CS1 Customizable Counter

Fast, Powerful, Flexible

The Customizable Counter Unit is a fully programmable counter module with discreet, analog, and pulse outputs for maximum control on the CS1 PLC platform. The unit's on-board PLC provides high speed independent control suitable for a wide array of applications ranging from high speed counting and interrupts to simple dual axis following, camming, and actuation. Programming is easy with CX-Programmer (Version. 1.2 or later) or hand-held programming consoles. No additional software is needed.

- Parallel processing reduces system scan-times and improves performance
- All three models feature 20 I/O points for added control
- Counter, pulse, and analog I/O can be controlled independently - not through the main CS1 CPU - allowing greater flexibility
- Easy synchronous control provides electronic following, camming, and gearing capabilities
- Users may pre-program modules for quick, off-the-shelf replacement
- UL, CSA, CE certified

Features and Functions

■ Three Customizable Counter models available:

CS1W-HIO01

- 12 DC inputs (4 interrupt/2 kHz counter and 8 normal)
- 8 transistor outputs

CS1W-HCA22

- 12 DC inputs (4 interrupt/2 kHz counter and 8 normal)
- 8 transistor outputs
- 2 high speed counters (50 or 200 kHz)
- 2 analog DC outputs

CS1W-HCP22

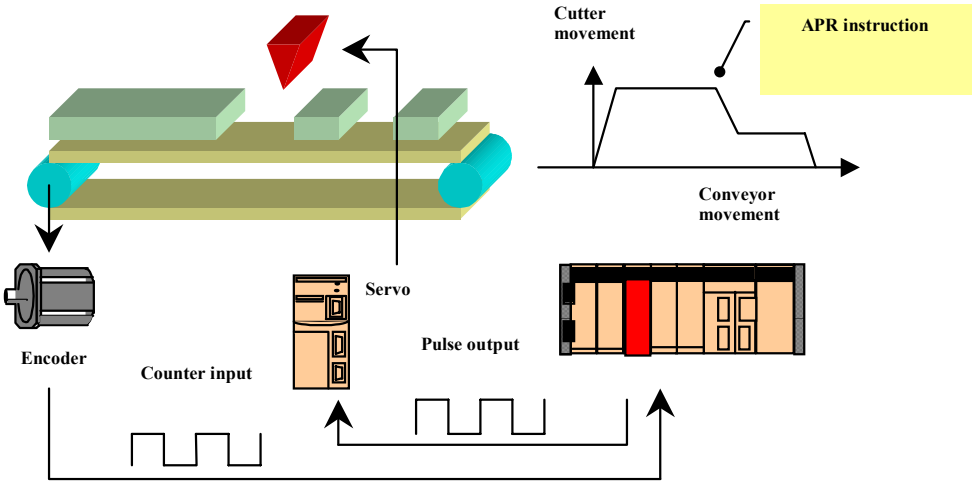
- 12 DC inputs (4 interrupt/2 kHz counter and 8 normal)
- 8 transistor outputs
- 2 high speed counters (50 or 200 kHz)
- 2 pulse outputs.

Application Examples

■ Electronic cam

- Cutting operation of packaging machine

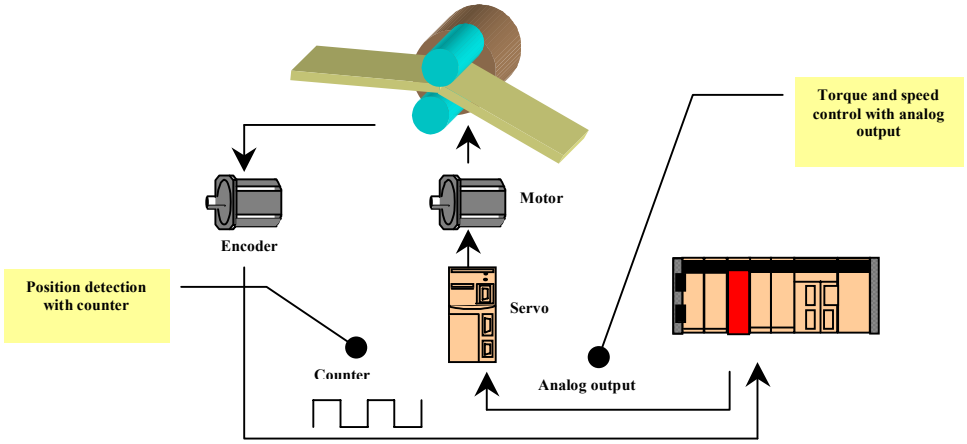
- Non-linear sychronization with a conveyor by arithmetic process instruction



■ Torque control

- Metal object bending example

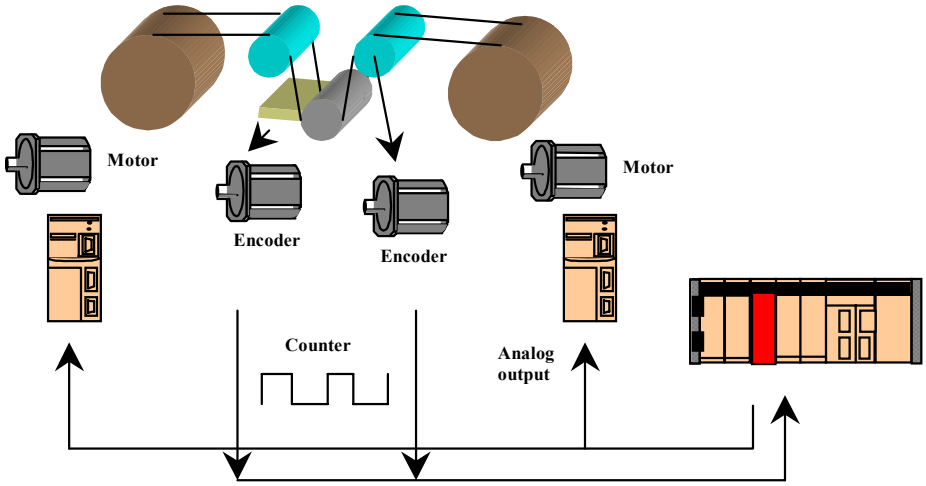
- Torque, speed and position control



■ Tension control

- Paper feeding example

- Easy tension control with ladder program



Specifications

Item			Specification
Model number			CS1W-HIO01/CS1W-HCP22/CS1W-HCA22
Unit classification			CS1 Special I/O Unit
Applicable PLCs			CS1-series PLCs
Applicable unit numbers			00 to 95 (Must not be duplicated with other Special I/O Units)
Applicable Rack/slot			CS1-series CPU Rack or Expansion Rack **Note:** **1.** There are no restrictions on the mounting slot. **2.** Mounting to C200H Expansion Racks or SYSMAC BUS Slave Racks is not possible.
Exchange of general-purpose data with CPU	Special I/O Unit Area (CIO n to n+9; n = 2000 + (unit number x 10))		10 words per Unit (data exchanged constantly) 5 words: CPU → Customizable Counter Unit (RUN/STOP commands, general-purpose output data) 5 words: Customizable Counter Unit → CPU (Unit status, general-purpose input data)
	DM Area words allocated to Special I/O Units (m to m+99; m = D20000 + (unit number x 99))		100 words per Unit
		Initial settings from the CPU	10 words: System Setup Area (transferred from the CPU to the Customizable Counter Unit at startup or Unit restart). The System Setup Area contains the following settings: Enable/disable of RUN/STOP command from the CPU; startup operating mode; specification of beginning word addresses for the output and input areas for data exchange with the CPU; number of exchange words; the area used as the data exchange area in the Customizable Counter Unit; address specifications, etc.
		Area for exchanging general-purpose data with the CPU	90 words: For exchanging the general-purpose data listed below.
	Continuous data exchange between words in the SR Area in the Customizable Counter Unit and CIO Area allocated words in the CPU		4 input words and 4 output words (Inputs are to Customizable Counter Unit) I/O refresh is performed between words in the Customizable Counter Unit's SR Area (SR 231 to SR 234 and SR 236 to SR 239) and words allocated in the CPU's CIO Area.
	Continuous data exchange between user-set words in the Customizable Counter Unit and words allocated in the CPU's DM Area		90 words max. I/O refresh is performed for up to 90 words between user-set words in the Customizable Counter Unit and words allocated in the CPU's DM Area. **Note** Both inputs and outputs can be set in Customizable Counter Unit's DM, AR, IR, LR, and EM Areas.
	Continuous data exchange between LR Area words in the Customizable Counter Unit and user-set words in the CPU		32 words max. I/O refresh is performed for up to 32 words between the Customizable Counter Unit's LR Area (in the order inputs → outputs) and user-set words in the CPU. **Note** Both inputs and outputs can be set in CPU's CIO, WR, AR, HR, DM, and EM Areas.

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Specifications table - continued from previous page

Item	Specification
Effect on CPU's cycle time	• When data exchange is performed using the words allocated in the CIO Area only: 0.2 ms • When data exchange is performed using words allocated in the DM Area or the LR Area: 0.5 ms
Internal current consumption	CS1W-HIO01: 600 mA at 5 VDC CS1W-HCP22: 800 mA at 5 VDC CS1W-HCA22: 750 mA at 5 VDC, 150 mA at 26 VDC
Dimensions	34.5 x 130 x 100.5 mm (W x H x D)
Weight	CS1W-HIO01: 250 g max. CS1W-HCP22/HCA22: 350 g max.
Standard accessories	CS1W-HIO01 One OMRON C500-CE241 Connector Set for connecting to I/O connector (soldered type; socket: FCN-361J024-AU made by Fujitsu; connector cover: FCN-360C024-J2 made by Fujitsu) CS1W-HCP22/HCA22 In addition to the above, one C500-CE404 Connector Set (made by OMRON) for connecting to special I/O connector (soldered type; socket: FCN-361J040-AU made by Fujitsu; connector cover: FCN-360C040-J2 made by Fujitsu)

■ Program and Memory

Item		Specifications
Control method		Stored program
I/O control method		Cyclic scan and immediate processing are both possible.
Customizable Counter Unit operating modes		RUN mode, MONITOR mode, PROGRAM mode
RUN/STOP specification method for Customizable Counter Unit's program		Select between the following: 1. RUN/STOP commands from the CPU's allocated memory 2. Operating mode command at startup, or command from the Programming Device after startup
Status output to CPU		Unit's operating mode (RUN/STOP), fatal errors, CYCLE TIME OVER errors, Unit error codes, etc.
Compatible Programming Devices		Programming Console (C200H-PRO27 or CQM1H-PRO01) or CX-Programmer Ver. 1.2 or later (Specify CQM1H as the PLC type. There are restrictions, such as the program capacity.)
Programming language		Ladder diagram
Execution modes		Possible to switch between Normal Execution Mode and High-speed Execution Mode. • Normal Execution Mode: 0.4 μs for LD instruction • High-speed Execution Mode: 0.2 μs for LD instruction
Program capacity		4 Kwords (Normal Execution Mode) **Note** In High-speed Execution Mode, the capacity for which execution (compiling) is possible is restricted. Also, whether or not pro grams can be executed depends on the contents of the pro gram. The average program capacity in High-speed Execution Mode is approx. 1 Kword.
Instruction length		1 to 4 words per instruction
Number of instructions		113 (14 basic instructions and 99 special instructions)
Instruction execution time	Basic instructions	Normal Execution Mode: 0.4 μs (LD instruction) High-speed Execution Mode: 0.2 μs (LD instruction)
	Special instructions	Normal Execution Mode: 4.8 μs (MOV instruction) High-speed Execution Mode: 4.4 μs (MOV instruction)
Common processing (overhead)		CS1W-HIO01: 0.08 ms max. CS1W-HCP22/HCA22: 0.1 ms max. The above figures are for operation under the following conditions: 1. Data exchange with the CPU is performed using the allocated words in the CIO Area only. 2. The Programming Device connection switch is set to OFF. 3. With the HCP22/HCA22, Measurement Mode is not being used. 4. With the HCA22, analog output is refreshed immediately.

■ Functions

Item				Specifications	
Types of interrupts	Input interrupts (4 points max.)	Input Interrupt Mode		Interrupt is executed in response to input to the Unit's built-in input points (input bits 00000 to 00003). Interrupts can be executed when the corresponding input turns ON, OFF, or both. The response time between the input conditions being satisfied and execution of the interrupt program is 0.08 ms (for execution at ON).	Note 1: Specify the mode as either Input Interrupt Mode or Counter Mode using the INT instruction. Note 2: Specify ON, OFF, or both in the Unit Setup Area.
		Counter Mode		Interrupt is executed after input is received via the Unit's built-in input points a certain number of times. The number of times is counted decrementally when the corresponding input turns ON, OFF, or both.	
	Interval timer interrupt (1 point)	Scheduled Interrupt Mode		Program is interrupted at regular intervals measured by one of the Unit's internal timers.	
		One-shot Interrupt Mode		Program is interrupted once after a certain time measured by one of the Unit's internal timers.	
	CS1W-HCP22 (pulse I/O)	Pulse inputs (high-speed counter)	Target value interrupts	Interrupt is executed when the high-speed counter PV is equal to a target value set with the CTBL instruction.	
		Pulse outputs	Target value interrupts	Interrupt is executed when the pulse output PV is equal to a target value set with the CTBL instruction.	
	CS1W-HCA22 (pulse inputs and analog outputs)	Pulse inputs (high-speed counter)	Target value interrupts	Interrupt is executed when the high-speed counter PV is equal to a target value set with the CTBL instruction.	
Bit pattern output for comparison	CS1W-HCP22 (pulse I/O)	Pulse input (high-speed counter)	Range comparison bit pattern output	A specified bit pattern is output when the high-speed counter PV lies within a range specified with the CTBL instruction.	
		Pulse output	Range comparison bit pattern output	A specified bit pattern is output when the pulse output PV or the pulse counter PV (measurement time) lies within a range specified with the CTBL instruction.	
	CS1W-HCA22 (pulse inputs and analog outputs)	Pulse input (high-speed counter)	Range comparison bit pattern output	A specified bit pattern is output when the high-speed counter PV lies within a range specified with the CTBL instruction.	

■ I/O Specifications

Part number	I/O	Contents
All Units: CS1W-HIO01, CS1W-HCP22, and CS1W-HCA22	Contact inputs	12 inputs (24-VDC; bits IR 00000 to IR 00011) Details: • 4 interrupt inputs in Input Interrupt Mode or Counter Mode. Can also be used as normal inputs (bits IR 00000 to IR 00003) • 8 normal inputs (bits IR 00004 to IR 00011) **Note** It is possible to specify ON, OFF, or both for the timing of interrupts in Input Interrupt Mode.
	Contact outputs	8 outputs (transistor NPN outputs; bits IR 00100 to IR 00107)
CS1W-HCP22 (pulse I/O)	Pulse inputs (high-speed counters)	2 inputs Each input can be set to either single-phase or differential-phase (multiplication factor of 1, 2, or 4) at 50 or 200 kHz (switchable). **Note** Target value interrupts or range comparison bit pattern outputs for high-speed counter present values can be programmed. Measurement of the rate of change in high-speed counter pres ent values and measurement of the frequency from the high-speed counter present values is also possible.
	Pulse outputs	2 outputs Each output can be set to any one of the following: 1. Pulse output: 6 Hz to 200 kHz 2. One-shot pulse output: Output can be set to turn ON for a time specified by the user. (Set in range 0.01 to 9,999 ms in 0.01-ms units.) 3. Pulse output counter timer (time measurement): High-precision timer measurement in 0.01-ms units is possible using one-shot pulse output. (In this case, external pulse output is not possible.)
CS1W-HCA22 (pulse inputs and analog outputs)	Pulse inputs (high-speed counters)	2 inputs Each input can be set to either single-phase or differential-phase (multiplication factor of 1, 2, or 4) at 50 or 200 kHz (switchable). **Note** Target value interrupts or range comparison bit pattern outputs for high-speed counter present values can be programmed. Measurement of the rate of change in high-speed counter pres ent values and measurement of the frequency from the high-speed counter present values is also possible.
	Analog outputs	2 outputs Each output can be set to any one of the following: 1 to 5 V, 0 to 5 V, 0 to 10 V, or -10 to 10 V Accuracy: ±0.3%; Resolution: 4,000 (1 to 5 V, 0 to 5 V, 0 to 10 V) or 10,000 (-10 to 10 V), D/A conversion time: 0.5 ms max. Outputs the output values set in the AR Area. Also, for each point, using the SPED instruction and ACC instruction (combined use possible), output at a fixed analog value, or output at values rising or falling at a fixed rate, is possible. • It is possible to select either immediate refreshing when instructions are executed or refreshing of output values in the AR Area after exe cution of the END instruction as the refreshing method for analog out put. • Analog output values can be held. (Analog values can be output at their peak, held, or cleared values when the Conversion Enable Flag is OFF, a fatal error occurs, or an analog output error occurs.) **Note** It is also possible to produce trapezoidal output of analog values according to the time elapsed by combining the SPED instruc tion, the ACC instruction, timer instructions, and scheduled in terrupts.

Ordering Information

Description	Part Number
Basic counter unit 20 digital I/O, 12 dc inputs 8 transistor outputs	**CS1W-HIO01**
Counter with 20 digital I/O and 2 high speed inputs and analog outputs	**CS1W-HCA22**
Counter with 20 digital I/O and 2 high speed inputs and pulse outputs	**CS1W-HCP22**
Screw Terminal block for 40 pin CN2 special I/O connector	**XW2B-40G5**
0.5 m (1.64 ft) connecting cable to 40 pin screw terminal block	**XW2Z-050B**
1.0 m (3.28 ft) connecting cable to 40 pin screw terminal block	**XW2Z-100B**
2.0 m (6.56 ft) connecting cable to 40 pin screw terminal block	**XW2Z-200B**
3.0 m (9.84 ft) connecting cable to 40 pin screw terminal block	**XW2Z-300B**
5.0 m (16.40 ft) connecting cable to 40 pin screw terminal block	**XW2Z-500B**
Operation Manual for all Customizable Counter models	**W378-E1-1**
Programming Manual all Customizable Counter models	**W384-E1-1**

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