-ch (J14) is USB Device, it is used for downloading firmware program, the other 2-ch (J13) are as USB Host. This test is only for the USB Host.

Test Principle:

USB host supports hot plug; After inserting USB flash disk, the system will recognize automatically, then prints the relevant information.

After recognizing, it generates the device node [/dev/sda]and partition node [/dev/sda1] in this directory [/dev].(If there are many partitions, the numerical part will be added successively).

Finally, the system will mount all partitions into [/media] directory automatically, it will judge whether the interface is ok by the files in the relevant directory.

Test Process & Test Result:

Here is an example, the test is base on the USB flash disk with one partition.

Insert USB flash disk into J13, the debug UART will print the following informations:

```
[root@sama5d3x board_test]# usb 1-2: new high-speed USB device number 2 using atmel-ehci
usb 1-2: New USB device found, idVendor=0781, idProduct=5567
usb 1-2: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-2: Product: Cruzer Blade
usb 1-2: Manufacturer: SanDisk
usb 1-2: SerialNumber: 4C532000010831118150
scsi0 : usb-storage 1-2:1.0
scsi 0:0:0:0: Direct-Access     SanDisk  Cruzer Blade     1.26 PQ: 0 ANSI: 6
sd 0:0:0:0: [sda] 15633408 512-byte logical blocks: (8.00 GB/7.45 GiB)
sd 0:0:0:0: [sda] Write Protect is off
sd 0:0:0:0: [sda] Mode Sense: 43 00 00 00
sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
 sda: sda4
sd 0:0:0:0: [sda] Attached SCSI disk
```

As the above picture shown, it shows some basic information about the USB flash disk. USB flash disk could recognize the device node is [sda], child node is [sda4].

We also could check the USB flash disk information by [fdisk] command.

[root@sama5d3x /root]# fdisk -l /dev/sda

Here, we have mounted the USB flash disk to [/media/sda4] directory automatically, you could check the USB flash disk content directly.

[root@sama5d3x /root]# ls /media/sda4

```
[root@sama5d3x board_test]# ls /media/sda4
$RECYCLE.BIN              ?????2013?????        System Volume Information
1234                     Recycled
[root@sama5d3x board_test]#
```

You could test the USB Flash Disk reading and writing by creating ,copying, deleting files.

If you need mount manually, suppose mount USB flash disk to [/mnt]directory, you could use the following command to achieve.

[root@sama5d3x /root]# mount -t vfat /dev/sda4 /mnt

Use the same method to test 2-ch hot usb, after testing , pull out the USB flash disk, it will print the information as follows:

```
[root@sama5d3x board_test]# usb 1-2: USB disconnect, device number 2
```

Device Node:

USB Flash Disk: [/dev/sda].

USB Flash Disk First Partition:[/dev/sda1]

If several partitions, in turn, the N partition should be [/dev/sdan].

Test Code:

Test Command: [fdisk]

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3mb.dtsi

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/usb/host/ohci-at91.c

The Kernel Options:

Device Drivers --->

   USB support   --->

     [*]   USB announce new devices

     <*>   EHCI HCD (USB 2.0) support

     [*]   Improved Transaction Translator scheduling

     <*>   OHCI HCD support

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<*>　　　User mode SPI device driver support

<*>　　　USB Gadget Support　　--->

　　　　　　USB Peripheral Controller　　--->

　　　　　　<*> Atmel AT91 USB Device Port

　　　　　　< *> Atmel USBA

FAQ:

After inserting USB flash disk, there is no printed information. Or it could recognize but there is some error in reading and writing. Maybe the USB flash disk is damaged. Or you could format it on PC, then try it again. Or you could change another USB flash disk.

1.10.MMC Test

IAC-A5D3X-KIT development board provides 2-ch MMC(J20 and J21). It could be used by users.

Include, J20 is the standard SD card interface, J21 is the SDIO interface.

Here, we only test the SD card, SDIO needs the external module to test.

Test Principle:

The SD card interface on board supports hot-plug. Insert the SD card, then the system will recognize this SD card, and it will print relevant information.

It generates the device node and partition node in this [/dev] directory, then the system will mount all partitions into [/media/] directory automatically. It could judge the connectors whether it is ok by reading or writing documentations in directory.

Test Process & Test Result:

The following test process take an example for the SD card with one partition, if several partition, the test method is similar.

After inserting SD card, it generate device node [/dev/mmcblk0], Partition N is corresponding to device node [/dev/mmcblk0pn].

Here, we insert 8G SD card, the printed information is as follows:

```
[root@sama5d3x board_test]# mmc0: host does not support reading read-only switch
. assuming write-enable.
mmc0: new high speed SDHC card at address e624
mmcblk0: mmc0:e624 SU08G 7.40 GiB
 mmcblk0: p1
```

As the above picture shown, it shows SD card's some basic information. Here ,the device

node is [mmcblk0], partition is [p1].

You also could use [fdisk] command to check the SD card information.

[root@sama5d3x /root]# fdisk -l /dev/mmcblk0

```
[root@sama5d3x board_test]# fdisk -l /dev/mmcblk0

Disk /dev/mmcblk0: 7948 MB, 7948206080 bytes
81 heads, 10 sectors/track, 19165 cylinders, total 15523840 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
Disk identifier: 0x00000000

        Device Boot      Start         End      Blocks   Id  System
/dev/mmcblk0p1            8192    15523839     7757824    b  W95 FAT32
[root@sama5d3x board_test]#
```

Here, we have mounted SD card to [/media/mmcblk0p1] directory, you could check the SD card content directly.

[root@sama5d3x /root]# ls /media/mmcblk0p1

```
[root@sama5d3x board_test]# ls /media/mmcblk0p1/
alpu_test               key_test                vedio
buzzer_test             pwm_test                watchdog_feed_test
can_test                rtc_test                watchdog_notfeed_test
gpio_test               serial_test
hotelcalifornia.mp3     spi_test
[root@sama5d3x board_test]#
```

You could test the SD card reading and writing by creating, copying, deleting files.

If you need mount by manual, suppose that you have mounted USB flash disk to [/mnt]directory, you could achieve by the following command:

[root@sama5d3x /root]# mount -t vfat /dev/mmcblk0p1 /mnt

Pull out SD card, the printed information is as follows:

```
[root@sama5d3x board_test]# mmc0: card e624 removed
```

Test Code:

Test Tool: [fdisk]

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3mb.dtsi

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/mmc/host/atmel-mci.c

The Kernel Options:

Device Drivers --->

    <*> MMC/SD/SDIO card support   --->

        <*>   MMC block device driver

          Number of minors per block device

          <*>   Atmel SD/MMC Driver (Atmel Multimedia Card Interface support

FAQ:

① .After inserting SD card, there is no printed information or it can recognize but some errors. The SD card may be damaged. You could use the card reader to connect to PC mainframe then format it. Then try it again. Or you could use another SD card.

②、After inserting SD card, it could recognize but it hints protection. Please make sure that hardware writing protection has been dialed into the LOCK setting.

1.11. LCD and VGA Test

IAC-A5D3X-KIT development board provides 1-ch LCD TFT display interface(J9) ,and 1-chVGA interface (J12). The current kernel support the resolutions [480x272,640x480,800x480,800x600,1024x768].

Test Principle:

After booting system, LCD screen or VGA displayer will show the penguin picture which the kernel owns.

Test Process & Test Result:

According to Hardware Manual, connect to the LCD and VGA displayer.

Power on, the system will boot, LCD or VGA displayer will show the following picture on the upper left corner.

You could check whether this logo color is shaking or distortion to confirm the displayer

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work normally. Or you could run [qt] program to test LCD or VGA displayer according to 1.13.

Test Code:

None.

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3dm.dtsi

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/video/atmel_lcdfb_core.c

linux-at91-3.6.9/drivers/video/atmel_hlcdfb.c

The Kernel Options:

Device Drivers --->

     Graphics support   --->

          <*> Support for frame buffer devices   --->

             <*>   AT91 HLCD Controller support

                AT91 frame buffer display (LCD 800X600 display)   --->

          Console display driver support   --->

             <*> Framebuffer Console support

          [*] Bootup logo   --->

             [*]   Standard 224-color Linux logo

FAQ:

①.LCD displayer is without picture, please confirm whether you have selected the relevant options according to the above kernel option. Please make sure that the relevant node for the device file is enabled.

②.If the picture display position do not match the LCD displayer, please use [fbset] command to check the current kernel solution and the current LCD displayer size, whether they are corresponding.

1.12. Touch Panel Test

According to Hardware Manual, connect the touch panel, then the LCD screen resolution must same as the LCD resolution which has been set in the kernel.

```
[root@sama5d3x /root]# fbset

mode "1024x768-64"
        # D: 66.002 MHz, H: 51.889 kHz, V: 64.378 Hz
        geometry 1024 768 1024 768 16
        timings 15151 24 160 3 29 64 6
        accel false
        rgba 5/11,6/5,5/0,0/0
endmode

[root@sama5d3x /root]#
```

Test Principle:

Use [tslib]touch panel test tool to do touch panel calibration, after calibration, use the test tool to do drag and drawing. You could find the cursor will show current touch point nearby. And it could be moved as the touch panel moved.

Test Process & Test Result:

Execute touch calibration program [ts_calibrate].

[root@sama5d3x qy-demo]# ts_calibrate

No picture now .

As the above picture showed, it shows the cross picture at the upper left corner. Click this picture, it will jumper to another corner. After finishing calibration for the four corners and the central point, it finished.

After calibration, execute [ts_test] to test touch panel precious.

[root@sama5d3x qy-demo]# ts_test

As the above picture shown, you could click drag button or drawing button to do test, you will find that the mouse will move along the touch point locus.

Test Code:

Test Tool: [ts_calibrate][ts_test].

Tool Source Code: [CD/Test Code/tslib]

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3dm.dtsi

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/input/touchscreen/atmel_tsadcc.c

The Kernel Options:

Device Drivers --->

      Input device support   --->

         [*]   Touchscreens   --->

               <*>   Atmel Touchscreen Interface

FAQ:

①.If the showing picture is abnormal in LCD, you could use [fbset] to check the current LCD configuration to confirm whether the current LCD resolution in kernel match the current using LCD.

②.Click touch panel, the cursor location and click location are with a little error or shaking, this circumstance is normal.

③.If there is any other question, please check[tslib] part environment variables in [/etc/profile.d/ usr_env.sh]. Please check whether they/etc/profile.d/ usr_env.sh re the following environment variables.

```
#set tslib environment
export T_ROOT=$LOCAL_PATH/tslib:$T_ROOT
export PATH=$PATH:$LOCAL_PATH/tslib/bin
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$LOCAL_PATH/tslib/lib
export TSLIB_PLUGINDIR=$LOCAL_PATH/tslib/lib/ts
export TSLIB_CONFFILE=$LOCAL_PATH/tslib/etc/ts.conf
export TSLIB_CONSOLEDEVICE=none
export TSLIB_FBDEVICE=/dev/fb0
export TSLIB_TSDEVICE=/dev/input/event0          # set ts deviec
export POINTERCAL_FILE=/etc/pointercal
export TSLIB_CALIBFILE=/etc/pointercal
export QWS_MOUSE_PROTO="TSLIB:/dev/input/event0" # set ts  device for qt
#export QWS_MOUSE_PROTO="Intellimouse:/dev/input/mouse1" # set mouse device
#export QWS_MOUSE_PROTO="TSLIB:/dev/input/event0 Intellimouse:/dev/input/mouse1"
#export LD_LIBRARY_PATH=/home/share/liuc/a5d3/aplay/install/lib:$LD_LIBRARY_PATH
```

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1.13. QT Test

IAC-A5D3x-KIT file system owns QT 4.8.2,and our company's QT demo program.

Test Principle:

Execute [qy-demo]program, it shows QT interface on LCD screen. It could do interaction with QT by moving cursor through touch panel or mouse.

Test Process &Test Result:

The system support mouse and touch panel operation by default, the specific environment variables could be set in [/etc/profile.d/usr_env.sh].

[root@sama5d3x qy-demo]# vi /etc/profile.d/usr_env.sh

```
[root@sama5d3x qy-demo]# vi /etc/profile.d/usr_env.sh

#!/bin/sh
# user can add environment here if needed.
export LOCAL_PATH=/usr/local

#set alsa & libmad library path
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$LOCAL_PATH/alsa/lib:$LOCAL_PATH/libmad/li

#set qt environment
export QTDIR=$LOCAL_PATH/qt
export LD_LIBRARY_PATH=$QTDIR/lib:$LD_LIBRARY_PATH
export QT_QWS_FONTDIR=$QTDIR/lib/usr_fonts
#export QT_QWS_FONTDIR=$QTDIR/lib/fonts

#set tslib environment
export T_ROOT=$LOCAL_PATH/tslib:$T_ROOT
export PATH=$PATH:$LOCAL_PATH/tslib/bin
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$LOCAL_PATH/tslib/lib
export TSLIB_PLUGINDIR=$LOCAL_PATH/tslib/lib/ts
export TSLIB_CONFFILE=$LOCAL_PATH/tslib/etc/ts.conf
export TSLIB_CONSOLEDEVICE=none
export TSLIB_FBDEVICE=/dev/fb0
export TSLIB_TSDEVICE=/dev/input/event0          # set ts deviec
export POINTERCAL_FILE=/etc/pointercal
export TSLIB_CALIBFILE=/etc/pointercal
export QWS_MOUSE_PROTO="TSLIB:/dev/input/event0" # set ts  device for qt
#export QWS_MOUSE_PROTO="Intellimouse:/dev/input/mouse1" # set mouse device
#export QWS_MOUSE_PROTO="TSLIB:/dev/input/event0 Intellimouse:/dev/input/mouse1" #
#export LD_LIBRARY_PATH=/home/share/liuc/a5d3/aplay/install/lib:$LD_LIBRARY_PATH
```

Illustration：export QWS_MOUSE_PROTO="TSLIB:/dev/input/event0"

　　/*Support Touch Panel */

　　　export QWS_MOUSE_PROTO="Intellimouse:/dev/input/mouse1"

　　/*Support Mouse */

---

export QWS_MOUSE_PROTO="TSLIB:/dev/input/event0 Intellimouse:/dev/input/mouse1"
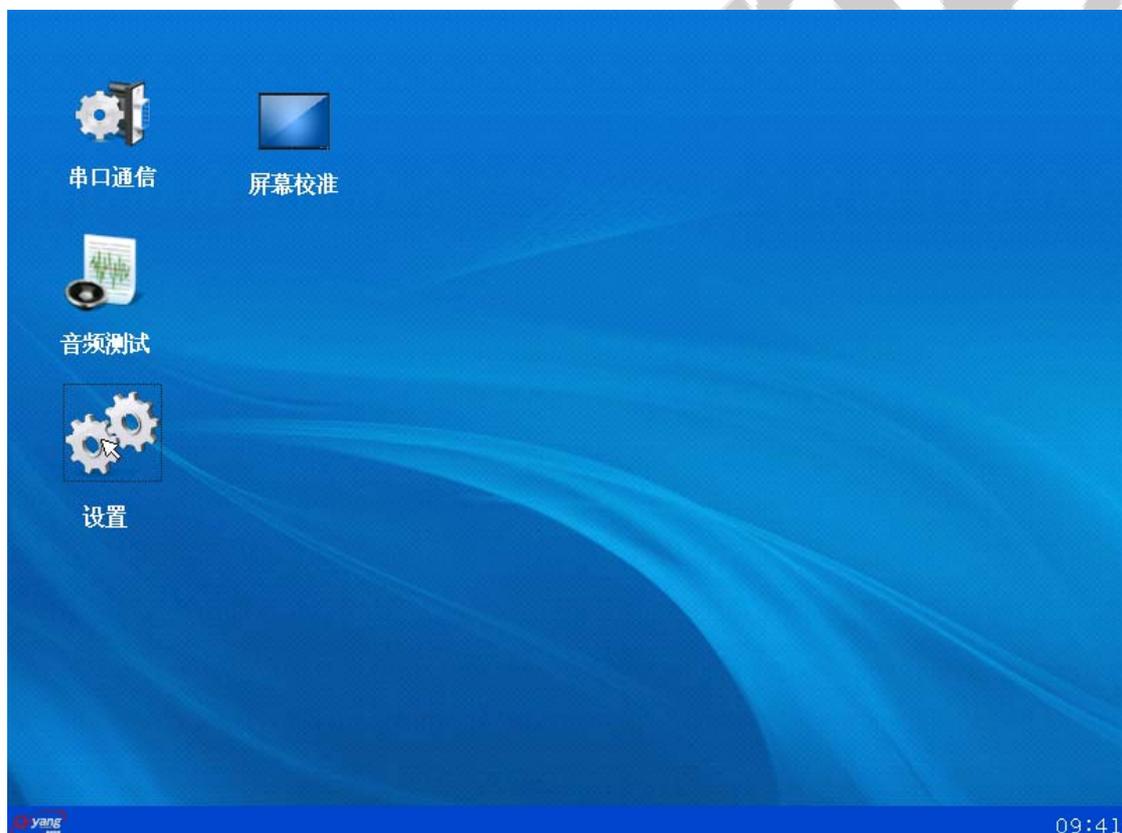
/* Support Touch Panel and Mouse*/

Open the relevant set according to the actual demand, close the other 2 sets.

If using touch panel operation, before running QT program, please use [ts_calibrate] to do calibration at first. After calibration, then execute [qy-demo]program.

[root@sama5d3x qy-demo]# cd /usr/local/board_test/qt/qy-demo

[root@sama5d3x qy-demo]# ./qy-demo -qws

After running ,the system will mount QT program interface, as shown:

Test Code:

CD/Test Code/   qt /qy-demo

FAQ:

Please refer to the touch panel and LCD charter to solve the problems.

1.14. Video Test

IAC-A5D3x-Kit development board supports video playing function by software decoding. The file system provides [mplay]video player tool.

Test Principle:

It provides [video]file in test program, you could use [mplayer]command to play it on the development board.

Test Process:

Execute [mplayer]command to play [video].

[root@sama5d3x board_test]# mplayer -vo fbdev2 vedio

```
[root@sama5d3x board_test]#   mplayer -vo fbdev2 vedio
Creating config file: /root/.mplayer/config
MPlayer 1.1-4.7.3 (C) 2000-2012 MPlayer Team

Playing vedio.
libavformat version 54.6.100 (internal)
AVI file format detected.
[aviheader] Video stream found, -vid 0
[aviheader] Audio stream found, -aid 1
VIDEO:  [XVID]  800x600  12bpp  18.000 fps  397.2 kbps (48.5 kbyte/s)
Clip info:
 Software: MEncoder SVN-r33883(20110719-gcc4.5.2)
Load subtitles in ./
========================================================================
Opening video decoder: [ffmpeg] FFmpeg's libavcodec codec family
libavcodec version 54.23.100 (internal)
Unsupported PixelFormat 61
Unsupported PixelFormat 53
Unsupported PixelFormat 81
Selected video codec: [ffodivx] vfm: ffmpeg (FFmpeg MPEG-4)
========================================================================
========================================================================
Requested audio codec family [mpg123] (afm=mpg123) not available.
Enable it at compilation.
Opening audio decoder: [ffmpeg] FFmpeg/libavcodec audio decoders
AUDIO: 22050 Hz, 2 ch, floatle, 64.0 kbit/4.54% (ratio: 8000->176400)
Selected audio codec: [ffmp3float] afm: ffmpeg (FFmpeg MPEG layer-3 audio)
========================================================================
[AO OSS] audio_setup: Can't open audio device /dev/dsp: No such file or directory
**2*****************************aic3x->sysclk :0
******************************aic3x_hw_params
1*****************************aic3x->sysclk :12000000
*****************************fsref:44100
*****************************aic3x->sysclk:12000000
*****************************codec_clk:7526
*****************************last_clk:7526
AO: [alsa] 22050Hz 2ch floatle (4 bytes per sample)
Starting playback...
Could not find matching colorspace - retrying with -vf scale...
Opening video filter: [scale]
Movie-Aspect is 1.33:1 - prescaling to correct movie aspect.
[swscaler @ 0x887260]No accelerated colorspace conversion found from yuv420p to bgra.
[swscaler @ 0x887260]using unscaled yuv420p -> bgra special converter
VO: [fbdev2] 800x600 => 800x600 BGRA
A:   4.8 V:   2.8 A-V:  1.936 ct: -0.047  52/ 52 109% 44% 10.1% 50 0
```

```
     ***************************************************
     **** Your system is too SLOW to play this!  ****
     ***************************************************

Possible reasons, problems, workarounds:
- Most common: broken/buggy _audio_ driver
  - Try -ao sdl or use the OSS emulation of ALSA.
  - Experiment with different values for -autosync, 30 is a good start.
- Slow video output
  - Try a different -vo driver (-vo help for a list) or try -framedrop!
- Slow CPU
  - Don't try to play a big DVD/DivX on a slow CPU! Try some of the lavdopts,
    e.g. -vfm ffmpeg -lavdopts lowres=1:fast:skiploopfilter=all.
- Broken file
  - Try various combinations of -nobps -ni -forceidx -mc 0.
- Slow media (NFS/SMB mounts, DVD, VCD etc)
  - Try -cache 8192.
- Are you using -cache to play a non-interleaved AVI file?
  - Try -nocache.
Read DOCS/HTML/en/video.html for tuning/speedup tips.
If none of this helps you, read DOCS/HTML/en/bugreports.html.

A: 177.1 V: 177.0 A-V:  0.061 ct:  5.257 3187/3187 88% 43%  6.0% 2224 0


Exiting... (End of file)
[root@sama5d3x board_test]#
```

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The video starts playing, when the video finished, it prints [Exiting...(End of file)]automatically.

Because of the software decoding, so the video resolution is not clear. We suggest to use:

Player Tool:

mplay

FAQ:

①、If there are some issues in display part, please refer to the LCD chapter to check the LCD problem.

②、If the video do not play smoothly, please make sure that the current system do not be occupied by the programs or operations.

③、Because the software decoding ability is limited, if using the other video to test, please choose the suitable video. Please do not use the high resolution video, or it do not play smoothly.

④、In default circumstance, please use the LCD resolution which higher than the current movie resolution. Or the displaying is not normal.

1.15. CAN Test

IAC-A5D3X-KIT development board has brought out 1-ch CAN signal (can0)from core board to base board(J27). If you need to test CAN, it needs to connect to another development board's CAN interface , then to do CAN transmitting and CAN receiving.

Test Principle:

The file system has provided two methods for testing CAN, one is by using CAN tool to do test, the another one is by using test file to do test.

The test file are using [socket can] to achieve transmitting and receiving for CAN0.

Test Process & Test Result:

Connect [CANH0,CANL0, GND] on one IAC-A5D3X-KIT to [CANH0,CANL0, GND] on another IAC-A5D3X-KIT respectively. After booting the system, it will open [can0] device automatically. Then set [bitrate] as [125000]. Take one [CAN] as the transmit terminal, another [CAN] as receiving terminal. Then do exchanged test.

①、Use test tool to do test.

Use [cansend] command to send data, test transmitting function. Including [111] is the local machine address.[11 22 33 44 55 66] means the transmitted data. It is hexadecimal number, it supports to transmit 8-data in one time.

Set one CAN on one development board as receiving.

[root@sama5d3x board_test]# candump can0

Set another CAN on another development board as transmitting.

[root@sama5d3x board_test]# cansend can0 111# 11 22 33 44 55 66

Now, the receiving development board has received the corresponding data.

After testing ok, exchange this two development boards to test the receiving and transmitting function.

① .Use the test file to test:

Execute [can] test program [can_test].

[root@sama5d3x board_test]# ./can_test

```
[root@sama5d3x board_test]# ./can_test
Invalid arguments!
Usage: ./can_test [01]
 0  -- test can recieve.
 1  -- test can send.
[root@sama5d3x board_test]#
```

Illustration: [can_test0] means executing receiving test.

[can_test 1] means executing transmitting test.

Execute [can_test0] on development board 1.

[root@sama5d3x board_test]# ./can_test 0

```
[root@sama5d3x board_test]# ./can_test 0
IAC-A5D3x-v2.x CAN Start Testing ...
recieve can datas: can_id = 0x123,data_len = 8
data[0] = 0x0
data[1] = 0x1
data[2] = 0x2
data[3] = 0x3
data[4] = 0x4
data[5] = 0x5
data[6] = 0x6
data[7] = 0x7
Test success.
[root@sama5d3x board_test]#
```

Execute[can_test1] on development board 2.

[root@sama5d3x board_test]# ./can_test 1

```
[root@sama5d3x board_test]# ./can_test 1
IAC-A5D3x-v2.x CAN Start Testing ...
send can datas: can_id = 0x123,data_len = 8
data[0] = 0x0
data[1] = 0x1
data[2] = 0x2
data[3] = 0x3
data[4] = 0x4
data[5] = 0x5
data[6] = 0x6
data[7] = 0x7
Test success.
```

After finishing test, exchange two development boards to do receiving and transmitting test.

Test Code:

CD/Test Code/ can_test/can_test.c

Test Tool:

[Cansend, candump]

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dtsi

linux-at91-3.6.9/arch/arm/boot /dts/sama5d3.dtsi

Driver Code:

linux-at91-3.6.9/drivers/net/can/at91_can.c

The Kernel Options:

[*] Networking support   --->

    <*>   CAN bus subsystem support   --->

         --- CAN bus subsystem support

            <*>   Raw CAN Protocol (raw access with CAN-ID filtering)

            <*>   Broadcast Manager CAN Protocol (with content filtering)

            <*>   CAN Gateway/Router (with netlink configuration)

         CAN Device Drivers   --->

            <*> Virtual Local CAN Interface (vcan)

            <*> Platform CAN drivers with Netlink support

             [*]   CAN bit-timing calculation

            <*>   Atmel AT91 onchip CAN controller

FAQ:

①、Failed to transmit and receive data from CAN.

Please use [ifconfig] to check the current [can0]whether it is [up].

```
[root@sama5d3x board_test]# ifconfig
can0      Link encap:UNSPEC  HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
-00
          UP RUNNING NOARP  MTU:16  Metric:1
          RX packets:2 errors:1 dropped:0 overruns:0 frame:0
          TX packets:11 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:10
          RX bytes:16 (16.0 B)  TX bytes:77 (77.0 B)
          Interrupt:20
```

If you could not find out [can0] information, you could use the following command to set and enable [can0].

[root@sama5d3x board_test]# ip link set can0 type can bitrate 125000

[root@sama5d3x board_test]# ifconfig can0 up

②、[ifconfig can0 up] failed.

Please check device tree or kernel configuration option, whether it has configured [can0]function.

① .Transmit successfully, but the other terminal did not receive the data.

a、Please check whether the [bitrate] for this two terminal has been set consistently or not.

b、Whether the hardware is connected well or not.

1.16. Audio Test

There are audio interface (J16 and J28) on board. Including ,J16 is the audio output which could be plugged by the earphone to do test. J28 is the audio output, you could use the microphone to do recording test.

Test Principle:

We have ported [mplayer] audio and video player tool to test audio.

Test Process:

We have provided audio test file [hotelcalifornia.mp3] in development board file system, please plug earphone in J16, then execute the following command on development board:

[root@sama5d3x board_test]# mplayer hotelcalifornia.mp3

```
[root@sama5d3x board_test]# mplayer hotelcalifornia.mp3
Creating config file: /root/.mplayer/config
MPlayer 1.1-4.7.3 (C) 2000-2012 MPlayer Team

Playing hotelcalifornia.mp3.
libavformat version 54.6.100 (internal)
Audio only file format detected.
Load subtitles in ./
========================================================================
Requested audio codec family [mpg123] (afm=mpg123) not available.
Enable it at compilation.
Opening audio decoder: [ffmpeg] FFmpeg/libavcodec audio decoders
libavcodec version 54.23.100 (internal)
AUDIO: 44100 Hz, 2 ch, floatle, 192.0 kbit/6.80% (ratio: 24002->352800)
Selected audio codec: [ffmp3float] afm: ffmpeg (FFmpeg MPEG layer-3 audio)
========================================================================
[AO OSS] audio_setup: Can't open audio device /dev/dsp: No such file or director
y
**2***************************aic3x->sysclk :0
*****************************aic3x_hw_params
1****************************aic3x->sysclk :12000000
****************************fsref:44100
****************************aic3x->sysclk:12000000
****************************codec_clk:7526
****************************last_clk:7526
AO: [alsa] 44100Hz 2ch floatle (4 bytes per sample)
Video: no video
Starting playback...
A:    4.3 (04.2) of 287.0 (04:47.0)  5.3%
```

You could hear the test music clearly from the earphone.

You could volume up by using [*] on keyboard, or volume down by using [/]. Show the current volume in debug UART.

```
Volume: 75 %
```

Device Node:

/dev/snd/pcmC0D0p

Test Tool:

mplayer

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

Driver Code:

linux-at91-3.6.9\sound\soc\atmel\sama5d3_tlv320aic31.c

The Kernel Options:

Device Drivers   --->

<*> Sound card support   --->

<*> Advanced Linux Sound Architecture   --->

<*> ALSA for SoC audio support   --->

<*> SoC Audio support for TLV320AIC31 based SAMA5D3-EK board

FAQ:

①、Could not hear the voice, please check:

　　a、Whether the device node [/dev/snd/pcmC0D0p] is existing.

　　b、Whether the device tree file enabled the device node.

　　c、Whether the earphone connect the J16.

　　d. Whether the earphone works normally.

②、If the volume is too light, you could use [*]or[/]to adjust the volume.

1.17.Watchdog Test

The hardware watchdog has been designed on the IAC-A5D3X-KIT base board, please use [PIO_C12]and [PIO_C13] to control the watchdog on base board.

When [PIO_C12] is high level, watchdog work; when it is in low level, the watchdog does not work.

[PIO_C13]PIN it is the control pin to feed the dog.

Test Principle:

The test program mainly to open the watchdog, when feeding the dog, the development board system will not reset. Or it will reset.

Test Program & Test Result:

Run watchdog test program [watchdog_feed_test]and [watchdog_notfeed_test].

　　　Illustration: [watchdog_feed_test] is used for opening watchdog and executing feeding dog program.

　　　　　[watchdog_notfeed_test] is used for opening watchdog but not executing feeding dog program.

[root@sama5d3x board_test]# ./watchdog_feed_test

```
[root@sama5d3x board_test]# ./watchdog_feed_test
watchdog: enable watchdog
```

At this moment, open the watchdog, and execute feeding dog, the system will not reset.

[root@sama5d3x board_test]# ./watchdog_notfeed_test

```
[root@sama5d3x board_test]# ./watchdog_notfeed_test
watchdog: enable watchdog
RomBOOT

AT91Bootstrap 3.5.4 QiYang (Wed Jan  8 12:36:06 CST 2014)

SF: Got Manufacturer and Device ID:0x1f 0x26 0x0 0x0 0x0
SF: Copy 0x80000 bytes from 0x8400 to 0x26f00000
SF: Done to load image


U-Boot 2012.10 QiYang (Jan 08 2014 - 11:39:56)

CPU: SAMA5D34
Crystal frequency:        12 MHz
CPU clock       :        528 MHz
Master clock    :        132 MHz
```

At current, the watchdog opened, but did not feed dog, the system reset will be reboot!

Device Node:

/dev/ sama5d3x-watchdog

Test Code:

CD/Test Code/ watchdog _test/ watchdog_feed_test

CD/Test Code/ watchdog _test/ watchdog_notfeed_test

Device Tree File:

linux-at91-3.6.9/arch/arm/boot /dts/sama5d34ek.dts

Driver Code:

linux-at91-3.6.9/drivers/misc/ watchdog.c

The Kernel Options:

Device Drivers --->

     Misc devices --->

       <*> Atmel SAMA5D3X WATCHDOG support

FAQ:

The debug UART shows the printed information:

```
Open device watchdog error!
: No such file or directory
[root@sama5d3x board_test]# ./watchdog_notfeed_test
Open device watchdog error!
: No such file or directory
[root@sama5d3x board_test]#
```

Please check the following items:

①.Whether there is [sama5d3x-watchdog]node in [/dev]directory.

②.Whether the kernel configuration has selected [<*>Atmel sama5d3xwatchdogdriver support]option.

③.Whether the device tree file enabled [watchdog]node.

1.18. EBI Test

The development board has brought EBI interface (J17)

Test Principle:

Test EBI signal on development board, you can test reading and writing date. EBI brought out 2-ch chip selection. You can test the specific reading and writing operation by executing different parameters. Support 8-bit address,16-bit address. If select to read data, then it reads address [0x55]and [0xaa] alternatively. If select to write data, then write [0x55] and [0xaa] to [0x555].

Test Process & Test Result:

Run EBI test program [ebi-test]

[root@sama5d3x board_test]# ./ebi_test

```
[root@sama5d3x board_test]# ./ebi_test
Invalid arguments!
ebi_test_1.c     main     39
Usage: ./ebi_test [0,1] [rd,wr,rdwr]
 0  -- ebi1 test.
 1  -- ebi2 test.
        rd -- ebi read.
        wr -- ebi read.
        rdwr -- ebi read & write.
[root@sama5d3x board_test]#
```

EBI read and write test

```
[root@sama5d3x board_test]# ./ebi_test 0 rd
EBI '/dev/sama5d3x-ebi-2' Test Start...
[read] addr: 0x55, data: 0x0
[read] addr: 0xaa, data: 0x0
[read] addr: 0x55, data: 0x0
[read] addr: 0xaa, data: 0x0
[read] addr: 0x55, data: 0x0
[read] addr: 0xaa, data: 0x0
[read] addr: 0x55, data: 0x0
[read] addr: 0xaa, data: 0x0
[read] addr: 0x55, data: 0x0
[read] addr: 0xaa, data: 0x0

[root@sama5d3x board_test]#
```

```
[root@sama5d3x board_test]# ./ebi_test 0 wr
EBI '/dev/sama5d3x-ebi-2' Test Start...
[write] addr:0x55, data: 0x5555
[write] addr:0xaa, data: 0x5555
[write] addr:0x55, data: 0x5555
[write] addr:0xaa, data: 0x5555
[write] addr:0x55, data: 0x5555
[write] addr:0xaa, data: 0x5555
```

Device Node:

/dev/sama5d3x-ebi-1

/dev/sama5d3x-ebi-2

Test Code:

CD/Test Code/ebi_test.c

Device Tree File:

Linux-at91-3.6.9/arch/arm/boot/dts/sama5d34ek.dts

Linux-at91-3.6.9/arch/arm/boot/dts/sama5d36ek.dts

Linux-at91-3.6.9/arch/arm/boot/dts/sama5d3.dtsi

Driver Code:

Linux-at91-3.6.9/driver/misc/atmel_ebi_sama5.c

The Kernel Options:

Device Drivers----→

      Misc Devices-→

           <*>Atmel SAMA5D3X EBI support

FAQ:

If there is any errors, please check the following items:

① Whether there is [sama5d3x-ebi-x]node in [/dev]directory, [x] means the current test node.

② Whether the kernel has configured option [<*>Atmel SAMA5D3X EBI support].

③Whether the device tree file enabled node.

1.19. Ethernet Test

There are two 2-ch Ethernet port on J7 ,J8. J7 is the Ethernet port which is brought from core board, J8 is the brought Ethernet port on base board.

Test Principle:

SAMA5D34 core board supports 1-ch Ethernet port on J7. SAMA5D36 core board supports 2-ch Ethernet port. The following test is base on 1-ch Ethernet port is [up], if you want to test both Ethernet port on sama5d36, please set the two Ethernet port in different segment.

Test Process & Test Result:

At first ,test Ethernet port J7, it is [eth0].

Set [eth0] ip information

[ifconfig eth0 192.168.1.88 up].

Check the IP information:

```
[root@sama5d3x board_test]# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 12:34:56:78:90:01
          inet addr:192.168.1.88  Bcast:192.168.1.255  M
          inet6 addr: fe80::1034:56ff:fe78:9001/64 Scope
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metr
          RX packets:112 errors:0 dropped:8 overruns:0 f
          TX packets:6 errors:0 dropped:0 overruns:0 car
          collisions:0 txqueuelen:1000
          RX bytes:6452 (6.3 KiB)  TX bytes:468 (468.0 B
          Interrupt:24 Base address:0x8000
```

Test network, ping 192.168.1.1

Then test Ethernet J8 interface, it is [eth1]:

Set [eth1] IP information:

Ifconfig eth0 down

Ifconfig eth0 192.168.1.88up

Check IP information:

Test Network

```
[root@sama5d3x board_test]# ping 192.168.1
PING 192.168.1.1 (192.168.1.1): 56 data by
64 bytes from 192.168.1.1: seq=0 ttl=64 ti
64 bytes from 192.168.1.1: seq=1 ttl=64 ti
64 bytes from 192.168.1.1: seq=2 ttl=64 ti
64 bytes from 192.168.1.1: seq=3 ttl=64 ti
64 bytes from 192.168.1.1: seq=4 ttl=64 ti
```

FAQ:

1. When you are testing ,the [eth1] is not ping well, [eth1] is only workable by sama5d36 core board.

Ⅲ.Summary

The basic function tests were finished here. If there is any problem

in test process, you could check by the provided source code. If there is

any error in this documentation, please kindly provide us your comment.

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