

# DT9853/DT9854

Isolated, low cost D/A modules for USB

DT9853/DT9854

Type: Analog Output Modules Bus: USB

## Key Features

- **4 or 8 glitchless analog output channels** with 16-bit resolution – ideal for process control, control loop, and test applications
- **8 dedicated** digital input lines and 8 dedicated digital output lines
- **Interrupt on change** support on up to 7 digital inputs – great for monitoring and controlling critical signals
- **Output ranges** of 0-10V,  $\pm 10V$ , and 0-20mA for maximum flexibility
- **Scalable design** – easily connect multiple modules together for high-channel count applications
- **Compatible** with 8 to 36 VDC external excitation for current drive
- **Configurable digital input state** – choose either pull-up or pull-down to suit your application needs
- **Many software options:** from VB.NET to full no programming Measure Foundry applications.
- **Galvanically isolated to  $\pm 300V$**  to protect your computer and maintain signal integrity

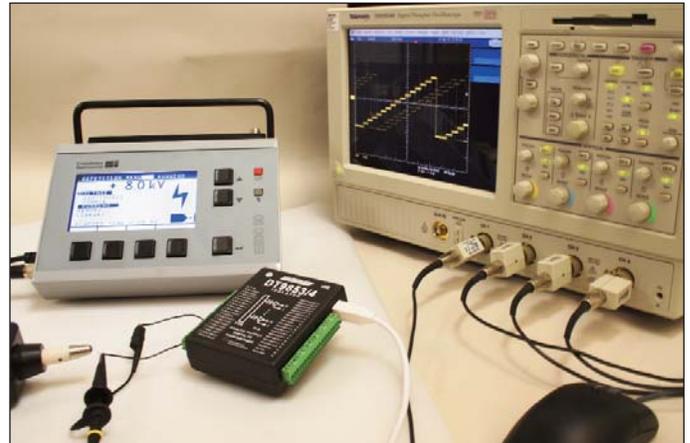


Figure 1. The DT9853/54 can withstand an 8,000V spike directly to any pin without disrupting the module operation. The scope output above shows such a test. (See Figure 3. for a more in-depth explanation.)

- **Compact, rugged enclosure** with standard screw terminal connections for easy wiring
- **Software calibration utility** for calibrating the analog output circuitry

## Available Models

Model	# of Channels	Resolution (bits)	Digital I/O	C/T	Output Range	Isolation
DT9853	4	16	16	1	0-10V, $\pm 10V$	$\pm 300V$
DT9853-M	4	16	16	1	0-10V, $\pm 10V$ , 0-20mA	$\pm 300V$
DT9854	8	16	16	1	0-10V, $\pm 10V$	$\pm 300V$
DT9854-M	8	16	16	1	0-10V, $\pm 10V$ , 0-20mA	$\pm 300V$

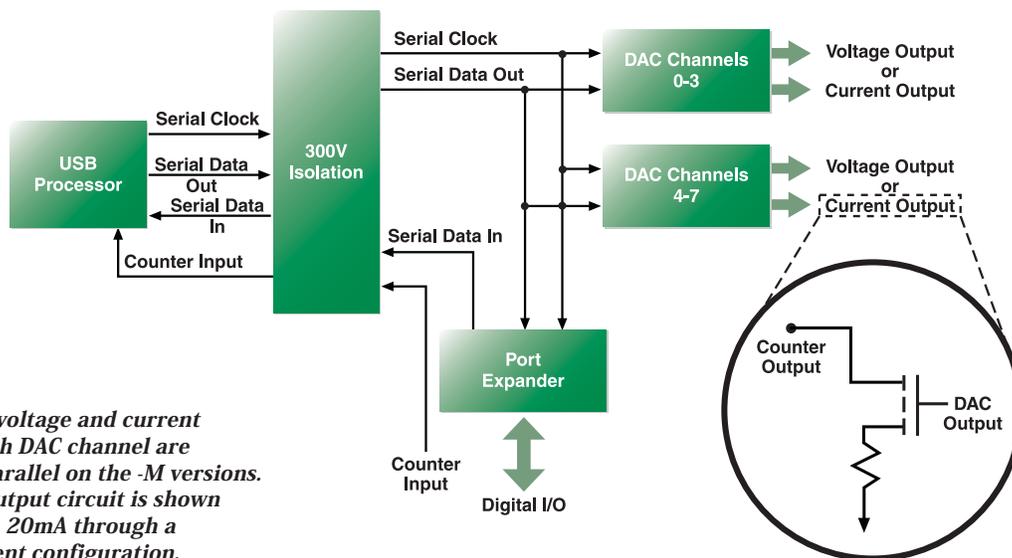


Figure 2. The voltage and current output for each DAC channel are available in parallel on the -M versions. The current output circuit is shown providing 0 to 20mA through a constant current configuration.

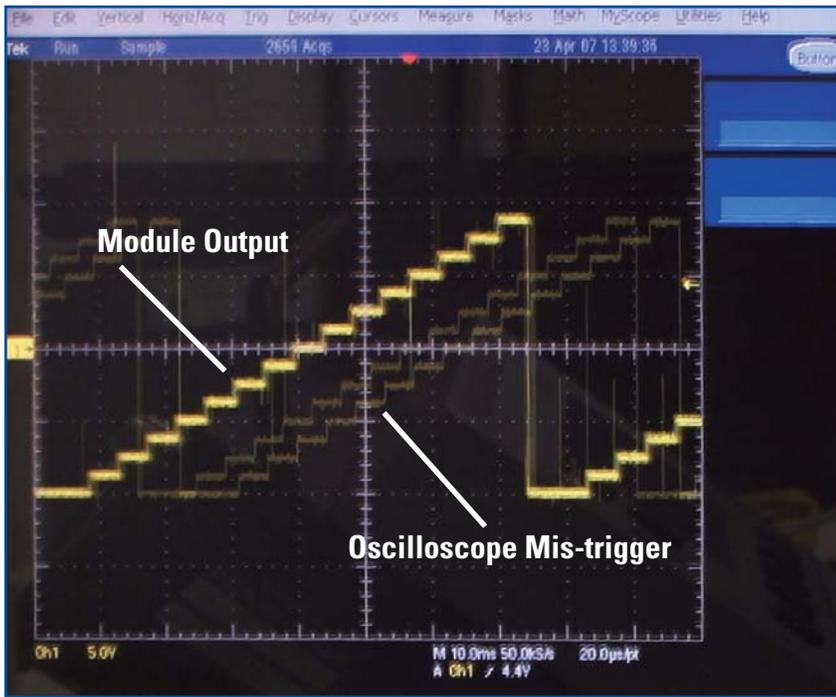


Figure 3. Screen shot of a digital scope trace from Figure 1. shows an analog output waveform updated for all 8 channels at 100Hz each. The module is being subjected to 8000V ESD discharges directly on the D/A output. The module keeps operating to specification, but the scope mis-triggers as a result of the discharge. This performance, despite the high voltage noise, shows that USB measurements can be performed reliably in hostile environments. This measurement integrity is due to shielding in the enclosure and galvanic isolation back to the host PC.

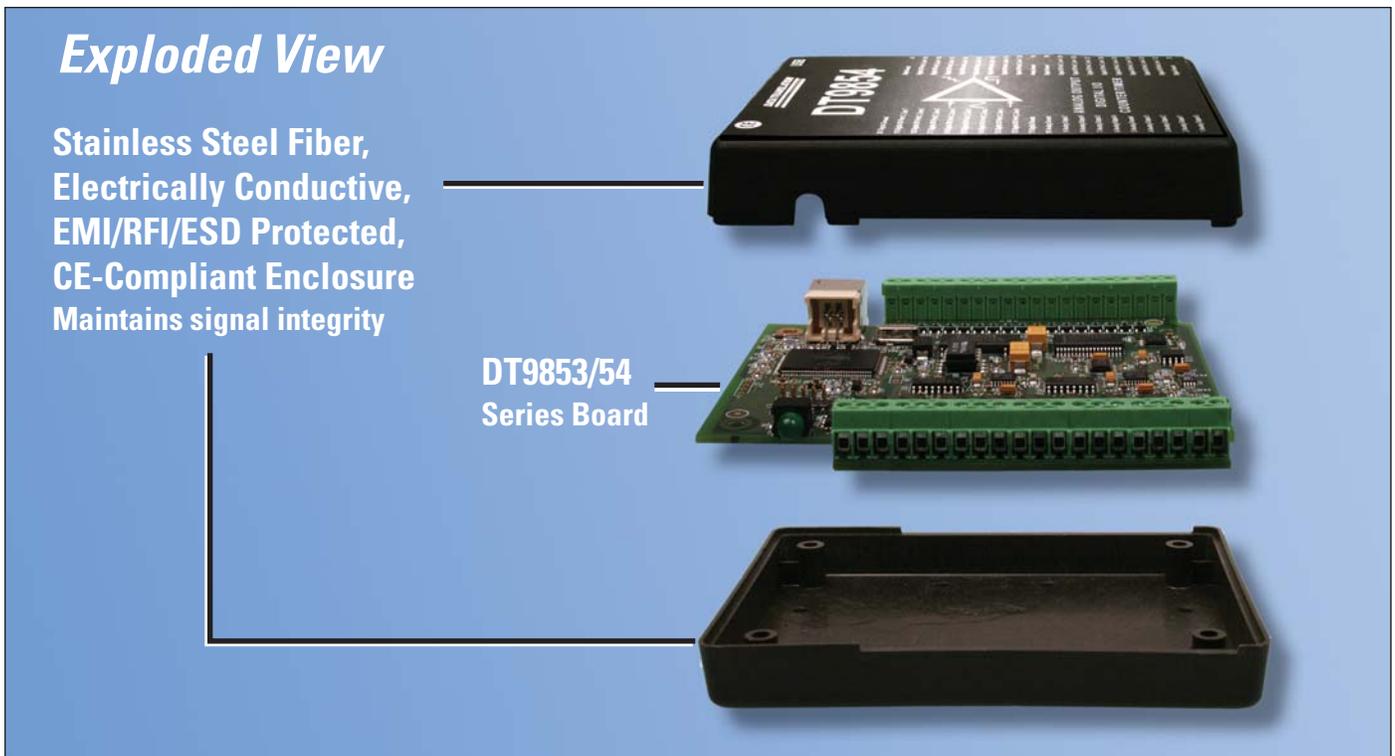


Figure 4. The DT9853/54 boards are encased in a rugged enclosure to ensure CE-compliance and maintain signal integrity.

## Overview

The DT9853 and DT9854 modules, are low-cost analog output and digital I/O modules for the USB bus. They provide 4 or 8 glitchless analog outputs at 16-bit resolution in a compact enclosure. These low cost modules are ideal for applications requiring stable and accurate output signals.

## Analog Output Subsystem

The DT9853 provides 4 glitchless analog outputs with 16-bit resolution and 16 digital I/O lines with an analog output range of 0-10V or  $\pm 10V$ .

The DT9854 provides 8 glitchless analog outputs with 16-bit resolution and 16 digital I/O lines with an analog output range of 0-10V or  $\pm 10V$ .

A unique feature of this series provides double-buffering of the digital data on each analog output channel to prevent spurious outputs.

## Current Output Option

Unlike the DT9853 and DT9854 modules, which support voltage output only, the DT9853-M and DT9854-M modules support both voltage and current output for each channel. Output ranges of 0-10V,  $\pm 10V$ , and 0-20mA are provided. Because current outputs do not degrade over distance (no IR drop), they are ideal for industrial settings where your PC may be remotely located from the devices you are driving.

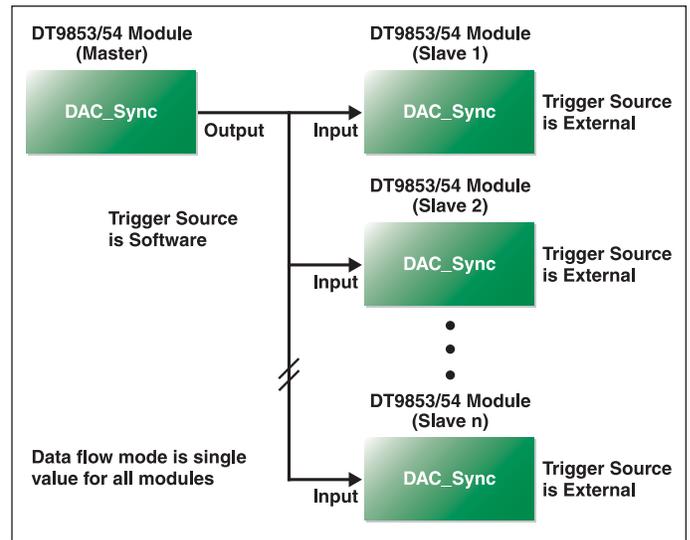
The D/A converter on the module controls the output on each channel pair. Therefore, when a value is written to a channel, both the current output signal and the voltage output signal of the associated channel are updated. How the analog output channels are wired determines how they are used.

The value that is output on the channel depends on the output range that is selected for the subsystem and the current load. For example, if specifying a range of  $\pm 10 V$ , writing a code of 0000 to the analog output channel corresponds to  $-10 V$  or 0 mA (depending on the load), while writing a code of FFFF to the channel corresponds to  $+10 V$  or 20 mA, (depending on the load).

## Analog Output Operation Modes

DT9853 and DT9854 modules provide multiple operation modes to match different application needs. The user can perform the following analog output operations with any of the modules:

- Single-value on one analog output channel
- Simultaneous single-value operations on multiple analog output channels of a single module
- Simultaneous single-value operations on multiple DT9853 and DT9854 modules



**Figure 5.** This diagram illustrates how to configure a system to simultaneously update all analog output channels on one or multiple modules.

## Updating All Analog Output Channels of One Module Simultaneously

All the analog output channels of one module can be updated simultaneously by setting the data flow mode to single value and using either a software or external trigger. The user specifies the values to write to the analog output channels. When the operation starts (by issuing a software command), the module simultaneously updates all the analog output channels with the specified values.

## Updating the Analog Output Channels of Multiple Modules Simultaneously

The user can simultaneously update all the analog output channels of multiple modules by connecting them together through their DAC\_Sync pins, setting their data flow mode to single value, and configuring their trigger sources appropriately. Figure 3 illustrates how this works.

In this configuration, the DAC\_Sync pin of one module (called the master module) is configured as an output - the trigger source is set to software. The DAC\_Sync pins of the other connected modules (called slave modules) are configured as inputs - their trigger sources are set to external. When the operation is started, the master module automatically sends a low-to-high signal from its DAC\_Sync pin to the other connected modules; the analog output channels of all connected modules are updated simultaneously with the values specified.

## Software Options

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

The following software is available for use with the DT9853 and DT9854 modules and is provided on the Data Acquisition Omni CD:

- **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** – These small applications, developed with Measure Foundry, can be modified or combined to provide a specific solution. Applets are included with the Measure Foundry evaluation version and are also available for download from our website. 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.
- **Quick DataAcq application** – The Quick DataAcq application provides a quick way to get up and running using a DT9853/DT9854 module. 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 a DT9853/DT9854 module 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 a DT9853/DT9854 module 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 the DT9853/DT9854 module 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 the DT9853/DT9854 module.

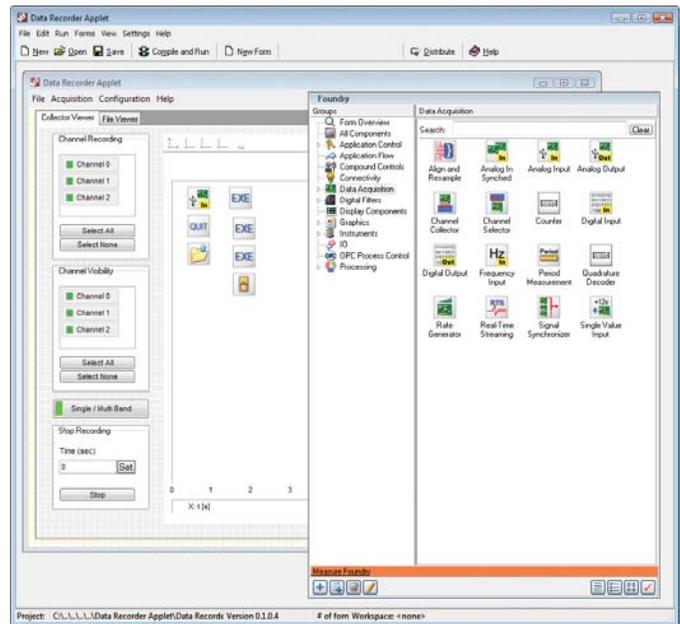


Figure 5. The data recorder applet is developed with Measure Foundry and allows you to acquire data, plot it, and save it to disk.

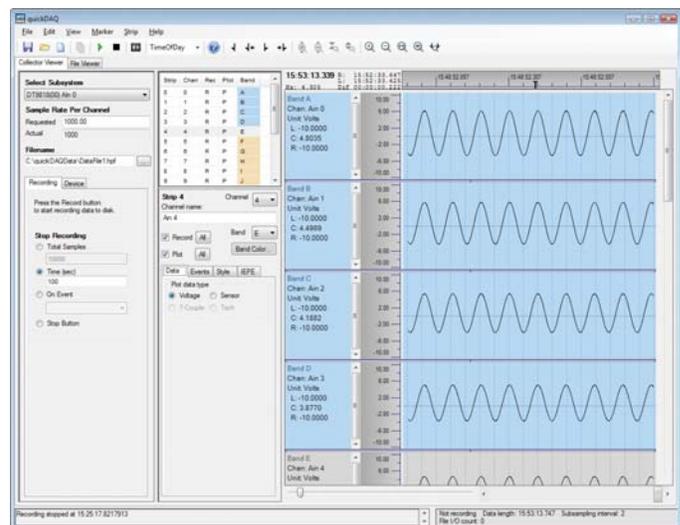


Figure 6. quickDAQ acquires analog data from all devices supported by DT-Open Layers for .NET software at high speed, plots it during acquisition, analyzes it, and/or saves it to disk for later analysis.

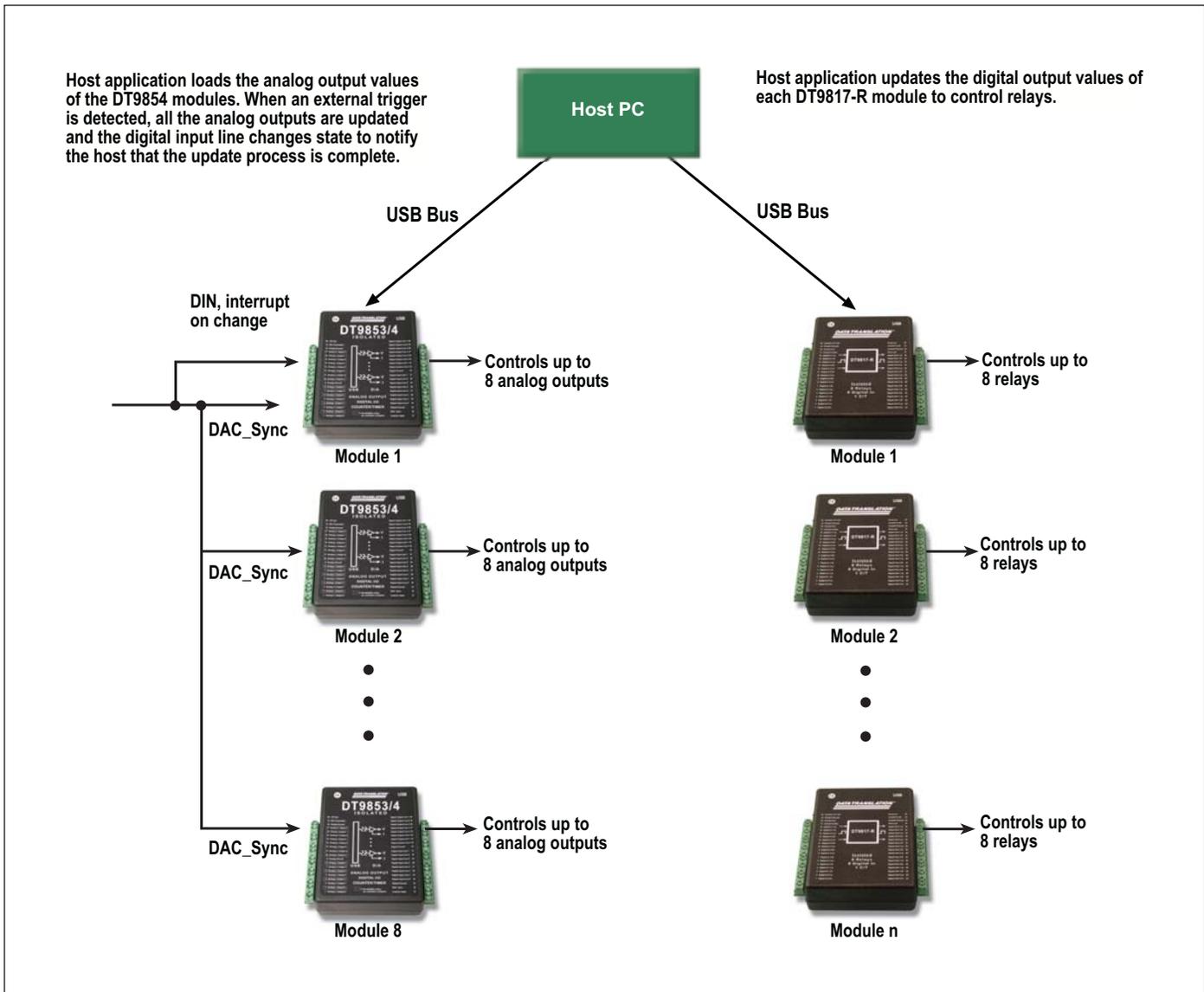


Figure 9. For high-channel count, industrial control applications, use multiple DT9853/54 modules to control analog output signals and multiple DT9817-R modules to control relays.

## Trigger Sources

The DT9853 and DT9854 provide a bi-directional signal that allows simultaneous update of the values of the analog output channels. This signal can be used in the following ways:

- Configure the trigger source for the module as external, the signal is configured as an input. When a low-to-high transition is detected, all the analog outputs of the module are updated simultaneously.
- Configure the trigger source for the module as software, the signal is configured as an output. When an operation is started (using a software command), the module outputs a signal. Use this signal to synchronize multiple modules so that all the analog output channels on each device are updated simultaneously.

## Digital I/O Lines

The DT9853 and DT9854 modules support 16 digital I/O lines. These lines are divided into two ports of eight. The user can specify the digital I/O line to read or write. Two operating modes are support for the digital I/O lines.

- Single-value digital I/O operations
- Continuous digital input operations

## Interrupts

The DT9853 and DT9854 modules can generate an interrupt when a digital input line changes state. This feature is useful for monitoring critical signals or when the user wants to signal the host computer to transfer data to or from the module.

## Counter/Timer Features

The DT9853 and DT9854 modules provide one 32-bit counter/timer that accepts a counter input signal with a frequency of 1 MHz. The module counts the number of rising edges that occur on the counter input signal. A maximum of 4,294,967,296 events can be counted before the counter rolls over to 0 and starts counting again.

## Ordering Summary

- **DT9853** – 4-channel USB analog output module
- **DT9853-M** – 4-channel USB analog output module with current
- **DT9854** – 8-channel USB analog output module
- **DT9854-M** – 8-channel USB analog output module with current

### Software:

The following software can be purchased separately:

- **Measure Foundry** – Test and measurement application builder for Windows XP/Vista. SP1300-CD.
- **quickDAQ** – High-performance, ready-to-run application that lets you acquire, plot, analyze, and save data to disk at up to 2 MHz per channel. SP8501-CD
- **LV-Link** – Access the power of Data Translation boards through LabVIEW.

### Free Software Downloads

The following software is available as a free download from our website:

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

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

For more information about the DT9853/DT9854, please visit:  
<http://www.datatranslation.com/go/DT9853/>

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