

DT9800 Series

USB Function Modules for Data Acquisition

DT9800 Series

Type: Multifunction Bus: USB

Key Features

- True plug-and-play:
 - One cable supplies both power and all connections to the USB module.
 - All connections are external so you do not need to open the chassis for installation.
 - Hot-swapping capability lets you plug and unplug while your computer is on; no rebooting is required.
- Compact measurement system includes isolated shielded box and direct I/O connections from sensors, useful for portable applications and noisy environments.
- Four different board configurations provide a range of flexible, cost-effective options for all general-purpose data acquisition.
- 500V isolation provides low-noise measurements, prevents ground loops, and protects your computer.
- Fully compatible with USB 2.0 and 1.1.
- Supported by Measure Foundry, test and measurement application builder software that lets you easily create complex measurement applications.
- Ships with WDM drivers, Ready-To-Measure™ applications and evaluation version of Measure Foundry, and more.

Overview

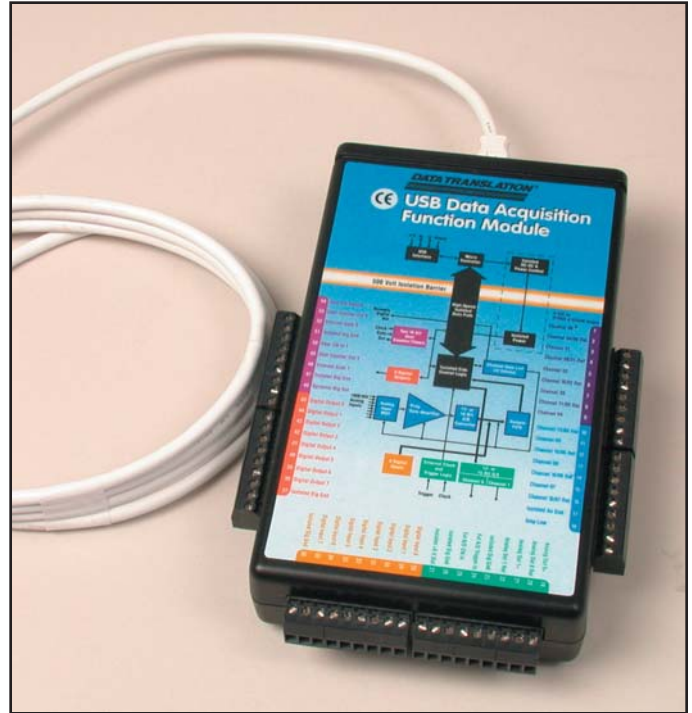
The DT9800 Series brings true plug-and-play data acquisition to computers that contain Universal Serial Bus (USB) ports. No more opening up your computer chassis to install boards — just plug in the module, then run the included quickDAQ software. It's easy and efficient.

DT9800 Series modules offer 16SE/8DI inputs with 12- or 16-bit resolution, up to 100 kS/s throughput, 16 digital I/O lines and 2 user counter/timers, and optional 12- or 16-bit analog outputs.

Analog Inputs

All DT9800 Series modules 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 gain settings of 1, 2, 4 or 8 provide input ranges of ± 1.25 V, ± 2.5 V, ± 5 V, and ± 10 V. On the DT9801 and DT9802, input ranges of 0-1.25, 2.5, 5, and 10 V are also available.



The DT9800 Series is a family of USB function modules for data acquisition.

For added flexibility, a 32-location channel-gain list allows you to sample non-sequential channels and channels with different gains. The A/D resolution sampling rate vary depending on the board type, as listed below:

Board	Resolution	Sampling Rate
DT9801/DT9802	12 bits	100 kS/s
DT9803/DT9804	16 bits	100 kS/s

By offering board types with different features, the DT9800 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.

500V Isolation Protects Your Data

Because they reside outside the computer, USB modules are susceptible to groundspikes. These spikes can cause system crashes and may even cause permanent damage to your computer. The DT9800 Series features 500 V galvanic isolation that protects your computer from groundspikes and ensures a reliable stream of data.

Analog Input Acquisition Modes

DT9800 Series modules can acquire a single value from any channel or a number of samples from multiple channels. To acquire data from multiple channels, DT9800 Series modules provide two scan modes: continuously paced and triggered scan mode. Using continuously paced mode, the module 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 module scans the channel-gain list at high speeds with a programmed interval between scans, emulating a simultaneous sample-and-hold operation. You can pace either scan mode using an internal or external clock.

Analog Trigger Modes

Internal Triggers:

- Software Trigger
- Triggered Scan Counter

External Trigger:

- External TTL Trigger Input

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

Analog Outputs

The DT9802 module features two analog output channels. These outputs have a 12-bit resolution and an output range of ± 5 V, 0-5 V, ± 10 V, and 0-10 V.

The DT9804 module features two 16-bit analog outputs with a range of ± 10 V.

Digital I/O

All DT9800 Series modules feature 16 digital I/O lines. These lines are divided into the following 8-bit ports: Port A, input and Port B, output.

You can also read the status of Port A at rates as high as the maximum speed of the A/D by including the digital input lines of Port A 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 8 digital input lines of Port A are read as one word.

The digital outputs have sufficient current capability to drive external solid-state relay modules (sink 12 mA and source 1 mA). If you apply +5 V to the +5 V outputs, the digital outputs maintain their previous state if the computer goes down or if the USB cable is unplugged. On enumeration, the module senses +5 V and does not reset the digital outputs.

User Counter/Timers

Two dedicated 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 user connections. You can also set the duty cycle, frequency, and output polarity of the output pulse from the user counter/timers.

Cross-Series Compatibility

Virtually all Data Translation data acquisition boards, including the DT9800 Series, are compatible with the DT-Open Layers for .NET Class Library 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 DT300 data acquisition board, upgrading to a DT9800 Series module is simple — just load the new drivers and you're done.

User Connections

A single USB cable, shipped with each DT9800 Series module, provides both power and connections from your PC. No external power or battery is required. Signal connections are made directly to the module, and pluggable terminal blocks are removable for easy connections. Pin assignments are clearly marked on the module label for quick setup.

USB 2.0 Compatibility

The DT9800 Series is fully compatible with USB 2.0 and USB 1.1. USB 2.0 is both forward and backward compatible with USB 1.1, resulting in a seamless transition process for the user. In fact, USB 2.0 uses the same cables and connectors as USB 1.1.

Features Summary

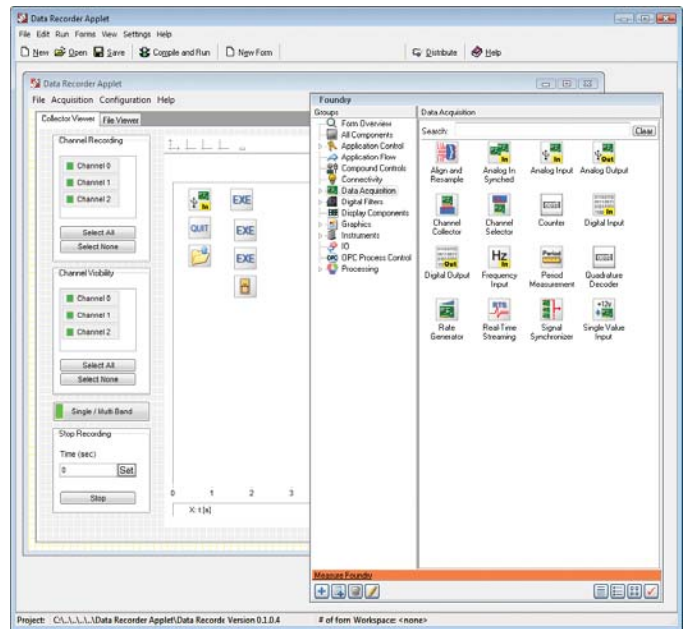
Board	Analog Inputs				Analog Outputs				Digital I/O	
	Ch.	Resolution	Input Range	Throughput	Ch.	Resolution	Output Range	Output Speed	I/O Lines	Counter/Timer
DT9801	16SE/8DI	12 bits	$\pm 1.25, 2.5, 5, 10V$ 0-1.25, 2.5, 5, 10V	100 kS/s	–	–	–	–	16	2
DT9802	16SE/8DI	12 bits	$\pm 1.25, 2.5, 5, 10V$ 0-1.25, 2.5, 5, 10V	100 kS/s	2	12 bits	$\pm 5, 10, 0-5, 0-10V$	50 Hz	16	2
DT9803	16SE/8DI	16 bits	$\pm 1.25, 2.5, 5, 10V$	100 kS/s	–	–	–	–	16	2
DT9804	16SE/8DI	16 bits	$\pm 1.25, 2.5, 5, 10V$	100 kS/s	2	16 bits	$\pm 10V$	50 Hz	16	2

Software Options

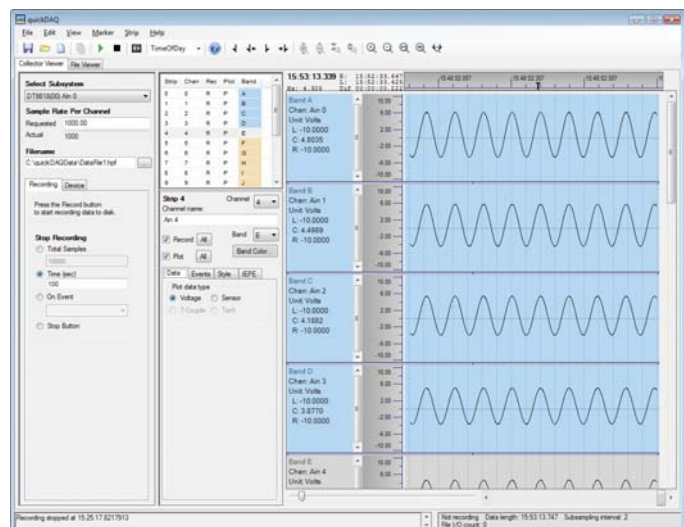
There are many software choices available for application development, from ready-to-measure applications to programming environments.

The following software is available for use with the DT9800 Series 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** – 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.
- **Quick DataAcq application** – The Quick DataAcq application provides a quick way to get up and running using a DT9800 Series 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 DT9800 Series 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 DT9800 Series 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 DT9800 Series 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 DT9800 Series module.

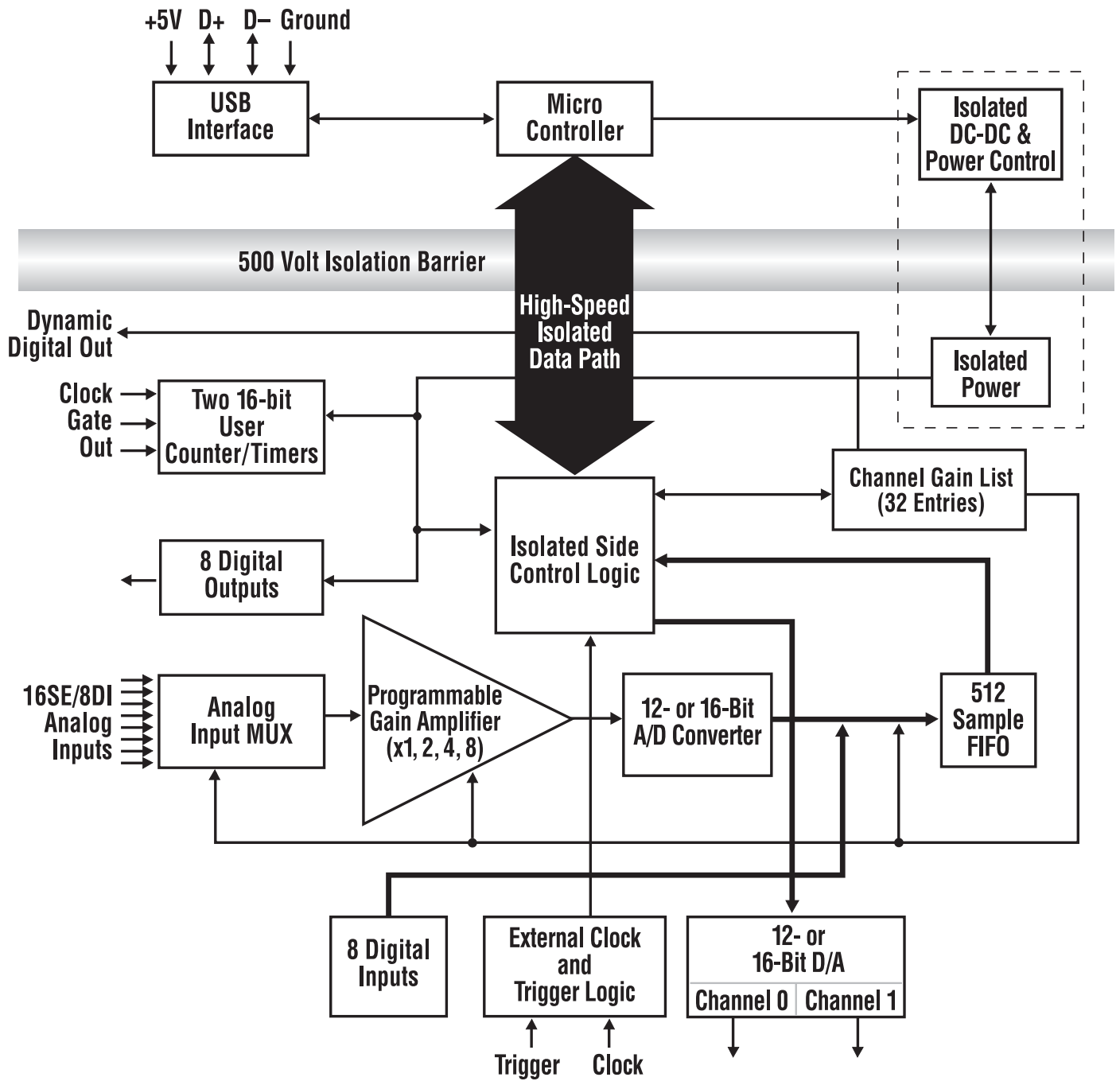


The data recorder applet is developed with Measure Foundry and allows you to acquire data, plot it, and save it to disk.



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.

DT9800 Series Block Diagram



User Connections

Pin Number	Signal Description	Pin Number	Signal Description
1	Analog Input 00	28	Digital Input 0
2	Analog Input 08/00 Return	29	Digital Input 1
3	Analog Input 01	30	Digital Input 2
4	Analog Input 09/01 Return	31	Digital Input 3
5	Analog Input 02	32	Digital Input 4
6	Analog Input 10/02 Return	33	Digital Input 5
7	Analog Input 03	34	Digital Input 6
8	Analog Input 11/03 Return	35	Digital Input 7
9	Analog Input 04	36	Isolated Digital Ground
10	Analog Input 12/04 Return	37	Isolated Digital Ground
11	Analog Input 05	38	Digital Output 7
12	Analog Input 13/05 Return	39	Digital Output 6
13	Analog Input 06	40	Digital Output 5
14	Analog Input 14/06 Return	41	Digital Output 4
15	Analog Input 07	42	Digital Output 3
16	Analog Input 15/07 Return	43	Digital Output 2
17	Isolated Analog Ground	44	Digital Output 1
18	Amp Low	45	Digital Output 0
19	Analog Output 0+	46	Dynamic Digital Output
20	Analog Output 0 Return	47	Isolated Digital Ground
21	Analog Output 1+	48	External Gate 1
22	Analog Output 1 Return	49	User Counter Output 1
23	Isolated Digital Ground	50	User Clock Input 1
24	External A/D Trigger	51	Isolated Digital Ground
25	External A/D Sample Clock In	52	External Gate 0
26	Isolated Digital Ground	53	User Counter Output 0
27	Isolated +5 V Out (10 mA)	54	User Clock Input 0

Digital I/O

	Port A	Port B
Number of lines	8 input	8 output
Inputs		
High-level input voltage	2.0 V minimum	
Low-level input voltage	0.8 V maximum	
High-level input current	3 μ A	
Low-level input current	-3 μ A	
Maximum internal pacer clock (single digital channel)	Maximum A/D rate	
Outputs		
Output driver high voltage		2.4 V minimum (IOH = 1mA)
Output driver low voltage		0.5 V maximum (IOL = 2mA)

Analog Inputs

		DT9801 / DT9802	DT9803 / DT9804
Channels		16SE/8DI	16SE/8DI
Resolution		12 bits	16 bits
Channel-Gain List		32 locations	32 locations
Input FIFO Size		512 samples	512 samples
Input Gains		1, 2, 4, 8	1, 2, 4, 8
Input Range	<i>Bipolar</i>	±1.25, 2.5, 5, 10V	±1.25, 2.5, 5, 10V
	<i>Unipolar</i>	0-1.25, 2.5, 5, 10V	–
Drift	<i>Zero Gain</i>	±30 (20 µV*Gain)/°C ±30 ppm/°C	±25 (10 µV*Gain)/°C ±20 ppm/°C
Input Impedance		100 MΩ, 10 pF, Off 100 MΩ, 100 pF, On	100 MΩ, 10 pF, Off 100 MΩ, 100 pF, On
Input Bias Current		±20 nA	±20 nA
Common Mode Voltage		±11V maximum (operational)	±11V maximum (operational)
Maximum Input Voltage		±40V maximum (protection)	±40V maximum (protection)
Channel Acquisition Time		3 µs	5 µs
A/D Conversion Time		6.6 µs	8 µs
Common Mode Rejection		>74 db	>74 db
DC Accuracy			
Nonlinearity (integral)		±1.0 LSB	±4 LSB
Differential nonlinearity		±0.5 LSB (no missing codes)	±1.0 LSB (no missing codes)
A/D Converter Noise		0.3 LSB rms	0.3 LSB rms
Channel-to-Channel Offset		±40.0 µV	±40.0 µV
AC Accuracy			
Effective Number of Bits (ENOB)		11.5 bits	13.5 bits
Total Harmonic Distortion (THD)		-80 db typical	-90 db typical
Channel Crosstalk		-80 db @ 1 kHz	-80 db @ 1 kHz
Clocking & Trigger Input			
Maximum A/D Pacer Clock Throughput	<i>Single Analog Input</i> <i>Multiple Analog Input</i> <i>Single Digital Input</i>	100 kS/s @ 0.03% accuracy 100 kS/s @ 0.03% accuracy Maximum A/D rate	100 kS/s @ 0.01% accuracy 100 kS/s @ 0.01% accuracy Maximum A/D rate
Minimum A/D Pacer Clock Throughput		0.75 S/s	0.75 S/s
External A/D Sample Clock	<i>Minimum Pulse Width</i> <i>Maximum Frequency (analog inputs)</i> <i>Maximum Frequency (digital inputs)</i>	600 ns (high); 600 ns (low) 100 kHz Maximum A/D rate	600 ns (high); 600 ns (low) 100 kHz Maximum A/D rate
External Digital (TTL) Trigger	<i>High-Level Input Voltage</i> <i>Low-Level Input Voltage</i> <i>Minimum Pulse Width</i>	2.4 V minimum 0.8 V maximum 600 ns (high); 600 ns (low)	2.4 V minimum 0.8 V maximum 600 ns (high); 600 ns (low)

Analog Outputs

		DT9802	DT9804
Channels		2 (voltage output)	2 (voltage output)
Resolution		12 bits	16 bits
Output Range		0-5, 0-10, ±5, ±10V	±10V
Output Speed		50Hz	50Hz
Error	<i>Gain</i> <i>Zero</i>	±2 LSB + Reference Software adjustable to 0	±6 LSB + Reference Software adjustable to 0
Current Output		±5 mA minimum	±5 mA minimum
Output Impedance		0.3Ω typical	0.3Ω typical
Capacitive Drive Capability		0.001 µF (no oscillators)	0.001 µF (no oscillators)
Nonlinearity (integral)		±1.0 LSB	±4 LSB
Differential nonlinearity		±0.5 LSB (monotonic)	±0.1 LSB (monotonic)
Protection		Short circuit to Analog Common	Short circuit to Analog Common
Power-On Voltage		0 V ±10 mV	0 V ±10 mV
Settling Time to 0.01% of FSR		50 µs, 20 V step; 10.0 µs, 100 mV step	50 µs, 20 V step; 10.0 µs, 100 mV step
Slew Rate		2 V/ µs	2 V/ µs

Counter/Timer

Number of counter/timer channels	2
Clock Inputs	
High-level input voltage	2.4 V minimum
Low-level input voltage	0.8 V maximum
Minimum pulse width	600 ns (high); 600 ns (low)
Maximum frequency	750.0 kHz
Gate Inputs	
High-level input voltage	2.4 V minimum
Low-level input voltage	0.8 V maximum
Minimum pulse width	600 ns (high); 600 ns (low)
Counter Outputs	
Output driver high voltage	3.0 V minimum (1 mA source)
Output driver low voltage	0.4 V maximum (2 mA sink)

Power, Physical, and Environmental Specifications



Power	
+5 V standby	0.5 mA maximum
+5 V enumeration	100 mA maximum
+5 V power on	500 mA maximum
+5 V isolated power out (TB 27)	10 mA maximum
Physical	
Dimensions	6.5 in. (length) x 4.5 in. (width) x 1.4 in. (height)
Weight	9 oz.
I/O connector	USB
Certification and Compliance	CE, FCC Part 15 Class B verified; will not compromise FCC compliance of host computer
Environmental	
Operating Temperature Range	0°C to 55°C
Storage Temperature Range	-25°C to 85°C
Relative Humidity	To 95%, noncondensing

User Manual

Each DT9800 Series module includes a user's manual that provides getting started and reference information about using the DT9800 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.

For more information about the DT9800 Series, please visit: <http://www.datatranslation.com/go/DT9800/>

Ordering Summary

DT9800 Series:

Each DT9800 Series module is shipped with the Data Acquisition Omni CD, which includes DT-Open Layers compliant drivers for Windows® 2000/XP/Vista, ready-to-run software, and a comprehensive user's manual in PDF format. Manuals are available in hard-copy form for an additional charge.

- **DT9801** – USB function module with 12-bit, 100 kS/s analog inputs
- **DT9802** – USB function module with 12-bit, 100 kS/s analog inputs and two (2) 12-bit analog outputs
- **DT9803** – USB function module with 16-bit, 100 kS/s analog inputs
- **DT9804** – USB function module with 16-bit, 100 kS/s analog inputs and two (2) 16-bit analog outputs

Accessories:

- DT9800 User Manual (hard-copy)
- DIN Rail Kit – Kit for mounting modules to walls, cabinets, or machinery.

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, see the current price list, visit our website, or contact your local reseller.