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CORELIS

NetUSB-1149.1

NetUSB-1149.1 High-Speed LAN/USB2.0 Boundary-Scan Controller

User's Manual

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Chapter 1
Product Overview

Introduction

The NetUSB-1149.1, NetUSB-1149.1/E and NetUSB-1149.1/SE High-Speed Boundary-Scan (JTAG) Controllers are members of the Corelis ScanPlus™ and ScanExpress™ family of scan-based test, analysis, and diagnostic tools. They are managed by a PC host, which is linked with either a USB2.0 (compatible with USB1.1) interface, or over 10/100 Ethernet network. Under host direction, the NetUSB-1149.1, NetUSB-1149.1/E and NetUSB-1149.1/SE test one or more IEEE Standard 1149.1 compatible target board (UUT). The NetUSB-1149.1 family is designed to control the operation of one or more IEEE Standard 1149.1 boundary-scan (JTAG) test access ports (TAPs) by generating the proper signals as dictated by software. This provides stimulus and accepts response signals of the attached customer target circuits, enabling their testing and/or programming. This capability is supported by memory-behind-the-pin architecture driving scan operations at continuous JTAG clock (TCK) speeds of up to 70 MHz.

The NetUSB-1149.1 family facilitates software-controlled boundary-scan operations per the IEEE Standard 1149.1. It provides command visibility to the target's Test Access Port (TAP), accessing device internal registers and on-chip debugger, verifying PCB interconnects, performing functional testing, and debug without manual probing. The JTAG interface provides access to internal device functions that are not accessible via external probing, enabling fault isolation within the device itself. The JTAG interface also enables programming target FLASH and CPLD devices, as well as data downloading and uploading to and from the target memory devices.

Either of the NetUSB-1149.1 type controllers can also be used to perform microprocessor emulation via that device's JTAG port. This facilitates firmware development by providing single-step, break, and content update/visibility access.

There are three models of this product. The basic NetUSB-1149.1 (no /E or /SE suffix) has scanning access through a single SCSI II 68-pin connector. This supports a single direct target TAP operation with the appropriate cable. With a different cable type, it implements the Corelis ScanExpress expansion bus to operate a remote intelligent pods, such as the ScanTAP-4, ScanTAP-8, ScanTAP-32, or ScanHUB (in turn accessing more of the ScanTAP intelligent pods). The NetUSB-1149.1/E and NetUSB-1149.1/SE models are capable of scanning multiple TAPs concurrently when used with the ScanExpress Runner software which is sold separately.

The NetUSB-1149.1/E model is similar to the NetUSB-1149.1 above, but has the equivalent of a ScanTAP-4 remote pod built-in as an integral resource, enabling it to operate up to four boundary-scan TAPs simultaneously. Note that the external SCSI connector on this unit is not used and no external ScanTAP pod is required.

The NetUSB-1149.1/SE model is similar to the NetUSB-1149.1/E except that it contains a built in ScanTAP-8 pod as an integral resource, enabling it to operate up to eight target TAPs simultaneously, with no other external equipment And therefore the NetUSB-1149.1/SE model does not use the external SCSI connector.

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The versions offered at the time of this publication are shown in Table 1-1 below.

P/N	Model Description	Scan Connector
10338	NetUSB-1149.1, direct TAP or remote pod ScanExpress port	68-pin SCSI II
10337A	NetUSB-1149.1/E, four built-in TAP ports	four 20-pin TAP headers
10339	NetUSB-1149.1/SE, eight built-in TAP ports	eight 20-pin TAP headers

Table 1-1. Model Descriptions



Figure 1-1. The Corelis NetUSB-1149.1 Boundary-Scan Controller

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Figure 1-2. The Corelis NetUSB-1149.1/E Boundary-Scan Controller



Figure 1-3. The Corelis NetUSB-1149.1/SE Boundary-Scan Controller

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What Is IEEE Standard 1149.1?

The IEEE Standard 1149.1 Test Access Port (TAP) and boundary-scan architecture enable control of an IC, board, or system, via a standard four-signal interface. Each IEEE-1149.1 compliant IC incorporates a feature known as boundary-scan, which ensures that a JTAG controller can control and observe each functional pin of the IC via the JTAG interface. A controller can load test, debug, or initialization patterns serially into the appropriate IC(s) via the IEEE-1149.1 TAP. Thus, even with limited physical access, a user can observe or control IC, board, or system functions.

Two main elements comprise the IEEE Standard 1149.1 test Port: a Test Access Port (TAP), which interfaces internal IC logic with the external world via a four-signal (optionally five-signal) Port as shown in Figure 1-4**,** and a boundary-scan architecture, which defines standard boundary cells that drive and receive data at the IC pins. IEEE Standard 1149.1 also defines both mandatory and optional OPCODES and test features. The test Port signals are: Test Clock (TCK), Test Mode Select (TMS), Test Data In (TDI), Test Data Out (TDO), and the optional Test Logic Reset (TRST).

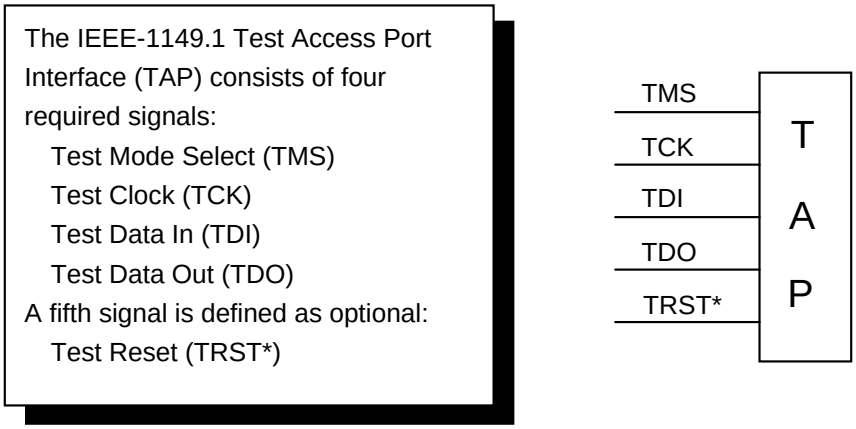


Figure 1-4. Minimal Test Access Port (TAP)

Features of the NetUSB-1149.1

The Corelis NetUSB-1149.1 family includes the NetUSB-1149.1, NetUSB-1149.1/E and the NetUSB-1149.1/SE models. It is a high performance boundary-scan test and programming controller that can access devices, boards or systems compliant with IEEE Standard 1149.1. It has two distinct host PC access ports for easy deployment, including USB 2.0 (also compatible with USB 1.1) and Ethernet 10/100baseT, only one of which manages operations at a time. If a host connection is made both at the Ethernet and USB ports, the USB access controls operation.

These scan controllers drive one or more JTAG boundary-scan chains (TAP), depending on module type and/or attachment of external pods (ScanTAP-x). Included per TAP are a number of input and/or output discrete signals available to test or control non-boundary-scan areas of the unit under test (UUT) target. They facilitate non-scanned target FLASH write pulsing and FLASH ready/busy line sensing to greatly reduce the scanning cycles required for such devices. With its software-controlled voltage translating logic, the NetUSB-1149.1 family can test low voltage as well as standard TTL/CMOS systems.

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The NetUSB-1149.1 family contains several performance enhancing functional sections aimed at increasing test vector throughput. Key elements include the TAP controller, and the memory resources that support it. The large on-board memory provides scan data storage and can often hold the data for an entire scan, maximizing performance and enabling real-time operations.

A test system accesses the TAP controller and its associated memory by host management communications. This is supported by the high data rate of the USB 2.0 or Ethernet 10/100baseT links, regardless of actual TCK test clock speeds. The ability to download information into these memory elements decouples the scan operations from the host software. A state machine that contains status and control registers accessible to the host controls all functions of the NetUSB-1149.1 controllers.

The NetUSB-1149.1 family TAP controllers contain special autonomous hardware accelerator mechanisms to greatly increase performance where scan patterns repeat numerous times. This applies to target download/upload sequence loops, which convey large data blocks. As a result, time consuming tasks such as flash programming and emulator data transfers are more efficient for a given clock rate. This mechanism off-loads the host interaction requirements by generating repeated vectors internally, using host pre-loaded memory information. After host initialization, this mode of operation results in continuous, maximal scanning rates at all clock frequencies. The only exception occurs when the target paces the sequence by indicating a non-ready completion of data transfer, requiring a re-scan of the target's status. When not in this special autonomous mode, the scan stream bursts at the programmed TCK rate, as paced by the flow of vector bits from the host.

Another performance enhancement provides hardware expected-value verification of scanned-back data at programmable chain positions. Thus, the target output stream is evaluated for each TAP without host intervention and accompanying process delays. This also supports the above autonomous operation enabling the scanning sequence to loop and rescan until the desired feedback is supplied, without host intervention.

A programmable, time delay skew compensation mechanism supports the NetUSB-1149.1 family high clock rates. This accommodates the returned target scan bit delays due to signal travel time down and up the cables. It can also adjust for a target's on-board TCK-to-TDO response delay.

An auxiliary feature of the NetUSB-1149.1 family is the target power-shorted detector for two voltages. With the target un-powered, this mechanism effectively measures the impedance of the target load for each of two possible connected voltages, determining if a short exists (some unacceptably low impedance). If this impedance is less than about 1 ohm (about an 11 watt target or more at 3.3V, for example), it is deemed shorted and reported to the user.

Adjustable Voltage Interface

The software-programmable voltage level of the discrete I/O and TAP interface can be set to any voltage between 1.25 V and 3.30 V with 0.05V resolution .

Discrete Input/Output Signals

SCSI Connector Direct TAP Port

The NetUSB-1149.1 family offers 3 discrete input and 5 discrete output signals on the SCSI connector (front panel). They are driven or sensed under host software control, in coordination with the scanning operation. All of these signals track the software adjustable interface voltage level.

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One of the discrete inputs is designated a FLASH ready/busy handshake input, enabling the direct (non-scanned) pacing of device programming. This avoids the need to scan in this information, speeding up the overall process.

One of the discrete outputs is dedicated as an external write pulse signal. This can reduce cycle times by directly driving (non-scanned) the FLASH device, without the need to scan it out.

The other 4 outputs are generally useful for providing control functions on the user target system such as reset, power control, and disable/enable signals for non-boundary-scan target devices. Further, the additional 2 inputs enable host sensing of the target as a pacing method.

If open-collector mode is selected, the external write and two of the general discretes (porta_out0, and porta_out1) operate that way, while the other two general discrete output will float. Otherwise, all 5 outputs will operate as adjustable voltage totem-pole.

Built-in or Remote Pod TAP Ports

The NetUSB-1149.1 with an external pod (ScanTAP-x), the NetUSB-1149.1/E with 4 built-in TAP ports or the NetUSB-1149.1/SE with 8 built-in TAP ports provide 3 discrete bi-directional input/output signals. These are independently direction steer-able under software control, as well as capable of open-collector (open-drain) drive operation. Here also, one can function as the FLASH external write strobe and another as the FLASH ready/busy sense signal, as above, for accelerated operations.

USB Port Interface

The NetUSB-1149.1 family USB interface complies with the version 2.0 standard with backward compatibility to version 1.1 (excluding low speed). Speed adjustment is automatic per the standard. The hot-plug feature of this standard is fully supported such that attachment is easily made to a running PC, which will automatically sense its presence. For optimal performance, the user is strongly recommended to utilize a host PC with a USB 2.0 port. This interface serves as one of two host access points, only one of which operates the controller at a time.

Ethernet Port Interface

This serves as an alternate host access point to the USB interface. The NetUSB-1149.1 family Ethernet interface supports 10/100baseT with automatic speed switching. It is IEEE 802.3u 100BASE-FX compatible.

RS-232 Serial Maintenance Port Interface

THIS IS FOR FACTORY USE ONLY … As delivered, this port is disabled on all NetUSB-1149.1 products.

The NetUSB-1149.1 family serial port is provided for trouble shooting purpose only at the factory. During normal operation, users should not need to access this port. Its connector is a female DB9, wired with a DTE pin-out. The default communications parameters are 115200 baud, 8 bits, no parity, 1 stop bit, XON/XOFF flow control. This port should be connected to a PC on COM1 using a NULL modem cable.

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Programmable Clocks

The NetUSB-1149.1 family's programmable TCK output to the IEEE Standard 1149.1 compatible target system can be generated with a wide range of frequencies using on-board clock generation circuitry. A programmable Phase Locked Loop (PLL) and counter dividers enable both an agile and fine resolution set of rates. See Table 1-2 for the set of programmable values.

TCK range (MHz)	Rate Resolution (MHz)
25 to 70	1.0
12.5 to 25.0	0.5
6.25 to 12.5	0.25
5.0 to 6.25	0.125
2.5 to 5.0	0.10
1.25 to 2.5	0.05
0.62 to 1.25	0.025
0.39 to 0.62	0.0156
0.05 to 0.39	0.05

Table 1-2. Programmable TCK Frequencies

Other Features of the TAP Ports

Besides the direct target TAP operation, NetUSB-1149.1 (not the NetUSB-1149.1/E or NetUSB-1149.1/SE) can operate a remote pod, such as the Corelis ScanTAP-x or ScanHUB family. By special differential signaling methods, and automatic propagation delay compensation, such remote pods can employ cables up 30 feet in length, with no additional hardware, at full TCK rate performance.

The 8 TAPs of the NetUSB-1149.1/SE, the 4 TAPs of the NetUSB-1149.1/E, or the remote pod TAPs driven by the NetUSB-1149.1 can be programmed to daisy-chain sub-sets of the TAP ports into single chains. During gang (concurrent) TAP operations, all targets can be scanned simultaneously. While scanning, each TAP returns scanned in information that is compared against expected patterns for verification and possible mismatch error detection. An unexpected pattern on any individual TAP will be logged, but need not necessarily stop the scan session for the others. This method supports rapid FLASH content validation, for example, for a large set of targets. Failed targets are isolated while the checking the others continues to completion.

The JTAG scanning signals can be programmed to transition at fast or slow rates, although by default, the software selects this based on requested TCK clock rate. This feature has some

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limitations due to adjustable voltage level and available configurations for discrete I/O lines. This is offered to aid in system signal noise management.

Another significant feature is that each TAP can detect a target power short to ground for up to 2 voltages per TAP, allowing the ScanTAP-4 to discover potentially damaging conditions before the target system(s) is powered up.

Specifications

Host Computer

CPU	Pentium III @ 1 GHz or better, with USB 2.0 or 1.1 (2.0 strongly recommended for top performance), or 10/100 LAN interfaces.
Operating System	Windows 2000 SP2, XP (Linux support is available for Scan Function Library)

Host Interface Compliance

USB	2.0 (backward compatible to 1.1, excluding low speed)
Ethernet	10/100baseT, IEEE 802.3u 100BASE-FX

I/O Cable Connectors

USB Connector	Standard USB type B socket
Ethernet Connector	Standard RJ-45 socket
Boundary Scan Connector	68-pin SCSI II type (AMP P/N 787171-7 or equivalent)
TAP1, TAP2, TAP3, TAP4 (NetUSB-1149.1/E model only)	Four 2x10 pin shrouded headers, 0.1 in. × 0.1 in. spacing with long ejectors (3M 3428-6302 or equivalent)
TAP1, TAP2, TAP3, TAP4, TAP5, TAP6, TAP7, TAP8 (NetUSB-1149.1/SE model only)	Eight 2x10 pin shrouded headers, 0.1 in. × 0.1 in. spacing with long ejectors (3M 3428-6302 or equivalent)
Serial Port (factory use only)	Standard female DB9 socket

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Physical Dimensions

NetUSB-1149.1	5.2 in. x 7.1 in. x 1.0 in.
NetUSB-1149.1/E	5.2 in. x 7.1 in. x 1.5 in.
NetUSB-1149.1/SE	5.2 in. x 7.1 in. x 1.9 in.

TAP Interface

TCK frequency range	0.05 MHz to 70 MHz
Maximum scanning data length	Virtually unlimited
Signal DC Characteristics	See Table 1-3, Table 1-4 and Table 1-5:

Symbol	Test Conditions	Limit Min	Limit Max	Units
V_{IH}	Vdd Adjust = 3.0 V	2	Vdd Adjust	V
V_{IL}	Vdd Adjust = 3.0 V		0.8	V
V_{OH}	I_{OH}= 4 mA Vdd Adjust = 3.0V	2.3		V
V_{OL}	I_{OL} = -12 mA Vdd Adjust = 3.0V		0.7	V

Table 1-3. NetUSB-1149.1 SCSI Direct TAP Target Interface DC Characteristics

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Symbol	Test Conditions	Limit Min	Limit Max	Units
V_{IH}	Vdd Adjust >= 2.5 V	2	Vdd + 0.5	V
	Vdd Adjust < 2.50 V	0.65 × Vdd	Vdd + 0.5	V
V_{IL}	Vdd Adjust >= 2.00		0.7	V
	Vdd Adjust <= 2.0		0.35 × Vdd	V
V_{OH}	I_{OH}= -2 mA	Vdd – 0.35		V
V_{OL}	I_{OL} = 2 mA Vdd =1.65 V		0.45	V
I_{OH}	Vdd = 1.65-1.95 V		-4	mA
I_{OL}	Vdd = 1.65-1.95 V		4	mA

Table 1-4. NetUSB-1149.1/E TAPs Target Interface DC Characteristics

Symbol	Test Conditions	Limit Min	Limit Max	Units
V_{IH}	Vdd Adjust >= 2.5 V	2	Vdd + 0.5	V
	Vdd Adjust < 2.50 V	0.65 × Vdd	Vdd + 0.5	V
V_{IL}	Vdd Adjust >= 2.00		0.7	V
	Vdd Adjust <= 2.0		0.35 × Vdd	V
V_{OH}	I_{OH}= -2 mA	Vdd – 0.35		V
V_{OL}	I_{OL} = 2 mA Vdd =1.65 V		0.45	V
I_{OH}	Vdd = 1.65-1.95 V		-4	mA
I_{OL}	Vdd = 1.65-1.95 V		4	mA

Table 1-5. NetUSB-1149.1/SE TAPs Target Interface DC Characteristics

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SPI Interface (NetUSB-1149.1/E with Blue LED Only)

SCK frequency 1 MHz
Signal DC Characteristics See Table 1-6:

Symbol	Test Conditions	Limit Min	Limit Max	Units
V_{IH}	Vdd Adjust >= 2.5 V	2	Vdd + 0.5	V
	Vdd Adjust < 2.50 V	0.65 × Vdd	Vdd + 0.5	V
V_{IL}	Vdd Adjust >= 2.00		0.7	V
	Vdd Adjust <= 2.0		0.35 × Vdd	V
V_{OH}	I_{OH}= -2 mA	Vdd – 0.35		V
V_{OL}	I_{OL} = 2 mA Vdd =1.65 V		0.45	V
I_{OH}	Vdd = 1.65-1.95 V		-4	mA
I_{OL}	Vdd = 1.65-1.95 V		4	mA

Table 1-6. NetUSB-1149.1/E SPI Interface DC Characteristics

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I2C Interface (NetUSB-1149.1/E with Blue LED Only)

The NetUSB-1149.1/E I2C interface has open-drain outputs and the SDA/SCL signals must be pulled up to 3.3V (V_{DD}) by the target.

SCL frequency	100 kHz
Signal DC Characteristics	See Table 1-7:

Symbol	Test Conditions	Limit Min	Limit Max	Units
V_{DD}		3.0	3.6	V
V_{IH}	V_{DD} >= 3.3 V	2.0	3.6	V
V_{IL}	V_{DD} >= 3.3 V	-0.5	0.8	V
V_{OL}	I_{OL} = 16 mA V_{DD} = 3.3 V	0.0	0.4	V
I_{OL}	V_{DD} = 3.3 V		16	mA

Table 1-7. NetUSB-1149.1/E I2C Interface DC Characteristics

Power Requirements

5 V +/-5%	4 A maximum

On-board Fuse (feeds power from NetUSB-1149.1 to external pod)

1.5 Amp, SLO-BLO	Littelfuse part number 045401.5

Operating Environment

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

Storage Environment

Temperature	-40°C to 85°C

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Chapter 2
NetUSB-1149.1 Installation

The NetUSB-1149.1 product family typically consists of the following components:

- NetUSB-1149.1 or NetUSB-1149.1/E or NetUSB-1149.1/SE boundary-scan controller module
- This NetUSB-1149.1 User's Manual
- A set of four 20-pin to 10-pin TAP cables, Corelis P/N 15310 (NetUSB-1149.1/E model only)
- A set of eight 20-pin to 10-pin TAP cables, Corelis P/N 15310 (NetUSB-1149.1/SE model only)
- One SCSI to 10-pin TAP cable, Corelis P/N 15298 (NetUSB-1149.1 model only)
- Standard USB 2.0 compatible cable, A-to-B type
- Standard LAN cable, RJ45 compatible

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.

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Software Installation First!

The installation procedure requires the use of software that contains the driver for the NetUSB-1149.1 family modules. Obtain the ScanExpress CD-ROM (or any other Corelis application that supports the NetUSB-1149.1 family) in order to proceed with installation. **Install the ScanExpress Application Software before installing one of the NetUSB-1149.1 controllers.** The NetUSB-1149.1 family controller is a hot-plug USB device, and its drivers are installed with the ScanExpress Application Software. Windows will automatically recognize and configure the controller the first time it is detected in your system after the driver is installed. When connected to an Ethernet network, it becomes visible to all hosts on the system.

WARNING !

You MUST install the software first – before installing the controller. **Do not install the either of the NetUSB-1149.1 modules until you have successfully installed the driver and application software** (ScanExpress, CodeRunner, etc.). Installing the software provides the hot-plug USB driver for the card so that the operating system is able to properly detect and configure the card. Installing the controller before the software may result in improper card configuration and operation.

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Hardware Installation

Again, make sure to **install the ScanExpress Application Software before installing either of the NetUSB-1149.1 controllers.** The controller is a hot-plug USB device, and its drivers are installed with the ScanExpress Application Software. After that, Windows will automatically recognize and configure the NetUSB-1149.1 the first time it is detected in your system. Windows XP may issue a warning the first time the module is plugged-in, indicating that the device driver is not digitally signed by Microsoft. You can safely ignore this warning and continue with the driver installation.

If an external pod (ScanTAP-4 for example) is to be connected to the Expansion Port, complete the hook-up at both ends prior to powering up the NetUSB-1149.1.

To connect the relevant NetUSB-1149.1 model controller to the host PC using the **USB** link:

1. Install ScanExpress Applications from the CD.
2. Only after software is successfully installed, plug the provided USB 2.0 compatible cable and connect any available USB mating connector on your PC to the NetUSB-1149.1 box.

To install either of the NetUSB-1149.1 controllers on a host PC over the **Ethernet** link:

1. Install ScanExpress Applications from the CD.
2. Only after software is successfully installed, plug the provided USB 2.0 compatible cable and connect any available USB mating connector on your PC to the NetUSB-1149.1 box.
3. Start NetUSBConfig.exe which can be found in the installation directories of ScanExpress Runner, Programmer or Debugger. (By default these applications are installed in the local hard drive at C:\Program Files\ScanExpress Runner, C:\Program Files\ScanExpress Programmer, C:\Program Files\ScanExpress Debugger) A dialog box as shown in Figure 2-1 will pop up.
4. Click on the Query button to read the current network configuration.
5. Change the settings as required and click on Configure button to save it. Note that the controller uses port 6470 when communicating over the network. If the controller is behind a firewall, make sure to open port 6470.
6. Remove the USB cable from the NetUSB-1149.1 controller. If the cable remains connected, the controller will not respond to network connection since it defaults to USB connection first.
7. Power off the unit and power it back on to have the new settings to take effect.

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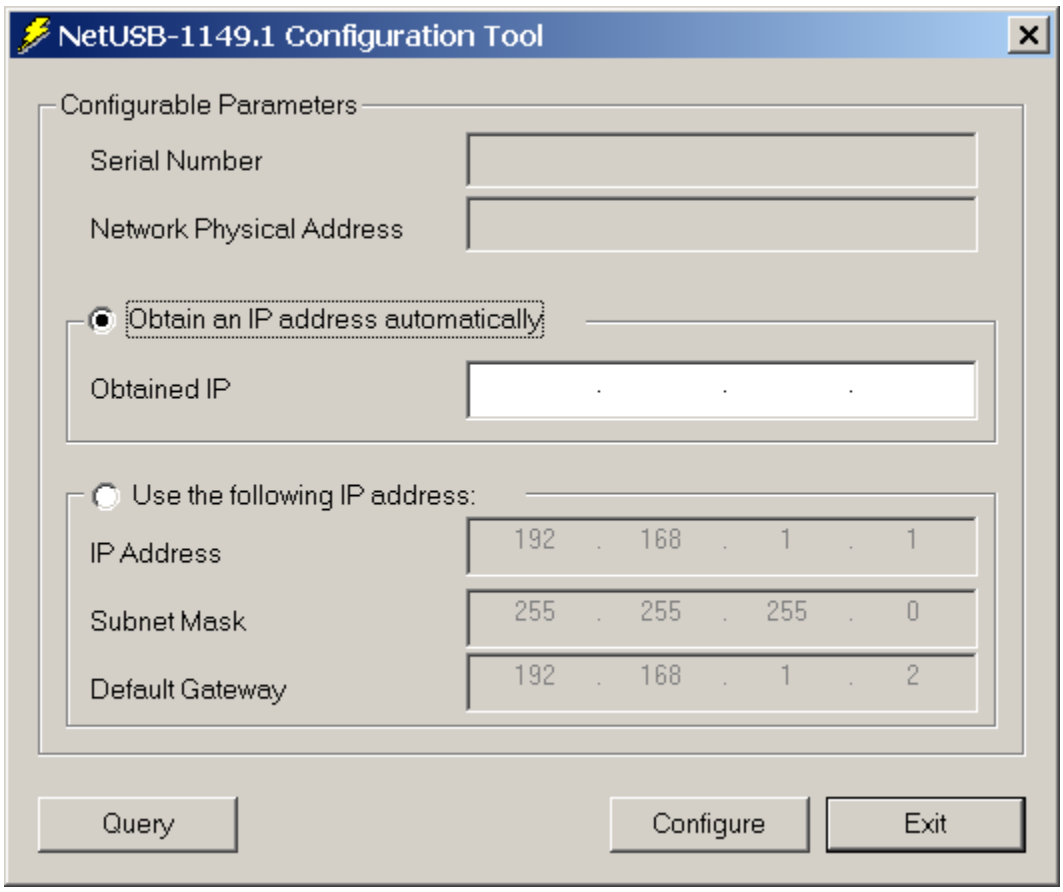


Figure 2-1. NetUSB-1149.1 Configuration Utility

Preserve the original packing material for future shipment or storage of the controller.

In the event that you installed either of the NetUSB-1149.1 controllers before installing the software, unplug the module, **cancel** the **Add/Remove Hardware Wizard** (that will automatically show up when you use Windows 2000 or Windows XP operating system) and install the ScanExpress Applications from the CD. The next time you start the PC and plug in the controller, Windows will automatically recognize and configure it.

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Chapter 3
Connecting to the Target

Connecting to the Target

Appendix A contains general recommendation for implementing compatible target TAP connector(s). Following these recommendations in the target design makes connecting a target to either of the NetUSB-1149.1 controllers easy and straightforward.

To accommodate target boards with TAP connectors in addition to the above standards, Corelis offers short, custom adapter cables for third-party connectors such as the Altera ByteBlaster connector, the Xilinx 9 pin header, the Lattice TAP connector or the TI 14 pin DSP connector).

NetUSB-1149.1

This type of controller attaches to a target (UUT) either via the SCSI to 10 pin cable, or remotely using an intelligent pod such as a ScanTAP-4 (sold separately). In the case of the external ScanTAP type pod, multiple targets may be scanned, with the attachment method similar to that of the NetUSB-1149.1/E below.

For the direct single target attachment of this controller, connect the SCSI to 10-pin TAP cable to the controller's SCSI connector. The other end of the cable plugs into the target TAP connector.

NetUSB-1149.1/E

This type of controller connects from one to four targets (UUTs) via its 4 TAP connectors. Using the provided 20-pin to 10-pin TAP cables, plug into any of connectors on top of the controller (except for ganged scanning, where they must be consecutive TAP ports). The other end of the cables attach to the set of targets at their TAP connector. This arrangement is identical to that of hooking up a remote ScanTAP-4.

NetUSB-1149.1/SE

This type of controller connects from one to eight targets (UUTs) via its set of TAP connectors. Using the provided 20-pin to 10-pin TAP cables, plug into any of connectors on top of the controller (except for ganged scanning, where they must be consecutive TAP ports). The other end of the cables attach to the set of targets at their TAP connector. This arrangement is identical to that of hooking up a remote ScanTAP-8.

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Target Connector Pin Assignments

The following tables enumerate the target-end pin numbers for each of the NetUSB-1149.1 family cable connectors.

Pin	Signal	Direction	NetUSB-1149.1 side Termination
1	TRST*	Input to the UUT	33 ohm series
2	GND		
3	TDI	Input to the UUT	33 ohm series
4	GND		
5	TDO	Output from the UUT	4.7k ohm pull-up
6	GND		
7	TMS	Input to the UUT	33 ohm series
8	GND		
9	TCK	Input to the UUT	33 ohm series
10	GND		

Table 3-1. TAP Cable Target Pin Assignments

Pin 1 can be easily identified by a red stripe on the flat cable and also by the small triangle arrow that is engraved on the flat cable IDC type socket connector. See Appendix for recommended target connector.

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Chapter 4
Using NetUSB-1149.1 with ScanExpress

Hardware Setup

You must configure the particular NetUSB-1149.1 controller model that you are using inside the ScanExpress (or ScanPlus) application before the application can use it. This chapter uses ScanExpress Runner as an example to illustrate the configuration process.

Using NetUSB-1149.1 Family with ScanExpress Tools over a Network Connection

The NetUSB-1149.1 family modules are compatible with ScanExpress Runner, ScanExpress Debugger and ScanExpress Programmer. The following steps are provided for ScanExpress Runner. Selecting the module in ScanExpress Debugger or ScanExpress Programmer is done in a similar fashion.

1. Make sure that NetUSB-1149.1 controller is plugged in to network port and is properly configured with desired network settings. Wait 10 to 15 seconds before starting ScanExpress Applications if you just powered up the controller.
2. Invoke the ScanExpress Runner application.
3. Click the **Setup** menu item and then select the **Controller** entry to display the Controller Configuration screen shown in Figure 4-1.

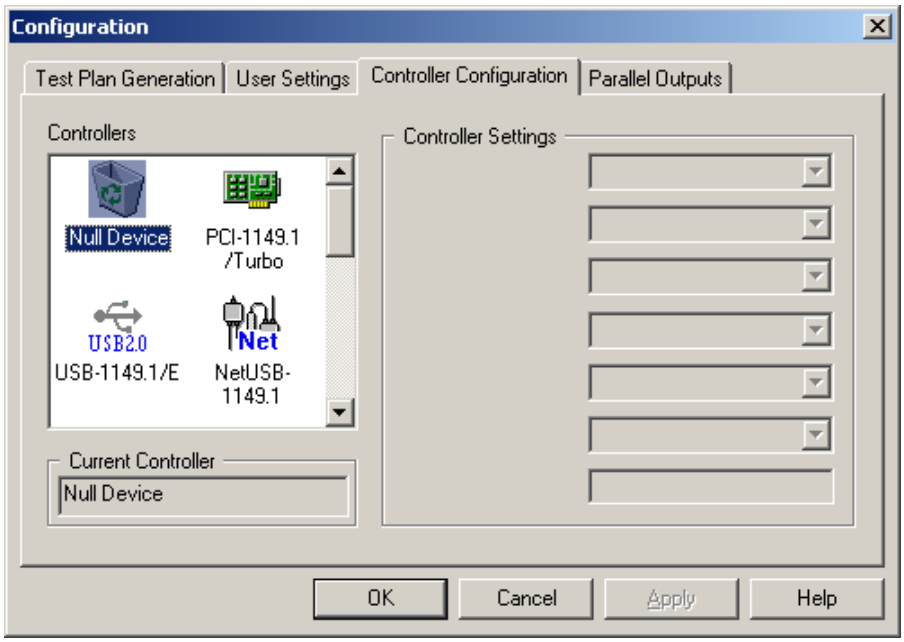


Figure 4-1. Controller Configuration Screen

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4. Select the **NetUSB-1149.1/Net** controller from the icons on the left. Adjust the settings to the desired values. Note that the controller uses port 6470 when communicating over the network. If the controller is behind a firewall, make sure to open port 6470.

5. After you have made your selections, click on the **Apply** button to test and save the settings. When the program saves the settings successfully, it displays the controller in the **Current Controller** box. If ScanExpress Runner cannot find the controller, it displays an error dialog.

6. Once ScanExpress Runner finds the NetUSB-1149.1 controller, it displays a screen similar to Figure 4-2.

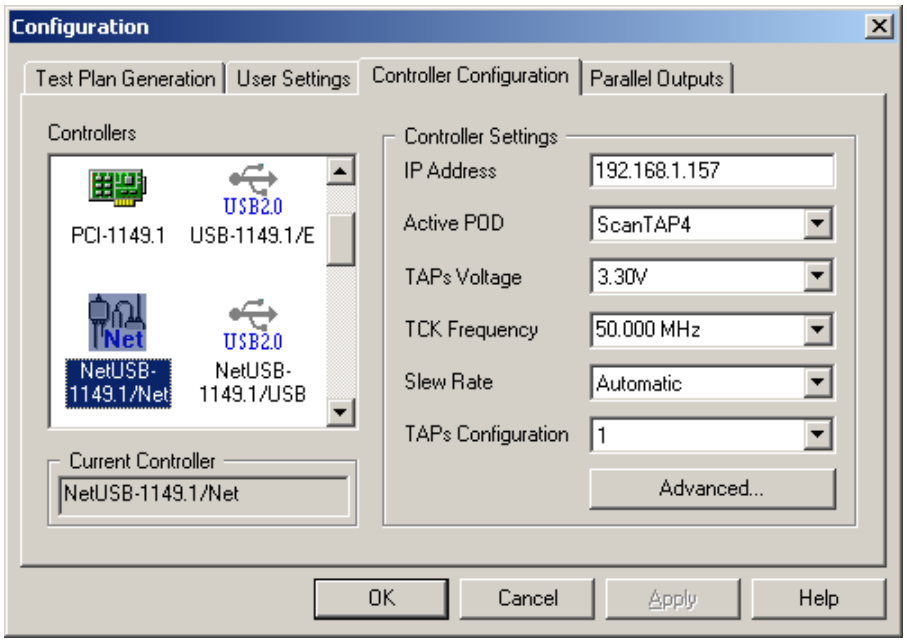


Figure 4-2. NetUSB-1149.1 Setup Screen

7. It is important that the users select the correct Active POD. The NetUSB-1149.1 controller has no built in Active POD. The NetUSB-1149.1/E has a ScanTAP-4 built in. The NetUSB-1149.1/SE has a ScanTAP-8 built in. If an incorrect Active POD is selected, the following error message will pop up.



Figure 4-3. Incorrect Active POD Selected

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8. The **Advanced** button can be used for selecting different voltage settings for each individual TAP. While most targets with multiple TAPs use the same voltage settings for all the TAPs it is not uncommon to find targets that use, for example, the 3.3 V setting for one TAP, 2.5 V for another, and 1.8 V for one or two additional TAPs. The Advanced Configuration screen is shown in Figure 4-4.

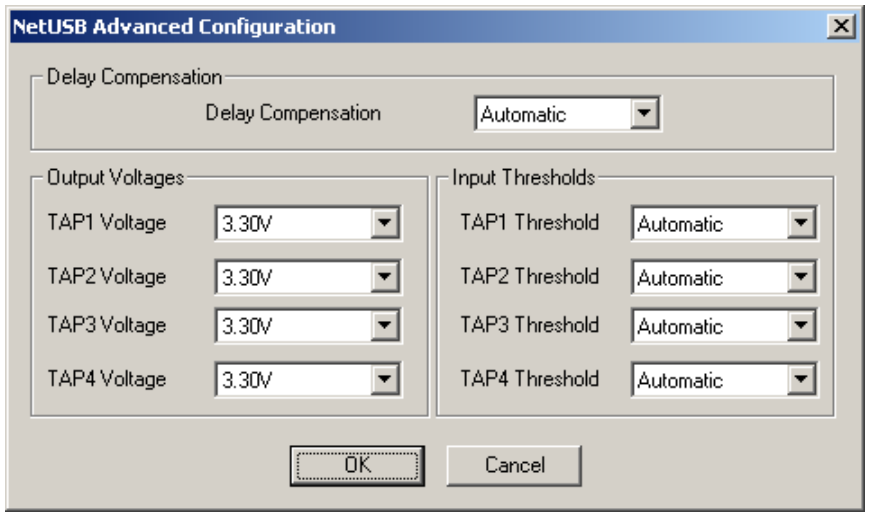


Figure 4-4. Advanced Configuration Setup Screen

Using NetUSB-1149.1 Family with ScanExpress Tools over a USB Connection

The following steps are provided for ScanExpress Runner. Selecting the module in ScanExpress Debugger or ScanExpress Programmer is done in a similar fashion.

1. Make sure that NetUSB-1149.1 controller is plugged in to USB port. Wait 10 to 15 seconds before starting ScanExpress Applications if you just powered up the controller.
2. Invoke the ScanExpress Runner application.
3. Click the **Setup** menu item and then select the **Controller** entry to display the Controller Configuration screen shown in Figure 4-1.
4. Select the **NetUSB-1149.1/USB** controller from the icons on the left. Adjust the settings to the desired values.
5. After you have made your selections, click on the **Apply** button to test and save the settings. When the program saves the settings successfully, it displays the controller in the **Current Controller** box. If ScanExpress Runner cannot find the controller, it displays an error dialog.
6. Once ScanExpress Runner finds the NetUSB-1149.1 controller, it displays a screen similar to Figure 4-5.

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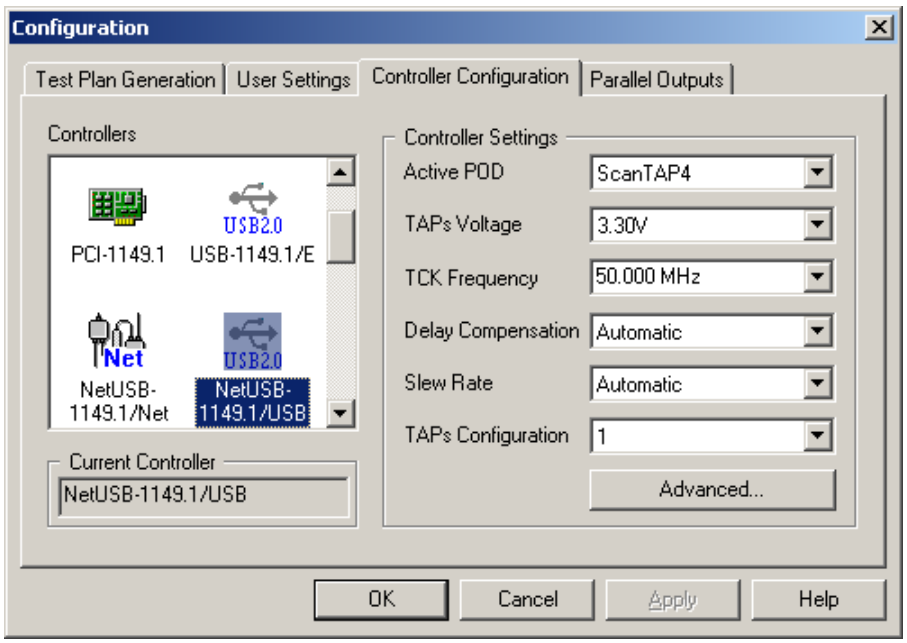


Figure 4-5. NetUSB-1149.1 Setup Screen

7. It is important that the users select the correct Active POD. The NetUSB-1149.1 controller has no built in Active POD. The NetUSB-1149.1/E has a ScanTAP-4 built in. The NetUSB-1149.1/SE has a ScanTAP-8 built in. If an incorrect Active POD is selected, the following error message will pop up.



Figure 4-6. Incorrect Active POD Selected

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8. The **Advanced** button can be used for selecting different voltage settings for each individual TAP. While most targets with multiple TAPs use the same voltage settings for all the TAPs it is not uncommon to find targets that use, for example, the 3.3 V setting for one TAP, 2.5 V for another, and 1.8 V for one or two additional TAPs. The Advanced Configuration screen is shown in Figure 4-4.

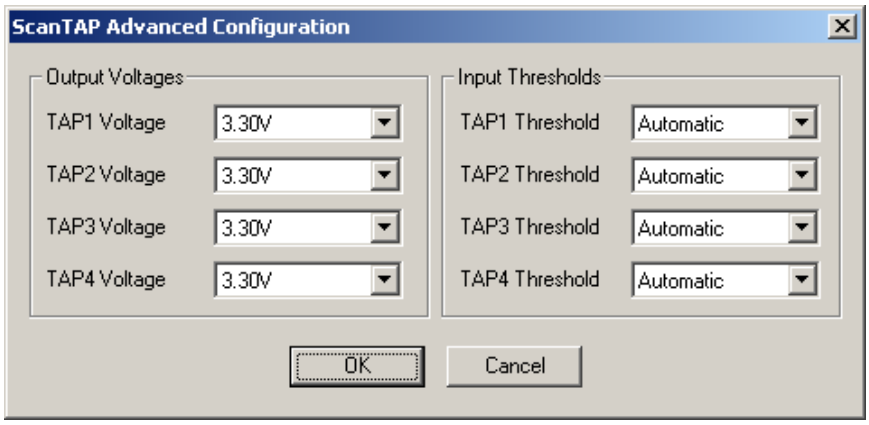


Figure 4-7. Advanced Configuration Setup Screen

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Chapter 5
Third Party Application Interface

ScanExpress Runner provides a general purpose, third-party application interface that includes specifying the correct controller card and settings. This section clarifies the requirements related to the NetUSB-1149.1 card and to the ScanTAP-4. Refer to the ScanExpress Runner manual for further information.

Using NetUSB-1149.1 with ScanExpress Runner Command-line

You can invoke ScanExpress Runner with special command line parameters to execute a Test Step file, provide test results and diagnostic messages in a log file (if you have the ScanExpress Runner ADO), and then terminate. The following table shows the controller identifiers and associated parameters. Consult the ScanExpress Runner User's Manual for more detail.

The NetUSB-1149.1 controller over network connection uses 15 parameters. The parameters are described in the table below.

Controller keyword: **NetUSB-1149.1/Net**

Position	Parameter	Value	Setting
1	IP Address	(string)	IP Address (ie: 192.168.1.2)
2	Active POD	1 2 3 4 5 6	None ScanTAP4 (ie: NetUSB-1149.1/E version) ScanTAP8 (ie: NetUSB-1149.1/SE version) ScanTAP32 ChipTester HighSpeedPOD
3	TAPs Voltage	1 2 … 41 42 43	1.25 V 1.30 V … (0.05 volts per step) 3.25 V 3.30 V Use advanced voltage settings in position 8 through 11

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Position	Parameter		Value	Setting
4	Clock Frequency		31 … 76 77 … 101 102 … 126 127 … 136 137 … 161 162 … 186 187 … 211 212 … 226 227 … 233	70 MHz … (1 MHz increment) 25 MHz 24.5 MHz … (0.5 MHz increment) 12.5 MHz 12.25 MHz … (0.25 MHz increment) 6.25 MHz 6.125 MHz … (0.125 MHz increment) 5 MHz 4.9 MHz … (0.1 MHz increment) 2.5 MHz 2.45 MHz … (0.05 MHz increment) 1.25 MHz 1.225 MHz … (0.025 MHz increment) .625 MHz .609MHz … (0.0156 MHz increment) .391MHz .350MHz … (0.050 MHz increment) .050MHz
5	Slew Rate		1 2 3	Automatic Slow slew rate Normal slew rate
6	TAPs Configuration (Only applicable if Active POD is connected)	Scan TAP-4	1 2 3 4 5 6 7	Use TAP1 Use TAP2 Use TAP3 Use TAP4 Use TAPs 1 and 2 in series Use TAPs 1, 2, and 3 in series Use TAPs 1, 2, 3, and 4 in series
		Scan TAP-8	1 2 … 7 8 9 10 … 14 15	Use TAP1 Use TAP2 … Use TAP7 Use TAP8 Use TAPs 1 and 2 in series Use TAPs 1, 2, and 3 in series … Use TAPs 1 through 7 in series Use TAPs 1 through 8 in series

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Position	Parameter	Value	Setting
7	Delay Compensation	1 2 3 4 5 6 7	Automatic No Delay 0.5 Clock Delay 1.0 Clock Delay 1.5 Clock Delay 2.0 Clock Delay 2.5 Clock Delay
8	TAP1 Voltage (Only applicable if Active POD is connected)	1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V
9	TAP2 Voltage (Only applicable if Active POD is connected)	1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V
10	TAP3 Voltage (Only applicable if Active POD is connected)	1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V
11	TAP4 Voltage (Only applicable if Active POD is connected)	1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V
12	TAP1 Input Threshold	1	Automatic

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Position	Parameter	Value	Setting
13	TAP2 Input Threshold	1	Automatic
14	TAP3 Input Threshold	1	Automatic
15	TAP4 Input Threshold	1	Automatic

Table 5-1. NetUSB-1149.1/Net Controller Parameters

Example:

To select a NetUSB-1149.1/E controller card using network connection at IP address 192.168.1.1 with all TAP voltages of 3.30 V, TCK frequency of 1 MHz, automatic slew rate, TAP1, automatic delay compensation, automatic input threshold use this "controller specification" string:

```
-controller "NetUSB-1149.1/Net,192.168.1.1,2,42,196,1,1,1,42,42,42,42,1,1,1,1"
```


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The NetUSB-1149.1 controller over USB connection uses 14 parameters. The parameters are described in the table below.

Controller keyword: **NetUSB-1149.1/USB**

Position	Parameter	Value	Setting
1	Active POD	1 2 3 4 5 6	None ScanTAP4 (ie: NetUSB-1149.1/E version) ScanTAP8 (ie: NetUSB-1149.1/SE version) ScanTAP32 ChipTester HighSpeedPOD
2	TAPs Voltage	1 2 … 41 42 43	1.25 V 1.30 V … (0.05 volts per step) 3.25 V 3.30 V Use advanced voltage settings in position 8 through 11
3	Clock Frequency	31 … 76 77 … 101 102 … 126 127 … 136 137 … 161 162 … 186 187 … 211 212 … 226 227 … 233	70 MHz … (1 MHz increment) 25 MHz 24.5 MHz … (0.5 MHz increment) 12.5 MHz 12.25 MHz … (0.25 MHz increment) 6.25 MHz 6.125 MHz … (0.125 MHz increment) 5 MHz 4.9 MHz … (0.1 MHz increment) 2.5 MHz 2.45 MHz … (0.05 MHz increment) 1.25 MHz 1.225 MHz … (0.025 MHz increment) .625 MHz .609MHz … (0.0156 MHz increment) .391MHz .350MHz … (0.050 MHz increment) .050Hz

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Position	Parameter		Value	Setting
4	Delay Compensation		1 2 3 4 5 6 7	Automatic No Delay 0.5 Clock Delay 1.0 Clock Delay 1.5 Clock Delay 2.0 Clock Delay 2.5 Clock Delay
5	Slew Rate		1 2 3	Automatic Slow slew rate Normal slew rate
6	TAPs Configuration (Only applicable if Active POD is connected)	Scan TAP-4	1 2 3 4 5 6 7	Use TAP1 Use TAP2 Use TAP3 Use TAP4 Use TAPs 1 and 2 in series Use TAPs 1, 2, and 3 in series Use TAPs 1, 2, 3, and 4 in series
		Scan TAP-8	1 2 … 7 8 9 10 … 14 15	Use TAP1 Use TAP2 … Use TAP7 Use TAP8 Use TAPs 1 and 2 in series Use TAPs 1, 2, and 3 in series … Use TAPs 1 through 7 in series Use TAPs 1 through 8 in series
7	TAP1 Voltage (Only applicable if Active POD is connected)		1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V
8	TAP2 Voltage (Only applicable if Active POD is connected)		1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V
9	TAP3 Voltage (Only applicable if Active POD is connected)		1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V

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Position	Parameter	Value	Setting
10	TAP4 Voltage (Only applicable if Active POD is connected)	1 2 3 … 40 41 42	1.25 V 1.30 V 1.35 V … (0.05 V per step) 3.20 V 3.25 V 3.30 V
11	TAP1 Input Threshold	1	Automatic
12	TAP2 Input Threshold	1	Automatic
13	TAP3 Input Threshold	1	Automatic
14	TAP4 Input Threshold	1	Automatic

Table 5-2. NetUSB-1149.1/USB Controller Parameters

Example:

To select a NetUSB-1149.1/E controller card using USB connection with all TAP voltages of 3.30 V, TCK frequency of 1 MHz, automatic slew rate, TAP1, automatic delay compensation, automatic input threshold use this "controller specification" string:

```
-controller "NetUSB-1149.1/USB,2,42,196,1,1,1,42,42,42,42,1,1,1,1"
```


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Appendix A
Recommended Target Connectors

10-pin TAP Connector

The Boundary-Scan TAP is a well-defined IEEE-1149.1-compatible electrical interface between boundary-scan test equipment and the boundary-scan compatible devices in the user's target board. Boundary-scan based test equipment, such as the Corelis ScanExpress family of products, utilize a single TAP to interface to the UUT. This section explains how to design in a simple TAP connector for your target that is compatible with most standard test equipment.

The cables provided with either model of NetUSB-1149.1 provide a connector compatible with this standard.

The TAP contains 5 signals: TCK, TMS, TDO, TDI and optionally TRST*. It also contains ground signal(s). Corelis recommends the standard TAP connector shown in Figure A-1, which is widely regarded as the industry standard. Note that each signal is terminated with a resistor (discussed below) in order to improve noise immunity.

The connector on the user's target should have a standard flat cable compatible pin-out to match the TAP connector described in Table A-1. Figure A-1 shows the top component-side view of the basic target 10-pin connector header (0.100 × 0.100 in. spacing):

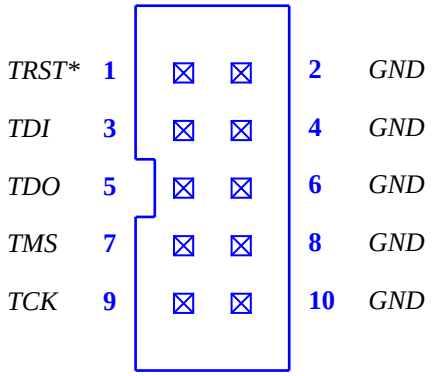


Figure A-1. Standard 10-pin TAP connector (top view)

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Table A-1 describes the 10-pin TAP connector signals and the Corelis recommended values of terminating resistors:

Pin	Signal	Direction	Termination
1	TRST*	Input to the UUT	1K pull-up (or 1.5K pull-down)
2	GND		
3	TDI	Input to the UUT	1K pull-up
4	GND		
5	TDO	Output of the UUT	33 ohm series
6	GND		
7	TMS	Input to the UUT	1K pull-up
8	GND		
9	TCK	Input to the UUT	1K pull-up
10	GND		

Note: Some target boards may require a pull-down resistor on the TRST* signal to assure normal device operations when not in boundary-scan test mode.

Table A-1. Signal Description and Termination

Table A-2 summarizes the specifications for the 10-pin TAP connector. Equivalent connectors are available from other manufacturers.

Reference	Description	Manufacturer	Part Number
10-Pin Target TAP	Straight header, 10-pin, 4 wall, with center notch	3M	3473-6610

Table A-2. Standard 10-Pin TAP Connector

Figure A-2 shows a typical schematic of the target TAP connector with the recommended termination resistors. The 1K pull-up resistors should connect to the target Vcc supply corresponding to the interface voltage (programmable on either of the NetUSB-1149.1 controllers from 1.25 to 3.3 V). Recommended resistor values are +/- 5%.

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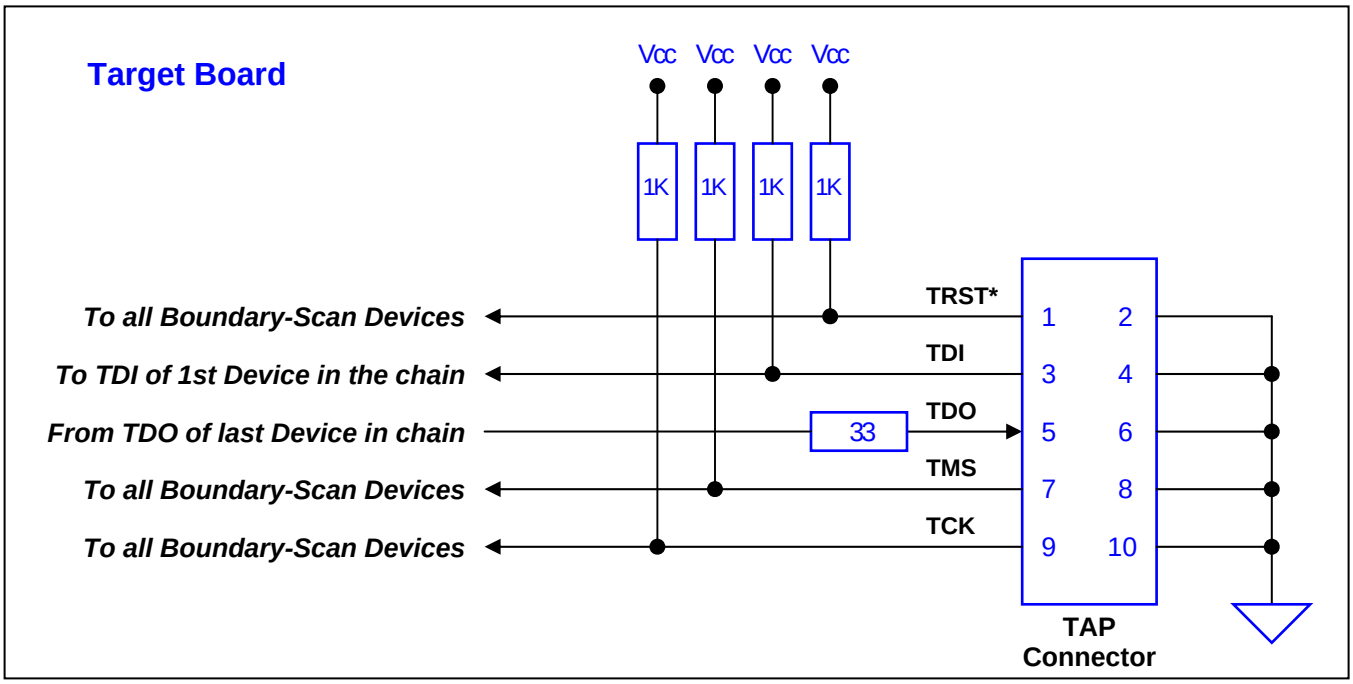


Figure A-2. 10-pin TAP Connector Schematic

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16-pin Flash Programming TAP Connector

To support expedited in-circuit programming of flash or microprocessor devices, Corelis recommends including supplemental control signals in the TAP interface. These will exploit the Corelis controllers' advanced methods to accelerate the target device programming session. The ScanExpress Programmer, for example, can use the added signals of a 16-pin TAP, similar to Figure A-3, to improve programming time. Cables complying with this topology are available for the NetUSB-1149.1 family.

This interface adds Write_Strobe*, Ready/Busy*, and additional ground signals to the standard 5-signal interface. Terminating resistors (see Table) can further improve signal quality.

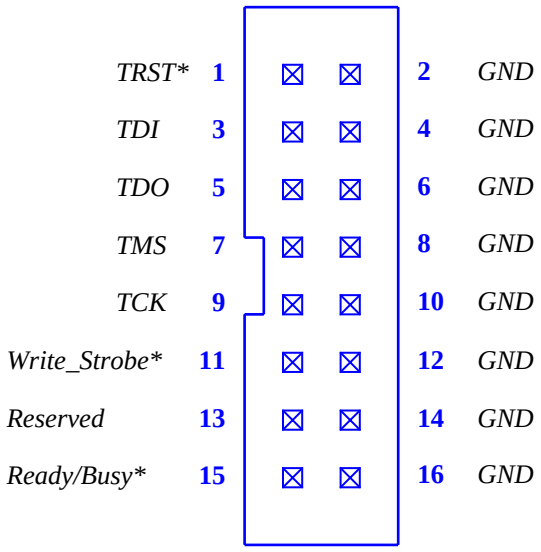


Figure A-3. Boundary-scan Flash Programming 16-pin TAP Connector (top view)

Corelis' Flash Programming software supports the external signals Write_Strobe* and Ready/Busy*, while still offering the standard, but slower, fully scanned out/in signals approach.

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. This way either the target's flash Write-Enable (WE*) signal or the controller's external Write_Strobe* going low will assert the flash WE* input.

The active low Ready/Busy* signal is typically an open-collector/open-drain signal that ties directly to the same signal(s) on the Flash device(s). This enables multiple devices to drive it toward either of the NetUSB-1149.1 controllers.

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Table A-3 summarizes the specifications for a 16-pin TAP connector without latch ejector. Equivalent connectors are available from other manufacturers.

Reference	Description	Manufacturer	Part Number
Flash TAP	Straight header, 16-pin, 4 wall, with center notch	3M	2516-6002UG

Table A-3. Flash Programming TAP 16 Pin Connector

Table A-4 describes the signals and Corelis recommended values of terminating resistors:

Pin	Signal	Direction	Termination
1	TRST*	Input to the UUT	1K pull-up (or 1.5K pull-down)
2	GND		
3	TDI	Input to the UUT	1K pull-up
4	GND		
5	TDO	Output from UUT	33 ohm series
6	GND		
7	TMS	Input to the UUT	1K pull-up
8	GND		
9	TCK	Input to the UUT	1K pull-up
10	GND		
11	Write_Strobe*	Input to the UUT	1K pull-up
12	GND		
13	Reserved		
14	GND		
15	Ready/Busy*	Output from UUT	1K pull-up
16	GND		

Note: Some target boards may require a pull-down resistor on the TRST* signal to assure normal device operations when not in boundary-scan test mode

Note: The target TDI signal is driven by the TDO signal of the boundary-scan controller

Note: The target TDO signal drives the boundary scan controller's TDI signal

Table A-4. Signal Description and Termination

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Figure A-4 shows a typical schematic of the target TAP connector with termination resistors. The 1K pull-up resistors should connect to the target Vcc supply corresponding to the interface voltage (programmable on either of the NetUSB-1149.1 controllers from 1.25 to 3.3 V). Recommended resistor values are +/- 5%.

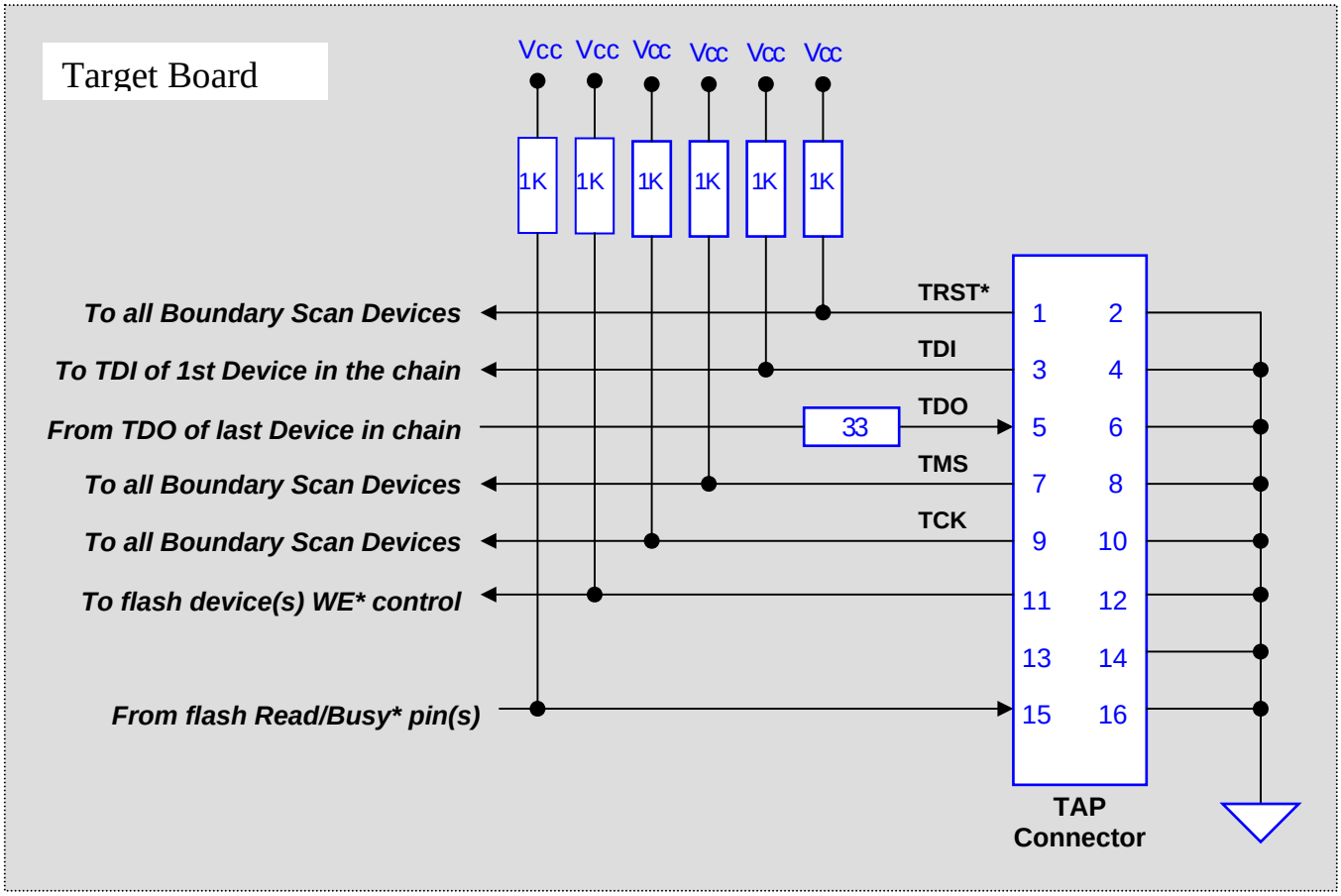


Figure A-4. 16-pin Flash Programming TAP Connector Schematics

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20-pin Flash Programming TAP Connector

To support expedited in-circuit programming of flash or microprocessor devices, Corelis recommends including supplemental control signals in the TAP interface. These will exploit the Corelis controllers' advanced methods to accelerate the target device programming session. The ScanExpress Programmer, for example, can use the added signals of a 20-pin TAP, similar to Figure A-5, to improve programming time. Cables complying with this topology are available for the NetUSB-1149.1 family.

This interface adds Write_Strobe*, Ready/Busy*, and additional ground signals to the standard 5-signal interface. Terminating resistors (see Table A-5) can further improve signal quality.

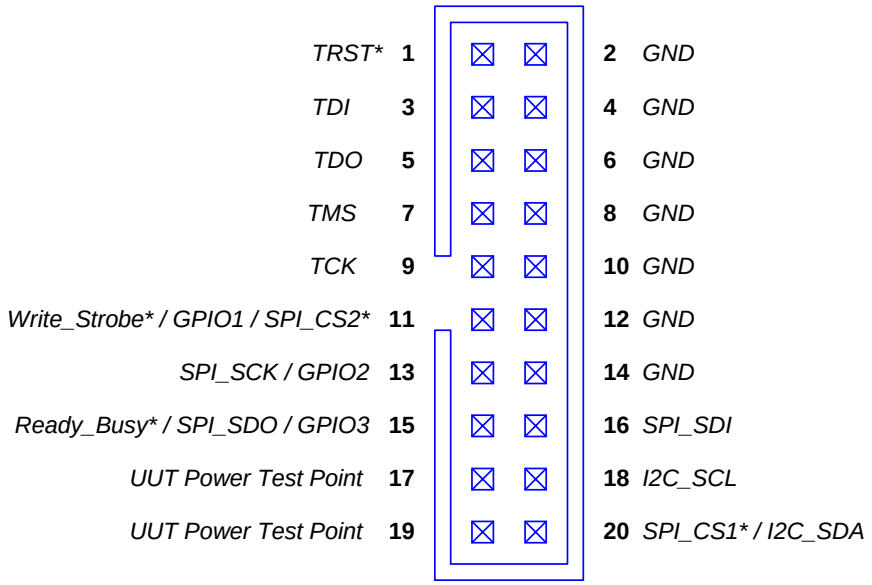


Figure A-5. Boundary-scan Flash Programming 20-pin TAP Connector (top view)

Corelis' Flash Programming software supports the external signals Write_Strobe* and Ready/Busy*, while still offering the standard, but slower, fully scanned out/in signals approach.

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. This way either the target's flash Write-Enable (WE*) signal or the controller's external Write_Strobe* going low will assert the flash WE* input.

The active low Ready/Busy* signal is typically an open-collector/open-drain signal that ties directly to the same signal(s) on the Flash device(s). This enables multiple devices to drive it toward either of the NetUSB-1149.1 controllers.

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Table A-5 summarizes the specifications for a 16-pin TAP connector without latch ejector. Equivalent connectors are available from other manufacturers.

Reference	Description	Manufacturer	Part Number
Flash TAP	Straight header, 20-pin, 4 wall, with center notch	3M	2516-6002UG

Table A-5. Flash Programming TAP 20-pin Connector

Table A-6 describes the signals and Corelis recommended values of terminating resistors:

Pin	Signal	Direction	Termination
1	TRST*	Input to the UUT	1K pull-up (or 1.5K pull-down)
2	GND		
3	TDI	Input to the UUT	1K pull-up
4	GND		
5	TDO	Output from UUT	33 ohm series
6	GND		
7	TMS	Input to the UUT	1K pull-up
8	GND		
9	TCK	Input to the UUT	1K pull-up
10	GND		
11	Write_Strobe* / GPIO1 / SPI_CS2*	Input to the UUT	1K pull-up
12	GND		
13	SPI_SDO (MISO) / GPIO2	Input to the UUT	1K pull-up
14	GND		
15	Ready/Busy* / GPIO3	Output from UUT	1K pull-up
16	SPI_SDI (MOSI)	Input to the UUT	1K pull-up
17	VCC1	Power Test Point	None
18	I2C_SCL	Input to the UUT	1K pull-up
19	VCC2	Power Test Point	None
20	SPI_CS1* / I2C_SDA	Input to the UUT	1K pull-up

Note: Some target boards may require a pull-down resistor on the TRST* signal to assure normal device operations when not in boundary-scan test mode

Table A-6. Signal Description and Termination

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Appendix B
Self Test Utility Software

The NetUSB-1149.1 family has a self-test utility that can be used to test the card and make sure that it is fully functional to a high level of confidence. Logic at the TAP connectors can read back data shifted out on TMS and TDO synchronously with the TCK. Using these signal paths, a host can test the TAP signals all the way to the connectors, verifying the overall functionality of the system.

Self-Test

The self-test utility is provided for off-line confidence test only and **under normal circumstances there is no need to run the self-test utility software**. However, if you suspect that the board is damaged, you can run the self-test on either of the NetUSB-1149.1 controllers. The self-test utility is installed on your computer in the same folder where ScanExpress Applications (ScanExpress Runner, ScanExpress Debugger and ScanExpress Programmer) are installed. Make sure to disconnect the target TAP cables before running the test.

Using the Windows Explorer, select and run the ***NetUSB_test.exe*** file. A pop-up dialog box should appear as shown in Figure B-1.

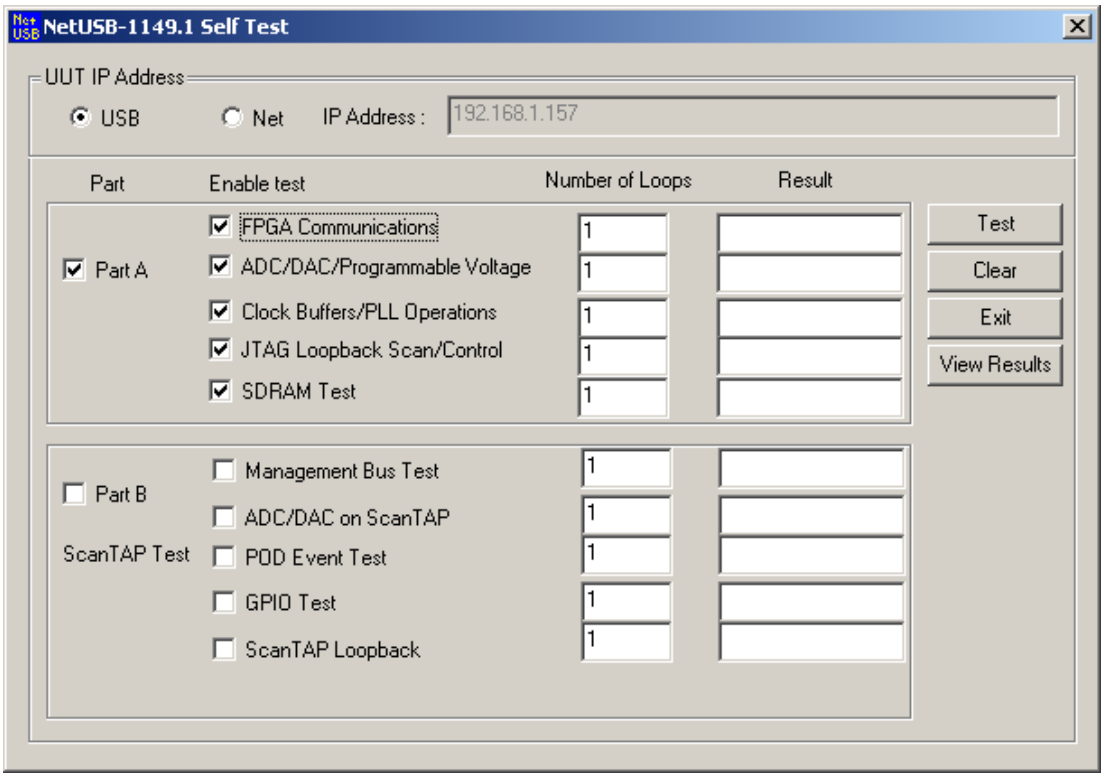


Figure B-1. Self-Test Results for the NetUSB-1149.1/E and the NetUSB-1149.1/SE

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The test consists of 2 parts. Part A is for both NET-1149.1 and NET-1149.1/E. Part B is only for NET-1149.1/E. Users should run part A and B separately.

Running part A of the test will detect if there is ScanTAP-4 or ScanTAP-8 connected to the controller (i.e. if the unit is an NetUSB-1149.1/E or NetUSB-1149.1/SE). Click on **Test** to run the self-test. Figure B-2 show the result of Self-Test Part A for a NetUSB-1149.1/E or a NetUSB-1149.1/SE. Part A tests the main JTAG scan engine. Note also that ADC/DAC/Programmable Voltage test is grayed out. This test is only applicable to a NetUSB-1149.1 unit and is automatically grayed out if a NetUSB-1149.1/E or NetUSB-1149.1/SE is detected.

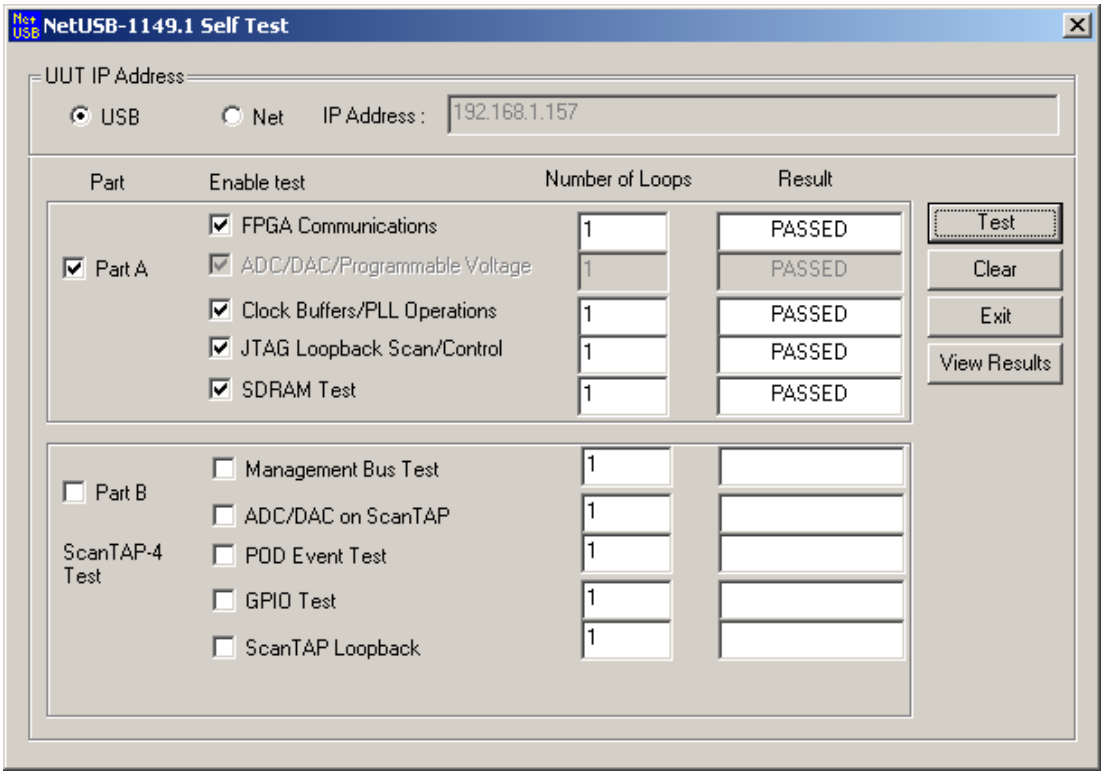


Figure B-2. Self-Test Part A Results for the NetUSB-1149.1/E or the NetUSB-1149.1/SE

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Part B is only applicable to a NetUSB-1149.1/E or NetUSB-1149.1/SE unit and it tests the embedded ScanTAP-4 or ScanTAP-8 module. Figure B-3 shows the result of Self-Test Part B.

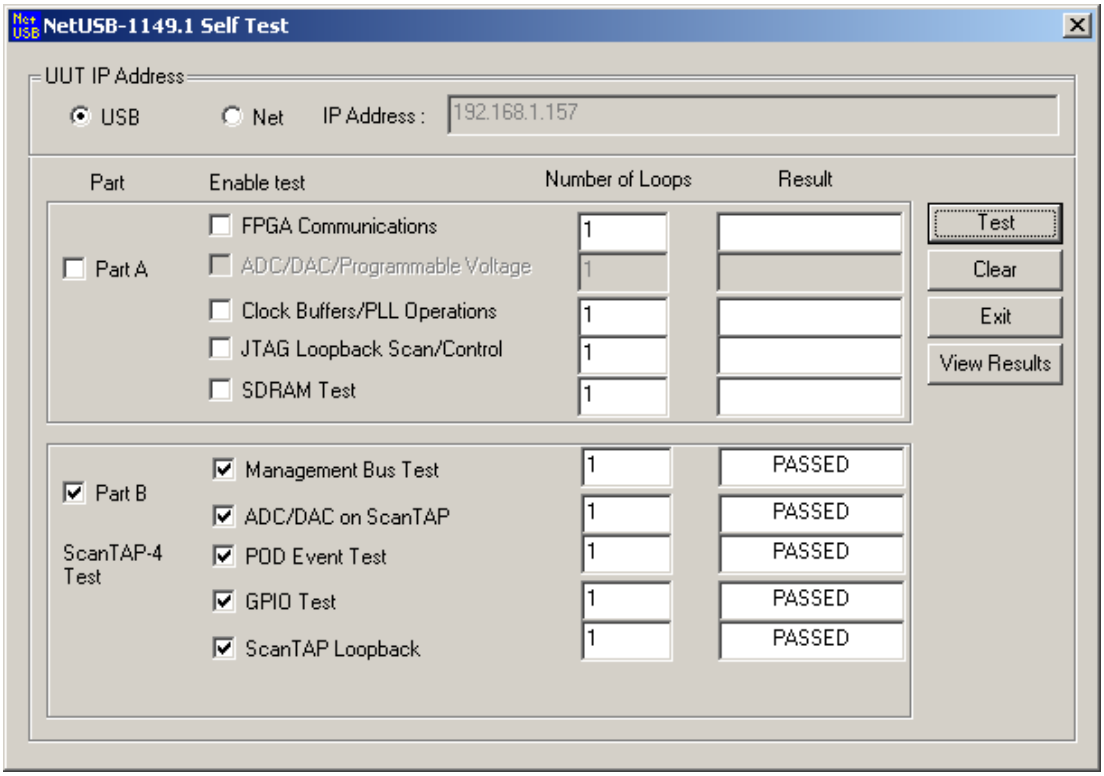


Figure B-3. Self-Test Part B Results for the NetUSB-1149.1/E or the NetUSB-1149.1/**S**E

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Appendix C
Firmware Update Utility Software

The NetUSB-1149.1 family is shipped with the latest version of the firmware at the time of shipping. Although the firmware is very mature and thoroughly tested, in an effort to provide additional functionality and bug fixes, Corelis may release a firmware update. Firmware update should only be done when it is absolutely necessary (e.x. Application such as ScanExpress Runner informs that the firmware must be updated or a support personal from Corelis asks to do so.)

Firmware Update Utility

The firmware update utility is installed along with the Boundary Scan Tools CD and can be found at the program installation directory under Firmware\NetUSB-1149.1 subdirectory. (e.x. C:\Program Files\ScanExpress Runner v6\Firmware\NetUSB-1149.1) The new firmware should also be in the same directory if the application requires the firmware update.

Using the Windows Explorer, select and run the ***NetUSBFlash.exe*** file. A pop-up dialog box should appear as shown in Figure C-1.

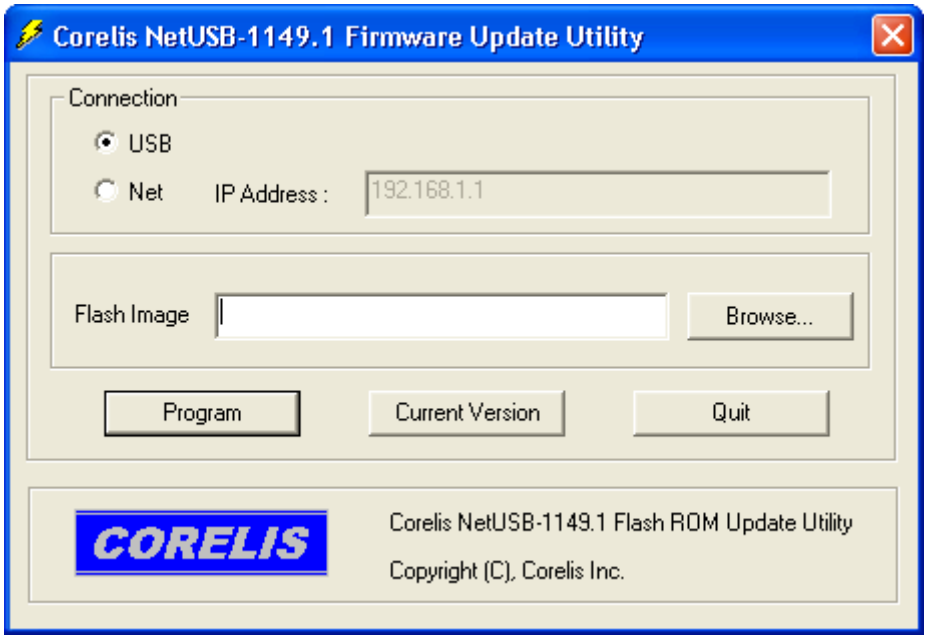


Figure C-1. Firmware Update Utility for the NetUSB-1149.1 family

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Click on the **Browse** button and the Select a firmware image file dialog box will pop up as shown below in Figure C-2. Find the updated firmware file and click on the open button to select the file.

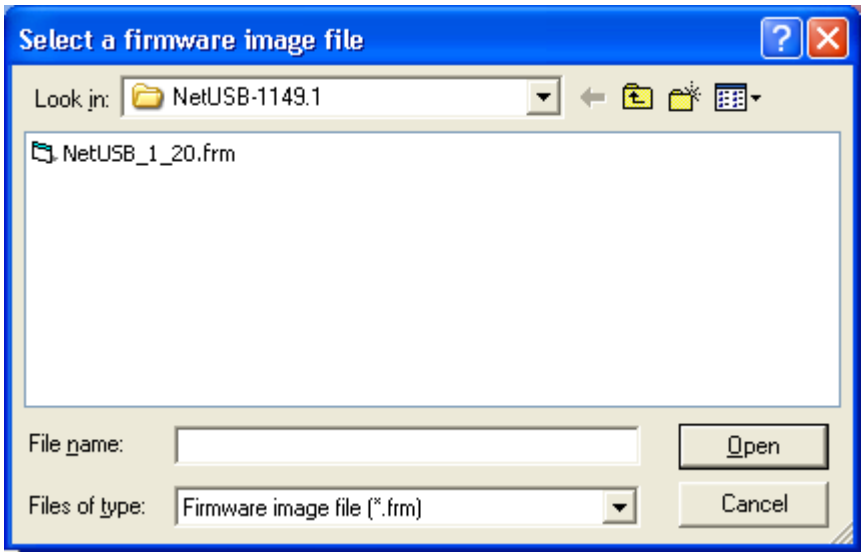


Figure C-2. Select a Firmware Image File Dialog Box

Once selected, the path to the firmware file will be displayed as shown below in Figure C-3. Click on the **Program** button to start updating the firmware.

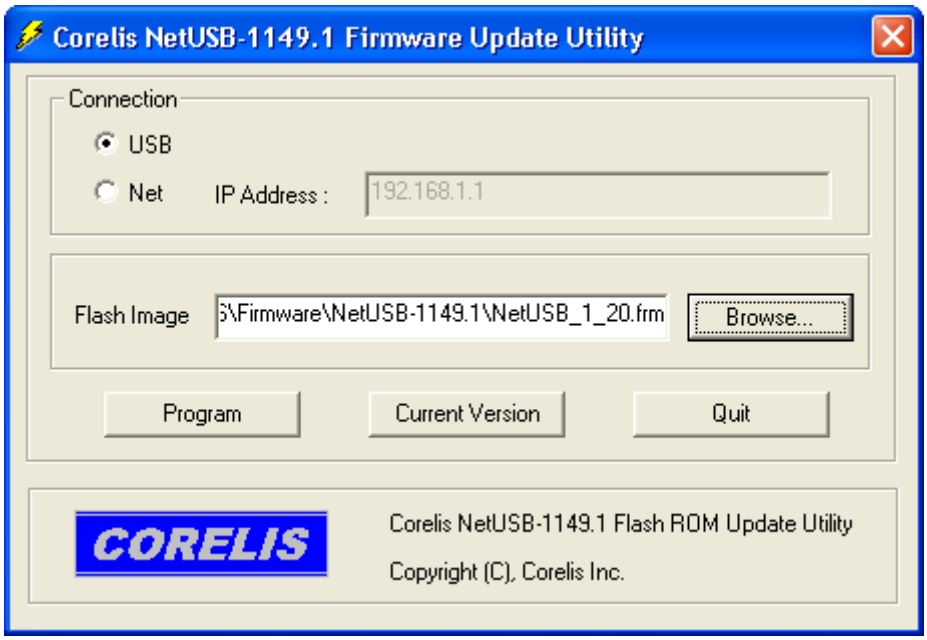


Figure C-3. Firmware Update Utility with the Firmware Selected

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Before actually starting to update the firmware, the application will ask for the confirmation as shown below in Figure C-4. Click on the **Yes** button to start update process. **Do not power off the unit or disconnect USB or network cable while updating the firmware.**

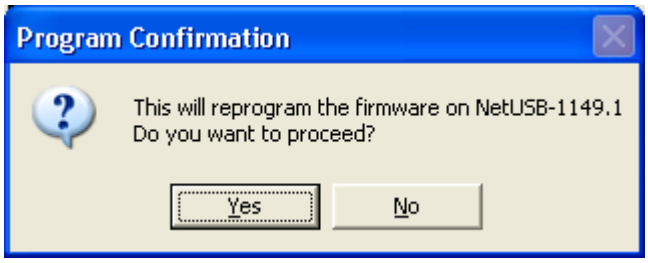


Figure C-4. Firmware Update Confirmation Dialog

While updating the firmware, the utility will show the progress as shown below in Figure C-5.

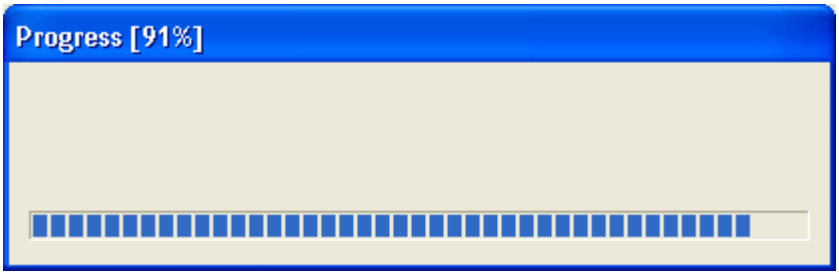


Figure C-5. Firmware Update Progress Dialog

When finished the following dialog box will pop up ask the user to power off and power back on the NetUSB-1149.1 unit.

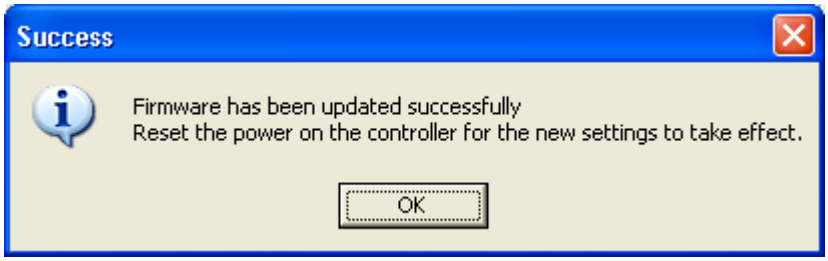


Figure C-6. Firmware Update Success Dialog

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