ControlLogix® 5560M03SE Combination Controller and SERCOS interface Revision 13

Cat. No. 1756-L60M03SE

When to Use These Release Notes

These release notes correspond to the following revision of the ControlLogix®5560M03SE controller:

Controller:	Catalog number:	Revision:
ControlLogix5560M03SE	1756-L60M03SE	13.6

These release notes include the changes and corrected anomalies of earlier revisions of 13.x firmware.

About the New ControlLogix5560M03SE Controller

The ControlLogix5560M03SE controller is a 2-slot ControlLogix controller that includes a 3-axes SERCOS interface. The controller gives you:

- 750K bytes of data and logic memory
- Performance similar to a ControlLogix5563 controller
- Control of up to 3 SERCOS interface drives via the integral SERCOS interface of the controller
- Control of up to 3 *additional* SERCOS interface drives or analog drives by adding modules to the chassis:
  - For SERCOS interface drives, use the 1756-M03SE module. Make sure each SERCOS interface module has its own ring.
  - For analog drives, use either the 1756-HYD02, 1756-M02AE, or 1756-M02AS module.
- Automatic update of the SERCOS interface when you update the firmware of the controller
- Nonvolatile memory storage via a 1784-CF64 Industrial CompactFlash card

When you:	The 1784-CF64 Industrial CompactFlash card:
store a project to nonvolatile memory	stores the firmware for both the controller and the SERCOS interface
load a project from nonvolatile memory	updates the firmware of both the controller and the SERCOS interface, if required

For more information on the use of nonvolatile memory, see *Logix5000 Controllers Common Procedures*, publication 1756-PM001.

- Extended battery support via a 1756-BATM battery module (recommended if you *do not* use a CompactFlash card)

Publication 1756-RN607B-EN-E - June 2004

Compatible Revisions

To use this controller revision, update your system as follows:

Update this:	To this revision or later:
1756-HYD02 module	13.2
1756-M02AE module	13.2
1756-M02AS module	13.6
1756-M03SE module	13.7
1756-M08SE module	13.7
1756-M16SE module	13.7

Update this:	To this revision or later:
RSLinx® software	2.42
RSLogix™ 5000 software	13.0
RSNetWorx™ for ControlNet™ software	4.21
RSNetWorx™ for DeviceNet™ software	4.21
RSNetWorx™ for EtherNet/IP software	4.21

What Is In These Release Notes

These release notes provide the following information:

For information about:	See this section:	On this page:
preliminary actions to take before you use this revision	Before You Update Your System	2
new features for ControlLogix5560M03SE controller	Enhancements	3
changes to existing features in the ControlLogix5560M03SE controller	Changes	6
restrictions that no longer apply to the ControlLogix5560M03SE controller	Corrected Anomalies	8
restrictions for the ControlLogix5560M03SE controller	Restrictions	12
additional memory required to update to this revision	Additional Memory Requirements	14

Before You Update Your System

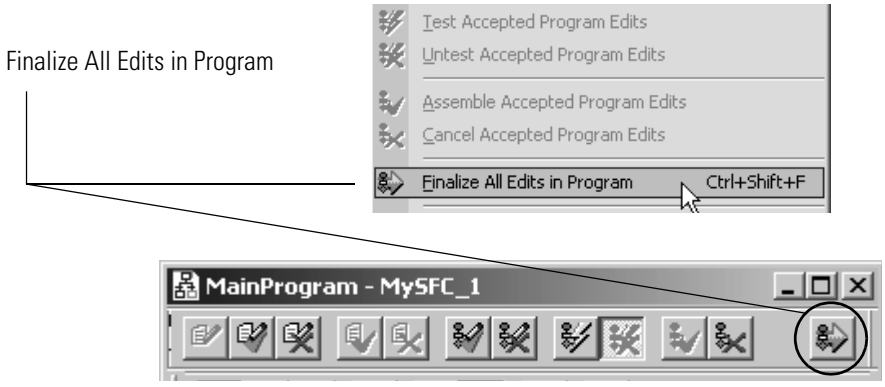
Before you update your controller to this revision, do the following preliminary actions:

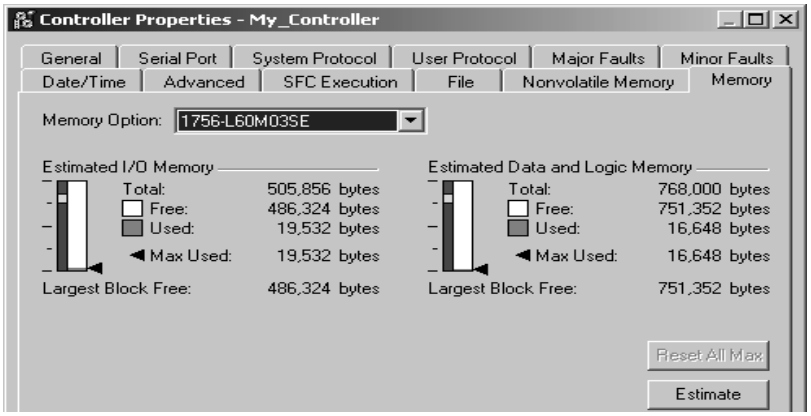
If:	Then:
Your controller is close to its limits of memory.	This revision *may* require more memory than previous revisions. • To see what components of your current project require more memory, see page 14. • RSLogix 5000 software revision 13.0 or later lets you estimate the memory requirements of the controller offline. See page 4.
Your controller is connected to a DH-485 network.	Disconnect it from the DH-485 network *before* you update the firmware of the controller. If you update the firmware of a controller while it is connected to a DH-485 network, communication on the network may stop.

Enhancements

This revision of ControlLogix5560M03SE controller contains the following new features when compared to ControlLogix controllers, revision 12.x or earlier:

Enhancement:	Description:
SERCOS interface	The SERCOS interface of the controller contains the following enhancements when compared to 1756-M08SE and 1756-M16SE modules, revision 12.x and earlier: • Use RSLinx to browse for RA drives on a SERCOS interface link. • Eliminated repetitive SERCOS interface ring scanning when module is not in the I/O configuration of the controller. • Use RA drives with Auxiliary Axis capability. • Direct a drive, at configuration, to ignore its Enable Input. • Use Continuous Torque Limit control in a drive. • Use a Kinetix6000™ Resistive Brake Module • Use a Kinetix6000 drive Auxiliary axis, feedback-only configuration • Use Physical Test Mode to aid in troubleshooting issues with fiber optic media integrity. See publication *Fiber Optic Cable Installation and Handling Instructions* (2090-IN010) for more information on this topic.
Online Edits of Sequential Function Charts (SFC) and Structured Text (ST)	This revision lets you perform online editing of Sequential Function Chart (SFC) and Structured Text (ST) routines. Like the Function Block Diagrams (FBD), online editing of SFC and ST routines is done at a routine level.

Finalize All Edits in a Program	The *Finalize All Edits in Program* option lets you make an online change to your logic *without* testing the change.
	 
	
	When you choose *Finalize All Edits in Program:*
	• *All* edits in the program (pending and test), immediately download to the controller and begin execution.
	• The original logic is permanently removed from the controller.
	• Outputs that were in the original logic stay in their last state unless executed by the new logic (or other logic).
	• If your edits include an SFC:
	  • The SFC resets to the initial step.
	  • Stored actions turn off.

Enhancement:	Description:
Motion Calculate Slave Value (MCSV) Instruction	Use the MCSV instruction in the following applications: • Position cam: electronic camming between two axes according to a specified cam profile • Time cam: electronic camming of an axis as a function of time, according to a specified cam profile The MCSV instruction returns the slave value within a specified cam profile for a given master value. The master value can be master position or time. Use that information to re-synchronize motion after a fault or to calculate dynamic phase corrections.
Estimate Memory Information Offline View Memory Information Online	To estimate how much controller memory your project requires, use the *Memory* tab of the controller properties dialog box. For each of the memory areas of your controller, it lets you estimate number of bytes of: • free (unused) memory • used memory • largest free contiguous block of memory  When online with a controller, the *Memory* tab shows the actual memory usage of the controller. The tab includes a *Max Used* entry for each type of memory. The *Max Used* values show the peak of memory usage as communications occur.
Improved Performance of Simple Structured Text Statements	The controller now executes simple structured text (ST) assignments and comparisons faster than previous revisions.

For this:	This is simple:	This is NOT simple:
assignment	A := B;	A := -B; A := B + C; A := sin(B);
comparison (=, <, <=, >, >=, <>)	A > B A = B	A > -B A > (B + C) A > sin(B)

Embedded EDS Support	ControlLogix controllers now include their electronic data sheet (EDS) file as part of their firmware. This lets RSNetWorx software 5.x or later upload and register the EDS file directly from the controller. In *previous* revisions, you had to find the file on a CD or a web site and manually install the EDS file.

Enhancement:	Description:
For Some Non-Recoverable Faults, the Controller Produces a Major Fault and May Be Able to Log Diagnostic Information.	If the controller detects a non-recoverable fault that was *not* caused by its hardware, the controller clears the project from its memory and produces a major fault (flashing red OK LED). The fault code that it displays depends on whether you have installed a CompactFlash card in the controller.

Type	Code	Cause	Recovery Method
1	60	For a controller with *no* CompactFlash card installed, the controller: • detected a non-recoverable fault • cleared the project from memory	1. Clear the fault. 2. Download the project. 3. Change to remote run/run mode. If the problem persists: 1. Before you cycle power to the controller, record the state of the OK and RS232 LEDs. 2. Contact Rockwell Automation support. See the back of this publication.
1	61	For a controller with a CompactFlash card installed, the controller: • detected a non-recoverable fault • wrote diagnostic information to the CompactFlash card • cleared the project from memory	1. Clear the fault. 2. Download the project. 3. Change to remote run/run mode. If the problem persists, contact Rockwell Automation support. See the back of this publication.

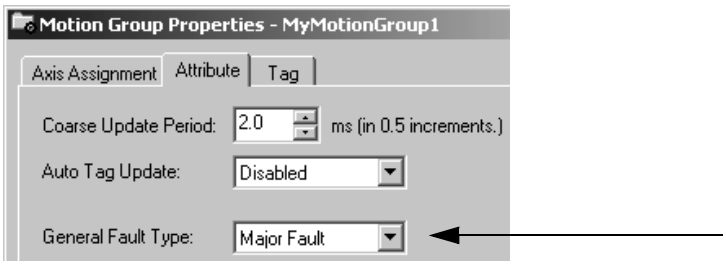
In *previous* revisions:

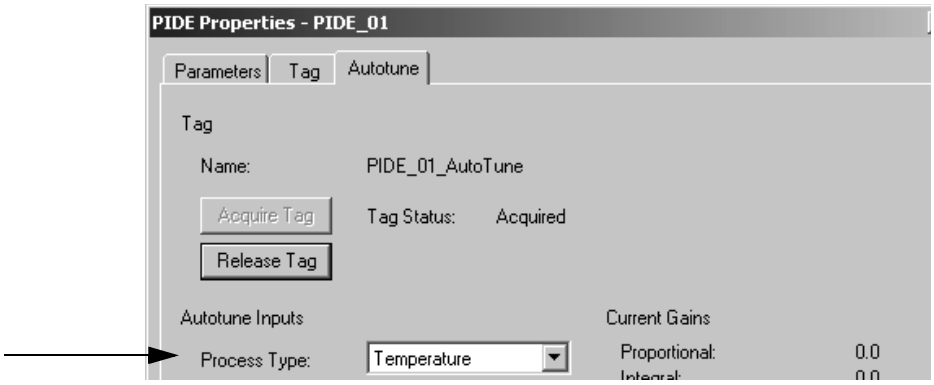
- The controller would *not* go to faulted mode or display a fault code for the type of situation described above.
- Controllers with a CompactFlash socket showed a solid red OK LED.

Changes

This revision of the ControlLogix5560M03SE controller contains the following changes when compared to ControlLogix controllers, revision 12.x or earlier. Changes are organized by the firmware revision in which the change occurred:

ControlLogix5560M03SE Rev 13.5

Change:	Description:
In a Message (MSG) Instruction, You *Cannot* Set or Clear Certain Status Bits.	*Do not* set or clear the following members of a Message (MSG) instruction: • EW • ER • DN • ST • Flags **Important**: If your logic currently manipulates any of the above members of a MSG instruction, your controller *may* operate differently when you update to this revision. If you set or clear one of those bits, RSLogix 5000 software displays the change. But the MSG instruction ignores the change and continues to execute based on the internally-stored value of those bits.
Motion Planner No Longer Waits for Consumed Data to Start Flowing	The motion planner now begins execution immediately, regardless of whether or not it is receiving data via a consumed axis. In previous revisions, a consumed axis caused the motion planner to delay its execution until data started flowing from the producing controller. Under the following *combination* of circumstances, the motion task of the controller failed to start at all: • The system included 2 ControlLogix controllers in the same chassis. • Each controller produced an axis for the other controller. Lgx00031365
For Function Block Instructions That Use Periodic Timing, DeltaT Now Includes the Fractional Portion of the Task's Period.	If your function block instruction uses the periodic timing mode, the controller *no longer* truncates the fractional portion of a task's period to produce the delta time (DeltaT). In *previous* revisions, the controller truncated the fractional portion of the task's period. Lgx00036282
While in Program Mode, a Motion Group Fault No Longer Produces a Major Fault	As an option, you can configure a motion group to produce a *major fault* any time the group detects a motion fault.  With this revision, a motion group that is configured to produce a major fault produces a major fault *only* if the controller is in run/remote run mode. In *previous* revisions, the motion group could produce a major fault while the controller was in program/remote program mode. For example, a store to nonvolatile memory interrupts the execution of the motion planner, which produces a fault. Lgx00036957

Change:	**Description:**
Out-of-Range Subscript No Longer Produces a Fault During Prescan	During prescan, the controller automatically clears any faults due to an array subscript that is beyond the range of the array (out of range). In *previous* revisions, this produced a major fault. Lgx00040220
AutoTune Now Uses a Non-Integrating Process Model for Temperature Processes	When you autotune an Enhanced PID (PIDE) function block with the Process Type = Temperature, autotune now uses a non-integrating process model to estimate tuning constants. This gives better tuning constants for most application.  In previous revisions, autotune used an integrating process model. Lgx00041638
You *Must* Place a Label (LBL) Instruction At the Start of a Rung.	If your logic includes a Label (LBL) instruction, make sure the instruction is the first instruction on the rung. If it is *not*, move the LBL instruction to the beginning of the rung. Otherwise, the routine will *not* verify. In *previous* revisions, RSLogix 5000 software let you place the LBL instruction elsewhere on the rung. But the controller always executed the instruction as if it were at the beginning of the rung. Lgx00042691
Reduction in the Prescan Time of Projects with Many Jump to Subroutine (JSR) Instructions	During a prescan, the controller no longer prescans a routine more than once. Once it prescans a routine, the controller does not prescan the routine again during that prescan. In *previous* revisions, the controller would prescan a routine as often as it was called in logic. For projects with many calls to subroutines, this could produce a very long prescan and cause a watchdog timeout fault. Lgx00043977

Corrected Anomalies

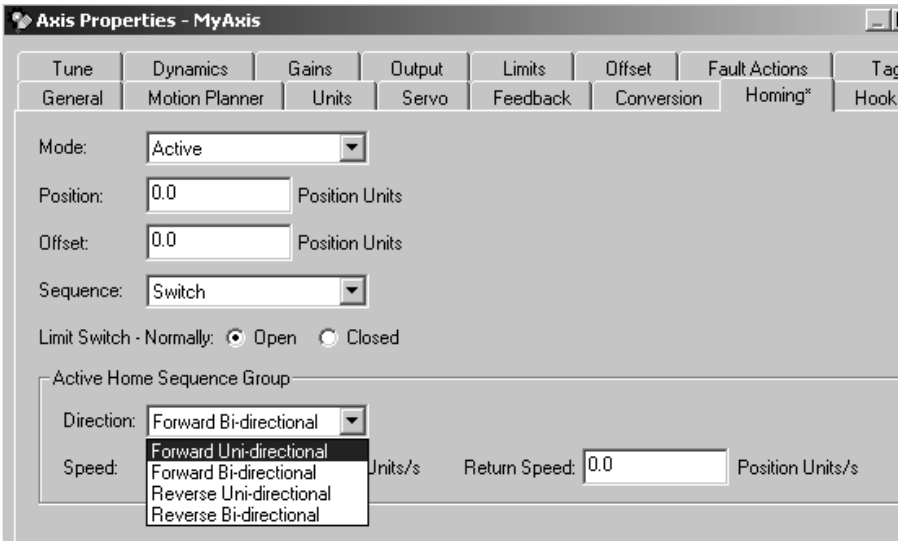
The corrected anomalies are organized by the firmware revision that corrected them.

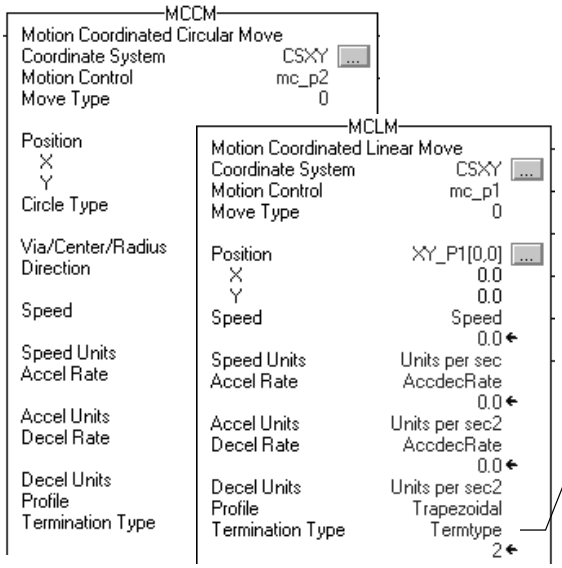
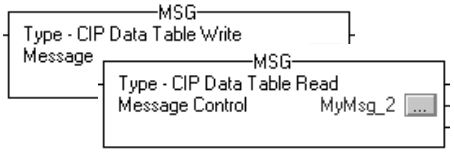
ControlLogix5560M03SE Rev 13.6

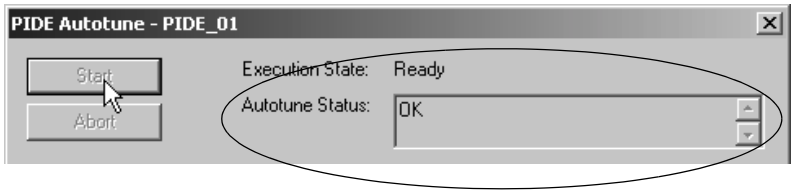
Corrected anomaly:	Description:
Certain Conditions Could Generate an Unknown Major Fault When a Motion Axis Fault Occurred	Under these conditions, RSLogix 5000 software displayed an unknown major fault after an axis fault occurred: • UID/UIE instruction in an event, periodic, or continuous task • the motion group is configured to trigger major faults in response to axis faults • fault handler routine responds to axis faults and clears the axis fault code • an axis fault occurs while the user task is in the UID section of code Lgx00046070
Loss of UID/UIE Behavior if a Fault Routine Executed	The controller uses an internal count to keep track of nesting UID/UIE instructions. When a UID is scanned, the count increments by one; when a UIE is scanned, the count decrements by one. The count is set to zero when a program completes execution. If a fault routine executed when the UID/UIE count was not zero, at the end of the fault routine, the controller set the UID/UIE count back to zero. Control was returned to the program with interrupts enabled when they should still be disabled. Lgx00046070
Memory Allocations for HMI OPC Applications Were Made in I/O Memory Rather Than Data and Logic Memory	For HMI OPC applications, memory normally allocated to "Data and Logic" memory was being allocated to "I/O" memory. This could cause the controller to run out of I/O memory where in previous versions it did not. This could also cause messaging and other HMI OPC applications to not respond or time out. This did not affect I/O based connections. Lgx00047148
Backplane Errors Caused Loss of Input Data	Errors that occur for certain backplane-noise conditions caused the data being received by the controller to stop flowing into the data table of the controller. The controller did not detect when this happened and the connection status and I/O LED indicators still indicated that everything was working. Lgx00047199
Subroutines Invoked from SFC Actions Were Not Properly Postscanned	A subroutine invoked from an SFC action was not properly postscanned when the SFC was configured for automatic reset. Instructions and assignments may not have set their data to postscan values. For example, an Output Energize (OTE) instruction may not have cleared its data during postscan. Lgx00047407

ControlLogix5560M03SE Rev 13.5

This revision of the ControlLogix5560M03SE controller corrects the following anomalies that were in ControlLogix controllers, revision 12.x or earlier.

Corrected anomaly:	**Description:**
SERCOS Interface	The SERCOS interface of the controller corrects the following anomalies that were in 1756-M08SE and 1756-M16SE modules, revision 12.x or earlier: • "Duplicate Node" error reporting operational when error is reported by SERCOS drives Verify that all drives on the SERCOS interface link support this functionality. The error can be viewed when on-line with RSLogix 5000 by opening the module's Module Properties page, SERCOS interface Info Tab, and repeatedly selecting Refresh button to capture the error. • Corrected the anomaly with Real Time Axis Information support of "Accel. Feedback" attribute. The attribute was not recognized and caused the module to fail configuration.
Uni-Directional Homing Failed to Complete	A Motion Axis Home (MAH) instruction sometime failed to complete (IP bit remained on) under the following axis configuration: • Return Speed = 0 • uni-directional homing (forward or reverse)  Lgx00032632

Corrected anomaly:	Description:
Unconditional MDR Instruction Did Not Re-Execute	A Motion Disarm Registration (MDR) instruction failed to repeatedly execute under the following circumstances: • You placed the MDR instruction in a structured text routine. • You did *not* provide any conditions to control the execution of the instruction. (I.e., you programed it to execute continuously.) In those circumstances, the EN bit might have been left on after the first execution and the instruction *no* longer executed again. **Important**: In structured text, we recommend that you condition the instruction so that it only executes on a transition. Lgx00037634
Blended Moves Produce Smoother, More Accurate Motion	This revision improves the response of the axes when you blend the execution of Motion Coordinated Linear Move (MCLM) and Motion Coordinated Circular Move (MCCM) instructions.  • If the Termination Type = command tolerance (2) or no decel (3), axes change more smoothly and follow the intended path more closely. • If the Termination Type = command tolerance (2) or no decel (3) and the program path direction is reversed, the instruction will exceed the specified acceleration/deceleration for the MCLM or MCCM instruction. Lgx00038048, Lgx00041461
Large Message (MSG) Instructions Might Have Caused a Non-Recoverable Fault	The following configuration of a Message (MSG) instruction might have produced a non-recoverable fault:  • Message type = CIP Data Table Read or Write • The instruction transferred > 240 bytes. • Communication was through the serial port. When the controller experiences a non-recoverable fault, it clears the project from memory. Lgx00040892
During Power Up, the Controller Erroneously Showed a Red I/O LED.	During power up, the controller sometimes showed a flashing red I/O LED when there was *no* problem Lgx00040151

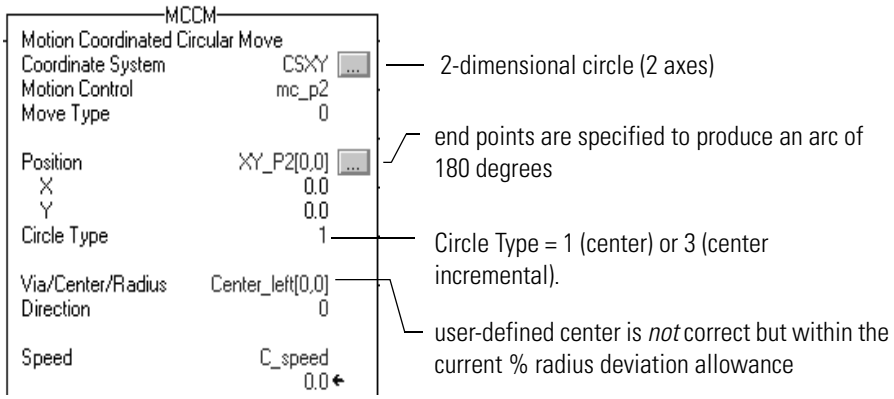
Corrected anomaly:	**Description:**
AutoTune Produced Unnecessary Warnings	When you completed an autotune of an Enhanced PID (PIDE) function block instruction, the Autotune Status field sometimes showed warning messages that were incorrect (did *not* apply).  Lgx00041613
Ramp/Soak (RMPS) Instruction Failed to Initialize to the Correct Mode	On download, a Ramp/Soak (RMPS) Instruction now initializes to Operator Manual mode unless some other mode is requested. In *previous* revisions, the instruction failed to initialize to the correct mode. This lack of initialization could have caused the RMPS instruction to ignore the soak time for the first ramp/soak segment. Lgx00043665
Remote Output Module Momentarily Dropped Its Connection	The following *combination* of circumstances occasionally caused an output module to drop its connection to the controller and then re-establish the connection: • The module was in a remote chassis. • The module used a *Rack Optimization* communication format. • The controller also executed a Message (MSG) instruction that bridged across the backplane of that same remote chassis to another communication module. Occurred most frequently if the MSG instruction was *not* cached. Lgx00043674
Non-recoverable Fault Occurred when Motion Speed Set to Zero	A non-recoverable fault occurred on some motion moves when the speed was set to zero. This occurred because planning calculations divided by 0. Lgx00045079

Restrictions

This revision of the ControlLogix5560M03SE controller has the following restrictions:

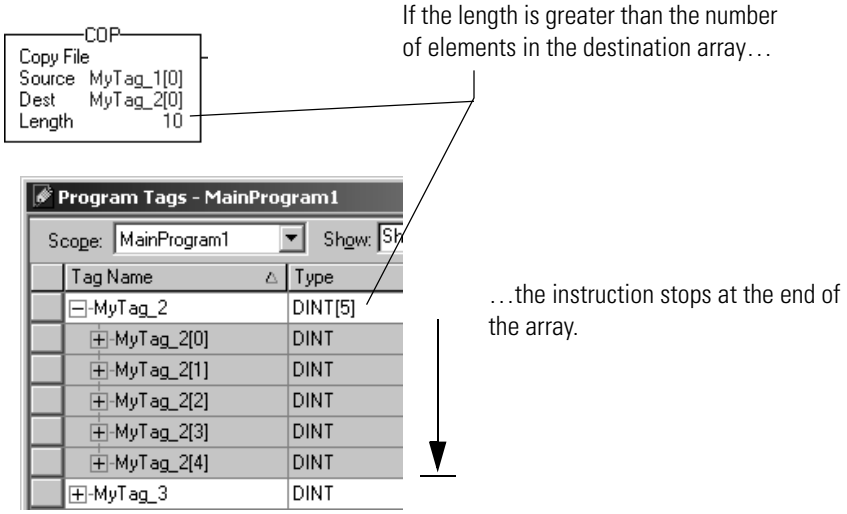
ATTENTION

Make sure that each axis on a SERCOS ring uses a unique SERCOS node number. If 2 axes have the same node number on the same ring, both respond to commanded motion. This could damage equipment or injure people.

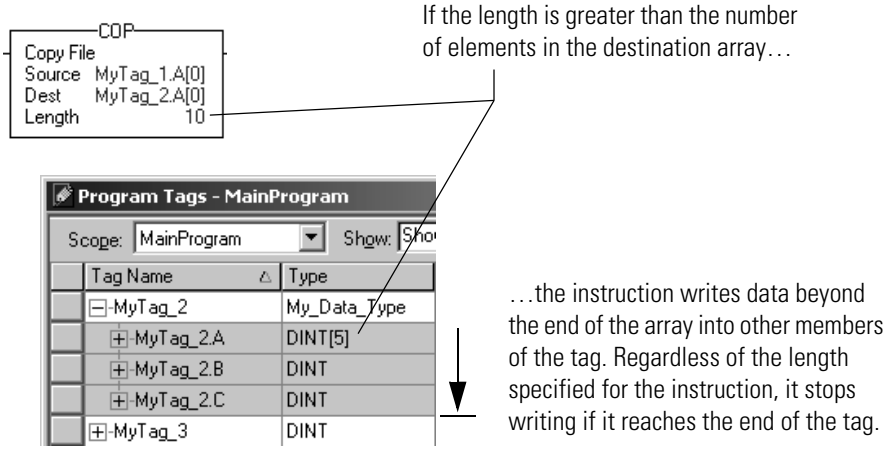
Restriction:	Description:
In Circular Center Programming Mode, a Motion Coordinated Circular Move (MCCM) Instruction May Fail to Reach the Specified End Point of a 180 Degree Arc If the Circle Center Is Miss-Programmed.	If you configure a Motion Coordinated Circular Move (MCCM) instruction as shown below, the instruction may *not* produce a move to the specified end points.  To work around this restriction, enter the correct circle center. Lgx00044813

Restriction:	Description:
In a Tag of a User-Defined Data Type, an Instruction May Write Past the End of an Array.	If you write too much data to an array that is within a user-defined data type, some instructions write beyond the array and into other members of the tag.

Example 1: Instruction Stops at the End of the Array



Example 2: Instruction Writes Beyond the Array



The following instructions write beyond the array into other members of the tag:

BSL	FBC	LFL
BSR	FFL	LFU
COP	FFU	SQL
CPS	FLL	SRT
DDT	GSV	SSV

This restriction also applies to *all previous revisions*.
To prevent writing beyond the limits of the destination array, make sure the length operand of the instruction is less than or equal to the number of elements in the array.

Lgx00033747

Additional Memory Requirements

Revision 13.0 or later *may* require more memory than previous revisions (e.g., 10.x, 11.x). To estimate the additional memory that your project *may* require, use the following table:

Table 1 Additional memory requirements when you convert a project to revision 13 (Sheet 1 of 2)

If you have this firmware revision (add *all* that apply):	Then add the following memory requirements to your project:			Which comes from this type of memory:	
	Component		**Increase per instance**	**I/O (base)**	**Data and Logic (expansion)**
12.x or earlier	I/O module with a comm format = *Rack Optimization*		90 bytes		✔
	I/O module with a comm format = something other than *Rack Optimization* (i.e., direct connection)		144 bytes		✔
	CompactLogix 1769 I/O module		170 bytes		✔
	bridge module with a comm format = *None*		160 bytes		✔
	bridge module with a comm format = *Rack Optimization*		220 bytes		✔
11.x or earlier	tag that uses the MOTION_INSTRUCTION data type		4 bytes		✔
	tag for an axis				
	If the data type is:	**And the tag is:**			
	AXIS_CONSUMED	⇒ ⇒ ⇒ ⇒ ⇒ ⇒ ⇒ ⇒ ⇒	264 bytes	✔	
	AXIS_SERVO	produced for another controller	264 bytes	✔	
		not produced for another controller	264 bytes		✔
	AXIS_SERVO_DRIVE	produced for another controller	288 bytes	✔	
		not produced for another controller	288 bytes		✔
	AXIS_VIRTUAL	produced for another controller	264 bytes	✔	
		not produced for another controller	264 bytes		✔
	output cam execution targets		648 bytes		✔
	user-defined data type: • number of user-defined data types in the controller organizer ⇒ Data Types folder ⇒ User-Defined folder • *not* the use of that data type in tags		128 bytes		✔
	indirect address (using a tag as the subscript for an array in an instruction, e.g., Array_A[Tag_B]). This memory change applies *only* if the array: • uses a structure as its data type • does *not* use one of these data types: CONTROL, COUNTER, PID, or TIMER • has only one dimension (e.g., UDT_1[5])		(-60 bytes)		✔

Table 1 Additional memory requirements when you convert a project to revision 13 (Sheet 2 of 2)

If you have this firmware revision (add *all* that apply):	Then add the following memory requirements to your project:				Which comes from this type of memory:	
	Component			Increase per instance	I/O (base)	Data and Logic (expansion)
10.x or earlier	project for a ControlLogix5555 controller			1200 bytes		✔
	project for a ControlLogix5563 controller			1200 bytes	✔	
	programs			12 bytes		✔
	routines			16 bytes		✔
9.x or earlier	project for a ControlLogix5550 controller			1200 bytes	✔	
	tag that uses the MESSAGE data type			376 bytes		✔
8.x or 9.x	produced or consumed axis			(-21.6K bytes)	✔	
	axis that *is not* produced or consumed			(-21.6K bytes)		✔
8.x or earlier	output cam execution targets			5,404 bytes		✔
	motion group			32 bytes		✔
7.x or earlier	project			1050 bytes	✔	
	tags			0.55 bytes		✔
	messages that: • transfer more than 500 bytes of data *and* • target a controller in the same chassis This memory is allocated only when the MSG instruction is enabled. To estimate, count the number of these messages that are enabled and/or cached at one time.			2000 bytes	✔	
6.x or earlier	base tags			24 bytes		✔
	alias tags			16 bytes		✔
	produced and consumed tags	Data type	Bytes per tag			
		DINT	4	12 bytes	✔	
		REAL	4	12 bytes	✔	
				3 x bytes per tag	✔	
				3 x bytes per tag	✔	
6.x	routines			68 bytes		✔
5.x or earlier	routines			116 bytes		✔

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

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