

# DT300 Series

## Low Cost, Multifunction PCI Data Acquisition Boards

DT300 Series

Low Cost, Multifunction PCI DAQ

### Key Features:

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



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

### 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,  $\pm 10$  V,  $\pm 5$  V,  $\pm 2.5$  V, and  $\pm 1.25$  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-bit	225 kS/s
DT303/304	12-bit	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.

### Features Summary

Board	Analog Inputs				Analog Outputs			Digital I/O	
	Channels	Resolution	Input Ranges*	Throughput	Channels	Resolution	Output Ranges	I/O Lines	Counter/Timer
DT301	16SE/8DI	12-bit	$\pm 1.25$ V, 2.5V, 5V, 10V 0-1.25V, 2.5V, 5V, 10V	225 kS/s	—	—	—	23	4
DT302	16SE/8DI	12-bit	$\pm 1.25$ V, 2.5V, 5V, 10V 0-1.25V, 2.5V, 5V, 10V	225 kS/s	2	12-bit	$\pm 5$ V, $\pm 10$ V 0-5V, 0-10V	23	4
DT303	16SE/8DI	12-bit	$\pm 1.25$ V, 2.5V, 5V, 10V 0-1.25V, 2.5V, 5V, 10V	400 kS/s	—	—	—	23	4
DT304	16SE/8DI	12-bit	$\pm 1.25$ V, 2.5V, 5V, 10V 0-1.25V, 2.5V, 5V, 10V	400 kS/s	2	12-bit	$\pm 5$ V, $\pm 10$ V 0-5V, 0-10V	23	4
DT321	16SE/8DI	16-bit	$\pm 1.25$ V, 2.5V, 5V, 10V	250 kS/s	—	—	—	23	4
DT322	16SE/8DI	16-bit	$\pm 1.25$ V, 2.5V, 5V, 10V	250 kS/s	2	16-bit	$\pm 10$ V	23	4

## 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-bit	$\pm 5V$ , $\pm 10V$ , 0-5V, 0-10V
DT304	12-bit	$\pm 5V$ , $\pm 10V$ , 0-5V, 0-10V
DT322	16-bit	$\pm 10V$

## 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

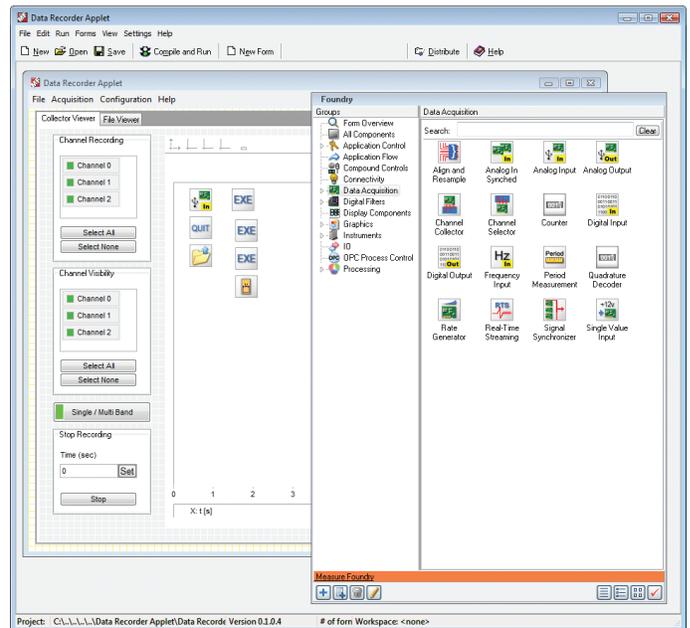
All signals are brought out to a dedicated 68-pin connector on the backplate of each DT300 Series board. The STP300 screw terminal panel is available to simplify connections. The EP305 cable connects the DT300 Series board to the STP300 screw terminal panel.

## Software Options

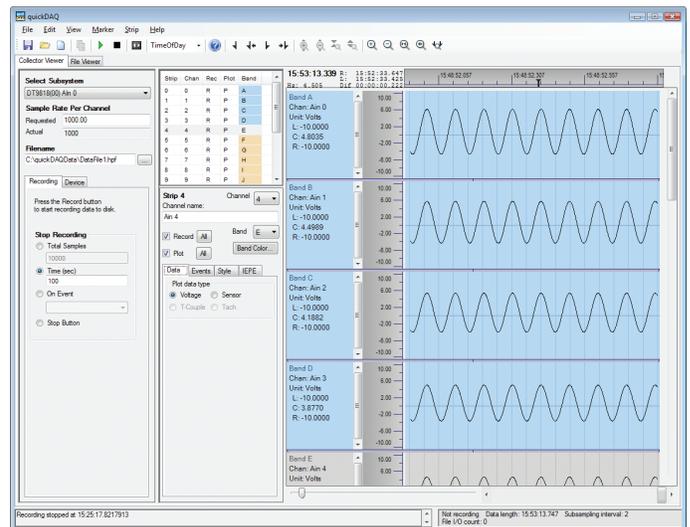
Many software choices are available for application development, from ready-to-measure applications to programming environments.

The following software is available for use with this DAQ module and is provided on the Data Acquisition Omni CD:

- Device Driver** – The device driver allows the use of this DAQ module or board with any of the supported software packages or utilities.
- Measure Foundry**® – An evaluation version of this software is included on the Data Acquisition Omni CD. Measure Foundry® is a drag-and-drop test and measurement application builder designed to give top performance with ease-of-use development.
- Measurement Applets** – Included in the Measure Foundry evaluation version. These small applications, developed with Measure Foundry, can be modified or combined to provide a specific solution. Order the full development version of Measure Foundry to develop applications using real hardware.
- quickDAQ application** – An evaluation version of this .NET application is included on the Data Acquisition Omni CD. quickDAQ acquires analog data from all devices supported by DT-Open Layers for .NET software at high speed, plots it during acquisition, analyzes it, and/or saves it to disk for later analysis. *Note: quickDAQ supports analog input functions only. DT9817 and DT9835 modules are DIO only and are not supported.*
- Quick DataAcq application** – The Quick DataAcq application provides a quick way to get up and running using your PCI board. Using this application, verify key features of the module, display data on the screen, and save data to disk.
- DT-Open Layers® for .NET Class Library** – Use this class library if you want to use Visual C#® or Visual Basic® for .NET to develop application software for your PCI board using Visual Studio® 2003/2005/2008; the class library complies with the DT-Open Layers standard.
- DataAcq SDK** – Use the Data Acq SDK to use Visual Studio 6.0 and Microsoft® C or C++ to develop application software for your PCI board using Windows®; the DataAcq SDK complies with the DT-Open Layers standard.
- DTx-EZ** – DTx-EZ provides ActiveX® controls, which allows access to the capabilities of your PCI board using Microsoft Visual Basic or Visual C++®; DTx-EZ complies with the DT-Open Layers standard.
- DAQ Adaptor for MATLAB** – Data Translation's DAQ Adaptor provides an interface between the MATLAB® Data Acquisition (DAQ) toolbox from The MathWorks™ and Data Translation's DT-Open Layers architecture.
- LV-Link** – An evaluation version of this software is included on the Data Acquisition Omni CD. Use LV-Link to use the LabVIEW™ graphical programming language to access the capabilities of your PCI board.



The data recorder applet is developed with Measure Foundry and allows you to acquire data, plot it, and save it to disk.



quickDAQ acquires analog data from all devices supported by DT-Open Layers for .NET software at high speed, plots it during acquisition, analyzes it, and/or saves it to disk for later analysis.

## 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.

## 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 table-top 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.



## Cross-Series Compatibility

Virtually all Data Translation data acquisition modules are compatible with the DT-Open Layers for .NET Class Library. 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. Little or no reprogramming is needed.

## User Manual

Each DT300 Series board includes a user's manual that provides getting started and reference information about using the DT300 Series. The manual is provided in electronic (PDF) format on the Data Acquisition Omni CD provided with the module.

## Technical Support

Application engineers are available by phone and email during normal business hours to discuss your application requirements. Extensive product information, including drivers, example code, pinouts, a searchable Knowledge Base, and much more, is available 24 hours a day on our web site at [www.datatranslation.com](http://www.datatranslation.com).

For more information about the DT300 Series, including specifications, please visit: <http://www.datatranslation.com/info/DT300/>

## Ordering Summary

All Data Translation hardware products are covered by a 1-year warranty. For pricing information, please visit our website or contact your local reseller.

### DT300 SERIES

- **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

### SOFTWARE

The following software is available for purchase separately:

- **Measure Foundry** (SP1300-CD)– Visual, drag-and-drop software development environment for Windows® XP, Vista, and Windows 7.
- **quickDAQ** (SP8501-CD) – High-performance, ready-to-run application that lets you acquire, plot, analyze, and save data to disk at up to 2 MHz per channel.
- **LV-Link** – Access the power of Data Translation boards through LabVIEW™.

### FREE SOFTWARE

The following software is available for free download from our website:

- **DAQ Adaptor for MATLAB** – Access the analysis and visualization tools of MATLAB®.