

# **DATA TRANSLATION**

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## **Q&A: DT9836 Simultaneous A/D & Multifunction USB Module**

### ***What is the DT9836?***

A USB data acquisition module with six or twelve independent A/D converters that sample data simultaneously and continuously at 225 kHz per channel. Also the DT9836 includes two simultaneous D/A channels that run at 500 kHz each, three quadrature decoders, two user counter timers and 32 bits of digital I/O. All subsystems are synchronized to an on-board 36 MHz clock and isolated to 500V.



The DT9836 adds higher performance A/D per channel at an economical price. The 225 kHz per channel sample rate allows signal bandwidths up to 112.5 kHz per channel (Nyquist) vs. just 9.375 kHz bandwidth per channel for conventional multiplexed modules. Simultaneous analog input channels provide higher throughput per channel, more signal bandwidth, and higher accuracy with 16-bit resolution...all at the lowest cost available.

### **Available versions are:**

6 channel, 16-bit A/D's sample at 225kS/s per channel, 32 Digital I/O, 2, 32-bit Up/Down Counter timers, 3 Quadrature decoders

**DT9836-6-0-OEM \$1,295**

**DT9836-6-0-BNC \$1,895**

Optional: 2 channel, 16-bit waveform D/A's sample at 500kS/s per channel

**DT9836-6-2-OEM \$1,695**

**DT9836-6-2-BNC \$2,295**

12 channel, 16-bit A/D's sample at 225kS/s per channel, 32 clocked digital I/O, 2, 32-bit Up/Down counter timers, 3 quadrature decoders

**DT9836-12-0-OEM \$1,595**

**DT9836-12-0-BNC \$2,195**

Optional: 2 channel, 16-bit waveform D/A's sample at 500kS/s per channel

**DT9836-12-2-OEM \$1,995**

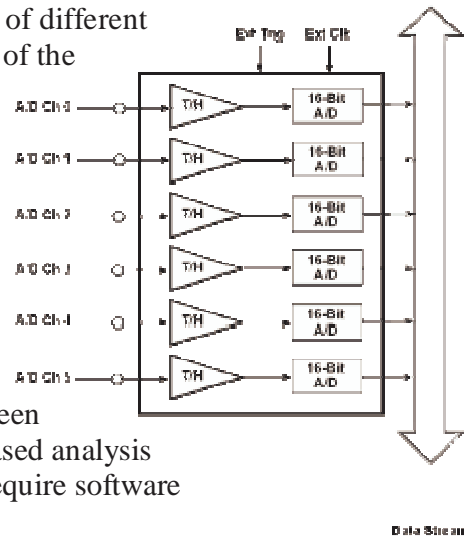
**DT9836-12-2-BNC \$2,595**

## Compare DT9836 series with DT9816 series simultaneous modules.

Model	Resolution/Throughput	# of Channels	System Accuracy % FSR	Isolation	Cost
DT9816	16-bit/ 50kHz	6	0.02%	No	\$399
DT9816-A	16-bit/ 150kHz	6	0.02%	No	\$499
DT9836-6-0-OEM	16-bit/ 250kHz	6	0.015%	500V	\$1,295

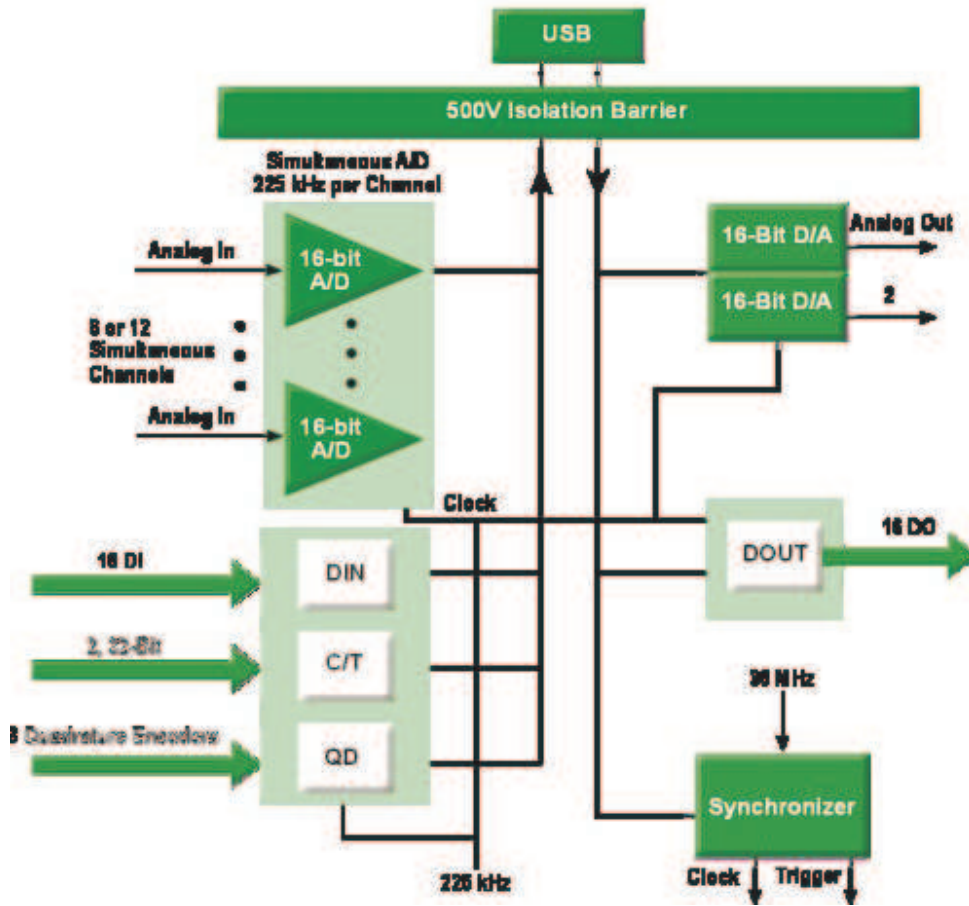
### *Why a simultaneous A/D per channel module?*

Simultaneous A/D's let you correlate measurement of different signals at the same instant in time. The A/D design of the DT9836 features built-in accuracy. A maximum aperture delay of 35 ns (the time that it takes the A/D to switch from track to hold mode) is well matched at 5 ns across all six track-and-hold circuits, virtually eliminating the channel-to-channel skew that is associated with multiplexed inputs. A maximum aperture uncertainty of 1 ns (the "jitter" or variance in aperture delay) virtually eliminates phase shift error in your data. Simultaneous Sampling eliminates time skew between channels and simplifies both time and frequency based analysis techniques. Sequentially (Muxed) Sampling may require software correction for detecting certain patterns.



### **Common clock**

The DT9836 series feature six or twelve independent, successive-approximation A/D converters with track-and-hold circuitry. Each converter uses a common clock and trigger for simultaneous sampling of all analog input signals at up to 225kHz per channel.

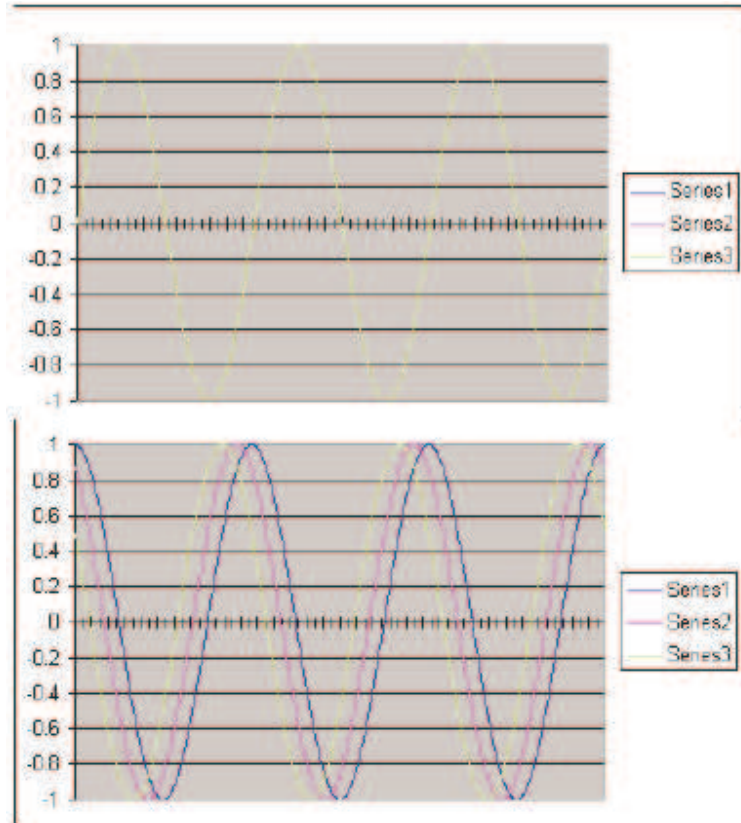


This detailed block diagram shows the relationship of each subsystem and the control signals used in the series.

**Key Features: All subsystems operate synchronously at 36 MHz**

- 6 or 12 simultaneous, 16-bit analog inputs at 225 kHz per channel
- Two 16-bit analog outputs for waveform generation at 500 kHz per channel
- 16 digital input and 16 digital output lines for external event synchronization
- Two 32-bit counter time channels offer flexible clocking and triggering
- Three quadrature decoders allow determination of X/Y positioning and rotation

**Simultaneous Sampling** eliminates time skew between channels and simplifies both time and frequency based analysis techniques.



**Sequentially (Muxed) Sampling** may require software correction for detecting certain patterns.

***How does this result in greater system throughput speed?***

Simultaneous signal acquisition (one A/D converter per channel) allows higher bandwidth measurements versus sequential or multiplexed (muxed) measured signals because all signals are acquired at the same instant in time, on the same clock pulse.

**Simultaneous A/D converter per channel**

Number of channels acquired	Sample rate per channel	Signal Bandwidth
1	225kHz	112.5kHz
2	225kHz	112.5kHz
3	225kHz	112.5kHz
4	225kHz	112.5kHz
5	225kHz	112.5kHz
6	225kHz	112.5kHz

Sequential or multiplexed sampling has only one A/D. Each Channel data point must be obtained in sequence. Using a single A/D converter decreases the throughput for each channel used.

## Multiplexed, Single A/D System

Number of channels acquired	Sample rate per channel	Signal Bandwidth
1	225,0 kHz	112.5 kHz
2	112.5 kHz	56.2 kHz
3	75,0 kHz	37.5 kHz
4	56.2 kHz	28.1 kHz
5	45,0 kHz	22.5 kHz
6	37.5 kHz	18.7 kHz

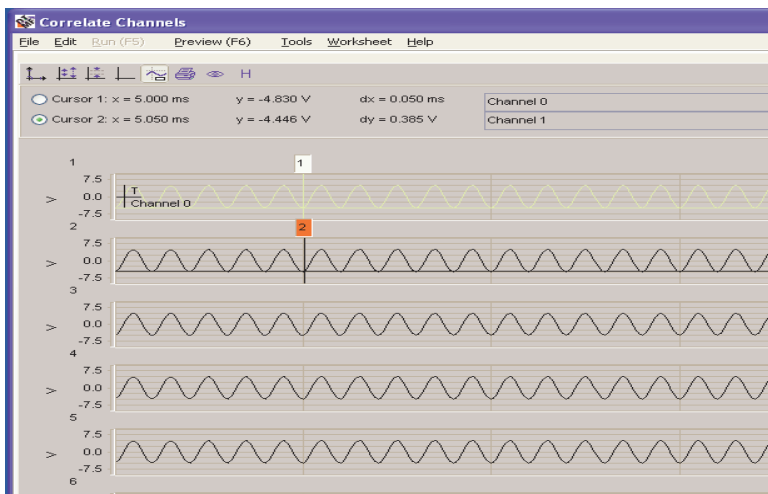
### Quadrature Decoder

Encoding techniques are used to measure the location or speed of rotating devices where two signals are 90 degrees offset in order to detect the direction of the motion.

The Quadrature Decoder subsystem contains three quadrature decoders which will allow simultaneous decoding of three quadrature encoder inputs. The quadrature decoders may be used to provide relative or absolute position or, by calculating the difference between samples, the rotational speed. Each quadrature decoder supports 'A', 'B' and 'Index' inputs where the Index input may be used to zero out the positional count and the A and B input relationships are used to increment or decrement the positional count. There are input filters on each of the inputs with a selectable filter clock frequency to eliminate noise on the input signals.

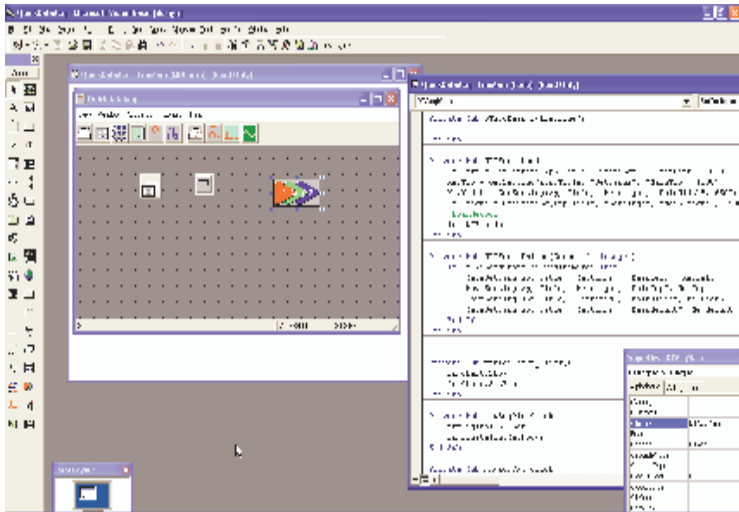
### What about software?

The DT9836 ships with the Omni CD that provides Ready-to-Measure applications to get users taking measurements in minutes. The Omni CD includes free software tools to be used in C#, C++, Visual Basic, VB.NET, LabVIEW. In addition, there is an uninhibited trial version of DT Measure Foundry to try.



### DT Measure Foundry

is a drag-and-drop application builder that lets you compare, correlate and analyze all your signals in a snap. The screen grab below uses just one of many displays available in DT Measure Foundry that let you do just that. These displays 'connect' to the hardware using property pages, no coding, no wiring.



**Quick DataAcq** is a menu-driven, ready-to-run application that lets you verify the operation of your Data Translation board, collect A/D data, display data to the screen, and save data to disk. Source code included! Modify the source code to Quick Data Acq application using Visual Basic and DTx-EZ software to fit custom applications.

## DT-LV Link

DT-LV Link is a high-level data acquisition hardware link to LabVIEW. DT-LV Link provides a collection of Virtual Instruments (VIs) that give programmers the ability to access the power of Data Translation's USB and PCI data acquisition boards through LabVIEW.

