

Stratix4 GX SATA3 Host Demo Instruction

Rev1.0 18-Jan-12

This document describes the instruction to run SATA-IP host demo on Stratix IV GX development board with SATA3 or SATA2 device.

1 Environment Setup

To run host demo, HSMC SATA board is required to connect Stratix IV GX development board with SATA-III or SATA-II HDD/SSD, as shown in Figure 1. "RESET" button must be used when use has just connected HDD/SSD to system.

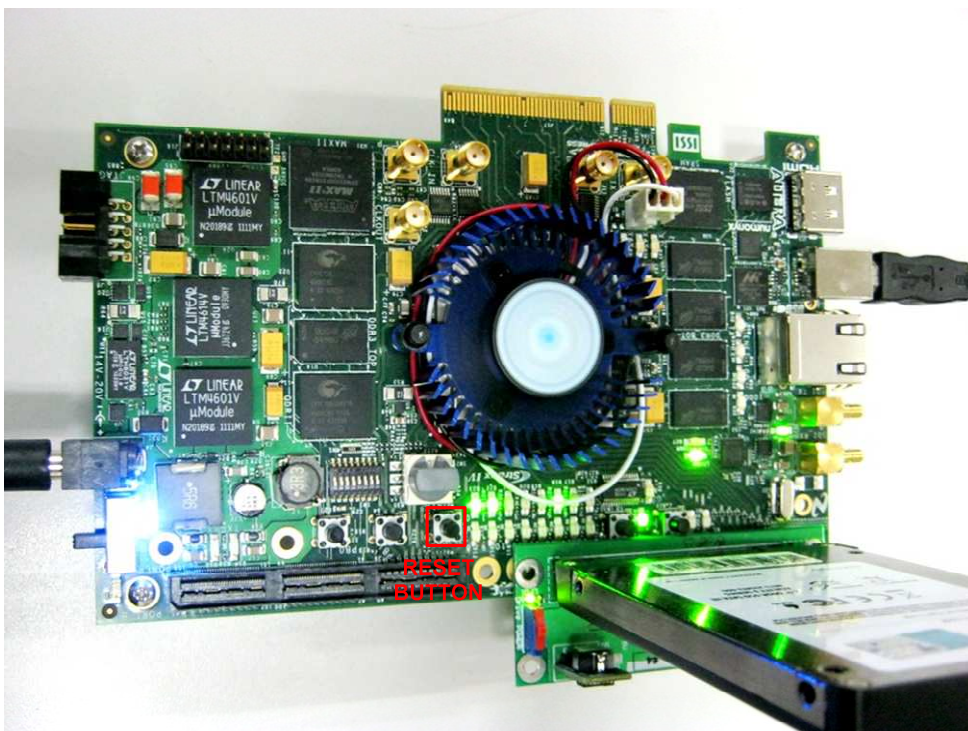


Figure 1 Host Demo Environment Setup

Following step is setup procedure for running demo.

- Insert SATA-III/SATA-II HDD/SSD to SATA socket on HSMC SATA board.
- Connect HSMC SATA board to HSMC connector Port A on Stratix IV GX development board
- Connect USB A-B cable from Stratix IV GX board to PC and connect power supply to Stratix IV GX board.
- Set bit1 of SW3 to select SATA Speed (OFF: SATA-III, ON: SATA-II), as shown in Figure 2 and Figure 3.

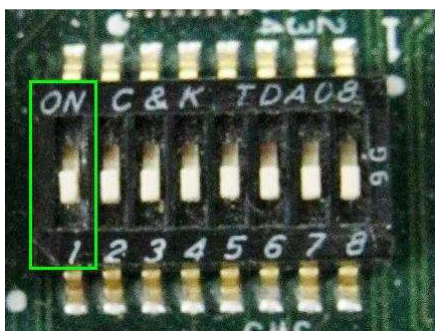


Figure 2 Set bit1 of SW3 to SATA-III

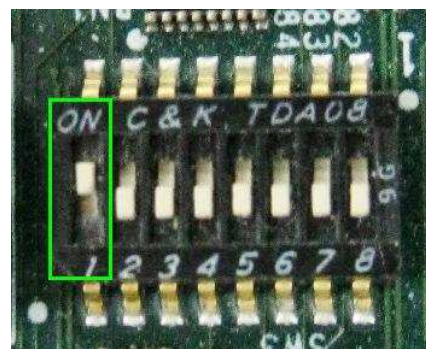


Figure 3 Set bit1 of SW3 to SATA-II

- Power on Startix IV GX board and power-on power switch on HSMC SATA board

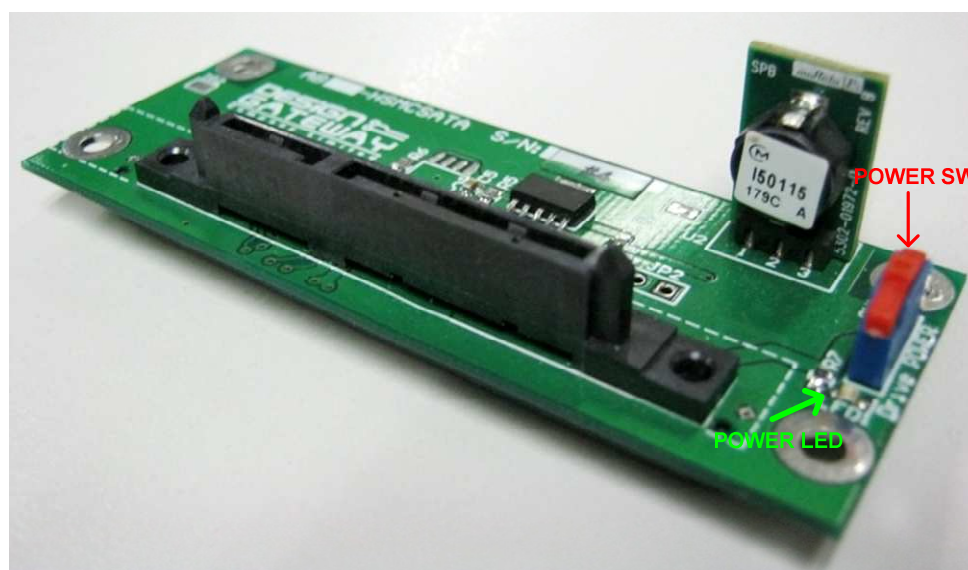


Figure 4 ON-Power Switch within HSMC SATA board

- Open Quartus Programmer and download “nios_sata3.sof” to Stratix IV GX board, as shown in Figure 5.

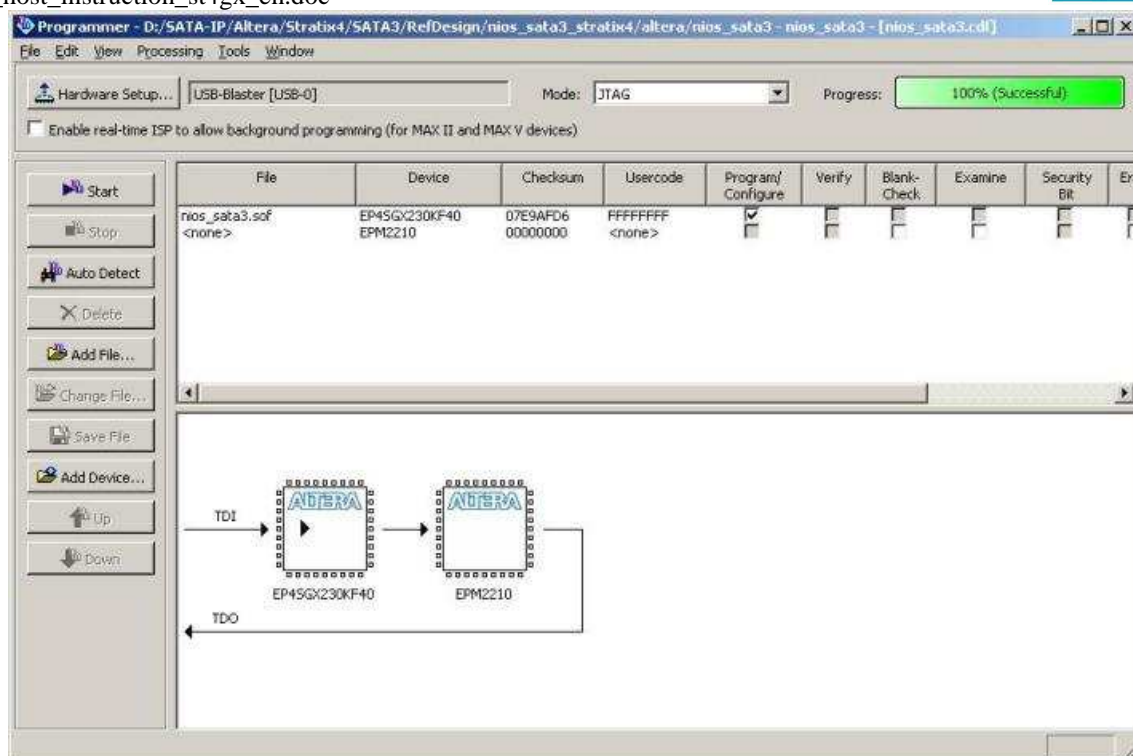


Figure 5 Programmer Environment

- Check LED status on Stratix IV GX board now and LED0-1 should be turn-on and LED5 should be on for SATA-III and off for SATA-II, as shown in Figure 6 and Figure 7.

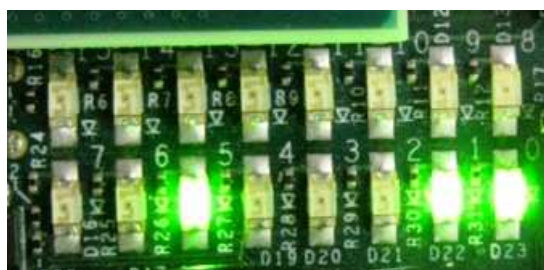


Figure 6 Normal operation LED Status for SATA-III speed

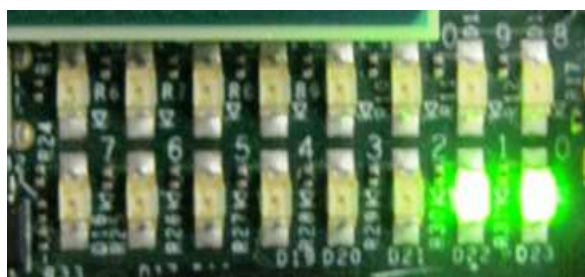


Figure 7 Normal operation LED Status for SATA-II speed

LED	ON	OFF
LED0	OK	SATA-IP cannot detect SATA device. Please check SATA-cable connection or reference clock frequency setting that should be 150 MHz.
LED1	OK	Internal PLL is not LOCK.
LED2	In process of write SATA HDD/SSD	Idle Status
LED3	In process of read SATA HDD/SSD	Idle Status
LED4	DDR3 initialize error. Please check DDR3 component.	OK
LED5	SATA-III speed	SATA-II speed

Table 1 LED Status of host reference design on Stratix-IV GX board

- Open NiosII 10.1 Command Shell.
- Type “nios2-terminal” and then boot-up screen with Main menu for running SATA host demo is displayed, as shown in Figure 8 and Figure 9. More details about each Menu are described in next topic.

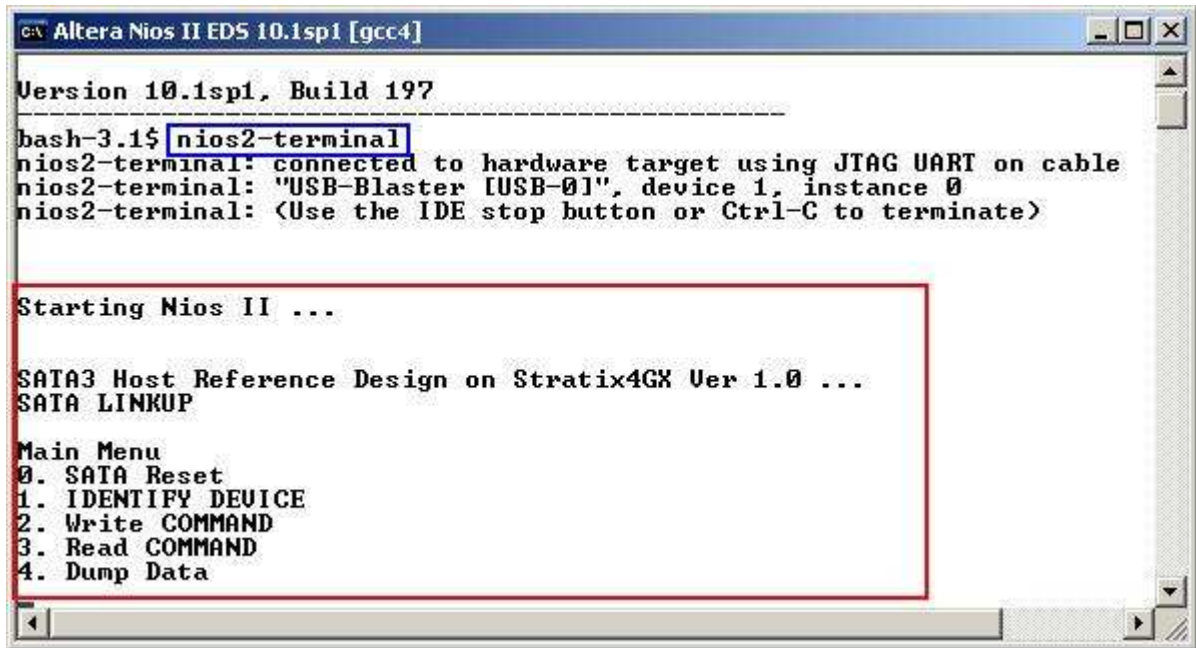


Figure 8 Run NIOSII Terminal and boot-up screen for SATA-III

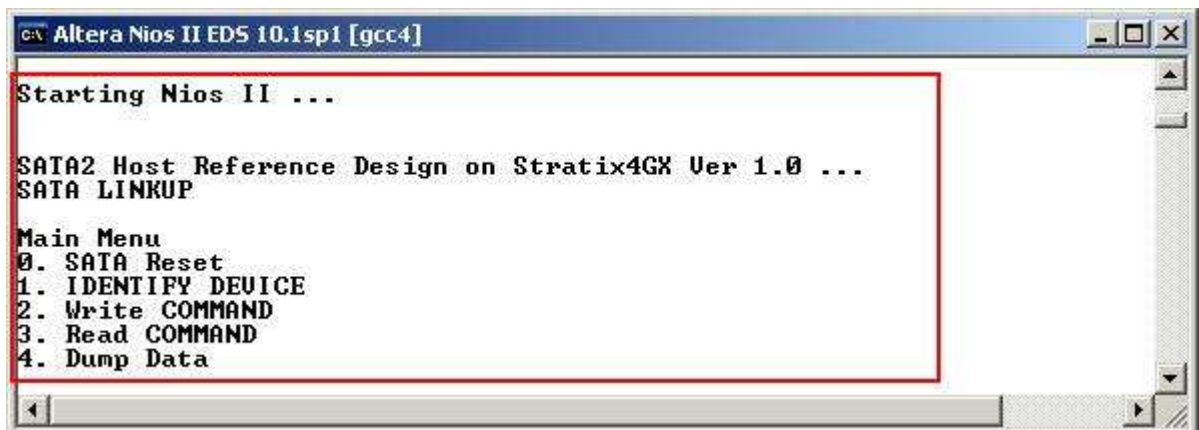


Figure 9 Boot-up screen for SATA-II

2 Main Menu

2.1 SATA RESET

Select '0' for sending hardware reset signal to SATA-IP. Hardware reset is designed to reset both SATA-IP and SATA-PHY module. So, SATA initialize process will be restart again and display "Hardware Reset", as shown in Figure 10, after sending this reset.

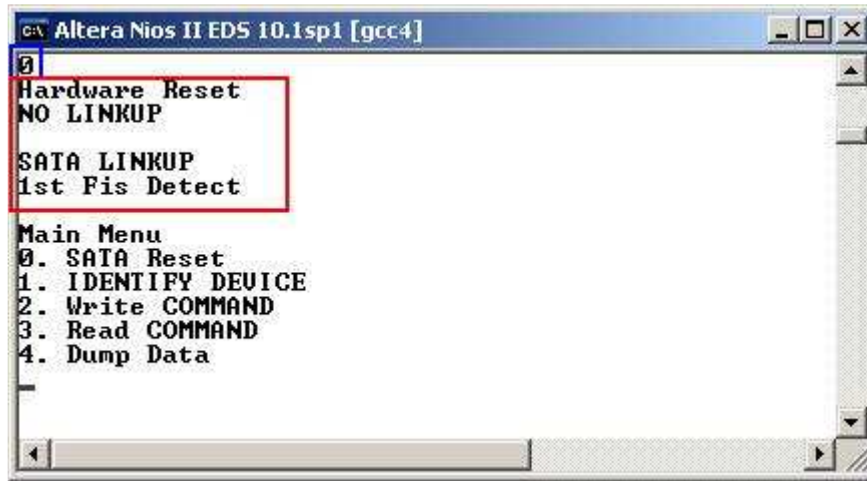


Figure 10 SATA RESET Menu

2.2 IDENTIFY DEVICE

Select '1' for sending "IDENTIFY DEVICE" command to HDD/SSD. Disk information (Model name, 48-bit LBA supported, disk capacity) will be displayed by using this menu, as shown in Figure 11.

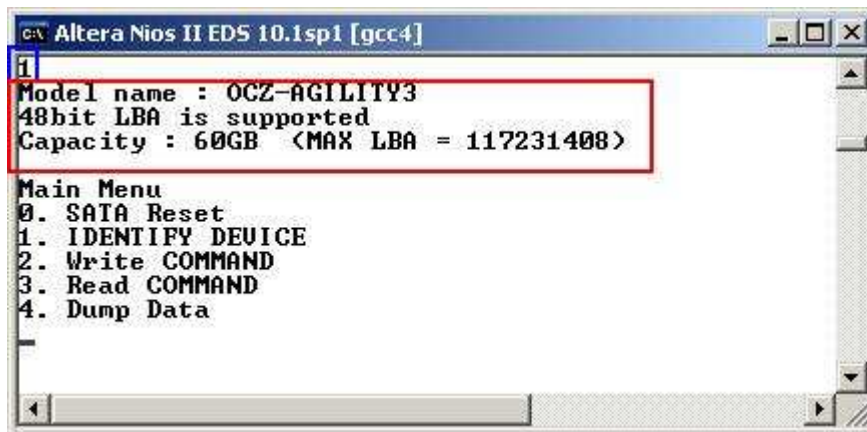


Figure 11 IDENTIFY DEVICE Menu

2.3 WRITE COMMAND

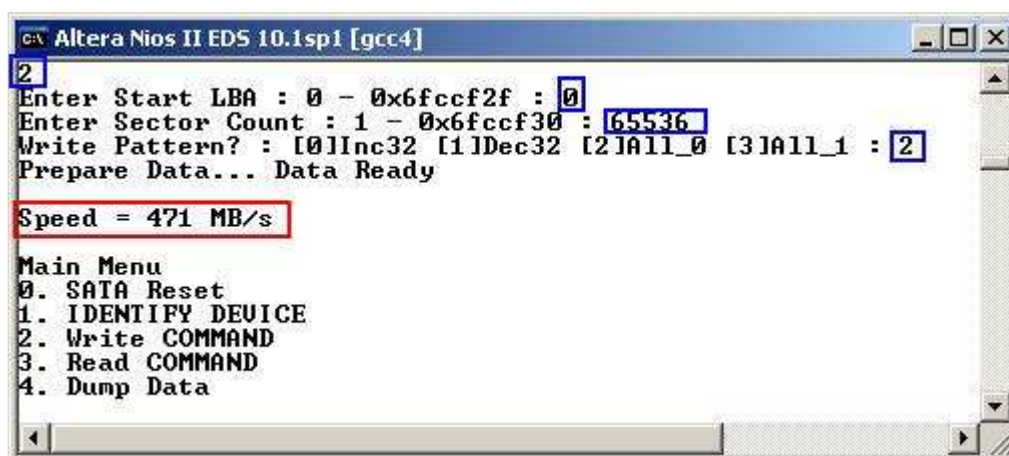
Select '2' for sending "WRITE DMA (EXT)" command to HDD/SSD. Three inputs are required for this menu, i.e.

- Start LBA: this value is used to be the sector number of HDD/SSD to start write data to it.
- Sector Count: this value is used to be total transfer size in sector unit (512 byte) to write HDD/SSD. If this value is more than 65536, data written to HDD/SSD will be duplicated every 65536 sectors from write buffer limitation.
- Write Pattern: this value is used to select test pattern to write to buffer and HDD/SSD. There are 4 test patterns in this demo, i.e. 32-bit increment pattern[0], 32-bit decrement pattern[1], 00000000H[2], FFFFFFFFH[3].

After Software receives all inputs correctly,

- "Prepare data" will be displayed during CPU writing test pattern data to write buffer.
- Transfer speed will be displayed after write operation complete.

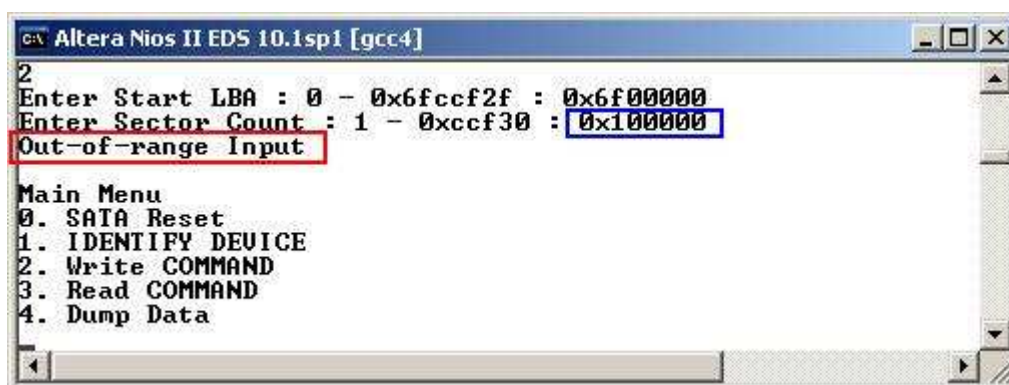
The example to use "WRITE COMMAND" menu is shown in Figure 12. Write operation will be cancelled when user input is out-of-range value, as shown in Figure 13.



```

CA Altera Nios II EDS 10.1sp1 [gcc4]
2
Enter Start LBA : 0 - 0x6fccf2f : 0
Enter Sector Count : 1 - 0x6fccf30 : 65536
Write Pattern? : [0]Inc32 [1]Dec32 [2]All_0 [3]All_1 : 2
Prepare Data... Data Ready
Speed = 471 MB/s
Main Menu
0. SATA Reset
1. IDENTIFY DEVICE
2. Write COMMAND
3. Read COMMAND
4. Dump Data
  
```

Figure 12 WRITE COMMAND Menu



```

CA Altera Nios II EDS 10.1sp1 [gcc4]
2
Enter Start LBA : 0 - 0x6fccf2f : 0x6f00000
Enter Sector Count : 1 - 0xccf30 : 0x100000
Out-of-range Input
Main Menu
0. SATA Reset
1. IDENTIFY DEVICE
2. Write COMMAND
3. Read COMMAND
4. Dump Data
  
```

Figure 13 Write operation cancelled from error input

2.4 READ COMMAND

Select '3' for sending "READ DMA (EXT)" command to HDD/SSD. Two or three inputs are required for this menu, i.e.

- Start LBA: this value is used to be the sector number of HDD/SSD to start read data from it.
- Sector Count: this value is used to be total transfer size in sector unit (512 byte) to read HDD/SSD. If this value is more than 65536 which is read buffer size value, transfer speed will be displayed as output without verify, as shown in Figure 14.
- Verify Pattern: this menu will be displayed if Sector Count value is not more than 65536. 4 verify patterns can be selected, like in WRITE COMMAND menu. "Verify Data ... Success" will be displayed if all data in read buffer is equal to check pattern, as shown in Figure 15. But "Data Mismatch with failure value" will be displayed instead if data is not equal, as shown in Figure 16.

Similar to WRITE COMMAND menu, read operation will be cancelled if receiving error input value, as shown in Figure 17.

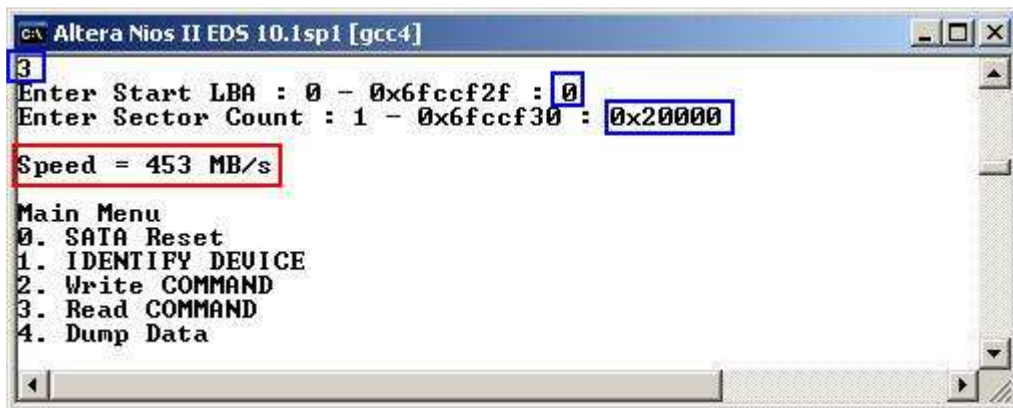


Figure 14 READ COMMAND without Verify

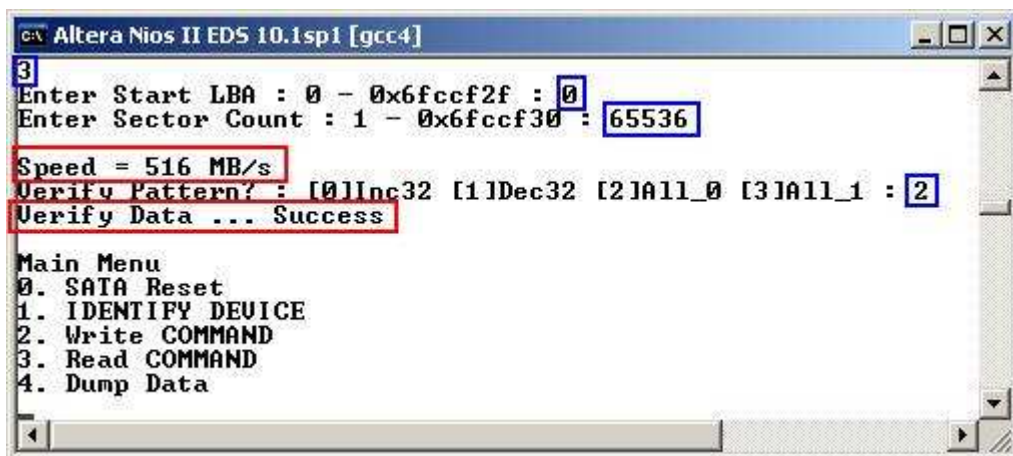


Figure 15 READ COMMAND with verify successful

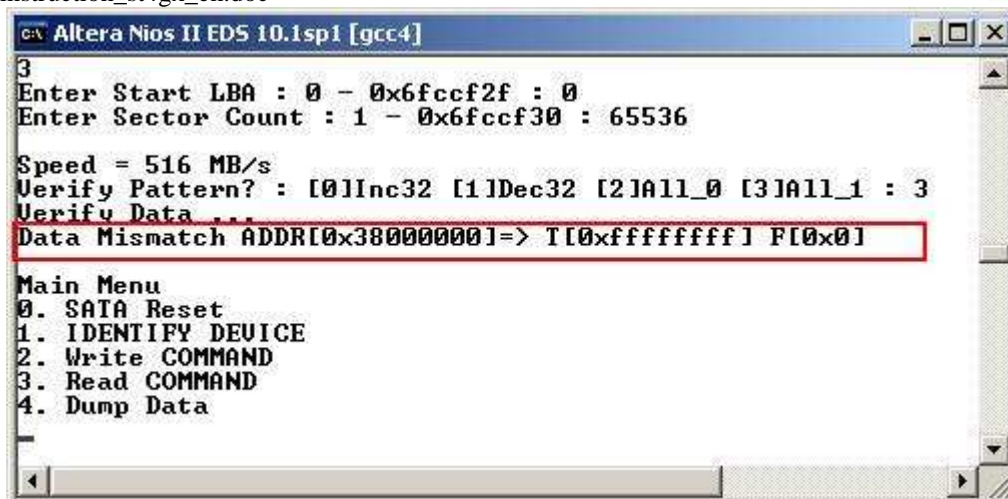


Figure 16 READ COMMAND with verify failure

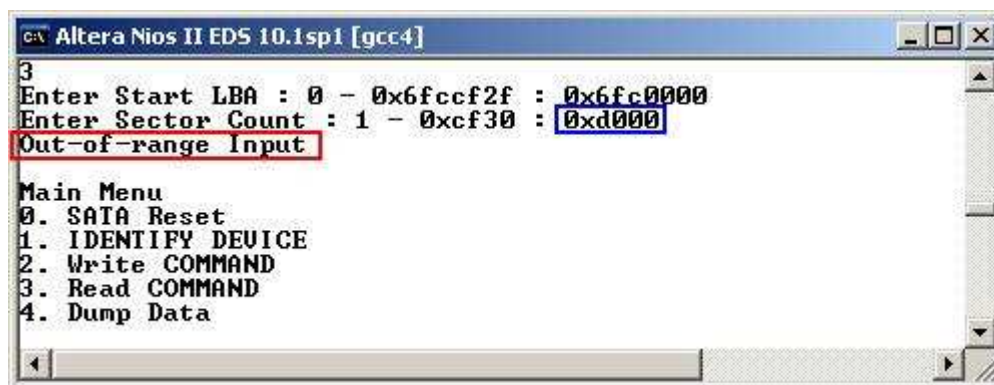


Figure 17 Read operation cancelled from error input

2.5 DUMP DATA

Select '4' to read data from DDR3 to check real value or read control register inside Avalon2SATA module. Two inputs are required for this menu, i.e.

- Start address: Heximal value can be input by adding prefix "0x". Memory map of this reference design is displayed in Table 2.
- Byte length: Input read length in byte unit.

After setting all inputs, all read values will be displayed on console, as shown in Figure 18.

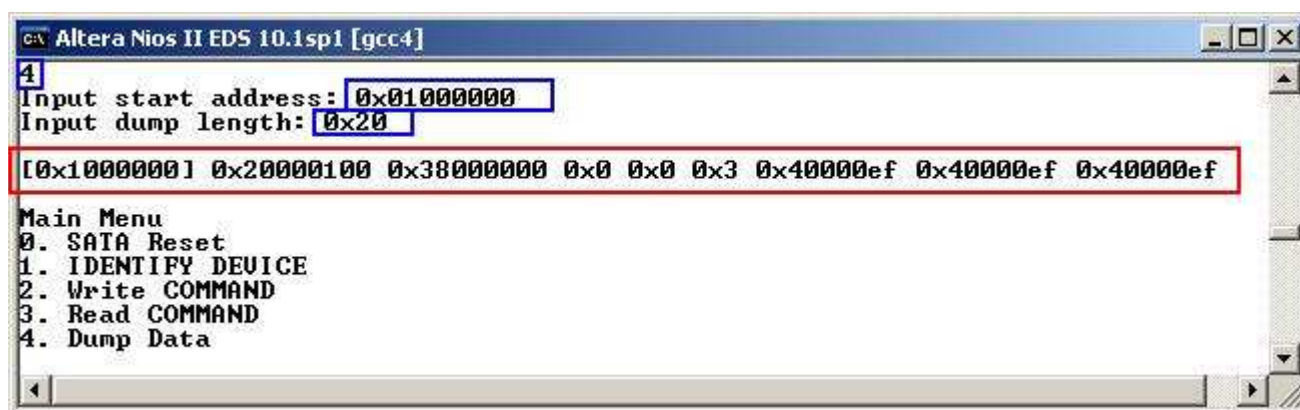


Figure 18 DUMP DATA Menu

Address	Memory map
0x01000000-0x0100001F	Avalon2SATA register area
0x20000000-0x3FFFFFFF	DDR3 memory area
- 0x20000000-0x20000FFF	TX FIS area
- 0x20001000-0x20001FFF	RX FIS area
- 0x30000000-0x37FFFFFF	TX DATA FIS area
- 0x38000000-0x3FFFFFFF	RX DATA FIS area

Table 2 Memory map in NIOSII system

3 Revision History

Revision	Date	Description
1.0	18-Jan-12	Initial version release