

CORELIS

ScanDIMM-168

**ScanDIMM-168
Boundary-Scan Based
Digital Tester**

User's Manual

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Chapter 1

Product Overview

Introduction

The ScanDIMM-168 Digital Tester module provides an easy-to-use method for interconnect testing of 168-pin Dual Inline Memory Module (DIMM) sockets. Through the use of Boundary-Scan technology, the ScanDIMM-168 Digital Tester provides 163 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 168-pin sockets are often used for Synchronous Dynamic Random Access Memory (SDRAM) memory modules, and the ScanDIMM-168 offers an accurate and easy-to-use mechanical and electrical solution for connecting test equipment to DIMM sockets.

Features of the ScanDIMM-168

- Tests 168-pin DIMM sockets
- Tests for opens on the socket's power and ground pins
- 3.3V interface, 5V tolerant.
- Daisy-chain up to 8 ScanDIMM-168 modules
- LEDs indicate power status and TAP-on
- Compatible with ScanExpress software.

Figure 1-1 shows the ScanDIMM-168 module with Pin 1 of the TAP-In connector identified.

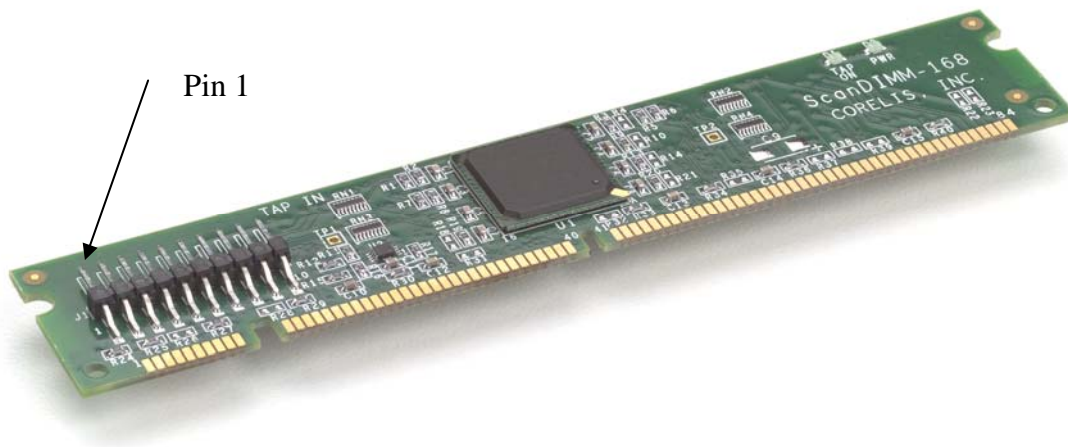


Figure 1-1. ScanDIMM-168 module (top view)

ScanDIMM-168/1.8V

The ScanDIMM-168 is designed to fit into the popular 168-pin, 3.3V-compatible DIMM socket. A similar module, the ScanDIMM-168/1.8V, fits into a 1.8V-compatible DIMM socket. This manual applies to both the 3.3V and 1.8V modules but for the sake of simplicity it references only the more popular 3.3V module. For ordering information on the 1.8V version, please contact sales@corelis.com.

Daisy-Chaining the TAPs

Multiple ScanDIMM-168s give access to units under test (UUTs) that contain multiple DIMM sockets. Each ScanDIMM-168 provides a TAP-In and a TAP-Out connector. The TAP-In connects to the external Boundary-Scan tester. Connect the TAP-Out only when daisy-chaining multiple ScanDIMM-168 modules. Although each ScanDIMM-168 module can connect to its own external TAP, daisy-chaining multiple ScanDIMM-168 modules together using the TAP-In and TAP-Out connectors minimizes the number of TAPs between the UUT and the external ScanExpress Boundary-Scan tester. The TAP-Out connector's presence-detect logic automatically detects the module connected to it and properly routes the Boundary-Scan signals to the next module in the chain.

ScanDIMM-168 Specifications

Size and Form Factor

| | |
|------------------|---|
| Compatibility | JEDEC MO-161 |
| Dimensions | 5.250 in. × 1.000 in. (JEDEC MO-161 AA dimension) |
| PCB thickness | 0.050 in. |
| Connector Keying | 3.3V-compatible, 1.8V version also available |

Number of Boundary-Scan Test Signals

163 per module

Maximum Test Clock (TCK) Frequency

| | |
|-----------------------|--------|
| Maximum TCK Frequency | 25 MHz |
|-----------------------|--------|

LEDs

| | |
|--------|--|
| PWR | Indicates 3.3V power source is present |
| TAP ON | Indicates the TAP is connected. |

I/O and TAP Signals DC Characteristics

| Parameter | Conditions | MIN | MAX | UNIT |
|---|-----------------------|-------|------|---------|
| Operating Power (V_{DD}) – Provided via the 168 pin socket pins | | 3.00 | 3.60 | V |
| High Level Input Voltage (V_{IH}) | | 2.0 | 5.5 | V |
| Low Level Input Voltage (V_{IL}) | | -0.30 | 0.80 | V |
| Output High Level Voltage (V_{OH}) | $I_{OH} = -4$ mA dc | 2.90 | | V |
| | $I_{OH} = -0.1$ mA dc | 3.10 | | V |
| Output Low Level Voltage (V_{OL}) | $I_{OL} = 8$ mA dc | | 0.40 | V |
| | $I_{OL} = 0.1$ mA dc | | 0.20 | V |
| Input leakage Current (I_I) | $V_I = V_{DD}$ or GND | | 10 | μ A |

Table 1-1. DC Characteristics

TAP Connectors

| | |
|-------------------|--|
| TAP-In Connector | 10-pin Single Row 0.100-in. spacing (Samtec part no. TSM-110-01-T-SH or equivalent) |
| TAP-Out Connector | 10-pin IDC (Samtec part no. TSM-110-01-T-SH or equivalent) |

Power Requirements (Provided by the 168-pin mating socket)

| | |
|--------|-------------------|
| 3.30 V | 0.200 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-168 Installation

The ScanDIMM-168 product consists of the following components:

- User's Manual
- Configuration Disk
- ScanDIMM-168 Module
- Host Adapter Cable, Corelis P/N 15336
- TAP-Out to TAP-In daisy-chain cable, 2" long, 10-pin 1:1, Corelis P/N 15337

Ensure 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 front cover immediately. Figure 2-1 shows the ScanDIMM-168 and the two cables that come with the product.

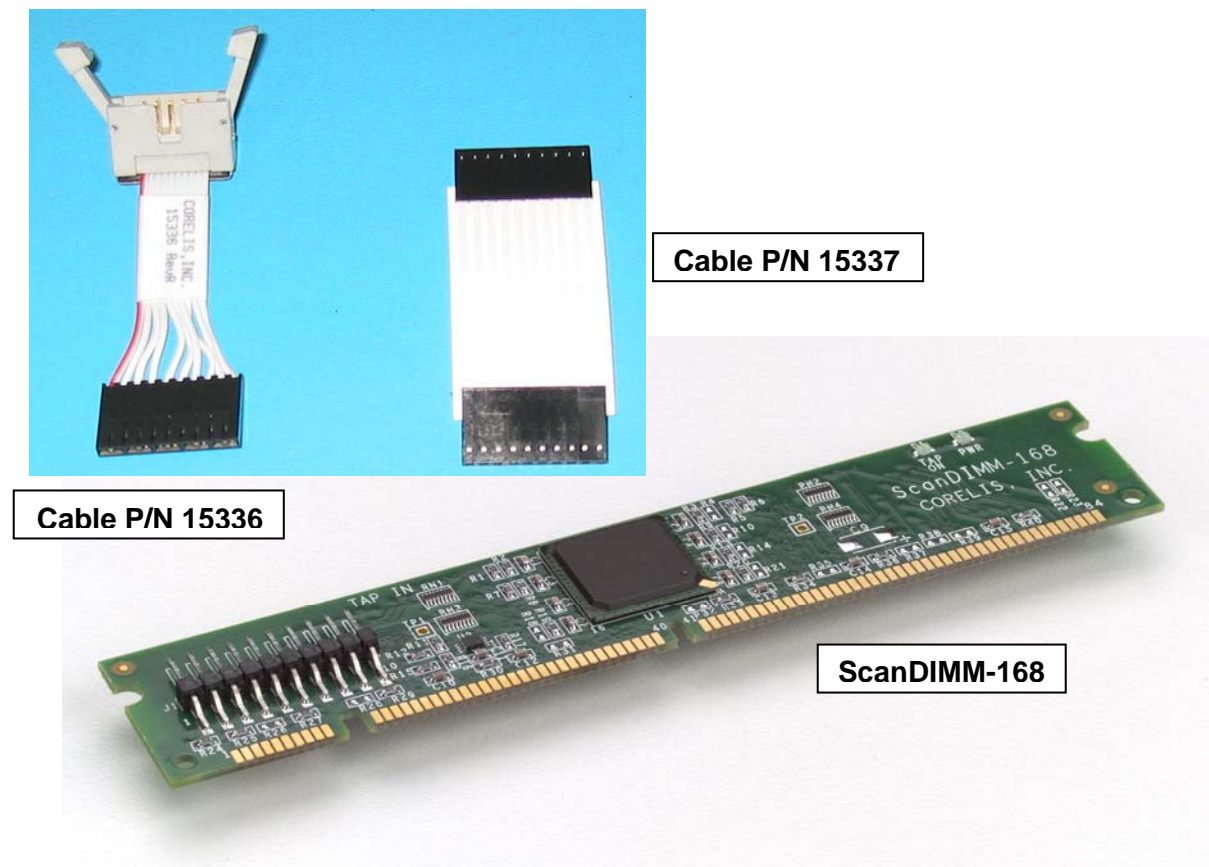


Figure 2-1. ScanDIMM-168 and Cable Accessories

What's on the Disk

The disk contains the following Test Vector Generation files:

| Filename | Description |
|---------------------------------|--|
| ScanDIMM-168.bsd | BSDL file for the ScanDIMM-168 Boundary-Scan component. |
| ScanDIMM-168.top | The topology file for the ScanDIMM-168. This file is merged with the Unit Under Test topology file. |
| SelfTest_Infrastructure_Inf.cvf | An infrastructure test for a single ScanDIMM-168 with nothing connected to its TAP-Out. It is used with ScanExpress Runner as a basic self-test of the ScanDIMM-168. |

Introduction

To ensure reliable operation of the ScanDIMM-168, it is important to connect it properly to both the Boundary-Scan tester and the UUT's 168-pin DIMM socket.

Connecting to the Boundary-Scan Controller

The external Boundary-Scan controller connects to the ScanDIMM-168 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-168. 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 single ScanDIMM-168 module.

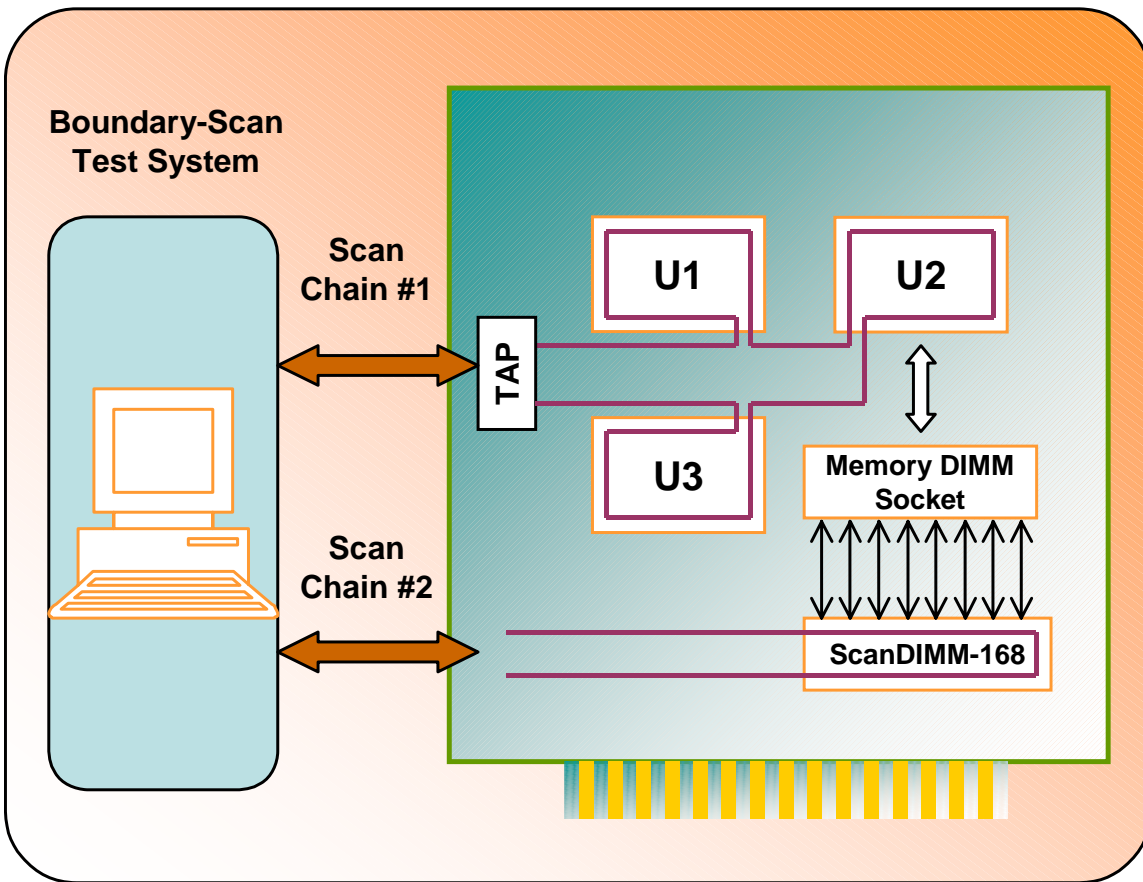


Figure 2-2. Block Diagram of Connection to a Single ScanDIMM-168

| Pin | Signal Name | I/O | Description |
|-----|-------------|-----|------------------|
| 1 | TRST* | In | TRST* |
| 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 2-1. 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-168 (or to multiple, daisy-chained ScanDIMM-168 modules) 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 two daisy-chained ScanDIMM-168 modules on TAP1 and the Target UUT on TAP2.

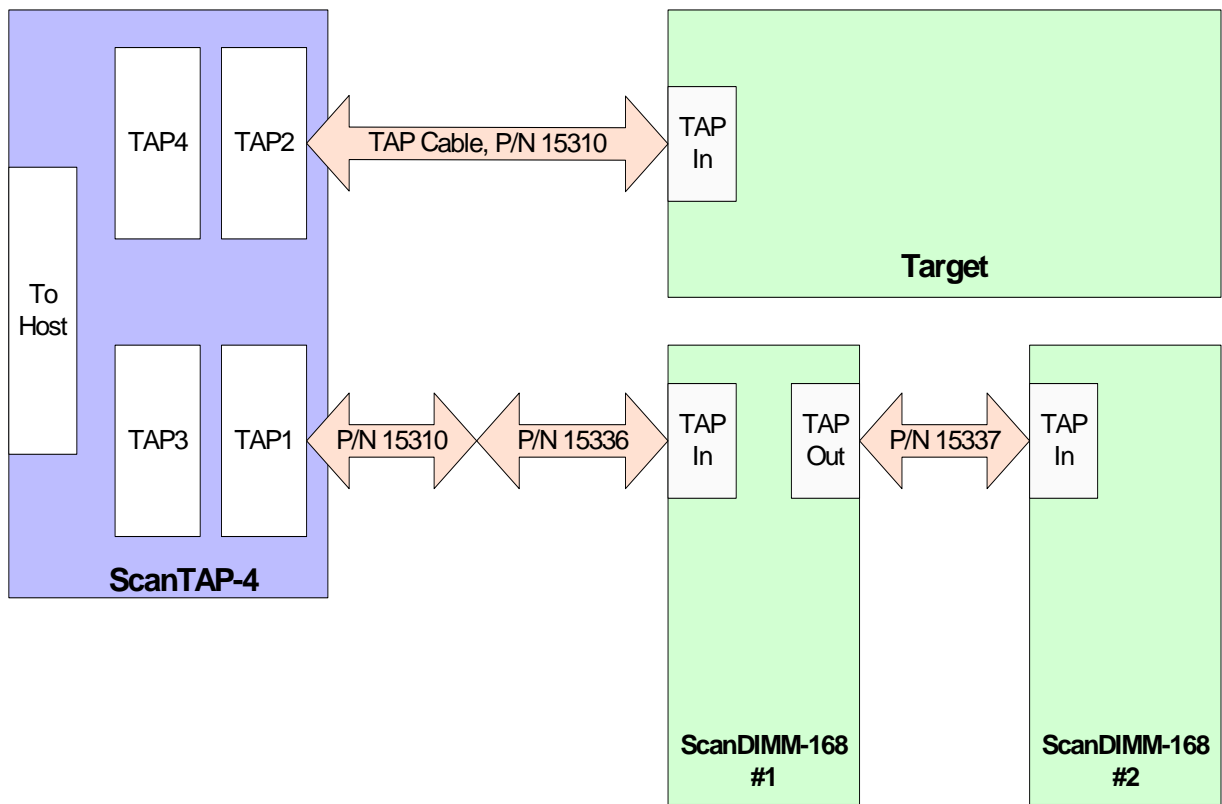


Figure 2-3. Connection of 2 ScanDIMM-168 Modules and the Target using Separate TAPs

Daisy-Chaining Multiple ScanDIMM-168 Modules

The TAP-Out connector can daisy-chain multiple ScanDIMM-168 modules together to form a high pin-count digital test system that can test multiple DIMM sockets at once. With the ScanDIMM-168 TAP-Out/TAP-In connectors connected in series, a single host TAP interface can access multiple ScanDIMM-168 modules as shown in Figure 2-4.

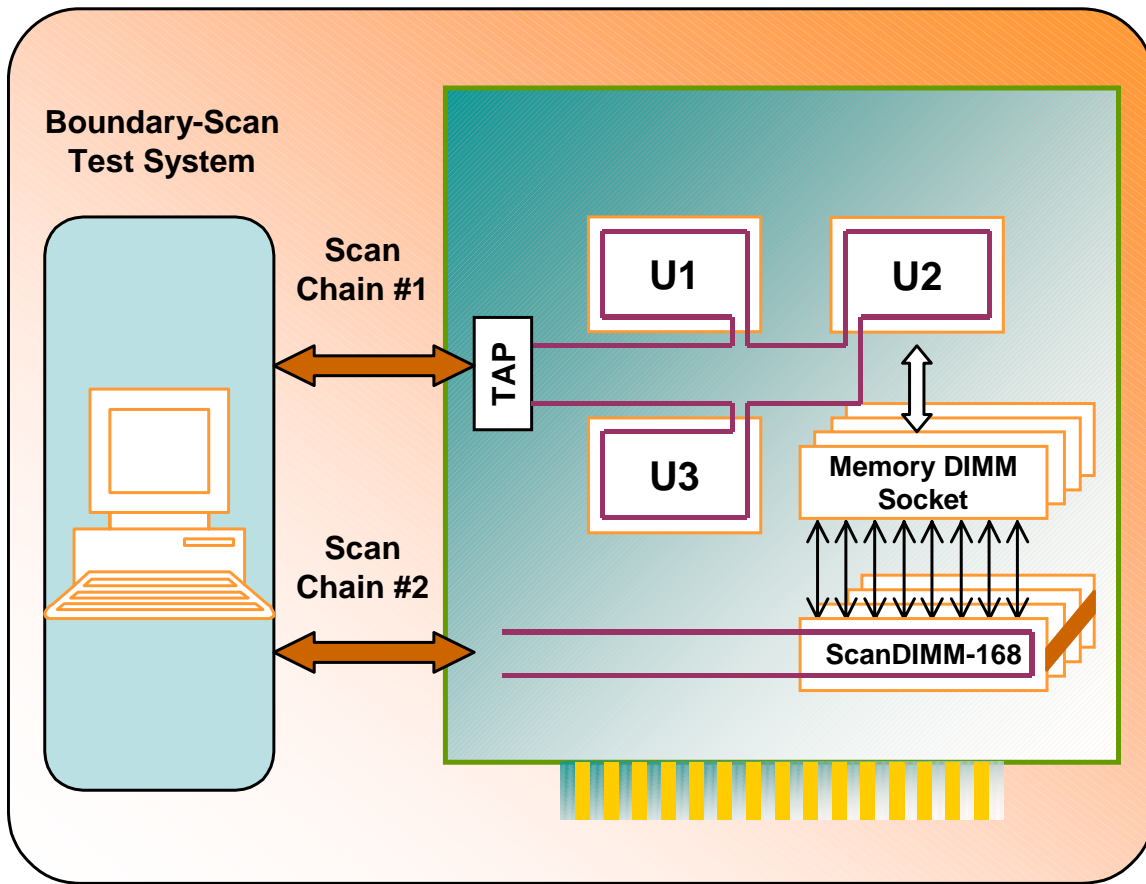


Figure 2-4. Connecting Multiple ScanDIMM-168 Modules

A straight-ten contact, single row, socket-connector-to-socket-connector, flex flat cable connects adjacent ScanDIMM-168 modules. The daisy chain cable (P/N 15337) connects the TAP-Out connector from the first ScanDIMM-168 module to the TAP-In connector on the second module. Additional ScanDIMM-168 modules are daisy-chained in a similar fashion. The UUT connects to the TAP-Out of the last ScanDIMM-168. Table 2-2 shows the pin assignments for the TAP-Out connector. Figure 2-5 shows a system with two daisy-chained ScanDIMM-168 modules installed on a target UUT.

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

Table 2-2. TAP-Out Connection List

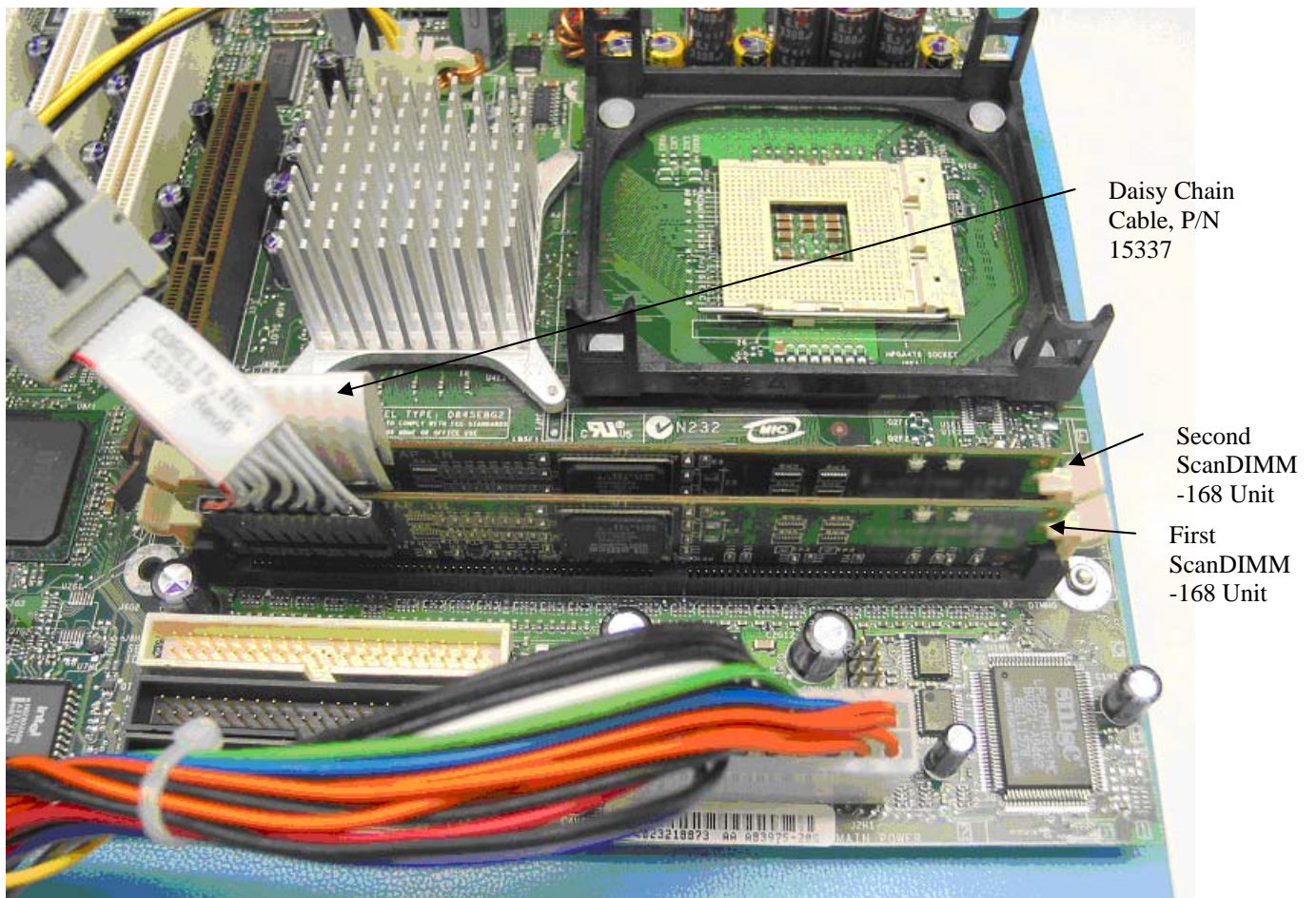


Figure 2-5. Example Target with Two ScanDIMM-168 Modules

Single TAP Connection to the Target UUT

There are two ways to connect to the target UUT. The first and most recommended way is using an external Corelis Buffer-1149.1/Gang pod or external ScanTAP-4 Intelligent Pod unit to chain the Target UUT with the ScanDIMM-168 module(s). In this case simply connect TAP2 from the pod to the TAP connector on the target UUT.

Another way to connect to the Target UUT is to daisy-chain the target with the ScanDIMM-168 module(s). In this case, the TAP-Out from the last ScanDIMM-168 module must connect to the TAP of the target. The connection list in Table 2-2 must be followed and all grounds must be connected. (Note that TDO from the TAP-Out connects to the TDI of the next device in the scan chain). This configuration is not desirable if there are many ScanDIMM-168 modules chained together, or if the target TAP connector is far away from the ScanDIMM-168 modules, because of signal integrity problems.

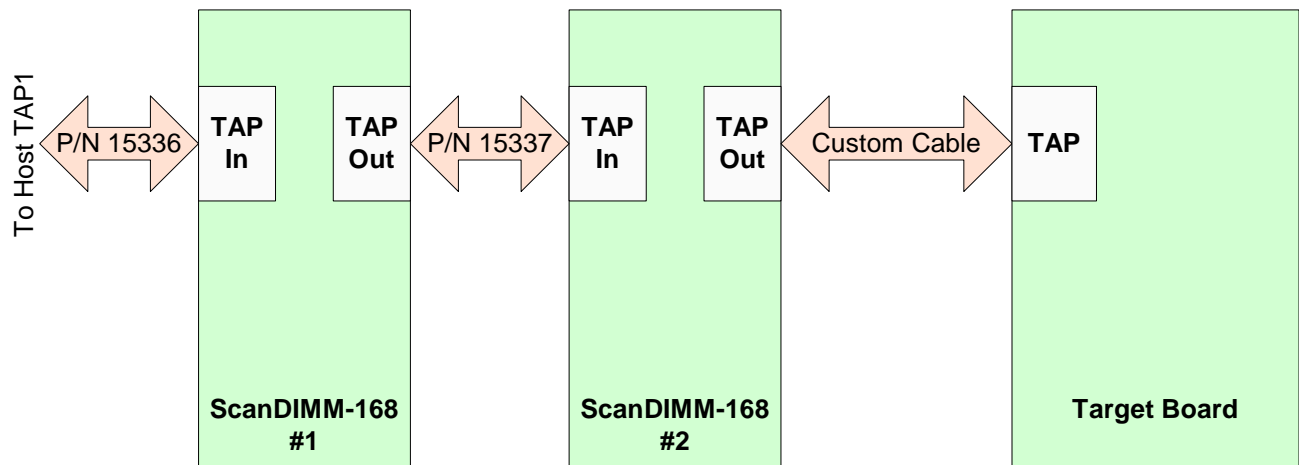


Figure 2-6. TAP Connection for a Single TAP System

Indicator LEDs

Two LEDs indicate the status of the ScanDIMM-168 module. D2 is labeled PWR. It illuminates if the ScanDIMM-168 is receiving power from the target (through pins 85 and 168). If the LED is not illuminated, the ScanDIMM-168 module is not powered up. D1 is labeled TAP ON. It indicates a detected connection to either a controller or a daisy-chained upstream ScanDIMM-168 module. The ScanDIMM-168 module will not operate unless D1 is illuminated.

Mating Connectors

Table 2-3 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 2-3. Mating Connectors for the ScanDIMM-168

Accessories

Additional TAP Adapter Cables (P/N 15336) and 2-inch 10-pin 1:1 cables (P/N 15337) can be ordered from Corelis:

| Description | Corelis P/N | Other Part Number |
|---|-------------|----------------------------|
| 10-pin dual row IDC plug to 10 pin single row 1:1 cable | 15336 | Custom |
| 10-pin single row 1:1 cable, 2 inch | 15337 | Digikey P/N A9BBG-1002F-ND |

Table 2-4. Cable Accessories for ScanDIMM-168

The single row 1:1 cables may be ordered directly from Digikey (see www.digikey.com) in different lengths:

| Length | Digikey P/N |
|--------|----------------|
| 3 in. | A9BBG-1003F-ND |
| 4 in. | A9BBG-1004F-ND |
| 5 in. | A9BBG-1005F-ND |
| 6 in. | A9BBG-1006F-ND |
| 8 in. | A9BBG-1008F-ND |

Table 2-5. Digikey Cable Part Numbers

Chapter 3

Preparation of Test Input Files

Introduction

The ScanDIMM-168 integrates easily with a boundary-scan test plan. When the ScanDIMM-168 is installed in a socket, the socket behaves like a boundary-scan component. Therefore, it is not necessary to make any changes to the netlist to include the ScanDIMM-168 in a test plan.

Once the ScanDIMM-168 is plugged into the socket on the target board, the boundary-scan test system will automatically test the socket. However, regeneration of the interconnect tests with the relevant ScanDIMM-168 input files included is required (using ScanExpress TPG).

How to Generate Vectors using the ScanDIMM-168

Copy the file **ScanDIMM-168.bsd** to your design directory. Add the ScanDIMM-168 modules to the topology file and regenerate your test vectors. In the topology file each ScanDIMM-168 takes the reference number of the socket in which it is installed. How the ScanDIMM-168 components are connected to the target system determines the order that they appear in the topology file. If the ScanDIMM-168 units are connected to TAP2 then they are placed at the end of the topology file.

Below is an example of a target system with two ScanDIMM-168 units connected to a second TAP installed in locations J1 and J2.

```
!-----  
! Boundary-Scan Chain Topology File  
! Example for the ScanDIMM-168  
!  
! File:      Example.top  
! Date:      February 19, 2003  
! Company:   Corelis Inc.  
!  
!-----  
  
CHAIN    chain1  
         DEVICES  
  
!  
!  -----  -----  
!  DEVICE   BSDL FILE ----->  PACKAGE ->  BYPASS?  
!  -----  -----  
!  U1       "EPM7032_bt44.bsd"    TQFP44    NO  
!  U2       "xc2s50_fg256.bsd"    FG256     NO  
!  J1       "ScanDIMM-168.bsd"    FPBGA_256 NO  
!  J2       "ScanDIMM-168.bsd"    FPBGA_256 NO  
!  
!  -----  -----  
!  
         END_DEVICES  
END_CHAIN
```

Figure 3-1. Example Topology *.top file

Testing the Socket Power and Ground Pins

To test the power and ground pins on the ScanDIMM-168 socket the constraint file should have added syntax:

```
SENSE_HIGH VDD  
SENSE_LOW GND
```

Where **VDD** and **GND** are the net names of the 3.3V power and the ground signal on the target board. This syntax may already be present to test other power or ground connections in the target system.

Chapter 4

Executing Selftest with ScanExpress Runner

ScanExpress Runner (sold separately) can load and run the compact vector file, `Selftest_Infrastructure_inf.cvf`, and quickly verify that the ScanDIMM-168 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-168. It also verifies that the Boundary-Scan infrastructure of the CPLD device on the ScanDIMM-168 is fully functional. The infrastructure test requires a Corelis Boundary-Scan controller, a ScanDIMM-168 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 DIMM socket(s) to be tested.
- Step 2 Install the ScanDIMM-168 in the socket.
- Step 3 Connect the Host TAP Adapter cable P/N 15336 to the “TAP-In” connector on the ScanDIMM-168.
- 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-168 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 “**Selftest_Infrastructure_inf.cvf**” file. Click OK.
- Step 10 Select Controller from the Setup menu, then choose the appropriate Boundary-Scan controller and set the frequency to 1 MHz.
- Step 11 Click “**Run Test**”. The test should run and pass. Figure 4-1 shows a passing infrastructure test.

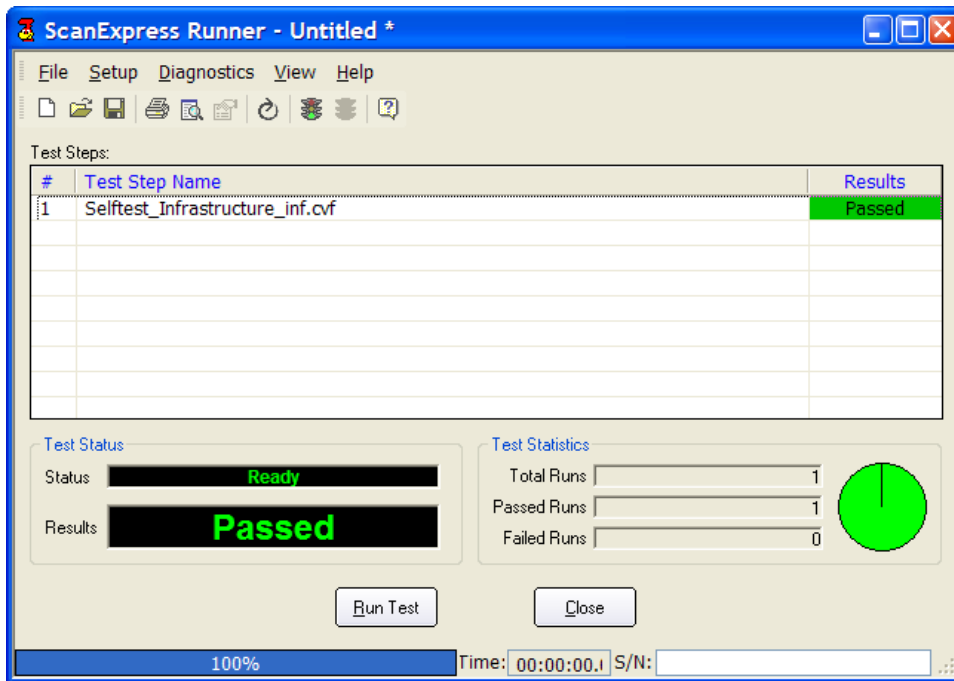


Figure 4-1. ScanExpress Runner Infrastructure Test