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Connection setup for the QD75P to A700 Inverter

This Document is designed to show a basic setup for connecting the QD75P to an A700 series inverter. For full information please see the manuals for the QD75P and the A700 Inverter.

Manuals

FR-A740EC Applied Instruction Manual	ib0600257eng
FR-A7AP instruction manual	ib0600238eng
QD75P-QD75D Positioning Module User's Manual	sh080058

All page reference in this document are for the manual A700 inverter dedicated instruction manual (Applied) IB(NA)-0600257ENG, unless other wise stated

Equipment needed:

A700 inverter
A7AP Encoder card
QD75P Position module

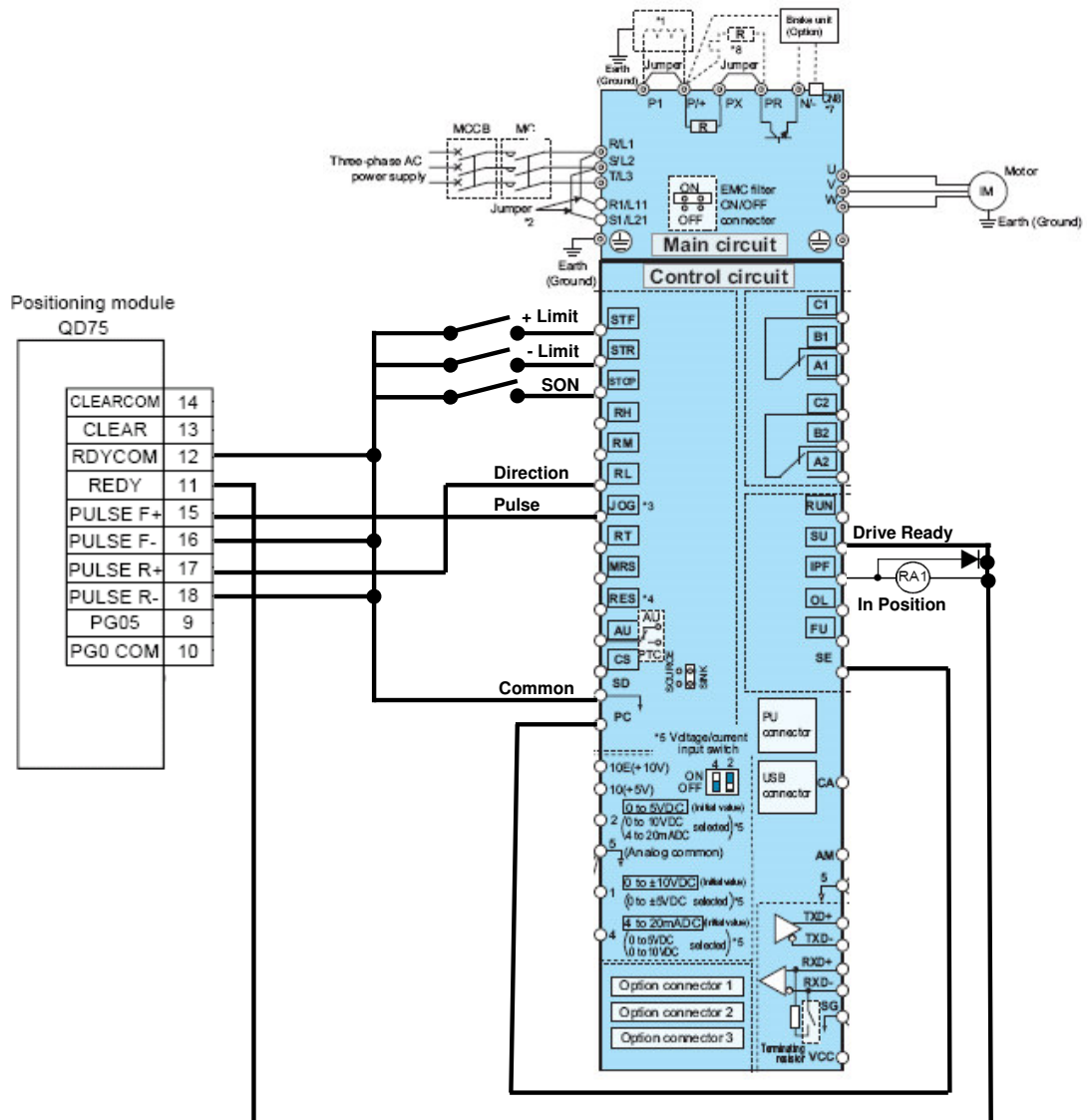
Recommendations

If the A700 inverter is also configured a network for instance CC-Link, all parameters are accessible in the PLC for monitoring and setting. This includes drive feed back information on current position.
This gives more flexibility in operation and diagnostics.

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Wiring Diagram for QD75P and A700 inverter

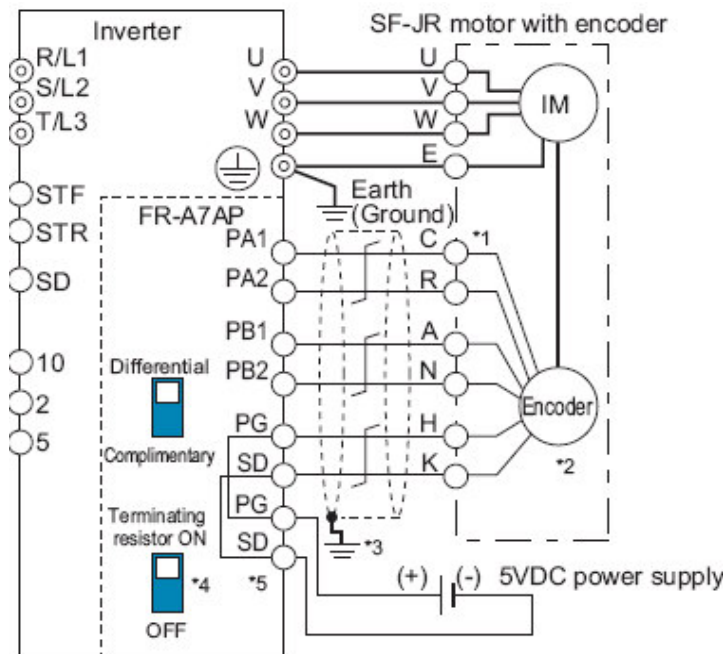
Select sink operation for the drive inputs.



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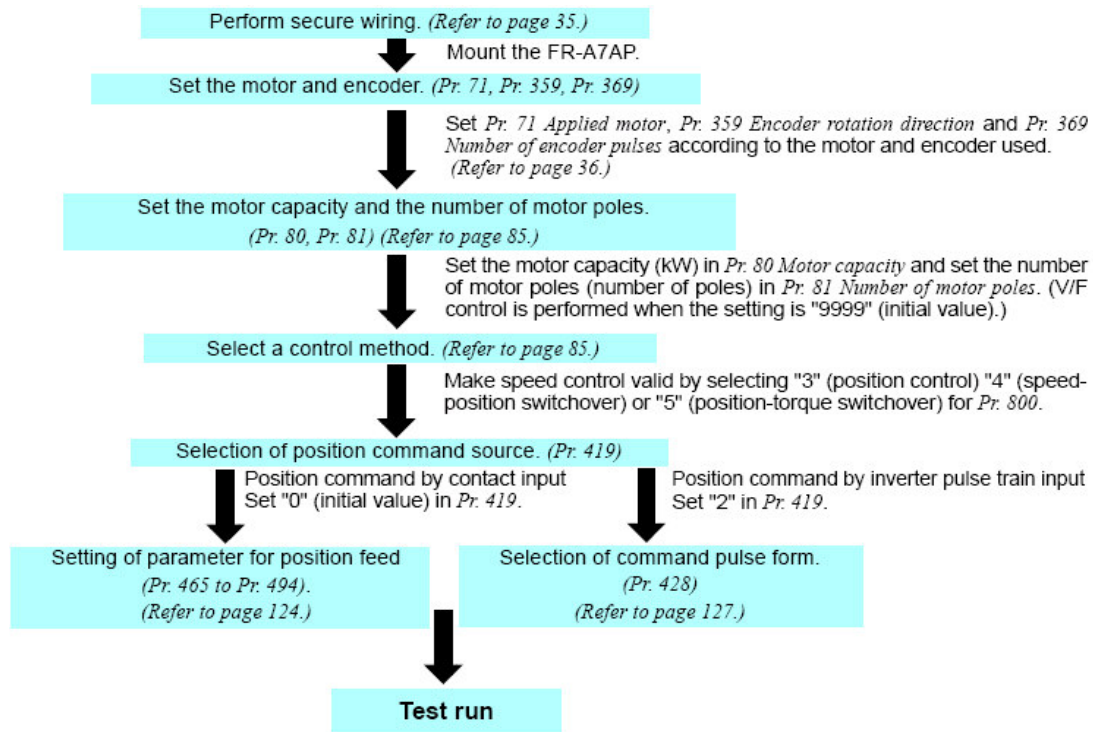
Wiring of A7AP

Terminal	Terminal Name	Application Explanation
PA1	Encoder A-phase signal input	A-, B- and Z-phase signals are input from the encoder. (For details of pulse signal, refer to <i>page 15</i> .)
PA2	Encoder A-phase inverse signal input	
PB1	Encoder B-phase signal input	
PB2	Encoder B-phase inverse signal input	
PZ1	Encoder Z-phase signal input	
PZ2	Encoder Z-phase inverse signal input	
PG	Power supply (positive side) input	Input power for the encoder power supply.
SD	Power supply ground	Connect the external power supply (5V, 12V, 15V, 24V) and the encoder power cable.



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Setting procedure for A700



As required

- Set the electronic gear. (refer to page 129)
- Setting of positioning adjustment parameter (refer to page 130)
- Gain adjustment of position control (refer to page 131)

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Parameter setting

Parameter No.	Name	Value	Function
Pr.71	Applied motor	13	Type of motor, 13 for other manufacturer's constant torque motor
Pr. 359	Encoder rotation direction		Encoder rotations directions 0=CW 1=CCW
Pr. 369	Number of encoder pulses		Encoder Pluses. Set as per the encoder on the motor.
Pr.80	Motor capacity		Rated name plate size of motor in Kw
Pr.81	Number of motor poles		Set the number of motor poles.
Pr.800	Control method selection	3	3 = position control mode, see manual for more options
Pr.188	STOP terminal function selection	23	this configures the STOP input on the drive to LX input for the Servo On signal
Pr.419	Position command source selection	2	Position command by inverter pulse train, (When Pr.419 is set to 2 the JOG terminal becomes a high speed input and there is no need to set Pr.291 Jog is PLS input Pr.291=1)
Pr. 180	RL terminal function selection	68	RL input is changed to the sign – Direction of travel input
Pr.191	SU terminal function selection	84	SU terminal changed to RDY Signal. output when the servo is on (LX-ON) and ready to operate
Pr.192	IPF terminal function selection	36	IPF terminal changed to Y36 In-position. Output when the number of droop pulses has fallen below the setting value.

Once parameters are set Cycle power on the drive

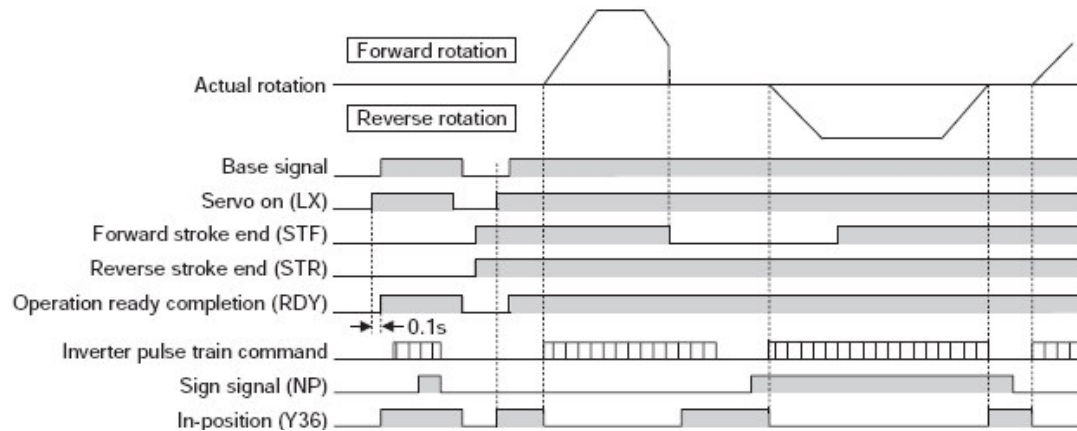
Auto Tune the drive for increased performance see parameter Pr. 96.
 Running the drive off table operation mode proves the drive and encoder are configured correctly.

Please factory reset the drive before auto tune!

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Operation

Turning on the servo on signal (LX) cancels the output shutoff and the operation ready signal (RDY) turns on after 0.1s. Turning on the STF (forward stroke end signal) or STR (reverse stroke end signal) runs the motor according to the commanded pulse. When the forward (reverse) stroke end signal turns off, the motor does not run in that direction.



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Other Parameter available when the A7NP option card is fitted for Position control mode.

See the A700 manual for full details.

Parameter Number	Name	Initial Value	Setting Range	Description	
419	Position command source selection	0	0	Conditional position control function by contact input. (position command by parameter settings)	
			2	Conditional pulse train position command by inverter pulse train input	
428	Command pulse selection	0	0 to 2	Pulse train + sign	Negative logic
			3 to 5		Positive logic
429	Clear signal selection	1	0	Deviation counter is cleared at edge of turning off of the clear signal (CLR) from on	
			1	Deviation counter while the clear signal (CLR) is on	
430	Pulse monitor selection	9999	0 to 5	The status of various pulses during running is displayed.	
			9999	Frequency monitor is displayed.	

Parameter Number	Name	Initial Value	Setting Range	Description
420	Command pulse scaling factor numerator	1	0 to 32767 *	Set the electric gear. Pr: 420 is a numerator and Pr: 421 is a denominator.
421	Command pulse scaling factor denominator	1	0 to 32767 *	
424	Position command acceleration/deceleration time constant	0s	0 to 50s	Used when rotation has become unsmooth at a large electronic gear ratio (about 10 times or more) and low speed.

Parameter Number	Name	Initial Value	Setting Range	Description
426	In-position width	100 pulses	0 to 32767 pulses *	When the number of droop pulses has fallen below the setting value, the in-position signal (Y36) turns on.
427	Excessive level error	40K	0 to 400K	A position error excessive (E.OD) occurs when the number of droop pulses exceeds the setting.
			9999	Function invalid

Parameter Number	Name	Initial Value	Setting Range	Description
422	Position loop gain	25s ⁻¹	0 to 150s ⁻¹	Set the gain of the position loop.
423	Position feed forward gain	0%	0 to 100%	Function to cancel a delay caused by the droop pulses of the deviation counter.
425	Position feed forward command filter	0s	0 to 5s	Enters the primary delay filter in response to the feed forward command.

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A700 tuning Parameter

Parameter Number	Name	Initial Value	Setting Range	Description
818	Easy gain tuning response level setting	2	1 to 15	Set the response level. 1: Slow response to 15: Fast response
819	Easy gain tuning selection	0	0	Without easy gain tuning
			1	With load estimation, with gain calculation (valid only during vector control)
			2	With load (Pr: 880) manual input, gain calculation
820	Speed control P gain 1	60%	0 to 1000%	Set the proportional gain for speed control. (Increasing the value improves trackability in response to a speed command change and reduces speed variation with disturbance.)
821	Speed control integral time 1	0.333s	0 to 20s	Set the integral time during speed control. (Decrease the value to shorten the time taken for returning to the original speed if speed variation with disturbance occurs.)
830	Speed control P gain 2	9999	0 to 1000%	Second function of Pr: 820 (valid when RT signal is on)
			9999	No function
831	Speed control integral time 2	9999	0 to 20s	Second function of Pr: 821 (valid when RT signal is on)
			9999	No function
880	Load inertia ratio	7 times	0 to 200 times	Set the load inertia ratio to the motor.

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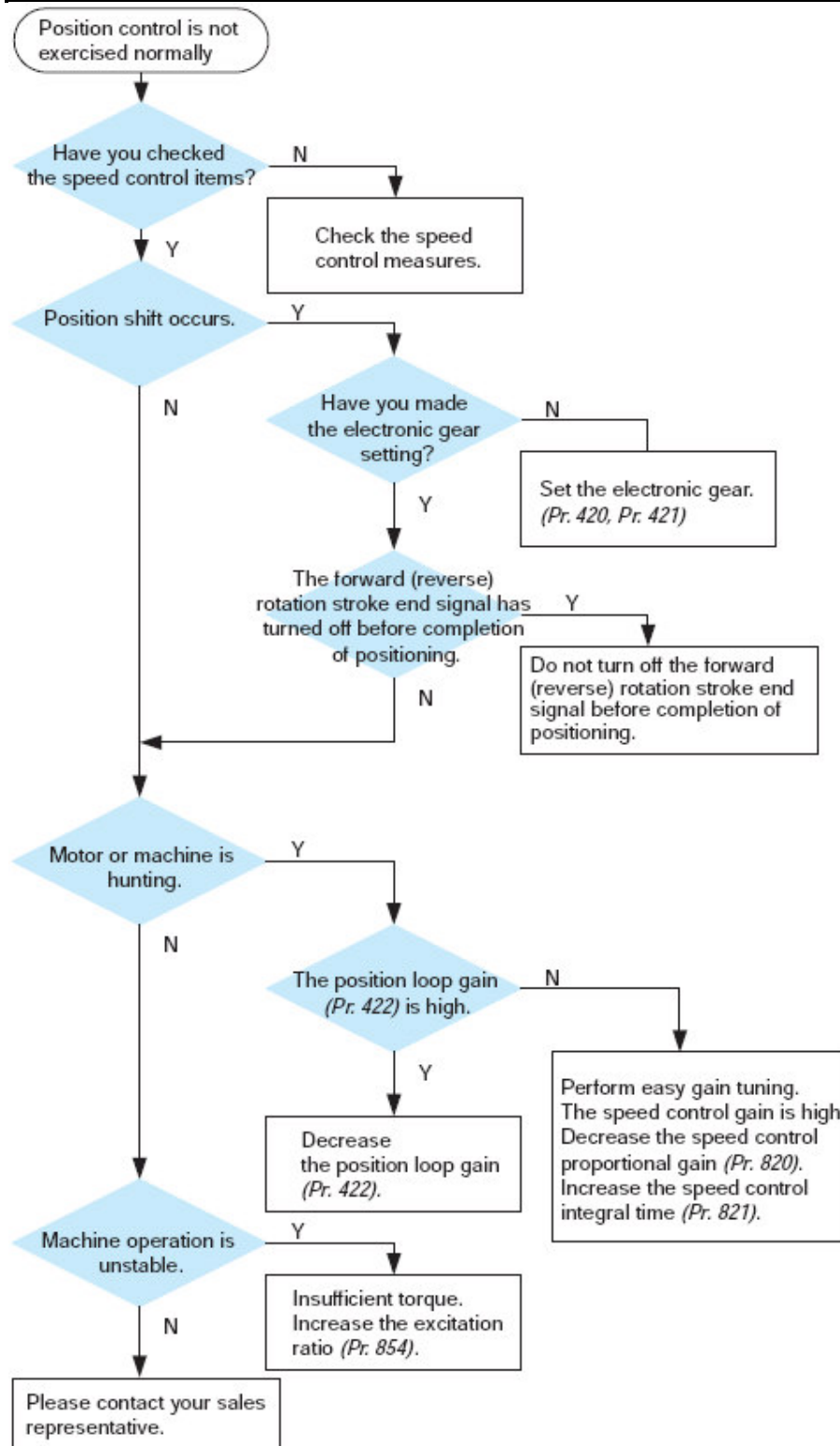
Troubleshooting

OLT = there is an issue with the wiring or rotation direction of the encoder.

	Phenomenon	Cause	Countermeasures
1	Motor does not rotate.	(1) The phase sequence of the motor or encoder wiring is wrong. (2) The control mode selection Pr. 800 setting is improper. (3) The servo on signal or stroke end signal (STF, STR) is not input. (4) Command pulse, position pulse sign (NP) are not correctly input. (5) Pr. 419 Position command source selection setting is not correct. (6) When "0" is set in Pr. 419 Position command source selection, the settings of position feed amount in Pr. 465 to Pr. 494 are not correct.	(1) Check the wiring. (Refer to page 34) (2) Check the Pr. 800 setting. (Refer to page 85) (3) Check that the signals are input normally. (4)-1 Check that the command pulses are input normally. (Check the cumulative command pulse value in Pr. 430) (4)-2 Check the command pulse form and command pulse selection, Pr. 428, setting. (4)-3 Check that the position pulse sign (NP) is assigned to the input terminal. (inverter pulse input) (5) Check the position command source selection in Pr. 419. (6) Check the position feed amount in Pr. 465 to Pr. 494 .
2	Position shift occurs.	(1) The command pulses are not input correctly. (2) The command is affected by noise. Or the encoder feedback signal is compounded with noise.	(1)-1 Check the command pulse form and command pulse selection, Pr. 428 setting. (1)-2 Check that the command pulses are input normally. (Check the cumulative command pulse value in Pr. 430) (1)-3 Check that the position pulse sign (NP) is assigned to the input terminal. (inverter pulse input) (2)-1 Decrease the Pr. 72 PWM frequency selection value. (2)-2 Change the earthing (grounding) point of shielded wire. Or leave the cable suspended.
3	Motor or machine hunts.	(1) The position loop gain is high. (2) The speed gain is high.	(1) Decrease the Pr. 422 value. (2)-1 Perform easy gain tuning. (2)-2 Decrease Pr. 820 and increase Pr. 821 .
4	Machine operation is unstable.	(1) The acceleration/deceleration time setting has adverse effect.	(1) Decrease Pr. 7 and Pr. 8 .

- Pr. 7 Acceleration time Refer to page 165
- Pr. 8 Deceleration time Refer to page 165
- Pr. 72 PWM frequency selection Refer to page 268
- Pr. 800 Control method selection Refer to page 85
- Pr. 802 Pre-excitation selection Refer to page 191
- Pr. 819 Easy gain tuning selection Refer to page 97
- Pr. 820 Speed control P gain 1 Refer to page 97
- Pr. 821 Speed control integral time 1 Refer to page 97

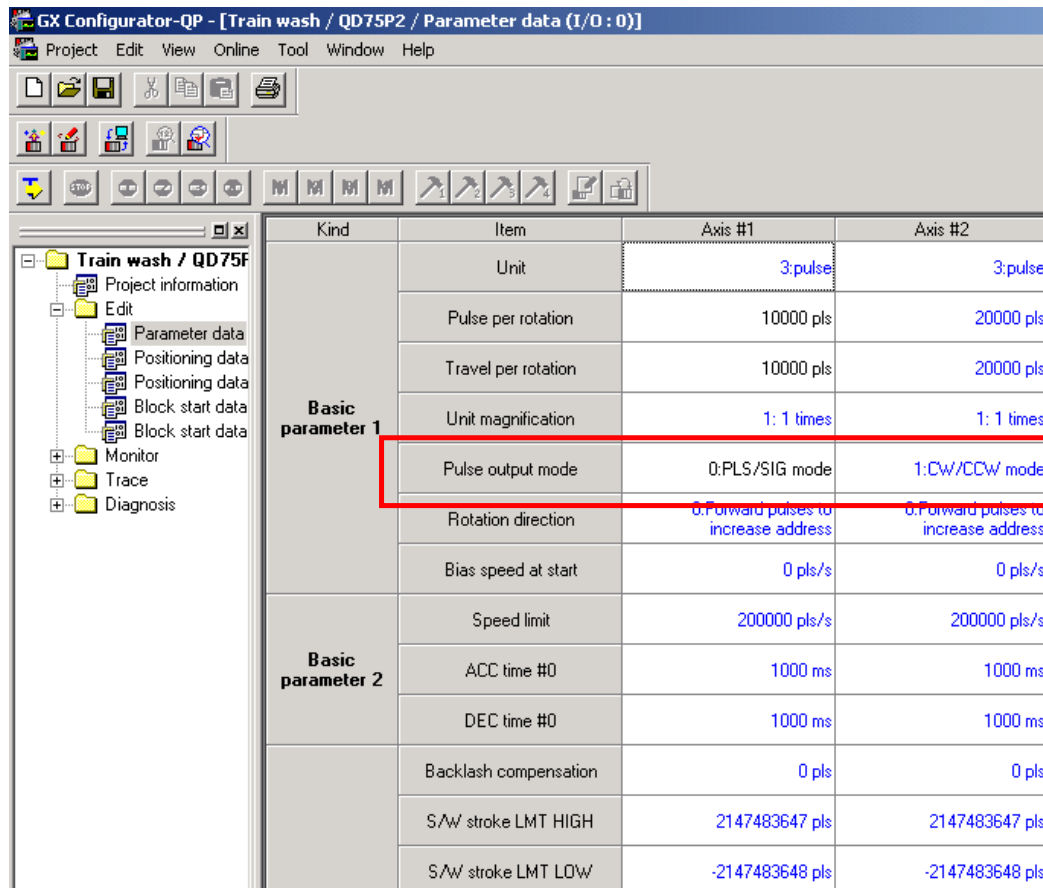
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Setting in the QD75P

In the QD75P make sure the setting for Pulse output and direction is selected.



Kind	Item	Axis #1	Axis #2
Basic parameter 1	Unit	3:pulse	3:pulse
	Pulse per rotation	10000 pls	20000 pls
	Travel per rotation	10000 pls	20000 pls
	Unit magnification	1: 1 times	1: 1 times
	Pulse output mode	0: PLS/SIG mode	1: CW/CCW mode
	Rotation direction	0: Forward pulses to increase address	0: Forward pulses to increase address
	Bias speed at start	0 pls/s	0 pls/s
	Speed limit	200000 pls/s	200000 pls/s
Basic parameter 2	ACC time #0	1000 ms	1000 ms
	DEC time #0	1000 ms	1000 ms
	Backlash compensation	0 pls	0 pls
	S/W stroke LMT HIGH	2147483647 pls	2147483647 pls
	S/W stroke LMT LOW	-2147483648 pls	-2147483648 pls