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The Programmable Solutions Company ®

Stratix™ Memory Board 1 Rev B

Production Test Guide
Rev 0.2

High Speed / End Applications Team
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1   Introduction

This document describes the Production Test process and procedures for revision B of the Stratix Memory Board I (SMBI). It also covers the hardware and software requirements for the tests.

The SMB1 is a demonstration board designed to showcase high-speed memories (DDR-I and RLDRAM-II) with Altera's current high end device, Stratix, using Altera developed Intellectual Property (IP). The main function of this board is to provide in-house hardware verification and demonstration platforms for the Stratix RLDRAM-II and DDR-I (non-DQS mode and DQS mode) memory controller IP.

1.1 Hardware requirements
- PC – A medium performance personal computer with standard features and Windows XP installed is used as the host system for the test process. It serves as the user interface for the test process and stores all of the software and files required for the tests.
- Programming Device – A programming device is required to program/configure the Altera devices on the SMB1. A Byte Blaster with a parallel cable interface is the standard device. The SMB1 is also compatible with a USB Blaster with USB cable interface. The USB Blaster provides a slightly faster download speed.
- Power supply – The SMB1 uses an IBM ThinkPad laptop compatible power supply as the main power source for the board. It produces a 16 volt DC output and supplies 60W of power.
- RS 232 cable – An RS232 serial cable is required for communication between the host system and the board being tested.
- NIOS Proto1 test card w/ modified resister value – A NIOS Proto1 test card is used to help verify the Proto 1 interface. It must have a resistor valued modified before the card is connected to a powered up SMB1 or the resistor will overheat and fail. The resistor is R8. The new value needs to be approximately 4-5k Ohms.
- Ethernet connection w/cable – An Ethernet connection and cable is required to verify the Ethernet port on the SMB1. As the test is currently configured, the SMB1 attempts to use DHCP to acquire an Ethernet address.
- DDR DIMM – Use a Micron 256 MByte PC3200 200 MHz DDR 1 module, Micron part number MT9VDDT3272AG-40B

1.2 Software requirements
- Quartus II 4.0 – Quartus II 4.0 is the assumed software environment. This provides the programming software used to configure the Altera devices.
- Board Test System (BTS) code – The BTS code is a collection of TCL scripts, batch files and compiled C programs used to automate the testing process.

- .sof files – Several .sof and .pof files are used to configure the Altera devices on the SMB1 to run the tests.

2 Test procedure
2.1 Board switch and jumper settings and other setup

SMB1 requires a number of jumpers, switch settings, and other hardware setup before testing should begin. See figure 1 for the location of the switches and jumpers. See figure 2 for the location of cables and test card. This work should be performed **before** applying power.

Table 2-1 DIP Switch settings		
DIP Switch	**Name**	**Setting**
S1 - 8	MSEL2	Closed
S1 – 7	MSEL1	Closed
S1 – 6	MSEL0	Closed
S1 – 5	MAX_EN	Open
S1 – 4	RU_N_LU	Open
S1 – 3	MPGM2	Closed
S1 – 2	MPGM1	Closed
S1 – 2	MPGM0	Closed
S2 – 1 to 8	USER DIP 0 -7	Closed
S3 – 1 to 8	USER DIP 8 – 15	Closed

Table 2-2 Other Switch Settings			
SW1 – POWER	SW2	SW3 - CLK_EN	SW4
OFF	DDR	ENABLE	S/M

Table 2-3 Jumper settings								
J15	J19,J22	J20,J23	J21,J24	J28	J29	J35	J42	J43
Off*	J22p1–J19p2	J23p1-J20p2	J24p1-J21p2	p1-p2	p1-p2	p1-p2	p1-p2	Off*

* Off means no jumper installed
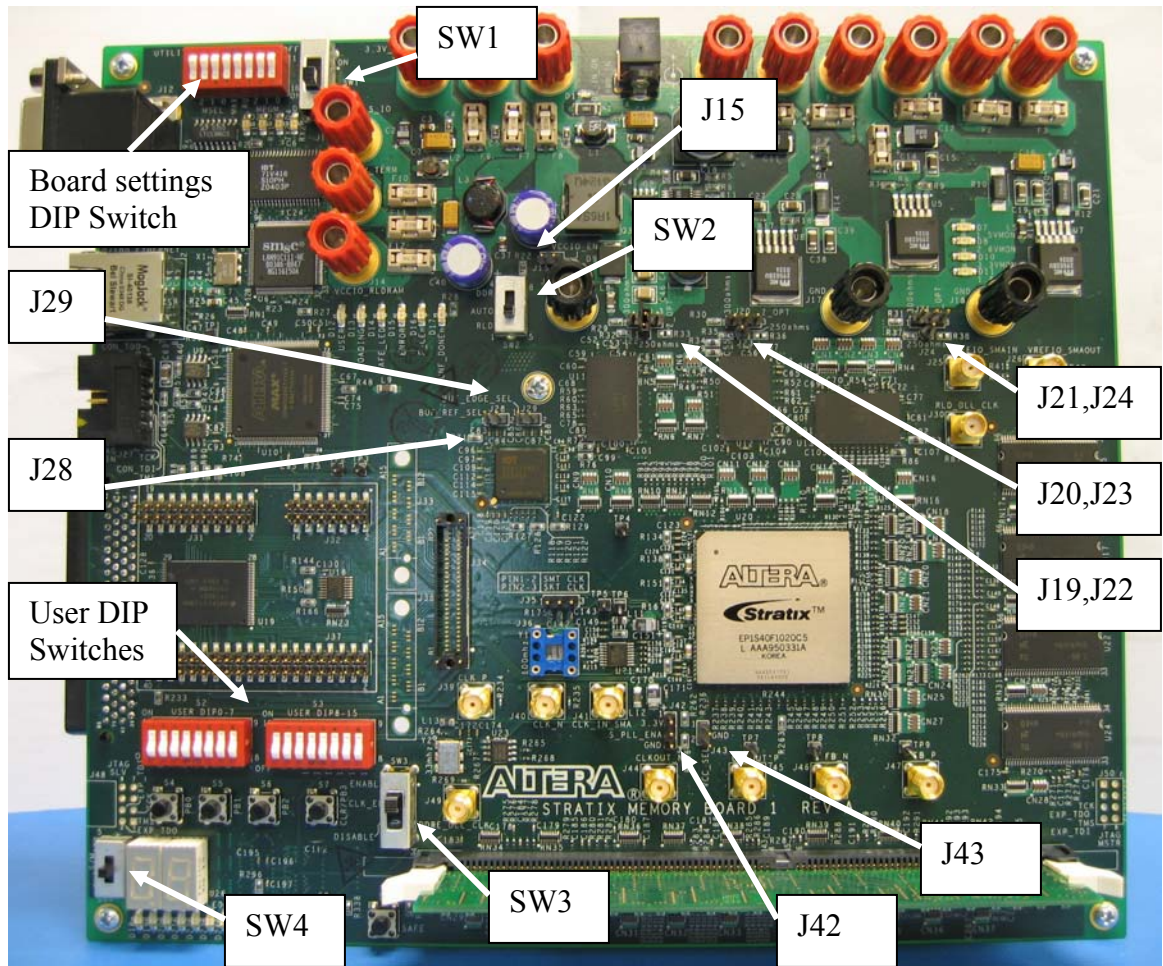
Figure 1 Switch and Jumper Locations

Proto1 Test Card – Attach Test card to the Proto 1 header.

DDR DIMM – Insert the DDR DIMM carefully if needed. Try not to flex the board if possible.

RS232 Serial Cable – Connect one end of the serial cable to the COM 1 port on the PC and the other to upper RS232 connector (RS232 A).

Parallel cable - Connect one end of the parallel cable to the Parallel port on the PC and the other end to the parallel port interface of the Byte Blaster cable. Connect the other end of the Byte Blaster cable to the JTAG connector on the SMB1.

Ethernet cable – Connect one end of the Ethernet cable to an active Ethernet port and the other end to the RJ45 connector on the SMB1.
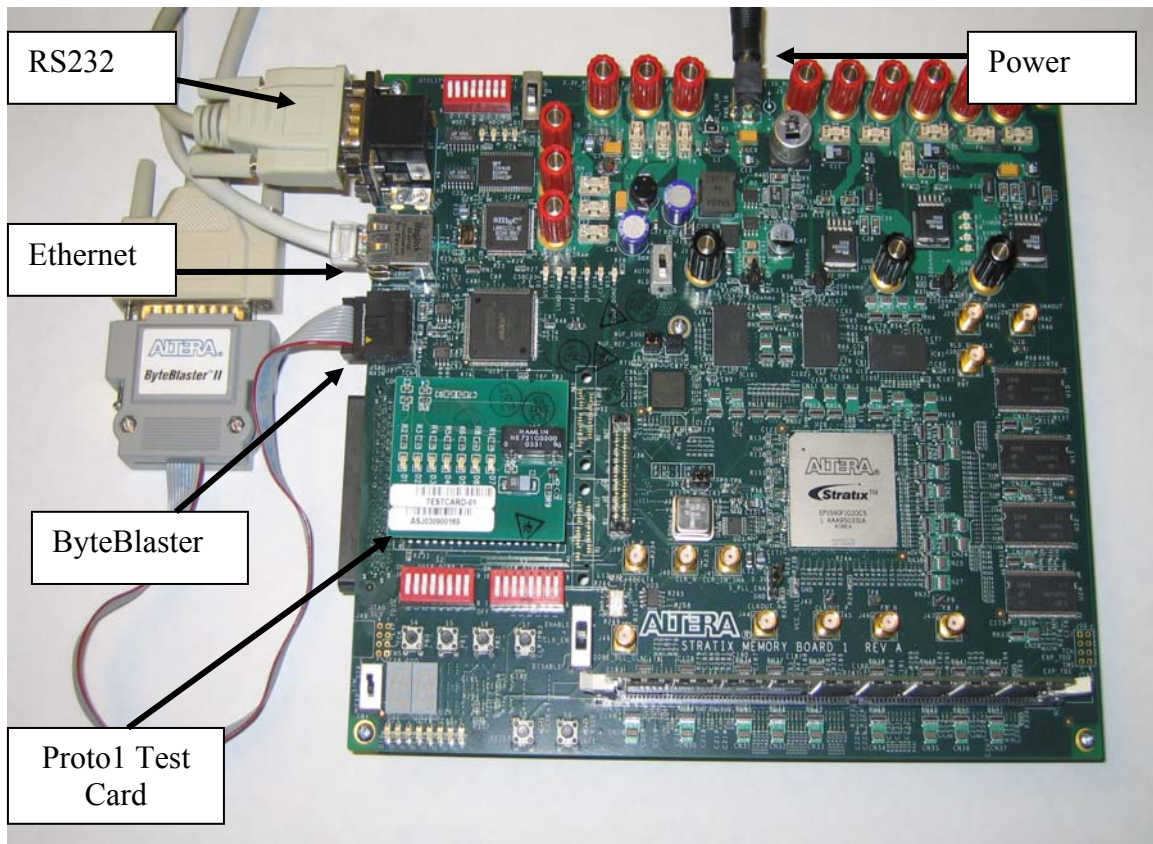
Figure 2 SMB1 with cables

2.2 Power up procedure

Insert the power connector into the socket. A red LED (D8) on the Proto1 test card should come on. This indicates that power is available to the board.

Move the power switch to the ON position. A bright blue LED (D1) next to the power connector and several LEDs on the SMB1 and LEDs D4 and D5 on the Proto 1 test card should come on.

Move SW2 from DDR to RLD. LED D11 (1.8VMON) goes on and LED D8 (2.6VMON) goes off. Move SW2 back to DDR.

2.3 User IO

The User IO and NIOS stamp functions are tested using a prototype of the Board Test System (BTS). The procedure for programming the Altera device and starting up the system is just running a DOS batch file. This script will configure both devices and start up the software required.

- Run the batch file by double clicking on the file name:
  smb1_bts_run_usbblaster.bat (if using a USB blaster)
  smb1_bts_run_b2.bat (if using a ByteBlaster II)

  A DOS command window opens and the scripts start executing.

- Wait until the Board Test System GUI window opens:
- Use the BTS pulldown menu to open the COM1 port.
  BTS ->Open Port -> RS232 Com1
- Click on the UserIO page.
- Click on the Enable Polling button.
- Test the Seven Segment display by slowly moving the slider using your mouse and verifying that display on the board match the digits displayed in the GUI.
- Test the User LEDs by hitting the LEDs On button followed by the LEDs Off button. Then click on the LED checkboxes one at a time while verifying the User LEDs on the board turn off and on.
- Check the DIP switches are working by turning them all open then back to closed while watching the switch indicators in the GUI.
- Check the User Push Buttons by pressing switches S4, S5 and S6 (PB0,PB1 and PB2) while watching the status in the GUI. Do not press S7 (CLR/PB3) as this will reset the system. If you accidentally press this button you will need to exit the GUI and start over.

This completes the User IO test section.

- If all of these tests pass, write the word "PASS" in the column under Stratix in the row User IO in the worksheet in section 2.9.

2.4 NIOS Stamp features

The next section to be test is the NIOS stamp features. This will test the onboard SRAM, Flash Memory, Proto 1 IO port and Ethernet port. If the GUI is still running you can just click on the NIOS Stamp page otherwise you will need to restart the system from the beginning.

- Click on the Start Test button in the Santa Cruz IO section.
  - Test Results should show
    Starting Santa Cruz Test
    Santa Cruz IO Test Complete
- Click on the Start Tests button in the SRAM section. This will run the "Walking Ones on Address" and "Walking Ones of Data" tests.
- Verify the tests complete without errors.
  - Test Results should show

Starting Test
Walking Ones on Data
Walking Ones on Address
There were 0 error(s).
Test Complete

- Click on the Start Tests button in the Flash section. This will run the "Walking Ones on Address" and "Walking Ones of Data" and Flash Erase tests. This may take 3 - 4 minutes to finish.
  Verify the tests complete without errors.
  - o Test Results should show
    Starting Test
    Walking Ones on Data
    Starting Flash Erase of sector offset 0
    Finished Flash Erase
    Walking Ones on Address
    Starting Flash Erase
    Test Complete
- Click on the Get DHCP address in the Ethernet section. This should return an IP address.
  - o Test Results should show
    Getting DHCP Address
    DHCP Address obtained. Address is 137.57.185.70.

- Click on the Blink Ethernet LEDs button.
  Verify that the LEDs on the Ethernet connector blink several times.

This finishes the NIOS Stamp section of the tests. Exit the GUI. The next tests use stand alone design files.

- If all of these tests pass, write the word "PASS" in the column under Stratix in the row NIOS Stamp in the worksheet in section 2.9.

2.5 DDR DIMM

Verify SW2 is set to DDR and LEDs D7, D8 and D10 are on.

Run the "load_smb1_dimm_200_usb.bat" batch file. Wait for LED D17 (CONF_DONEn) to come on.

Set dip switch S2-5 (USER DIP 4) to OFF. Set dip switch S3-5, S3-6, S3-7, and S3-8 (USER DIP 15) to off. All other DIP switch positions should be in the ON position. Press pushbutton S7 (CLR/PB3) to reset the design. LED 7 goes off as the S7 is pushed. Press pushbutton S4 (PB0). The Seven Segment Display should count up to F, after which user LED 0 should light turn off. LED 1 is the error indicator. If it turns off the test has failed.

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- If this test passes, write the word "PASS" in the column under Stratix in the row DDR DIMM in the worksheet in section 2.9.

2.6 DDR devices

Verify SW2 is set to DDR and LEDs D7, D8 and D10 are on.

Run the "load_smb1_sb_200_usb.bat" batch file. Wait for LED D17 (CONF_DONEn) to come on.

Set dip switch S2-5 (USER DIP 4) to OFF. Set dip switch S3-5, S3-6, S3-7, and S3-8 (USER DIP 15) to off. All other DIP switch positions should be in the ON position. Press pushbutton S7 (CLR/PB3) to reset the design. LED 7 goes off as the S7 is pushed. Press pushbutton S4 (PB0). The Seven Segment Display should count up to F, after which user LED 0 should light turn off. LED 1 is the error indicator. If it turns off the test has failed.

- If this test passes, write the word "PASS" in the column under Stratix in the row DDR Devices in the worksheet in section 2.9.

2.7 RLDRAM devices

- ### CIO

Verify SW2 is set to RLD and LEDs D7, D8 and D11 are on.

Run the "load_smb1_rldram_cio_200_usb.bat" batch file. Wait for LED D17 (CONF_DONEn) to come on.

Press pushbutton S7 (CLR/PB3) to reset the design. LED 7 and LED0 go off as the S7 is pushed. Press pushbutton S4 (PB0). User LED 7 should light up and the 7 segment display should count to 80. LED 0 will turn on after the test is complete. If led 1 turns on, the test has failed.

- If this test passes, write the word "PASS" in the column under Stratix in the row RLDRAM CIO Devices in the worksheet in section 2.9.

2.8 Downloading Factory Image

Set ALL DIP switch positions on S2 and S3 to the OFF position.

Set SW2 to the "DDR" position.

Run the "smb1_factory_image.bat" batch file. This will download the factory image to the board. The process takes approximately 15minutes. The TX1 (D2) and RX1 (D3) LEDs will blink until the download is complete.

After this is complete, turn the board power off by switching SW1 to the OFF position. Turn SW1 back to the ON position. The Loading LED should blink, and the process should end with the SAFE_LED (D14) and the CONF_DONEn (D17) should be on. If this is not the case, retry the process ONCE.

- If this test passes, write the word "PASS" in the column under Stratix in the row Factory Image Download in the worksheet in section 2.9.

2.9 Stratix Memory Board 1 Diagnostic Test Check-off Sheet

<table>
<tr><td colspan="3" align="center">Stratix Memory Board 1 Rev B Diagnostic Test Check-off Sheet</td></tr>
<tr><td colspan="2">Board Serial Number:_____</td><td>Tested by:_____</td></tr>
<tr><td>Test</td><td>Tested on Stratix (PASS,FAIL,n/a)</td><td>Comments</td></tr>
<tr><td>User IO</td><td></td><td></td></tr>
<tr><td>NIOS Stamp</td><td></td><td></td></tr>
<tr><td>DDR DIMM</td><td></td><td></td></tr>
<tr><td>DDR Devices</td><td></td><td></td></tr>
<tr><td>RDLDRAM CIO Devices</td><td></td><td></td></tr>
<tr><td>Factory Image Download</td><td></td><td></td></tr>
</table>

3   Troubleshooting

Refer to the following table (table 3-1) for solutions to problems with the board, if they should occur, for power-up, configuration, and errors with test designs.

Problems	Possible Solutions
LEDs fail to come on when power is applied	Check that main connector power supply is properly connected to J4. Check that switch SW1 is turned on (all the way up). Check that the power supply is plugged in to wall. Check that switch (SW2) is in proper position (up for RLD and down for DDR).
Devices fail to configure	Check that correct program file is chosen. Check that the Byteblaster II/USB cable is installed correctly to JJ27 (check pin one indicator on cable) Check that configuration switch (SW4) is set appropriately.
Design does not work properly	If using on-board oscillators, check that jumper (J35) is placed across pins 1 and 2. Check that switch (SW3) is in the ENABLE position (all the way up). If using external oscillators, check that switches (SW6 and SW9) are set to EXT (down position) Check that cables are installed correctly. Check that correct program file is chosen. Check that correct push buttons and dip switches are being used. Check that dip switches, if used, are at the correct values. Ensure that the cards are fully seated (DDR) Check that the PROTO1 Test Card is installed and fully seated. Check that switch (SW2) is in proper position (up for RLD and down for DDR).
RS-232 connection not working	Check that RS-232 connector is plugged into correct port (on board and on PC)

Table 3-1: Troubleshooting