Preface

PRINTING HISTORY

Edition 1, January 2009
Edition 2, March 2009

GENERAL NOTICE

Information contained in this document is subject to change without notice. CORELIS shall not be liable for errors contained herein for incidental or consequential damages in connection with the furnishing, performance, or use of material contained in this manual.

This document contains proprietary information that is protected by copyright. All rights reserved. No part of this document may be reproduced or translated to other languages without the prior written consent of CORELIS. This manual is a CORELIS proprietary document and may not be transferred to another party without the prior written permission of CORELIS.

CORELIS assumes no responsibility for the use of or reliability of its software on equipment that is not furnished by CORELIS.

ENVIRONMENTAL NOTICE

This product must be disposed of in accordance with the WEEE directive.

TRADEMARK NOTICE

Pentium is a registered trademark of Intel Corporation.
Windows is a registered trademark of Microsoft Corporation.
I²C Bus is a registered trademark of NXP (formerly Philips Electronics).

Other products and services named in this manual are trademarks or registered trademarks of their respective companies. All trademarks and registered trademarks in this manual are the property of their respective holders.
PRODUCT WARRANTY

For product warranty and software maintenance information, see the PRODUCT WARRANTY AND SOFTWARE MAINTENANCE POLICY statement included with your product shipment.

EXCLUSIVE REMEDIES

THE REMEDIES CONTAINED HEREIN ARE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. CORELIS SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Product maintenance agreements and other customer assistance agreements are available for Corelis products. For assistance, contact your nearest Corelis Sales and Service Office.

RETURN POLICY

No items returned to CORELIS for warranty, service, or any other reason shall be accepted unless first authorized by CORELIS, either direct or through its authorized sales representatives. All returned items must be shipped pre-paid and clearly display a Return Merchandise Authorization (RMA) number on the shipping carton. Freight collect items will NOT be accepted.

Customers or authorized sales representatives must first contact CORELIS with notice of request for return of merchandise. RMA's can only originate from CORELIS. If authorization is granted, an RMA number will be forwarded to the customer either directly or through its authorized sales representative.

CONTACT INFORMATION

For sales inquiries, please contact sales@corelis.com.

For any support related questions, please enter a support request at www.corelis.com/support or email support@corelis.com.

For more information about other products and services that Corelis offers, please visit www.corelis.com.
# Table of Contents

## Chapter 1: Product Overview

- **Introduction** ..................................................................................................................................................... 1

## ScanTAP IsoPod Hardware Specifications

- **Physical**............................................................................................................................................................................................ 2
- **Operating Environment**..................................................................................................................................................................... 2
- **Storage Environment**.................................................................................................................................................................... 2
- **Host Interface**................................................................................................................................................................................ 2
- **TAP Interface**................................................................................................................................................................................ 2
- **Power Requirements**..................................................................................................................................................................... 2

## ScanTAP IsoPod Electrical Specifications

- **Target TAP Interface**.................................................................................................................................................................... 3
- **Absolute Maximum Ratings**........................................................................................................................................................ 3
- **DC Specifications**.......................................................................................................................................................................... 4

## ScanTAP IsoPod Power Indicator LED................................................................................................................................. 4

## Chapter 2: ScanTAP IsoPod Installation and Usage

- **ScanTAP IsoPod Hardware Installation**................................................................................................................................. 6
- **Connecting to the Controller and the Target**............................................................................................................................ 7
- **Applying Power**................................................................................................................................................ 7
- **Signal Description**........................................................................................................................................................................ 8
- **Using the ScanTAP IsoPod with ScanExpress Tools**........................................................................................................... 9
- **ScanTAP IsoPod Performance and Feature Tradeoffs** ......................................................................................................... 11
- **Troubleshooting**........................................................................................................................................................................ 11
List of Figures

Figure 1-1. ScanTAP IsoPod Hardware.................................................................................................1
Figure 2-1. ScanTAP IsoPod System Connection Diagram...............................................................6
Figure 2-2. ScanTAP IsoPod 20-pin Controller Connector (top view)................................................7
Figure 2-3. Controller Configuration Screen.....................................................................................9
Figure 2-4. USB-1149.1/E Controller Configuration Screen in ScanExpress Runner ..................10

List of Tables

Table 1-1. ScanTAP IsoPod Absolute Maximum Ratings...............................................................3
Table 1-2. ScanTAP IsoPod DC and Switching Characteristics.........................................................4
Table 2-1. ScanTAP IsoPod 20-pin Target Connector Pin Assignment.............................................8
Table 2-2. Recommended ScanTAP IsoPod Delay Compensation Settings..................................10
Chapter 1:
Product Overview

Introduction

The ScanTAP IsoPod is an add-on accessory that provides a complete electrical isolation barrier between a Corelis boundary-scan (JTAG) controller and target unit under test (UUT). The complete isolation helps prevent damage to the controller from harsh electrical environments where over-voltage and over-current can cause damage to components. This feature is especially useful for new or untested targets where unknown faults may cause damage, and to protect against accidental misconnection of TAP signals through custom cabling or test fixtures. The ScanTAP IsoPod is compatible with all Corelis boundary-scan controllers and ScanTAP intelligent modules. The ScanTAP IsoPod supports continuous scan operations at JTAG test clock (TCK) frequencies up to 40 MHz.

![ScanTAP IsoPod Hardware](image)

**Figure 1-1.** ScanTAP IsoPod Hardware

---

1 Use of the ScanTAP IsoPod does not guarantee that damage will not occur to hardware that is subjected to extreme conditions. Damage may still be possible under certain circumstances that are beyond the scope of what is generally accepted as “normal operation”.
ScanTAP IsoPod Hardware Specifications

**Physical**

- Mechanical Dimensions (box) 2.75 inches x 2.0 inches x 0.80 inches (+/- 0.10”)

**Operating Environment**

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

**Storage Environment**

- Temperature -40°C to 85°C

**Controller Interface (Host)**

- Host Connector 20-pin header, AMP part no. 104130-4 or equivalent
- Host Cable Length 20-pin to 20-pin (12”), Corelis P/N 15312-2 (standard). Other options are available.

**Target Interface (TAP)**

- TAP Connector 20-pin header, AMP part no. 104130-4 or equivalent
- Mating TAP Connector 20-pin IDC (flat cable), 3M part no. 3421-6620 or equivalent
- TAP Cable Length 20-pin to 20-pin (12”), Corelis P/N 15312-2 (standard). Other options are available.

**Power Requirements**

- 5V Provided by an external power supply, Corelis P/N 4000-05V4A1R3MM
  Only the included power supply from Corelis should be used.
ScanTAP IsoPod Electrical Specifications

**Target TAP Interface**

- **ScanTAP IsoPod Target TAP Connector**
  - 20-pin (2x10) header (0.100" x 0.100"),
  - AMP part number: 104130-4

- **ScanTAP IsoPod Target TAP Connector Mating Connectors**
  - 20-pin (2x10) IDC receptacle (0.100" x 0.100"),
  - 3M part number: 3421-6620

- **Minimum TCK Frequency**: 0.05 MHz
- **Maximum TCK Frequency**: 40 MHz
- **TAP Voltage**: 3.3V

**Absolute Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>JTAG Signals</th>
<th>GPIO Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Transient Overvoltage Isolation (V_{IOTM})</td>
<td>4000V-peak</td>
<td>2500V-peak</td>
</tr>
<tr>
<td>Maximum Working Insulation Voltage (V_{IORM})</td>
<td></td>
<td>560V-peak</td>
</tr>
<tr>
<td>Maximum $V_{IN}$</td>
<td>6.0V</td>
<td>3.8V</td>
</tr>
<tr>
<td>Maximum $V_{OUT}$</td>
<td>6.0V</td>
<td>3.8V</td>
</tr>
</tbody>
</table>

**Table 1-1.** ScanTAP IsoPod Absolute Maximum Ratings

**NOTE:** Use of the ScanTAP IsoPod does not guarantee that damage will not occur to hardware that is subjected to extreme conditions. Damage may still be possible under certain circumstances that are beyond the scope of what is generally accepted as “normal operation”.

---

2 TCK maximum of 40MHz is for JTAG signals and GPIO1 only using 12” cables between the controller and IsoPod and between the IsoPod and target (higher TCK frequencies are possible using shorter cables). The remaining GPIO, I2C, and SPI signals support a maximum clock rate of 1MHz, but these signals typically toggle at much slower rates than TCK. See **Table 2-1** for details on the pinout.
**DC Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Limit Min</th>
<th>Limit Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{IH}$</td>
<td>$V_{CC} = 3.3,\text{V}$, $0.7 \times V_{CC}$</td>
<td>$V_{CC}$</td>
<td>$V_{CC}$</td>
<td>V</td>
</tr>
<tr>
<td>$V_{IL}$</td>
<td>$V_{CC} = 3.3,\text{V}$</td>
<td>0</td>
<td>$0.3 \times V_{CC}$</td>
<td>V</td>
</tr>
<tr>
<td>$V_{OH}$</td>
<td>$V_{CC} = 3.3,\text{V}$, $I_{IH} = 4,\text{mA}$</td>
<td>$V_{CC} - 0.4$</td>
<td>$V_{CC} - 0.4$</td>
<td>V</td>
</tr>
<tr>
<td>$V_{OL}$</td>
<td>$V_{CC} = 3.3,\text{V}$, $I_{IL} = 4,\text{mA}$</td>
<td>0.4</td>
<td>0.4</td>
<td>V</td>
</tr>
</tbody>
</table>

Table 1-2. ScanTAP IsoPod DC and Switching Characteristics

**ScanTAP IsoPod Power Indicator LED**

When the external power supply is plugged in, the blue LED on top of the ScanTAP IsoPod will turn on to indicate that the unit is receiving power.
Chapter 2: ScanTAP IsoPod Installation and Usage

The ScanTAP IsoPod product consists of the following components:

- ScanTAP IsoPod Hardware, Corelis P/N ASF4020100
- ScanTAP IsoPod User’s Manual (pdf version)
- Two 20-pin to 20-pin TAP Cables (12”), Corelis P/N 15312-2
- 5V Power Supply, Corelis P/N 4000-05V4A1R3MM
- Power Cord, Corelis P/N 6000-86537030

Please 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 shown on the title page immediately.

**NOTE:** The actual hardware shipped with the ScanTAP IsoPod may vary depending on the customer order.

The following optional interface cables are also available from Corelis:

- 20-pin to 20-pin TAP Cable (8”), Corelis P/N 15312-1
- 20-pin HD (high-density) to 20-pin TAP Cable (12”), Corelis P/N 15392-2
- 20-pin HD (high-density) to 20-pin TAP Cable (8”), Corelis P/N 15392-1
ScanTAP IsoPod Hardware Installation

The Corelis ScanTAP IsoPod module connects to Corelis boundary-scan controllers through a 20-pin flat ribbon cable. External power is required and the required 5V power supply is included.

![Diagram of ScanTAP IsoPod System Connection](image)

**Figure 2-1.** ScanTAP IsoPod System Connection Diagram

There are two 20-pin connectors on the ScanTAP IsoPod. The connector marked **Controller** connects to the Corelis boundary-scan controller and the connector marked **Target** connects to the target unit under test (UUT).
Connecting to the Controller and the Target

The Corelis ScanTAP IsoPod module connects to Corelis boundary-scan controllers and to targets through a 20-pin flat ribbon cable. The top view of the 20-pin controller connector (0.100” x 0.100” spacing), including the pin numbering, is shown in Figure 2-2 below.

![ScanTAP IsoPod 20-pin Controller Connector (top view)](image)

**Figure 2-2.** ScanTAP IsoPod 20-pin Controller Connector (top view)

The following steps for connecting the ScanTAP IsoPod to the boundary-scan controller and the target UUT should be performed in the order listed:

1. Before applying power to the ScanTAP IsoPod, connect the ScanTAP IsoPod to the Corelis boundary-scan controller using a standard 20-pin TAP cable. The Corelis boundary-scan controller should also be unpowered whenever the cable is connected/disconnected.

2. Verify that the target power is OFF.

3. Plug the TAP cable connector from the ScanTAP IsoPod into the mating target header on the UUT.

4. Make sure that the target is connected to ground.

5. Supply power to the ScanTAP IsoPod by plugging the provided 5V power adapter into the side of the box.

6. When you are ready to execute tests you can now turn the target power ON.

Applying Power

The ScanTAP IsoPod power must be supplied by the included 5V power supply provided by Corelis (Corelis P/N 4000-05V4A1R3MM). The power supply must be plugged into the same outlet or power strip as the host PC.
Signal Description

The connector pin descriptions are shown in Table 2-1. The ScanTAP IsoPod supports the 5 standard IEEE-1149.1 signals, an external write strobe signal (Write_Strobe*), an external Ready/Busy* signal, direct SPI and I²C³ programming signals, and other GPIO.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Signal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TRST*</td>
<td>Test Reset (Input to the UUT)</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TDI</td>
<td>Test Data In (Input to the UUT)</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>TDO</td>
<td>Test Data Out (Output from the UUT)</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TMS</td>
<td>Test Mode Select (Input to the UUT)</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>TCK</td>
<td>Test Clock (Input to the UUT)</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Write_Strobe* / SPI_CS2* / GPIO1</td>
<td>Discrete Output (Input to the UUT)</td>
</tr>
<tr>
<td>12</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>SPI_SCK / GPIO2</td>
<td>Discrete Input/Output (Bidirectional)</td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Ready_Busy* / SPI_SDO (MISO) / GPIO3</td>
<td>Discrete Input/Output (Bidirectional)</td>
</tr>
<tr>
<td>16</td>
<td>SPI SDI (MOSI)</td>
<td>Discrete Input/Output (Bidirectional)</td>
</tr>
<tr>
<td>17</td>
<td>GPIO4</td>
<td>Discrete Input/Output (Bidirectional)</td>
</tr>
<tr>
<td>18</td>
<td>I2C_SCL</td>
<td>Discrete Input/Output (Bidirectional)</td>
</tr>
<tr>
<td>19</td>
<td>GPIO5</td>
<td>Discrete Input/Output (Bidirectional)</td>
</tr>
<tr>
<td>20</td>
<td>SPI_CS1* / I2C_SDA</td>
<td>Discrete Input/Output (Bidirectional)</td>
</tr>
</tbody>
</table>

Table 2-1. ScanTAP IsoPod 20-pin Target Connector Pin Assignment

Note that while the signals routed through the ScanTAP IsoPod are 1:1, not all signals are bidirectional. TRST*, TDI, TDO, TMS, TCK, and GPIO1 are unidirectional, while the remaining non-GND signals are bidirectional.

³ I2C address 0x40 is a reserved address.
The Write_Strobe* signal is active low and should be pulled up with a 1K resistor on the target board. It needs to be logically OR-ed with the flash Write-Enable (WE*) signal so that assertion of either the flash Write_Enable (WE*) signal or external write strobe will assert the flash WE* input.

The Ready/Busy* signal is an open-collector/open-drain signal which is directly tied to the same signal(s) on the Flash device(s).

**Using the ScanTAP IsoPod with ScanExpress Tools**

The ScanTAP IsoPod module is compatible with ScanExpress Runner, ScanExpress Debugger and ScanExpress Programmer.

The Delay Compensation must be adjusted manually to account for the extra signal delay from the ScanTAP IsoPod and cabling. The following steps are provided for ScanExpress Runner. Adjusting the settings in ScanExpress Debugger or ScanExpress Programmer is done in a similar fashion.

1. Invoke the ScanExpress Runner application.
2. Click the **Setup** menu item and then select the **Controller** entry to display the controller **Configuration** screen shown in Figure 2-3.

![Figure 2-3. Controller Configuration Screen](image)

3. Select the boundary-scan controller that will be used with the ScanTAP IsoPod from the **Controllers** section.
4. Under **Controller Settings**, set the **TAP Voltage** to **3.30V**. The TAP Voltage must be set to 3.30V to insure proper operation.
5. Using Table 2-2 as a reference, select the test plan’s TCK Frequency and Delay Compensation under Controller Settings. The delay may need to be adjusted by ±0.5 clocks depending on the cable lengths and the selected boundary-scan controller.

<table>
<thead>
<tr>
<th>TCK Frequency</th>
<th>Delay Compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 MHz – 6.0 MHz</td>
<td>No Delay</td>
</tr>
<tr>
<td>7.5 MHz – 12.0 MHz</td>
<td>0.5 Clock</td>
</tr>
<tr>
<td>15.0 MHz – 19.0 MHz</td>
<td>1.0 Clock</td>
</tr>
<tr>
<td>20.0 MHz – 25.0 MHz</td>
<td>1.5 Clocks</td>
</tr>
<tr>
<td>28.0 MHz – 31.0 MHz</td>
<td>2.0 Clocks</td>
</tr>
<tr>
<td>34.0 MHz – 38.0 MHz</td>
<td>2.5 Clocks</td>
</tr>
<tr>
<td>41.0 MHz – 44.0 MHz</td>
<td>3.0 Clocks</td>
</tr>
</tbody>
</table>

Table 2-2. Recommended ScanTAP IsoPod Delay Compensation Settings

6. The remaining controller settings vary depending on the boundary-scan controller in use. If applicable, set the Input Threshold and Slew Rate to Automatic, and set the TAP Off State to Active.

7. After you have made your selections, click on the Apply button to save the settings. Figure 2-4 shows the ScanExpress Runner controller settings screen after the USB-1149.1/E is selected using a 10 MHz TCK frequency and 0.5 Clock delay compensation.

![Figure 2-4. USB-1149.1/E Controller Configuration Screen in ScanExpress Runner](image)
ScanTAP IsoPod Performance and Feature Tradeoffs

The ScanTAP IsoPod provides a hardware environment with higher fault tolerance at the expense of some of the more advanced features available in the Corelis boundary-scan controllers. The following list itemizes some of the tradeoffs to be aware of.

1. The ScanTAP IsoPod supports 3.3V TAP signals
2. The ScanTAP IsoPod and its cabling contributes to signal quality degradation, requiring the maximum TCK be reduce by 15% on average
3. The ScanTAP IsoPod supports JTAG test clock (TCK) frequencies up to 40 MHz
4. The ScanTAP IsoPod supports I2C and SPI direct programming speeds up to 1 MHz
5. The ScanTAP IsoPod supports one TAP (additional ScanTAP IsoPod units can be added if support for more TAPs is required)
6. The ScanTAP IsoPod requires an external power supply
7. The ScanTAP IsoPod delay compensation is applied to each test step in a test plan. As a result test steps with different TCK rates configured in the options may fail. In order to ensure these steps do not fail, it is advised not to use the options to change the TCK rate for an individual test step.
8. The ScanTAP IsoPod has a fixed pinout and does not support the configurable TAP signal assignment feature
9. The ScanTAP IsoPod does not support any custom controller settings for Input Threshold, Slew Rate and TAP Off State features
10. The ScanTAP IsoPod completely isolates the UUT’s signals from the boundary-scan controller’s so it does not support voltage measurement or power/ground short testing
11. The ScanTAP IsoPod uses I2C address 0x40 for internal communication with the Corelis boundary-scan controller so this address is not available for I2C direct programming

Troubleshooting

Use the following general guidelines to troubleshoot problems such as boundary-scan tests failing during execution when the ScanTAP IsoPod is added to the test system.

1. Make sure power is being supplied to the ScanTAP IsoPod, the boundary-scan controller, and the target. The ScanTAP IsoPod’s blue LED will be illuminated if power is being supplied to the ScanTAP IsoPod module.
2. Make sure that the controller’s TAP voltage is set to 3.30V and the delay compensation is set in the controller Configuration window correctly. Use Table 2-2 as a guideline for selecting the proper delay compensation. Sometimes delay can be introduced by long cables or buffering in the target board design and the default delay compensation settings will require some manual adjustment.
3. Reduce the test clock frequency (TCK) to 1 MHz. The TCK frequency is commonly set too high for the chain and using a lower frequency will allow the test steps to pass. Once the scan chain is known to be stable the TCK frequency can then be increased to the maximum frequency that will allow the test steps to pass.
4. Make sure that the target interface is indeed a 3.3V interface. Probe the voltages on the target TAP to verify the voltages are being applied correctly.

5. Check the target connector to make sure that the pinout matches the ScanTAP IsoPod pinout.

6. You will need to revert the controller’s Delay Compensation setting back to Automatic if you remove the ScanTAP IsoPod from the test setup.