

ScanDIMM-240/DDR3/R

Boundary-Scan Based Digital Tester

User's Manual

Document Part Number: 70404 Revision C

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Chapter 1: Product Overview

Introduction

The ScanDIMM-240/DDR3/R Digital Tester module provides an easy-to-use method for structurally testing 240-pin Registered Dual Inline Memory Module (DIMM) sockets. Through the use of boundary-scan technology, the ScanDIMM-240/DDR3/R Digital Tester provides 232 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 DIMM socket pins. The 240-pin sockets are often used for Double Data Rate Dynamic Random Access Memory (DDR3 SDRAM) modules. The ScanDIMM-240/DDR3/R offers an accurate and easy-to-use mechanical and electrical solution for connecting test equipment to DIMM sockets.

Features of the ScanDIMM-240/DDR3/R

- Tests 240-pin Registered DDR3 DIMM sockets for opens and shorts
- Tests for opens on the socket's power and ground pins
- 1.5V DIMM interface, 3.3V tolerant
- 1.8V TAP interface, 3.3V tolerant
- LEDs indicate power status and whether an active TAP connection is present
- Compatible with the Corelis ScanExpress boundary-scan test development tools and other third party software

The figure below shows the ScanDIMM-240/DDR3/R module with **Pin 1** of the **TAP IN** connector identified.



Figure 1-1. ScanDIMM-240/DDR3/R module (top view)

ScanDIMM-240/DDR3/R Specifications

Size and Form Factor

Mechanical Compatibility	JEDEC MO-269F (240-pin Registered DDR3 DIMM)
Dimensions	133.35 mm x 30.00 mm $\pm$ 0.15 mm [5.25 inches x 1.25 inches $\pm$ 0.01 inches]
PCB thickness	1.27 mm $\pm$ 0.10 mm [0.05 $\pm$ 0.01 inches]
Connector Keying	1.5V-compatible

Maximum Test Clock (TCK) Frequency

Maximum TCK Frequency	25 MHz
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LEDs

PWR	Indicates the 1.5V power source is present
TAP ON	Indicates the TAP is connected

TAP Connectors

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

Power Requirements (Provided by the 240-pin mating socket)

1.50 V	0.250 A (Maximum)
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Operating Environment

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

Absolute Maximum Ratings

Symbol	Description	Value	Units
V_{CC}	Supply voltage relative to ground	-0.5 to 2.0	V
V_{IN}	Input voltage relative to ground	-0.5 to 4.0	V
T_{STG}	Storage Temperature (ambient)	-65 to +150	°C
T_J	Junction Temperature	+150	°C

Table 1-9. Absolute Maximum Ratings

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units
V_{CC}	Supply voltage	1.4	1.6	V

Table 1-10. Recommended Operating Conditions

DC Electrical Characteristics (DIMM Socket Interface)

(1.5V DC Over Recommended Operating Conditions)

Symbol	Parameter	Typical	Max	Units
V_{IH}	High level input voltage	0.98	3.9	V
V_{IL}	Low level input voltage	-0.3	0.53	V
V_{OH}	High level output voltage	1.05	-	V
V_{OL}	Low level output voltage	-	0.4	V

Table 1-11. DC Electrical Characteristics (DIMM Socket Interface)

DC Electrical Characteristics (JTAG Interface)

(1.8V DC Over Recommended Operating Conditions)

Symbol	Parameter	Typical	Max	Units
V_{IH}	High level input voltage	1.17	1.5	V
V_{IL}	Low level input voltage	-0.3	0.63	V
V_{OH}	High level output voltage	1.35	-	V
V_{OL}	Low level output voltage	-	0.45	V

Table 1-12. DC Electrical Characteristics (JTAG Interface)

Chapter 2: ScanDIMM-240/DDR3/R Installation

Overview

To ensure reliable operation of the ScanDIMM-240/DDR3/R, it is important to connect it properly to both the Corelis boundary-scan controller and the 240-pin DDR3 DIMM socket on the unit under test (UUT).

ScanDIMM-240/DDR3/R Hardware

The ScanDIMM-240/DDR3/R product consists of the following components:

- ScanDIMM-240/DDR3/R, Corelis P/N 10407
- User's Manual, Corelis P/N 70404
- Host Adapter Cable, 10-pin, Corelis P/N 15336
- TAP OUT to TAP IN daisy-chain cable, 2" long, 10-pin 1:1, Corelis P/N 15337

The files related to the ScanDIMM-240/DDR3/R 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.

The figure below shows the ScanDIMM-240/DDR3/R and the cables that are included with the product.

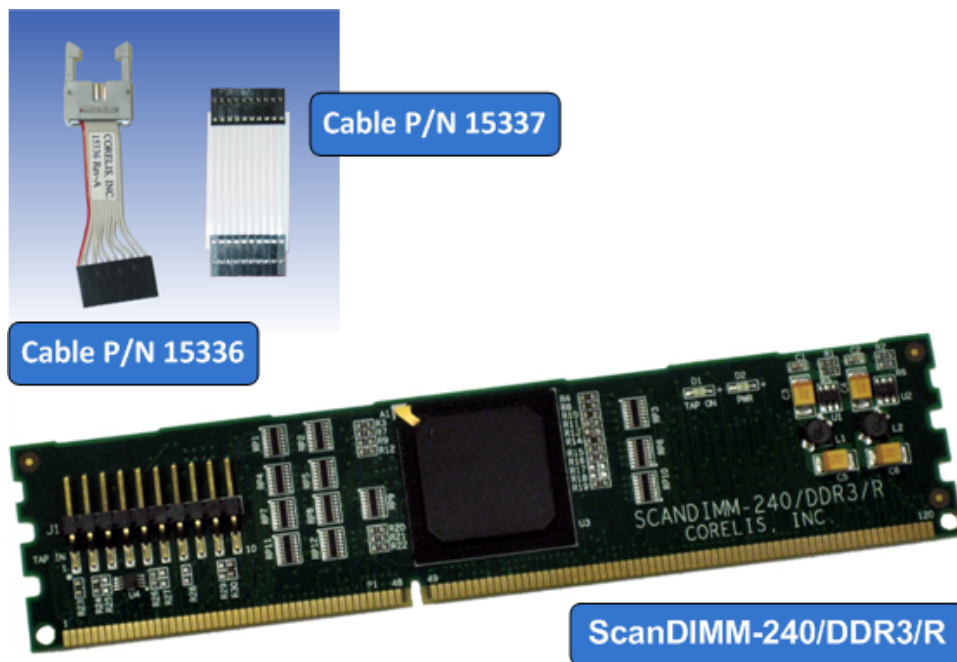


Figure 2-1. ScanDIMM-240/DDR3/R and Cable Accessories

ScanDIMM-240/DDR3/R Software

The ScanExpress CD installs the files to a subdirectory of the ScanExpress TPG application.

The default location is:

"C:\Program Files\Coreelis\ScanExpressTPG\ScanDIMM-240-DDR3-R".

Filename	Description
ScanDIMM-240-DDR3-R.bsd	The BSDL file for the ScanDIMM-240/DDR3/R Boundary-Scan component
ScanDIMM-240-DDR3-R.top	Sample topology file for the ScanDIMM-240/DDR3/R
ScanDIMM-240-DDR3-R_Selftest_inf.cvf	An infrastructure test for a single ScanDIMM-240/DDR3/R. It is used with ScanExpress Runner as a basic functionality check

Table 2-13. ScanDIMM-240/DDR3/R Files

Connecting to the Boundary-Scan Controller

The external boundary-scan controller connects to the ScanDIMM-240/DDR3/R **TAP IN** connector via the 10-pin Host Adapter Cable.

Connect one end of the Host Adapter Cable P/N 15336 to the TAP IN connector of the ScanDIMM-240/DDR3/R.

Connect the 10-pin cable from the boundary-scan controller (ScanTAP-4, ScanTAP-8, etc.) to the other end of the adapter cable.

The TAP Voltage for the boundary-scan controller should be set to 1.8V

The figure below shows a block diagram for the a typical TAP connection to a ScanDIMM-240/DDR3/R module.

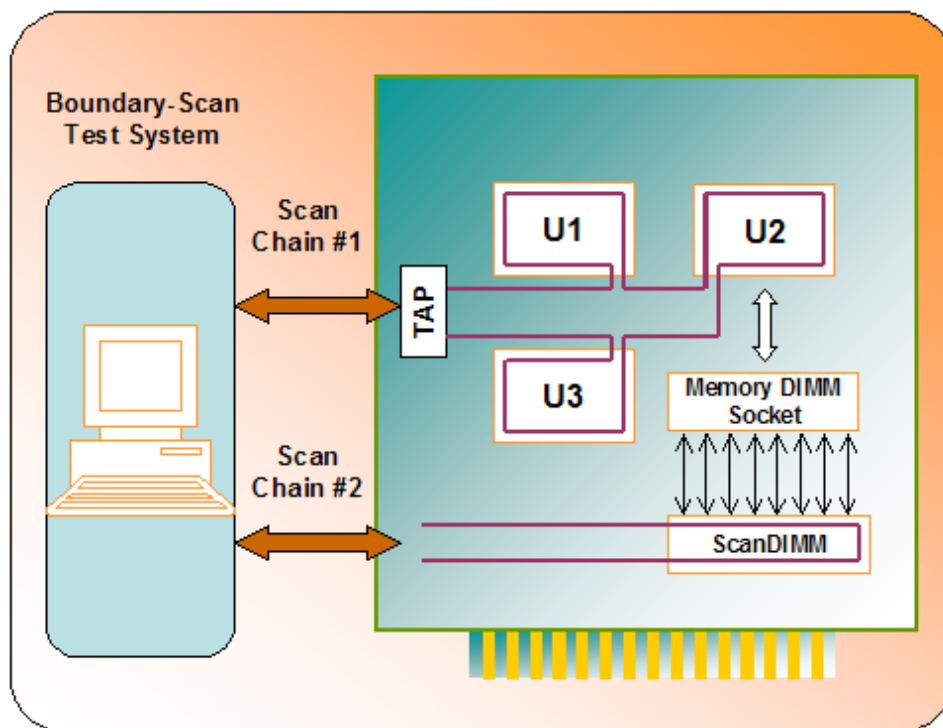


Figure 2-2. Block Diagram of Connection to a ScanDIMM-240/DDR3/R

This table shows the pin assignments for the TAP IN connector.

Pin	Signal Name	I/O	Description
1	TRST*	In	Test Reset
2	GND		Ground
3	TDI	In	Test Data In
4	GND		Ground
5	TDO	Out	Test Data Out
6	GND		Ground
7	TMS	In	Test Mode Select
8	GND		Ground
9	TCK	In	Test Clock
10	GND		Ground

Table 2-14. 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 x 1) instead of dual row (5 x 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-240/DDR3/R and with additional TAP(s) connected to the UUT. Other Corelis controllers like the NetUSB-1149.1/E can also be used so that the UUT can connect on a separate TAP.

The figure below shows the TAP connections for a ScanDIMM-240/DDR3/R module on TAP1 and the Target UUT on TAP2.

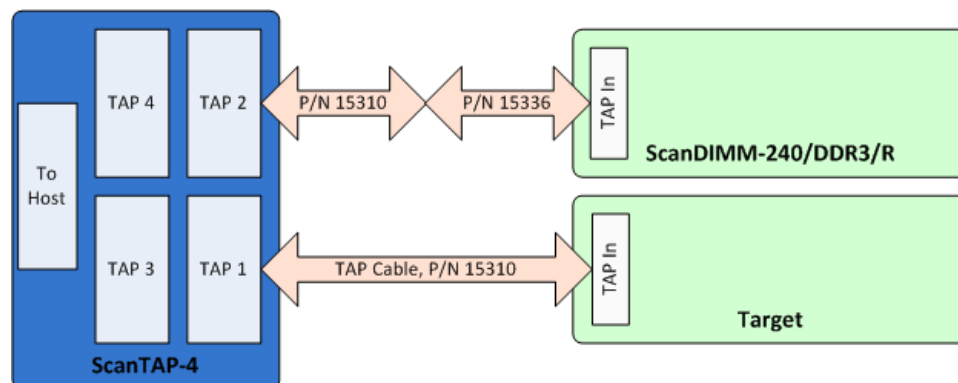


Figure 2-3. Connection of a ScanDIMM-240/DDR3/R Module and the Target using Separate TAPs

Indicator LEDs

Two LEDs indicate the status of the ScanDIMM-240/DDR3/R module. D1 is labeled PWR. It illuminates if the ScanDIMM-240/DDR3/R is receiving power from the target (through pins 57, 60 and 176). If the LED is not illuminated, the ScanDIMM-240/DDR3/R module is not powered up. D2 is labeled TAP ON. It indicates that a connection to a controller is detected. The ScanDIMM-240/DDR3/R module will not operate unless D2 is illuminated.

Mating Connectors

The table below shows the mating connectors needed to make cables for the Boundary-Scan connector.

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

Table 2-15. Mating Connectors for the ScanDIMM-240/DDR3/R

Accessories

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

Description	Corelis Part Number	Other Part Number
10-pin dual row IDC plug to 10 pin single row 1:1 cable	15336	Custom

Table 2-16. Cable Accessories for the ScanDIMM-240/DDR3/R

Chapter 3: Preparation of Test Input Files

Overview

The ScanDIMM-240/DDR3/R integrates easily with a boundary-scan test plan. When the ScanDIMM-240/DDR3/R is installed in a socket, the socket behaves like a boundary-scan component. Once the ScanDIMM-240/DDR3/R 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 ScanExpress TPG is required.

Preparation

Copy the provided BSDL file to your local project directory.

Add the ScanDIMM BSDL File

While in the "Preparation:BSDL Files" stage of ScanExpress TPG, click "Add..." to launch the "Add BSDL Files" dialog.

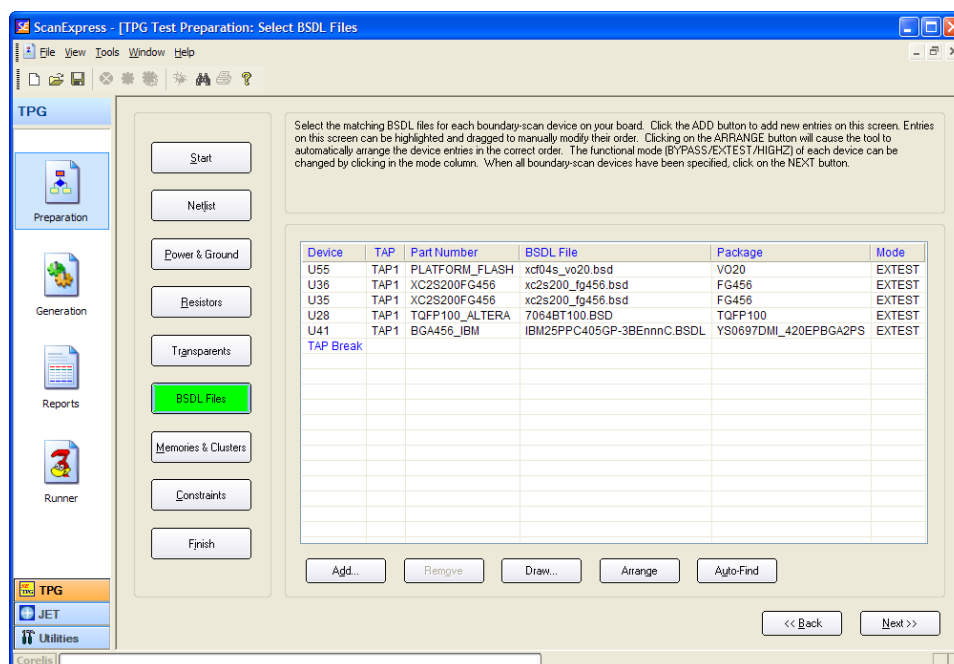


Figure 3-1. ScanExpress TPG Test Preparation: Select BSDL Files

Add BSDL Files Dialog

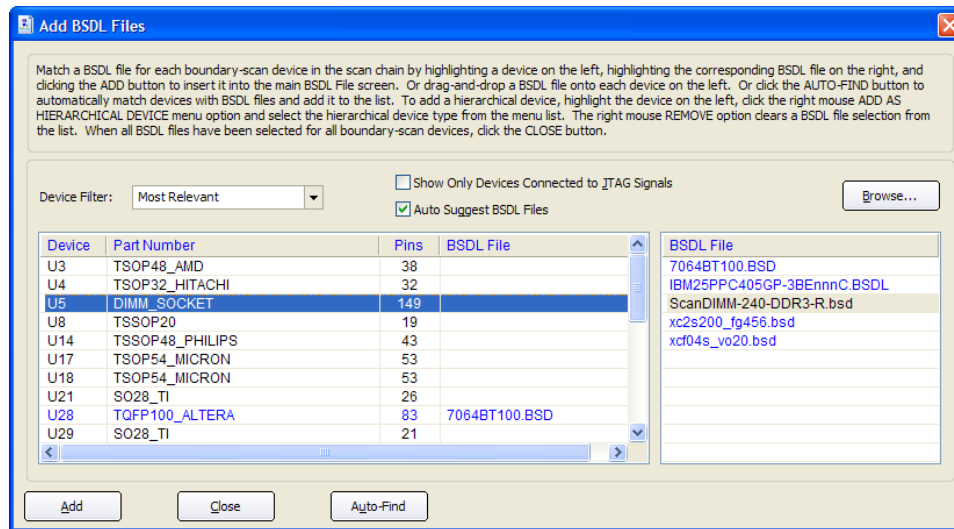


Figure 3-2. Add BSDL Files Dialog

Uncheck the box "**Show Only Devices Connected to JTAG Signals**"

Select the **Device** that corresponds to the DIMM socket on the board in the left pane.

Select the **BSDL File** for the ScanDIMM-240-DDR3-R in the right pane.

Click "**Add**".

Click "**Close**" to exit the Add BSDL Files dialog.

TAP Pins Not Found in Netlist Warning (Safe to Ignore)

In some cases a popup message may appear that indicates that the ScanDIMM TAP pins are not found in the netlist. The TAP connection between the boundary-scan controller and ScanDIMM module won't be in the board netlist and this warning is safe to ignore.

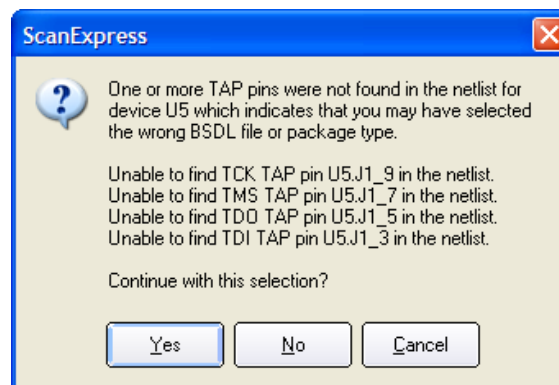


Figure 3-3. TAP Pins Not Found in Netlist Warning (Safe to Ignore)

Insert a TAP Break

The ScanDIMM is now in the scan chain. Insert a "TAP Break" by selecting the last device in the scan chain before the ScanDIMM, right clicking and selecting "Insert TAP Break"

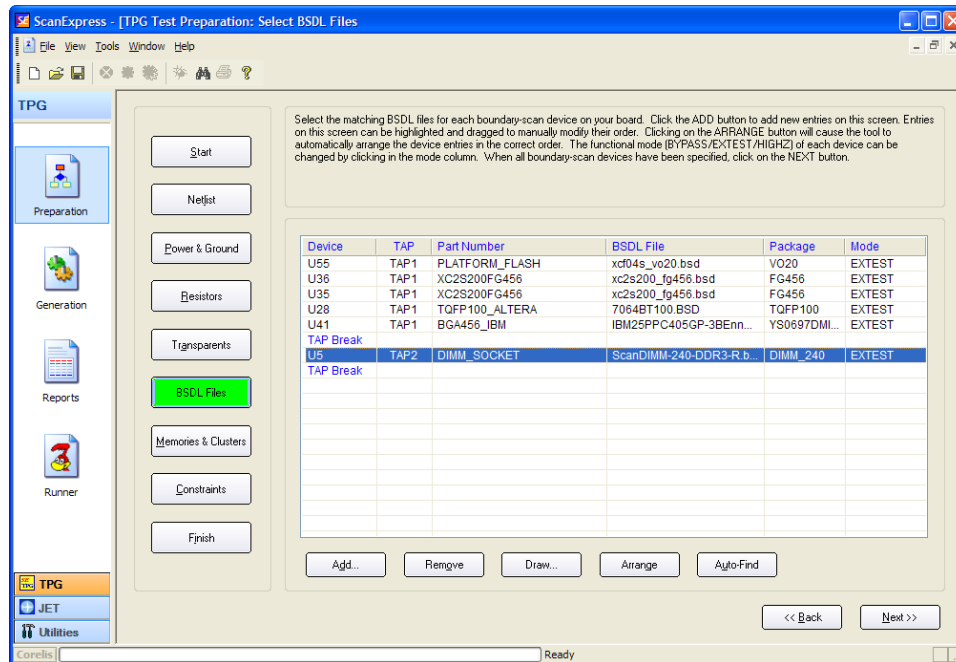


Figure 3-4. ScanExpress TPG Test Preparation: ScanDIMM BSDL File Added

Testing the Socket Power and Ground Pins

To test the power and ground pins on the ScanDIMM-240/DDR3/R 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 1.5V 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.

ScanExpress TPG will automatically add these constraints if the power and ground nets are specified during the **Power and Ground** screen of the preparation phase.

Chapter 4: Executing Selftest

Overview

ScanExpress Runner (sold separately) can load and run the compact vector file, ScanDIMM-240-DDR3-R_Selftest_inf.cvf, and quickly verify that the ScanDIMM-240/DDR3/R 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-240/DDR3/R. It also verifies that the boundary-scan infrastructure of the device on the ScanDIMM-240/DDR3/R is fully functional. The infrastructure test requires a Corelis Boundary-Scan controller, a ScanDIMM-240/DDR3/R unit and a Host TAP cable (P/N 15336). The following steps execute an infrastructure test.

Steps

1. Remove any memory modules from the Unit Under Test (UUT) DIMM socket(s) to be tested.
2. Install the ScanDIMM-240/DDR3/R in the socket.
3. Connect the Host TAP Adapter cable P/N 15336 to the **"TAP IN"** connector on the ScanDIMM-240/DDR3/R.
4. Connect the 10-pin TAP cable from the external controller to the other end of the Host TAP Adapter cable.
5. Apply power to the UUT.
6. Make sure that both LEDs on the ScanDIMM-240/DDR3/R illuminate.
7. Double-click on the ScanExpress Runner Icon.
8. Select **New Test Plan** from the **File** menu and click on the **Add** button.
9. With the file browser, find and select the **"ScanDIMM-240-DDR3-R_Selftest_inf.cvf"** file. Click **OK**.
10. Select Controller from the Setup menu, then choose the appropriate Boundary-Scan controller.
11. Set the **TCK frequency** to **1 MHz** and the **TAP voltage** to **1.8V**.
12. Select **Run Test**. The test should run and pass.

The figure below shows a passing infrastructure test.

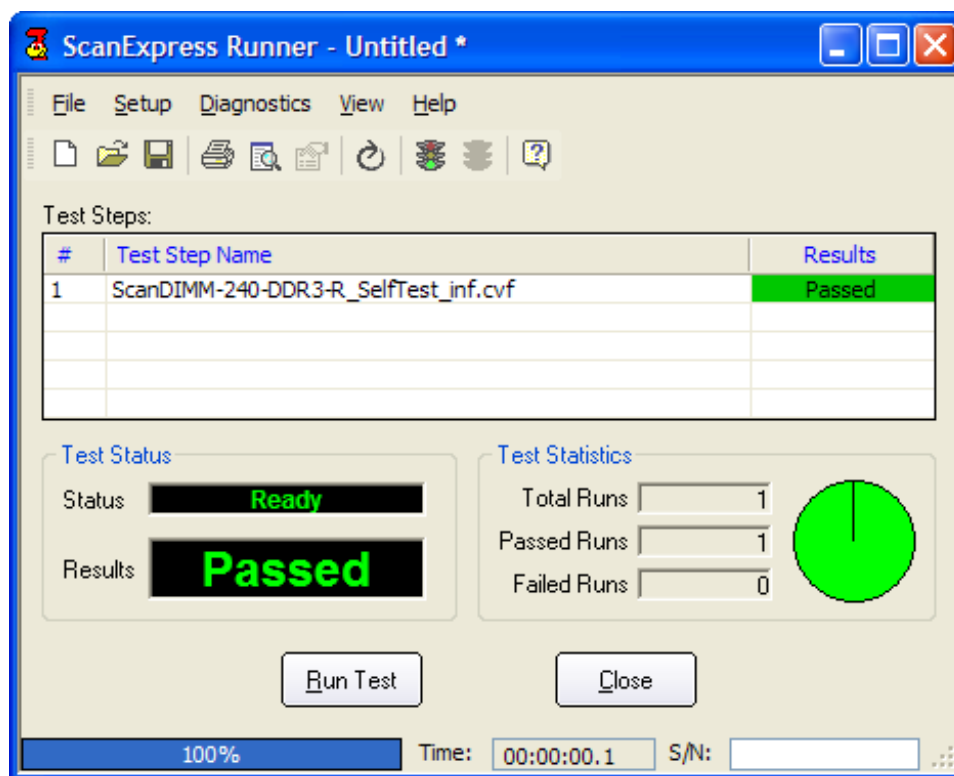


Figure 4-1. ScanExpress Runner Infrastructure Test

Chapter 5: Troubleshooting

Overview

Use the following general guidelines to troubleshoot problems when the ScanDIMM-240/DDR3/R is added to the test system.

1. Make sure the ScanDIMM-240/DDR3/R's **TAP Voltage** is set to **1.8V**
2. Make sure power is being supplied to the ScanDIMM-240/DDR3/R, the boundary-scan controller, and the target. The ScanDIMM-240/DDR3/R's green LEDs will be illuminated if power (1.5V) is being supplied to the DIMM socket and the boundary-scan controller is connected.
3. Run the provided self-test and make sure that it passes.
4. Reduce the **TCK** (test clock) frequency to **1 MHz**. The TCK frequency can be set too high for the scan chain and sometimes using a lower frequency will allow the test steps to pass. Once the scan chain is known to be stable, then the TCK frequency can be increased to the maximum frequency that will allow the test steps to pass.

Notes

1. DDR3 modules are not backwards compatible with DDR2 modules and DDR3 modules will not fit into DDR2 sockets; forcing them can damage the ScanDIMM and/or the board.

Chapter 6: Legal and Contact Information

PRINTING HISTORY

Revision A, January 2010

Revision B, March 2010

Revision C, May 2010

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