



## Features

Use with VT1415A/VT1419A/VT1422A

8-channel, Non-isolated, Variable Input Level

Frequency Counter Input to 100 kHz

Totalize to >16 Million Counts

PWM Output Square Wave or Variable Pulse Width

Pulse Width Measurement

Quadrature Count and Stepper Motor Control

## Enhanced Frequency/Totalize/PWM SCP

### Overview

The VXI Technology VT1538A Enhanced Frequency/Totalize/PWM SCP has eight channels. Each of the eight channels can be individually configured to perform input or output functions. Input functions include frequency measurement, and totalize, pulse width measurement, rpm, and quadrature count. Output functions can free run or be triggered, and include square waves, pulse trains, angular position pulse, and stepper motor control.

Any channel can be configured as a one-bit variable level digital input or output. Additionally, two channels may be configured for low-level sensors.

Use the VT1538A with the following VXI modules:

Model	Description
VT1415A	Algorithmic Closed Loop Controller
VT1419A	Multifunction Measurement and Control Module
VT1422A	Remote Channel Multifunction DAC

Refer to the VXI Technology Website for recent product updates, if applicable.

### Wide Range of Input/Output Functionality

The VT1538A channels can be individually configured to either an input or an output function.

#### Input functions include:

- static digital state
- frequency measurement
- totalize positive or negative digital transitions
- pulse width measurement
- rotational velocity (senses added or missing cogwheel teeth)
- quadrature count (two channels required)

#### Output functions include:

- static digital state
- single pulse per trigger
- pulse width modulation
- frequency modulation
- rotationally position pulse
- stepper motor control

The logical sense of input and output channels can be configured as inverted or normal.

Input channels have individual threshold levels up to  $\pm 48$  V. Output channels can be configured as either open drain or passive pull-up.

## Enhanced Frequency/Totalize/PWM SCP

### Input Functions

**Digital Input:** Each channel has a programmable threshold comparator. The digital input threshold can be programmatically set from -48 V to + 47 V. The digital input polarity may also be changed.

**Low Level Sensors:** The first two channels provide variable level inputs compatible with magnetic pickup sensors or variable reluctance sensors, like turbine flowmeters, that provide signals within the level and frequency ranges specified below. These channels are configured with adaptive amplifiers to sense the wide range of sensor output voltages. The VT1538A can directly sense voltage from 100 mV to 10 V. Voltages up to 120 V can be sensed using an external resistor.

**Totalize, Frequency, and Period:** Totalize on either positive or negative transitions. Measure frequency with a programmable aperture time. Measure logical 1 pulse widths from 1.5  $\mu$ s to 1 s.

**Quadrature Count:** Use two channels to make 24-bit quadrature counts. One channel provides the count, the second channel controls the count direction (up or down). Counts from 0 to 16,777,215.

**Rotational Velocity:** One VT1538A input channel can be used to sense rotational velocity using a toothed wheel sensor. The tooth-to-tooth periods are measured and converted into revolutions-per-second (RPS). Use this function with sensors that have either a missing or extra tooth to mark their index position.

### Output Functions

**Digital Output:** Each VT1538A output "open-drain" MOSFET can switch from 0 V to 48 V and sink up to 100 mA. An internal pull-up resistor is provided for driving logic devices directly. Output logic polarity is programmable.

**Pulse Output:** Each VT1538A channel can be programmed to output a variety of pulses and pulse trains. Variable width, PWM, FM, and rotationally positioned pulse outputs are available.

**Stepper Motor Control:** The VT1538A can control 2- or 4-phase motors in either full- or half-step mode. The SCP can directly drive four-phase stepper motors requiring <100 mA phase current. Higher phase current requirements are possible using external output amplifier circuits.

### Specifications

#### Output Characteristics

##### Current source (logic 1):

Pull-up off: 0 mA  
Pull-up on: 380 mA @ 1.2 V

##### Current sink (logic 0):

Pull-up off: 100 mA  
Pull-up on: 100 mA

##### Voltage (logic 1):

Pull-up off: 0 V  
Pull-up on: 5 V (no load)

##### Voltage (logic 0):

Pull-up off: 0.1 V max. @ 100 mA load  
0.05 V max. @ 20 mA load

Pull-up on: 0.1 V max. @ 100 mA  
0.5 V max. @ 20 mA load

#### Input Characteristics

##### Equivalent circuit:

Pull-up off: 120 k  $\Omega$  connected to 0 V  
Pull-up on: 9.2 k  $\Omega$  connected to 4.6 V

##### Maximum input low:

Pull-up off: -46 V to 46 V prog.  
Pull-up on: -46 V to 46 V prog.

##### Minimum input high:

Pull-up off: -46 V to 46 V prog.  
Pull-up on: -46 V to 46 V prog.

##### Maximum voltage:

Applied to input terminal: -48 V to 48 V  
Applied to output terminal: 0 V to 48 V (diode clamped at -0.3 V)

#### Totalizer

**Capacity:** 24 bits or 16,777,215 counts

**Minimum pulse width:** 500 ns

**Frequency range:** 0 - 100 kHz

#### Frequency Counter

**Gate time ( $t_{\text{aperture}}$ ):** 1 ms to 1 s, resolution  $1/f_{\text{IN}}$

**Range:**  $1/t_{\text{aperture}}$  to 100 kHz

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**Accuracy:** 0.01%  
**Resolution:**  $f_{in}/(t_{aperture} \times 4.194 \text{ MHz})$   
**Min. pulse width:** 500 ns

### Rotational Velocity Measure

**Range in RPS:**  $1/n_{teeth}$  to  $100,000/n_{teeth}$   
**Accuracy:** 0.01%  
**Resolution in RPS:**  $(n_{teeth} \times f)^2 / 4.194 \text{ MHz}$   
**Minimum pulse width:** 500 ns

### Pulse Width Measure

**Periods averaged:** 1 to 255  
**Range:** 1.5  $\mu$ s to 1  $\mu$ s  
**Accuracy:**  $\pm(100 \text{ ns} + 0.1\%)$   
**Resolution:** 59.6 ns

### Frequency Source

**Square wave:** 64 Hz to 40 kHz  
**Other shapes:** 128 Hz to 40 kHz  
**Accuracy:** 0.01%  
**Resolution:**  $(f_{out})^2 / 4.194 \text{ MHz}$

### Pulse Source

**Pulse width:** 7.87  $\mu$ s to  $1/f-7.87 \mu$ s  
**Pulse per trig:** 7.87  $\mu$ s to 7.812 ms  
**Accuracy:** 200 ns + 0.01%  
**Resolution:** 238.4 ns

### Current Requirements (Amps)

<b>5 V max</b>	<b>24 V max</b>	<b>-24 V max</b>
0.2	0.054	0.025

### Ordering Information

**VT1538A** Enhanced Frequency/Totalize/PWM SCP

VT1538A