

NUC900 Series Diagnostic Code User's Manual

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1. Introduction

1.1 NUC910 Test Items

- USB Host (2 ports)
- USB Device
- LCD
- 2D Graphic Engine
- Audio (AC97)
- FMI (SD Card, Memory Stick, and NAND flash)
- ATAPI
- Ethernet MAC
- UART
- I2C
- ADC
- RTC
- PS/2
- Smart Card
- SPI

1.2 NUC920 Test Items

- USB Host (2 ports)
- USB Device
- PCI
- Audio (AC97)
- FMI (SD card 1 or Memory Stick 1)
- ATAPI
- Ethernet MAC

- UART
- I2C
- ADC
- RTC
- PS/2
- SPI

1.3 NUC950 Test Items

- USB Host (2 ports)
- USB Device
- Audio (AC97 and I2S)
- FMI (SD card 1 or Memory Stick 1)
- Ethernet MAC
- UART
- SPI
- LCD
- ADC

1.4 NUC960 Test Items

- USB Host (1 port)
- USB Device
- PCI
- Ethernet MAC
- UART
- I2C
- SPI

2. Diagnostic Code

2.1 USB Host

NUC910 USB Host combines EHCI and OHCI host controllers. Which host controller will run the diagnostic code depends on the connected device. If you want to test EHCI, please plug USB 2.0 device into the USB ports. If you want to test OHCI, please plug USB 1.1 device into the USB ports.

The USB Host diagnostic code can do the following test:

- EHCI with USB 2.0 mass storage device
- EHCI split transfer
- OHCI with USB 1.1 mass storage device

2.1.1 EHCI with USB 2.0 mass storage device

Instrument	Any USB 2.0 mass storage device.
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug any USB 2.0 mass storage device into USB port 1 or port 2 2. Test program will create an 8M bytes file on the USB disk and read back to compare. 3. If the test was completed and passed, you will see "Test OK" message on console. Otherwise, the test failed.
Note	This test can also be done under an USB 2.0 Hub.

2.1.2 EHCI split transfer

Instrument	An USB 2.0 Hub and an USB 1.1 mass storage device
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the USB 2.0 Hub into USB port 1 or port 2, and connect the USB 1.1 mass storage device under the USB 2.0 Hub 2. Test program will create an 8M bytes file on the USB disk and read back to compare. The transfers between NUC910 and USB 2.0 Hub were split transfers.

	3. If the test was completed and passed, you will see "Test OK" message on console. Otherwise, the test failed.
Note	

2.1.3 OHCI with USB 1.1 mass storage device

Instrument	Any USB 1.1 mass storage device.
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug any USB 1.1 mass storage device into USB port 1 or port 2 2. Test program will create an 8M bytes file on the USB disk and read back to compare. 3. If the test was completed and passed, you will see "Test OK" message on console. Otherwise, the test failed.
Note	This test can also be done under an USB 1.1 Hub.

2.1.4 Eye diagram test

Instrument	Eye diagram test equipment
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Connect USB Host with eye diagram test equipment, then press any key to start 2. USB host enter test mode 3. User can press any key to make it return from test mode
Note	

2.2 USB Device

The USB controller interfaces the AHB bus and the USB bus. The USB controller contains both the AHB master interface and AHB slave interface. CPU programs the USB controller through the AHB slave interface. For IN or OUT transfer, the USB controller needs to write data to

memory or read data from memory through the AHB master interface. The USB controller also contains the USB transceiver to interface the USB. It consists of four endpoints, designated EP0, EP1, EP2 and EP3.

The USB Device diagnostic code can do the following test:

- RAM disk access

2.2.1 RAM disk access

Instrument	On board DRAM
Jumper Settings	JP11
Test Sequence	<ol style="list-style-type: none"> 1. Plug USB cable into PC USB port. 2. Copy any file to the removable disk, and then open it. 3. If file access is ok, this test passed
Note	<ol style="list-style-type: none"> 1. USB library must be built with RAM disk. Please edit nuc900_udc.h, enable "TEST_RAM" and disable all other "TEST_XXX". Rebuild USB library.

2.3 LCD

NUC910 LCD controllers will run the diagnostic code and 3 tests runs continuously.

The LCD diagnostic code can do the following test:

- Video display test
- OSD display test
- Alpha test

2.3.1 Video display test

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Press any key to start the three tests 2. Plug the LCD module TD035STED3 on the EV board 3. See the image shows on the LCD correct or not
Note	Full size 240X320 image shows on the LCD

2.3.2 OSD display test

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	1. Plug the LCD module TD035STED3 on the EV board 2. See the image shows on the LCD correct or not
Note	Size 128X160 color bar image cover on the video image

2.3.3 Alpha test

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	1. Plug the LCD module TD035STED3 on the EV board 2. See the image shows on the LCD correct or not
Note	Size 128X160 color bar image cover on the video image. The read part of color bar image is transparent.

2.4 2D Graphic Engine

The 2D diagnostic code can do the following test:

- Bitblt test
- Solid Fill
- Color Pattern Fill
- Mono Pattern Fill
- ROP test
- Alpha test
- Line Draw

- Style Line Draw
- Rotate
- Scaling Up
- Scaling Down

2.4.1 Bitblt test

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	Bitblt test includes several kinds of Pattern BLT, Color/Font Expanding BLT, Rectangle Fill, etc.

2.4.2 Solid Fill

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	

2.4.3 Color Pattern Fill

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board.

	2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	The pattern size is 8x8 pixels. The image is showed according to specified width and height.

2.4.4 Mono Pattern Fill

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	The pattern size is 8x8 pixels. The image is showed according to specified width and height.

2.4.5 ROP test

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	2D-GE supports all 256 ternary raster-operation codes.

2.4.6 Alpha test

Instrument	LCD module TD035STED3
-------------------	-----------------------

Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	Several images overlap on the LCD.

2.4.7 Line Draw

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	

2.4.8 Style Line Draw

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	

2.4.9 Rotate

Instrument	LCD module TD035STED3
-------------------	-----------------------

Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	Program will capture the image and rotate the image on the LCD.

2.4.10 Scaling Up

Instrument	LCD module TD035STED3
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	Program will scale up the image on the LCD gradually.

2.4.11 Scaling Down

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the LCD module TD035STED3 on the EV board. 2. Test function will show the image on the LCD. 3. The image demonstrates whether correctly.
Note	Program will scale down the image on the LCD gradually.

2.5 Audio

NUC910 audio controller has two audio interfaces - I2S and AC-link. AC'97 is used on the NUC910 EV board. The AC'97 playback test is executed.

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2.5.1 Playback Test

Instrument	AC'97 external codec (and I2S on NUC950)
Jumper Settings	SW1 AC97 1~5:ON (I2S 1~5 ON on NUC950)
Test Sequence	1. Plug the output device (head phone or speaker) 2. Listen the sound output from AC'97 (I2S) is correct or not
Note	8K sampling rate PCM is used

2.6 FMI

NUC910 Storage Interface Controller includes SD host, NAND host, and MS host.

The FMI diagnostic code can do the following test:

- SD two ports access
- NAND access
- MS two ports access
- SD two ports card detection
- MS two ports card detection

2.6.1 SD0 Test

Instrument	Any SDHC / SD / MMC card
Jumper Settings	SD0 switch turn ON and MS0 switch turn OFF
Test Sequence	Initial the card and then write / read / compare
Note	

2.6.2 SD1 Test

Instrument	Any SDHC / SD / MMC card
Jumper Settings	SD1 switch turn ON and MS1 switch turn OFF

Test Sequence	Initial the card and then write / read / compare
Note	

2.6.3 NAND Test

Instrument	None (on board NAND)
Jumper Settings	NAND switch turn ON
Test Sequence	Initial the NAND flash and then write / read / compare
Note	

2.6.4 MS0 Test

Instrument	Any MS / MS PRO card
Jumper Settings	MS0 switch turn ON and SD0 switch turn OFF
Test Sequence	Initial the card and then write / read / compare
Note	

2.6.5 MS1 Test

Instrument	Any MS / MS PRO card
Jumper Settings	MS1 switch turn ON and SD1 switch turn OFF
Test Sequence	Initial the card and then write / read / compare
Note	

2.6.6 SD0 Card detection Test

Instrument	Any SDHC / SD / MMC card
Jumper Settings	SD0 switch turn ON and MS0 switch turn OFF
Test Sequence	Initial the card and then wait the card insert or remove. After

	insert/remove card two times, the program will exit.
Note	

2.6.7 SD1 Card detection Test

Instrument	Any SDHC / SD / MMC card
Jumper Settings	SD1 switch turn ON and MS1 switch turn OFF
Test Sequence	Initial the card and then wait the card insert or remove. After insert/remove card two times, the program will exit.
Note	

2.6.8 MS0 Card detection Test

Instrument	Any MS / MS PRO card
Jumper Settings	MS0 switch turn ON and SD0 switch turn OFF
Test Sequence	Initial the card and then wait the card insert or remove. After insert/remove card two times, the program will exit.
Note	

2.6.9 MS1 Card detection Test

Instrument	Any MS / MS PRO card
Jumper Settings	MS1 switch turn ON and SD1 switch turn OFF
Test Sequence	Initial the card and then wait the card insert or remove. After insert/remove card two times, the program will exit.
Note	

2.7 ATAPI

The ATAPI controller can control the disk connected at the master or slave position, but the diagnostic code only test the device connected at the master position. Before testing, make sure the disk is connected at the master position.

The ATAPI diagnostic code can do the following test:

- Get the disk information
- Read/Write/Compare data test

2.7.1 Get the disk information

Instrument	One IDE hard disk.
Jumper Settings	SW3 all on, SW4 all off
Test Sequence	1. Connect hard disk at master position. 2. Run diagnostic code.
Note	If any error occurs at this test, the diagnostic code will not do the following read/write/compare test.

2.7.2 Read/Write/Compare data test

Instrument	One IDE hard disk.
Jumper Settings	SW3 all on, SW4 all off
Test Sequence	1. Connect hard disk at master position. 2. Run diagnostic code.
Note	

2.8 Ethernet MAC

The Ethernet MAC (EMC) function can test whether EMC interface is working properly or not.

The Ethernet MAC diagnostic code can do the following test:

- Tx/Rx test

2.8.1 Tx/Rx Test

Instrument	One CAT5 cable and a loop back connector.
Jumper Settings	Plug a loop-back connector into RJ45 jack
Test Sequence	<ol style="list-style-type: none"> 1. Connect on board RJ45 jack with loop back connector via CAT5 cable 2. Test function will send an UDP packet out and wait for 5 seconds maximum before return. 3. This test is passed if loop back is received within 5 seconds after UDP packet was sent.
Note	

2.9 UART

NUC910 has 5 UART channels, UART0 ~ UART4. Both NUC920 and NUC960 only have 3 UART channels, UART0 ~ UART2.

UART0 is a general UART block without Modem I/O signals. UART1 is a high speed UART for the Bluetooth transceiver. The FIFO has 64-byte for receiving and 64-byte for transmitting. The clock source is programmable in chip clock generator. UART2 is a general UART with IrDA SIR. UART3 is a general UART with modem function for micro-printer. UART4 is a general UART block with Modem I/O signals, which is the same as UART0.

The UART diagnostic code can do the following test:

- External loop-back
- Simple UART receiving
- Simple UART transmitting
- Get UART registers value
- UART line break interrupt
- UART1 or UART3 Modem loop-back
- UART1 high baud rate (Bluetooth)
- UART2 IrDA
- UART1 Modem

- UART1 H/W flow control
- UART1 S/W flow control

2.9.1 External loop-back

Instrument	A RS232 socket that TX/RX is closed.
Jumper Settings	Set JP1 to select TXD2 or DTR1. Set JP2 to select TXD4 or RIn1. Set JP3 to select RXD2 or DSR1. Set JP4 to select RXD4 or CDn1.
Test Sequence	1. Plug a RS232 socket into UART port. 2. Select the UART channel which you want to test on UART0 HyperTerminal.
Note	If the RS232 socket plugs in the wrong port, program should be suspended.

2.9.2 Simple UART receiving

Instrument	HyperTerminal.
Jumper Settings	Set JP1 to select TXD2 or DTR1. Set JP2 to select TXD4 or RIn1. Set JP3 to select RXD2 or DSR1. Set JP4 to select RXD4 or CDn1.
Test Sequence	1. Select UART1~4 settings on UART0 HyperTerminal. 2. Key in 10 characters from the other UART HyperTerminal.
Note	

2.9.3 Simple UART transmitting

Instrument	HyperTerminal.
Jumper Settings	Set JP1 to select TXD2 or DTR1. Set JP2 to select TXD4 or RIn1. Set JP3 to select RXD2 or DSR1. Set JP4 to select RXD4 or CDn1.
Test Sequence	1. Select UART1~4 settings on UART0 HyperTerminal. 2. Program should transmit 50 times of characters 0 ~ 9.
Note	

2.9.4 Get UART registers value

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Select UART0~4 on UART0 HyperTerminal. 2. Program should print the UART registers value.
Note	

2.9.5 UART line break interrupt

Instrument	A RS232 socket that TX/RX is closed.
Jumper Settings	Set JP1 to select TXD2 or DTR1. Set JP2 to select TXD4 or RIn1. Set JP3 to select RXD2 or DSR1. Set JP4 to select RXD4 or CDn1.
Test Sequence	<ol style="list-style-type: none"> 1. Plug a RS232 socket into UART port. 2. Select the UART channel which you want to test on UART0 HyperTerminal.
Note	If the RS232 socket plugs in the wrong port, program should be suspended.

2.9.6 UART1 & UART3 Modem loop-back

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Select the UART1 or UART3 which you want to test on UART0 HyperTerminal. 2. Program should print the test result on UART0 HyperTerminal.
Note	

2.9.7 UART1 high baud rate (Bluetooth)

Instrument	If test with Bluetooth, UART1 should be connected with one Bluetooth module. Otherwise, connect with the USB to serial cable for high baud rate test.
Jumper Settings	None
Test Sequence	1. Set UART1 HyperTerminal to capture text file and start TX test. 2. Start RX test and then send the text file that captured before by UART1 HyperTerminal.
Note	Only for UART1 test.

2.9.8 UART2 IrDA

Instrument	IrDA module.
Jumper Settings	None
Test Sequence	1. Set UART2 HyperTerminal to capture text file and start TX test. 2. Start RX test and then send the text file that captured before by UART2 HyperTerminal.
Note	Only for UART2 test.

2.9.9 UART1 Modem

Instrument	Real Modem.
Jumper Settings	Set JP1 to select TXD2 or DTR1. Set JP2 to select TXD4 or RIn1. Set JP3 to select RXD2 or DSR1. Set JP4 to select RXD4 or CDn1.
Test Sequence	1. Plug Modem into UART1 and start test. Program should send command to Modem by UART1.
Note	Only for UART1 test.

2.9.10 UART1 H/W flow control

Instrument	HyperTerminal.
Jumper Settings	Set JP1 to select TXD2 or DTR1. Set JP2 to select TXD4 or RIn1. Set JP3 to select RXD2 or DSR1. Set JP4 to select RXD4 or CDn1.
Test Sequence	<ol style="list-style-type: none"> 1. Configure UART1 HyperTerminal as hardware flow control and set it to capture text file. Then start TX test. 2. Start RX test and then send the text file that captured before by UART1 HyperTerminal. 3. Program should compare the TX and RX data.
Note	Only for UART1 test.

2.9.11 UART1 S/W flow control

Instrument	HyperTerminal.
Jumper Settings	Set JP1 to select TXD2 or DTR1. Set JP2 to select TXD4 or RIn1. Set JP3 to select RXD2 or DSR1. Set JP4 to select RXD4 or CDn1.
Test Sequence	<ol style="list-style-type: none"> 1. Configure UART1 HyperTerminal as Xon/Xoff mode and set it to capture text file. Then start TX test. 2. Start RX test and then send the text file that captured before by UART1 HyperTerminal. 3. Program should compare the TX and RX data.
Note	Only for UART1 test.

2.10 I2C

The NUC910 I2C includes two channels, I2C_0 and I2C_1, which is a two-wire, bi-directional serial bus that provides a simple and efficient method of data exchange between devices. The I2C standard is a true multi-master bus including collision detection and arbitration that prevents data corruption if two or more masters attempt to control the bus simultaneously.

The I2C diagnostic code can do the following test:

- I2C0 byte write / random read
- I2C0 page write / sequential read
- I2C1 byte write / random read
- I2C1 page write / sequential read

2.10.1 I2C0 byte write / random read

Instrument	EEPROM.
Jumper Settings	SW1: 1-4 ON, 5-8 OFF. SW5: 1-4 OFF.
Test Sequence	<ol style="list-style-type: none"> 1. Program should write data to EEPROM at offset address. 2. Program read data from EEPROM at the address that wrote before. 3. Compare TX and RX data.
Note	

2.10.2 I2C0 page write / sequential read

Instrument	EEPROM.
Jumper Settings	SW1: 1-4 ON, 5-8 OFF. SW5: 1-4 OFF.
Test Sequence	<ol style="list-style-type: none"> 1. Program should write data to EEPROM at offset address. 2. Program read data from EEPROM at the address that wrote before. 3. Compare TX and RX data.
Note	

2.10.3 I2C1 byte write / random read

Instrument	EEPROM.
Jumper Settings	SW1: 1-4 ON, 5-8 OFF. SW5: 1-4 OFF.

Test Sequence	<ol style="list-style-type: none"> 1. Program should write data to EEPROM at offset address. 2. Program read data from EEPROM at the address that wrote before. 3. Compare TX and RX data.
Note	

2.10.4 I2C1 page write / sequential read

Instrument	EEPROM.
Jumper Settings	SW1: 1-4 ON, 5-8 OFF. SW5: 1-4 OFF.
Test Sequence	<ol style="list-style-type: none"> 1. Program should write data to EEPROM at offset address. 2. Program read data from EEPROM at the address that wrote before. 3. Compare TX and RX data.
Note	

2.11 ADC

The NUC910 ADC is 10-bit analog to digital converter with 8-channel inputs. The ADC supports touch screen interface for 4-wire, 5-wire, and 8-wire analog resistive touch panel. The ADC diagnostic code can test whether ADC interface is working with 4-wire touch panel properly or not.

The ADC diagnostic code can do the following test:

- ADC interface with 4-wire touch panel

2.11.1 ADC interface with 4-wire touch panel

Instrument	Touch panel module on top of an LCD display
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Plug the touch panel module on the EV board. 2. Touch 4 targets on the screen in sequence. If touch position is

	<p>within the target, the next target will appear on the screen until 4th target appears. If touch position is out of target, the next target won't show on the screen and the error message will be shown on the console.</p> <p>3. If 4 targets are all touched correctly, the ADC test finishes and the 'OK' message will occur on the console.</p>
Note	Please press the red mark, '+', in center of square target.

2.12 RTC

The NUC910/920 Real Time Clock (RTC) block can be operated by independent power supply while the system power is off. It will run the test items as below continuously.

The RTC diagnostic code can do the following test:

- Initial test
- Set current time test
- Set alarm time test
- Alarm interrupt test
- Read current time test
- Tick interrupt test
- Leap year test
- Wake-up interrupt test

2.12.1 Initial test

Instrument	None
Jumper Settings	None
Test Sequence	<p>1. Test program will initial and reset RTC.</p> <p>2. If the test was completed and passed, you will see "OK" message on console. Otherwise, the test failed.</p>
Note	Remember to install battery

2.12.2 Set alarm time test

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Test program will set alarm time 2. If the test was completed and passed, you will see "OK" message on console. Otherwise, the test failed.
Note	Remember to install battery

2.12.3 Set current time test

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Test program will set current time 2. If the test was completed and passed, you will see "OK" message on console. Otherwise, the test failed.
Note	Remember to install battery

2.12.4 Read current time test

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Test program will set current time 2. Read current time and console out UART about 10sec 3. Check if it is changed by time.
Note	Remember to install battery

2.12.5 Leap year test

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Test program will set current time 2. If the test was completed and passed, you will see "OK" message on console. Otherwise, the test failed.
Note	Remember to install battery

2.12.6 Alarm interrupt test

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Test program will enable alarm interrupt function, set current and alarm time by one sec. 2. When alarm time is equal to current, it will trigger alarm interrupt and. 3. If the test was completed and passed, you will see "OK" message on console. Otherwise, the test failed.
Note	Remember to install battery

2.12.7 Tick interrupt test

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Test program will enable tick interrupt and set tick interval equal to one sec. 2. If the test was completed and passed, you will see "OK" message on console after one second. Otherwise, the test failed.

Note	Remember to install battery
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2.12.8 Wake-up interrupt test

Instrument	None
Jumper Settings	None
Test Sequence	<ol style="list-style-type: none"> 1. Test program will enable wake-up function, set current and alarm time by one sec. 2. After one sec, 910/920 should wake up. 3. If the test was completed and passed, you will see "OK" message on console. Otherwise, the test failed.
Note	Remember to install RTC battery

2.13 PS/2

NUC910 PS/2 host controller interface implements a bi-directional serial protocol to connect an IBM AT or PS/2 keyboard. The host controller handles the electronic interface and protocol without software involving. If any key is being pressed, released, or held down, the keyboard will send a packet of information known as a "scan code" to host controller. The host controller will put the scan code and its corresponding ASCII code into registers, then generate an interrupt to note software driver. Instead of using interrupt method, the software drives can continuously read the status register to check whether a scan code arrived or not. Besides, the host controller provides a command register for software driver to send commands to keyboard.

The PS/2 diagnostic code can do the following test:

- PS/2 Keyboard
- PS/2 Mouse

2.13.1 PS/2 Keyboard

Instrument	PS/2 Keyboard.
Jumper Settings	SW5: 1-8 ON. SW6: 1-8 OFF. SW7: 1-8 OFF.

Test Sequence	1. Send command to PS/2 keyboard and get data from it.
Note	Plug in PS/2 keyboard first.

2.13.2 PS/2 Mouse

Instrument	PS/2 Mouse.
Jumper Settings	SW5: 1-8 ON. SW6: 1-8 OFF. SW7: 1-8 OFF.
Test Sequence	1. Get data packet from PS/2 Mouse. 2. Program should print the packet message on UART0 HyperTerminal.
Note	Plug in PS/2 Mouse first.

2.14 Smart Card

The smartcard test function can test whether smartcard interface is working properly or not.

The Smart Card diagnostic code can do the following test:

- Read ATR test

2.14.1 Read ATR test

Instrument	Two T = 0 smartcards, one full size and the other SIM size.
Jumper Settings	SW8[ON], SW9[ON], SW6[OFF], SW7[OFF], SW10[OFF], SW11[OFF]
Test Sequence	1. Make sure the jumper setting on board is consisting with above list. 2. Insert full size smartcard to slot 0 and SIM size smartcard to slot 1. 3. The test function will try to activate these smartcard, read the ATR, and then deactivate these cards. 4. Test is passed if valid ATR could be read from smartcard.

Note	
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2.15 SPI

NUC910 supports Synchronous Serial Port Controller. It performs a serial to parallel conversion on data characters received from the peripheral, and a parallel to serial conversion on data characters received from CPU.

The SPI diagnostic code can do the following test:

- Access SPI Flash Test

2.15.1 SPI Flash Test

Instrument	None (on board SPI Flash)
Jumper Settings	SPI switch ON
Test Sequence	Initial SPI flash and then write / read / compare
Note	

2.16 PCI

NUC910 PCI bus controller will run the RTL8139 loop back test. If you want to test it, the RTL8139 PCI LAN Card must be prepared.

2.16.1 RTL8139 loop back test

Instrument	1. RTL8139 PCI LAN Card 2. Loop backed RJ-45 connector
Jumper Settings	None
Test Sequence	1. Plug the PCI LAN Card 2. Plug the RJ-45 connector

Note	If OK, shows the time period and throughput If fail, shows error message
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2.17 PWM

PWM test function could test each individual timer in one shot mode and toggle mode. All the APIs accessing PWM related registers are provided by PWM Non-OS Library. In toggle mode testing, timeout interval will decrease by half the duration every time an interrupt occurs.

2.17.1 PWM timer operation test

Instrument	Oscilloscope (option)
Jumper Settings	PWM switch ON (option)
Test Sequence	1. Configure PWM 2. One shot mode test 3. Toggle mode
Note	If OK, shows the timer operation message If fail, shows error message

2.18 KPI

PWM test function could test each individual timer in one shot mode and toggle mode. All the APIs accessing PWM related registers are provided by PWM Non-OS Library. In toggle mode testing, timeout interval will decrease by half the duration every time an interrupt occurs.

NUC910 KPI supports GPIOC and GPIOI interfaces. Use keypad size is 4*8 on NUC910 EV board to test.

The KPI diagnostic code can do the following test:

- Power down wake up test
- KPI block mode test

- KPI non-block mode test
- KPI buffer test
- KPI three key test

2.18.1 Power Down Wake Up Test

Instrument	On board 4*8 keypad
Jumper Settings	SW3[OFF],SW4[ON],
Test Sequence	<ol style="list-style-type: none"> 1. Press any key to enter power down mode 2. System will enter power down mode until press [0,0] to trigger wake-up function. 3. If the test was completed and passed, you will see "Wake up success" message on console. Otherwise, there is no any message on console.
Note	None

2.18.2 KPI Block Mode Test

Instrument	On board 4*8 keypad
Jumper Settings	SW3[OFF],SW4[ON],
Test Sequence	Test program will console out the key which you pressed whenever one or two keys.
Note	Press key[0,1] to leave the test

2.18.3 KPI Non-Block Mode Test

Instrument	On board 4*8 keypad
Jumper Settings	SW3[OFF],SW4[ON],
Test Sequence	Test program will console out the key which you pressed before time-out.
Note	Notice time-out time

2.18.4 KPI Buffer Test

Instrument	On board 4*8 keypad
Jumper Settings	SW3[OFF],SW4[ON],
Test Sequence	<ol style="list-style-type: none"> 1. Please press any KPI key. 2. Test program will console out the key which you have ever pressed after press any key in PC.
Note	Press KPI key less than ten times

2.18.5 KPI Three Key Mode Test

Instrument	On board 4*8 keypad
Jumper Settings	SW3[OFF],SW4[ON],
Test Sequence	<ol style="list-style-type: none"> 1. Test program will set [1,0][1,1][1,2] to 3Key reset. 2. Choose reset chip or not in three key mode 3. Press keys [1,0][1,1][1,2]at the same time. 4. If the test was completed and passed, you will see "Three key test OK" message on console. Otherwise, there is no any message on console.
Note	Press key[0,1] to leave the test

Note: set[m,n]means set 'row m' and 'column n'.

