DT300 Series

Key Features

Low-Cost, Multifunction Data Acquisition Boards for the PCI Bus

- *Six different board configurations provide a range of flexible, cost-effective options*
- *High-speed bus-master transfers data without CPU intervention freeing up system resources for processing*
- *ENOB specification guarantees outstanding total system accuracy*
- *High-speed dynamic digital inputs can time stamp your digital input in relation to A/D*
- *Generous 1024-location channel gain list allows flexible channel selection in any sequence desired*
- *Flexible triggering and clocking capabilities*
- *No interrupts required, freeing up system resources*

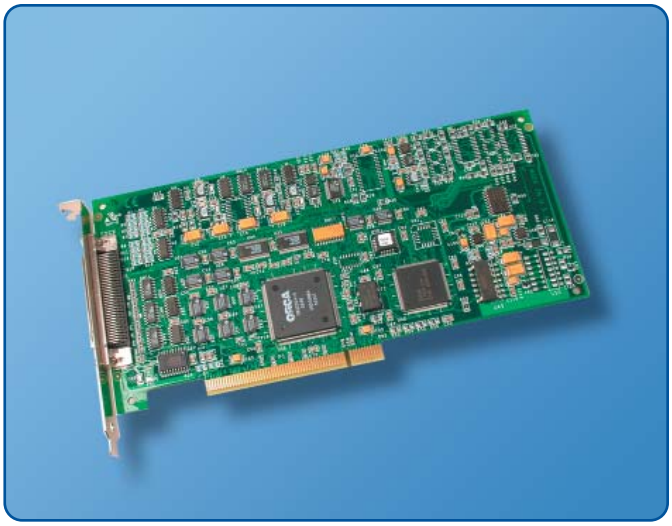


Figure 1. The DT300 Series is a family of low-cost, multifunction PCI bus-mastering boards.

- *Supported by Measure Foundry™, test and measurement application builder software that lets you easily create complex measurement applications*

Features Summary

Analog Inputs				
Board	**Channels**	**Resolution**	**Input Ranges**	**Throughput**
DT301	16SE/8DI	12 bits	±1.25, 2.5, 5, 10 V 0-1.25, 2.5, 5, 10 V	225 kS/s
DT302	16SE/8DI	12 bits	±1.25, 2.5, 5, 10 V 0-1.25, 2.5, 5, 10 V	225 kS/s
DT303	16SE/8DI	12 bits	±1.25, 2.5, 5, 10 V 0-1.25, 2.5, 5, 10 V	400 kS/s
DT304	16SE/8DI	12 bits	±1.25, 2.5, 5, 10 V 0-1.25, 2.5, 5, 10 V	400 kS/s
DT321	16SE/8DI	16 bits	±1.25, 2.5, 5, 10 V	250 kS/s
DT322	16SE/8DI	16 bits	±1.25, 2.5, 5, 10 V	250 kS/s

	Analog Outputs			Digital I/O	
Board	**Channels**	**Resolution**	**Output Ranges**	**I/O Lines**	**Counter/Timer**
DT301	0	NA	NA	23	4
DT302	2	12 bits	±5, 10 V, 0-5, 10 V	23	4
DT303	0	NA	NA	23	4
DT304	2	12 bits	±5, 10 V, 0-5, 10 V	23	4
DT321	0	NA	NA	23	4
DT322	2	16 bits	±10 V	23	4

Overview

By sharing a common architecture and making use of standard accessories and software, the DT300 Series provides a full range of cost-effective options to meet your data acquisition needs both now and in the future.

Multifunction Data Acquisition Boards

Each DT300 Series board contains 16 single-ended or 8 differential analog inputs, 23 digital I/O lines, and four counter/timer channels. The resolution and throughput of the analog input channels differ depending on the model. The DT302, DT304, and DT322 boards also provide 2 analog output channels. With the plug-and-play feature of the PCI bus, no jumpers or switches to set, and the common architecture, accessories, and software of the DT300 Series, installing and upgrading DT300 Series boards is easy.

Analog Inputs

All DT300 Series boards feature 16 single-ended or 8 differential inputs. In addition, an Amp Low connection allows single-ended inputs to be referenced to a common point other than ground to provide 16 pseudo-differential inputs. Software-selectable unipolar or bipolar operation and gain settings of 1, 2, 4 or 8 provide input ranges of 0-10 V, 0-5 V, 0-2.5 V, 0-1.25 V, ±10 V, ±5 V, ±2.5 V, and ±1.25 V. For added flexibility, a 1024-location channel-gain list allows you to sample non-sequential channels and channels with different gains. The A/D resolution and maximum sampling rate vary depending on the board type, as listed below:

Board	Resolution	Sampling Rate
DT301/302:	12 bits	225 kS/s
DT303/304:	12 bits	400 kS/s

By offering board types with different features, the DT300 Series provides the right cost-effective solution for your data acquisition needs. The analog input subsystem can be completely software calibrated for hands-off operation.

Analog Input Acquisition Modes

DT300 Series boards can acquire a single value from any channel or a number of samples from multiple channels. To acquire data from multiple channels, DT300 Series boards provide two scan modes: continuously paced and triggered scan mode. Using continuously paced mode, the board scans the channel-gain list continuously and acquires data until you stop the operation or until a specific number of samples is acquired. Using triggered scan mode, the board scans the channel-gain list at high speeds with a programmed interval between scans, emulating a simultaneous sample-and-hold operation. Using an external or internal trigger source, you can retrigger a triggered scan operation to cycle through the channel-gain list up to 256 times per trigger; this allows you to acquire a waveform of data per channel for each trigger, up to 256K samples per trigger. You can pace either scan mode using an internal or external clock.

Flexible Triggering and Clocking Capabilities

Clocking and triggering of the A/D system in DT300 Series boards is provided by two 24-bit counter/timers with a 20 MHz oscillator. Four additional 16-bit counter/timers are available to the user.

The DT300 Series provides flexibility in triggering, both in the trigger modes available and the events that can cause the trigger. Trigger modes include post-trigger, pre-trigger and about-trigger acquisitions.

In post-trigger mode, the board acquires data after a digital (TTL) trigger or software trigger. In pre-trigger mode, acquisition proceeds until a digital trigger occurs. In about-trigger mode, the board acquires data both before and after a digital trigger occurs.

ENOB Specification Measures Total Accuracy

Total system performance of the DT300 Series is specified with the most accurate measurement available: ENOB (Effective Number of Bits). Derived from a board's signal-to-noise ratio, ENOB specifies the overall accuracy of the A/D transfer function. This single comprehensive figure of merit enables you to easily evaluate a board's AC accuracy and performance.

ENOB is 11.5 bits for the DT301, DT302, DT303, and DT304, and 14 bits for the DT321 and DT322.

You can pace the analog inputs using an internal or an external clock. You can set the internal clock to acquire data from one or more channels from 1.2 samples/second up to the maximum sampling rate of the board. If slower rates are desired you can use an external source, or cascade two or more of the user counter/timers and connect the output to the external clock input.

The external A/D sample clock and the digital trigger input signals are accessible through the user connector.

Analog Outputs

The DT302, DT304, and DT322 boards feature two serial, multiplying, analog output channels. The speed for each channel is 10 kHz (typical), based on a single-value, polled operation. The resolution and software selectable output range options for each board are listed below:

Board	Resolution	Output Ranges
DT302	12 bits	±5 V, 10 V 0-5 V, 10 V
DT304	12 bits	±5 V, 10 V 0-5 V, 10 V
DT322	16 bits	±10 V

Digital I/O

All DT300 Series boards feature 23 digital I/O lines. These lines are divided into the following ports:

- Ports A, lines 0 to 7
- Port B, lines 0 to 7, and
- Port C, lines 0 to 6

Using software, Ports A and B can be combined to create a virtual port consisting of 16 digital I/O lines. You can program each port for input or output and read or write to the port.

High-Speed Dynamic Digital Inputs

You can also read the status of the Ports A and B at rates as high as 3 Msamples/s by including the digital input lines of Ports A and B as a channel in the analog channel-gain list. This dynamic digital input feature allows you to "time stamp" the digital inputs in relation to the analog inputs. In this mode, all 16 digital input lines of Ports A and B are read as one word. The digital outputs have sufficient current capability to drive external solid-state relay modules (sink 12 mA and source 15 mA).

User/Counter Timers

Four 16-bit user counter/timers are available for counting events, creating a one-shot or frequency output, or measuring a frequency input. You can cascade two counters internally through software or cascade more than two counters externally on the screw terminal accessory. You can also set the duty cycle, frequency, and output polarity of the output pulse from the user counter/timers.

These four user counter/timers are in addition to the two 24-bit counter timers dedicated to clocking and triggering in the A/D system.

User Connections

All signals are brought out to a dedicated 68-pin connector on the backplate of each DT300 Series board. The STP300 screw terminal panel is available to simplify connections. The EP305 cable connects the DT300 Series board to the STP300 screw terminal panel.

High-Speed Burst Data Transfer

A custom-designed PCI bus interface chip allows for high-speed, bus-mastering data transfers to the host computer. By setting aside a block of memory in the host computer, a DT300 Series board performs bus-master data transfers without CPU intervention, allowing the CPU to perform other tasks such as data analysis and graphics. This implementation does not carry the additional overhead of scatter-gather or other DMA transfer methods which necessitate reprogramming the controller for new addresses.

No Interrupts Required

Many data acquisition boards require interrupts. This uses up valuable system capability. DT300 Series boards require no interrupts, so installation is simple and valuable system resources are free for other uses.

Software

All boards ship with the Omni CD that includes the following software:

- DT-Open Layers for .NET with DT-Display:
  The DT-Open Layers for .NET Class Library is a collection of classes, methods, properties, and events that provides a programming interface for DT-Open Layers-compatible hardware devices. It can be used from any language that conforms to the Common Language Specification (CLS), including Visual Basic.NET, Visual C#, Visual C++.NET with managed extensions, and Visual J#.NET.
  - — DT-Display for .NET is a control for plotting data to a Windows form. It provides a powerful and user-friendly interface for rendering data.
- DT-Open Layers for Win32:
  DT-Open Layers for Win32 consists of the DataAcq SDK and DTx-EZ.
  - — The DataAcq SDK consists of the necessary header files, libraries, example programs, and documentation to develop your own DT-Open Layers data acquisition and control applications. It is intended for use with non .NET languages, such as ANSI C, Visual C++ 6.0, and Visual Basic 6.0.
  - — DTx-EZ provides visual programming tools for Microsoft Visual Basic and Visual C++ that enable quick and easy development of test and measurement applications.

Note: If you have an existing application that was written using the DataAcq SDK, we recommend that you migrate your application to use the DT-Open Layers for .NET Class Library. This will guarantee compatibility with future Data Translation hardware and software.

- Drivers:
  The 32-bit WDM device drivers make your application cross-platform compatible. These drivers support Data Translation USB and PCI boards using Windows 2000/XP.

You can choose to install demo versions of the following software from the CD:

- Measure Foundry is an open, powerful application builder for test and measurement systems. No programming is required!
- quickDAQ is a high performance, ready-to-run application that lets you acquire, plot, analyze, and save data to disc at 2MHz per channel without writing any code. quickDAQ supports applications from temperature measurement to high-speed testing and analysis.

Accessories

- LV-Link contains all necessary VIs, examples, and documentation to use Data Translation hardware in LabVIEW 8.0 and greater.

The following software is available as a free download from our web site.

- DAQ Adaptor for MATLAB™ to access the visualization and analysis capabilities of MATLAB from The MathWorks™.

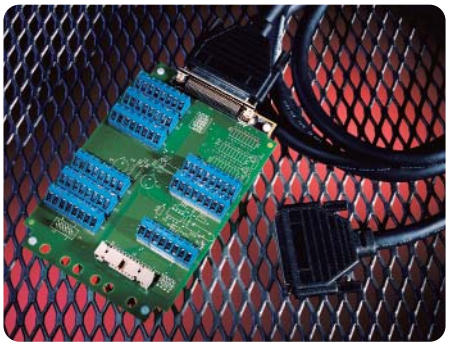
Cross-Series Compatibility Saves Programming Time, Protects Your Investment

Virtually all Data Translation data acquisition boards, including the DT300 Series, are compatible with the DT-Open Layers software standard. This means that if your application was developed with one of Data Translation's software products, you can easily upgrade to a new Data Translation board, now or in the future. Little or no reprogramming is needed. For example, if you are currently using a Data Translation DT2801 data acquisition board, upgrading to a DT300 Series board is simple – just load the new drivers and you're done.

STP300 Screw Terminal Panel and the EP305 Cable

The STP300 screw terminal panel together with the EP305 cable simplifies the connection of input and output devices to any DT300 Series board. Accommodating all user connections on convenient screw clamp connectors, the STP300 mounts on a panel and includes nylon standoffs for tabletop applications. The panel measures 4.9 in. wide by 6.9 in. long.

The EP305 is a 68-pin, 2 meter, shielded cable that connects the DT300 Series board to the STP300 screw terminal panel.



DT300 Series User's Manual

This manual is provided in electronic (PDF) format on the CD-ROM provided with the board. You can also purchase a hard copy of this manual.

Note: The STP300 screw terminal panel fits inside a standard EAI plastic enclosure (part # 0-0-94-14-110). Contact EAI for availability.

- **Click here for specifications.**
- **Click here for pin assignments.**

Ordering Summary

All Data Translation hardware products are covered by a 1-year warranty. For pricing information, see a current price list, visit our web site, or contact your local reseller.

DT300 Series

Each DT300 Series board is shipped with the Data Acquisition Omni CD, which includes DT-Open Layers.NET compliant drivers drivers for Microsoft Windows 2000/XP, ready-to-run software, and a comprehensive user's manual in PDF format. Manuals are available in hard-copy form for an additional charge.

- DT301 PCI data acquisition board with 12-bit, 225 kS/s analog inputs and no analog outputs.
- DT302 PCI data acquisition board with 12-bit, 225 kS/s analog inputs and 2, 12-bit analog outputs.
- DT303 PCI data acquisition board with 12-bit, 400 kS/s analog inputs and no analog outputs.
- DT304 PCI data acquisition board with 12-bit, 400 kS/s analog inputs 2, 12-bit analog outputs.
- DT321 PCI data acquisition board with 16-bit, 250 kS/s analog inputs and no analog outputs.
- DT322 PCI data acquisition board with 16-bit, 250 kS/s analog inputs 2, 16-bit analog outputs.

Accessories

- STP300 — Shielded screw terminal panel.
- STP68 — Low cost screw terminal panel.
- STP68-DIN — STP68 screw terminal panel equipped for DIN-rail mounting.
- EP305 — 68-pin, 2 meter, shielded cable for connecting STP300
- 5801 or 5808 — Signal conditioning backplane
- AC1315 — 2 foot, cable for connecting 5B backplanes
- 7B Series — Modular signal conditioning
- DT300 Series User's Manual in hard-copy form

Software

The following software can be purchased separately:

- Measure Foundry is an open, powerful application builder for test and measurement systems.
  SP1300-CD
- quickDAQ is a high-performance, ready-to-run application that lets you acquire, plot analyze, and save data to disk at up to 2 MHz per channel.
  SP8051-CD
- LV-Link to access the power of our boards through LabVIEW.
  SP0811

Data Translation now offers free downloads on the Web for:

- DAQ Adaptor for MATLAB to access the analysis and visualization tools in MATLAB.