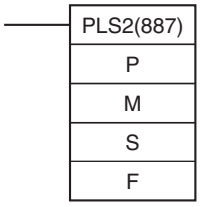
3-20-7 PULSE OUTPUT: PLS2(887)

Purpose

PLS2(887) outputs a specified number of pulses to the specified port. Pulse output starts at a specified startup frequency, accelerates to the target frequency at a specified acceleration rate, decelerates at the specified deceleration rate, and stops at approximately the same frequency as the startup frequency. Only independent mode positioning is supported.

PLS2(887) can also be executed during pulse output to change the number of output pulses, target frequency, acceleration rate, or deceleration rate. PLS2(887) can thus be used for sloped speed changes with different acceleration and deceleration rates, target position changes, target and speed changes, or direction changes.

Ladder Symbol



P: Port specifier
M: Output mode
S: First word of settings table
F: First word of starting frequency

Variations

Variations	**Executed Each Cycle for ON Condition**	PLS2(887)
	Executed Once for Upward Differentiation	@PLS2(887)
	Executed Once for Downward Differentiation	Not supported
Immediate Refreshing Specification		Not supported

Applicable Program Areas

Block program areas	Step program areas	Subroutines	Interrupt tasks
OK	OK	OK	OK

Operands

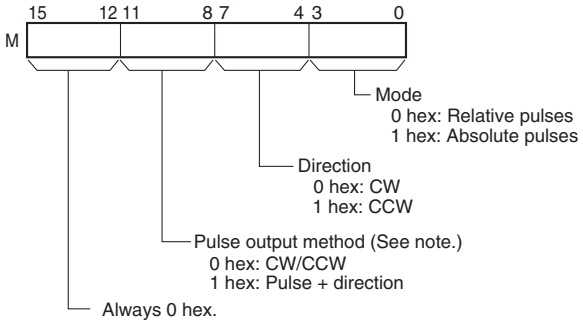
P: Port Specifier

The port specifier indicates the port.

P	Port
0000 hex	Pulse output 0
0001 hex	Pulse output 1
0002 hex	Pulse output 2 (CP1H only)
0003 hex	Pulse output 3 (CP1H only)
0020 hex	Inverter positioning 0 (CP1L only)
0021 hex	Inverter positioning 1 (CP1L only)

M: Output Mode

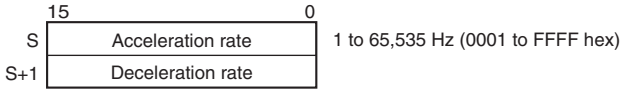
The content of M specifies the parameters for the pulse output as follows:



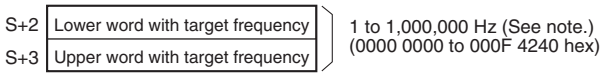
Note: Use the same pulse output method when using both pulse outputs 0 and 1.

S: First Word of Settings Table

The contents of S to S+5 control the pulse output as shown in the following diagrams.

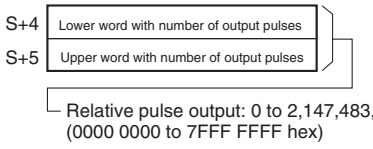


Specify the increase or decrease in the frequency per pulse control period (4 ms).



Specify the frequency after acceleration in Hz.

Note: The maximum frequency that can be specified depends on the model and pulse output support. Refer to the *CP1H Operation Manual.*

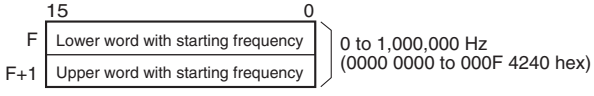


The actual number of movement pulses that will be output are as follows:

For relative pulse output, the number of movement pulses = the set number of pulses. For absolute pulse output, the number of movement pulses = the set number of pulses − the PV.

F: First Word of Starting Frequency

The starting frequency is given in F and F+1.



Specify the starting frequency in Hz.

Operand Specifications

Area	P	M	S	F
CIO Area	---	---	CIO 0 to CIO 6138	CIO 0 to CIO 6142
Work Area	---	---	W0 to W506	W0 to W510
Holding Bit Area	---	---	H0 to H506	H0 to H510
Auxiliary Bit Area	---	---	A448 to A954	A448 to A958
Timer Area	---	---	T0000 to T4090	T0000 to T4094

Area	P	M	S	F
Counter Area	---	---	C0000 to C4090	C0000 to C4094
DM Area	---	---	D0 to D32762	D0 to D32766
Indirect DM addresses in binary	---	---	@ D0 to @ D32767	@ D0 to @ D32767
Indirect DM addresses in BCD	---	---	*D0 to *D32767	*D0 to *D32767
Constants	See description of operand.	See description of operand.	---	See description of operand.
Data Registers	---	---	---	---
Index Registers	---	---	---	---
Indirect addressing using Index Registers	---	---	,IR0 to ,IR15 –2048 to +2047 ,IR0 to –2048 to +2047 ,IR15 DR0 to DR15, IR0 to IR15 ,IR0+(++) to ,IR15+(++) ,–(– –)IR0 to, –(– –)IR15	,IR0 to ,IR15 –2048 to +2047 ,IR0 to –2048 to +2047 ,IR15 DR0 to DR15, IR0 to IR15 ,IR0+(++) to ,IR15+(++) ,–(– –)IR0 to, –(– –)IR15

Upper Limits to the Target Frequency and Starting Frequency

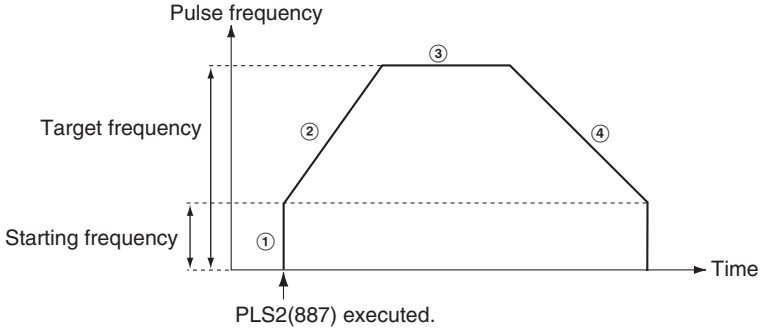
Port	CP1H			CP1L
	X40/XA40 version 1.0	X40/XA40 version 1.1 or higher	Y20	
Port 0	100 kHz	100 kHz	1 MHz	100 kHz
Port 1	100 kHz	100 kHz	1 MHz	100 kHz
Port 2	30 kHz	100 kHz	100 kHz	---
Port 3	30 kHz	100 kHz	100 kHz	---

Description

PLS2(887) starts pulse output on the port specified in P using the mode specified in M at the start frequency specified in F (1 in diagram). The frequency is increased every pulse control period (4 ms) at the acceleration rate specified in S until the target frequency specified in S is reached (2 in diagram). When the target frequency has been reached, acceleration is stopped and pulse output continues at a constant speed (3 in diagram).

The deceleration point is calculated from the number of output pulses and deceleration rate set in S and when that point is reached, the frequency is decreased every pulse control period (4 ms) at the deceleration rate specified in S until the starting frequency specified in S is reached, at which point pulse output is stopped (4 in diagram).

Pulse output is started each time PLS2(887) is executed. It is thus normally sufficient to use the differentiated version (@PLS2(887)) of the instruction or an execution condition that is turned ON only for one scan.



PLS2(887) can be used only for positioning.

PLS2(887) can be executed during pulse output for ACC(888) in either independent or continuous mode, and during acceleration, constant speed, or deceleration. (See note.) ACC(888) can also be executed during pulse output for PLS2(887) during acceleration, constant speed, or deceleration.

Note (1) Executing PLS2(887) during speed control with ACC(888) (continuous mode) with the same target frequency as ACC(888) can be used to achieve interrupt feeding of a fixed distance. Acceleration will not be performed by PLS2(887) for this application, but if the acceleration rate is set to 0, the Error Flag will turn ON and PLS2(887) will not be executed. Always set the acceleration rate to a value other than 0.

(2) The acceleration/deceleration rate can be specified as 1 Hz or higher. There is no upper limit to the acceleration/deceleration time. If the difference between the starting speed and target speed is more than 100 kHz, the acceleration/deceleration rate will be automatically increased.

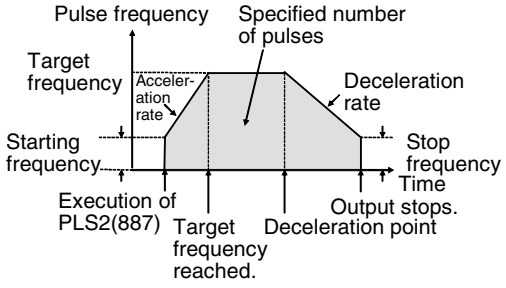
- If the difference between the starting speed and target speed is between 100 and 200 KHz, the acceleration/deceleration rate will be 2 Hz or higher.
- If the difference between the starting speed and target speed is between 200 and 300 KHz, the acceleration/deceleration rate will be 3 Hz or higher.

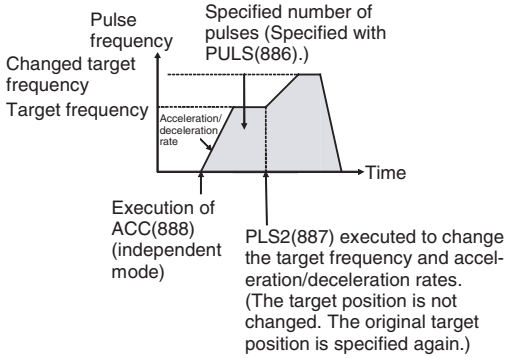
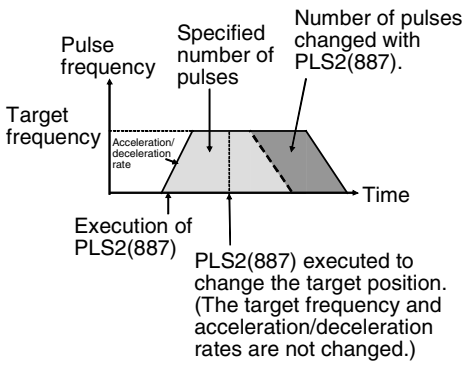
⋮

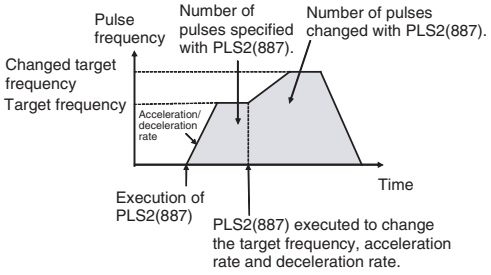
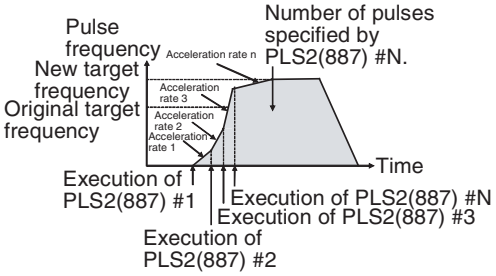
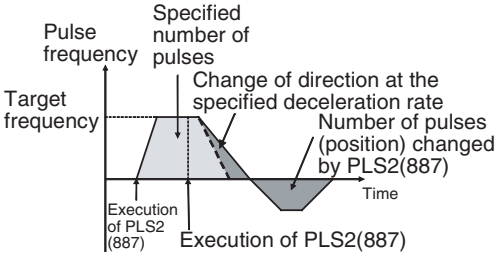
- If the difference between the starting speed and target speed is between 900 and 1,000 KHz, the acceleration/deceleration rate will be 10 Hz or higher.

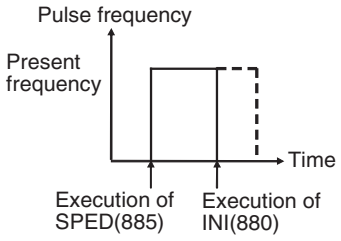
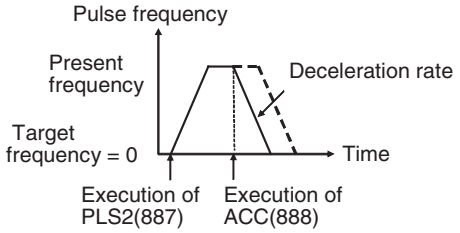
■ Independent Mode Positioning

Note Pulse output will stop immediately if the CPU Unit is changed to PROGRAM mode.

Operation	Purpose	Application	Frequency changes	Description	Procedure/ instruction
Starting pulse output	Complex trapezoidal control	Positioning with trapezoidal acceleration and deceleration (Separate rates used for acceleration and deceleration; starting speed) The number of pulses can be changed during positioning.		Accelerates and decelerates at a fixed rates. The pulse output is stopped when the specified number of pulses has been output. (See note.) **Note** The target position (specified number of pulses) can be changed during positioning.	PLS2(887)

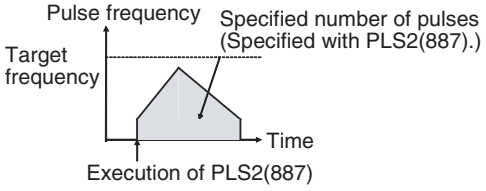
Operation	Purpose	Application	Frequency changes	Description	Procedure/ instruction
Changing settings	To change speed smoothly (with unequal acceleration and deceleration rates)	Changing the target speed (frequency) during positioning (different acceleration and deceleration rates)		PLS2(887) can be executed during positioning to change the acceleration rate, deceleration rate, and target frequency. **Note** To prevent the target position from being changed intentionally, the original target position must be specified in absolute coordinates.	PLS2(887) ↓ PLS2(887) PULS(886) ↓ ACC(888) (Independent) ↓ PLS2(887)
	To change target position	Changing the target position during positioning (multiple start function)		PLS2(887) can be executed during positioning to change the target position (number of pulses), acceleration rate, deceleration rate, and target frequency. **Note** If a constant speed cannot be maintained after changing the settings, an error will occur and the original operation will continue to the original target position.	PLS2(887) ↓ PLS2(887) PULS(886) ↓ ACC(888) (Independent) ↓ PLS2(887)

Operation	Purpose	Application	Frequency changes	Description	Procedure/ instruction
Changing settings, continued	To change target position and speed smoothly	Changing the target position and target speed (frequency) during positioning (multiple start function)		PLS2(887) can be executed during positioning to change the target position (number of pulses), acceleration rate, deceleration rate, and target frequency. **Note** If a constant speed cannot be maintained after changing the settings, an error will occur and the original operation will continue to the original target position.	PULS(886) ↓ ACC(888) (Independent) ↓ PLS2(887)
		Changing the acceleration and deceleration rates during positioning (multiple start function)		PLS2(887) can be executed during positioning (acceleration or deceleration) to change the acceleration rate or deceleration rate.	PLS2(887) ↓ PLS2(887) PULS(886) ↓ ACC(888) (Independent) ↓ PLS2(887)
	To change direction	Changing the direction during positioning		PLS2(887) can be executed during positioning with absolute pulse specification to change to absolute pulses and reverse direction.	PLS2(887) ↓ PLS2(887) PULS(886) ↓ ACC(888) (Independent) ↓ PLS2(887)

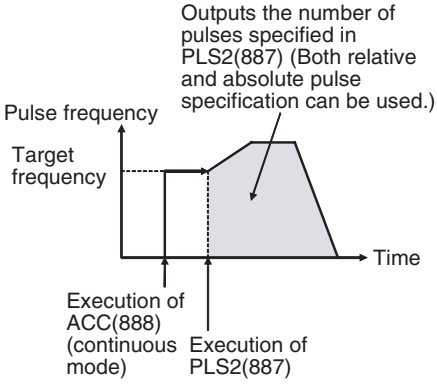
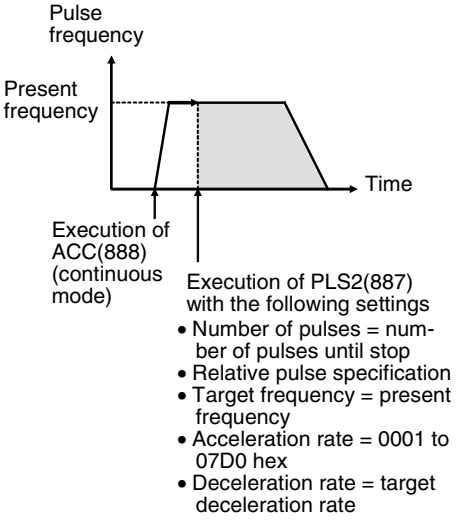
Operation	Purpose	Application	Frequency changes	Description	Procedure/ instruction
Stopping pulse output	Stop pulse output (Number of pulses setting is not preserved.)	Immediate stop		Stops the pulse output immediately and clears the number of output pulses.	PLS2(887) ↓ INI(880)
	Stop pulse output smoothly. (Number of pulses setting is not preserved.)	Decelerate to a stop		Decelerates the pulse output to a stop.	PLS2(887) ↓ ACC(888) (Independent, target frequency of 0 Hz)

Note Triangular Control

If the specified number of pulses is less than the number required to reach the target frequency and return to zero, the function will automatically reduce the acceleration/deceleration time and perform triangular control (acceleration and deceleration only.) An error will not occur.



■ Switching from Continuous Mode Speed Control to Independent Mode Positioning

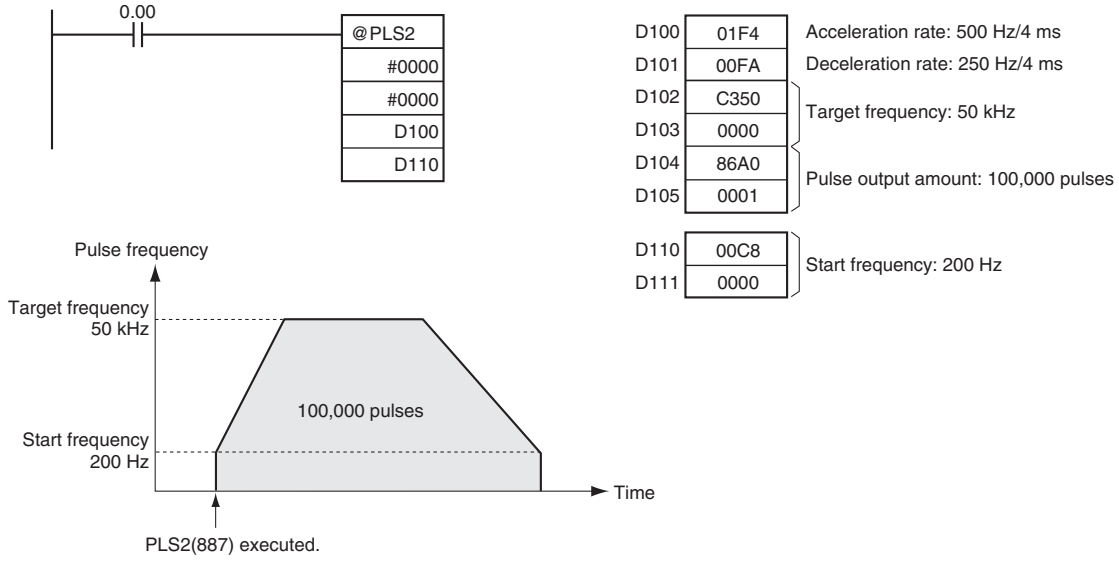
Example application	Frequency changes	Description	Procedure/ instruction
Change from speed control to fixed distance positioning during operation		PLS2(887) can be executed during a speed control operation started with ACC(888) to change to positioning operation.	ACC(888) (Continuous) ↓ PLS2(887)
Fixed distance feed interrupt			

Flags

Name	Label	Operation
Error Flag	ER	ON if the specified range for P, M, S, or F is exceeded. ON if PLS2(887) is executed for a port that is already outputting pulses for SPED(885) or ORG(889). ON if PLS2(887) is executed in an interrupt task when an instruction controlling pulse output is being executed in a cyclic task. ON if PLS2(887) is executed for an absolute pulse output but the origin has not been established.

Example

When CIO 0.00 turns ON in the following programming example, PLS2(887) starts pulse output from pulse output 0 with an absolute pulse specification of 100,000 pulses. Pulse output is accelerated at a rate of 500 Hz every 4 ms starting at 200 Hz until the target speed of 50 kHz is reached. From the deceleration point, the pulse output is decelerated at a rate of 250 Hz every 4 ms starting until the starting speed of at 200 Hz is reached, at which point pulse output is stopped.

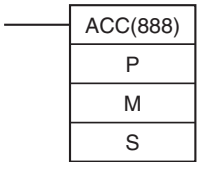


3-20-8 ACCELERATION CONTROL: ACC(888)

Purpose

ACC(888) outputs pulses to the specified output port at the specified frequency using the specified acceleration and deceleration rate. (Acceleration rate is the same as the deceleration rate.) Either independent mode positioning or constant mode speed control is possible. For positioning, ACC(888) is used in combination with PULS(886). ACC(888) can also be executed during pulse output to change the target frequency or acceleration/deceleration rate, enabling smooth (sloped) speed changes.

Ladder Symbol



P: Port specifier
M: Output mode
S: First word of settings table

Variations

Variations		
	Executed Each Cycle for ON Condition	ACC(888)
	Executed Once for Upward Differentiation	@ACC(888)
	Executed Once for Downward Differentiation	Not supported
Immediate Refreshing Specification		Not supported

Applicable Program Areas

Block program areas	Step program areas	Subroutines	Interrupt tasks
OK	OK	OK	OK

Operands

P: Port Specifier

The port specifier specifies the port where the pulses will be output.

P	Port
0000 hex	Pulse output 0
0001 hex	Pulse output 1
0002 hex	Pulse output 2 (CP1H only)
0003 hex	Pulse output 3 (CP1H only)
0020 hex	Inverter positioning 0 (CP1L only)
0021 hex	Inverter positioning 1 (CP1L only)