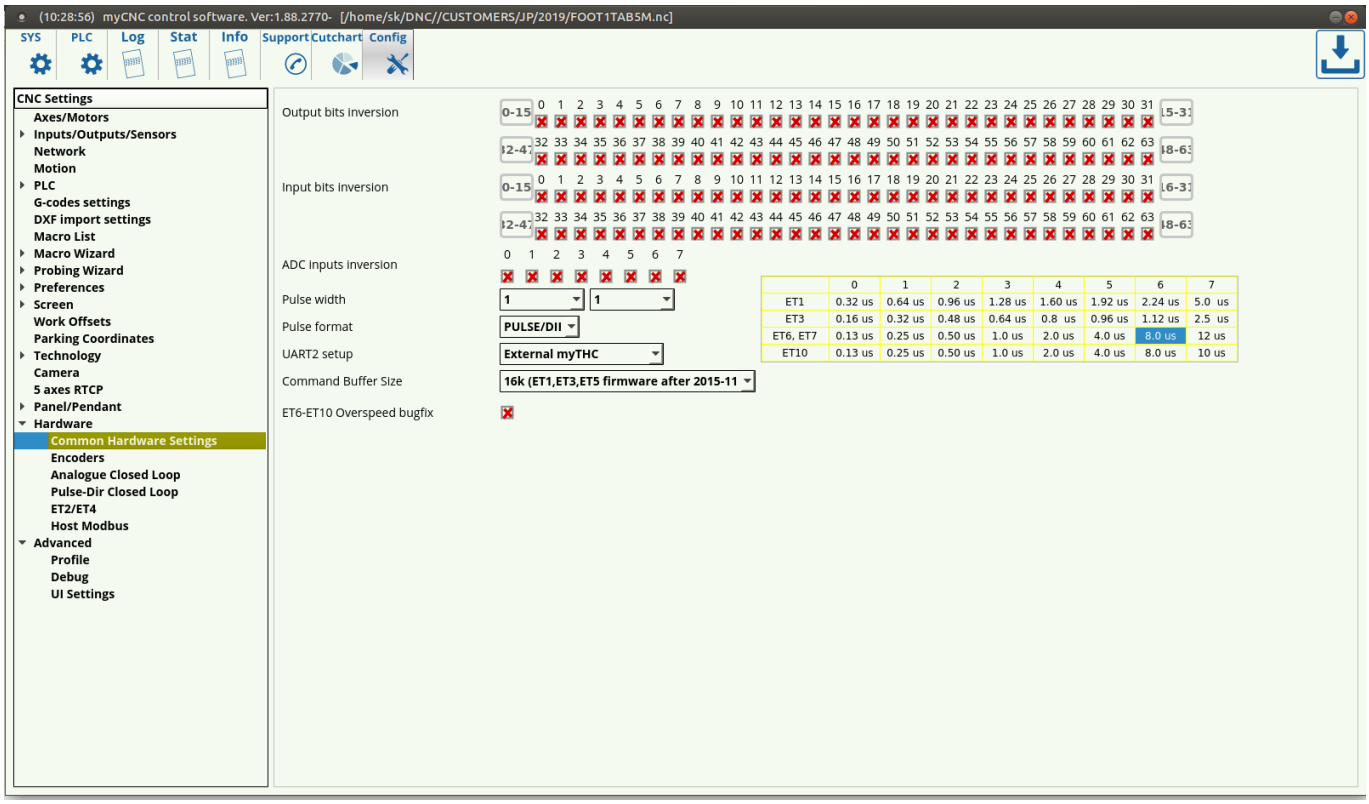
MyCNC Pulse Width Setup

- In myCNC software, navigate to **Settings**
- Open the **Hardware** tab
- Open the **Common Hardware Settings** tab. The following GUI will be presented:



- Select the appropriate **Pulse Width**

Selecting the Appropriate Pulse Width for your motor

A common procedure required for proper motor operation is selecting the appropriate pulse width for the signal going from the controller to the step/servo motor on the CNC machine. The pulse impulses sent from the controller to the motor have a certain width (as seen below), that cannot be too large due to the signal overlap that would occur otherwise because of each individual signal interfering with the next one. However, as seen in the following instructions from Panasonic's MINAS A5-series AC Servo Motor & Driver, the pulses also have to have a minimum width for the machine to register the signal, for example, 0.25 µs for t1 of the 4 Mpps input and 2.5 µs for t1 of the 500 kpps input:

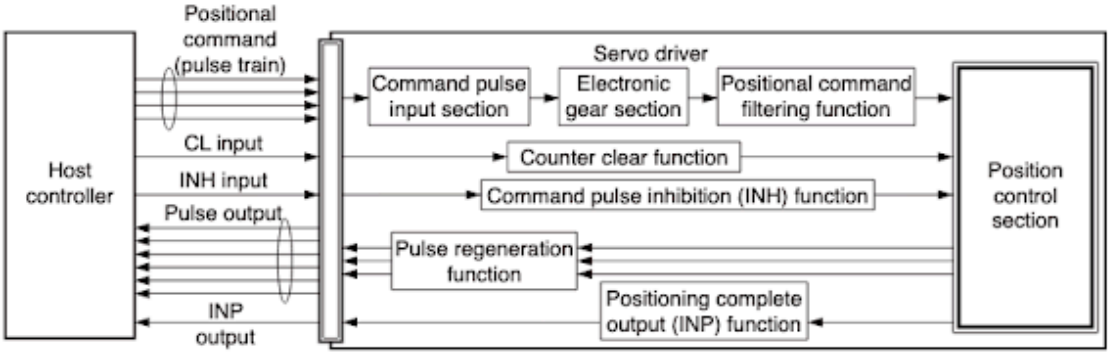
3 Connection

1. Outline of mode

Position Control Mode

Outline

You can perform position control based on the positional command (pulse train) from the host controller.
This section describes the fundamental setup to be used for the position control.



Function

(1) Process of command pulse input

The positional commands of the following 3 types (pulse train) are available.

- 2-phase pulse
- Positive direction pulse/negative direction pulse
- Pulse train + sign

Set the pulse configuration and pulse counting method based on the specification and configuration of installation of the host controller.
The input terminals can accommodate the following 2 systems.

- Input 1 “PULSH1, PULSH2, SIGNH1, SIGNH2” line receiver input (4 Mpps)
- Input 2 “PULS1, PULS2, SIGN1, SIGN2” photocoupler input (500 kpps)

Caution For line driver output, “Input 2” can also be used without changing the allowable input frequency.

· Relevant parameters

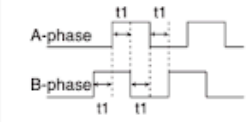
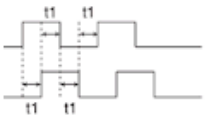
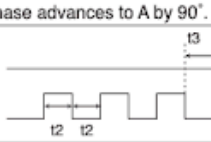
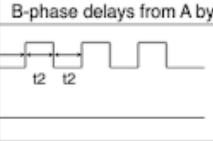
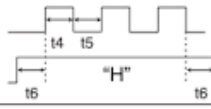
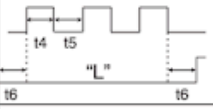
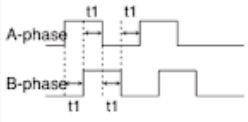
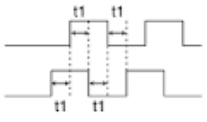
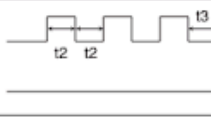
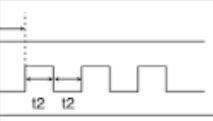
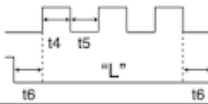
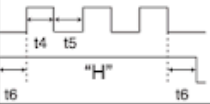
Parameter No.	Title	Range	Function
Pr0.05	Selection of command pulse input	0 to 1	You can select either the photo-coupler input or the exclusive input for line driver as the command pulse input.
Pr0.06	Command pulse rotational direction setup	0 to 1	Sets the counting direction when command pulse is input.
Pr0.07	Command pulse input mode setup	0 to 3	Sets the counting method when command pulse is input.

Note For details of these parameters, refer to P.4-6 and 7 “Details of parameter”.

4. Inputs and outputs on connector X4

Input Signal and Pin No.

• Input format command pulse

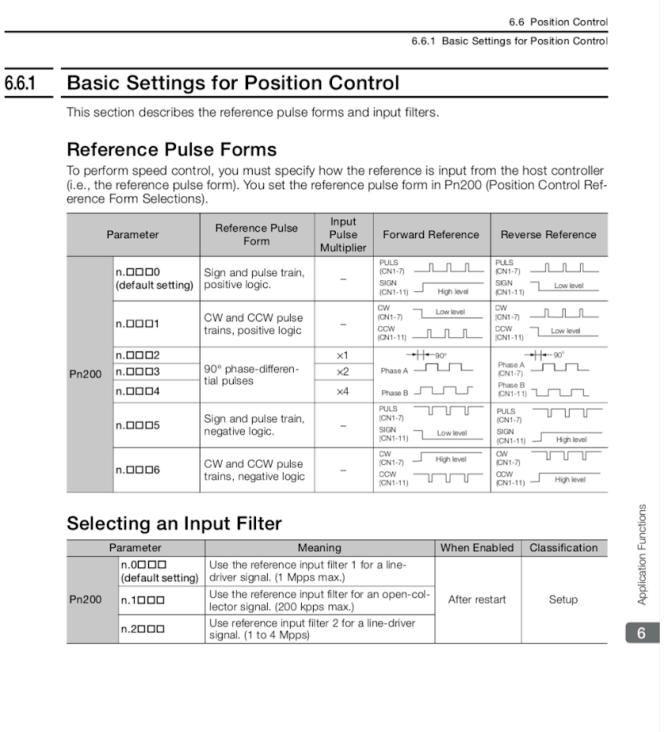
Pr0.06 setup value (Command pulse rotational direction setup)	Pr0.07 setup value (Command pulse input mode setup)	Command pulse format	Signal title	Positive direction command	Negative direction command
0	0 or 2	90° phase difference 2-phase pulse (A + B-phase)	PULS SIGN	 B-phase advances to A by 90°.	 B-phase delays from A by 90°.
	1	Positive direction pulse train + Negative direction pulse train	PULS SIGN		
	3	pulse train + Signal	PULS SIGN		
1	0 or 2	90° phase difference 2-phase pulse (A + B-phase)	PULS SIGN	 B-phase delays from A by 90°.	 B-phase advances to A by 90°.
	1	Positive direction pulse train + Negative direction pulse train	PULS SIGN		
	3	pulse train + Signal	PULS SIGN		

- PULS and SIGN represents the outputs of pulse train in put circuit. Refer to the fig. of P.3-30, "Input Circuit".
- In case of negative direction pulse train + positive direction pulse train and pulse train + sign, pulse train will be cap tured at the rising edge.
- In case of 2-phase pulse, pulse train will be captured at each edge.

• Permissible max. input frequency, and min. necessary time width of command pulse input signal.

Input I/F of PULS/SIGN signal		Permissible max. input frequency	Min. necessary time width (μs)					
			t_1	t_2	t_3	t_4	t_5	t_6
Pulse train interface exclusive to line driver		4Mpps	0.25	0.125	0.125	0.125	0.125	0.125
Pulse train interface	Line driver interface	500kpps	2	1	1	1	1	1
	Open collector interface	200kpps	5	2.5	2.5	2.5	2.5	2.5

As another example, the Yaskawa's E-7-Series AC Servo Drive also imposes a similar constraint on the minimum widths:



6.6 Position Control
6.6.1 Basic Settings for Position Control

6.6.1 Basic Settings for Position Control

This section describes the reference pulse forms and input filters.

Reference Pulse Forms

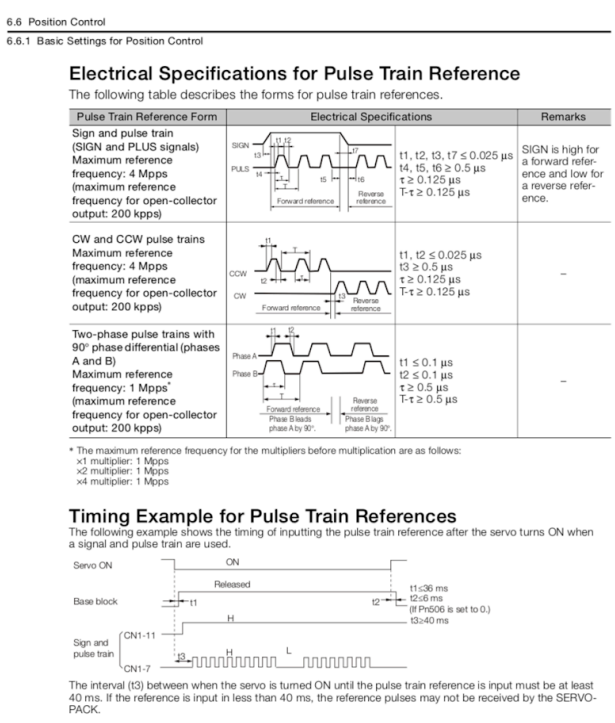
To perform speed control, you must specify how the reference is input from the host controller (i.e., the reference pulse form). You set the reference pulse form in Pn200 (Position Control Reference Form Selections).

Parameter		Reference Pulse Form	Input Pulse Multiplier	Forward Reference	Reverse Reference
Pn200	n.□□□0 (default setting)	Sign and pulse train, positive logic.	–	PULS (CN1-7), SIGN (CN1-11), High level	PULS (CN1-7), SIGN (CN1-11), Low level
	n.□□□1	CW and CCW pulse trains, positive logic	–	CW (CN1-7), Low level; CCW (CN1-11)	CW (CN1-7), Low level; CCW (CN1-11)
	n.□□□2	90° phase-differential pulses	×1	90°, Phase A, Phase B	90°, Phase A (CN1-7), Phase B (CN1-11)
	n.□□□3		×2		
	n.□□□4		×4		
	n.□□□5	Sign and pulse train, negative logic.	–	PULS (CN1-7), SIGN (CN1-11), Low level	PULS (CN1-7), SIGN (CN1-11), High level
	n.□□□6	CW and CCW pulse trains, negative logic	–	CW (CN1-7), CCW (CN1-11), High level	CW (CN1-7), CCW (CN1-11), High level

Selecting an Input Filter

Parameter		Meaning	When Enabled	Classification
Pn200	n.□□□□ (default setting)	Use the reference input filter 1 for a line-driver signal. (1 Mpps max.)	After restart	Setup
	n.1□□□	Use the reference input filter for an open-collector signal. (200 kpps max.)		
	n.2□□□	Use reference input filter 2 for a line-driver signal. (1 to 4 Mpps)		

Application Functions
6



6.6 Position Control
6.6.1 Basic Settings for Position Control

Electrical Specifications for Pulse Train Reference

The following table describes the forms for pulse train references.

Pulse Train Reference Form	Electrical Specifications		Remarks
Sign and pulse train (SIGN and PLUS signals) Maximum reference frequency: 4 Mpps (maximum reference frequency for open-collector output: 200 kpps)	SIGN, PLUS, t1, t2, t3, t4, t5, t6, t7, Forward reference, Reverse reference	t1, t2, t3, t7 ≤ 0.025 µs t4, t5, t6 ≥ 0.5 µs τ ≥ 0.125 µs T-τ ≥ 0.125 µs	SIGN is high for a forward reference and low for a reverse reference.
CW and CCW pulse trains Maximum reference frequency: 4 Mpps (maximum reference frequency for open-collector output: 200 kpps)	CCW, CW, t1, t2, T, τ, Forward reference, Reverse reference	t1, t2 ≤ 0.025 µs t3 ≥ 0.5 µs τ ≥ 0.125 µs T-τ ≥ 0.125 µs	–
Two-phase pulse trains with 90° phase differential (phases A and B) Maximum reference frequency: 1 Mpps* (maximum reference frequency for open-collector output: 200 kpps)	Phase A, Phase B, t1, t2, T, Forward reference, Phase B leads phase A by 90°, Reverse reference, Phase B lags phase A by 90°	t1 ≤ 0.1 µs t2 ≤ 0.1 µs τ ≥ 0.5 µs T-τ ≥ 0.5 µs	–

* The maximum reference frequency for the multipliers before multiplication are as follows:
×1 multiplier: 1 Mpps
×2 multiplier: 1 Mpps
×4 multiplier: 1 Mpps

Timing Example for Pulse Train References

The following example shows the timing of inputting the pulse train reference after the servo turns ON when a signal and pulse train are used.

The interval (t3) between when the servo is turned ON until the pulse train reference is input must be at least 40 ms. If the reference is input in less than 40 ms, the reference pulses may not be received by the SERVOPACK.

As such, the pulses have to have both a minimum width, such that the motor (or the particular setting of that motor, as with the Panasonic MINAS A5-series) is able to register pulses that are sent to it, and a maximum width, such that the pulses do not overlap.

In order to select such an appropriate pulse width:

- Choose the speed at which your machine will move in **[meters / minute]**
- Convert the **[meters / minute]** speed with which the machine moves to the number of **[revolutions / second]** of the screw/belt/etc based on the **[meters / revolution]** value of the screw/belt on your machine
    - For example, if the desired **[meters / minute]** speed is equal to 5 meters/minute, and the **[meters / revolution]** value of the screw/belt is 5 millimeters/revolution, the **[revolutions / second]** value will be 16 revolutions/second
- Locate the minimum **[seconds / step]** value of your step/servo motor (the minimum time it takes the motor to process each individual impulse)
- Using the **[revolutions / second]** value and the minimum allowed **[seconds / step]** value of the motor, calculate how many **[steps / revolution]** the stepper driver will have to make.
    - For example, if the minimum allowable pulse width on the motor is 8 µs/step, and the machine will produce 16 revolutions/second, then the maximum value for the **[steps / revolution]** will be around 7800.
- As discussed earlier, the value selected on the stepper motor must be equal or smaller than the number of **[steps / revolution]** obtained from the previous step for the motor to register the signal and function properly.
    - For example, if the **[steps / revolution]** value has been calculated to be 7800 steps/revolution, then if the stepper driver allows for 3200, 6400, and 12800 steps/revolution, 6400 steps/revolution will be selected.
- Using the **[revolutions / second]** value and the updated stepper driver **[steps / revolution]** value, calculate the actual **[seconds / step]** value of the motor. This actual **[seconds / step]**

value will always be equal or higher than the minimum allowable **[seconds / step]** value of the motor due to selecting a lower **[steps / revolution]** value in the previous steps.
    - For example, if the **[revolutions / second]** value was equal to 16 revolutions/second and the stepper driver **[steps / revolution]** value was equal to 6400 steps/revolution, the actual **[seconds / step]** value of the motor will be equal to 9.8 µs/step.

- The value for the **Pulse Width** in myCNC software must be equal or higher than the actual **[seconds / step]** value of the motor.
    - For example, if the **[seconds / step]** value was equal to 9.8 µs/step, and an ET6 or an ET7 board was used, 12 µs would be selected from the chart in the **Common Hardware Settings** tab as it is the closest value that's higher than 9.8 µs.

	0	1	2	3	4	5	6	7
ET1	0.32 us	0.64 us	0.96 us	1.28 us	1.60 us	1.92 us	2.24 us	5.0 us
ET3	0.16 us	0.32 us	0.48 us	0.64 us	0.8 us	0.96 us	1.12 us	2.5 us
ET6, ET7	0.13 us	0.25 us	0.50 us	1.0 us	2.0 us	4.0 us	8.0 us	12 us
ET10	0.13 us	0.25 us	0.50 us	1.0 us	2.0 us	4.0 us	8.0 us	10 us

- The 12 µs corresponds to Setting 7 in the chart, thus the **Pulse width** value should be set to 7.
    - NOTE: The first value in the **Pulse Width** line refers to the first four axes of the controller (for example, the horizontal X and Y axes), while the second value refers to the other two axes of the controller (for example, the vertical Z axis). These values are set to be different if the controller used on the vertical axis is separate from that used on the horizontal, and are left the same if only one controller is used.

- The pulse width setup is now complete.