...We *are* boundary-scan.

JTAG TECHNOLOGIES™

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datasheet *Controllers*

JT 37x7/TSI/PCI/PCIe/PXI

QuadPOD

JT 3705/USB

...We *are* boundary-scan.

Rugged, dependable, fast
JTAG Technologies boundary-scan controllers

Overview

JTAG Technologies offers a comprehensive line of hardware and software products to test and program printed circuit boards in compliance with the IEEE 1149.1 and related boundary-scan standards. The IEEE specification defines a 4- or 5-wire electrical interface and control protocol to communicate with the target board, providing superior access to complex, high-density PCBs.

JTAG Technologies DataBlaster™ and Explorer controllers interface between the boundary-scan station and the target board or system to be tested or programmed. Available controllers cover a complete range of requirements, from those of budget-minded R&D laboratories up to the most demanding production environments. Regardless of the application, each of the controllers is rugged and dependable, true to JTAG Technologies outstanding record of in-service reliability.

Features

JT 37x7 DataBlaster

- Scalable architecture with easy expansion to match application requirements
- Automatic TCK speed matching and programmability for optimum chain performance, up to 40 MHz continuous data rate
- Unlimited target memory width (from one bit to more than 64K bits) for flash programming
- Enhanced Throughput Technology™ (ETT) delivers high volume production capability
- Independent control of four TAPs per DataBlaster controller
- Gang controller operation for large-scale parallel programming and testing
- PCI, PCIe, PXI, USB (1.1 and 2.0), Ethernet, Firewire and CompactPCI (3U and 6U) interfaces
- Includes JTAG Technologies JT 2147 QuadPOD™ system with programmable I/O voltages, high-performance signal integrity and long distance capability
- 256 boundary-scan I/O's to enhance test access and maximum coverage (/RMI version)
- Hot-swapping of QuadPOD for easy fixture changes

JT 3705/USB Explorer

- Compatible with USB 1.1 and 2.0 formats
- Automatic or programmable TCK speed up to 6 MHz burst data rate
- Programmable I/O voltages
- Independent control of two TAPs per controller
- Powered by host computer's USB port

Application and performance

All of the controllers are designed by us and built to our specifications in an ISO9000-certified factory for assured system compatibility, life cycle support, and long-term availability. The advanced architecture of JTAG Technologies hardware and software permits applications to be easily ported between development and production, regardless of the controller types in use. The high degree of portability is valuable in multi-user and multi-department environments.

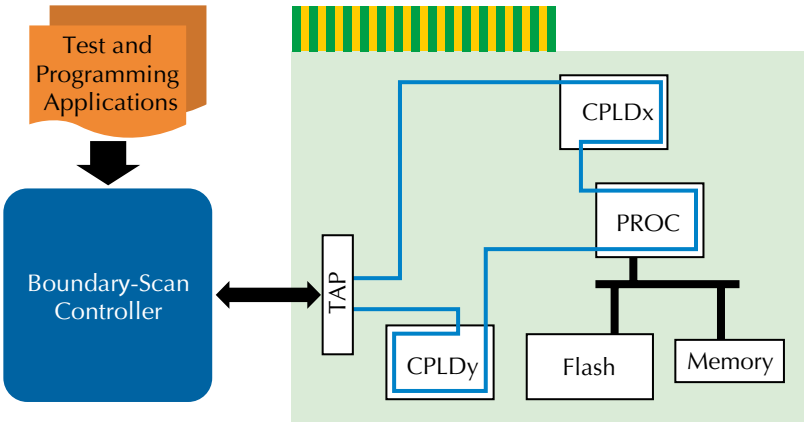


Figure 1. Block diagram

Figure 1 depicts a typical boundary-scan application. The controller sends a sequence of serial data vectors from the test system to the boundary-scan chain(s) on the target board and receives serial data back from the target.

On the target, the data input causes electrical testing and device programming to be performed, while the results of the operations are reported via the output stream. Controllers can be implemented in the development station as well as a wide variety of production environments includ-ing a stand-alone boundary-scan station or integrated within in-circuit, flying probe and functional test systems. Refer to the JTAG Technologies website for additional information on the many production alternatives including OEM and Symphony systems for in-circuit testers and flying probe systems as well as integrations for LabVIEW, LabWindows, TestStand, C/C++ and Visual Basic.

JT 37x7 DataBlaster

The JT 37x7 DataBlaster controller provides four test access ports (TAPs) to communicate simultaneously and independently with up to four boundary-scan chains on one board or multiple boards. Use of more than one chain on a board does not reduce the test coverage and may ease design constraints; refer to JTAG Technologies DFT Guidelines for more information. In flash programming applications, each controller allows true gang programming including individual verification of up to four flash memories. The number of chains may be increased almost without limit by the use of multiple controllers or by system-level techniques.

DataBlaster's scalable architecture provides three levels of operating performance to match the application requirements:

DataBlaster type	Intended applications
JT 3707	Base-level for board testing, CPLD programming and flash programming of small data blocks
JT 3717	Board testing, CPLD programming, and programming of moderate-size flash memories in manufacturing and debugging
JT 3727	All applications including board testing and in-system programming of large flash memories and CPLDs in manufacturing and debugging

Upgrading among the -07/-17/-27 types is handled swiftly and economically by means of modules that plug into the controller:

DataBlaster type	Description
JT 3707 to 3717	JT 2108 ETT (Enhanced Throughput Technology™) module
JT 3717 to 3727	JT 2116 Flash image module

For each of the three DataBlaster performance levels, several form factors are available to support a variety of engineering, manufacturing, and service environments:

DataBlaster type	Description
JT 37x7/TSI	Portable unit containing three interfaces to the test system: USB (1.1 and 2.0 high speed), Ethernet and Firewire
JT 37x7/PCI	PC plug-in controller to PCI bus slot
JT 37x7/PCIe	PC plug-in controller to PCI Express bus slot
JT 37x7/PXI	PXI and CompactPCI plug-in controller with 3U height
JT 37x7/CompactPCI	CompactPCI plug-in controller with 6U height
JT 37x7/RMI (*)	Rack mountable boundary-scan instrument, including 256 digital I/O's to enhance test access and coverage
JT 37x7/APC (**)	Plug-in controller for installation in Agilent 3070 ICT pin-card slot

DataBlaster's programmable TCK operates at a maximum sustained rate of 40 MHz and is adjustable down to 1KHz. Normally, the clock speed matches the slowest device on the boundary-scan chain automatically. However, TCK can also be programmed in steps: for example, in the 6.25 - 12.5 MHz range, the step size is 50 kHz, and in the 25 - 40 MHz range, the step size is 200 kHz. Rates of less than 1 KHz and static operation are supported by the use of an external clock.

Dedicated hardware within the DataBlaster maximizes throughput by continuously delivering test and programming files to the target, compared with burst operation typically used in other products. Furthermore, DataBlaster performs data compression and decompression on the fly and operates autonomously, returning control to the host computer only when the operation is completed.

Because of the large amount of data required, programming flash memory efficiently requires superior hardware and software tools. All DataBlaster controllers support JTAG Technologies' AutoWrite™, nearly tripling the flash programming throughput. DataBlaster controllers support programming target flash memory width from 1 bit to more than 64k bits. Use of separate counters for source and destination allows a block of image memory data to be positioned anywhere in the target memory. DataBlaster also supports other flash-specific control signals including Vpp Enable (to control optional programming voltages on the target), User0/User1 (user-definable, software-controlled outputs, for example a watchdog) and Ready/Busy (to verify completion of an operation).

Use of the Ethernet interface of the JT 37x7/TSI controller allows remote operation of boundary-scan applications, for example across a corporate intranet. This topology can be very beneficial for an enterprise with a centralized engineering facility and multiple distant production facilities. Figure 2 illustrates network-based provisioning of boundary-scan using the TSI controller.

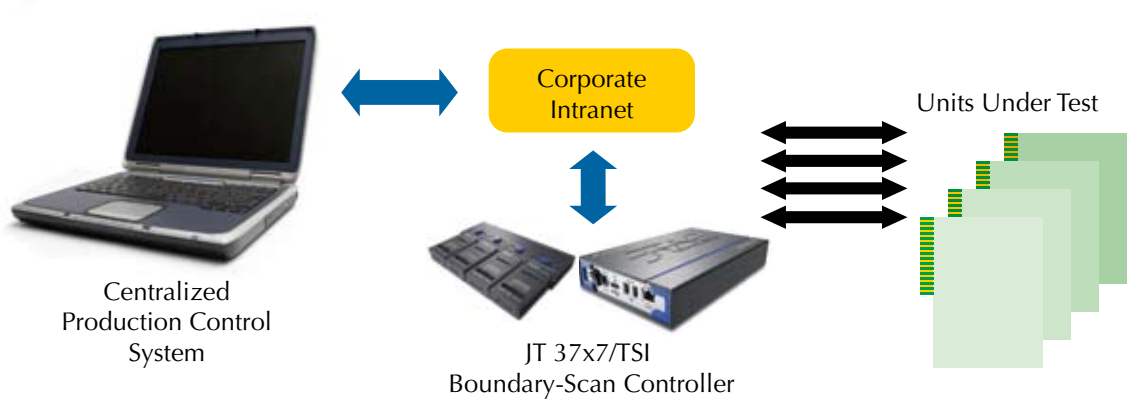


Figure 2. Block diagram of TSI-based remote operation

(*) Refer to JT 37x7/RMI spec sheet for more information
(**) Refer to Production Systems datasheet for more information

JT 2147 QuadPOD

DataBlaster controllers are delivered with the with the JT 2147 QuadPOD consisting of the JT 2148 transceiver and four independent, programmable JT 2149 TAP PODs. The QuadPOD interfaces between the boundary-scan controller and the target board(s) providing excellent signal quality and configuration flexibility. Connection from the controller to the QuadPOD is via a SCSI II-type cable and from the individual PODs to the target(s) via (ribbon) cables.

PODs can be detached individually from the QuadPOD transceiver via the provided one-meter cables.

JT 2148 QuadPOD transceiver

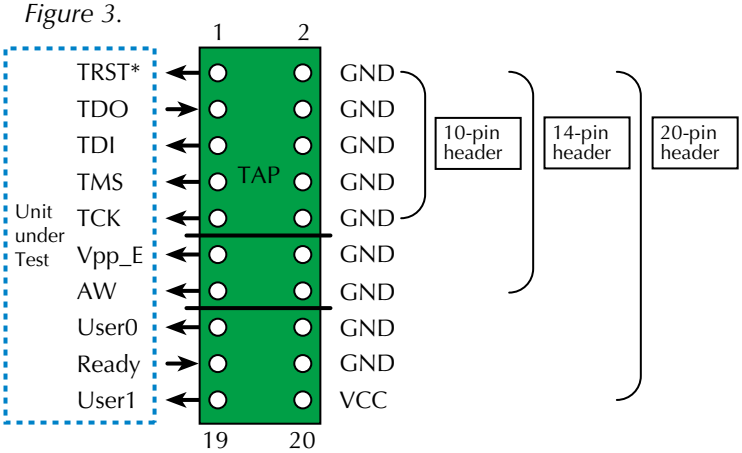
Cabling provided with the /10 version of the QuadPOD transceiver is ideal for most desktop applications, while the cables and splitter provided with the /13 version allow it to be easily integrated into a test fixture. The PODs meet industrial specifications for use in demanding applications such as environmental test chambers. Each POD contains an in-use indicator, and if no TAP is selected by the execution software, the QuadPOD is switched off and outputs are tri-stated. The QuadPOD can be hot-swapped, disconnected from the DataBlaster under power. When the QuadPOD is built into a fixture, this feature allows convenient changing or removal of the fixture in the test set-up.

JT 2149 TAP POD

Each POD provides active line terminations, maintaining the integrity of critical signals at the point of test. In addition to the TAP signals, the POD provides four programmable static I/O pins which can be used to pre-condition and monitor test and programming activities. I/O voltage levels of each POD can be independently programmed, and within each POD the TDI and TDO signal voltages can be set separately to match a variety of target chip technologies.

Connection to the target printed circuit board can be made using a standard 10-, 14- or 20-pin connector as shown in Figure 3. TDI on the header connects to the TDI pin of the first device in the target scan chain. TDO on the header connects to the TDO pin of last device in the chain. The JT 37x7 DataBlaster controllers are also compatible with earlier PF 2137 versions of the TAP POD, allowing existing production arrangements to be easily supported without impact on fixtures.

Figure 3.



Recommended TAP pin-out

Note: The standard boundary-scan signals, TRST, TDO, TDI, TMS, and TCK are on pins 1, 3, 5, 7 and 9, respectively, of all header types. With the 14-pin header, Vpp_E and AW are added. With the 20-pin header, two additional user signals are added plus a Ready/Busy pin. Four additional programmable I/O pins for static drive/sense are available with each JT 2149 TAP POD. A separate 26-p fine pitch connector at the front-end of each JT2149 POD carries all signals (TAP + I/O's).*

JT 2149/MPV Multi-Purpose/Voltage TAPModule

As with the other DIOS modules (*), the JT 2149/MPV increases the coverage and improves the diagnostic resolution of boundary-scan testing. It is fully supported by JTAG Technologies development tools, Classic and JTAG ProVision.

Besides a standard TAP POD and its 4 (static) I/O pins the JT 2149/MPV provides bi-directional parallel-scan access to up to 32 (dynamic) I/O channels grouped in two segments, each of which can be individually bypassed. Other DIOS modules can be serially connected if more parallel access points are required.

(*) Refer to Boundary-scan I/O modules datasheet for more information


JT 2149/MPV


JT 2149/MPV-017


JT 2149/eMPV

All JT 2149/MPV modules directly dock into a JT 2148 (Quad-Pod Tranceiver (QPT)) and are therefore powered by the controller. This means that the controller software will set both output voltage and input threshold voltage.
In principle the JT 2149/MPV is designed to enable more advanced functional and pattern-oriented testing. This is because a JT 2149/MPV can be programmed with different functions called SCIL's (Scan Configurable Interface Logic). By default the standard JT 2149/MPV(-001) is loaded with SCIL-1 function (TAP POD in series with 32-bit of digital I/O access points for testing.)
Another example is JT 2149/MPV-017. SCIL 17 turns the module into a HC(S)08, HCS12 Programming Adapter.

JT 2149/eMPV Extended Multi-Purpose/Voltage TAPModule
Like the JT 2149 standard TAP POD the JT2149/MPV has a fine pitch TAP-connector at its front. For users who like to use a standard pith (0.1″) TAP-connector the JT 2149/eMPV is available replacing the finepitch connector at the front.

JT 3705/USB Explorer
The JT 3705/USB Explorer supports two fully-compliant self-contained boundary-scan TAPs which can be synchronized for test purposes. Explorer is suitable for running a complete battery of board tests including IEEE 1149.1, 1149.4 and 1149.6 as well as PLD programming and low-volume flash programming. It connects to the host computer's USB port for power and signalling.

Test clock frequency is programmable up to 6 MHz allowing rapid test execution while TAP voltages can be set for a wide range of input and output characteristics. Both the input voltage and the output voltage of each TAP can be set individually. Explorer is compatible with all JTAG Technologies development tools including JTAG ProVision™ and all production software including stand-alone tools and production integration packages for LabVIEW, LabWindows and TestStand as well as C/C++ and Visual Basic.

Specifications

Range	
JT 37x7 controller to JT 2148 transceiver (at 40 MHz)	1 meters
JT 2148 transceiver to TAP POD (at 40 MHz)	1 meters
POD to target	L = 0.1 (T - Tco) - 0.9 L Length of TAP cable in meters T (1/f) Period of a TCK cycle in nanoseconds Tco Clock-to-Output delay time of the target board in nanoseconds f Frequency in GHz
JT 3705/USB to target	15 cm (*)

QuadPOD I/O voltages	
POD inputs/outputs	Four programmable I/Os per POD, 5-volt tolerant
Output voltage, programmable on an individual POD basis	From 1.65 V to 3.6 V in steps of 0.1 V (JT 2149 & JT 3705/USB) From 1.0 V to 3.6 V (JT 2149/(e)MPV)
Input voltage threshold	Separately adjustable 0 V to 1.8 V (JT 2149 & JT 3705/USB) Half the output voltage (JT 2149/(e)MPV)

(*) With delivered cable

QuadPOD dimensions	Transceiver / TAP POD
Width	190 mm / 44 mm
Depth	68 mm / 90 mm
Height	27 mm / 24 mm
Weight	0.16 kg / 0.04 kg

Connectivity	
POD connector	0.1″ and 0.05″ pitch
Controller to QuadPOD (JT 2147/10)	1-meter, 50-pin SCSI-II type cable with high-density connector
Controller to QuadPOD (JT 2147/13)	1-meter, 50-pin SCSI-II type cable with high-density connector plus splitter plus customer-provided interconnection ≈ 50 cm

Power and environmental	
QuadPOD	Powered from controller
JT 3705/USB	Powered from computer (USB)
JT 37x7/TSI	Powered from adapter
JT 37x7/PCI and JT 37x7/PCIe	Powered from computer
Temperature, Transceiver	Commercial temperature specifications
Temperature, PODs	Industrial temperature specifications

Interface compatibility	
Ethernet (JT 37x7/TSI) + /RMI	10 Base-T / 100 Base-TX UTP for LAN and WAN applications
USB (JT 3705/USB)	Plug and Play compatibility with Revision 1.1 and 2.0 (12 Mbits/sec)
(JT 37x7/TSI + /RMI)	Revision 1.1 and 2.0 (480 Mbits/sec) universal system bus interfaces
Firewire (JT 37x7/TSI + /RMI)	Compatible with IEEE 1394A-2000 100/200/400 Mbits/sec

Ordering information

Product Number	Description
JT 3707/<x> (*)	High-speed DataBlaster boundary-scan controller, including JT 2147 QuadPOD
JT 3717/<x> (*)	High-speed DataBlaster boundary-scan controller with ETT module, including JT 2147 QuadPOD
JT 3727/<x> (*)	High-speed DataBlaster boundary-scan controller with ETT and flash image modules, including JT 2147 QuadPOD
JT 2108	Flash ETT module, expands JT 3707 to JT 3717; enables flash programming features plus image memory size of 64Mbit
JT 2116	Flash Image module, expands JT 3717 to JT 3727; extends image memory size to 128Mbit
JT 2147/10	QuadPOD, including JT 2148/10 transceiver and four JT 2149 PODs
JT 2147/13	QuadPOD, including JT 2148/13 transceiver and four JT 2149 PODs
JT 2148/10	QuadPOD transceiver with SCSI-II interface and 1 meter SCSI cable to interface JT 37x7 controller and transceiver.
JT 2148/13	QuadPOD transceiver with two 25-pin sub-D-type connectors, splitter and 1 meter SCSI cable to interface JT 37x7 controller and transceiver.
JT 2149	TAP POD including one JT 2131/47 cable (1-meter, transceiver-to-TAP POD) and one PF 2131/26 cable (15-cm, TAP-to-UUT)
JT 2149/MPV	32 pin multi purpose/voltage DIOS TAP POD module for docking into JT 2148 QuadPOD transceiver
JT 2149/eMPV	Extended JT 2149/MPV but with standard pitch connectors
JT 3705/USB	2.0 full speed boundary-scan Explorer and 2 PF 2131/10 cables and 2 PF 2131/11 flying leads

(*) Specify form factor: <x> = PCI, PCIe, PXI, RMI, Compact PCI/3U, Compact PCI/6U. All JT 37x7 controllers are delivered with either the JT 2147/10 or JT 2147/13 QuadPOD; specify in PO. JT 37x7/RMI has a built-in QuadPOD.

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