

Example 1:

To perform processing when the Loop Controller has stopped running
 Execution of a specific process is enabled as follows when the Loop Controller has stopped running or a data exchange error has occurred with the CPU Unit functioning as an Inner Board:



Example 2:

To notify that function blocks have changed while the Loop Controller was running.

If a function block is changed from the CX-Process Tool during Loop Controller operation, notification is made by creating a warning or other indication of the change.



Auxiliary Area Flags Relevant to the Loop Controller

Flags (Loop Controller to CPU Unit)

Word	Bit	Name	Explanation	Settings
A324	06	Right-side Inner Board Nonfatal Error Flag (Process-control CPU Unit (CS1D-CPU□□P) only)	This flag is set to 1 (ON) when the right-side Inner Board has a nonfatal error when the CS1D CPU Unit is in duplex mode.	1: Nonfatal error 0: No nonfatal error
	07	Left-side Inner Board Nonfatal Error Flag (Process-control CPU Unit (CS1D-CPU□□P) only)	This flag is set to 1 (ON) when the left-side Inner Board has a nonfatal error when the CS1D CPU Unit is in duplex mode.	1: Nonfatal error 0: No nonfatal error

Word	Bit	Name	Explanation	Settings
A358	01	PV Error Input Flag	This flag notifies the CPU Unit whether ITEM018 (PV error input) of the Basic PID block (block model 011) or Advanced PID block (block model 012) is ON or OFF. Note: Normally specify the Analog Input Block's "output from disconnected line detection contact ITEM" as the source of ITEM018 (PV error contact source designation.)	1: PV error input is ON. 0: PV error input is OFF.
	02	MV Error Input Flag	This flag notifies the CPU Unit whether ITEM090 (MV error input) of the Basic PID block (block model 011) or Advanced PID block (block model 012) is ON or OFF. Note: Normally specify the Analog Output Unit's "output from disconnected line detection contact ITEM" as the source of ITEM090 (MV error contact source designation.)	1: MV error input is ON. 0: MV error input is OFF.
	03	Execution Error Flag	This flag notifies the CPU Unit that a function block execution error has occurred when ITEM003 (the execution error code) of one or more blocks is non-zero. Note: When an execution error has occurred (there is an error code other than 0), refer to <i>7-1 Errors and Alarm Troubleshooting</i> for details on troubleshooting the error.	1: Execution error(s) occurred 0: No execution errors
	04	Function Block Database (RAM) Error Flag	This flag notifies the CPU Unit that the function block data in the Loop Controller's RAM has been corrupted. If the function block data in RAM is invalid, a cold start will be performed even if a hot start is specified. Note: When an error has occurred, use the CX-Process Tool to execute the Clear All , Download , or Recovery operation or transfer the affected function block's settings again.	1: Function block database error occurred 0: No function block database error
	07	Automatic Cold Start Execution Flag	This flag notifies the CPU Unit that a cold start was executed automatically because the RAM data was invalid due to a discharged backup capacitor or other cause while power was not being supplied (i.e., that the Board is running with the data that was last backed up to flash memory). This flag will be 0 (OFF) when the Board is not running. When necessary, check whether this flag is 1 (ON) and download the most up-to-date function block data.	1: A cold start was executed automatically after writing backup data from the flash memory to RAM. 0: Automatic cold start not executed.
	11	Run Status Flag	This flag notifies the CPU Unit that the Loop Controller is running. The flag is 1 (ON) when the Board is running.	1: Loop Controller running 0: Stopped
	13	Backup during Operation Flag	Notifies the CPU Unit whether or not the Loop Controller is backing up data during operation.	1: Backup during operation 0: No backup during operation.
	15	Function Block Changed Flag	This flag notifies the CPU Unit that the function block data download (change) operation was executed from the CX-Process Tool while the Loop Controller was running. Monitor the status of this flag in the CPU Unit's ladder program and perform any required processes, such as a notification of function block data change, if the function block data has been changed during operation (i.e., if online editing of the Loop Controller has been executed). Note: When the function block data has been downloaded (changed) by an operation from the CX-Process Tool, the function block data is not stored in flash memory. Always execute the Backup operation from the CX-Process Tool to backup data to flash memory after downloading function block data.	1: Function block data (file) was downloaded. 0: Function block data (file) was not downloaded, a hot start was performed, or a cold start was performed.

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	02	MV Error Input Flag	This flag notifies the CPU Unit whether ITEM090 (MV error input) of the Basic PID block (block model 011) or Advanced PID block (block model 012) is ON or OFF. Note: Normally specify the Analog Output Unit's "output from disconnected line detection contact ITEM" as the source of ITEM090 (MV error contact source designation.)	1: MV error input is ON. 0: MV error input is OFF.
	03	Execution Error Flag	This flag notifies the CPU Unit that a function block execution error has occurred when ITEM003 (the execution error code) of one or more blocks is non-zero. Note: When an execution error has occurred (there is an error code other than 0), refer to <i>7-1 Errors and Alarm Troubleshooting</i> for details on troubleshooting the error.	1: Execution error(s) occurred 0: No execution errors
	04	Function Block Database (RAM) Error Flag	This flag notifies the CPU Unit that the function block data in the Loop Controller's RAM has been corrupted. If the function block data in RAM is invalid, a cold start will be performed even if a hot start is specified. Note: When an error has occurred, use the CX-Process Tool to execute the Clear All , Download , or Recovery operation or transfer the affected function block's settings again.	1: Function block database error occurred 0: No function block database error
	07	Automatic Cold Start Execution Flag	This flag notifies the CPU Unit that a cold start was executed automatically because the RAM data was invalid due to a discharged backup capacitor or other cause while power was not being supplied (i.e., that the Board is running with the data that was last backed up to flash memory). This flag will be 0 (OFF) when the Board is not running. When necessary, check whether this flag is 1 (ON) and download the most up-to-date function block data.	1: A cold start was executed automatically after writing backup data from the flash memory to RAM. 0: Automatic cold start not executed.
	11	Run Status Flag	This flag notifies the CPU Unit that the Loop Controller is running. The flag is 1 (ON) when the Board is running.	1: Loop Controller running 0: Stopped
	13	Backup during Operation Flag	Notifies the CPU Unit whether or not the Loop Controller is backing up data during operation.	1: Backup during operation 0: No backup during operation.
	15	Function Block Changed Flag	This flag notifies the CPU Unit that the function block data download (change) operation was executed from the CX-Process Tool while the Loop Controller was running. Monitor the status of this flag in the CPU Unit's ladder program and perform any required processes, such as a notification of function block data change, if the function block data has been changed during operation (i.e., if online editing of the Loop Controller has been executed). Note: When the function block data has been downloaded (changed) by an operation from the CX-Process Tool, the function block data is not stored in flash memory. Always execute the Backup operation from the CX-Process Tool to backup data to flash memory after downloading function block data.	1: Function block data (file) was downloaded. 0: Function block data (file) was not downloaded, a hot start was performed, or a cold start was performed.

Word	Bit	Name	Explanation	Settings
A356	00 to 06	ORed Function Block Alarm Outputs	These flags notify the CPU Unit when one of the following alarms occurred in any function block (logical OR of all function block outputs.)	---
	00		MV Low Limit Alarm Flag (MLA: ITEM079)	1: At or below the low limit 0: Above the low limit
	01		MV High Limit Alarm Flag (MHA: ITEM078)	1: At or above the high limit 0: Below the high limit
	02		Deviation Alarm Flag (DVA: ITEM 042)	1: At or above the set value 0: Below the set value
	03		Low/Low Limit Alarm Flag (LL: ITEM 016)	1: At or below the set value 0: Above the set value
	04		Low Limit Alarm Flag (L: ITEM 015)	1: At or below the set value 0: Above the set value
	05		High Limit Alarm Flag (H: ITEM 014)	1: At or above the set value 0: Below the set value
	06		High/High Limit Alarm Flag (HH: FITEM013)	1: At or above the set value 0: Below the set value
A357	00	Duplex Operation Flag (for Process-control CPU Unit (CS1D-CPU□□P) only)	This flag is set to 1 (ON) while the Inner Board is performing duplex operation when CS1D CPU Unit is in duplex mode.	1: Performing duplex operation 0: Not performing duplex operation
	02	Duplex Initialization Flag (for Process-control CPU Unit (CS1D-CPU□□P) only)	This flag is set to 1 (ON) while duplex initialization being performed on Inner Board (while data being transferred/verified from active Inner Board to standby Inner Board) when CS1D CPU Unit in duplex mode.	1: Performing duplex initialization 0: Not performing duplex initialization
A401	12	Inner Board Stopped Error Flag (Fatal error)	<p>This flag is set to 1 (ON) when an error occurs in the Loop Controller such as a WDT error or Inner Board bus error. The CPU Unit will stop running and the ERR/ALM Indicator on the front of the CPU Unit will light.</p> <p>If an error occurs in the Loop Controller for the active Process-control CPU Unit (CS1D-CPU□□P), operation will be switched to the Loop Controller in the standby Process-control CPU Unit.</p> <p>Note 1: This flag can be reset to 0 (OFF) by clearing the error, but it will go ON again unless the cause of the error is eliminated.</p> <p>Note 2: The cause of the error is indicated in bits A42400 to A42403.</p>	1: Error occurred 0: Normal
A402	08	Inner Board Error Flag (Non-fatal error)	<p>This flag is set to 1 (ON) when an error occurs in the data exchange between the Loop Controller and CPU Unit (including errors originating in the Loop Controller itself). The CPU Unit will continue running and the ERR/ALM Indicator on the front of the CPU Unit will flash. The Loop Controller will stop operating.</p> <p>Note 1: The cause of the error is indicated in bits A42404 to A42415.</p> <p>Note 2: This flag will be reset to 0 (OFF) when the error is cleared.</p>	1: Error occurred 0: No error

Word	Bit	Name	Explanation	Settings
A424	00 to 12	Inner Board Error Information	The following flags provide details on Inner Board errors (errors common to all Inner Boards as well as errors specific to Loop Controllers.)	---
	00	Inner Board WDT Error Flag (fatal error)	This flag is set to 1 (ON) if the Loop Controller is faulty.	1: Inner Board WDT Error 0: Normal
	01	Inner Board Bus Error Flag (fatal error)	This flag is set to 1 (ON) if an Inner Board Bus Error has occurred.	1: Inner Board Bus Error 0: Normal
	02	Cyclic Monitor Error Flag (fatal error)	This flag is set to 1 (ON) when a Cyclic Monitor Error is detected, i.e., the cyclic area's access right token was not returned to the Loop Controller within the cyclic monitor time.	1: Cyclic Monitor Error 0: Normal
	03	Flash Memory Data Error or All Function Block Database (RAM) Error during Duplex Operation Flag (fatal error)	This flag is set to 1 (ON) in the situations outlined below. Use the CX-Process Tool software to download all function blocks (LCB/LCU unit). Alternatively, backup to flash memory. When there is a flash memory data error during the data check at a cold start. A database (RAM) error occurred for all function blocks during operation in duplex mode when mounted to a CS1D CPU Unit.	1: Flash Memory Data Error or All Function Block Database (RAM) Error 0: Flash memory normal and all function block database (RAM) normal during duplex operation
	04	Incompatible CPU Unit Error Flag (non-fatal error)	This flag is set to 1 (ON) when the Loop Control Board is mounted in a CPU Unit other than a CS1-H CPU Unit. Note: The CS1 CPU Units without the "H" suffix do not support the Loop Control Board.	1: The Loop Control Board is mounted in a CPU Unit that does not support the Board. The EM file memory has been created or the EM does not exist. 0: Normal
	05	Not used.	---	---
	06	CPU Bus Unit Settings Area Error Flag	(Loop Control Units only.)	---
	07	Routing Table Error Flag	(Loop Control Units only.)	---
	08	Loop Controller High Load Flag (non-fatal error)	This flag is set to 1 (ON) when the LCB load rate exceeds 80% for three consecutive cycles. If this error occurs, extend the operation cycles of function blocks that can be extended. If the error recurs after extending the operation cycles, add a Loop Control Unit and divert some of the load to that Unit.	1: Loop Controller running at a high load rate 0: Normal
09	Operation Cycle Error Flag (non-fatal error) (for Process-control CPU Unit (CS1D-CPU□□P) only)	This flag is set to 1 (ON) when the Loop Controller's operation cycle is inaccurate because the cycle time is too long (when the CPU Unit's cycle time is more than 20% of the minimum operation cycle) during duplex mode operation when mounted in a CS1D CPU Unit.	1: Operation cycle error 0: Normal	

Word	Bit	Name	Explanation	Settings
A424	10	Partial Function Block Database (RAM) Error During Simplex Operation (non-fatal error)	Changes to 1 (turns ON) when a database (RAM) error occurs for some function blocks or when an error occurs while restoring data from the Memory Card using the simple backup function when mounted to CS1D CPU Units and operating in simplex mode or when mounted to CS1-H CPU Units.	1: Function block database error during simplex operation or error while restoring data. 0: Normal
	11	Backup Data (Flash Memory) Error Flag	This flag is set to 1 (ON) when the parameter data stored in flash memory has been corrupted.	1: Flash memory data error 0: Normal
	12	Specified EM Bank Unusable Error Flag	This flag is set to 1 (ON) when specified EM bank is not a usable bank.	1: Cannot be used. 0: Can be used.
	13 to 14	Not used.	---	---
	15	Automatic Recovery from Cycle Offset Flag (nonfatal error)	If something unforeseen causes the cycle to the right or left to be offset, duplex initialization is automatically executed to restore synchronous operation. The flag is set to 1 (ON) when recovery is achieved.	1: Duplex initialization executed for synchronous displacement recovery. 0: Normal

3-3-2 Commands from the CPU Unit to the Loop Controller

The Loop Controller's start mode at power ON can be specified from the CPU Unit.

Auxiliary Area Control Bits Relevant to the Loop Controller

Control Bits (CPU Unit to Loop Controller)

Word	Bit	Name	Explanation	Settings	Status when Run Mode Changes	Status when power goes ON	Timing of setting
A608	00	Inner Board Restart Bit	Turn this bit from OFF to ON to restart the Loop Controller. (The Loop Controller will start initialization.) Note: The bit will be reset to 0 (OFF) automatically when initialization is completed.	0 → 1: Restarts the Inner Board	Pre-served	Cleared	
A609	01	Start Mode at Power ON: Hot Start (Cannot be used for Process-control CPU Unit (CS1D-CPU□□P).)	When this bit is set to 1 (ON), the Loop Controller's "start mode at power ON" will be hot start mode (as a command from the CPU Unit to the Loop Controller.) This bit is effective only when ITEM018 of the System Control block (block model 000) is set to 3 (command from CPU Unit.) Note: If bits A60901 and A60902 are both ON at the same time, this bit takes precedence and a hot start will be performed.	1: Perform a hot start when power is turned ON. 0: If A60902 is also set to 0, the Board stops running. If A60902 is set to 1, a cold start will be performed when power is turned ON.	Pre-served	Pre-served	User's choice
	02	Start Mode at Power ON: Cold Start (Cannot be used for Process-control CPU Unit (CS1D-CPU□□P).)	When this bit is set to 1 (ON), the Loop Controller's "start mode at power ON" will be cold start mode (as a command from the CPU Unit to the Loop Controller.) This bit is effective only when ITEM018 of the System Control block (block model 000) is set to 3 (command from CPU Unit.) Note: If bits A60901 and A60902 are both ON at the same time, A60901 takes precedence and a hot start will be performed.	1: Perform a cold start when power is turned ON. 0: If A60901 is also set to 0, the Board stops running. If A60902 is set to 1, a hot start will be performed when power is turned ON.	Pre-served	Pre-served	User's choice

Note When ITEM018 (Start Mode at Power ON) of the System Control block (block model 000) has been set to "3: Command from CPU Unit," the Loop Controller will not operate (including exchanging data with the CPU Unit) until the RDY LED indicator goes ON and either A60901 or A60902 is set to 1 (ON).