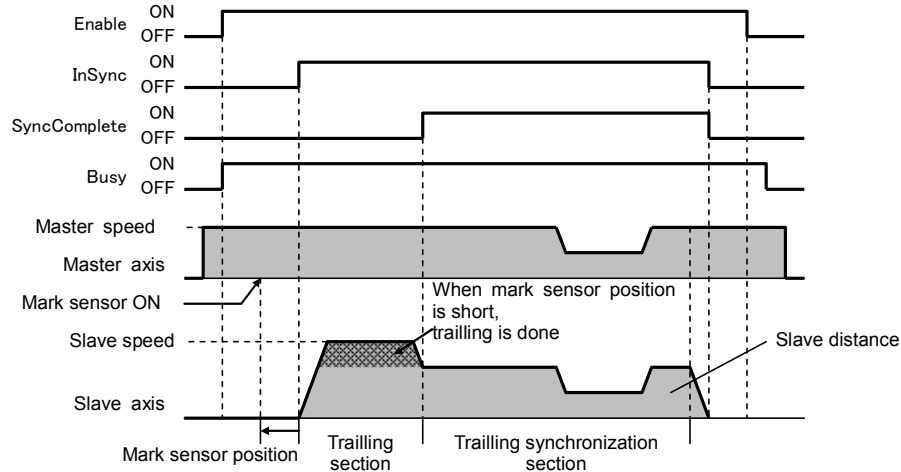
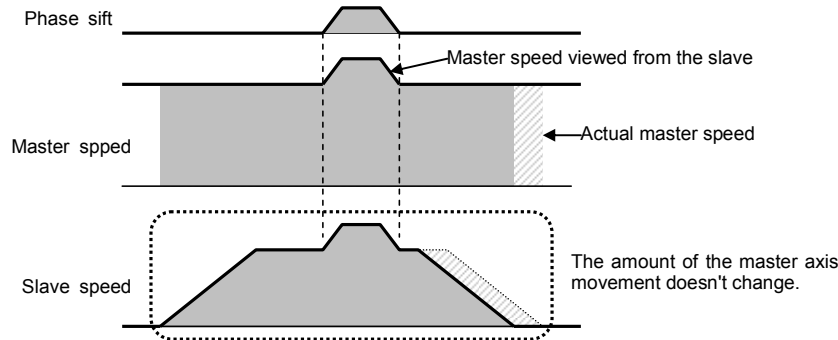


NC2x 163	Trailing Synchronization _NC2x163_TrailingSync
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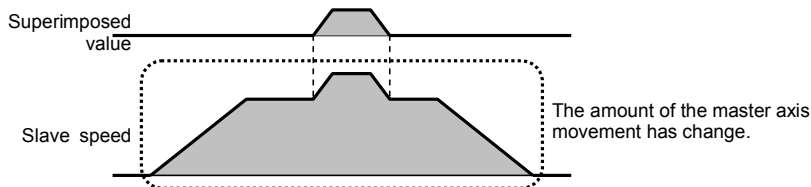
Basic function	Performs trailing synchronization operation with the specified master axis.																																																																																																																	
Symbol	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td colspan="2" style="text-align: center;">_NC2x163_TrailingSync</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td style="text-align: center;">Always ON (P_On)</td> <td style="text-align: center;">(BOOL) EN</td> <td style="text-align: center;">(BOOL) ENO</td> <td style="text-align: center;"> </td> <td style="text-align: center;">○</td> <td style="text-align: center;"> </td> <td></td> </tr> <tr> <td style="text-align: center;">Master counter</td> <td style="text-align: center;">(INT) Master</td> <td style="text-align: center;">(DINT) Slave</td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">Slave position</td> </tr> <tr> <td style="text-align: center;">Master unit No.</td> <td style="text-align: center;">(INT) MasterUnitNo</td> <td style="text-align: center;">(BOOL) InSync</td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">Synchronous operation</td> </tr> <tr> <td style="text-align: center;">Master axis</td> <td style="text-align: center;">(INT) MasterAxis</td> <td style="text-align: center;">(BOOL) SyncComplete</td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">Trailing complete</td> </tr> <tr> <td style="text-align: center;">Slave unit No.</td> <td style="text-align: center;">(INT) SlaveUnitNo</td> <td style="text-align: center;">(BOOL) Busy</td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">Busy</td> </tr> <tr> <td style="text-align: center;">Slave axis</td> <td style="text-align: center;">(INT) SlaveAxis</td> <td style="text-align: center;">(BOOL) CommandAborted</td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">Abort</td> </tr> <tr> <td style="text-align: center;">Start</td> <td style="text-align: center;">(BOOL) Enable</td> <td style="text-align: center;">(BOOL) Error</td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">Error</td> </tr> <tr> <td style="text-align: center;">Master speed command</td> <td style="text-align: center;">(DINT) MasterVelocity</td> <td style="text-align: center;">(WORD) ErrorID</td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">Error code</td> </tr> <tr> <td style="text-align: center;">Slave distance</td> <td style="text-align: center;">(DINT) SlaveDistance</td> <td></td> <td style="text-align: center;"> </td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Slave speed command</td> <td style="text-align: center;">(DINT) SlaveVelocity</td> <td></td> <td style="text-align: center;"> </td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Slave acceleration time</td> <td style="text-align: center;">(DINT) SlaveAcceleration</td> <td></td> <td style="text-align: center;"> </td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Slave deceleration time</td> <td style="text-align: center;">(DINT) SlaveDeceleration</td> <td></td> <td style="text-align: center;"> </td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Mark sensor position</td> <td style="text-align: center;">(DINT) MarkPosition</td> <td></td> <td style="text-align: center;"> </td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Phase shift value</td> <td style="text-align: center;">(DINT) PhaseShift</td> <td></td> <td style="text-align: center;"> </td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Superimposed value</td> <td style="text-align: center;">(DINT) Superimpose</td> <td></td> <td style="text-align: center;"> </td> <td></td> <td></td> <td></td> </tr> </table>			_NC2x163_TrailingSync						Always ON (P_On)	(BOOL) EN	(BOOL) ENO		○			Master counter	(INT) Master	(DINT) Slave				Slave position	Master unit No.	(INT) MasterUnitNo	(BOOL) InSync				Synchronous operation	Master axis	(INT) MasterAxis	(BOOL) SyncComplete				Trailing complete	Slave unit No.	(INT) SlaveUnitNo	(BOOL) Busy				Busy	Slave axis	(INT) SlaveAxis	(BOOL) CommandAborted				Abort	Start	(BOOL) Enable	(BOOL) Error				Error	Master speed command	(DINT) MasterVelocity	(WORD) ErrorID				Error code	Slave distance	(DINT) SlaveDistance						Slave speed command	(DINT) SlaveVelocity						Slave acceleration time	(DINT) SlaveAcceleration						Slave deceleration time	(DINT) SlaveDeceleration						Mark sensor position	(DINT) MarkPosition						Phase shift value	(DINT) PhaseShift						Superimposed 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File name	Lib\FBL\omronlib\PositionController\NC2x\ NC2x163_TrailingSync10.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)". • "Master speed command (MasterVelocity)", "Slave distance(SlaveDistance)", "Slave speed command (SlaveVelocity)", "Slave acceleration time(SlaveAcceleration)", "Slave deceleration time (SlaveDecelerration)"and "Mark sensor position (MarkPosition)"is set. • For the specified slave axis, trailing synchronization will start when "Start (Enable)" turns ON. • The link operation ends when turn off "Start (Enable)" while trilling synchronization. • "Synchronous operation (InSync)" is set while tralling synchronization by this FB. • "Busy (Busy)" will be set when the "Start (Enable)" is turned ON. • "Busy (Busy)" will be reset when trailing synchronization 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. 																																																																																																																	



- In the following cases, "Trailing data error (Error code: #0102)" is generated.
 - Master speed is greater than or equal to slave speed in trilling.
 - Trailing section is long and there is no trilling synchronous section.
- If a value is set in "Phase shift value (PhaseShift)", the phase of the master axis viewed from the slave axis will change. But the actual operation of the master axis will not be affected.

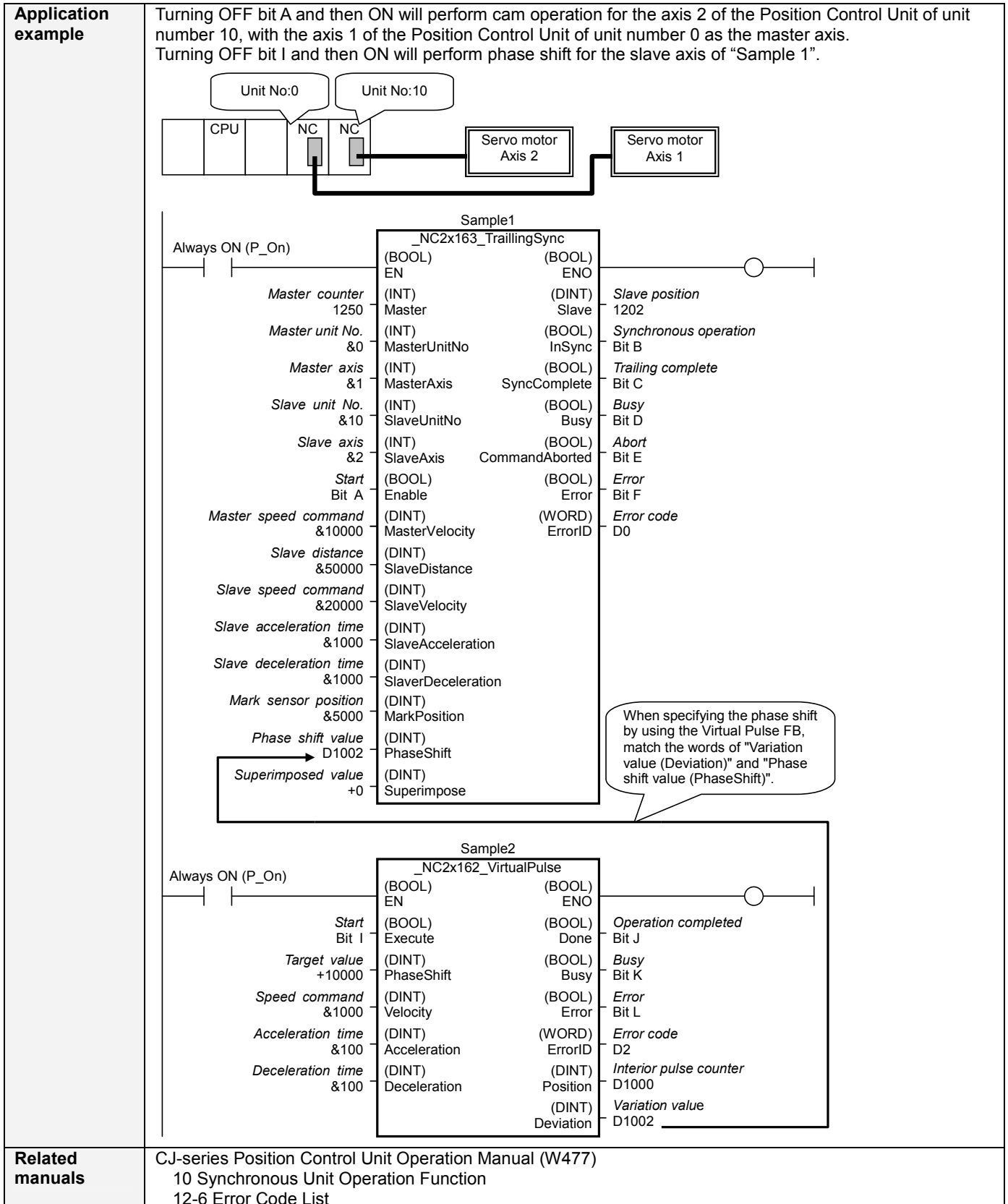


- If a value is set in "Superimposed value (Superimpose)", the slave axis position will change.



- 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. ("During Synchronization (InSync)" has turned ON.)

Kind of FB definition	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.
FB precautions	<ul style="list-style-type: none"> • 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.
EN input condition	<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.
Restrictions Other	<ul style="list-style-type: none"> • "Slave position (Slave)" had rounding errors, if "Slave distance(SlaveDistance)" was set to the value that is greater than 24bit. In this case, Use "_NC2x163A_TrailingSync" FB. • 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



■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 trailing synchronous. ↓: Stops trailing synchronous.
Master speed command	Master Velocity	DINT	+1	+1 to +4000000	Specify the master axis speed command. Unit: Command units/s.
Slave distance	Slave Distance	DINT	+0	+0 to +2147483647	Specify the slave axis movement distance. Unit: Command units
Slave speed command	Slave Velocity	DINT	+1	+1 to +4000000	Specify the slave axis speed command. Unit: Command units/s.
Slave acceleration time	Slave Acceleration	UINT	+0	+0 to +250000	Specify the slave acceleration time until reaching Slave speed command from 0 speed. Unit: ms.
Slave deceleration time	Slave Deceleration	UINT	+0	+0 to +250000	Specify the slave deceleration time until reaching Slave speed command from 0 speed. Unit: ms.
Mark sensor position	MarkPosition	DINT	+0	-2147483648 to +2147483647	Specify the position of the mark sensor on the slave axis coordinate system. Unit: Command units.
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	InSync	BOOL		Turns ON when synchronous operation is being performed.
Trailing complete	SyncComplete	BOOL		Turns ON when the trailing is completed. (Trailing synchronization section)
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.
Trailing data error	#0102	Master speed is greater than or equal to slave speed in trilling. Trailing section is long and there is no trilling synchronous section.	Correct the value that can trailing synchronous of "Slave distance (SlaveDistance) " and "Slave speed command (SlaveVelocity) ".
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 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.	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.

■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.