ControlLogix Combination Controller and SERCOS Interface Card, Revision 16.20

Catalog Number 1756-L60M03SE

IMPORTANT Before updating your controller, we strongly recommend that you review information pertinent to previous major firmware revisions. For example, when updating from revision 15.*x* to 16.*x*, view information for revision 15 in the ControlLogix Controllers, Revision 15 Release Notes, publication number 1756-RN620, in addition to the content of this release note.

Firmware release notes contain material for all minor revisions subsequent to each major revision. If your controller, for example, is at revision 15.3, and not the last minor revision, 15.5, you should view all of the information for revision 15.3...15.5 before updating to revision 16.*x*.

These release notes correspond to the ControlLogix 5560M03SE controller, catalog number 1756-L60M03SE, revision 16.20.

Compatible Revisions

To use this controller revision, update your system to these software levels.

Software	Update
RSLinx Classic RSLinx Enterprise	2.51 4.00
RSLogix 5000	16.00[(1)]
RSNetWorx for ControlNet	8.00
RSNetWorx for DeviceNet	
RSNetWorx for EtherNet/IP	

[(1)]   Note that firmware revision 16.20 is compatible with RSLogix 5000 software, version 16.0. However, many of the corrected anomalies and restrictions described in these release notes are only available when firmware revision 16.20 is used with RSLogix 5000, version 16.03 software.

Before You Begin

> **IMPORTANT**   Loss of communication or power during a controller firmware flash upgrade may result in the controller's rejection of the new firmware. If the controller firmware upgrade fails due to the conditions described, you may need to:
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> - cycle controller power and successfully complete the flash upgrade.
>
> - return the controller for factory repair if there is a nonrecoverable fault.

These preliminary actions are required before upgrading your controller firmware.

Preliminary Actions

If	Then
Your controller is approaching its memory capacity	This revision may require more memory than previous revisions. • To see what components of your current project require more memory, see Additional Memory Requirements on page 23. • With RSLogix 5000 programming software, version 13.0 or later, you can estimate the memory requirements of the controller offline. To update to this revision, you may have to add an expansion memory card to the controller or use a larger memory card.
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, network communication may stop.

Enhancements

These enhancements have been made in firmware revision 16.20.

Enhancements Provided with Firmware Revision 16.20

Revision	Enhancement	Description
16.20	Radio Modem Protocol Support	With this revision, the DF1 Radio Modem protocol, already supported by SLC 500 and MicroLogix products, has been implemented and enabled in the ControlLogix, CompactLogix, FlexLogix, and DriveLogix controllers. Legacy and Logix5000 controllers can be mixed and can support both master-and-slave and store and forward configurations.
	Kinematic Geometries	Four native geometry types have been added. • 2-axis Delta robot geometries • 3-axis Delta robot geometries • SCARA Delta • SCARA independent
	Motion Planner Enhancements	Several Motion Planner enhancements have been made and enabled by this firmware revision. For more information about Motion Planner enhancements, see the Motion Planner Application Solution, publication RA-AP031.

These enhancements have been made in previous firmware revisions.

Enhancements Provided with Previous Firmware Revisions

Revision	Enhancement	Description
16.03	Programmable Jerk	You can specify acceleration and deceleration jerk rates on single-axis moves directly via operands in the instruction faceplate for S-Curve profile motion. Jerk rates for S-Curve motion can be specified as either Units/Second^3, % of Maximum, or a new % of Time, letting you optimize the need for speed and smoothness. The configurable maximum jerk rates are accessible programmatically via GSV/SSV instructions. Earlier revisions of projects using S-Curve velocity profiles will be automatically migrated forward and prepopulate the new Jerk Operands in the MAM, MAJ, and MAS instructions with default values for Jerk rate as 100% of Time.

Enhancements Provided with Previous Firmware Revisions

Revision	Enhancement	Description
16.03	Kinematic Transformation Instructions Added	Motion control capabilities have been extended by allowing inverse and forward kinematic transformations. This feature helps control robots used in packaging and pick-and-place applications.

The native geometries supported include: two and three axes articulated-dependent and articulated-independent robot geometries, as well as configurable support for three-axis SCARA geometries by leveraging the native geometries. To accomplish this, the coordinate system configuration has been enhanced to let you select a Cartesian or articulated coordinate system type.

Additionally, two new instructions, Motion Coordinated Transform (MCT) and Motion Calculate Transform Position (MCTP), have been added. The MCT lets you set a gearing relationship between two coordinated systems, for example, between a Cartesian coordinate system made by virtual axes and an articulated coordinate system that is made by the robot's real axes. Once the MCT is active, by simply programming moves on the virtual axes configured in the Cartesian coordinate system, it is possible to move the robot in joint coordinates. The MCTP instruction lets you change a position from one coordinate system to another. Typically, the MCTP instruction would be used to calculate the Cartesian position from a given joint position (forward kinematics). |
| 16.03 | Home to Torque (Kinetix 2000, 6000, and 7000) | Motion homing capabilities have been extended to provide two additional homing modes.

• Torque Level lets you set the homing position when a configured torque limit is reached.

• Torque Level- Marker lets you set the homing position when the configured torque limit is reached and a feedback marker has been detected.

These capabilities allow for enhanced application flexibility by removing the need for a home switch. |
16.03	Kinetix 2000 Drive Support	The Kinetix 2000 servo drive 230V ac family is now supported. Power range is 100 W...1.5 kW. The Kinetix 2000 drive can also be configured to operate with single-phase or three-phase power.
16.03	Kinetix 7000 Drive Analog Input Configuration	This feature lets an analog device be connected to the Kinetix 7000 drive analog inputs. The drive transmits to the controller an integer number with a range of -16,384...16,384 representative of the analog value. The analog values are accessible programmatically via the GSV instruction. These inputs can convert applications with load cell (measuring web force on a roller) or dancer (measuring web force/position directly) that can be directly connected to the drive controlling the web.
16.03	Ability to Unicast Producer/Consumer Tags on Ethernet/IP Networks	This revision lets you use RSLogix 5000 software to set producer and consumer tag connections to Unicast. Setting the tags to Unicast decreases the network bandwidth and simplifies Ethernet switch configuration.

Enhancements Provided with Previous Firmware Revisions

Revision	Enhancement	Description
16.03	Add-On Instructions	With version 16 of RSLogix 5000 programming software, you can design and configure sets of commonly used instructions to increase project consistency. Similar to the built-in instructions contained in Logix5000 controllers, these instructions you create are called Add-On Instructions. Add-On Instructions reuse common control algorithms. With Add-On Instructions, you can: • ease maintenance by animating logic for a single instance. • protect intellectual property with password-protected instructions. • reduce documentation development time. For more information about using Add-On Instructions, see the Logix5000 Controllers Common Procedures Programming Manual, publication 1756-PM001.
16.03	Logix Date Base Changed January 1, 1970	The Logix real-time clock operates as a 64-bit binary number that counts microseconds from a fixed date. Prior to revision 16, the base date was January 1, 1972. Recent developments with the Common Industrial Protocol (CIP) specification have resulted in the selection of a different base date of January 1, 1970 by the Open DeviceNet Vendors Association (ODVA). With revision 16, the date base that the Logix system uses has been changed to bring it into alignment with the CIP specification. Additionally, in support of the changes to the real-time clock, several other GSV attributes were also added, such as LocalDateTime, TimeZoneString, ApplyDST (daylight savings time), and DSTAdjustment. Generally, the date and time were accessed via the GSV instruction within a Logix program by using the DateTime attribute, which breaks down the date and time to its various components (μsec, sec, min, hour, day, month, year). Applications that use this attribute to the real-time clock should not be impacted by this change. However, the time was also available in its 64-bit form using the CurrentValue GSV attribute. A GSV to CurrentValue of wall clock was changed to the number of microseconds from the new base date. Any applications that interpreted the old 1972 64-bit number may now require a change.
16.03	DF1 Radio Modem Protocol Support	With revision 16, the DF1 Radio Modem protocol, already supported by SLC 500 and MicroLogix products, has been implemented in the ControlLogix, CompactLogix, FlexLogix, and DriveLogix controllers. Legacy and Logix5000 controllers can be mixed and can support both master-and-slave and store and forward configurations. This feature has been disabled in this version 16.0 of RSLogix 5000 software. Please contact Rockwell Automation Services & Support to determine when this feature will be available. See the back cover of this publication.
16.03	FactoryTalk Alarms and Events Software	Alarms are now embedded in the controller with two new instructions, ALMD and ALMA, available in RSLogix 5000 software. These digital and analog alarm instructions are fully self-contained.

Enhancements Provided with Previous Firmware Revisions

Revision	Enhancement	Description
16.03	Logix5000 Firmware Supervisor	Use of the Logix5000 Firmware Supervisor with ControlLogix controllers and certain I/O modules enables you to program the controller to complete firmware updates by using a GSV or SSV instruction. The controller uses a firmware kit loaded on a CompactFlash card and can complete firmware updates in Program and Run modes. In GuardLogix controllers, this enhancement is available for use with standard I/O modules.
16.03	System Overhead Time Slice	The System Overhead Time Slice (SOTS) lets you reserve a percentage of the controller processing resources for the handling of communication. Prior to this revision, any unused part of the SOTS was used by the controller to resume the continuous task. This firmware revision lets you configure the unused portion of SOTS to either: • run the continuous task (Default/Legacy mode), allowing for faster execution of application code. • reserve it for communication, providing for more predictable and deterministic continuous-task scan time.
16.03	EtherNet/IP Reduced Heartbeat	The Reduced Heartbeat feature reduces the rate at which heartbeat packets are sent from a device in an I/O connection or a produced/consumed connection. This feature preserves bandwidth in EtherNet/IP network installations. The change is automatic and requires no selection. You will notice a reduction in the packets per second used on your EtherNet/IP network for several cases including all input modules and produce/consume tags. **IMPORTANT** You must also upgrade the adapter firmware to revision 2.003 if you are using a Logix controller and upgrade the controller's firmware to revision 16.*x*, with the following adapter modules: • 1734-AENT, POINT I/O EtherNet/IP adapter. • 1738-AENT, ArmorPoint I/O EtherNet/IP adapter. Failure to upgrade your EtherNet/IP adapter firmware may impact your application if more than one Logix controller is connected to POINT I/O or ArmorPoint I/O modules. For more information on using the 1734-AENT or 1738-AENT adapters with Logix controllers that have been upgraded to firmware revision 16.*x* or later, see: • POINT I/O EtherNet/IP Adapter Release Notes, publication 1734-RN002 • ArmorPoint I/O EtherNet Adapter Release Notes, publication 1738-RN002

Enhancements Provided with Previous Firmware Revisions

Revision	Enhancement	Description
16.03	Online Changes in Output CAM Editor	Parameter values can be changed for the output CAM profile either on the grid or by using the graphical view. Insertion and/or deletion of points while in Run mode are not allowed. A new status rectangle icon has been added to the Output CAM Editor dialog to show the state of the control. The color of the rectangle is green when the controller is in Run mode, cyan while in Program mode, and gray while in the offline state.
16.03	AutoFlash for SERCOS Drives	The AutoFlash feature has been enhanced to let the Kinetix 2000, Kinetix 6000, Kinetix 7000, 1394, Ultra 3000, and 8720MC SERCOS drives to be firmware flashed. This simplifies the software upgrade process by, in one step, flashing firmware for the controller module, motion modules, and Rockwell Automation SERCOS rings when downloading the application.
16.03	Configurable Power Loss Fault Action	A fault action called Phase Loss has been added for the Kinetix 6000 and Kinetix 2000 drives. This addition lets you configure the fault action during a phase loss. The configurable fault actions are Shutdown (default), Disable Drive, Stop Motion, and Status Only. When the Phase Loss fault group is configured as Status Only, Logix5000 motion commands continue and the drive uses available stored dc bus energy to operate axes. This attribute cannot be set via an SSV instruction. For a description of user application logic needed to support this feature on Axis Modules (AM), refer to the topic entitled Phase Loss Fault-action for AM vs. IAM on Kinetix 2000 & 6000 in the Application Note section of Online Help.
16.03	Positive and Negative Rotary Move Types for an MAM Instruction	Previously, the move type of the Motion Axis Move (MAM) instruction generated a directional reversal if the deceleration distance was longer than the distance between the start point and the end point. In this revision, two new rotary-move types (Rotary Negative and Rotary Positive) have been added for the MAM instruction. These two move types travel in a unidirectional path to reach the end point. The unidirectional path is continued until the end point is reached even if that means additional turns or unwinds are required.
16.03	S-Curve MCS stop Adjustment via Dynamics Configuration Bits	Bits for user-definable configurations have been added to the COORDINATE_SYSTEM data type to permit more adjustment to the deceleration mechanism for S-Curve profile moves. The DynamicsConfigurationBits attribute lets you configure: • reduced S-Curve stop delay. • reduced S-Curve velocity reversal. • reduced S-Curve velocity overshoot. This attribute can be accessed via GSV/SSV.

Corrected Anomalies

These anomalies have been identified and corrected in firmware revision 16.20.

Anomalies Corrected in Firmware Revision 16.20

Revision	Anomaly	Description
16.20	Circular colinearity error.	In addition to the circular colinearity error (44) for a coordinate system with three primary axes, we have now added the same error check for a coordinate system with two primary axes. The current error check for a three-axis system generates the error if the specified start, end, and center points are colinear in any order. However, for a two-axis coordinate system, the error is generated only if the specified points are both colinear and in this order: Start Point -> End Point -> Center Point For example, for a two-axis coordinate system with these three points: • Error 44 is generated: Start Point = (0,0) -> End Point = (10,0) -> Center Point = (20,0). • No error is generated: Start Point = (0,0) -> End Point = (20,0) -> Center Point = (10,0). Lgx00069493
	MCT instruction followed by an MCS instruction.	Only execute an MCT instruction when an axis involved in the transformation is not moving. You can check the axis status via the **ControlledByTransformStatus** bit of the source and target axes. Your controller might get a random major fault if you program it as follows: 1. The MCT instruction is active and the axis moves. 2. The MCS instruction of the type Stop Coordinated Transform is executed. 3. An MCT instruction is activated with a different orientation or translation. 4. The axis moves. Lgx00075124
	MAS IP bits - may remain set if an MGS instruction is initiated.	If an MGS instruction is issued while MAS-All instructions are being executed, the MAS instruction in process bit would remain latched true. All axis motion would stop, but the MAS instructions would remain in process. Lgx00076212
	Position overshoot on velocity-limited moves.	For moves with very special combinations of fast velocities, slow decelerations and distances that produced velocity-limited moves, it was possible to sometimes overshoot a programmed end point and then return to it. Lgx00069310
	Invalid transformation position if two MCT instructions share a common coordinate system.	This anomaly occurs if two executed MCT instructions are configured this way. <table><tr><td></td><td>Source Axes</td><td>Target Axes</td></tr><tr><td>MCT1</td><td>X, Y, Z</td><td>J1, J2, J3</td></tr><tr><td>MCT2</td><td>J1, J2, J3</td><td>X1, Y1, Z1</td></tr></table> If you move any of the MCT2 target axes while the MCT instructions are active, then the MCT1 source axes will end up at invalid positions. Lgx00073921

Anomalies Corrected in Firmware Revision 16.20

Revision	Anomaly	Description
16.20	Configuration of an MAS instruction for a single axis	If your program has an active MAS instruction with a StopType of All (0), Jog (1), Move (2), Gear (3), Home (4), Tune (5), Test (6), Position Cam (7), Time Cam (8), or Master Offset Move (9), and it is followed by an MAS instruction with a StopType of All (0), then the motion of the axis is not stopped. The process complete bit (.PC) for the MAS (All) instruction may appear to be set; however, the instruction is ignored by the system. To stop motion, you must configure an additional MAS instruction with a StopType of Move (2) that has the same instruction operands and execution time as the MAS instruction with the StopType of All (0). For more information, see the Tech Note titled "Advisory Information for Configuring Motion Axis Stop Instructions for an Axis with CompactLogix, ControlLogix, and SoftLogix Controllers" in the Technical Support Knowledgebase. Lgx00075962
	Controller power cycling and power ups may result in anomalous behavior.	When using the 1756-L64 ControlLogix controller, certain power conditions may affect the processor. Possible anomalous behavior includes: • the controller may power up with a major non-recoverable fault. • the controller could loose its program and power up with empty memory. • the controller could power up and run with corrupted data table values. Testing has shown that a power cycle of less than 10 seconds may cause the anomalous behavior. There may be a correlation between the size of the program, the power cycle time, and the anomalous behavior. Lgx00076231
	Changing the controller mode from Run to Program is unsuccessful.	When the controller mode is changed from Run to Program and an alarm instruction has a delivery state of In Progress, the controller does not change modes. To view the delivery state, open the Alarm Properties dialog and click the Messages tab. This anomaly may occur even when the controller is not connected to a FactoryTalk Alarm server. Lgx00075913
	Simultaneous branches in a Sequential Function Chart may not execute at the same time or in the same scan.	When executing a simultaneous branch, it may take two scans of the routine before all of the simultaneous branches execute. It does not take more than two scans for all simultaneous branches to completely execute. Lgx00075143

Anomalies Corrected in Firmware Revision 16.20

Revision	Anomaly	Description
16.20	During Prescan, a Major Recoverable Fault, Type 6, Code 1, occurs.	Each task programmed for a Logix controller has a Prescan Watchdog of 5 seconds. You cannot change this setting in RSLogix 5000 software. The fault typically occurs when these elements are present in the program: • Add-On Instructions that use PreScan mode. • A large program with many tasks and subroutines where a majority of the application memory is used by the application code and not tags. Other elements and factors may also cause the fault; however, those listed are the most common. When the fault occurs, the Prescan Watchdog has been exceeded. With this firmware revision, the Prescan Watchdog has been increased to 60 seconds. Lgx00077337
	Use of an ACL with other ASCII Serial Port instructions may result in a major non-recoverable fault.	If an ACL instruction is executed while other ASCII instructions are active, a major non-recoverable fault may occur. Lgx00076857
	Add-On Instructions yield unexpected results.	When calling an Add-On Instruction, if the data types of the tags passed into or out of the instruction do not match the parameter definitions, unexpected behavior can result. In the logic of an Add-On Instruction, reading a tag of type INT can also yield incorrect results. Lgx00075524
	Digital alarms (ALMD) may prematurely report an in-alarm state.	The tag InAlarm reports the alarm (InAlarm=1) before the time entered in the MinDurationPRE tag expires. Lgx00075889

The following table contains descriptions of anomalies corrected in previous firmware revisions.

Anomalies Corrected in Previous Firmware Revisions

Revision	Anomaly	Description
16.04	Using FFL (FIFO load) or LFL (LIFO load) instructions in the same program as an Add-On Instruction may cause the controller to experience a major non-recoverable fault.	If an Add-On Instruction is executed after an FFL or LFL instruction in a given program, the internal registers are incorrectly written to and the result is a Major Nonrecoverable fault. For the fault to occur, these conditions must exist: • The Add-On Instruction and FFL and LFL instructions reside in the same program in a Logix application. • If the application has two programs defined and the Add-On Instruction is in program A and the FFL or LFL are in program B, no anomaly is seen. • The FFL/LFL loads a scalar type (SINT, INT, DINT, or REAL). • If the source value is a structure, no anomaly is seen. • The FFL/LFL is scanned before the Add-On Instruction. • If the Add-On Instruction comes first in the code, no anomaly is seen. The rung condition does not matter. If the required conditions exist, the fault occurs during the prescan. Lgx00074725
16.04	PanelView Plus operator terminals using the serial port to communicate with the controller will not establish communication when the controller is started.	When the application on the PanelView Plus operator terminal begins to initialize communication with the controller, the controller responds with packets that exceed the 500-byte packet size. The PanelView Plus operator terminal then stops attempting communication with the controller. When this occurs, data is not updated on the PanelView Plus operator terminal. Lgx00074400
16.03	In coordinated motion, a rotary axis always moves.	When there is a rotary axis configured for the Coordinate System, the rotary axis makes one complete revolution even if the current command position is equal to the position in the Motion Coordinated Linear Move (MCLM) instruction. Lgx00056359
16.03	SlaveAxis.PositionCam-LockStatus is reset when master axis stops or starts quickly using a Motion Axis Jog (MAJ) instruction.	When the manual jog input is turned on and off rapidly, the SlaveAxis.PositionCamLockStatus gets reset and the SlaveAxis.PositionCamStatus remains set. Lgx00066064
16.03	While an axis is accelerating and an MAS instruction is initiated, a delay is experienced before the axis begins to decelerate to a stop.	This occurs with Stop Move and Stop Jog in combination with S-Curve velocity profiles. While an MAM or MAJ instruction is accelerating, an MAS instruction is initiated to stop it. Even though the deceleration rate is higher than the ones specified in the MAM or MAJ, the axis begins to decelerate at a lower rate before decelerating at the higher rate programmed in the MAS instruction. Lgx00055080

Anomalies Corrected in Previous Firmware Revisions

Revision	Anomaly	Description
16.03	LimitsInv and SelectLimitInv are swapped.	In the High/Low Limit (HLL) instruction the: • LimitsInv parameter is set when the SelectLimit is invalid. • SelectLimitInv parameter is set when the HighLimit and LowLimit parameters are invalid. Lgx00055977
16.03	Minor faults logged multiple times when certain instructions are used.	The same minor faults, typically minor math-overflow errors, may be logged more than once, depending on the type of instructions used in the program. For example, if in a task the program contained a Multiply instruction that logged a math overflow error as a minor fault, a GSV instruction in the same program will log the same fault when it should not. Instructions affected include Message BTR, Message BTW, GSV, SSV, UIE, UID, STOD, STOR, STOI, PCMD, PSC, PATT, PDET, PCLF, PPD, and PRNP. Lgx00028500, Lgx00045361, and Lgx00045365
16.03	Changes to RPI are not communicated to all workstations when multiple workstations are connected to the controller.	If you are online with one controller from two or more workstations and you alter the RPI for an I/O connection on one workstation, the change in RPI does not register on the other workstations. The change in RPI registers only if the altered RPI program is uploaded from the controller by the other workstations. Lgx00070714
16.03	Event Task Overlap Counter registers large values after the controller is put in Run mode.	If an application that uses event-based tasks is downloaded to the controller and then the controller is put into Run mode, the overlap counts for event-based tasks may exceed 800,000. This value is a false indication of task overlaps and does not affect the execution of event-based tasks. Lgx00058132
16.03	Processing of denormalized number exceptions causes a Major Nonrecoverable fault.	A denormalized number is any 32-bit, floating-point value that is less than $1.75494210 \times 10^{-38}$ and greater than $-1.75494210 \times 10^{-38}$, excluding zero. Denormalized numbers typically occur when very small real numbers are divided by very large real numbers. This anomaly typically exists when these events happen in sequence. 1. The controller is handling an exception of a floating-point denormalized number in task A. 2. Task B begins to execute and handles an exception of a floating-point denormalized number. 3. Task B completes as task A begins again. Lgx00057774
16.03	A Cam Profile can become locked such that an MCCP instruction can no longer update it.	This anomaly can occur if an MCSV instruction executing in an application task is interrupted by the motion task that is executing an MAPC instruction. Lgx00060094

Anomalies Corrected in Previous Firmware Revisions

Revision	Anomaly	Description
16.03	On a unidirectional home, the IP bit is cleared, the AxisHomedStatus attribute is set, but the PC bit is not set.	If the home direction is unidirectional and the home offset is less than the deceleration distance, then the axis simply decelerates to a stop. The axis does not reverse direction to move to the home position. In this case, the PC bit of the MAH instruction is not set. The PC bit is set when the axis stops at the configured home position. Lgx00063431
16.03	Unexpected motion can happen when you home a rotary axis of a SERCOS drive.	A rotary axis of a SERCOS drive can move unexpectedly if you use a Homing Offset to home the axis. The axis starts to move at a high speed until a position error fault happens. Once the fault happens, the axis responds with the configured fault action. For example, the default fault action is Disable Drive. In that case, the controller disables the axes and the drive stops the axis. This anomaly happens when all of these specific conditions occur: • The type of axis is AXIS_SERVO_DRIVE (SERCOS interface drive). • The Positioning mode of the axis is Rotary. • The axis has a Homing Offset that is near or greater than the Position Unwind value of the axis. • A Motion Axis Home (MAH) Instruction executes when the axis is near its unwind position. For more information, see Tech Note 34404. Lgx00061613 and Lgx00056675
16.03	MAOC instruction output remains on when enable input is low.	An Output CAM element is configured with a Latch type of Position and Enable, and Unlatch type of Position and Enable. While the CAM element is active (the output is on), the application sets the Unlatch Position to the value of the Latch Position. The output remains on even if the Enable Input is dropped. For more information, see Tech Note 37835. Lgx00069685
16.03	Extensive use of UID and UIE instructions results in a User-Task Watchdog timeout fault.	If you use extensive amounts of UID and UIE instructions, when the controller is put into Run mode, a Major Recoverable fault type 6, type 1, Task Watchdog Expired, may be logged. Attempts to clear the fault and return to Run mode are unsuccessful. Lgx00050393

Known Anomalies

This table lists known anomalies of controller revisions 16.0...16.20.

Known Anomalies for Firmware Revisions 16.0...16.20

Revision	Anomaly	Description
16.20	MRP Error 13 for positions within the range.	You may get the error **Parameter out of Range** if the MRP is executed when: Current Position + MRP Position > 2^{31}/Axis Conversion Constant. Or Current Position + MRP Position <- 2^{31}/Axis Conversion Constant. For example, assume that the: • axis conversion constant = 120,000.0 feedback counts/1.0 unit. • current command position = 17,893.0 units. If you MRP with a position of five units, which exceeds 2^{31}/Axis Conversion Constant, the MRP will error. To work around this anomaly, move the axis to a value within the acceptable range specified above. Lgx00073719
	SSV of MotionGroup Average Scan Time causes a jump in scan time.	If an SSV instruction with a value of zero is executed against the MotionGroup attribute TaskAverageScanTime, when the GSV instruction is finished, the average scan time will have jumped to an incorrect value. The larger the Coarse Update Period, the larger the jump will be. For example, with a Coarse Update Period of 26 ms, the average scan time value can increase to over 300 ms. Lgx00071520
	Axis ActualAcceleration tag is not updated for virtual axes.	For the virtual axis, the Axis_tag.ActualAcceleration does not update, but the Axis_tag.CommandedAcceleration does. The actual position of a physical axis is based on actual motor feedback, which is why the virtual Actual Acceleration tag does not update on a virtual axis. To work around this anomaly, use these command-based tags: • Virtual_Axis.CommandPosition • Virtual_Axis.CommandVelocity • Virtual_Axis.CommandAcceleration Lgx00073829

Known Anomalies for Firmware Revisions 16.0...16.20

Revision	Anomaly	Description
	MCT error 61 with extended error.	You will get error 61 with extended error 10 if you execute an MCT instruction immediately after the .PC bit for a motion controlled limited move (MCLM) or motion controlled circular move (MCCM) is set for a zero length move, indicating that axes are moving or locked by some other operation.
		To work around this error, execute a minimum of a one-iteration delay right before executing the MCT instruction after the completion of the zero-length coordinated move instruction. This delay is not necessary if the move before the MCT has any length.
		Lgx00075286
16.20	Setting invalid home sequence value via an SSV instruction.	Do not attempt to program a set system value (SSV) instruction to set the home sequence to torque or torque marker if the drive is not a SERCOS drive. If you do so on a non-SERCOS drive, any subsequent attempt to program this attribute via an SSV instruction will produce a minor controller fault.
		Lgx00068281
	Kinematics transformations, additional native geometry support - compatibility description.	In version 16.03 of RSLogix 5000 programming software, these four additional native geometry types are supported only on 1756-L6*x* and 1756-L6*x*S controller with firmware revisions 16.20 or later:
		• 2-axis Delta robot geometries
		• 3-axis Delta robot geometries
		• SCARA Delta
		• SCARA independent
		When a version 16.0 project configured with any of these four additional geometries is downloaded to a controller with firmware revision lower than 16.20, a download attribute list error will result.
		Version 16.0 of RSLogix 5000 programming software can also go online and even upload from a controller with firmware revision 16.20 or later, but if that project contains any of these 4 new native geometries that are specific to version 16.03 of RSLogix 5000 programming software, the project cannot be redownloaded once it has been saved. Version 16.0 of RSLogix 5000 programming software will convert any unsupported geometries, such as version 16.03-specific geometry additions, to the default Coordinate System Type = Cartesian. Therefore, do not use version 16.0 of RSLogix 5000 programming software to go online with a project containing any of these four new geometry types that is running on a ControlLogix controller with firmware revision 16.20 or later.
		Lgx00075769

Known Anomalies for Firmware Revisions 16.0...16.20

Revision	Anomaly	Description
	Duration Cam - Latch and Unlatch Delays.	Duration cams enable an application to turn an output on at a specific position and off after the configured Duration time. Latch and unlatch delays adjust the point at which an output turns on and off, regardless of axis speed.
		If you enter a latch delay, your application will adjust the point at which your output turns on. For example, a latch delay of 0.5 seconds will cause your output to turn on 0.5 seconds sooner and then remain on for the configured Duration time, in addition to the 0.5-second head start. However, using this example, currently, the total time your application's output remains on is being decreased by 0.5 seconds.
		If you enter an unlatch delay, your application will adjust the point at which your output turns off. For example, an unlatch delay of 0.5 seconds will cause your output to turn off 0.5 seconds sooner. However, by using this example, currently, the total time your application's output remains on is extended by 0.5 seconds above and beyond the configured Duration time.
		If you execute a latch and unlatch delay for the identical value, no anomaly occurs, and the output will remain on for the configured Duration time.
		Lgx00068599
	Use of revision 16 firmware and the controller serial port results in extended program scan times.	If you use firmware at revision 16, including revisions 16.02...16.20, and the controller's serial port, the program scan time may increase. The program scan time increase in revision 16 may be two...ten times the scan time of the same program with revision 15.
		This anomaly only occurs when the controller serial port is used and there is no workaround.
		Lgx00077845
	Indirectly addressing an instance tag in an Add-On Instruction results in a major nonrecoverable fault.	When an indirectly-addressed instance tag is used instead of a directly- addressed instance tag within an Add-On Instruction, a major nonrecoverable fault occurs. Typically the major fault occurs during the prescan of the controller.
		See the Restrictions section on page 20 for more information about this anomaly.
		Lgx00077261

Known Anomalies for Firmware Revisions 16.0...16.20

Revision	Anomaly	Description
16.04 16.03	PI function block appears to stop executing as the output does not change and no instruction faults are logged.	If the PI instruction is being used in Linear mode, the following floating-point equation is used to calculate the ITerm: $$Kp \times Wld \times \frac{WldInput + WldInput_{n-1}}{2} \times DeltaT + ITerm_{n-1}$$ Due to the use of the single-precision floating point value and depending upon the WDL and KP values, the ITerm value may equate to a value too small (less than 0.0000001) to be registered as a change when the PTerm parameter is determined. For more information regarding the PI instruction, see the Logix5000 Process Controls and Drives Instructions Reference Manual, publication 1756-RM006. Lgx00070832
16.04 16.03	A function block is initiated, either directly or indirectly by an SFC instruction, when the parent step becomes active.	During the first scan of an SFC step, the Step.FS bit is set. In addition, the S:FS bit is set, which lets the logic in any associated actions easily detect the first scan state. This behavior is useful when a subroutine that is called by multiple actions (actions that may be connected to other steps) is used. The first scan state can be detected without programming a reference to the tag of a specific step. Many function blocks contain internal data that must be initialized before the block can be used. One of the methods a block uses to determine if it should initialize is by evaluating the S:FS bit, which the function block identifies as the first scan following a prescan. Lgx00071558
16.04 16.03	Changes made to a timeout in the alarms system require a new download of the program to controller.	To verify that the timeout change is used by the controller, you must download the program to the controller after each change to the timeout variable. Lgx00069461
16.04 16.03	Attempts to download a program to a controller following a failed firmware upgrade are successful. Failure is indicated by the OK status indicator flashing red after the upgrade is complete.	After a firmware upgrade attempt fails during the upgrade, the controller's OK status indicator flashes red and any attempts to clear the fault by toggling the controller's keyswitch are unsuccessful. Upgrade failure can occur due to a cable disconnection or communication interruption. You can download a program to the controller, place the controller in Run mode, and run the program; the RUN status indicator displays run status. The outputs behave as specified by the program. However, when controller power is cycled, the program is lost and the controller properties indicate a firmware revision different from that most recently downloaded to the controller. Lgx00071250

Known Anomalies for Firmware Revisions 16.0...16.20

Revision	Anomaly	Description
16.04 16.03	Outputs controlled by an MAOC instruction can remain on in some configurations.	This anomaly occurs when the output CAM ON window positions are redefined while the output controlled by the output CAM element is active. In some instances, the Motion Planner may not detect the off-crossing of the window and the output controlled by the output CAM element remains on. This issue is applicable to any output point or virtual output controlled by an MAOC instruction. For more information, see Tech Note 37835. Lgx00071061
16.04 16.03	When the SFC instruction's Last Scan of Active Steps option is set to Automatic Reset, a Major Nonrecoverable fault occurs.	A major nonrecoverable fault may occur when these conditions exist: • Within an SFC instruction, a JSR instruction is used to jump to another SFC, also know as a nested SFC. • One or more of the nested SFC instructions contains simultaneous branches. • The Last Scan of Active Steps option, specified in the SFC Execution tab of the controller Properties dialog, is set to Automatic Reset. To avoid a major nonrecoverable fault when these elements are present, set the Last Scan of Active Steps to Don't Scan or to Programmatic Reset. Lgx00072702
16.04 16.03	An SFC R action continues to post-scan on the specified action.	This anomaly occurs only if the SFC Last Scan of Active Steps option is set to Programmatic Reset or Automatic Reset. When the default, Don't Scan, is set, the anomaly does not occur. The intention of a reset action, type R, is to terminate the execution of another action that was previously stored. When configured as described previously, the reset action causes logic to execute a final scan. The reset action does not check to verify that an action is stored before it completes the final scan. As a result, each time the reset action is scanned, the target logic will be scanned one last time. You may observe that: • the timer of the stored action will continue to time even though the action is no longer active. • the logic in the stored action will be executed in the configured mode. • at Automatic Reset, nonretentive outputs are cleared. • at Programmatic Reset, the logic will execute. In this situation, the action logic checks for the final scan condition (action.A = 1 and action.Q = 0) and performs some shutdown operations. This is the code that will be executed. Lgx00069295

Known Anomalies for Firmware Revisions 16.0...16.20

Revision	Anomaly	Description
16.04 16.03	Using the CompactFlash card to update firmware can cause the SERCOS interface card to become inoperable.	When you use the CompactFlash card to update the firmware of the 1756-L60M03SE combination controller, the controller-portion of the module is updated first. Upon the completion of the controller update, both the controller and SERCOS interface card reset. After the reset, the controller starts up and follows the configured load option on the CompactFlash card. Then, the SERCOS interface card update begins, and the status indicator flashes red. If power is removed from the rack, or the 1756-L60M03SE combination controller is removed from the rack while the status indicator is flashing, the module becomes inoperable. To avoid rendering your module inoperable, ignore the controller status indicators while the red status indicator on the SERCOS interface card is flashing. Wait until it has stopped flashing and the whole module has completed a final reset before removing the module from the rack or removing power. Lgx00070115
16.04 16.03	MCT instruction PC bit operational but not defined.	Within an MCT instruction control word, there is a default PC bit. When the MCT instruction transitions from true to false, the PC bit may set to 1. The MCT instruction is not intended to have operation associated with this bit and we recommend that you do not use the PC bit in your application. Lgx00073233

Restrictions

These restrictions apply to the use of ControlLogix controllers.

Restrictions with Firmware Revision 16.20

Firmware Revision	Restriction	Description
16.20	Outputs controlled by an MAOC instruction can remain ON in some configurations.	This anomaly occurs when the output CAM ON window positions are redefined while the output controlled by the output CAM element is active. In some instances, the Motion Planner may not detect the off-crossing of the window and the output controlled by the output CAM element remains ON. This issue is applicable to any output point or virtual output controlled by an MAOC instruction.

For more information, see Tech Note 37835. |
| 16.20 | Use of an indirectly-indexed tag within an Add-On Instruction instance tag is not accepted by the RSLogix 5000 program. | In RSLogix 5000 software, version 16.00, if you use an indirectly-indexed array in an instance tag of an Add-On Instruction, anomalous behavior may result.

For example, in the instruction call `MyAOI(AOIData[Index])`, the value `[Index]` selects the `AOIData` tag element used to call `MyAOI`. The use of `[Index]` results in anomalous behavior when the program is executed.

In RSLogix 5000 software, version 16.03, and controllers firmware revision 16.20, if an indirectly-indexed tag is used in an instance tag, the edit is not accepted by the program. Instead, use a directly-indexed instance tag. For example, instead of using tag `MyAOI(AOIData[Index])`, use tag `MyAOI(AOIData[2])` or similar so that the exact element of the array is directly-indexed. The program accepts directly-indexed instance tags.

You may continue to use indirectly-addressed tags in Add-On Instruction parameters without anomalous behavior in RSLogix 5000 software, versions 16.00 and 16.03.

Lgx00077261 |

Restrictions with Firmware Revision 16.20

Firmware Revision	Restriction	Description
16.20	Passing a User-defined Data Type (UDT) into an Add-On Instruction results in a Major Recoverable Fault or data memory corruption.	An anomaly occurs when you pass a tag based on a User-defined Data Type (UDT) into an Add-On Instruction, and certain conditions are met that result in a Major Recoverable Fault or data memory corruption. Conditions required for Major Recoverable Fault or data memory corruption include the following: • A one-dimensional array tag that is based on a UDT is passed into the Add-On Instruction. • The UDT tag contains a member that is a one-dimensional array. • Inside the Add-On Instruction, an operand address that specifies an immediate member of the UDT tag array and a variable element of the member array (for example, array[0].memberArray[x]) is used. Examples: `UDT array[0].memberArray[x]` When the size of the UDT array is smaller than that of the memberArray and the [x] value of the memberArray is larger than the size of the UDT array, a Major Recoverable Fault Code 4 Type 20 occurs. `UDT array[0].memberArray[x]` When the size of the UDT array is bigger than the memberArray and the [x] value is smaller than the size of the UDT Array but larger than the size of the memberArray, the expected fault does not occur and the data is written to a location outside the bounds of the memberArray. Lgx00077270 and Lgx00076136
16.20	Upload of Add-On Instruction with Literal Boolean Input Parameter Modifies Offline Image	When an Add-On Instruction containing a literal value for one of its Boolean Input parameters is referenced from a Ladder Diagram routine, an upload of the project will modify the display of the literal value by appending a ".0". Each time the project is downloaded and re-uploaded, another ".0" is appended, so that after the second download/upload sequence, the project file will not verify and can no longer be downloaded without first editing the modified literal value. The edit may be successfully performed either online or offline. Note, however, that when editing online, because the rung is in an unverified state, the "Finalize All Edits in Program" will not operate. In this case, use of the Accept/Test/Assemble sequence of operations will allow the edit to be completed. This condition does not affect the executing image, which will continue execution by using the unmodified literal value. To avoid exposure to this problem, replace the literal value with a reference to a tag having the desired value. Lgx00077802

Install Revision 16.20

To install this revision, download the firmware from http://support.rockwellautomation.com and use ControlFlash software to upgrade your controller.

Alternatively, if you have installed version 16.03 of RSLogix 5000 programming software and related firmware, you may not need to complete the tasks described. The AutoFlash feature of version 16.03 RSLogix 5000 programming software detects if your controller firmware needs upgraded upon a program download to the controller. If a firmware upgrade is necessary, AutoFlash will initiate an update.

After you have completed your firmware upgrade, complete these steps to verify that the upgrade was successful.

1. Cycle power to the controller.

2. Go online with the controller and view controller properties.

3. Verify that the firmware revision listed matches the firmware to which you intended to upgrade.

4. If the controller's firmware is not correct, initiate another firmware upgrade.

For more information about errors when completing a ControlFlash upgrade, see the ControlFlash Firmware Upgrade Kit Quick Start, publication 1756-QS105.

Additional Memory Requirements

Revision 16.0 or later may require more memory than previous revisions, for example: 10.*x*, 11.*x*. To estimate the additional memory that your project may require, use the following table.

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)**
15.*x* or earlier	Input module	4 bytes	✓	
	Produced tag	12 bytes	✓	
	Consumed tag	4 bytes	✓	
	Task	20 bytes		✓
	Program or equipment phase	24 bytes		✓
	Routine	4 bytes		✓
	Tag that uses COORDINATE_SYSTEM data type	748 bytes		✓
	Tag the uses any AXIS data type	800 bytes		✓
	Serial port	1120 bytes		✓
	Project	4012 bytes		✓
14.*x* or earlier	Tag that uses the COORDINATE SYSTEM data type	60 bytes		✓
	Tag that uses any AXIS data type	4 bytes		✓
13.*x* or earlier	Program	12 bytes		✓
	Task	4 bytes		✓
	User-defined data type	4 bytes		✓
	I/O module	16 bytes	✓ (8 bytes)	✓ (8 bytes)
	Produced or consumed tag	8 bytes	✓	

Additional Resources

To learn about version 16.03 of the Motion Planner, see the Motion Planner Application Solution, publication RA-AP031.

You can view or download publications at http://literature.rockwellautomation.com. To order paper copies, contact your local Rockwell Automation distributor or sales representative.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its 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 its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need 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.

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