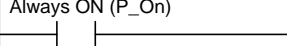
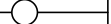
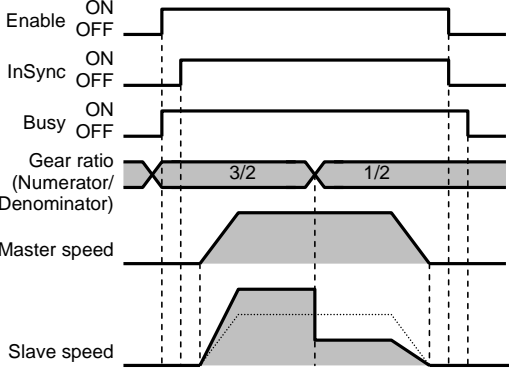
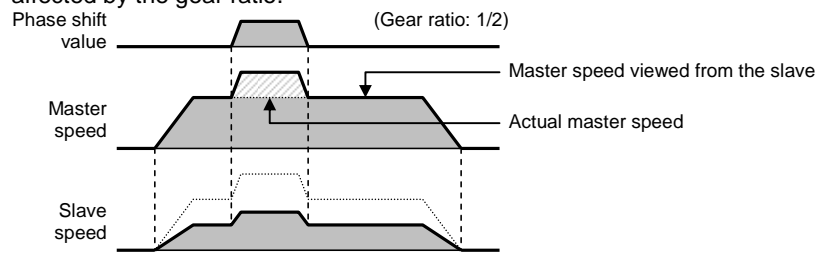
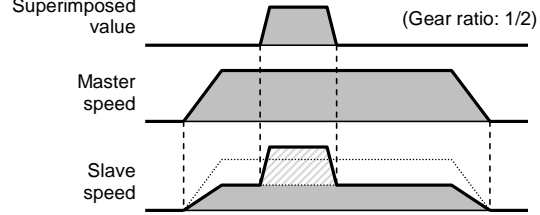


NC2x 161	Electronic Shaft _NC2x161_ElectronicShaft
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Basic function	Performs electronic shaft operation in sync with the specified master axis.																							
Symbol	<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>Always ON (P_On)</p>  </div> <div style="flex: 2; border: 1px solid black; padding: 5px; margin: 0 10px;"> <p style="text-align: center; margin: 0;">_NC2x161_ElectronicShaft</p> <table style="width: 100%; border-collapse: collapse; font-size: small;"> <tr> <td style="width: 50%; padding: 2px;">(BOOL) EN</td> <td style="width: 50%; padding: 2px;">(BOOL) ENO</td> </tr> <tr> <td style="padding: 2px;">(INT) Master</td> <td style="padding: 2px;">(DINT) Slave</td> </tr> <tr> <td style="padding: 2px;">(INT) MasterUnitNo</td> <td style="padding: 2px;">(BOOL) InGear</td> </tr> <tr> <td style="padding: 2px;">(INT) MasterAxis</td> <td style="padding: 2px;">(BOOL) Busy</td> </tr> <tr> <td style="padding: 2px;">(INT) SlaveUnitNo</td> <td style="padding: 2px;">(BOOL) CommandAborted</td> </tr> <tr> <td style="padding: 2px;">(INT) SlaveAxis</td> <td style="padding: 2px;">(BOOL) Error</td> </tr> <tr> <td style="padding: 2px;">(BOOL) Enable</td> <td style="padding: 2px;">(WORD) ErrorID</td> </tr> <tr> <td style="padding: 2px;">(INT) Numerator</td> <td></td> </tr> <tr> <td style="padding: 2px;">(INT) Denominator</td> <td></td> </tr> <tr> <td style="padding: 2px;">(DINT) PhaseShift</td> <td></td> </tr> <tr> <td style="padding: 2px;">(DINT) SuperImpose</td> <td></td> </tr> </table> </div> <div style="flex: 1; padding-left: 10px;">  <p>Slave position</p> <p>Synchronous operation</p> <p>Buay flag</p> <p>Abort</p> <p>Error flag</p> <p>Error code</p> </div> </div>		(BOOL) EN	(BOOL) ENO	(INT) Master	(DINT) Slave	(INT) MasterUnitNo	(BOOL) InGear	(INT) MasterAxis	(BOOL) Busy	(INT) SlaveUnitNo	(BOOL) CommandAborted	(INT) SlaveAxis	(BOOL) Error	(BOOL) Enable	(WORD) ErrorID	(INT) Numerator		(INT) Denominator		(DINT) PhaseShift		(DINT) SuperImpose	
(BOOL) EN	(BOOL) ENO																							
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(INT) SlaveUnitNo	(BOOL) CommandAborted																							
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(BOOL) Enable	(WORD) ErrorID																							
(INT) Numerator																								
(INT) Denominator																								
(DINT) PhaseShift																								
(DINT) SuperImpose																								
File name	Lib\FBL\omronlib\PositionController\NC2x_NC2x161_ElectronicShaft10.cxf																							
Applicable models	Position Control Units	CJ1W-NC214/234/414/434																						
	CPU Unit	CJ2H-CPU*(-EIP) Version 1.1 or later																						
	CX-Programmer	Version 8.1 or later																						
Languages in function block definitions	Ladder programming																							
Conditions for usage	<ul style="list-style-type: none"> • When using this FB, enable “Synchronous Unit Operation” of the CJ2-CPU unit, and place the instance of this FB to the synchronous interrupt task. • For the master axis counter value and the slave axis position command value, use the synchronous data refresh area. • Refer to “Related Manuals” for details. 																							
Function description	<ul style="list-style-type: none"> • The master axis will be specified in "Master unit No. (MasterUnitNo)" and "Master axis (MasterAxis)". • The word of the synchronous data, for which the present value of the master axis is output, will be input in "Master counter (Master)". • The slave axis will be specified in "Slave unit No. (SlaveUnitNo)" and "Slave axis (SlaveAxis)". • The synchronous data word that outputs the slave axis synchronous feeding command position data will be set in "Slave position (Slave)". • The gear ratio will be specified in "Numerator of gear ratio (Numerator)" and "Denominator of gear ratio (Denominator)". • For the specified slave axis, electronic shaft operation will start under the specified operation conditions and with the gear ratio when "Start (Enable)" turns ON. • If "Start (Enable)" turns OFF during shaft operation, shaft operation will end. • "Synchronous operation (InGear)" will turn ON when synchronous operation is begun by this FB. • "Busy (Busy)" will be set when the "Start (Enable)" is turned ON. • "Busy (Busy)" will be reset when any of the Synchronous operation end, "Abort (CommandAborted)", or "Error (Error)" is turned ON. • Even if an error occurs when the input variable is out of the range, etc., "Busy (Busy)" will be set for at least one cycle. • "Error (Error)" will be turned ON and "Error code (ErrorID)" will be output if an error occurs for the FB. This will not occur for error in other FBs or other instances of the FB. • These statuses (CommandAborted/Error/ErrorID) will be reset when "Start (Enable)" turns OFF. If "Start (Enable)" turns OFF before the positioning operation has been completed, the status will be set for at least one cycle when corresponding conditions have occurred. 																							

	 <p> <ul style="list-style-type: none"> The gear ratio can be changed during operation. If the set value is out of range, an input variable out-of-range error will be output. If a value is set in "Phase shift value (PhaseShift)", the speed of the master axis viewed from the slave axis will change. But the actual operation of the master axis will not be affected. Because this is a speed change of the master axis viewed from the slave axis, the phase shift will be affected by the gear ratio. </p>  <p> <ul style="list-style-type: none"> If a value is set in "Superimposed value (Superimpose)", the slave axis speed will change. Because this is a speed change of the slave axis, the superimposition will not be affected by the gear ratio. </p>  <p> <ul style="list-style-type: none"> Specify "Phase shift value (PhaseShift)" and "Superimposed value (Superimpose)" using the variation value per cycle. Be careful of the amount of variation value. If it is too large, abrupt braking of the axis will occur. For the input of "Phase shift value (PhaseShift)" and "Superimposed value (Superimpose)", use the Virtual Pulse FB "_NC2x162_VirtualPulse". (Refer to "Application example".) "Phase shift value (PhaseShift)" and "Superimposed value (Superimpose)" will be enabled after synchronous operation has started. ("Synchronous operation (InSync)" has turned ON.) </p>
<p>Kind of FB definition</p>	<p>Always execution type. Connect the EN input to the Always ON Flag (P_On). The same instance cannot be used in two or more places.</p>
<p>FB precautions</p>	<ul style="list-style-type: none"> If the master axis variation value per cycle is larger than half of the maximum value of the master axis ring counter, the master axis movement amount cannot be detected correctly. (The operation will be regarded as in the opposite direction from the actual operation.) Set the constant value of 0 when "Phase shift value (PhaseShift)" and "Superimposed value (Superimpose)" are not used. If the value other than 0 is set, the set value will be added every cycle. If the slave axis variation value per cycle is larger than half of the maximum value of the master axis ring counter, an error code "Slave axis excessive movement" occurs.
<p>EN input condition</p>	<ul style="list-style-type: none"> Connect the EN input to the Always ON Flag (P_On). If another bit is connected to EN, the FB outputs will be held when the connected bit turns OFF.
<p>Restrictions Other</p>	<ul style="list-style-type: none"> This FB does not recognize the existence of the axis specified in "Master unit No. (MasterUnitNo)", "Master axis (MasterAxis)", and "Slave unit No. (SlaveUnitNo)", "Slave axis (SlaveAxis)". If these input variables have not been set correctly, the FB may not work normally. This FB uses bits of the Position Control Unit. Therefore, do not turn these bits ON or OFF. For the same reason, do not use these bits for coil outputs (OUT commands). Refer to the "■Used bits list" for the bits used by this FB. When EN is set first, the following axis parameters which master axis and slave axis have are read from PCU. Therefore, even if Enable (effective) and EN are set again, these axis parameters are not reflected even if changed. Axis Parameters : Axis Feeding Mode / Rotation Axis Upper Limit

Application example

Turning OFF bit A and then ON will perform shaft operation for the axis 2 of the Position Control Unit of unit number 10, with the axis 1 of the Position Control Unit of unit number 0 as the master axis. Turning OFF bit I and then ON will perform phase shift for the slave axis of "Sample 1".

Sample1

Always ON (P_On)	(BOOL) EN	(BOOL) ENO	
Master counter 1252	(INT) Master	(DINT) Slave	Slave position 1202
Master unit No. &0	(INT) MasterUnitNo	(BOOL) InGera	Synchronous operation Bit B
Master axis &1	(INT) MasterAxis	(BOOL) Busy	Busy Bit C
Slave unit No. &10	(INT) SlaveUnitNo	(BOOL) CommandAborte	Abort Bit D
Slave axis &2	(INT) SlaveAxis	(BOOL) Error	Error Bit E
Start Bit A	(BOOL) Enable	(WORD) ErrorID	Error code D0
Numerator of gear ratio +50	(INT) Numerator		
Denominator of gear ratio &100	(INT) Denominator		
Phase shift value D1002	(DINT) PhaseShift		
Superimposed value +0	(DINT) SuperImpose		

When specifying the phase shift by using the Virtual Pulse FB, match the words of "Variation value (Deviation)" and "Phase shift value (PhaseShift)".

Sample2

Always ON (P_On)	(BOOL) EN	(BOOL) ENO	
Start Bit I	(BOOL) Execute	(BOOL) Done	Operation completed Bit J
Target value +10000	(DINT) PhaseShift	(BOOL) Busy	Busy Bit K
Speed command &1000	(DINT) Velocity	(BOOL) Error	Error Bit L
Acceleration time &100	(DINT) Acceleration	(WORD) ErrorID	Error code D2
Deceleration time &100	(DINT) Deceleration	(DINT) Position	Interior pulse counter D1000
		(DINT) Deviation	Variation value D1002

Related manuals

CJ-series Position Control Unit Operation Manual (W477)
 10 Synchronous Unit Operation Function
 12-6 Error Code List

■Variable Tables
Input Variables

Name	Variable name	Data type	Default	Range	Description
EN	EN	BOOL			1(ON): FB started 0(OFF): FB not started
Master counter	Master	DINT	+0	-2147483648 to +2147483647	Input the present value of the master counter. Set the relevant word of synchronous data.
Master unit No.	MasterUnitNo	INT	+0	+0 to +94, -1	Specify the unit number of the master axis. ※ If -1 is specified, the Position Control Unit is not used for the master axis. In this case, the master axis works as the ring counter with the range of -2147483648 to +2147483647.
Master axis	MasterAxis	INT	+1	+1 to +4, +241(#F1)	Specify the axis or external encoder. +1 to +4: Specify the axis number of the master axis. +241(#F1): Specify an external encoder for the master axis. ※ If -1 is specified in "Master unit No. (MasterUnitNo)", this input variable is not used.
Slave unit No.	SlaveUnitNo	INT	+0	+0 to +94	Specify the unit number of the slave axis.
Slave axis	SlaveAxis	INT	+1	+1 to +4	Specify the axis number of the slave axis.
Start	Enable	BOOL	0(OFF)		⬆: Starts electronic shaft ⬇: Stops electronic shaft
Numerator of gear ratio	Numerator	INT	+0	-32768 to +32767	Specify the numerator of gear ratio. Setting the negative value will reverse the travel direction of slave axes and master axes.
Denominator of gear ratio	Denominator	INT	+1	+1 to +32767	Specify the denominator of gear ratio.
Phase shift value	PhaseShift	DINT	+0	-2147483648 to +2147483647	Specify the phase shift value per cycle. Input the output variable "Variation value (Deviation)" of the FB "_NC2x162_VirtualPulse".
Superimposed value	SuperImpose	DINT	+0	-2147483648 to +2147483647	Specify the superimposed value per cycle. Input the output variable "Variation value (Deviation)" of the FB "_NC2x162_VirtualPulse".

Output Variables

Name	Variable name	Data type	Range	Description
ENO	ENO	BOOL		1(ON): FB operating normally 0(OFF): FB not started / FB ended with error
Slave position	Slave	DINT		Outputs the slave axis position command value. Set the corresponding word of synchronous feeding command position data.
Synchronous operation	InGear	BOOL		Turns ON when synchronous operation is being performed.
Busy	Busy	BOOL		Turns ON when FB is in the process.
Abort	CommandAborted	BOOL		Turns ON when an abort has occurred in the FB. Refer to "Error code (ErrorID)" for details.
Error	Error	BOOL		Turns ON when an error has occurred in the FB. Refer to "Error code (ErrorID)" for details.
Error code	ErrorID	WORD		Returns the error code when an error occurred in the FB. Refer to "■Error code list" for details.

■Error code list

Error name	Error code	Probable cause	Clearing method
Input variable out of range	#0001	The value of input variable of this FB is out of valid range.	Set the value of input variable within the specified range.
Operating memory area allocation out of range	#0002	The allocation of Axis Operating Memory Area of Common Parameter is out of allowable setting range.	Correct the allocation of Axis Operating Memory Area of Common Parameter so that it falls within the allowable setting range of data.
Synchronous operation setting error	#0100	Axes to be used have not met FB operation conditions.	Check the settings for the master and slave axes.
Master axis excessive movement	#0103	Normal operation has not been performed due to the excessive movement of the master axis.	Check the master axis operation speed and phase shift value.
Slave axis excessive movement	#0104	Normal operation has not been performed due to the excessive movement of the slave axis.	Check master axis operation speed, gear ratio and superimposed value.
Synchronous disabled	#01F0	The synchronous unit operation is disabled.	Enable the synchronous unit operation by the PLC system setting.
Unit error	#1001	An error in individual unit has occurred.	Check "Unit common error code". Identify the error cause from the Operation Manual of the Position Control Unit.
Axis error	#1002	An error in individual axis has occurred.	Check "Axis error code". Identify the error cause from the Operation Manual of the Position Control Unit.
Unit setup	#2000	The Position Control Unit is not in unit ready status.	Execute the FB after putting the Position Control Unit in unit ready status.
Deceleration stop	#2100	The deceleration stop (Deceleration stop / Synchronous group stop Selection / All Synchronous Unit stop) or the Error counter reset output was executed while the FB was active.	Due to the deceleration stop command, the active FB was interrupted. But this is normal operation. Check that the deceleration stop command has started correctly.
Servo unlock	#2102	The Servo unlock was executed while the FB was active.	Due to the servo unlock command, the active FB was interrupted. But this is normal operation. Check that the servo unlock command has started correctly.
Command disabled	#2300	FB commands have not been accepted.	Execute the FB after putting the unit in status that can accept commands.
Synchronous feeding	#3208	"Synchronous feeding" of the Direct Operation Command Memory area has been operated by the outside of the FB.	Do not operate each bit which the active FB is operating, by the external unit of the FB. Do not use it on OUT command.

■Used bits list

Memory area	Name	Data type	Address	Note
Direct Operation Command Memory area	Synchronous feeding	BOOL	B+00.08	
Synchronous Data Refresh Area	Output	DINT	(Note.)	Used as "Slave position (Slave)".
	Input	DINT	(Note.)	Used as "Master counter (Master)".

(Note.) Specify via the PLC system setting. Refer to "Related Manuals" for details.

■Version History

Version	Date	Contents
1.00	2009.06.	Original production.
1.01	2011.04	<ul style="list-style-type: none"> The problem that the direction of slave axis movement is reverse when slave movement is over the half of slave ring count value has been improved. The problem that the direction of slave axis movement is reverse when master movement is excessive has been improved.
1.02	2014.10	<ul style="list-style-type: none"> The problem that "Error (Error)" is turned ON when "Numerator of gear ratio (Numerator)" is negative value has been improved.

■Note

This document explains the function of the function block.

It does not provide information of restrictions on the use of Units and Components or combination of them. For actual applications, make sure to read the operation manuals of the applicable products.