

Chapter 1

Module Overview

The 1746sc-CTR4 and the 1746sc-CTR8 are 4 and 8 channel Counter/ Flow Meter modules. The modules are suitable for general purpose counter and flow meter applications that require a large number of input channels and high accuracy. The module supports both AC and DC input signal types. The counter functions include programmable control of the counter including start, stop, reset, preset control and user defined flags. The input levels for the counter mode are 5, 12, and 24 volts DC. The Flow Meter mode is compatible with variable reluctance AC input. This differential AC input will count AC zero crossing signals from 50 mV to 75 V peak.



Read this chapter to familiarize yourself further with your isolated analog module (shown above). This chapter covers:

- General features and benefits.
- Detailed specifications.

Section 1.1

General Features And Benefits

- 8 Input Channels or 4 Channels of Quadrature Encoders.
- 4 External Counter enable inputs.

- Input voltage ranges: AC (50mv–75V peak), 5 Vdc, 12 Vdc, 24 Vdc.
- Input frequency: AC 50 kHz Max, DC 50 kHz Max.
- Maximum count value: ± 32 K or ± 8 M.
- Programmable Scaling, K, M, R Factor.
- Channel update time of 4 msec/channel.
- Rate output mode (Integer and Floating Point).
- Counter logic level state.
- Programmable Counter functions: start/stop/reset/present.
- Programmable counter Alarm flags and zero flags.
- 3 Selectable filters: 15 kHz, 30 kHz, 50 kHz.
- Channel to back Plane isolation of 1000 VDC.

Section 1.2 Increased Accuracy and Reliability

The counter module offers ± 1 count accuracy and $\pm 1\%$ or better frequency measurement accuracy. Programmable functions allow the user to define counter ranges and flags to accommodate process-specific requirements. Full speed counter operation of over 50kHz is possible.

Section 1.3 Reduced System Costs

High Channel density allows for lower resource usage. Eight channels consume the resources associated with a standard two channel module.

Section 1.4 State- of-the-Art Performance

These modules incorporate state of the art Programmable Gate Array technology that allows high circuit density and functionality. The module uses proprietary Allen-Bradley technology, so they operate and perform like the latest Allen-Bradley products. They also provide high resolution, user-programmable range settings, continuous temperature compensation (no field calibration), software configuration, programmable output limits, and programmable safe states in case of a fault.

Section 1.5

Detailed Specifications

Table 1-1. Thermocouple Temperature Ranges

Specification	Description			
Configuration	4/8 Channel of differential counter inputs 2/4 Channels of quadrature encoding 2/4 Input enable Control lines			
Input Modes	DC counter, AC flow meter			
Voltage Range	AC 0-30 VP	5 VDC	12 VDC	24 VDC
VIL	-50 mV	1 V	3 V	5 V
VIH	+50 mV	3.5 V	9 V	13 V
Vmax (CE)	±75 V	±75 V	±75 V	±75 V
Vmax (UL)	±100 V	±100 V	±100 V	±100 V
Current Range	5 mA maximum at 120 V			
Input Impedance	Rin greater than 10 ohms when within -10 V to +12 V range. Rin = 25 Kohms when outside of -10 V to +12 V range Cin 100 pF Input Filter Off Cin 1000 pF Input Filter On			
Counter Speed	DC Inputs	0 Hz to 50 kHz		
	AC Inputs	0 Hz to 50 kHz		
Input Frequency	DC Inputs	1 Hz to 50 kHz		
	AC Inputs	1 Hz to 50 kHz		
Counter Enable Input	VIL	1.0 V maximum		
	VIH	3.5 V minimum		
	Vmax	75 V		
Input impedance	25 Kohms			
Input Filter:				
Digital Filter	50 kHz (Default)			
Digital Filter	30 kHz			
Analog Filter	15 kHz			
Min Pulse Time:				
DC mode	8 us			
External Enable/Disable	Enable and Disable setup time = 20 us			
Channel Update Time:				
Counter Output	Scaling OFF	ON		
	4.00	5.6 (msec per channel)		
Rate Output:				
Rate Instantaneous Mode	4.00	5.6 (msec per channel)		
Rate Average Mode	1.00	1.00 (sec per channel)		

Specification	Description	
Accuracy: Count mode Rate (Instant) Rate (Average)	± 1 Count $\pm 1\%$ at 50 kHz, .001% at 1 Hz ± 1 Hz	
Maximum Count Value	Low Range -32,768 to +32,767 High Range -8,388,608 to +8,388,607	
Fault detection	Over and under range status bits, for all modes.	
Data Format: Counter mode Rate mode	Max Binary Value: -8,388,608 to +8,388,607 Max Binary Value: -32,768 to +32,767	
Isolation: Channel to Rack Channel to Channel	1000 VDC Continuous Optical and magnetic 0 VDC	
Input Protection	Maximum input voltage ± 100 VDC, 150 VAC peak-to-peak Maximum input current ± 5 mA at 100 VDC	
Power Requirements:	CTR4	CTR8
Internal rack +5 V	17.5 mA	225 mA
Internal rack +24 V	75 mA	125 mA

Table 1-2 Physical Specifications

Specification	Description
LED Indicators	
Module Status	The Module Status LED indicates the status of the power up self-test. The LED is on when the module is ready. Any self-test error is indicated with a blink code.
Channel Status	CTR4 - 4 Green LEDs CTR8 - 8 Green LEDs The 8 Channel LEDs indicate that a channel is enabled.
Terminal Block	24-pin removable connector.
Wire Size	One 12 AWG to 28 AWG wire
Torque	0.5 Nm, (4.5 lb.-in)

Table 1-3 Environmental Specifications

Specification	Description
Operating Temperature	-0 °C to 60 °C (32 °F to 140 °F)
Storage/Non-Operating Temperature	-40 °C to 85 °C (-40 °F to 185 °F)
Operating Humidity	5% to 95%, non-condensing

Section 1.6 Regulatory Requirements

Compliance Standards	Industry Standards
UL Safety	UL 61010-2-201 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-201: Particular Requirements for Control Equipment (NRAQ, NRAQ7) CAN/CSA C22.2 No. 61010-1-12 (Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements)
UL Hazardous Locations	ANSI/ISA–12.12.01 Nonincendive Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations (NRAG) CSA C22.2 No. 213-M1987 - Non-incendive Electrical Equipment for use in Class I Division 2 Hazardous Locations - March 1987 (NRAG7) Temp code T4 or better, Pollution degree 2, gas groups A, B, C, and D
CE EMC Directive	EN 61131-2 Programmable Controllers: Third Edition 2007-02, Clause 8, Zones A&B EN 61000-6-2: Generic Industrial Immunity EN 61000-6-4: Generic Industrial Emissions
UKCA	Electromagnetic Compatibility Regulations 2016 BS EN 61131-2, BS EN 61000-6-4, BS EN 61000-6-2
FCC	27 CFR Part 15, Class A
CMIM	Arrêté ministériel n° 6404-15 du 29 ramadan 1436 (16 juillet 2015) NM EN 61131-2, NM EN 61000-6-4, NM EN 61000-6-2

1.6.1 Diagnostic LEDs

The module contains diagnostic LEDs that help you identify the source of problems that may occur during power-up or during normal operation. Power-up and channel diagnostics are explained in Chapter N, Testing Your Module.

Section 1.7 System Overview

The module communicates with the SLC 500 processor and receives +5 VDC and +24 VDC power from the system power supply through the parallel backplane interface. No external power supply is required. You may install as many modules in the system as the power supply can support.

Section 1.8 System Operation

At power-up, the module checks its internal circuits, memory, and basic functions. During this time the module status LED remains off. If the module finds no faults, it turns on its module status LED.

After completing power-up checks, the module waits for valid channel configuration data from your SLC ladder logic program (channel status LEDs are off). After channel configuration data is transferred and channel enable bits are set for one or more channels, the module turns on its channel status LEDs. Then it continuously converts the inputs to the data format you selected for the channel.