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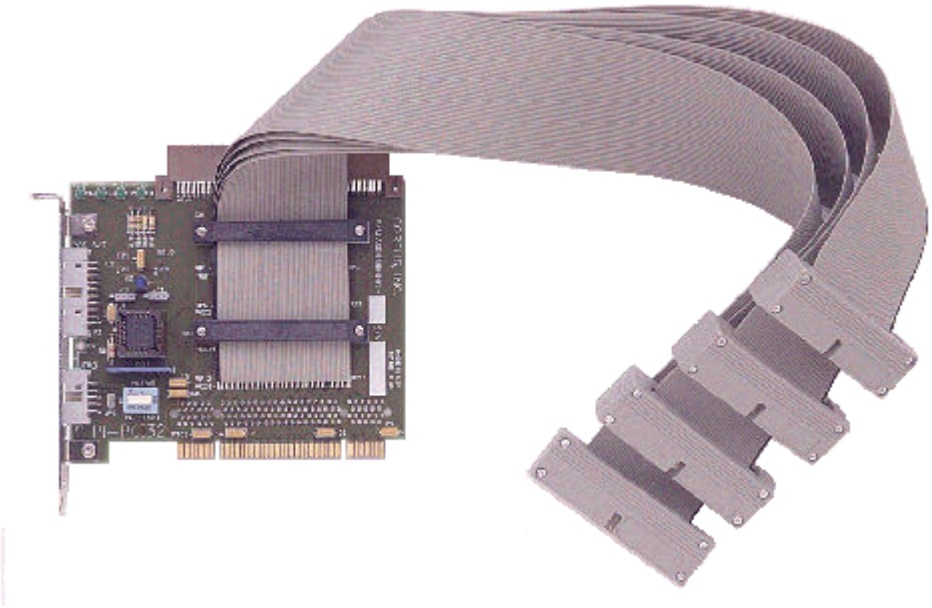
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PI-PCI32 & PI-PCI64 PCI Bus Analyzers



(PI-PCI32 Pictured)

Key Features

- Logic Analyzer Preprocessor for the 32 or 64-bit PCI Bus
- Combines Five Functions in One
  - PCI Bus State Analyzer With Inverse Assembler
  - PCI Bus Timing Analyzer
  - PCI Bus Extender Card
  - Boundary-Scan Test Bus (JTAG) State Analyzer With Inverse Assembler

    - Boundary-Scan Test Bus Access Card For Corelis And Other Boundary-Scan Testers
- Small Mechanical Form Factor with ISA and MCA Slot-Plate Options
- Narrow Design Ensures Fit in Single Width PCI Card Slot
- Supports Both 5.0 and 3.3 V Systems with Individual Power Planes for High Noise Immunity
- Powerful PCI Bus State Analysis including Disassembly Software
- Matched Signal Skew Enables Timing Analysis of all PCI Bus Signals
- Integrated IEEE-1149.1 JTAG Bus Analyzer and Disassembly Support
- Optional Right Angle (90 Degree) Connector

General Overview

The Corelis PIPCI preprocessors for the PCI bus can be used for a multitude of purposes, specifically:

- PCI Bus analyzer in conjunction with an HP logic analyzer and the provided State Disassembler.
- Quick connection to PCI Bus signals for timing analysis using the Logic Analyzer and Oscilloscope.
- PCI Bus Extender card raising the PCI plug-in card completely above adjacent cards for signal access to non PCI bus signals located on either side of the PCB.
- IEEE-1149.1 boundary-scan bus analyzer in conjunction with the HP logic analyzer and the provided JTAG TAP Controller State Disassembler.
- IEEE-1149.1 boundary-scan tester access board through a special test connector located on the back of the board.

The PIPCI preprocessor is carefully designed to provide a non-intrusive electrical and mechanical link between the PCI high performance computer bus standard and design, test, and debug tools.

The wide range of uses for the PIPCI preprocessor board as outlined below makes it the most cost effective tool available for a wide range of PCI Bus applications. Examples include:

- PCI bus compliance testing and verification. Test results can be stored on disk and printed as part of compliance report document.
- PCI protocol testing.
- Motherboard testing for desktop and notebook systems with full or half size slots.
- Connection to external boundary-scan (JTAG) testers.
- I/O cards diagnostics, troubleshooting, and monitoring.
- Manufacturing test of motherboards, I/O cards.
- PCI system debugging. The PI-PCI is an excellent tool for triggering and tracing intermittent and/or hard to find problems

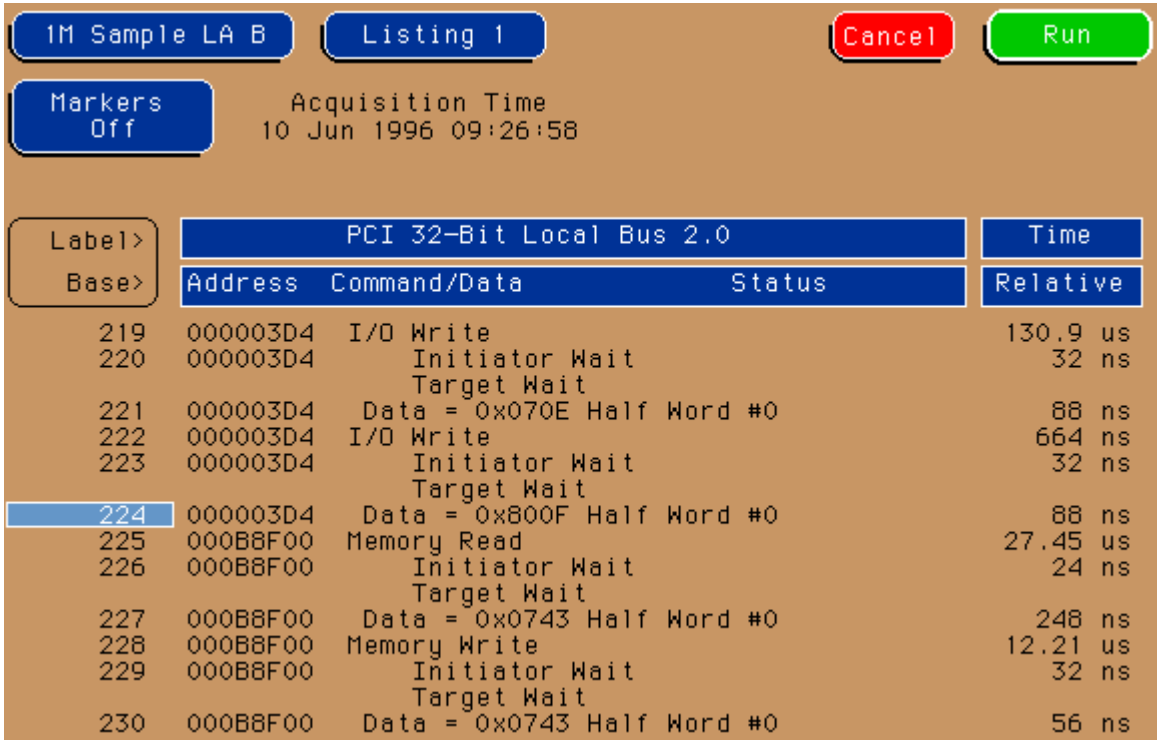
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PCI Bus Analyzer

The Corelis PIPCI preprocessor is carefully designed to provide a non-intrusive electrical and mechanical link between the PCI high performance computer bus and the HP family of logic analyzers. The small preprocessor board can be inserted into any available PCI Bus card slot and provides

access to all PCI Bus signals. A set of four impedance matched flat cables on the PI-PCI32 (six on the PI-PCI64) with mating HP Logic Analyzer connectors extends from the board for quick connection of the entire family of HP165XX, and 166X logic analyzers. To support all PCI Bus signals and inverse assembly, four HP analyzer pods or 64 State Analyzer channels are required for the PI-PCI32, and six pods or 96 channels are required for the PI-PCI64.

The HP Logic Analyzer Pod cables can be connected directly to the PIPCI cables. There is no need for additional termination adapters since the required termination is integrated into the PIPCI design. All PCI Bus signals are terminated directly at the PCI Bus connectors to ensure minimal trace length between the PCI Bus and the logic analyzer test points. As such, the PIPCI presents a load of 10 pF @ 100 K ohm to each PCI Bus signal.



PCI-32 State Analyzer Screen Snapshot

For users of the HP Logic Analyzer family, an inverse assembler is provided on disk which configures the logic analyzer for use with the PIPCI and provides bus state disassembly. All PCI Bus states are captured and clearly labeled in the inverse assembler screen. The inverse assembler includes support for Burst reads and writes as well as Bus Error Reporting (*PERR and *SERR). A sample inverse assembler screen is shown in Figure 1.

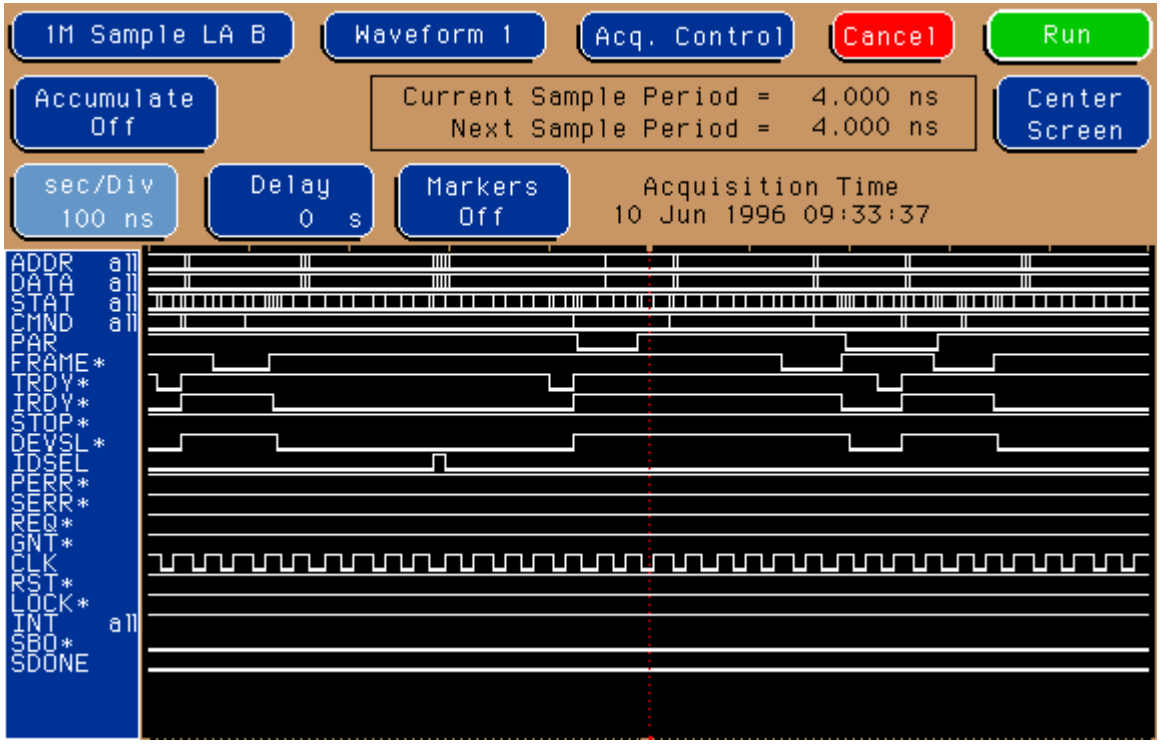
Special features for the inverse assembler such as the Symbol Download Utility and INVASM Post Processing Filters are supported on those HP Logic Analyzer models that support these capabilities.

PCI Bus Timing Analyzer

All PCI Bus signals provided to the logic analyzer are taken directly at the PCI bus connector to ensure signal fidelity. This is made possible by integrating the required logic analyzer termination circuitry directly on the PIPCI as close as possible to the gold finger contacts.

As such, the PIPCI is an excellent tool for not only logic state analysis but also timing analysis applications. Signal skew of all PCI Bus signals is carefully matched to ensure proper time correlation between PCI Bus signals. Equally important is the fact that no buffers are used on the PIPCI that would result in propagation delays and increased signal-to-signal skew.

This enables accurate timing measurements to be made with the HP Logic Analyzer up to 500 MHz acquisition speeds.



PCI-32 Timing Analyzer Screen Snapshot

The PIPCI provides PCI Bus signal access for other test tools such as oscilloscopes. In this case, an area of wire wrap stakes can be added on either side of the PIPCI card directly above the PCI Bus connector. All PCI Bus signals are available in this area for this purpose.

PCI Bus Extender

The PIPCI can double as a PCI Bus card extender using the PCI Bus connector at the top of the PIPCI preprocessor. This ensures that at no time a PCI bus slot is lost when the PIPCI preprocessor is used for any other purpose. To minimize the impact of its use as a bus extender, the mating PCI Bus connector is placed directly above the original PCI Bus connector on the mother board. Thus, there is no offset in either direction. The height of the PIPCI exactly matches that of a standard PCI Card ensuring that the card plugged into the PIPCI completely clears any adjacent cards. This provides complete access to both sides of the inserted PCI Card for test and troubleshooting purposes.

A right angle PCI Bus connector can be placed on the PIPCI Preprocessor as an option to enable 90° PCI card insertion. This provides enhanced flexibility for unusual mechanical environments

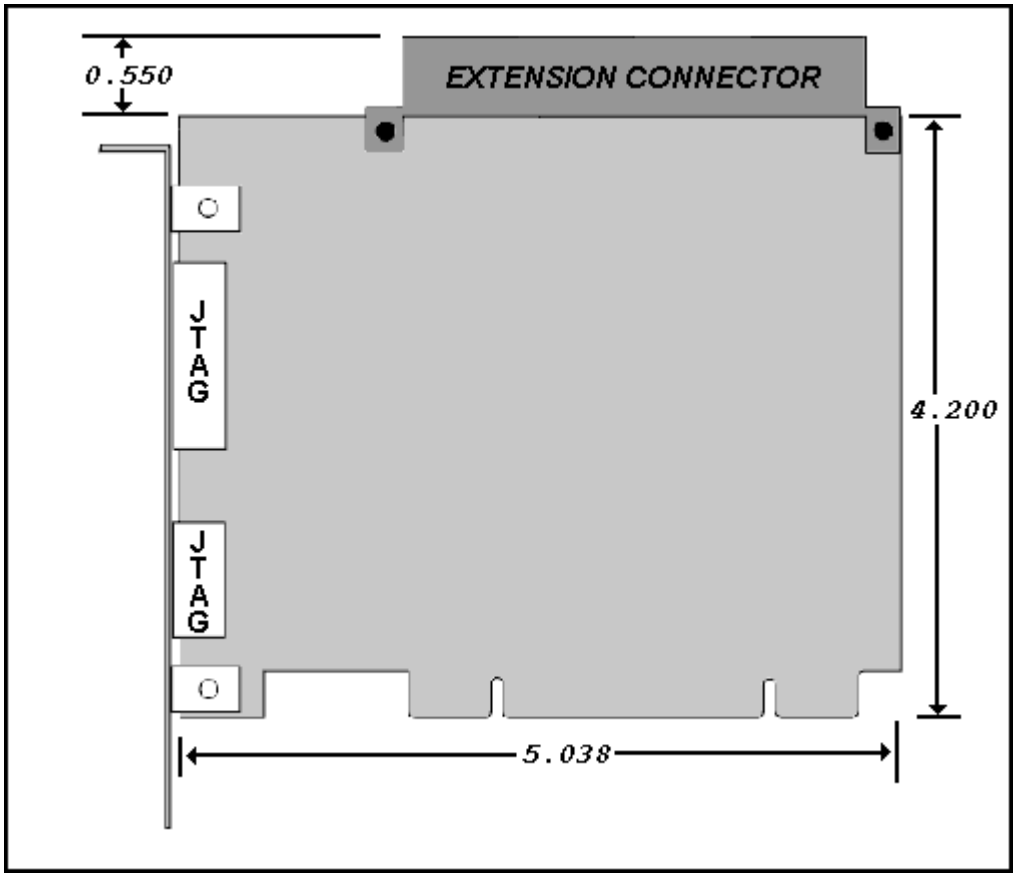
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Mechanical Considerations

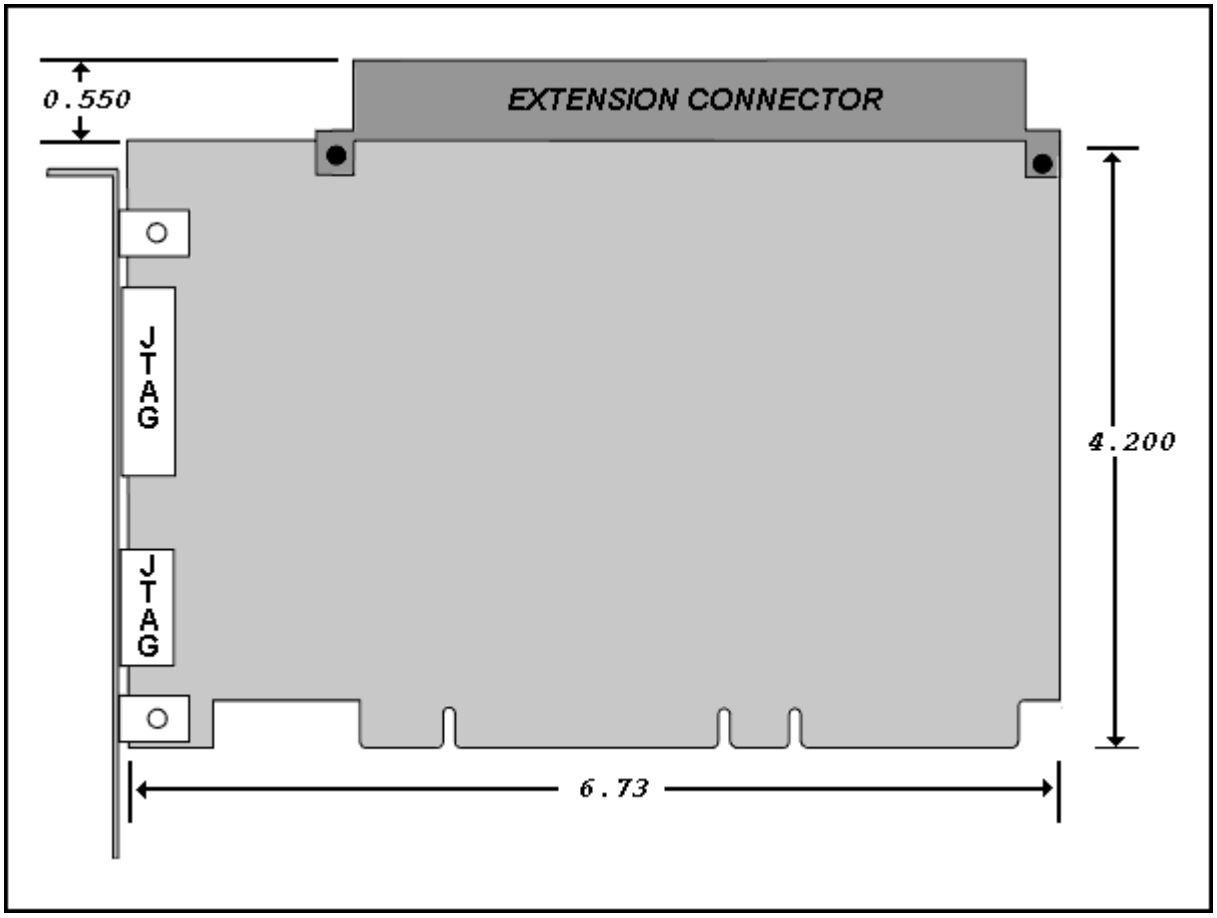
To ensure mechanical compatibility with the widest range of PCI bus systems, the PCI preprocessor was designed with minimal mechanical dimensions. Actual dimensions are shown below for both the 32 bit version and 64 bit versions.

The length of the PIPCI is less than that of a typical PC Plug in card enabling its use with many notebook designs where space is limited. To ensure clearance between PCI card slots, the logic analyzer pod connectors are not mounted on the adapter card, as is often the case with this type of tool, but rather brought out on a set of long flexible cables that end in mating connectors for the logic analyzer pod cables. This means these cables can be looped easily away from the PCI Bus backplane under any angle desired. It also ensures that the PIPCI adapter height is well within the PCI Bus specifications on both sides, whether the logic analyzer pod cables are connected or not. Use of connectors directly on the plug in module would limit its use as a bus or timing analyzer to the outer slot of a backplane as a minimum 2 inches of clearance is required to accommodate the Logic Analyzer pod cable connectors. The unique mechanical design of the PIPCI ensures it can be used in any PCI slot.

To attach the PIPCI to the backplane chassis of the system under test, both ISA style (Industry Standard Architecture - Standard) and MCA (Micro Channel Architecture - Optional) slot plates are available.



PI-PCI32 Mechanical Drawing



PI-PCI64 Mechanical Drawing

PCI Bus Specification Compliance

The PIPCI was specifically designed to maintain mechanical and electrical compatibility with the PCI Bus Specification Version 2.0. Care must be taken however when the PIPCI is used as an extender card using the PCI connector located at the top of the PIPCI card since this extends the lead length from the original PCI Bus connector to the PCI bus card by about four inches. In situations where this can be critical, it is recommended the PI-PCI be inserted into a slot adjacent to the card to be tested.

Boundary-Scan Background

The IEEE1149.1 test bus and boundary-scan architecture allows IC level access through a standard four signal bus. IC's that comply with the IEEE-1149.1 standard contain special test logic that allows control and sampling of individual IC pins. Test debug and initialization patterns can be loaded serially into each device. Applications for boundary-scan include board and system level testing, processor emulation, on-board programming of EPROM's, FPGA's and PAL's. Many complex large scale integration devices such as RISC and CISC processors incorporate the boundary-scan standard. The recently defined PCI Bus standard also makes provisions for the four boundary-scan standard test bus signals. Thus, PCI-based designs inherently contain the ability to take advantage of this standardized IC level access bus. For more information on boundary-scan and the wide choice of IEEE1149.1 support products available from Corelis Inc., please contact Corelis directly.

Boundary-Scan Analyzer

The IEEE-1149.1 boundary-scan test bus standard is incorporated as part of the PCI Bus specification.

To support this test bus with the PIPCI, the state encoder of the Corelis BA-1149.1 JTAG bus analyzer has been incorporated on the PIPCI preprocessor. This IEEE-1149.1 compatible JTAG bus analyzer provides TAP state information to a logic analyzer via a special HP compatible connector located on the back of the PIPCI card. For users of the HP family of logic analyzers, a disk with setup files and an inverse assembler is provided with the PIPCI. The inverse assembler clearly labels all TAP Controller states and data. A sample screen of boundary-scan test activity occurring on the PCI Bus is shown in Figure 3. Connection of an HP Logic Analyzer to the 20-pin Bus State Analyzer connector does require an HP termination adapter model number HP01650-63203.

If no PCI card is inserted in the PIPCI a jumper is provided on the preprocessor card that connects TDO (Test Data Out) to TDI (Test Data In) thus closing the scan chain. This prevents the scan chain from being broken by the insertion of the PIPCI.

Boundary-Tester Access

In addition to the BA-1149.1 bus analyzer connector, the PIPCI contains a special 10-pin JTAG Test Access Port connector that provides a direct connection for any Corelis boundary-scan test controller providing easy access to the PCI bus boundary-scan chain. This allows boundary-scan access for testing, troubleshooting, CPU emulation or programming of Flash EPROM's, ASIC's and other scanable parts on either the PCI bus motherboard or any of the inserted PCI cards.

The PIPCI automatically detects the connection of a boundary-scan test controller and will switch the test controller directly into the PCI backplane boundary-scan chain. All features and functions of the BA-1149.1 Bus Analyzer remain in effect when a boundary-scan tester is used through this connector.

Specifications

Logic Analyzer required

- HewlettPackard HP 16500B, HP1660, or HP1670 Series
- Requires 4 pods for the PI-PCI32, and 6 pods for the PI-PCI64

Maximum Acquisition Speed

- 500 MHz Timing
- 100 MHz State

Signal Line Loading

- 10 pF @ 100 KOhms
- Preprocessor contains on board termination for HP Logic Analyzers

Address and Data Bus Width Supported

- 32 Bits (model PI-PCI32)
- 64 Bits (model PI-PCI64)

Power Requirements

- 250 ma @ +5.0 VDC (for JTAG logic and 5V LED)
- 20 ma @ +3.3 VDC (for +3.3V LED)
- 20 ma @ +12.0 VDC (for +12V LED)
- 20 ma @ -12.0 VDC (for -12V LED)

Specify:

- PI-PCI32 for 32 bit model
- PI-PCI64 for 64 bit mode**l**

Included:

- PIPCI preprocessor adapter
- Configuration software on 3.5" Disk (HP) with:
- Inverse Assembler for PCI bus
- Inverse Assembler for IEEE1149.1 Bus
- Users Manual

Options

- Right Angle Connector
- MCA Slot plate

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