

SATA-IP RAIDx4 Demo Instruction on ML605

Rev1.0 23-Feb-10

This document describes how to use SATA-IP RAIDx4 Demo reference design bit-file on ML605. This design is RAID0 system connecting with 4 HDD/SSDs to increase transfer speed in system to be 4 times of normal disk speed.

From our check, some models of SATA-II HDD/SSDs can be supported for GTX on ML605. Section 4 shows HDD/SSD model lists which can run this design.

1 Environment

For real board evaluation of Raid reference design on ML605, environment shown in Figure 1 is required.

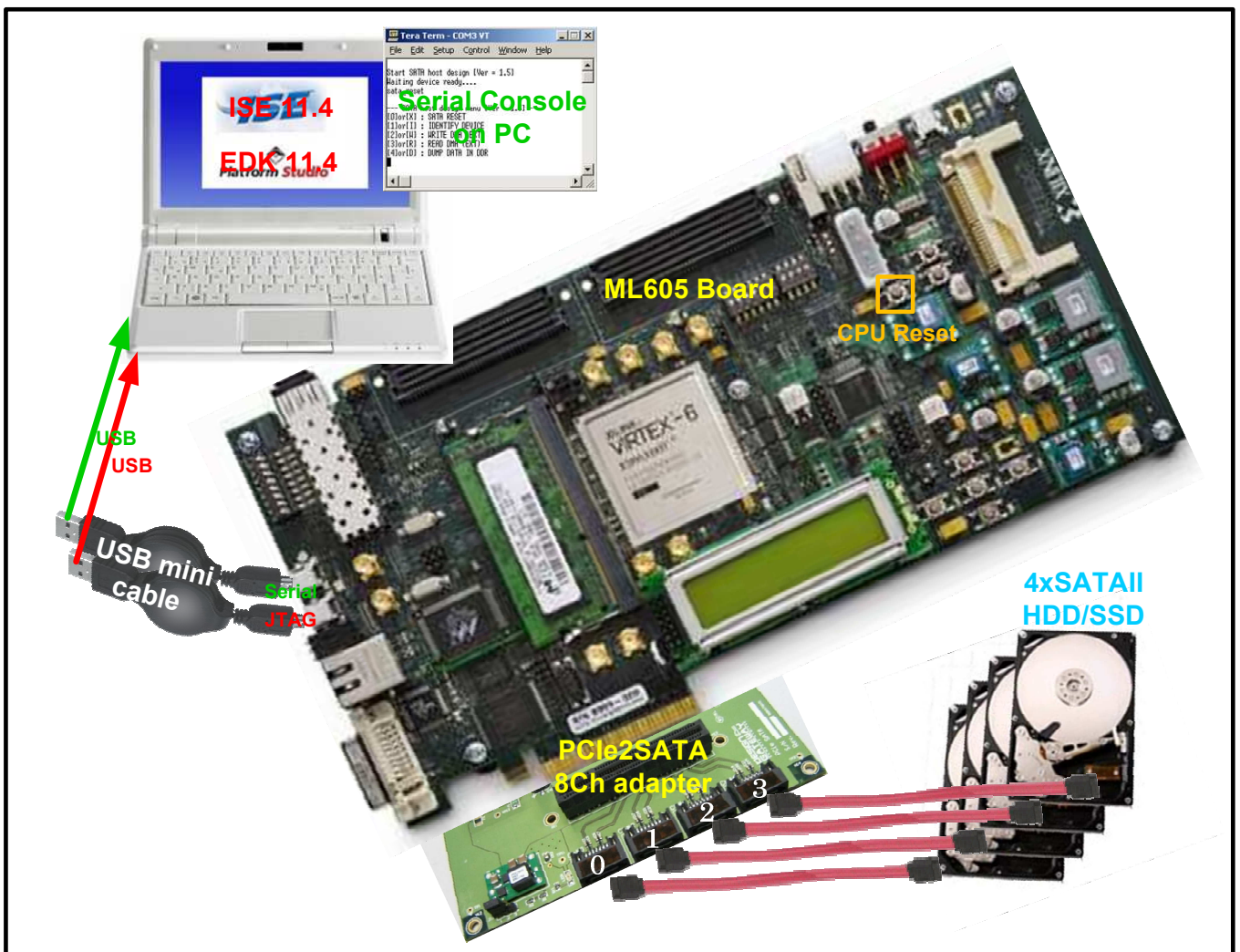


Figure 1 Evaluation environment using reference design bit-file

Note: For evaluation version, IP-Core has 1-hour time limitation to use. After 1-hour use, IP-core will stop any data transfer.

2 Evaluation procedure

- Check all system is power off
- Connect 1st USB mini cable from J22 on ML605 to USB Slot on PC for JTAG programming
- Connect 2nd USB mini cable from J21 on ML605 to USB Slot on PC for Serial Console
- Connect PCIe2SATA 8Ch adapter board to ML605 board at PCIe connector
Note: PCIe2SATA 8Ch adapter board can be requested from Design Gateway.
- Connect 4 standard SATA cable from SATA Ch#0,#2,#4,#6 on PCIe2SATA adapter board to 4 SATA-II HDD/SSD
Note: In design, source code maps SATA Ch#0, #2, #4, #6 to be disk number #0, #1, #2, and #3 sequentially.
- Power up ML605 board and open serial monitoring software such as HyperTerminal. Terminal settings should be (Baud Rate=115,200 Data=8 bit Non-Parity Stop=1).
- Download bit-file to ML605 by using iMPACT Software.
- After FPGA start operation, check 8 GPIO LEDs status at top-left corner on ML605 board. All LEDs must be ON, as shown in Figure 2. Each LED description is described as follows.

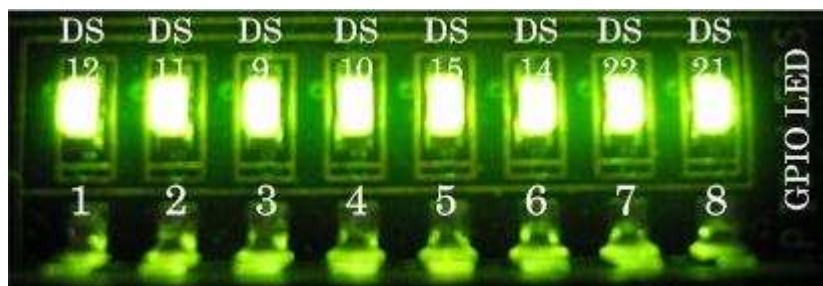


Figure 2 LED status after system set up complete

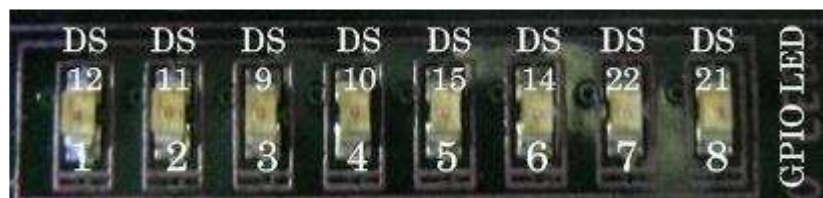


Figure 3 LED status after 1-hour timeout

LED	ON	OFF
DS12	OK	SATA clock cannot lock. Please check OSC 200 MHz at U11 on the bottom side of ML605 board.
DS11	OK	SATA-IP cannot detect SATA device. Please check SATA cable connection at Device number#0 (SATA Ch#0).
DS9	OK	FPGA cannot run correctly. Please check configuration file.
DS10	OK	DDR3 cannot initialize. Please check DDR3 on ML605 board.
DS15	Same description as DS12.	
DS14	Same description as DS11, but check SATA cable at Device number#1 (SATA Ch#2)	
DS22	Same description as DS9	
DS21	Same description as DS10	

Table 1 LED Status of host reference design on ML605 board

Note: All LEDs will be OFF after 1-hour timeout.

- At serial console on PC, main menu will be displayed as shown in Figure 4. Then, user can execute each command operation. Please check serial-cable connection if this menu is not displayed on console.
- If there is any disk cannot link up correctly, it'll display error message to report user that which disk number has the problem. As shown in Figure 5, "No Disk(number) Detected" will be displayed until all four HDD/SSDs be found.

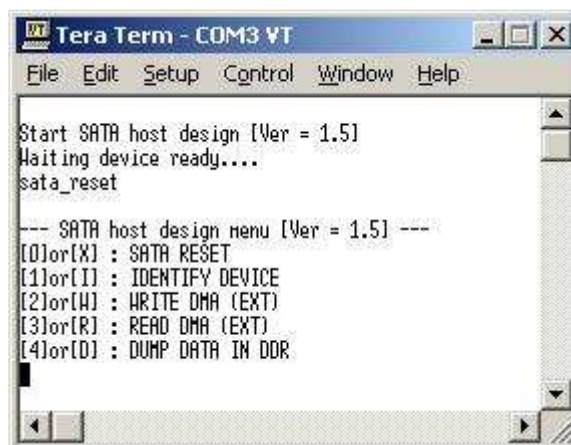


Figure 4 Main Menu of host demo

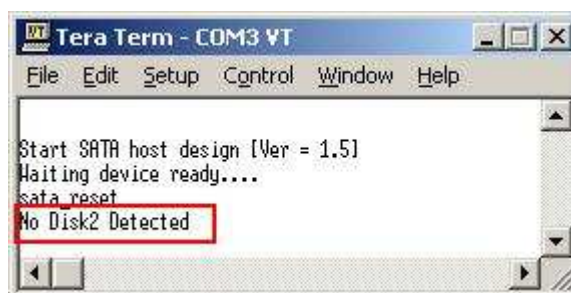


Figure 5 The example of error message when disk number#2 has problem

3 Main Menu

3.1 SATA RESET

Select '0' or 'X' for sending hardware reset signal to SATA-IP. Hardware reset is designed to reset both SATA-IP and SATA-PHY module in every SATA channel. So, SATA initialize process will restart again and display "SATA RESET selected", as shown in Figure 6, after sending this reset.

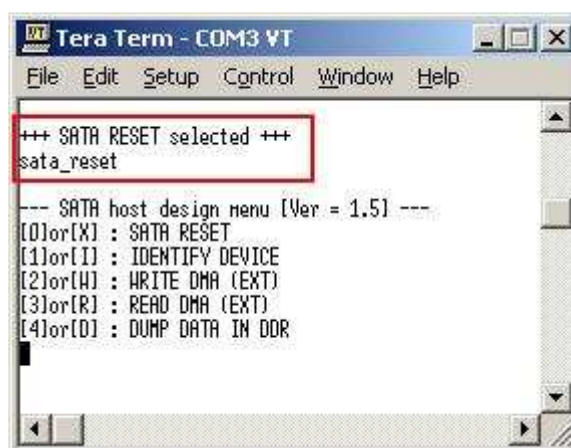


Figure 6 SATA Reset Output

3.2 IDENTIFY DEVICE

Select '1' or 'I' for sending "IDENTIFY DEVICE" command to HDD/SSD. Disk information (Model name, 48-bit LBA supported, disk capacity) of all four channels will be displayed by using this menu, as shown in Figure 7. From this command, maximum LBA size will be calculated from disk number#0 x 4. So, please connect disk which has the smallest capacity to Ch#0.

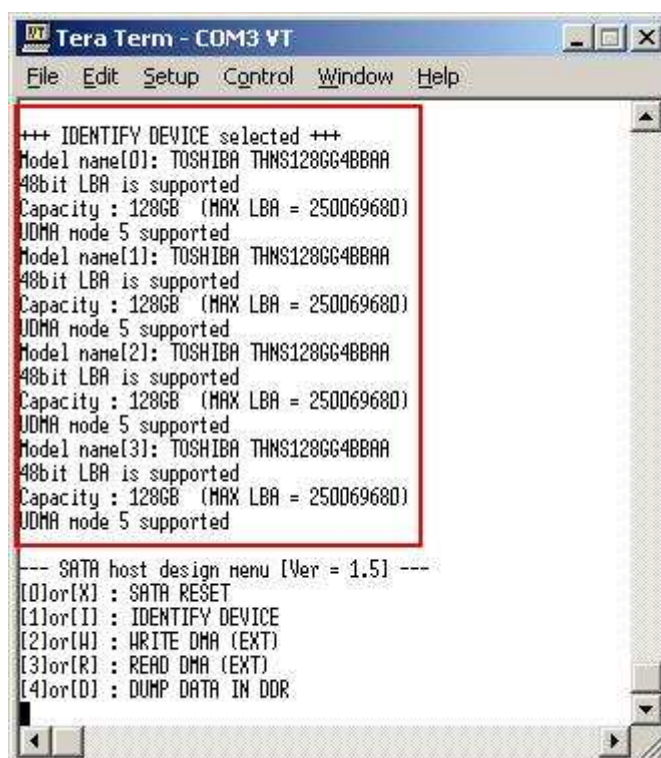


Figure 7 Disk Information from IDENTIFY DEVICE command

3.3 WRITE DMA (EXT)

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

- Start LBA: this value, divided by 4, is used to be the sector number of 4 HDD/SSD to start write data to it.
- Sector Count: this value, divide by 4, is used to be total transfer size in sector unit (512 byte) to write HDD/SSD. If this value is more than 131072, data written to HDD/SSD will be repeated every 131072 sectors from write buffer limitation (64 MB).
- Write Pattern: this value is used to select test pattern to write to buffer and HDD/SSD. There are five test patterns in this demo, i.e. 32-bit increment pattern[0], 32-bit decrement pattern[1], 00000000H[2], FFFFFFFFH[3], and current data in read buffer[4].

After Software receives all inputs correctly,

- "Prepare data" will be displayed during CPU writing test pattern data to write buffer.
- "Execute Write" will be displayed during CPU sending WRITE DMA (EXT) command and transferring data from write buffer to HDD/SSD.
- Transfer speed will be displayed after write operation complete.

Figure 8 shows the example of test result when operation complete. Write operation will be canceled from two cases, i.e. receiving error input or receiving any input from user during CPU processing this operation, as shown in Figure 9 and Figure 10.

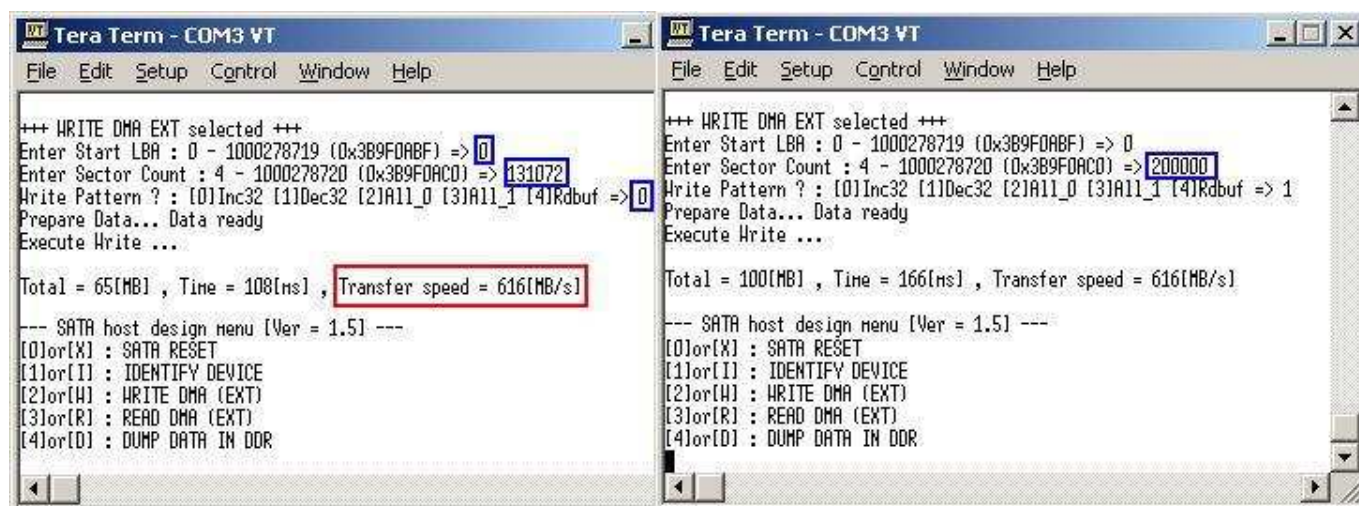


Figure 8 WRITE DMA (EXT) command input and output

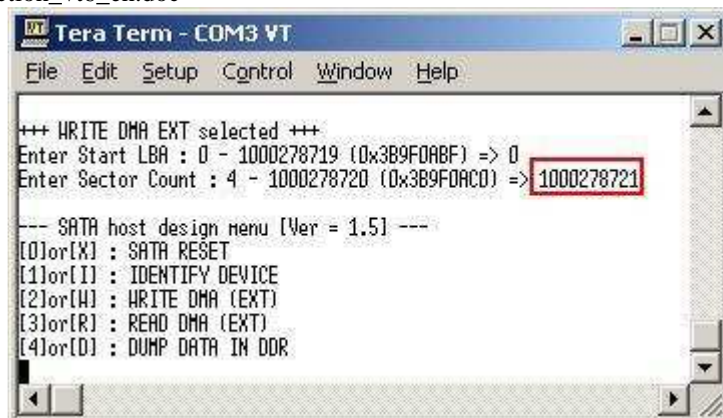


Figure 9 Write Operation canceled from error input

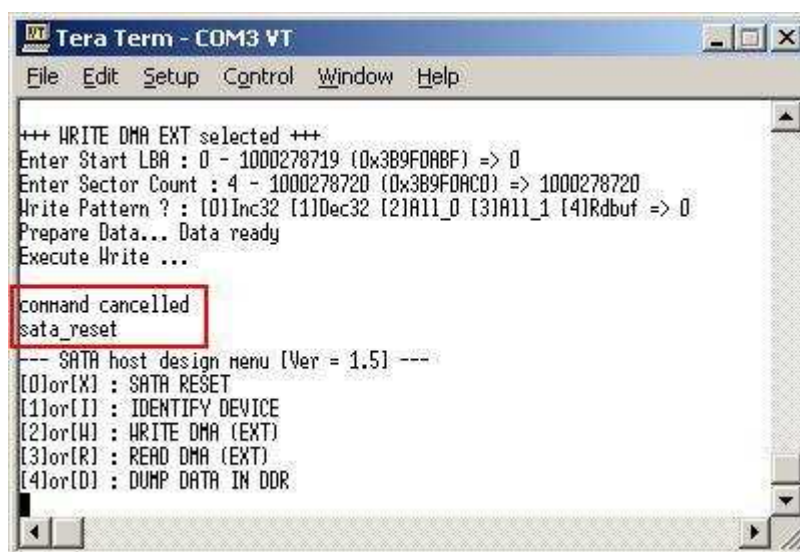


Figure 10 Write Operation canceled from receiving input during operation

3.4 READ DMA (EXT)

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

- Start LBA: this value, divided by 4, is used to be the sector number of HDD/SSD to start read data from it.
- Sector Count: this value, divided by 4, is used to be total transfer size in sector unit (512 byte) to read HDD/SSD. If this value is more than 131072 which is equal to read buffer size (64 MB) value, transfer speed will be displayed as output without verify, as shown in Figure 11.
- Verify Pattern: this menu will be displayed if Sector Count is less than or equal 131072. Five verify pattern can be selected, like in WRITE DMA (EXT) menu. "Verify Data ... Success" will be displayed if all data in read buffer are equal to check pattern, but "Data Mismatch with failure value" will be displayed instead if any data is not equal, as shown in Figure 12.

Similar to WRITE DMA (EXT) menu, Read operation will be canceled if receiving error input or receiving any input from user during CPU processing, as shown in Figure 13 and Figure 14.

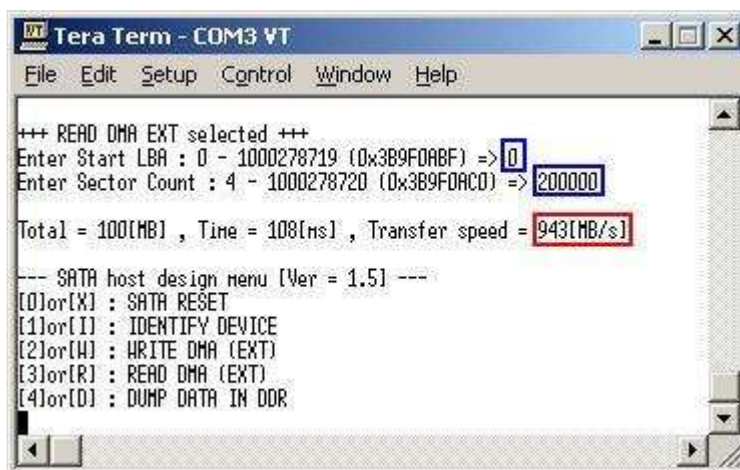


Figure 11 READ DMA (EXT) command without verify

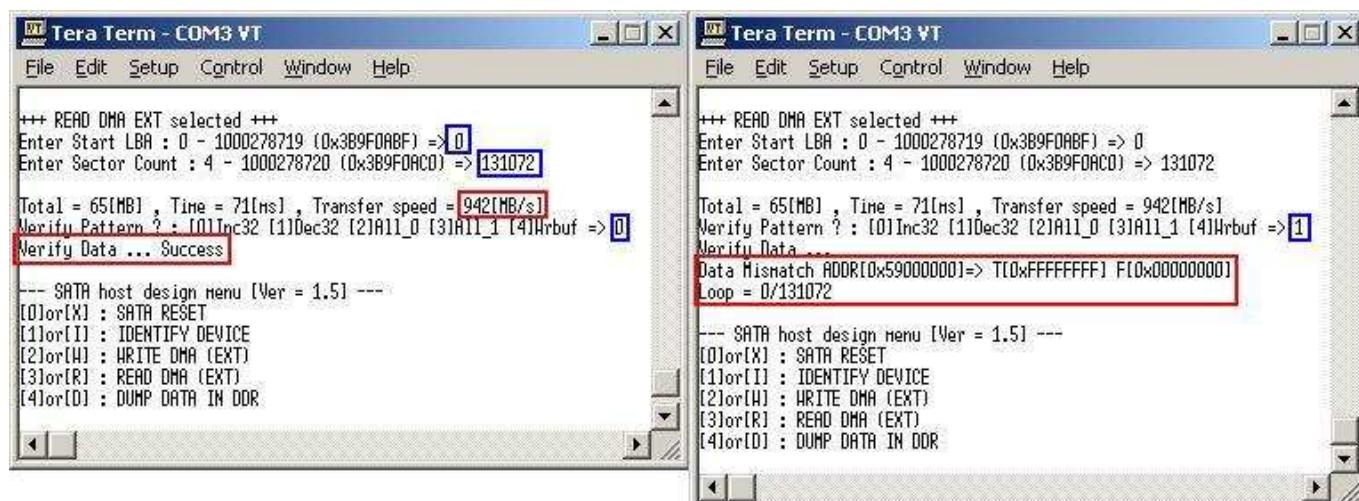


Figure 12 READ DMA (EXT) with verify process

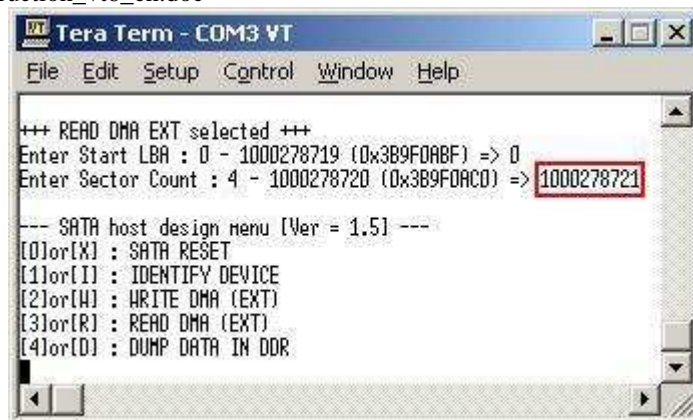


Figure 13 Read Operation canceled from error input

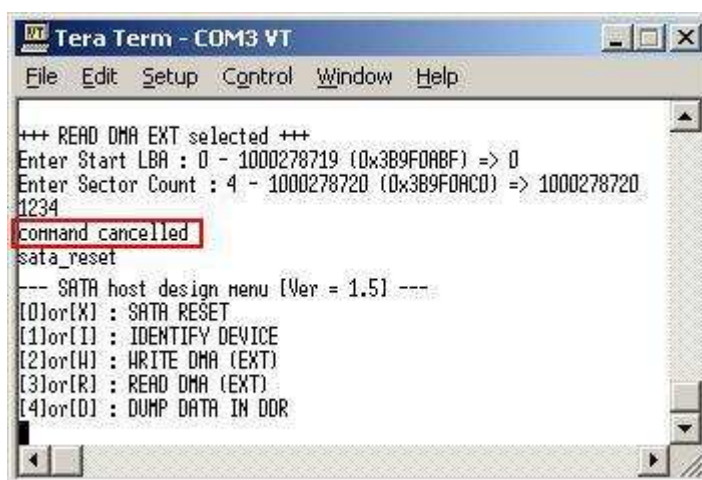


Figure 14 Read Operation canceled from receiving input during operation

3.5 DUMP DATA IN DDR

Select '4' or 'D' to dump data from buffer to display on Serial Console. In this demo, DDR3 is mapped to address = 50000000H-5FFFFFFFH. Six submenus can be selected, i.e.

- 'G': this submenu is used to select the address to read, as shown in Figure 15. The address can be input to be hex value by adding prefix "0x", so decimal value will be received with no any prefix.

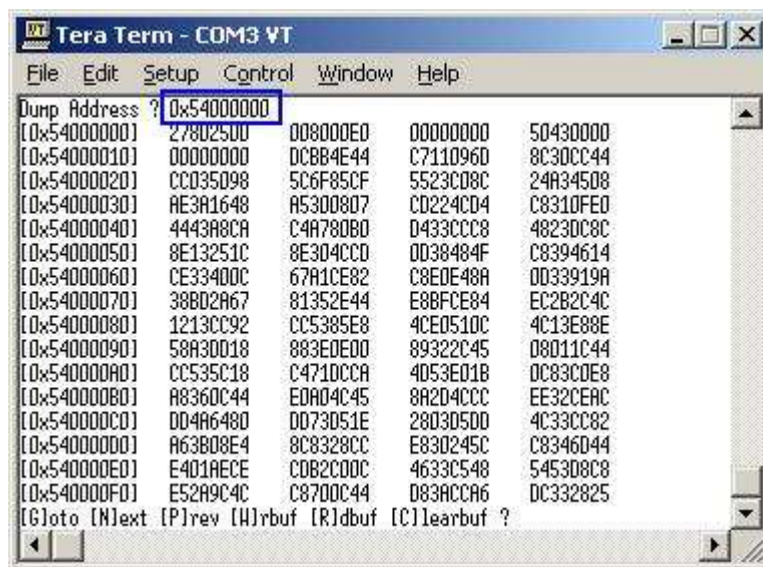


Figure 15 Goto submenu example

- 'N': this submenu is used to read next 256 byte data in buffer, as shown in Figure 16.
- 'P': this submenu is used to read previous 256 byte data in buffer, as shown in Figure 16.

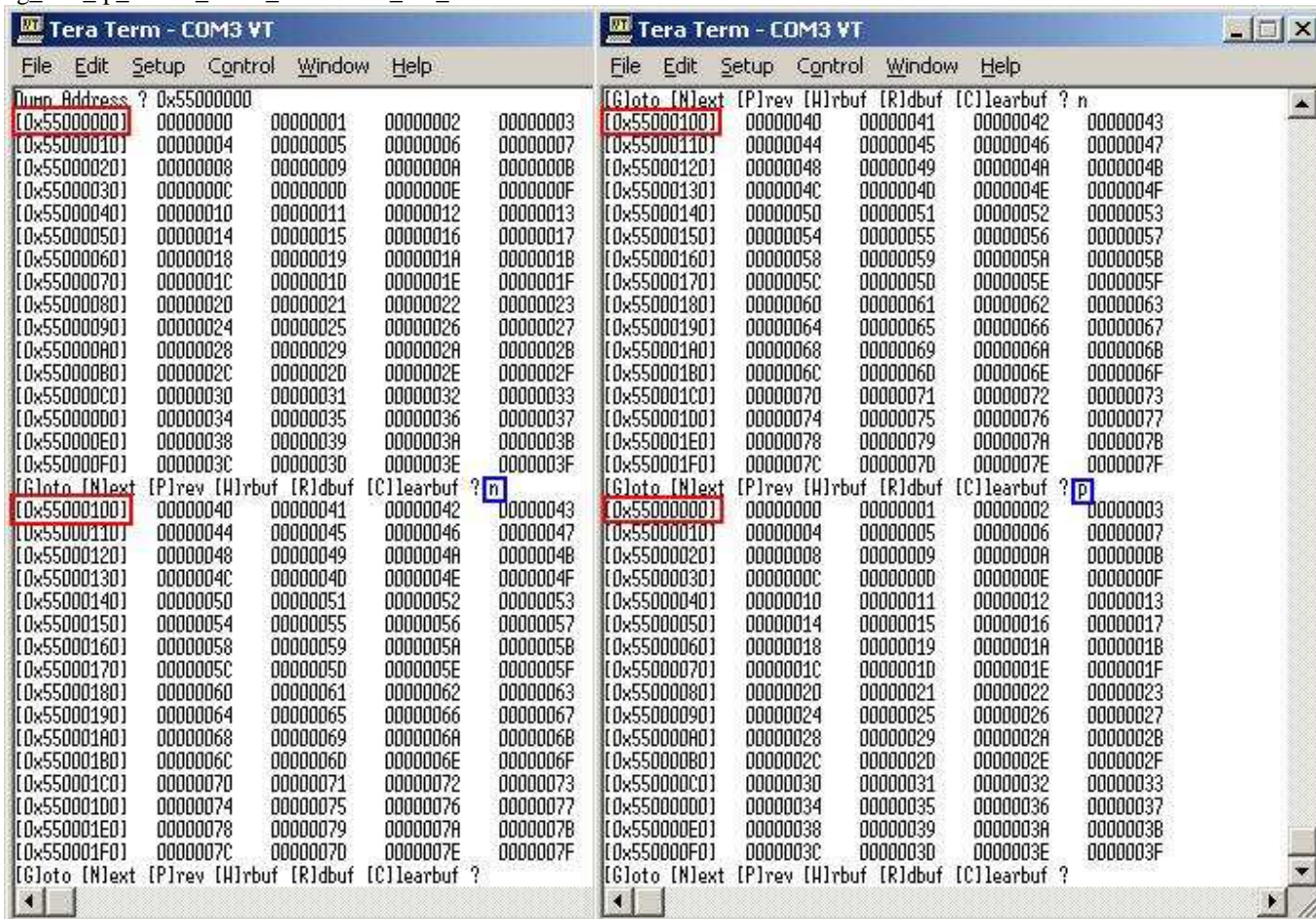


Figure 16 Read Next/Previous 256 byte data in buffer

- 'W': this submenu is used to read 256 byte data at top of write buffer for disk#0, as shown in Figure 17.
- 'R': this submenu is used to read 256 byte data at top of read buffer for disk#0, as shown in Figure 17.

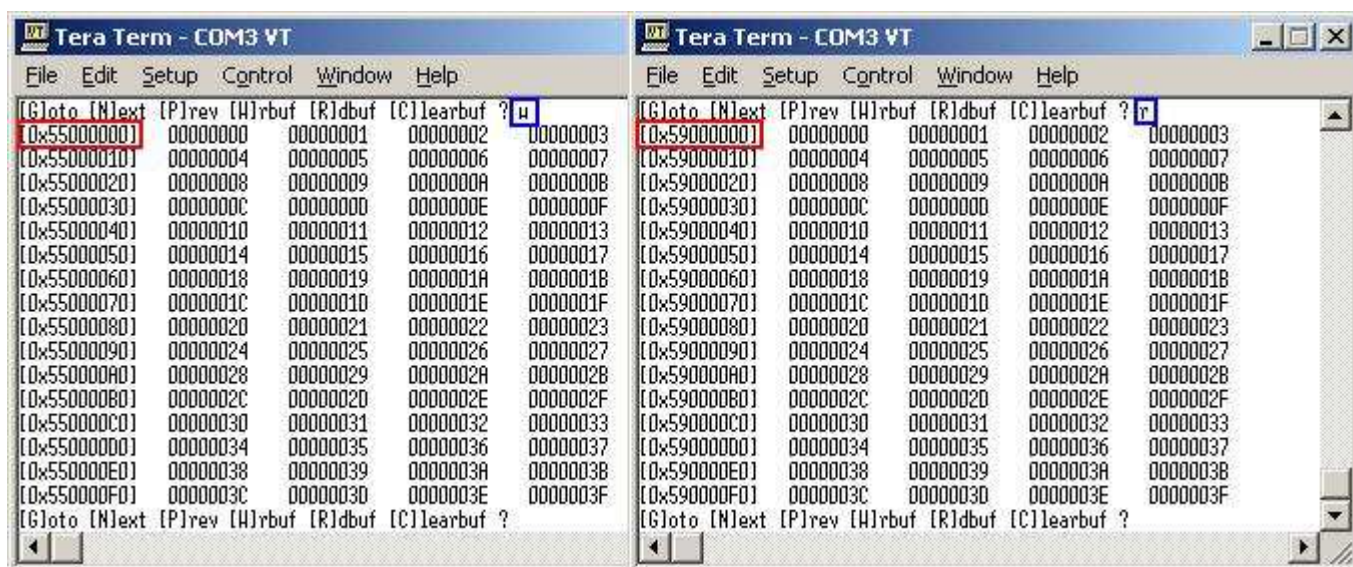


Figure 17 Read 256 byte data at top of write/read buffer

- 'C': this submenu is used to clear data in write/read buffer to be zero value. Select 'Y' to confirm for clear write/read buffer, but user can select 'N' to not clear the current buffer.

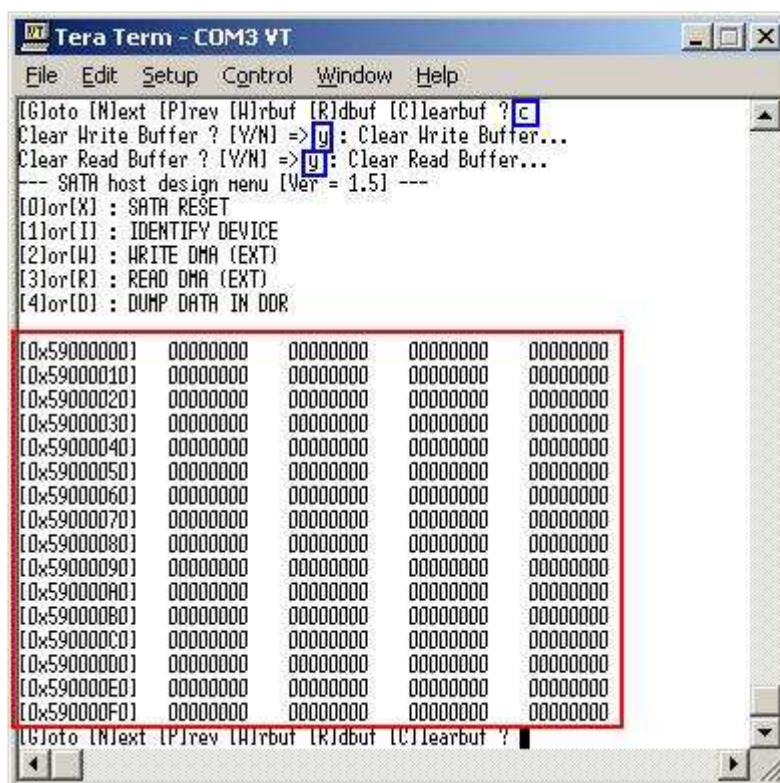


Figure 18 Clear buffer to be zero

User can exit this menu by input other key, such as 'x'.

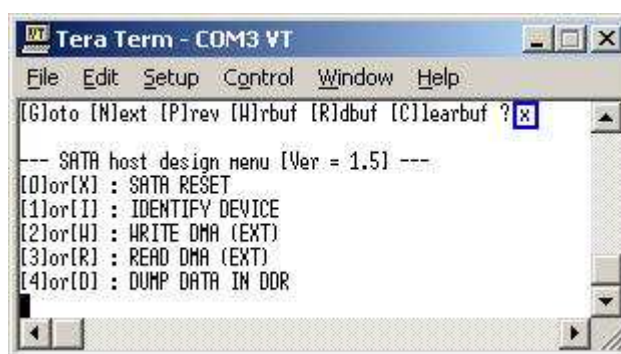


Figure 19 Exit dump menu

4 SATA Device List

Model number	Type	Capacity	Brand
HDP725025GLA380	3.5" SATA-II HDD	250 GB	Hitachi
WD2500KS-00MJB0	3.5" SATA-II HDD	250 GB	Western
TS32GSSD25S-M	2.5" SATA-II SSD	32 GB	Transcend
SHD-NSUM30G	2.5" SATA-II SSD	32 GB	Buffalo
SSDSA2SH032G1	2.5" SATA-II SSD	32 GB	Intel
THNS512GG8BBAA	2.5" SATA-II SSD	512 GB	Toshiba
THNS128GG4BBAA	2.5" SATA-II SSD	128 GB	Toshiba

Table 2 Device List to test with GTX on ML605 board

5 Revision History

Revision	Date	Description
1.0	23-Feb-10	Initial version release