ScanDIMM-200/DDR2

Boundary-Scan Based Digital Tester

User’s Manual

Document Part Number: 71359

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Corelis, Inc.
12607 Hiddencreek Way
Cerritos, CA  90703-2146
Telephone: (562) 926-6727 • Fax: (562) 404-6196
Preface

PRINTING HISTORY

Edition 1, January 2006
Edition 2, November 2007
Edition 3, April 2009

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<th>Page</th>
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<td>8</td>
</tr>
</tbody>
</table>
Introduction

The ScanDIMM-200/DDR2 Digital Tester module provides an easy-to-use method for interconnect testing of 200-pin Small Outline Dual Inline Memory Module (SO-DIMM) sockets. Through the use of boundary-scan technology, the ScanDIMM-200/DDR2 Digital Tester provides 192 fully bi-directional test signals. A Boundary-Scan Test Access Port (TAP) connects to a host computer, which provides virtually unlimited memory depth for testing each of the SO-DIMM socket pins. The 200-pin sockets are often used for Double Data Rate Dynamic Random Access Memory (DDR2 SDRAM) modules. The ScanDIMM-200/DDR2 offers an accurate and easy-to-use mechanical and electrical solution for connecting test equipment to SO-DIMM sockets.

Features of the ScanDIMM-200/DDR2

- Tests 200-pin DDR2 SO-DIMM sockets
- Tests for opens on the socket’s power and ground pins
- 1.8V interface, 3.3V tolerant
- LEDs indicate power status and active TAP connection
- Compatible with ScanExpress software

Figure 1-1 shows the ScanDIMM-200/DDR2 module with Pin 1 of the TAP IN connector identified.

Figure 1-1. ScanDIMM-200/DDR2 module (top view)
ScanDIMM-200/DDR2 Specifications

Size and Form Factor

Compatibility
PCB dimensions
PCB thickness
Connector Keying

JEDEC MO-224
2.661 ± 0.005 inches × 1.181 ± 0.005 inches
0.039 ± 0.005 inches
1.8V-compatible

Number of Boundary-Scan Test Signals

192 per module

Maximum Test Clock (TCK) Frequency

Maximum TCK Frequency

20 MHz

LEDs

PWR
TAP ON

Indicates the 1.8V power source is present
Indicates the TAP is connected

I/O and TAP Signals DC Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Power (V&lt;sub&gt;DD&lt;/sub&gt;)</td>
<td>– Provided via the 200-pin socket pins</td>
<td>1.7</td>
<td>1.9</td>
<td>V</td>
</tr>
<tr>
<td>High Level Input Voltage (V&lt;sub&gt;Hi&lt;/sub&gt;)</td>
<td></td>
<td>1.17</td>
<td>3.9</td>
<td>V</td>
</tr>
<tr>
<td>Low Level Input Voltage (V&lt;sub&gt;Il&lt;/sub&gt;)</td>
<td></td>
<td>-0.3</td>
<td>0.63</td>
<td>V</td>
</tr>
<tr>
<td>Output High Level Voltage (V&lt;sub&gt;OH&lt;/sub&gt;)</td>
<td>I&lt;sub&gt;OH&lt;/sub&gt; = -8 mA dc</td>
<td>1.35</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>I&lt;sub&gt;OH&lt;/sub&gt; = -0.1 mA dc</td>
<td>1.6</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Output Low Level Voltage (V&lt;sub&gt;OL&lt;/sub&gt;)</td>
<td>I&lt;sub&gt;OL&lt;/sub&gt; = 8 mA dc</td>
<td>0.40</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>I&lt;sub&gt;OL&lt;/sub&gt; = 0.1 mA dc</td>
<td>0.20</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Input leakage Current (I&lt;sub&gt;I&lt;/sub&gt;)</td>
<td>V&lt;sub&gt;I&lt;/sub&gt; = V&lt;sub&gt;DD&lt;/sub&gt; or GND</td>
<td>1</td>
<td></td>
<td>µA</td>
</tr>
</tbody>
</table>

Table 1-1. DC Characteristics
**TAP Connectors**

**TAP IN Connector**
10-pin Single Row 0.100-in. spacing
(Samtec part no. TSM-110-01-G-SH or equivalent)

**Power Requirements (Provided by the 200-pin mating socket)**

1.80 V 0.250 A (Maximum)

**Operating Environment**

Temperature 0°C to 55°C
Relative Humidity 10% to 90%, non-condensing

**Storage Environment**

Temperature -40°C to 85°C
Chapter 2

ScanDIMM-200/DDR2 Installation

The ScanDIMM-200/DDR2 product consists of the following components:

- ScanDIMM-200/DDR2 Module
- User’s Manual
- Host Adapter Cable, Corelis P/N 15336

The files related to the ScanDIMM-200/DDR2 are installed by the ScanExpress installer.

Ensure that all materials listed are present and free from visible damage or defects before proceeding. If anything appears to be missing or damaged, contact Corelis at the number listed on the title page immediately. Figure 2-1 shows the ScanDIMM-200/DDR2 and the cable that comes with the product.

ScanDIMM-200/DDR2 Files

The ScanExpress CD installs the files to the default directory “C:\Program Files\ScanExpressTPG\ScanDIMM-200-DDR2”.

Figure 2-1. ScanDIMM-200/DDR2 and Cable Accessories
Introduction

To ensure reliable operation of the ScanDIMM-200/DDR2, it is important to connect it properly to both the Boundary-Scan tester and the UUT’s 200-pin SO-DIMM socket.

Connecting to the Boundary-Scan Controller

The external Boundary-Scan controller connects to the ScanDIMM-200/DDR2 TAP IN connector via the Host Adapter Cable. Connect one end of the Host Adapter Cable P/N 15336 to the TAP IN connector of the ScanDIMM-200/DDR2. Connect the 10-pin cable from the Boundary-Scan Controller (ScanTAP-4, Buffer-1149.1/Gang, etc.) to the other end of the adapter cable. Table 2-1 shows the pin assignments for the TAP IN connector. Figure 2-2 shows a block diagram for the TAP connection to a ScanDIMM-200/DDR2 module.
Figure 2-2. Block Diagram of Connection to a ScanDIMM-200/DDR2

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>I/O</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TRST*</td>
<td>In</td>
<td>TRST*</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td></td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>TDI</td>
<td>In</td>
<td>Test Data In</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td></td>
<td>Ground</td>
</tr>
<tr>
<td>5</td>
<td>TDO</td>
<td>Out</td>
<td>Test Data Out</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td></td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>TMS</td>
<td>In</td>
<td>Test Mode Select</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td></td>
<td>Ground</td>
</tr>
<tr>
<td>9</td>
<td>TCK</td>
<td>In</td>
<td>Test Clock</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td></td>
<td>Ground</td>
</tr>
</tbody>
</table>

Table 2-1. TAP IN Connection List
The TAP IN connector conforms to the popular Corelis 10-pin TAP connector pinout except that it is a single row (10 × 1) instead of dual row (5 × 2). The Host TAP Adapter Cable P/N 15336 is a 1:1 adapter cable. The pin assignment is standard, connecting to any Corelis controller using the appropriate standard 10-pin TAP cable. It is best to use the PCI-1149.1/Turbo equipped with a ScanTAP-4 Intelligent Pod, with one TAP connected to the ScanDIMM-200/DDR2 and with additional TAP(s) connected to the UUT. Other Corelis controllers with an appropriate version of the Buffer-1149.1 can also be used so that the UUT can connect on a separate TAP.

Figure 2-3 shows the TAP connections for a ScanDIMM-200/DDR2 module on TAP1 and the Target UUT on TAP2.

![Figure 2-3. Connection of a ScanDIMM-200/DDR2 Module and the Target using Separate TAPs](image)

**Indicator LEDs**

Two LEDs indicate the status of the ScanDIMM-200/DDR2 module. D1 is labeled PWR. It illuminates if the ScanDIMM-200/DDR2 is receiving power from the target (through pins 81, 82, 117 and 118). If the LED is not illuminated, the ScanDIMM-200/DDR2 module is not powered up. D2 is labeled TAP ON. It indicates that a connection to a controller is detected. The ScanDIMM-200/DDR2 module will not operate unless D2 is illuminated.
## Mating Connectors

Table 2-2 shows the mating connectors needed to make cables for the Boundary-Scan connector.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAP IN to TAP OUT</td>
<td>10-pin 0.1 in. single row connector</td>
<td>Molex</td>
<td>50-57-9010</td>
</tr>
<tr>
<td></td>
<td>Crimp Terminals</td>
<td>Molex</td>
<td>16-02-0097</td>
</tr>
<tr>
<td>Host TAP Adapter Plug</td>
<td>10-pin IDC Plug</td>
<td>3M</td>
<td>4610-6351</td>
</tr>
<tr>
<td></td>
<td>Strain Relief</td>
<td>3M</td>
<td>3448-3010</td>
</tr>
<tr>
<td>Host TAP Adapter Socket (Connects with Target)</td>
<td>10-pin IDC Socket</td>
<td>3M</td>
<td>3473-6610</td>
</tr>
<tr>
<td></td>
<td>Strain Relief</td>
<td>3M</td>
<td>3448-3010</td>
</tr>
</tbody>
</table>

Table 2-2. Mating Connectors for the ScanDIMM-200/DDR2

## Accessories

Additional TAP Adapter Cables (P/N 15336) can be ordered from Corelis:

<table>
<thead>
<tr>
<th>Description</th>
<th>Corelis P/N</th>
<th>Other Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-pin dual row IDC plug to 10 pin single row 1:1 cable</td>
<td>15336</td>
<td>Custom</td>
</tr>
</tbody>
</table>

Table 2-3. Cable Accessories for the ScanDIMM-200/DDR2
Chapter 3
Preparation of Test Input Files

Introduction

The ScanDIMM-200/DDDR2 integrates easily with a boundary-scan test plan. When the ScanDIMM-200/DDDR2 is installed in a socket, the socket behaves like a boundary-scan component. Once the ScanDIMM-200/DDDR2 is plugged into the socket on the target board, the boundary-scan test system will automatically test the socket. However, regeneration of the boundary-scan tests with ScanExpressTPG/ScanExpress Merge is required.

Step 1 – Generate the Test Pattern Preparation File for the Main Board

Proceed through the ScanExpressTPG test generation steps for the main board normally to generate the Test Pattern Preparation file (.tpp).

Step 2 – Start ScanExpress Merge

Exit ScanExpressTPG and start ScanExpress Merge by selecting the ScanExpress Merge entry from the ScanExpress group in the Windows Start menu.
When ScanExpress Merge starts, the Start window is displayed as shown below in Figure 3-1.

![ScanExpress Merge Start Screen](image)

**Figure 3-1. ScanExpress Merge Start Screen**

The start screen is used to specify a Merge Plan name and a project directory where merged files will be stored. To prevent unintentional overwriting of input files during the merge process, the Merge Plan name should be a different name than any assembly included in the merge, and the project directory should not be the same directory as any assembly included in the merge.
Step 3 – Create a Merge Plan

Select a name for the Merge Plan File and a project directory where the Merge Plan file and all files generated by the merge process will be stored. Create a new project folder for the combined assembly if it doesn’t already exist. You can create this folder using the Make New Folder button in the Browse For Files window, or by appending the name of the new folder to the path in the Directory field.

Your window should now look like Figure 3-2.

![ScanExpress Merge Start Screen with Merge Plan](image)

Figure 3-2. ScanExpress Merge Start Screen with Merge Plan

Click on the Next button to proceed.
The Assemblies screen shown in Figure 3-3 will appear. This screen is used to specify the individual assemblies and associated test step files that will be merged into a combined assembly.

![ScanExpress Merge Assemblies Screen](image)

**Figure 3-3. ScanExpress Merge Assemblies Screen**
**Step 4 – Add the Main Assembly**

Click on the Add button to add an existing assembly using its Test Pattern Preparation (.tpp) file. The Select Test Pattern Preparation File browser window will be displayed. Select the .tpp file and click on the Add command button.

The Assembly Configuration pane will be updated to include the new assembly using the name of the Test Pattern Preparation file (without the extension) as the name for the assembly. The Assembly Input Files pane is updated with Test Step files for the assembly from the assembly’s Test Pattern Preparation file. The assemblies screen should appear as shown below in Figure 3-4.

![Figure 3-4. ScanExpress Merge Assemblies Window with a New Assembly](image)

Click on the ScanDIMM button to proceed.
Step 5 – Add the ScanDIMM Connection

The ScanDIMM window will be displayed. Change the Assembly filter to the main assembly and the Device Filter to “All Devices”. Select the reference designator of the connector that will contain the ScanDIMM-200/DDR2 module as shown in Figure 3-5.

![ScanExpress Merge ScanDIMM Screen](image)

Figure 3-5. ScanExpress Merge ScanDIMM Screen

Click on the Select ScanDIMM button.
The **Select ScanDIMM Type** window will be displayed as shown in Figure 3-6.

![Select ScanDIMM Type Dialog](image)

**Figure 3-6. Select ScanDIMM Type Dialog**

Select the ScanDIMM Module Type. Click on the **OK** button to close the dialog and apply the settings to the selected connector on the ScanDIMM screen.
The ScanDIMM screen will now indicate the connection to the ScanDIMM in the ScanDIMM Type column as shown in Figure 3-7.

Click on the **Finish** button to merge the assemblies.
The BSDL files screen in ScanExpressTPG now contains entries for all the JTAG compatible devices on the board. This can be seen in Figure 3-8.

Click the **Next** button to proceed with the rest of the test generation steps. ScanExpressTPG will use the input files to generate the actual test patterns that will be applied to the board by ScanExpress Runner.

The warnings about the netlist not having a TAP signal connection to the ScanDIMM may be safely ignored.
Testing the Socket Power and Ground Pins

To test the power and ground pins on the ScanDIMM-200/DDR2 socket, the constraint file should have the following syntax added:

SENSE_HIGH VDD
SENSE_LOW GND

VDD and GND are the net names of the 1.8V SDRAM power and ground signals on the target board. This syntax may already be present to test other power or ground connections in the target system. Scan Express will automatically add these constraints if the power and ground nets are specified during the Power & Ground screen of the preparation phase.
ScanExpress Runner (sold separately) can load and run the compact vector file, ScanDIMM-200-DDR2_Selftest_inf.cvf, and quickly verify that the ScanDIMM-200/DDR2 is functional. Both the ScanExpress Runner software and a Corelis Boundary-Scan controller such as the PCI-1149.1/Turbo are required to execute this file.

**Infrastructure Test**

The infrastructure test verifies the TAP connection between the controller and the ScanDIMM-200/DDR2. It also verifies that the boundary-scan infrastructure of the CPLD device on the ScanDIMM-200/DDR2 is fully functional. The infrastructure test requires a Corelis Boundary-Scan controller, a ScanDIMM-200/DDR2 unit and a Host TAP cable (P/N 15336). The following steps execute an infrastructure test.

**Step 1** Remove any memory modules from the UUT SO-DIMM socket(s) to be tested.

**Step 2** Install the ScanDIMM-200/DDR2 in the socket.

**Step 3** Connect the Host TAP Adapter cable P/N 15336 to the “TAP IN” connector on the ScanDIMM-200/DDR2.

**Step 4** Connect the 10-pin TAP cable from the external controller to the other end of the Host TAP Adapter cable.

**Step 5** Apply power to the UUT.

**Step 6** Make sure that both LEDs on the ScanDIMM-200/DDR2 illuminate.

**Step 7** Double-click on the ScanExpress Runner Icon.

**Step 8** Select New Test Plan from the File menu and click on the Add button.

**Step 9** With the file browser, find and select the ScanDIMM-200-DDR2_Selftest_inf.cvf file. Click OK.

**Step 10** Select Controller from the Setup menu, and then choose the appropriate Boundary-Scan controller.

**Step 11** Set the TCK frequency to 1 MHz and the TAP voltage to 1.8V.

**Step 12** Select Run Test. The test should run and pass. Figure 4-1 shows a passing infrastructure test.
20 Executing Selftest with ScanExpress Runner

Troubleshooting

If the self test infrastructure test fails and reports that the revision code portion of the ID check is failing with an actual value of 0001, verify that you have the latest version of the ScanDIMM-200/DDR2 BSDL file and the corresponding ScanDIMM-200-DDR2_SelfTest_inf.cvf file.