

Integrated Motion on Sercos and EtherNet/IP Network – Analysis and Comparison

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This application technique compares the similarities and differences between these two Integrated Motion systems:

- Systems that use Serial Real-time Communications System (Sercos) interfaces
- Systems that use EtherNet/IP networks

Both comparisons use ControlLogix[®] controllers.

Topics that are covered include hardware, axis configurations, Get System Variable (GSV), Set System Variable (SSV), and axis exceptions for the two different systems.





Hardware

This table lists the hardware information for Integrated Motion on Sercos interfaces and EtherNet/IP networks.

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
 Sercos II technology 1756-L6x, 1756-L7x, GuardLogix[®], 1768-L43, and 1768-L45 controllers 1756-M03SE, 1756-M08SE, 1756-M16SE, and 1768-M04SE Sercos cards Ultra[®] 3000 SE, Kinetix[®] 2000, Kinetix 6000, Kinetix 6200, and Kinetix 7000 servo drives 	 EtherNet/IP technology 1756-L6x, 1756-L7x, 1756-L8x, 1769-LxxERM, 1769-L3YS, and GuardLogix[®] controllers 1756-EN2T⁽¹⁾, 1756-EN2F, 1756-EN2TR, and 1756-EN3TR Ethernet communication modules Kinetix 6500 servo drive, PowerFlex[®] 755 AC drive, PowerFlex 527, Kinetix 350, Kinetix 5500, and Kinetix 5700 drives 1783-ETAP, 1783-ETAP1F, and 1783-ETAP2F EtherNet/IP taps with embedded switch technology (optional) Stratix 2000[™], Stratix 5100[™], Stratix 5400[™], Stratix 5700[™], Stratix 8000[™], Stratix 8300[™] switches (and commercially available switches, optional)

(1) Firmware revision 4.00 or later.

Features

This table lists features for Integrated Motion on Sercos interfaces and EtherNet/IP networks.

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
 Sercos is a controller/drive interface that uses noise-immune, fiber-optic cables. A fiber-optic ring serves as the sole interface between the control and the drive. The fiber-optic ring replaces costly command and feedback wiring, which reduces installation time and the cost of wiring. Kinetix drives provide advanced diagnostics and process reports via the Sercos interface. Wide variety of motion module options for ControlLogix, CompactLogix™, and GuardLogix controllers. Up to 16 axes of motion can be controlled from one motion module. System is fully expandable, with up to 100 axes that are supported per controller. Multiple controllers can be used if additional axes are needed. 	 EtherNet/IP technology, Integrated Motion on the EtherNet/IP network, and CIP Sync technologies are global standards from ODVA. These standards help to provide device standardization and compatibility. EtherNet/IP technology has an installed base that numbers in the billions of nodes. Compliance with IEEE Ethernet standards provides users with a choice of network interface speeds; for example, 10, 100 Mbps, and 1 Gbps. EtherNet/IP technology is an agile, multidiscipline network that can be used to control, configure, monitor, and do peer interlock for motion, safety, process, and discrete applications; it provides a Connected Enterprise. Multiplexing, a new feature in Integrated Motion on the EtherNet/IP network, allows for the controller to execute up to three effective Coarse Update Periods for a Motion Group. Within the Motion Group, drives can execute at different rates, relative to the needed application performance. The drive multiplex feature is available in Studio 5000° revision 24 and up, and is compatible with Axis CIP Drive and AXIS VIRTUAL data types. Single network architecture integration. High-performance drives, I/O, smart actuators, human machine interface (HMI), programming terminal, and any other EtherNet/IP device providing lower system cost, improved performance, flexibility, and ease-of-use benefits. Extends the benefits and simplicity of Integrated Motion to Kinetix 350, Kinetix 5500, Kinetix 5700, Kinetix 6500, PowerFlex 527, and PowerFlex 755 drives on an EtherNet/IP network. Kinetix and PowerFlex drives can be used on the same network to configure, program, commission, diagnose, and for drive maintenance. Support for any Ethernet topology for maximum flexibility. Embedded switch Device Level Ring (DLR) technology available on Kinetix 5500, Kinetix 5700, Kinetix 6500, PowerFlex 755 drives. An optional dual-port card is available on PowerFlex 755 drives.

Topology

This section lists information on the topologies for Integrated Motion on Sercos and EtherNet/IP network.

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
 Sercos II technology, 8 MB transmission rate. Maximum of 16 drives per Sercos module or ring. Supports multiple Sercos modules per controller. Dedicated motion network. Supports only Sercos interface drives. Must be configured in ring topology. 	 EtherNet/IP technology, 100 MB fast Ethernet. Standard unmodified Ethernet and maximum of 128 drives per Ethernet module. ControlLogix 5580 controllers offer a 1 GB embedded Ethernet port and support 300 devices in its I/O tree with 256 being drives. Any combination of EtherNet/IP devices on a common network: AC and servo drives, distributed I/O, EOI, and any other EtherNet/IP device. Coupled with an Ethernet communication module, the ControlLogix 5580 controller supports all Ethernet topologies: star, linear, ring (Device Level Ring or DLR), or hybrid. IMPORTANT: A 1756-L7<i>x</i> controller motion group is limited to 100 axes while a ControlLogix 5580 controller motion group can have up to 256 axes. Multiple controllers can control drives on a common Ethernet module. IMPORTANT: A standalone ControlLogix 5580 controller supports only linear topology. Other topologies (liner and ring) can be achieved by adding an Ethernet module to the rack.
Ring Topology	Basic Ring Topology
ControlLogix Controller	ControlLogix Controller
<image/>	Device Level Ring (DLR) Device Level Ring (DLR) PanelView ^M Plus 7 Performance Terriminal Ninetix 5700 Drive Point I/0 ^M PowerFlex 527 Drive
	IMPORTANT: For additional topology examples, see <u>Appendix C — Design and</u> Implementation Guide for Using Integrated Motion on an EtherNet/IP Network on page 40.

Communication Module and Drive Configuration

This section compares the communication module and drive configuration for Integrated Motion on Sercos and EtherNet/IP systems.

Communication Module and Drive Configuration Comparison

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
Select a Sercos Communication Module	Select an Ethernet Communication Module
 Select the appropriate Sercos communication module: 1756-M03SE = 3 Sercos drives 1756-M08SE = 8 Sercos drives 1756-M16SE = 16 Sercos drives 	 Select the appropriate Ethernet communication module: 1756-EN2x = Up to 128 EtherNet/IP drives with a maximum of 8 position-configured drives 1756-EN3x = Up to 128 EtherNet/IP drives 5580 controller = Up to 256 EtherNet/IP drives
Select Module	Select Module
Module Description Vendor Image: Distribution of the second s	Verdor Verdor 1756-DHR10/C 1756 DH+ Bridge/RIO Scanner Allen-Bradley 1756-DHR10/D 1756 DH+ Bridge/RIO Scanner Allen-Bradley 1756-DNE 1756 IO(100 Mbps Ethernet Bridge, Fiber Media Allen-Bradley 1756-ENDF 1756 IO(100 Mbps Ethernet Bridge, Fiber Media Allen-Bradley 1756-ENDT 1756 IO(100 Mbps Ethernet Bridge, 2-Port, Twisted-Pair Media Allen-Bradley 1756-ENDT 1756 Ethernet Controllegix 5580 Embedded Ethernet Bridge, 2-Port, Twisted-Pair Media Allen-Bradley 1756-ENET/B 1756 Ethernet Communication Interface Allen-Bradley Allen-Bradley 1756-ENET/B 1756 Ethernet Communication module. Illen-Bradley Allen-Bradley 1756-ENET/B 1756 Ethernet Communication module. Illen-Bradley Illen-Bradley
General Connection SERCOS Interface Into Module Info Backplane Data Rate: Subo Datest Mb Cycle Time: 2 ms Transmit Power: High Max Statu:: Office OK Cancel Apply Help OK Cancel Apply Help	Controller Properties - IntegratedHotion Immed Protocol Post Configuration General Major Fault Date Time* Other and Time Spectromer Exclusion File Execution Protocol Protocol Other and Time Spectromer Exclusion Immed Protocol Date and Time Immed Protocol Time Spectromize Immed Protocol Enable Time Spectromized Immed Protocol Time Spectromized Immed Protocol In the system fine master Immed Protocol In the system fine master Immed Protocol Duplicate CST master Advanced Immed Spectromized Immed Protocol Immed Spec
	IMPORTANT: To configure ControlLogix 5580 controllers, see the ControlLogix 5580 Controllers User Manual, publication <u>1756-UM543</u> .

Communication Module and Drive Configuration Comparison (Continued)

2094-BM03 2094-BM05 2094-BMP5

4

2094-5E02F-M00-50/2094-AC05-M01-M 2094-5E02F-M00-50/2094-AC05-MP5-M

2094-5E02F-M00-50/2094-AC09-M02-M 2094-5E02F-M00-50/2094-AC16-M03-M

By Category By Vendor Favorites

Kinetix 6000, 460VAC, AM, 104 CONT., 224 Peak Kinetix 6000, 460VAC, AM, 30A Cont., 45A Peak Kinetix 6000, 460VAC, AM, 49A Cont., 73A Peak Kinetix 6000, 460VAC, AM, 4A Cont., 6A Peak Kinetix 6000, 230Vac, IAM, 3kW PS, 6.0A

Kinetix 6000, 230Vac, IAM, 3kW PS, 3.7A

Kinetix 6000, 230Vac, IAM, 6kW PS, 10.6A Kinetix 6000, 230Vac, IAM, 15kW PS, 17.3A

Find...

Cancel

Integrated Motion on Sercos I	nterface	Integrated Motion on the EtherNet/IP Network
Drive Selection		Drive Selection: Control and Power Structure
When selecting a Sercos drive, sel	ect both the control and power structure.	Compared to the Kinetix 5500 and Kinetix 6500 drives, the Kinetix 5700 drive consists of a power supply/converter and inverter. The power supply is separate from the axis module and is configured in the I/O tree. There is no auto population of the power structure. You can choose the required power supply.
Select Module	X	Select Module Type
Module - 2094-BC01-MP5 - 2094-BC02-M02 - 2094-BC07-M05 - 2094-BC07-M05 - 2094-BM02	Description Kinetix 6000, 460VAC, IAM, 6kW PS, 4A Cont., 6A Kinetix 6000, 460VAC, IAM, 15kW PS, 15A Cont., : Kinetix 6000, 460VAC, IAM, 9KPS, 195, 0A Cont., : Kinetix 6000, 460VAC, IAM, 9A Cont., 13A Peak Kinetix 6000, 460VAC, AM, 15A Cont., 22A Peak	Catalog Module Biscovery Favorites

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Help

7 Module MDI to EtherNet/IP	Type Category Filters	Module Type V Iradlev	Vehicu Pikeis	_
Motion		stadley ss+Hauser		
Motor Overload		C CORPORATION		
MotorOverload		C Bobolics America		
MotorStarter		an Enclosures		
		T ale de		1
	1	-	1	
 Catalog Number 	Description	Vendor	Category	-
2198-P031	Kinetix 5700 Bus Power Supply, 10A, 324-528 Volt	Allen-Bradley	Drive,Motion	
2198-P070	Kinetix 5700 Bus Power Supply, 25A, 324-528 Volt	Allen-Bradley	Drive,Motion	
2198-P141	Kinetix 5700 Bus Power Supply, 47A, 324-528 Volt	Allen-Bradley	Drive,Motion	
2198-P208	Kinetix 5700 Bus Power Supply, 69A, 324-528 Volt	Allen-Bradley	Drive,Motion	
2198-S086-ERS3	Kinetix 5700, 43A, 458-747 Volt DC, Network Safety S	Allen-Bradley	Drive, Motion, Safety	
2198-S130-ERS3	Kinetix 5700, 65A, 458-747 Volt DC, Network Safety S	Allen-Bradley	Drive, Motion, Safety	
2198-S160-ERS3	Kinetix 5700, 85A, 458-747 Volt DC, Network Safety S	Allen-Bradley	Drive Motion Safety	
842E-CM-M	Multi Tum Encoder - CIP Motion - 262144 Count Reso	Allen-Bradley	Motion	
842E-CM-S	Single Turn Encoder - CIP Motion - 262144 Count Res	Allen-Bradlev	Motion	
PowerFlex 527-ST0 CIP	PowerFlex 527 AC Drive - CIP Motion / Safe Torque D	Allen-Bradley	Drive Motion Safety	
1				•

IMPORTANT: For complete information on configuration of a Kinetix 5700 drive, see the Kinetix 5700 Servo Drives User Manual, publication <u>2198–UM002</u>.

The power structure is displayed in the module definition.

/endor: Parent: Name: Description:	Alen-Bradley Local K5700_PowerSupply	Ethernet Address C Private Network: 192.168.1.
Module Defi Revision: Electronic Ke Connection: Power Struc	3.001 2001 Compatible Module Motion	
		1

After you select the power supply, then you select the inverter module.

	Module Tve	e Category Filters	-	1		Module Type V	endor Filters	-
	fanaged Ethemet Switch IDI to EtherNet/IP fotion fotor Overload fotor/Overload		_	NN		lauser ORPORATION obotics America		
	fototu venoad		×		Horman E			-
T	Catalog Number	Description				Vendor	Category	
	97-V34PB6-LM	Kinetix 350 6A 480V No Elh	er Ethernet D	tive		Alen-Bradley	Drive Motion	
215	98-0006-EBS3	Kinetix 5700 Dual Axis 2 5A	458-747 Volt	00.1	letwor	Allen-Bradley	Drive Motion, Safety	
21	98-0012-ERS3	Kinetix 5700 Dual Axis, 5A, 45	8-747 Volt D	C. Ne	twork	Allen-Bradley	Drive Motion Safety	
215	98-0020-ERS3	Kinetix 5700 Dual Axis, 8A, 45	8-747 Volt D	C, Ne	stwork	Allen-Bradley	Drive, Motion, Safety	
215	98-0032-ERS3	Kinetix 5700 Dual Axis, 13A, 4	58-747 Volt 0	DC, N	letwor	Allen-Bradley	Drive, Motion, Safety	-
211	98-D057-ERS3	Kinetix 5700 Dual Axis, 23A, 4	58-747 Volt 0	DC, N	etwor	Allen-Bradley	Drive, Motion, Safety	
211	98-H003-ERS	Kinetix 5500, 1A, 195-528 Vol	t, Safe Torqu	ю Off	Drive	Allen-Bradley	Drive Motion	
211	98-H003-ERS2	Kinetix 5500, 1A, 195-528 Vol	, CIP Safe T	orque	Off Dr	Allen-Bradley	Drive,Motion,Safety	
211	98-H008-ERS	Kinetix 5500, 2.5A, 195-528 V	olt, Safe Toro	que C	Iff Drive	Allen-Bradley	Drive,Motion	
21	98-H008-ERS2	Kinetix 5500, 2.5A, 195-528 V	olt, CIP Safe	Torq	ue Olf	Allen-Bradley	Drive,Motion,Safety	L PÉ

IMPORTANT: Kinetix 5500 and Kinetix 6500 drives have an integrated axis (IAM) power module, which requires the power structure to be specified during configuration.

Communication Module and Drive Configuration Comparison (Continued)

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
Set the Node Address	Set the IP Address
Set the Node Address Each Sercos drive must have a unique network identifier that is the node address of the drive. General Connection Associated Axes Power Module Info Type: 2094-BC01-MP5 Kinetix 6000, 460VAC, IAM, 6kW PS, 4A Cont., 6A Peak Vendor: Allen-Bradley Name: PRV_SERCOS Description: Image: Competible Keying: Competible Keying Status: Offine	Set the IP Address Each EtherNet/IP drive must have a unique network identifier that is the IP address of the drive.
	Statu:::::::::::::::::::::::::::::::::::

Communication Module and Drive Configuration Comparison (Continued)

🔲 Drive Enable Input Fault

Integrated Motion on Sercos Interface			Integrated Motion on the EtherNet/IP Network		
Digital Inputs			Configurable Digital Inputs		
Sercos drives contain up to six digital inputs. Typically the function of these inputs cannot be configured.		o to six digital inputs. Typically the function of these inputs	EtherNet/IP drives have configurable digital inputs. The Kinetix 5700 converter module has two configurable inputs, while its axis modules have four configurable inputs.		
IOD Pin	Signal	Description	Connection Time Sync Module Info Internet Protocol Port Configuration Network Associated Aves Power Digital Input		
10D-2	ENABLE	Optically isolated, single-ended active high signal. The current load is nominally 10 mA. A 24V DC input is applied to this terminal to enable each axis.	Avis: 1 Avis Name: <none> Digital Input 1: Enable Unassigned Digital Input 2: Enable But Capedor OK</none>		
IOD-5	HOME	Optically isolated, single-ended active high signal. The current load is nominally 10 mA. Home switch (normally open contact) inputs for each axis require 24V DC (nominal).	Shunt Thermal Switch OK		
10D-15 10D-17	REG1 REG2	Fast registration inputs are required to inform the motor interface to capture the positional information with less than 3 µs of uncertainty. Optically isolated, single-ended active high signal. The current load is nominally 10 mA. A 24V DC input is applied to this terminal to enable each axis.			
IOD-8 IOD-11	0T+ 0T-	Over-travel detection is available as an optically isolated, single-ended active high signal. The current load is nominally 10 mA per input. The positive/negative limit switch (normally closed contact) inputs for each axis require 24V DC (nominal).			
Drive Enable Input Checking Example For a Sercos drive, the Drive Enable Input Checking checkbox is on the Drive/Motor tab of the Axis Properties.			Drive Enable Input Checking Example For an EtherNet/IP drive, to disable input checking, make sure that none of the inputs are assigned to enable.		
Homing Hookup Tune Dynamics Gains C General Motion Planner Units Drive/Motor Amplifier Catalog Number: 2094-BC01-MP5 Motor Catalog Number: MPL-B310P-M Loop Configuration: Position Servo Drive Resolution: 720000 Drive Counts / M			Digital Input 1: Inassigned Digital Input 2: Home Digital Input 3: Registration 1 Digital Input 4: Registration 2		

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Communication Module and Drive Configuration Comparison (Continued)

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network			
Hard Travel Limits Example	Overtravel Limits Example			
For a Sercos drive, the Hard Travel Limits checkbox is on the Limits tab of the Axis Properties.	For an EtherNet/IP drive, to enable the hard travel limits on the Kinetix 5700 or Kinetix 6500 drives, assign the inputs to Positive Overtravel and Negative Overtravel.			
General Motion Planner Units Drive/Motor Motor Feedback Homing Hookup Tune Dynamics Gains Output Limits I Hard Travel Limits	Digital Input 1: Enable Digital Input 2: Home Digital Input 2: Home			
🔽 Soft Travel Limits	Digital Input 3: Registration 1 🗨> Digital Input 3: Positive Overtravel 💌			
Maximum Positive: 0.0 degs	Digital Input 4: Registration 2 Digital Input 4: Negative Overtravel			
Maximum Negative: 0.0 degs				
IMPORTANT: The Kinetix 6200 drive is limited to four digital inputs.	IMPORTANT: The following digital inputs can be assigned for the Kinetix 5700 drives.			

IOD Pin	Input	IDN	Туре	Default
41	1	P-0-052		Enable
42	2	P-0-053	INT	Home
43	3	P-0-054		Registration 1
44	4	P-0-055		Registration 2

The digital input default settings can be configured by using a Sercos IDN write instruction.

Unassigned Unassigned Enable Home Registration 1 Registration 2 Positive Overtravel Negative Overtravel Regeneration OK Bus Capacitor OK Shunt Thermal Switch OK

Axis Configuration

This section compares the axis configuration for Integrated Motion on Sercos and EtherNet/IP systems.

Axis Configuration Comparison

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network		
General Homing Hookup Tune Dynamics Gains Output Limits Offset Fault Actions Tag General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion Axis Configuration: Servo	General Categories Categorie		
Associated Module: Module: DRV_SERCDS Module Type: 2094-8C01-MP5 Node: 1 OK Cancel Apply Help	Fadit & Alame Tag Assigned Group Motion Group: Update Peod 1.0 Associated Module Module: Module: Module: Power Structure: 2139-P031 Asis State: Mostiof Time DK Cancel Actory: Help		
	Categorie: General Mode Asti Configuration: Mode Asti Configuration: Mode Scafing House Basic Polaton Motor Feedback: Polaton Testback Polaton Motor Feedback: Polaton Motor Feedback: Polaton Modure Polaton Modure: Polaton Modure: Polaton Modure: Polaton Modure: Polaton Loop Module: Polaton Loop Module: Power Structure: 2004 END2 MOLS1 Powerestruture:		

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network			
Axis and Loop Configuration	Axis and Feedback Configuration For the Kinetix 5700 drive, configure the converter module as a CIP drive because it is used for the faults and shutdown mechanism of the inverter. Axis Configuration: Axis Configuration: Feedback Configuration: No Feedback			
	Even though the converter module does not spin a motor, an axis must be configured as part of the axis properties for the drive.			
For a Sercos axis, the Axis Configuration selects between Servo and Feedback Only operation control.	For an EtherNet/IP axis, the control mode is a combination of the Axis Configuration and Feedback Configurations.			
Axis Configuration	Axis Configuration			
Axis Configuration: Servo 💽 Motion Group: Feedback Only Servo	Axis Configuration: Position Loop Feedback Configuration: Feedback Only Frequency Control Frequency Control Application Type: Position Loop Loop Response: Torque Loop			
	IMPORTANT: The Kinetix 5700 and Kinetix 5500 servo drives support the basic volts/ hertz frequency control. Kinetix 6500 and PowerFlex 755 AC drives support all other modes.			
To configure the axis for Velocity Servo, Torque Servo, and so on, see Loop Configuration on the Drive/Motor tab.	On the Kinetix 5700 drive, feedback connections are made at the DSL feedback, 2-pin motor feedback (MF) connector, and the 15-pin universal feedback (UFB) connector.			
Loop Configuration	Feedback Configuration			
Loop Configuration: Position Servo Drive Resolution: Position Servo ✓ Drive Enable Input Che Dual Command Servo ✓ Drive Enable Position Servo ✓ Drive Enable Aux Position Servo ✓ Drive Enable Position Servo ✓ Drive Enable Val Command Servo ✓ Real Time Axis Informati Torque Servo ✓ Dual Command/Feedback. Servo Dual Command/Feedback. Servo	Feedback Configuration: Motor Feedback Application Type: Motor Feedback Loop Response: Dual Feedback			

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network		
Drive/Motor Homing Hookup Tune Dynamics Gains Output Limits Offset Fault Actions Tag General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion Amplifier Catalog Number: 2034/BC014/F5 Motor Catalog Number: MPL8310P-M Change Catalog Loop Configuration: Position Servo Drive Resolution: 20000 Drive Counts / Motor Rev V Calculate	Categoins: Value Device Specification General Value Device Specification General Data Source: Catego Number Parameters Addor Feedback Catego Number Catego Tests Motor Type: Addor Feedback Catego Number Change Catalog Data Source: Catego Number Change Catalog Scharb Noneplate / Datasheet - Phase to Phase parameters		
Drive Enable Input Flocking	Amount Rated Power: 0.77 KV Pole Count. 8 Observer: Rated Volage: 460.0 Vola: (RMS) Roted Count. 8 Observer: Pole Konto Rated Volage: 460.0 Vola: (RMS) Roted Count. 8 - Volabil: Log Rated Count. 1.77 Ango: (RMS) Pole Count. 8 - Volabil: Non Max Speed: 5000.0 Rote 8 - Volabil: Non Peak Current: 502 Ango: (RMS) - Togue/Curret: IS9 Nm Mole: Oveload Limit: 100.0 % Roted - Anong - Anong - Anong - Anong - Anong - Anong - Distanter - Faats & Alama - Faats & Alama - OK Concett Activ		
Change the Catalog Number For a Sercos axis, the Motor Data Source pull-down selection does not exist. By default,	Motor Data Source Options		
you can only select an available drive that is in the motor catalog database.	Data Source: Catalog Number: Nameplate Datasheet Change Catalog Motor Type: Motor Number: Motor Type: Motor Number: Motor Type: Motor Number: Motor Type: Motor Number: Catalog Number: Change Catalog Catalog Number: Motor Number: Motor database. You enter the motor parameters. Catalog Number: Catalog Number: Choose supported Allen-Bradley® motors by catalog number. Provides automatic setting of the required parameters. Motor NV: Motor parameters are derived from nonvolatile memory of a smart feedback device that is equipped with a serial interface. Applies to any Hiperface or EnDat feedback device that is preprogrammed with Rockwell Automation formatted motor data. This option is not available for PowerFlex 755 AC drives.		

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network		
Motor Feedback	Motor Feedback For an EtherNet/IP axis, the Motor Feedback page provides a summary of the connected feedback device when Catalog Number is selected as a Motor Data Source.		
For a Sercos axis, the Motor Feedback tab provides a summary of the connected feedback.			
Homing Hookup Tune Dynamics Gains Uuput Limits Offret Fault Actions Tag General Motion Planner Units Drive/Motor Motor Pleadback Aux Feedback Conversion Feedback Type: 1024 per Prov Interpolation Factor: 2043 Interpolation Factor: 2043 Peedback Counts per Rev Feedback Recolution: 2037152 DK Cancel Apply Help	Cargoin: Modal Modal Modal Modal Modal Modal Modal Modal Modal Modal Modal Modal Modal Modal Scaling Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Carding Horkage Horkage Carding Horkage Horkage Carding Horkage Hor		
	When Nameplate Datasheet is selected, you can define the motor feedback information. Device Function: Motor Mounted Feedback. Parameters Feedback Channel: Feedback 1 Type: Hiperface Units: Rev Hiperface Cycle Resolution: 1024 Effective Resolution: 2048 Effective Resolution: 2097152 Startup Method: Absolute Turns: 4096		
	IMPORTANT: For system features on the Kinetix 5700 drives, see the release notes of your installed firmware.		

Load Feedback		
The Load Feedback page is only visible if the Feedback Configuration is set to Load or Dual Feedback.		
Categoin: General Model Facebook Model Model Facebook Model Facebook Parce function: Load Categoine Device Function: Procesting Parce function: Load Categoine PerceDosine Load Categoine PerceDosine Load Categoine PerceDosine Load Categoine PerceDosine Load Categoine Perceductor: Load Categoine Perceductor: Load Categoine Option Hampatiants Device Functione: Perceductor: Option Hampatiants Other Earcolation: Status Method Incommental Marxial Ture. OK Cancel April/		
Master Feedback If the Axis Configuration is set to Feedback Only, the Master Feedback page replaces the Motor and Load Feedback pages.		
Scaling Calculator		
Categoos: General Statung to Convert Motion from Controller Units to Uses Defined Units: Model Load Type: Model Load Type: Ratio Loi: 1 Paral 10 Model Units: Devent 10 Model Units: Devent 10 Model 10 Model Units: Province Scaling: Model 10 Model Units: Province Scaling: Model 10 Province Scaling: Model Code: Province Scaling: Model Code: Province Scaling: Mode: Code: Province Scaling: Mode: Code: Province Scaling: Mode: Code: Province Scaling: Mode: Code: Province Scaling: Province Scaling: Pro		

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network		
Position Units	Units		
For a Sercos axis, the Position Units are on the Units tab.	The Scaling units are user-defined and are reflected throughout the Axis Properties.		
Homing Hookup Tune Dynamics G General Motion Planner Units Drive Position Units: degs	Scaling Units: degs		
N/A	Transmission Ratio and Actuator		
For a Sercos axis, the Transmission Ratio and Actuator entry does not exist. These input values must be directly included in the Conversion Constant and Drive Resolution calculations.	The Transmission Ratio and Actuator entry makes it easier to enter application-specific scaling information. For the Actuator, select from Screw, Belt and Pulley, Chain and Sprocket, and Rack and Pinion.		
	Load Type: Linear Actuator Transmission Ratio I:O: 1 : 1 Rev Actuator Type: Belt and Pulley Lead: 1.0 Millimeter/Rev ▼ Diameter: 1.0 Millimeter ▼		

A

ntegrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network		
ositioning Mode, Drive Resolution, Conversion Constant, and Position nwind	Scaling and Travel		
or a Sercos axis, the Positioning Mode and Unit Scaling/Unwind reside on different bs.	t For an EtherNet/IP axis, the Travel Mode selections include Unlimited, Limited, or Cy The Cyclic mode is similar to when you select a Sercos Positioning Mode set to Rotar		
rst, set the Positioning Mode on the Conversion tab.			
Positioning Mode: Rotary	Scaling Units: degs Scaling: 360 degs per 1.0 Load Rev Travel		
	Mode: Cyclic Range: 1000.0 Unwind: 360 degs per 1.0 Cycle		
ext, click Calculate on the Drive/Motor tab. Homing Hookup Tune Dynamics Gains Output Limits Offset FaultAct General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback			
Amplifier Catalog Number: 2034:BC01-MP5 Motor Catalog Number: MPL-B310P-M Change Catalog	Motion Axis Parameters Parameter Group: Scaling Associated Page		
Loop Configuration: Position Servo	Name 🛆 Value Unit		
Drive Resolution: 720000 Drive Counts / Motor Rev 💌 Calculate	ActuatorDiameter 1.0 ActuatorDiameterUnit Millimeter		
	ActuatorLead 1.0		
ou can then use the Calculate Position Parameters calculator to calculate the Drive esolution, Conversion Constant, and Position Unwind.	Actuator Excelor A Actuator Type Bett and Pulley ConversionConstant 1000.0 Motion Counts/degs		
	Control solitication Control solitica		
Calculate Position Parameters	MotionScalingConfiguration Control Scaling		
Position Unit Scaling: 360.0 degs per 1.0 Motor Rev	MotionUnit Load Millimeter PositionScalingDenominator 1.0 Load Millimeter		
Position Unit Unwind: 360.0 degs per 1.0 Unwind Cycle	PositionScalingNumerator 360.0 degs PositionUnits degs		
Calculate Parameters	PostionUnwind 360000 Motion Counts/Unwind Cycles		
	PositionUnwindNumerator 360.0 degs ScalingSource Direct Scaling Factor Entry		
Drive Resolution: 720000 Drive Counts/Motor Rev	SoftTravelLimitChecking No SoftTravelLimitNegative 0.0 degs		
Conversion Constant: 2000.0 Drive Counts/degs	Set the Scaling Source to Direct Scaling Factor Entry to let the Conversion Constant,		
Postion Unwind: 720000 Drive Counts/Unwind Cycle	Motion Resolution, and other scaling parameters be calculated and entered manual		
Update			
Close Help			
oming	Homing		
General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion Homing Hockup Tune Dynamics Gains Dutput Limits Offset Fault Actions Tag	Categories:		
Mode: Active	Molar Model Mode: Active		
Position: 0.0 degs	- Moor Freeback Position: 0.0 degs Test Market. - Scaling Offset 0.0 degs		
Olfset: 0.0 degs	Polarity Sequence: Switch Autotune Live Switch Conserver Conserver		
Sequence: Switch	E⇒Load Backlash Compliance Artive Home Sentience Group		
Limit Switch - Normally, C Open C Closed	Friction Direction: Direction: Forward Bi-directional		
Direction: Forward Bi-directional 🔽 Torque Level: 0.0 % Continuous Torque	Politic Loop Speed: 360.0 degs/s Velocity Loop Return Speed: 45.0 degs/s		
	- Torque/Current Loop		
Speed: 360.0 degs/s Return Speed: 45.0 degs/s	Planner		
Speed: 360.0 degs/s Return Speed: 45.0 degs/s			

Manual Tune...

Help 1

OK Cancel

OK Cancel Apply Help

Axis Configuration Comparison (Continued)						
Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network					
Homing Mode	Homing Mode					
Mode: Active Position: Active Passive Absolute degs	Mode: Active Position: Passive Active degs					
Active: The desired homing sequence is selected by specifying whether a home limit su trapezoidal velocity profile. Passive: Passive homing is most commonly used to calibrate uncontrolled axes, althout	witch or the encoder marker is used for this axis. Active homing sequences always use the gh it can also be used with controlled axes to create a custom homing sequence.					
Absolute: The absolute homing process establishes the true absolute position of the axis by applying the configured Home Position to the reported position of the absolute feedback device. IMPORTANT: The only valid Home Sequence for an absolute Homing Mode is immediate.	IMPORTANT: For an EtherNet/IP axis, if the motor contains an absolute position-capable feedback device, the homing operation automatically sets the absolute position.					
Homing Sequence	Homing Sequence					
Sequence: Switch Limit Switch Immediate Switch Switch Active Hom Switch-Marker Direction: Torque Level Torque Level-Marker	Sequence: Switch Limit Switch - No Immediate Switch Marker IMPORTANT: EtherNet/IP axes currently do not support the home to torque level sequence. This functionality can be implemented via software in your Studio 5000 project. See the Sample Code Library, filename/ID 055818 – CIP Axis Home To Torque A0I					
Fault Actions	Fault Actions					
General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion Homing Hookup Tune Dynamics Gains Output Limits Offset Feedback Tag Drive Enable Input: Disable Drive V Set Custom Stop Action Set Custom Stop Action Drive Thermal: Disable Drive V Set Custom Stop Action Disable Drive V Feedback: Status Drive V Set Custom Stop Action Destings may require programatically stopping or disable programmatically stopping or disable programmatically stopping or disable programmatically stopping or disable prove Set to user manual for additional information. Hard Overtravel: Disable Drive V Phase Loss: Shutdown V	Categories: Actions to 1 ake Upon Conditions Model Model Provide Standard Action: Parameter Standard Action:					

For an EtherNet/IP axis, see <u>Appendix G – Axis Exceptions on page 61</u> for the fault actions referred to as exception conditions. The number of configurable conditions has been expanded.

OK Cancel Apply Help

Manual Tune...

A Sercos axis is limited to nine fault actions.

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network			
Drive Enable Input Fault Example	Action – Enable Input Deactivated Example			
For Sercos axis, the Drive Enable Input Fault checkbox is on the Drive/Motor tab. Uncheck this box to ignore this fault.	For an EtherNet/IP axis, the Enable Input Deactivated actions (including Ignore) are available on the Actions page.			
Homing Hookup Tune Dynamics Gains C General Motion Planner Units Drive/Motor	Exceptions			
	Exception Condition Action			
Amplifier Catalog Number: 2094-BC01-MP5	Enable Input Deactivated Ignore			
Motor Catalog Number: MPL-B310P-M	Excessive Position Error StopDrive			
Loop Configuration: Position Serve	Excessive Velocity Error StopDrive			
Loop Configuration: Position Serve Drive Resolution: 720000 Drive Enable Input Checking □ Drive Enable Input Fault	Typically the following actions are available. Ignore Alarm			
Otherwise assign the appropriate fault action.	FaultStatusOnly StopPlanner StopDrive			
Drive Enable Input: Disable Drive Drive Thermal: Disable Drive Motor Thermal: Stop Motion Status Only	Shutdown IMPORTANT: The available actions can vary between exception conditions.			

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network			
Real-Time Axis Information	Drives Parameters			
	Categories			
Homing Hookup Tune Dynamics Gains Output Limits Offset Fault Actions Tag	Congeneral Drive Parameters to Controller Mapping			
General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion	Hotor Motor Parameters to be read each cycle: Parameters to be written each cycle:	:		
Amplifier Catalog Number: 2094-BC01-MP5	Motor Feedback Name Value - Name Ve	alue 🔺		
Motor Catalog Number: MPL-B310P-M Change Catalog	Scaling Desting Test Sectors and Desting Test Sectors	0.0		
Motor Catalog Number: MPL-B310P-M Change Catalog	Hookup Tests PositionReference 0.0 VelocityTrim	0.0		
Loop Configuration: Position Servo	Autotune PositionFeedback1 0.0 TorqueTrim	0.0		
Position Servo	Lood PositionError 0.0 VeloctyFeedforwardGain	0.0		
Drive Resolution: 720000 Drive Counts / Motor Rev 💌 Calculate	Backlash PositionintegratorOutput 0.0 CAccelerationFeedforwardGain	0.0		
Drive Lounts / Motor Rev Calculate	Compliance PositionLoopOutput 0.0 PositionLoopBandwidth	0.0		
Drive Enable Input Checking	Finition VelocityFineCommand 0.0 PositionIntegratorBandwidth	0.0		
• Directioneniper checking	Observer VelocityFeedforwardCommand 0.0 VelocityLoopBandwidth	0.0		
Drive Enable Input Fault	Position Loop VelocityReference 0.0 VelocityIntegratorBandwidth	0.0		
	VelocityFeedback 0.0 CodObserverBandwidth	0.0		
Real Time Axis Information	- Acceleration Loop	0.0		
	Torque/Current Loop VelocityIntegratorOutput 0.0 TorqueLinitPositive	0.0		
Attribute 1: Position Command	Planner VelocityLoopOutput 0.0 TorqueLinitNegative	0.0		
	Homma AccelerationFineCommand 0.0 VelocityLowPassFitterBandwidth	0.0 💌		
	Parameter Litt Subura Faulti & &Aame Tag Merval Ture DK Cancel Accel	Help		
OK Cancel Apply Help				
For a Sercos axis, you can select two additional real-time attributes, and default Auto Tag Update attributes. The attributes update at the coarse update rate and are read- only.	An EtherNet/IP axis supports up to 10 read parameters and 10 write param parameters are transferred at the cyclic/coarse rate and are available in the For a detailed list of the parameters, see <u>Appendix D – Drive Parameters C</u> <u>Write List on page 43</u> . IMPORTANT: Each parameter that is selected as a cyclic read/write attribu overhead to the controller/drive data exchange. You must analyze the tract time data on the timing of the axis.	e axis structure. <u>Syclic Read and</u> ute adds		
Update Period and Schedule	Update Period and Schedule			

To obtain real-time axis Information for both Sercos and EtherNet/IP axes, Auto Tag Update must be enabled. The Auto Tag Update Enable/Disable option has been moved to an SSV instruction in Studio 5000 Logix Designer® application, version 24 or later. The default setting for this feature is Enabled, the same as all previous releases of Logix Designer.

•	🐱 Motion Group Properties - MotionGroup					
Axis Assignment Attribute Tag						
	Coarse Update Period: 📃 📑 ms (in 0.5 increments.)					
	Auto Tag Update:	F	Enabled	•		

The Base Update Period is essentially the RPI rate for Ethernet communication between the controller and the motion module, a Unicast connection.

🕞 Motion Group Prope	_ 🗆 🗙	
Axis Assignment Attribu	ute Tag	
Base Update Period:	1.0 ms (in 0.5 increments.)	Axis Schedule
Alternate 1 Update:	5.0 ms	
Alternate 2 Update:	10.0 ms	
General Fault Type:	Non Major Fault	
Timing Model:	Two Cycle	

Integrated Motion on the EtherNet/IP network multiplexing allows for the controller to execute up to three effective update rates for a motion group. Multiplexing also improves EtherNet/IP Integrated Architecture® motion system performance by reducing average Logix controller and EtherNet/IP network utilization.

Base:		Alternate 1:	Alternate 2:
1.0 ms (in 0.5 in	rements)	5.0 💌 ms	10.0 • ms
AXIS2 Enc_Fbk PowerSupply	>>		>>
	<<		<<
stimated Utilization - Me	otion	Actual Utili	zation - Motion
Logix Controller:	5.8 %	Logix Cor	ntroller:
Task I/O Cycle:	8.4 %	Task I/O	Cyde:
Connection I/O Cycle:	23.6 %		
Communications:	4.7 %		
Ethernet Media:	3.3 %		
Motion Connections Using	:	Ethernet Port on Controller	•

Axis Commissioning

This section compares how to commission the axis for Integrated Motion on Sercos and EtherNet/IP systems.

Axis Commissioning Comparison

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion Homing Hookup Tune Dynamics Gains Output Limits Dfiset Fault Actions Tag Test Increment: Image: degs Test Marker Test Marker Test Marker Test Marker Drive Polarity: Positive Test Eeedback Test Command & Feedback Image: dash motion. Modifying polarity after executing Test Test Command & Feedback Image: dash motion. Modifying polarity after executing Test Command & Feedback test may cause axis runaway condition.	Handbard Test Addresses Ad
DK Cancel Apply Help	

The hookup tests interfaces between the Sercos and EtherNet/IP axes are similar.

The hookup tests are used to verify the proper connection of the feedback device, and to determine motor and feedback polarity.

IMPORTANT: The Hookup Tests for both Sercos and EtherNet/IP axes can be executed while the controller is in Program Mode.

N/A	Commutation Test
IMPORTANT: For a Sercos axis, the commutation test feature is not supported.	IMPORTANT: Check your firmware release notes for supported features.

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
Drive Polarity	Polarity
For a Sercos axis, the Drive Polarity is updated based on the results of the hookup tests. The Drive Polarity setting is on the Hookup tab.	For an EtherNet/IP axis, the Motion Polarity, Motor Polarity, and Feedback Polarity are updated based on the results of the hookup tests.
General Motion Planner Units Dr Homing Hookup Tune Dynamics Test Increment: SEOD degs Drive Polarity: Positive Image: Comparison of the second sec	General Concernent for exclusion. Sector Strategies Normal Invested House Polarity Normal Invested House Pol
Tune	Autotune
General Motion Planner Units Dirve/Motor Motor Feedback Aux Feedback Conversion Homing Hookup Tune Dynamice Gains Output Linnts Offret Fault Action Tag Travel Linnt: 50000 degs Statt Tuning DANGER: Starting tuning procedure with controller Speed: 7200.0 % Rated Torque/Force: Inholde Pangers: Starting tuning procedure with controller Direction: Forward Uni-directional T Torque/Force: Inholde Pangers: Starting tuning procedure with controller Damping Factor: 0.0 % Rated Fiction Compensation Program Stan Mode Unre Position Enror Integrator Velocity Enror Integrator Fiction Compensation Velocity Feedforward Forque Offset Velocity Feedforward Acceleration Feedforward Forque Offset Uutput Filter Uutput Filter	Caregories Genedication of the Control Loop by Messuring Lood Characteristics Genedication of Feddows Specific at a standard at a

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network						
une Settings or a Sercos axis, the Application Type pull-down selection does not exist. Instead, you elect the individual tuning parameters that are appropriate for the applications.	Application Type Application Type defines the servo loop tuning parameters that are used. These combinations determine how the gains are calculated, which can eliminate the need to tune the system manually.						
Tune Position Error Integrator Velocity Error Integrator Velocity Feedforward Coceleration Feedforward Torque Offset Output Filter		- F	Loop Response: T nad P	asic ustom asic racking oint-to-Point onstant Speed			
	Application Type	Крі	Kvi	ihold	Kvff	Kaff	TorqLPF
	Custom	-	-	-	-	-	-
	Basic (version 20 and later)	No	No	No	Yes	No	Yes
	Basic (version 19 and earlier)	No	No	No	No	No	_
	Tracking	No	Yes	No	Yes	Yes	Yes
	Point-to-Point	Yes	No	Yes	No	No	Yes
	Constant Speed	No	Yes	No	Yes	No	Yes
	Custom: Advanced application. Basic: Default sett configurations. Tracking: Intende un/winding, flying Point-to-Point: In minimal overshood Constant Speed: state speed. For ex	ip. Recomr d for appli shear, and ntended fo . For exam Intended f	nended as a cations that I web contro r applicatio ple, pick-n- or applicati	a starting po require min of application ns that requipace, packat ons that reconstruction	oint for or o nimal follov ons. Jire precise Iging, and ci quire minim	ut-of-the-b ving error. F position mo ut-to-lengt al velocity e	ox for example, oves with h applicatior

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network		
Damping Factor	Loop Response		
For a Sercos axis, the Loop Response pull-down selection does not exist. Instead you enter the desired damping factor, which impacts the gain calculations.	Loop Response: Load Coupling: Low Medium High Low Medium		
Travel Limit:36000.0degsSpeed:7200.0degs/sTorque/Force:100.0% RatedDirection:Forward Uni-directional TDamping Factor:Itel	Medium: Damping factor = 1.0 Medium is the default setting. Recommended as a starting point for out-of-the-box configurations. High: Damping factor = 0.8		
	IMPORTANT: The damping factor is used to calculate the maximum position and velocity servo bandwidth values. In general, the damping factor controls the dynamic response of the drive. When the tuning gains are calculated by using a small damping factor, for example 0.8, a step response test tends to demonstrate an under-damped behavior with velocity overshoot. However, when the damping factor is increased to 1.0, the step response tends to exhibit little to no overshoot and typically works well for most applications.		
N/A	Load Coupling		
For a Sercos axis, the Load Coupling pull-down selection feature is not supported.	Load Rigid Coupling: Figid Customize Compliant		
Tune Profile	Tune Profile		
Travel Limit:SOUDCdegsSpeed:7200.0degs/sTorque/Force:100.0& RatedDirection:Forward Uni-directional T	 ✓ Measure Inertia using Tune Profile ✓ Motor with Load ✓ Uncoupled Motor Travel 36000.0 ✓ degs Speed: 7200.0 ✓ degs/s Torque: 100.0 ✓ % Rated Direction: Forward Uni-directional 		
For a Sercos axis, you can adjust the tune profile according to the application limitations. The tune profile is used to measure the system inertia. This measurement requires the motor to move the connected load to assess the inertia.	For an EtherNet/IP axis, you can adjust the tune profile, and the tune profile can be used to measure the uncoupled motor inertia separate from the load. In cases where the system inertia has been established, the inertia test can also be disabled based on the selection of the Measure Inertia by using Tune Profile checkbox.		
	This allows the loop gains to be calculated each time the Perform Tune button is clicked and eliminates the need to re-run the inertia test during successive tuning iterations.		

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network			
Tune Results	Tune Results			
Tune Results X Position Loop Bandwidth: 21202887 Hertz Load Inertia Ratio: 1.5115328 Load Inertia/Motor Inertia DANGER: The Bandwidth determined by the tune process is the maximum bandwidth. Increasing the bandwidth may cause loop instability. OK Cancel Help	Perform Tune DANGER: Starting tuning procedure with controller in Program or Run Mode causes aixs motion. Tune Statu: Success Loop Parameters Tuned Name Vance Current Tuned Name Current Tuned PositionInopBandwidth 19.469685 19.479559 PostionIntegratorBand 0.0 0.0 * VelocityLoopBandwidth 77.87874 77.918236 E Advanced Compensation Load Parameters Tuned Name Current Tuned MaximumAcceleration 138079.39 138079.39 MaximumDeceleration 138079.39 138079.39 SystemInertia 0.53892267 0.53892267 Accept Tuned Values			
Upon completion of the autotune, a Sercos axis displays the Position Loop Bandwidth and measured Load Inertia Ratio. Click OK to accept the tune results.	For an EtherNet/IP axis, a more encompassing list of both loop and load parameters are displayed. The '*' next to a parameter indicates the values that are updated. Click Accept Tuned Values to accept these tune results.			
Manual Tuning – Manual Adjustment and Motion Direct Commands	Manual Tuning			
C Axis Properties - AX_SERCOS General Motion Planner Units Direz/Motor Motion Bains Output Proteinon Gains Manual Adjust Propertional State State Propertional State Proportional State Proportional <t< td=""><td>Manual funing Rest Solution (sing) (sing) So</td></t<>	Manual funing Rest Solution (sing) (sing) So			
For a Sercos axis, the Manual Adjust interface adjusts only the tuning related parameters.	The Manual Tuning interface consolidates many of the commonly used features that are used during the manual tuning process.			

Integrated Motion o	n Sercos Interface		Integrated Motion on the EtherN	et/IP Network
Motion Direct Comm	ands		Motion Generator	
Commands:	Motion Axis Move		Motion Generator	More Commands
	Axis: AX_SERCO Label Mave Type Position Speed Speed Units Accel Rate Accel Inits Decel Rate Decel Jerk Decel	Operand Absolute 0 0 Units per sec 100 Units per sec2 100 Units per sec2 100 2 of Time	MSC MAS MAH MAH MAH MAS MAS MAFR DANGER: Executing moti Program or Run Mode may Axis State: Running Axis State: Running Axis State: No Faults	Execute
Motion Group Shutdown For a Sercos axis, you ty of the drive during the	pically launch the Motior	Execute Close Help	As a part of the manual tuning interfa access to several of the most commor	ace, the Motion Generator feature includes direct ly used motion direct commands. The direct access in Direct Commands interface to complete the

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
Gains	Manual Tune – Loop Gains
Dynamics Gains Output Limits Offset Proportional: 151193418 + 1/s Integral: 0.0 - + 1/ms-s Velocity Gains - + 1/s Velocity: 0.0 - + 2 Integral: 0.0 - + 1/ms-s Velocity: 0.0 - + 2 Acceleration: 0.0 - + 1/ms-s - </td <td>Manual Tuning Reset System 19.469685 Bandwidth: 19.469685 System 0.0 El Tuning Configuration 0.8 Position Loop 0.0 Loop Bandwidth: 0.0 Integrator Bandwidth: 0.0 Uoop Bandwidth: 0.0 Velocity Loop </td>	Manual Tuning Reset System 19.469685 Bandwidth: 19.469685 System 0.0 El Tuning Configuration 0.8 Position Loop 0.0 Loop Bandwidth: 0.0 Integrator Bandwidth: 0.0 Uoop Bandwidth: 0.0 Velocity Loop
For a Sercos axis, the gains can only be adjusted individually via the Manual Adjust interface.	The Manual luning interface offers two options to adjust the loop gains. Each parameter can be adjusted on an individual basis, or as an entire set of gains that are adjusted proportionally with a parameter. Adjustments to the System Bandwidth or System Damping recalculates the gains accordingly. Manual Tuning Reset System 0.0 50.0 Bandwidth: 11.469685 0.0 System 0.0 50.0 Bandwidth: 1.5 50.0 Important: For an EtherNet/IP axis, the loop gains (including System Bandwidth) are now represented in Hertz.
Offset	Additional Tune
Dynamics Gains Output Limits Offset Friction Compensation Image: Compensation Image: Compensation Image: Compensation Backlash Compensation Image: Compensation Image: Compensation Image: Compensation Backlash Compensation Image: Compensation Image: Compensation Image: Compensation Reversal Offset: Image: Compensation Image: Compensation Image: Compensation Reversal Offset: Image: Compensation Image: Compensation Image: Compensation Velocity Offset: Image: Compensation Image: Compensation Image: Compensation Velocity Offset: Image: Compensation Image: Compensation Image: Compensation Velocity Offset: Image: Compensation Image: Compensation Image: Compensation Torque/Force Offset: Image: Compensation Image: Compensation Image: Compensation	Feedforward Compensation Filters Limits Planner System Inertia: 0.53892267
For a Sercos axis, the Manual Adjust interface provides access to the Dynamics, Gains, Output, Limits, and Offset parameters.	The Manual Tuning interface provides access to additional loop and load parameters that are often adjusted during the tuning process.

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network			
General Motion Planner Units Dirver/Motor Motor Feedback Aux Feedback Conversion Homing Hookup Tune Dynamics Gains Output Limits Offset Fault Actions Tag Motor Inertia: 0.000044 Kg·m²2 Manual Adjust Load Inertia Ratio: Imits Load Inertia/Motor Inertia Torque/Force Scaling 1.21850506e.004 % Rated/(degs/a²2) System Acceleration: 820677.75 (degs/a²2) at 100% Rated Enable Notch Filter Frequency 0.0 Hetz Motor Filter Frequency 0.0 Hetz	Load Categorie: General Model			
Low-pass Durput Filter Bendwidth: 0.0 Hertz OK Cancel Apply Help Help	- Action Torque Offset 0.0 % Raied - Parameter List - Parameter List - Parameter List - Fault & Alama - OK Cancel - Fault & Alama - OK - Cancel			
System Acceleration: 820677.75 (degs/s^2) at 100% Rated	System Inertia: 0.53892267 % Rated/(Rev/s^2) System Acceleration: 185.55537 Rev/s^2 @100 % Rated For an EtherNet/IP axis, the Torque/Force Scaling is referred as System Inertia.			
General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conve Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conve Friction Compensation 0 2 Window: 0.0 degs Backlash Compensation 0 degs Stabilization Window: 0.0 degs Velocity Offset: 0 degs Torque/Force Offset: 0 2 For a Sercos axis, Torque/Force Offset is on the Offset tab. Stabilization	Active Load Compensation Torque Offset: 0.0 % Rated			

Additional Axis Property Equivalents

This section compares the additional axis property equivalents for Integrated Motion on Sercos and EtherNet/IP systems.

Additional Axis Property Equivalents Comparison

Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
---------------------------------------	--

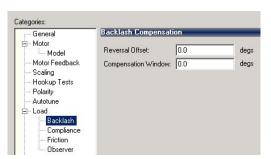
Torgue Control Compensation Features

A number of important compensation features are included in the torque control loop to help overcome physical effects that are typical in many mechanical systems. IMPORTANT: For complete details on tuning, see the Motion System Tuning Application Technique, publication MOTION-AT005, for both Sercos and Integrated Motion on the EtherNet/IP network.

Offset – Backlash Compensation

General Motion Pla	anner Units	Drive/Motor	Motor Feedb	ack Aux	Feedback Conv
Homing Hookup	Tune Dynami	s Gains	Output Limit	s Offset	Fault Actions
Friction Compensation					
Friction Compensation:	0.0	%			Manual Adjust
Window:	0.0	degs			
Backlash Compensation					
Reversal Offset:	0.0	degs			
Stabilization Window:	0.0	degs			
Velocity Offset:	0.0	degs/s			
Torque/Force Offset:	0.0	%			

Backlash Compensation



Use Backlash Compensation to stabilize the control loop for applications with high loadinertia ratios and mechanical backlash.

Compliance Compensation General Motion Planner Units Drive/Motor Motor Feedback Adaptive Tuning Configura Homing Hookup Tune Dynamics Gains Output Limits Of 0.000044 Motor Inertia: Kg·m² 1.5115328 Load Inertia/Motor Inertia Load Inertia Ratio: 1.21850506e-004 % Rated/(degs/s^2) Torque/Force Scaling: Adaptive Tuning Configural orque Notch Filter High Frequency Lim 820677.75 (degs/s^2) at 100% Rated System Acceleration: Torque Notch Filter Low Frequency Limit: 296.3398 Enable Notch Filter Frequency 1000.0 Notch Filter Frequency: Hertz A new feature available in Kinetix 5500 and Kinetix 5700 drives is Adaptive Tuning, which Enable Low-pass Output Filter includes the tracking notch filter and gain stabilization features. The Adaptive Tuning Low-pass Output Filter Bandwidth: 1000.0 Hertz features operate while the axis runs to mitigate high frequency resonances and help maintain stability during operation. **IMPORTANT:** The Lead-Lag filter in EtherNet/IP axes can be used in the lead configuration to boost velocity or acceleration loop bandwidth. The filter can also be used in the lag configuration to compensate for the frequency gain boost associated with compliant load mechanics.

Output – Low Pass and Notch Filters

Integrated Motion on Sercos Interface				Integrated Motion on the EtherNet/IP Network								
Offset – Friction	Compensat	tion					Frict	ion Compensation				
General Motion Plan Hookup Tune	ner Units Dynamics	Drive/Motor Gains	Motor Feed			nversion Homing Actions Tag		Categories:				
Friction Compensation	Dynamics	Gains	Output	LITING	1 auit	Actions ray		General	Friction Compensation	6		
Friction Compensation:	0.0	%			Manua	I Adjust		Motor Model	Sliding Friction Comp	pensation:	0.0	% Rated
Window.	0.0	degs						- Motor Feedback - Scaling	Compensation Wind	low:	0.0	degs
Backlash Compensation								— Hookup Tests — Polarity				
Reversal Offset Stabilization Window:	0.0	degs						- Autotune				
Clabilization William.		uega						Backlash <u>Compli</u> ance				
Velocity Offset Torque/Force Offset	0.0	degs/s										
Load Observer							overc minir		lies a compensating dir ction in the mechanical ontrol effort required.			
Load observer is no observer can be co	ot available tl	nrough ti h messa	he Sercos . ge instruc	Axis Prope tions.	erties menu	ı. However, load		Categories: General Motor Motor Feedback. Scaling Hookup Tests Polarity Autoture Load Backlash Compliance Friction	Load Observer Configuration: Bandwidth: Integrator Bandwidth:	78.09877	Hertz	
							load	on the motor and com	is a control loop inside t opensates for the load. Iloaded and relatively e	This featu	ire allows the cor	

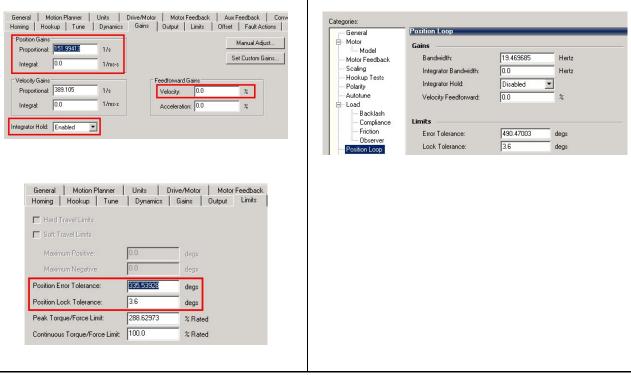
Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network

Loop Gains and Limits

The loop gains between a Sercos and EtherNet/IP axis are similar; however, a few notable differences do exist.

Position Gains and Limits





Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network
Velocity Gains and Limits	Velocity Loop
General Motion Planner Units Dive/Motor Motor Feedback Aux Feedback Conve Position Gains Tune Dynamics Gains Output Limits Offset Fault Actions I Position Gains 0.0 1/ms-s Feedforward Gains Set Custom Gains Feedforward Gains Velocity: 0.0 2 Velocity Gains 0.0 1/ms-s Feedforward Gains Velocity: 0.0 2 Integrator Hold Enabled Integrator Hold Enabled 0.0 2 2 Integrator Hold Enabled Integrator Hold Enabled Set Custom Limits. Griss Integrator Hold Enabled Initias Offset Fault Actions Manual Adjust Set Custom Limits. Manual Adjust Set Custom Limits Set Custom Limits Set Custom Limits Velocity.LimitBootar 11800000.0 degs/s "2 REAL Velocity.LimitBootar Velocity.LimitBootar 11800000.0 degs/s "2 REAL Velocity.LimitBootar Acceleration Velocity.Vimethold 0.0 degs/s "2 <th>Categories: General Model Bandwidth: 0.0 Hertz Moder Feedback Integrator Bandwidth: 0.0 Hertz Moder Feedback Integrator Bandwidth: 0.0 Keedback Foolup Test Compliance Integrator Hold: Disabled Keedback Position Loop Compliance Friction Goodowed Keedback Error Tolerance: 2000.0 degs/s Acceleration Loop Cock Tolerance: 300.0 degs/s degs/s Kelocity Limit Negative: Goodowed degs/s Important: For an EtherNet/IP axis, the Bipolar Velocity Limit does not exist. The Velocity Limit Positive and Velocity Limit Negative limits must be set independently.</th>	Categories: General Model Bandwidth: 0.0 Hertz Moder Feedback Integrator Bandwidth: 0.0 Hertz Moder Feedback Integrator Bandwidth: 0.0 Keedback Foolup Test Compliance Integrator Hold: Disabled Keedback Position Loop Compliance Friction Goodowed Keedback Error Tolerance: 2000.0 degs/s Acceleration Loop Cock Tolerance: 300.0 degs/s degs/s Kelocity Limit Negative: Goodowed degs/s Important: For an EtherNet/IP axis, the Bipolar Velocity Limit does not exist. The Velocity Limit Positive and Velocity Limit Negative limits must be set independently.
Acceleration Limits	Acceleration Loop
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Integrated Motion on Sercos Interface	Integrated Motion on the EtherNet/IP Network				
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Reversal Difset: U/U degs Stabilization Window: 0.0 degs Velocity/IntRygative -6000.0 degs/s Velocity/LockTolerance -300.0 degs/s Velocity/LoopBand/width -77.87874 Hz Velocity/LoopBand/width 0.0 Hz Velocity/LoopBant/weidanith 0.0 %	Reversal Diffset: UU degs Stabilization Window: 0.0 degs Velocity.LimitNegative 0.00000 Velocity.UnitPositive 0.000000 Velocity.LimitNegative 0.000000 Velocity.UnitPositive 0.00000000000000000000000000000000000	
Velocity/integrational Obsailed Stabilization Window: 0.0 degs Velocity/integrational Obsailed Velocity/integrational Velocity/integrational Velocity/integrational Obsailed Velocity/integrational 0.0 Ka Velocity/integrational Obsailed	Stabilization Window: 0.0 degs Velocity Uffset: 0.0 degs/s Velocity Uffset: 0.0 degs/s Torque/Force Offset: 0.0 %	
VelocityLinitPositive 60000.0 degs/s VelocityLinitPositive 0.0 degs/s VelocityLockTolerance 300.0 degs/s VelocityLockTolerance 77.874 Hz Torque/Force Diffset: 0.0 %	Velocity/LinitPositive 60000 Velocity/LinitPositive 60000 Velocity/LockTolerance 300 Velocity/VegativeFeedforwardGain 000 <td>1000 - 100 -</td>	1000 - 100 -
Velocity Offset: 0.0 degs/s VelocityLockTolerance 300.0 degs/s Torque/Force Offset: 0.0 % VelocityLockTolerance 0.0 %	Velocity Olfset: 0.0 degs/s YelocityLockTolerance 300 Torque/Force Olfset: 0.0 % VelocityLocgBandwidth 77.878 VelocityLockTolerance VelocityLocgBandwidth 0 0 VelocityLocgBandwidth 0 0	
Velocity Offset: 0.0 degs/s 77.67674 Hz Torque/Force Offset: 0.0 % VelocityLoxPBand/width 0.0 Hz	Velocity Offset: 0.0 degs/s 77.878 Torque/Force Offset: 0.0 % VelocityLoopBandwidth 77.878 VelocityLoopBandwidth C VelocityLoopBandwidth 00 VelocityVegevsFeetforwardGain C VelocityVegevsFeetforwardGain 00	
VelocityLowPassFilterBandwidth 0.0 Hz VolucityNegativeFeedforwardGain 0.0 %	Torque/Force Offset: 0.0 % VelocityLowPassFitterBandwidth VelocityLowPassFitterBandwidth	
	VelocityNegativeFeedTorWardGain	
VelocityOffset 0.0 degs/s		
	VelocityOffset) degs/s

Diagnostics

This section highlights some of the diagnostic capabilities unique to Integrated Motion on the EtherNet/IP networks.

Axis Structure

The AXIS_CIP_DRIVE axis structure is different as compared to the AXIS_SERVO_DRIVE axis structure that is the required axis structure for Sercos-based servo drives. Some of the tags match or have similar functions, while additional tags are included in the AXIS_CIP_DRIVE axis structure:

- The AXIS_SERVO_DRIVE axis structure contains 209 tags.
- The AXIS_CIP_DRIVE axis structure contains 468 tags.

One reason for the increase in tags is the increase in the number of faults, and also the addition of alarm tags. For example, there is a series of basic fault bits that now exist under the Axis Fault word. Basic Axis Fault Tags

Name	A 82	Value 🗧	Force Mask 🛛 🗲	Style	Data Type
-AX_Ethernet] {}	{}		AXIS_CIP_DRIVE
∃-AX_Ethernet.AxisFault		16#0000_0001		Hex	DINT
-AX_Ethernet.PhysicalAxisFault		1		Decimal	BOOL
-AX_Ethernet.ModuleFault		0		Decimal	BOOL
-AX_Ethernet.ConfigFault		0		Decimal	BOOL
-AX_Ethernet.GroupFault		0		Decimal	BOOL
-AX_Ethernet.MotionFault		0		Decimal	BOOL
-AX_Ethernet.GuardFault		0		Decimal	BOOL
-AX_Ethernet.InitializationFault		0		Decimal	BOOL
AX Ethernet.APRFault		0		Decimal	BOOL

When a fault condition is detected, the associated fault type bit is set. This action provides a high-level view to determine which fault group is active. Also, the fault types are broken down into individual fault and alarm status bits. **Fault and Alarm Status Bits**

Name === 🛆 Val	ue 🗲	Force Mask 🛛 🗧	Style	Data Type
	16#0000_0000		Hex	DINT
AX_Ethernet.ControlSyncFault	0		Decimal	BOOL
AX_Ethernet.ModuleSyncFault	0		Decimal	BOOL
AX_Ethernet.TimerEventFault Faults	0		Decimal	BOOL
AX_Ethernet.ModuleHardwareFault	0		Decimal	BOOL
-AX_Ethernet.ModuleConnFault	0		Decimal	BOOL
—AX_Ethernet.ConnFormatFault	0		Decimal	BOOL
AX_Ethernet.LocalModeFault	0		Decimal	BOOL
-AX_Ethernet.CPUWatchdogFault	0		Decimal	BOOL
-AX_Ethernet.ClockJitterFault	0		Decimal	BOOL
-AX_Ethernet.CyclicReadFault	0		Decimal	BOOL
-AX_Ethernet.CyclicWriteFault	0		Decimal	BOOL
—AX_Ethernet.ClockSkewFault	0		Decimal	BOOL
AX_Ethernet.ControlConnFault	0		Decimal	BOOL
-AX_Ethernet.ControlClockSyncFault	0		Decimal	BOOL
-AX_Ethernet.ModuleClockSyncFault	0		Decimal	BOOL
-AX_Ethernet.LogicWatchdogFault	0		Decimal	BOOL
-AX_Ethernet.DuplicateAddressFault	0		Decimal	BOOL
⊕-AX_Ethernet.ModuleAlarmStatus	16#0000_0000		Hex	DINT
-AX_Ethernet.ControlSyncAlarm	0		Decimal	BOOL
AX_Ethernet.ModuleSyncAlarm	0		Decimal	BOOL
AX_Ethernet.TimerEventAlarm Alarms	0		Decimal	BOOL
AX_Ethernet.CPUOverloadAlarm	0		Decimal	BOOL
—AX_Ethernet.ClockJitterAlarm	0		Decimal	BOOL
—AX_Ethernet.OutOfRangeAlarm	0		Decimal	BOOL
—AX_Ethernet.ClockSkewAlarm	0		Decimal	BOOL
-AX_Ethernet.ClockSyncAlarm	0		Decimal	BOOL
-AX_Ethernet.NodeAddressAlarm	0		Decimal	BOOL

Faults and Alarms Log

The Faults and Alarms Log displays the status of the faults and alarms that the controller logs for each individual axis.

Gronordi	Faults	and Ala	rms Log				
- Motor Model	D	ate/Time	Δ.	Source	Condition	Action	End State
Motor Feedback	2 3/	22/2011	16:18:05.906	Faults Cleared	Fault Log Reset	No Action	No Action
Scaling				No Alarms	Alarm Log Reset	Alarm Off	
- Hookup Tests	1		16:18:10.74	Faults Cleared	Connection Reset	No Action	No Action
Polarity	1 3/	22/2011	16:18:26.242	Axis Fault	Excessive Velocity Error	Immediate Stop (Co	Disabled
Autotune							
- Load							
Backlash							
Compliance							
Friction							
Observer							
Position Loop							
Velocity Loop							
- Acceleration Loop							
- Torque/Current Loop							
Planner							
Homing							
- Actions							
- Drive Parameters							
Parameter List							
Status							
Faults & Alarms	_						
- Tag	Show	🔽 Fau	ults 🔽 Alar	rms 🔽 Resets			Clear L
anual Tune					OK	Cancel App	V Held

The display is read-only except for the ability to clear each of the logs (Faults, Alarms, and Resets) independently. For example, the Alarms log can be cleared while maintaining the Faults and Resets logs. When online, select the Show checkboxes to toggle between show and hide for the specified group of entries, and click Clear Log to clear the selected log.

IMPORTANT	Only the last 25 faults and alarms are displayed.
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High-level Feature Comparison

This section compares features of the selected Kinetix drives.

Kinetix Product Comparison

Topics	Details	Kinetix 6000/6200 Drives	Kinetix 6500 Drives	Kinetix 5500 Drives	Kinetix 5700 Drives
Key Features	Key features	 Common bus for multi-axis applications Sercos topology 	 Integrated Motion on an EtherNet/IP network Common bus and modular design 	 Small footprint with optimized density Drive power ratings optimized to match VP low inertia motor family Innovative common AC/DC bus eliminates hardware, reduces installation time, and lowers costs Integrated Motion on an EtherNet/IP network 	 Small footprint with optimized power density for high axis applications Innovative and quick install DC bus connection eliminates hardware, reduces installation time, and lowers costs. Higher DC bus current capacity than the Kinetix 5500 drives. Integrated Motion on an EtherNet/IP network
	AC input voltage	 195264V AC, 3-phase 324528V AC, 3-phase 	324528V AC, 3-phase	 195264V AC, single-phase (H003H015) 195264V AC, 3-phase 324528V AC, 3-phase 	324528V AC, 3-phase
	Control power input voltage	95264V rms, single-phase	95264V rms, single-phase	24V DC	24V DC
	Output power rating (kW) 460V	1.822	1.822	0.614.6	1.660
	Converter rating (kW) 460V	645 kW	645 kW	0.614.9	7.046
Ratings	Continuous output current (A rms)	2.834.6	2.834.6	1.023A	3.5120 A
	Peak output current (A rms)	7.069.2	7.069.2	2.557.5	8.5A226 A
	Peak/Continuous ratio	250% BM05-200%	250% BM05-200%	250%	250%
	Ambient temperature limit	050 °C (32122 °F)	050 °C (32122 °F)	050 °C (32122 °F)	050 °C (32122 °F)
	EMC filters	External	External	External	External
	Standards	C-UL, CE, CSA, TÜV, C-Tick, KC	C-UL, CE, CSA, TÜV, C-Tick, KC, ODVA	C-UL, CE, CSA, TÜV, C-Tick, KC, Odva, Osha	C-UL, CE, CSA, TÜV, C-Tick, KC, ODVA, OSHA, RoHS
Drive configurations	Bus configurations that are supported	Common bus/shared DC	Common bus/shared DC	 Standalone/single-axis Shared AC/DC Shared DC Hybrid 	 Shared AC/DC Shared DC
Bus-sharing	Maximum number of axes in a bus-sharing group	18 axes (power rail dependent)	18 axes (power rail dependent)	18 axes	>16 axes per group, limited by max cable length or precharge capability
Axis instance	Axis instance support	 One full axis instance support 1/2 axis instance support (feedback only) 	 One full axis instance support 1/2 axis instance support (feedback only) 	One axis instance support	 Two full axes instance support 2-1/2 axes instance support (feedback only)
Network	Network compatibility	Sercos interface	EtherNet/IP	EtherNet/IP	EtherNet/IP
Controllers	Controller comparability	L4x, L6x, L7x	L2, L36ERM, L7 <i>x</i> , L8	L2, L36ERM, L7x, L8	L2, L36ERM, L7x, L8
Programming	RSLogix [™] software	RSLogix software Version 17 or later	RSLogix software Version 18 or later	Logix Designer application Version 21 or later	Logix Designer application Version 26 or later

Kinetix Product Comparison (Continued)

Topics	Details	Kinetix 6000/6200 Drives	Kinetix 6500 Drives	Kinetix 5500 Drives	Kinetix 5700 Drives
	Height, mm (in.) ⁽¹⁾	287 (11.3)	285 (11.2)	170 (6.7)	300 (11.8)
Dimensions	Width, mm (in.) ⁽¹⁾	125 (5.0)	125 (5.0)	50 (2.0)	55 (2.2)
Dimensions	Depth, mm (in.) ⁽¹⁾	249 (9.8)	290 (11.4)	200 (7.9)	200 (7.9)
	Volume, m ³ (ft ³)	0.089 (3.143)	0.103 (3.637)	0.017 (0.600)	0.033 (1.165)
Safety	Safety rating	 SIL 3 PLe Safe Torque Off Safe Speed Monitoring (only with K6200) 	 SIL 3 PLe Safe Torque Off Safe Speed Monitoring 	 SIL 3, PLe rated network Safe Torque Off with CIP safety SIL 2, PLd rated hardwired Safe Torque Off 	 SIL 3, PLe rated network Safe Torque Off with CIP safety SIL3, PLe rated hardwired Safe Torque Off
Digital inputs	Digital input support	 Four inputs Enable, home, overtravel (+/-) High-speed registration (2/axis) 	 Four inputs Enable, home, overtravel (+/-) High-speed registration (2/axis) 	 Two configurable digital inputs Home/Registration 1 (dual function) High-speed registration 	Four configurable digital inputs Home/Registration 1 Registration 2 Over travel Enable/Regen OK
Motor support	Motor and actuator compatibility	 MP-Series[™] low and medium inertia motors MP-Series food grade, stainless steel motors MP-Series linear stages and MPAR- Series linear actuators LDL-Series[™] and LDC-Series[™] linear motors RDD-Series[™] direct drive motors Kinetix 6000 IDM system 	 MP-Series low and medium inertia motors MP-Series food grade, stainless steel motors MP-Series linear stages and MPAR-Series linear actuators LDL-Series and LDC-Series linear motors RDD-Series direct drive motors 	 VP low inertia servo motor with 2198-H2DCK DSL feedback converter kit MP-Series low and medium inertia motors MP-Series food grade, stainless steel motors MP-Series ball screw linear stages and linear actuators 3rd-party induction motors 	 VP low inertia servo motor with 2198-H2DCK DSL feedback converter kit MP-Series low and medium inertia motors MP-Series food grade, stainless steel motors MP-Series ball screw linear stages and linear actuators 3rd-party induction motors
	Cable length (total), m (ft.)	240 (787.4)	240 (787.4)	250 (820.2)	400 (1 312.3) (Max motor cable length per bus power-sharing group)
	Cable length (max/axis), m (ft.)	90 (295.3)	90 (295.3)	50 (164.0)	90 (295.3)
Motor feedback support	Motor feedback	Kinetix 6000 drive Stegmann Hiperface Generic TTL Incremental Generic Sine/Cosine Incremental Heidenhain EnDat 2.1 ⁽²⁾ Heindenhain EnDat 2.2 ⁽²⁾ Resolver ⁽³⁾ Kinetix 6200 drive Stegmann Hiperface Generic TTL Incremental Generic TTL Incremental Generic Sine/Cosine Incremental Tamagawa 17 bit serial Heidenhain EnDat 2.1 Heidenhain EnDat 2.2	 Stegmann Hiperface Generic TTL Incremental Generic Sine/Cosine Incremental Tamagawa 17 bit serial Heidenhain EnDat 2.1 Heindenhain EnDat 2.2 	• Stegmann Hiperface DSL • Stegmann Hiperface ⁽⁴⁾	DSL feedback port • Stegmann Hiperface DSL • Stegmann Hiperface ⁽⁴⁾ Universal feedback port • Stegmann Hiperface • Generic TTL Incremental • Generic Sine/Cosine Incremental • Heidenhain EnDat 2.1 • Heindenhain EnDat 2.2
Auxiliary feedback support	Aux feedback	Kinetix 6000 drives • Stegmann Hiperface • Generic TTL Incremental • Generic Sine/Cosine Incremental • Heidenhain EnDat 2.1(2) • Heindenhain EnDat 2.2(2) Kinetix 6200 drives • Stegmann Hiperface • Generic TTL Incremental • Generic Sine/Cosine Incremental • Heidenhain EnDat 2.1 • Heindenhain EnDat 2.2	 Stegmann Hiperface Generic TTL Incremental Generic Sine/Cosine Incremental Heidenhain EnDat 2.1 Heindenhain EnDat 2.2 	Not applicable	DSL feedback port StegmannHiperface DSL Stegmann Hiperface(4) Universal feedback port Stegmann Hiperface Generic TTL Incremental Generic Sine/Cosine Incremental Heidenhain EnDat 2.1 Heindenhain EnDat 2.2

Kinetix Product Comparison (Continued)

Topics	Details	Kinetix 6000/6200 Drives	Kinetix 6500 Drives	Kinetix 5500 Drives	Kinetix 5700 Drives
	Surface-mounted permanent magnet motor (SPM)	Yes	Yes	Yes	Yes
Motor control	Induction motor (IM)	No	No	Yes	Yes
	Control type	No induction motor control	No induction motor control	 Induction motor control V/Hz Open-loop vector control 	 Induction motor control V/Hz Open- and closed-loop vector control
	Position loop update	125 µs	125 µs	125 µs	125 µs
	Velocity loop update	125 µs	125 µs	125 µs	125 µs
	Current loop update	125 µs	125 µs	125 µs	125 µs
	Pulse width modulation (PWM) frequency	 8 kHz – 01 modules 4 kHz – 02 modules 	 8 kHz – 01 modules 4 kHz – 02 modules 	• 8 kHz – H003 • 4 kHz	4 kHz
Performance	Current loop bandwidth	1300 Hz	1300 Hz	1000 Hz	1000 Hz
	Velocity loop bandwidth	500 Hz	500 Hz	400 Hz	400 Hz
	Dual loop control	Yes	Yes	No	Yes
	Load observer	Yes (with a message [MSG] instruction)	Yes	Yes	Yes
	Tracking notch	No	No	Yes	Yes
	Resistive brake modules	Yes	Yes	No	No
	Shunt modules	Yes	Yes	No	Yes
Shunting	Dynamic brake modules	No	No	No	Yes (through side car or capacitor module)
	External shunt resistors	Yes (through shunt module BSP2)	Yes (through shunt module BSP2)	Yes	Yes
	Shunt capability	Decentralized shunt (every drive has a shunt)	Decentralized shunt (every drive has a shunt)	Decentralized shunt (every drive has a shunt)	Centralized shunt (only power supplies)
Power supplies	Converter capability	 Shared DC with standalone non-CIP compliant active front end (AFE) (regenerative power supply [RPS] units) Centralized converter No parallel converter capability 	 Shared DC with standalone non-CIP compliant active front end (AFE) (regenerative power supply [RPS] units) Centralized converter No parallel converter capability 	 Integral converter in each drive Allows parallel converters for increased kW rating 	 Shared DC with standalone non-CIP compliant active front end (AFE) (regenerative power supply [RPS] units) CIP-compliant DC-bus power supply power supplies Allows parallel converters for increased kW rating

(1)

Dimensions that are shown are for the smallest frame. Requires the use of drive firmware revision 1.116 or later and the 2090-K6CK-KENDAT low-profile feedback module for EnDat to Hiperface conversion.

(2) (3) (4) Resolver support only on motor feedback.

Requires the use of drive firmware revision 2.002 or later and the 2198-H2DCK Hiperface to DSL feedback converter kit for Hiperface to DSL conversion.

High-level Safety Feature Comparison

This section compares the high-level safety features of the selected Kinetix drives.

Topics	Kinetix 6000/6200 Drives	Kinetix 6500 Drives	Kinetix 5500 Drives	Kinetix 5700 Drives
Safety type	Hard-wire STO, catalog numbers: • 2094-ACxx-Mxx-S • 2094-BCxx-Mxx-S • 2094-AMxx-S • 2094-BMxx-S • 2099-BMxx-S	Hard-wire advanced safety, catalog numbers: • 2094-SE02F-M00-S0 • 2094-EN02D-M01-S0	Hard-wire STO, catalog numbers: • 2198-H003-ERS • 2198-H008-ERS • 2198-H015-ERS • 2198-H025-ERS • 2198-H040-ERS • 2198-H040-ERS • 2198-H070-ERS Integrated STO, catalog numbers: • 2198-H003-ERS2 • 2198-H003-ERS2 • 2198-H025-ERS2 • 2198-H025-ERS2 • 2198-H040-ERS2 • 2198-H040-ERS2 • 2198-H040-ERS2 • 2198-H040-ERS2	Hard-wire STO mode/Integrated STO mode Catalog numbers: 2198-S086-ERS3 2198-S130-ERS3 2198-D06-ERS3 2198-D006-ERS3 2198-D012-ERS3 2198-D020-ERS3 2198-D020-ERS3 2198-D023-ERS3 2198-D057-ERS3
Configuration	None	Web page	AOP/Studio 5000 application	AOP/Studio 5000 application
Safety connection type	Not applicable	Safety internal to drive, only motion	Catalog numbers that end in -ERS, only motion Catalog numbers that end in -ERS2, motion and safety	Motion and safety (if network STO)
Reference	See the Kinetix Safe Torque Off Feature Safety Reference Manual, publication <u>GMC-RM002,</u> for connector data and wiring installation.	See the Kinetix 6200 and Kinetix 6500 Safe Torque Off Multi-axis Servo Drives Safety Reference Manual, publication <u>2094-RM002</u> , for installation and wiring, and Safe Torque Off I/O signals.	See the Kinetix 5500 Servo Drives User Manual, publication <u>2198-UM001</u> , for the STO connector pinout, installation, and wiring information. See the 'Kinetix 5500 Safe Torque Off Integrated Safety' chapter for integrated safety drive specifications, configuration of motion and safety connections, direct motion commands, and the STO bypass feature.	See the Kinetix 5700 Servo Drives User Manual, publication <u>2198-UM002</u> , for the STO connector pinout, installation, and wiring information. See the 'Kinetix 5700 Safe Torque Off Function' chapter for integrated safety drive specifications, configuration of motion and safety connections, direct motion commands, and the STO bypass feature.

Appendix A – Communication Networks and Managed Communication

See the 'Communication Networks' and 'Manage Controller Communication' chapters of the ControlLogix 5580 Controllers User Manual, publication <u>1756-UM543</u>, for examples of communication networks and connection resources available for ControlLogix[®] systems.

EtherNet/IP Network Communication

The EtherNet/IP network offers control, configuration, and data collection services by layering the Common Industrial Protocol (CIP) over the standard Internet protocols, such as TCP/IP and UDP. This combination of accepted standards provides the capability that is required to support information data exchange and control applications.

Connection Overview

A Logix5000[™] controller provides connection resources whenever communications are established between two devices. Connections are used when the system contains the following conditions or activities:

- I/O modules, communication modules, and adapters are present in the I/O configuration of the user project.
- Produced or consumed tags are configured in the user project.
- Connected messages are executed in the user application.
- External devices, programming terminals, or HMIs communicate with the controller.

See the ControlLogix 5580 Controllers User Manual, publication <u>1756-UM543</u>, for a detailed explanation of each topic.

Appendix B – Configuration of the Kinetix 5700 Converter Module

For information on how to configure your Kinetix 5700 drive system with a Logix5000[™] controller, see 'Configure and Start the Kinetix 5700 Drive System' in the Kinetix 5700 Servo Drives User Manual, publication <u>2198-UM002</u>.

Appendix C – Design and Implementation Guide for Using Integrated Motion on an EtherNet/IP Network

This section is intended to help balance the needs of the application with the cost of the network components. Motion control brings a need for real-time synchronization to the network, but a managed switched with Quality of Service (QoS) and CIP Sync on each machine is not always needed. However, when linking multiple automation cells or machines together, a managed switch with QoS and CIP Sync must be used. Detailed guidelines can be found in the 'CIP Sync' and 'CIP Sync Sequence of Events' chapters of the Converged Plantwide Ethernet (CPwE) Design and Implementation Guide, publication <u>ENET-TD001</u>.

Answers to Frequently Asked Questions

How can real-time applications be accomplished over a non-deterministic network like Ethernet?

- Each time-sensitive device has its own internal clock, accurate to the nanosecond level.
- The internal clocks are synchronized and tuned to a master clock over the network once per second.
- This update mechanism is known as CIP Sync and is part of the IEEE 1588-2008 standard for time synchronization.
- CIP Sync is designed to account for real-time latencies in the network and to allow the devices to ride through master clock changes.

How is motion control accomplished over standard Ethernet?

- The clocks in the servo drives are coordinated to the master clock by using CIP Sync.
- A packet of information is sent out to each drive in advance of when it is needed, so the drive can receive it and execute it when required:
 - Think of these packets as meeting invitations with a location and a time that represents the key position and time stamp coordinates for the axis.
 - Like meeting invitations, the drives receive these packets at random times due to network loading. But because they are sent in advance, the axes still arrive in their coordinated positions at the precise time.
- The drive further interpolates its position between these points to improve smoothness.

What could cause these time-sensitive devices to get out of sync and effect motion accuracy?

- Any traffic that interrupts the CIP Sync messages from being delivered accurately, including these items:
 - Unexpected network traffic without proper prioritization.
 - Broadcast traffic without proper prioritization.
 - Loops created using unmanaged switches that could fault the system and stop production.
- However, even these disturbances typically add less inaccuracy than the usual mechanical errors induced by system tuning, backlash, and compliance (which are often greater by an order of magnitude).

How can these disturbances be minimized and any risks mitigated?

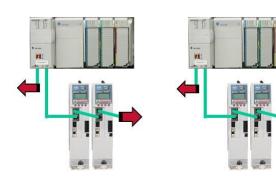
- Use managed switches with QoS and CIP Sync where economically feasible.
- Connect the time-sensitive devices that include embedded switches directly to the controller.
- Protect any unmanaged switches that are used in manufacturing cells with managed switches where they tie into the greater network.

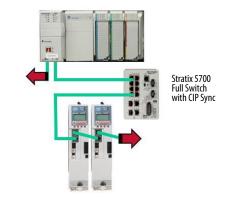
Component Selection Guidelines

General guidelines for devices that include an embedded Ethernet switch:

- Connect these devices directly to the controller without an interposing switch when possible.
- Place any switches without CIP Sync at the end of the line of embedded switch products.
- Use a switch that includes CIP Sync if connected between the controller and time-sensitive devices.
- Connect all other types of traffic to the red arrow points or to the switches as shown in <u>Embedded Ethernet</u> <u>Switch Connection Example on page 41</u>.

Embedded Ethernet Switch Connection Example



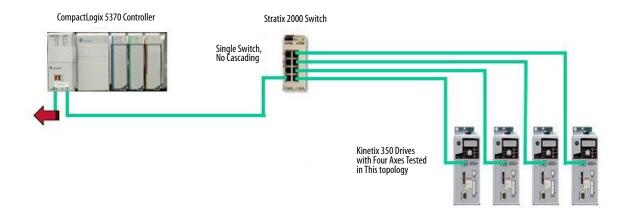


Any switch

General guidelines for single-port Ethernet products (like Kinetix 350 drives):

- For 1...4 axes, offer a Stratix 2000 unmanaged switch⁽¹⁾ if price is a concern.
- For 5...8 axes, offer a Stratix 5700 full managed switch⁽¹⁾ if price is a concern.
- Over 8 axes, offer a Stratix 5700 full (with CIP Sync) managed switch.
- Use 1783-ETAP devices for ring topologies with Kinetix 350 drives.

Single-port Ethernet Connection Example



(1) The application must not require tight coordination between axes or minimal following error when using these switches.

Appendix D – Drive Parameters Cyclic Read and Write List

This section provides cyclic read and write drive parameters.

Sercos Axis (Real-time Axis Info) Cyclic Read Parameters	Kinetix 5700 Drive EtherNet/IP Axis Cyclic Read Parameters	EtherNet/IP Axis Cyclic Write Parameters
PositionCommand	PositionFineCommand	PositionTrim
PositionFeedback	PositionReference	VelocityTrim
AuxPositionFeedback	PositionFeedback1	TorqueTrim
PositionError	PositionError	VelocityFeedforwardGain
PositionIntegratorError	PositionIntegratorOutput	AccerlationFeedforwardGain
VelocityCommand	PositionLoopOutput	PositionLoopBandwidth
VelocityFeedback	VelocityFineCommand	PositionIntegratorBandwidth
VelocityError	VelocityFeedforwardCommand	VelocityLoopBandwidth
VelocityIntegratorError	VelocityReference	VelocityIntegratorBandwidth
AccelerationCommand	VelocityFeedback	LoadObserverBandwidth
AccelerationFeedback	VelocityError	LoadObserverIntegratorBandwidth
MarkerDistance	VelocityIntegratorOutput	TorqueLimitPositive
TorqueCommand	VelocityLoopOutput	TorqueLimitNegative
TorqueFeedback	AccelerationFineCommand	VelocityLowPassFilterBandwidth
PositiveDynamicTorqueLimit	AccelerationFeedforwardCommand	TorqueLowPassFilterBandwidth
NegativeDynamicTorqueLimit	AccelerationReference	SystemInertia=
MotorCapacity	AccelerationFeedback	
DriveCapacity	LoadObserverAccelerationEstimate	
PowerCapacity	LoadObserverTorqueEstimate	
BusRegulatorCapacity	TorqueReference	
MotorElectricalAngle	TorqueReferenceFiltered	
TorqueLimitSource	TorqueReferenceLimited	
DCBusVoltage	CurrentCommand	
	CurrentReference	
	CurrentFeedback	
	CurrentError	
	FluxCurrentReference	
	FluxCurrentFeedback	
	FluxCurrentError	
	OperativeCurrentLimit	
	CurrentLimitSource	
	MotorElectricalAngle	1
	OutputFrequency	
	OutputCurrent	
	QueenetValtana	

OutputVoltage

Drive Parameters Cyclic Read and Write List

Drive Parameters Cyclic Read and Write List (Continued)

Sercos Axis (Real-time Axis Info) Cyclic Read Parameters	Kinetix 5700 Drive EtherNet/IP Axis Cyclic Read Parameters	EtherNet/IP Axis Cyclic Write Parameters
	OutputPower	
	DCBusVoltage	
	MotorCapacity	-
	InverterCapacity	
	Kinetix 5700 Drive EtherNet/IP <u>Converter</u> Axis Cyclic Read Parameters	_
	ConverterOutputCurrent	-
	ConverterOutputPower	
	DCBusVoltage	1
	ConverterCapacity	1
	BusRegulatorCapacity	1

Appendix E – Available GSV and SSV Data

This section provides information for system variables.

Get System Variable (GSV)

Get System Variable (GSV)	Sercos Axis	EtherNet/IP Axis
Acceleration Feedforward Command		Х
Acceleration Command	Х	
Acceleration Feedback	Х	Х
Actual Acceleration		Х
Actual Position	Х	Х
Actual Velocity	Х	Х
Analog Input 1	Х	Х
Analog Input 2	Х	Х
Attribute Error Code	Х	Х
Attribute Error ID	Х	Х
Aux Position Feedback	Х	
Average Velocity	Х	Х
Axis Configuration		Х
Axis Control Bits	Х	
Axis Event Bits	Х	Х
Axis Fault Bits	Х	Х
Axis Response Bits	Х	
Axis Status Bits	Х	Х
Axis Features		Х
Bus Regulator Capacity	Х	Х
CIP Axis Faults		Х
CIP Axis Faults RA		Х
CIP Axis IO Status		Х
CIP Axis IO Status RA		Х
CIP Axis State		Х
CIP Axis Status		Х
CIP Axis Status RA		Х
CIP Initialization Faults		Х
CIP Initialization Faults RA		Х
CIP Start Inhibit		X
CIP Start Inhibit RA		Х
Command Acceleration	Х	Х
Command Position	Х	X
Command Velocity	Х	Х
Control Method		Х
Current Command		Х

Get System Variable (GSV) (Continued)

Get System Variable (GSV)	Sercos Axis	EtherNet/IP Axis
DC Bus Voltage	Х	X
Drive Capacity	Х	
Drive Fault Bits	Х	
Drive Status Bits	Х	
Drive Warning Bits	Х	
Guard Faults	Х	Х
Guard Status	Х	Х
Hookup Test Commutation Offset		Х
Hookup Test Commutation Polarity		Х
Hookup Test Feedback 1 Direction		Х
Hookup Test Feedback 2 Direction		Х
Hookup Test Status		Х
Interpolated Actual Position	Х	X
Interpolated Command Position	Х	X
Inverter Capacity		X
Marker Distance	Х	X
Master Offset	Х	Х
Module Alarm Bits		Х
Module Fault Bits	Х	X
Module Status Bits	Х	
Motor Capacity	Х	X
Motion Alarm Bits		X
Motion Fault Bits		X
Motion Status Bits		X
Motor Electrical Angle	Х	X
Motor Test Counter EMF		X
Motor Test Inductance		X
Motor Test Resistance		X
Motor Test Status		X
Motor Unit		X
Negative Dynamic Torque Limit	Х	
Output Cam Lock Status	Х	X
Output Cam Pending Status	Х	X
Output Cam Status	Х	X
Output Cam Transition Status	Х	X
Output Current		X
Output Power		X
Output Voltage		X
Position Command	Х	

Get System Variable (GSV) (Continued)

Get System Variable (GSV)	Sercos Axis	EtherNet/IP Axis
Position Error	Х	Х
Position Feedback	Х	Х
Position Integrator Error	Х	
Position Integrator Output		Х
Position Loop Output		Х
Position Reference		Х
Positive Dynamic Torque Limit	Х	
Power Capacity	Х	
Registration 1 Negative Edge Position		Х
Registration 1 Negative Edge Time		Х
Registration 1 Position		Х
Registration 1 Positive Edge Position		Х
Registration 1 Positive Edge Time		Х
Registration 1 Time		Х
Registration 2 Negative Edge Position		Х
Registration 2 Negative Edge Time		X
Registration 2 Position		Х
Registration 2 Positive Edge Position		Х
Registration 2 Positive Edge Time		Х
Registration 2 Time		Х
Registration 1 Position	Х	Х
Registration 1 Time	Х	Х
Registration 2 Position	Х	Х
Registration 2 Time	Х	Х
Sercos Error Code	Х	
Start Actual Position	Х	Х
Start Command Position	Х	Х
Start Master Offset	Х	Х
Strobe Actual Position	Х	Х
Strobe Command Position	Х	Х
Strobe Master Offset	Х	Х
Test Direction Forward	Х	
Test Status	Х	
Torque Feedback	Х	
Torque Limit Source	Х	
Torque Reference		Х
Torque Reference Filtered		Х
Torque Reference Limited		Х
Tune Acceleration	Х	Х

Get System Variable (GSV) (Continued)

Get System Variable (GSV)	Sercos Axis	EtherNet/IP Axis
Tune Acceleration Time	Х	Х
Tune Deceleration	Х	X
Tune Deceleration Time	Х	Х
Tune Inertia	Х	
Tune Status		Х
Velocity Command	Х	
Velocity Error	Х	X
Velocity Feedback	Х	X
Velocity Feedforward Command		X
Velocity Integrator Error	Х	
Velocity Integrator Output		X
Velocity Loop Output		X
Velocity Reference		X
Watch Position	Х	Х

Set System Variables (SSV)

Set System Variables (SSV)	Sercos Axis	EtherNet/IP Axis
Acceleration Feedforward Gain	Х	Х
Acceleration Limit Bipolar	Х	
Acceleration Limit Negative	Х	
Acceleration Limit Positive	Х	
Average Velocity Time Base	Х	Х
AxisInfoSelect 1	Х	
AxisInfoSelect 2	Х	
Axis Type	Х	
Backlash Reversal Offset	X	Х
Backlash Stabilization Window	Х	
Brake Engage Time Delay	X	
Brake Release Time Delay	X	
CIP Axis Alarm Log Reset		Х
CIP Axis Fault Log Reset		Х
Command Update Delay Offset	X	Х
Continuous Torque Limit	X	
Control Mode		Х
Conversion Constant	X	Х
Damping Factor	X	Х
Drive Enable Fault Action	X	
Drive Model Time Constant	X	Х
Drive Polarity	Х	

Set System Variables (SSV) (Continued)

Set System Variables (SSV)	Sercos Axis	EtherNet/IP Axis
Drive Thermal Fault Action	Х	
Dynamics Configuration Bits	Х	Х
Fault Configuration Bits	Х	
Feedback Configuration		Х
Feedback Mode		Х
Feedback Fault Action	Х	
Feedback Noise Fault Action	Х	
Friction Compensation	Х	
Friction Compensation Window	Х	
Gain Tuning Configuration Bits		Х
Hardware Overtravel Fault Action	Х	
Home Configuration bits	Х	Х
Home Direction	Х	Х
Home Mode	Х	Х
Home Offset	Х	Х
Home Position	Х	Х
Home Return Speed	Х	Х
Home Sequence	Х	Х
Home Speed	Х	Х
Home Torque Level	Х	
Hookup Test Distance		Х
Hookup Test Feedback Channel		Х
Inhibit Axis	Х	Х
Integrator Hold Enable	Х	
Interpolation Time	Х	Х
Linear Motor Mass	Х	
Load Inertia Ratio	Х	Х
Load Ratio		Х
Master Input Configuration Bits	Х	Х
Master Position Filter Bandwidth	Х	Х
Maximum Acceleration	Х	Х
Maximum Acceleration Jerk	Х	Х
Maximum Deceleration	Х	Х
Maximum Deceleration Jerk	Х	Х
Maximum Negative Travel	Х	
Maximum Positive Travel	Х	
Maximum Speed		Х
Motion Polarity		Х
Motion Resolution		Х

Set System Variables (SSV) (Continued)

Set System Variables (SSV)	Sercos Axis	EtherNet/IP Axis
Motor Inertia	Х	
Motor Thermal Fault Action	Х	
Output LP Filter Bandwidth	Х	
Output Notch Filter Frequency	Х	
Position Error Fault Action	Х	
Position Error Tolerance	Х	Х
Position Integrator Bandwidth		Х
Position Integrator Control		Х
Position Integral Gain	Х	
Position Lock Tolerance	Х	Х
Position Loop Bandwidth		Х
Position Proportional Gain	Х	
Position Servo Bandwidth		X
Position Trim		X
Position Unwind	Х	X
Programmed Stop Mode	Х	X
Resistive Brake Contact Delay	Х	
Rotary Axis	Х	
Rotary Motor Inertia	Х	
Scaling Source		Х
Servo Loop configuration	Х	
Soft Overtravel Fault Action	Х	
Soft Travel Limit Checking		Х
Soft Travel Limit Negative		Х
Soft Travel Limit Positive		Х
Stopping Action		Х
Stopping Time Limit	Х	
Stopping Torque	Х	X
System Bandwidth		X
System Damping		X
System Inertia		X
Test Increment	Х	
Torque Limit Bipolar	Х	
Torque Limit Negative	Х	Х
Torque Limit Positive	X	X
Torque Offset	X	X
Torque Scaling	X	
Torque Threshold	Х	X
Torque Trim		X

Set System Variables (SSV) (Continued)

Set System Variables (SSV)	Sercos Axis	EtherNet/IP Axis
Travel Mode		Х
Travel Range		
Tune Friction		Х
Tune Inertia Mass		Х
Tune Load Offset		Х
Tuning Configuration Bits	Х	
Tuning Direction		Х
Tuning Select		Х
Tuning Speed	Х	Х
Tuning Torque	Х	Х
Tuning Travel Limits	Х	Х
Velocity Droop	Х	Х
Velocity Feedforward Gain	Х	Х
Velocity Integral Gain	Х	
Velocity Integrator Bandwidth		Х
Velocity Integrator Control		Х
Velocity Limit Bipolar	Х	
Velocity Limit Negative	Х	Х
Velocity Limit Positive	Х	Х
Velocity Loop Bandwidth		Х
Velocity Offset	Х	Х
Velocity Proportional Gain	Х	
Velocity Servo Bandwidth	Х	Х
Velocity Standstill Window	Х	Х
Velocity Threshold	Х	Х
Velocity Trim		Х
Velocity Window	Х	

Appendix F – Axis Attributes

This section highlights some of the differences in tags between Sercos axes and EtherNet/IP axes. Some tags in a Sercos axis are not applicable to an EtherNet/IP axis, and vice versa. Some tag names changed between Sercos and EtherNet/IP, such as AuxPositionFeedback and PositionFeedback2. See the Integrated Motion on the EtherNet/IP Network Reference Manual, publication <u>MOTION-RM003</u>, for a comprehensive list of EtherNet/IP Axis Attributes.

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
N/A	N/A	DirectVelocity ControlStatus	BOOL	When the Direct Velocity Control Status bit is set, the Direct Command Velocity value controls the axis speed. The Motion Drive Start instruction (MDS) sets this bit, and only applies to CIP drive axis types.
N/A	N/A	DirectTorque ControlStatus	BOOL	When the Direct Torque Control Status bit is set, the Command Torque value controls the axis torque. The Motion Drive Start instruction (MDS) sets this bit, and only applies to CIP drive axis types.
N/A	N/A	MotionAlarm Status	DINT	0 = Reserved 1 = SoftTravelLimitPositiveAlarm 2 = SoftTravelLimit NegativeAlarm 331 = Reserved
N/A	N/A	SoftTravelLimit PositiveAlarm	BOOL	This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Positive attribute value in the positive direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits. However, any attempt to move the axis beyond the Soft Travel Limit - Positive value by using a motion instruction results in an instruction error.
N/A	N/A	SoftTravelLimit NegativeAlarm	BOOL	This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Negative attribute value in the negative direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits. However, any attempt to move the axis beyond the Soft Travel Limit - Negative value by using a motion instruction results in an instruction error.
N/A	N/A	MotionFaultStatus	DINT	0 = Reserved 1 = SoftTravelLimitPositiveFault 2 = SoftTravelLimitNegativeFault 331 = Reserved
N/A	N/A	SoftTravelLimit PositiveFault	BOOL	This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Positive attribute value in the positive direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits. However, any attempt to move the axis beyond the Soft Travel Limit - Positive value by using a motion instruction results in an instruction error.
N/A	N/A	SoftTravelLimit NegativeFault	BOOL	This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Negative attribute value in the negative direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits. However, any attempt to move the axis beyond the Soft Travel Limit - Negative value by using a motion instruction results in an instruction error.
N/A	N/A	Registration1 PositiveEdgePosition	REAL	Feedback position that is latched on the rising edge of the Registration Input 1.

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
N/A	N/A	Registration1 NegativeEdgePosition	REAL	Feedback Position latched on the falling edge of the Registration Input 1.
N/A	N/A	Registration2 PositiveEdgePosition	REAL	Feedback position that is latched on the rising edge of the Registration Input 2.
N/A	N/A	Registration2 NegativeEdgePosition	REAL	Feedback Position latched on the falling edge of the Registration Input 2.
N/A	N/A	Registration1 PositiveEdgeTime	DINT	CST time stamp on the rising edge of the Registration Input 1.
N/A	N/A	Registration1 NegativeEdgeTime	DINT	CST time stamp on the falling edge of the Registration Input 1.
N/A	N/A	Registration2 PositiveEdgeTime	DINT	CST time stamp on the rising edge of the Registration Input 2.
N/A	N/A	Registration2 NegativeEdgeTime	DINT	CST time stamp on the falling edge of the Registration Input 2.
		DirectCommand		The Direct Command Velocity attribute provides tag access to the velocity command for the specified axis. Use this attribute to control the speed of a motor when an associated drive is configured for velocity control mode. For the value of this attribute, to be applied as the velocity
N/A	N/A	Velocity	REAL	command, a Motion Drive Start instruction is executed. The instruction sets the Direct Velocity Control Status bit of the Motion Status Bits attribute. If this bit is not set, the Direct Command Velocity value has no effect on axis motion. Only CIP Drive Axis data types currently support this capability.
PositionCommand	REAL	<i>Equivalent:</i> PositionFine Command	REAL	The Position Fine Command attribute is the output value from the Command Position fine interpolator.
N/A	N/A	PositionReference	REAL	The Position Reference attribute is the command position reference signal into the position loop-summing junction to be compared with a position feedback signal.
PositionFeedback	REAL	PositionFeedback1	REAL	The Position Feedback 1 attribute is the actual position of the encoder.
AuxPosition Feedback	REAL	PositionFeedback2	REAL	The Position Feedback 2 attribute is the actual position of the encoder.
PositionIntegrator Error	REAL	PositionIntegrator Output	REAL	The Position Integrator Output attribute is the output of position integrator that represents the contribution of the position integrator to Position Loop Output.
N/A	N/A	PositionLoop Output	REAL	The Position Loop Output attribute is the output of the position loop forward path that represents the total control effort of the position loop.
VelocityCommand	REAL	<i>Equivalent:</i> VelocityFine Command	REAL	The Velocity Fine Command attribute is the output value from the Command Velocity fine interpolator. When no Command Velocity signal is present when performing position control, this signal can be derived by scaling the Differential Position output value of the Command Position fine interpolator.
N/A	N/A	VelocityFeedforwardCommand	REAL	The Velocity Feedforward Command attribute is a command signal that represents a scaled version of the command velocity profile. This signal is the Velocity Fine Command signal that is scaled by Velocity Feedforward Gain and applied to the output of the position loop.
N/A	N/A	VelocityReference	REAL	Command velocity reference into velocity loop summing junction.
VelocityIntegrator Error	REAL	VelocityIntegrator Output	REAL	Output of velocity integrator that represents the contribution of the velocity integrator to Velocity Loop Output.

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
N/A	N/A	VelocityLoop Output	REAL	Output of velocity forward path that represents the total control effort of the velocity loop.
N/A	N/A	AccelerationFine Command	REAL	The Acceleration Fine Command attribute is the output value from the Command Acceleration fine interpolator. When no Command Acceleration signal is present when performing position or velocity control, this signal can be derived by scaling the Differential Velocity output value of the Command Velocity fine interpolator. If no Command Velocity signal is present, the Interpolated Command Acceleration signal can be derived by scaling the second Differential Position output value of the Command Position fine interpolator.
N/A	N/A	Acceleration FeedforwardCommand	REAL	The Acceleration Feedforward Command attribute is a signal that represents a scaled version of the command acceleration profile. This signal is the Acceleration Fine Command signal that is scaled by Acceleration Feedforward Gain and applied to the output of the velocity loop.
N/A	N/A	Acceleration Reference	REAL	Command velocity reference into velocity loop summing junction.
N/A	N/A	LoadObserver AccelerationEstimate	REAL	Output of the Load Observer that, when the Load Observer block is enabled, is applied to the acceleration reference-summing junction. In the Load Observer configuration, this signal compensates for disturbances to the load relative to an ideal load model. When the Load Observer is configured to operate in Acceleration Feedback Only mode, this signal is the estimated acceleration feedback signal that is used to close the acceleration loop. When the Load Observer is disabled, this signal is 0.
N/A	N/A	LoadObserver TorqueEstimate	REAL	Product of the Load Observer Acceleration Estimate signal and the current System Inertia value, Kj. In the Load Observer configuration, this signal represents the estimated torque disturbances to the load relative to an ideal load model. When the Load Observer is configured to operate in Acceleration Feedback Only mode, this signal is an estimate of the applied motor torque. When the Load Observer is disabled, this signal is 0.
N/A	N/A	CommandTorque	REAL	Command torque output from Fine Command Generator (if active) into torque input summing junction when configured for torque control.
N/A	N/A	TorqueReference	REAL	Commanded torque reference input signal before torque filter section that represents the sum of the Torque Command and Torque Trim signal inputs.
N/A	N/A	TorqueReference Filtered	REAL	Commanded torque reference input signal after torque filter section.
N/A	N/A	TorqueReference Limited	REAL	Commanded torque reference input signal after torque limiter section.
TorqueCommand	REAL	<i>Equivalent:</i> CurrentReference	REAL	Current reference signal, Iq, into the torque-producing current loop- summing junction.
N/A	N/A	CurrentCommand	REAL	Represents the instantaneous commanded torque-producing current signal, Iq, before passing through the Current Vector Limiter. The attribute is tied directly to the output of torque reference path after the 1/Kt scaling that represents the torque effort to be applied to the torque-producing Iq current loop of the drive. The nominal value for 1/Kt is 1 based on 100% rated torque that is produced by 100% rated current.
TorqueFeedback	REAL	<i>Equivalent:</i> CurrentFeedback	REAL	Actual torque current that is applied to the axis based on current sensor feedback (% Motor Rated).
N/A	N/A	CurrentError	REAL	Error between commanded and actual current that is the output of the torque-producing, q-axis, current loop.

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
N/A	N/A	FluxCurrent Reference	REAL	Command current reference, ld, into the flux-producing current loop-summing junction.
N/A	N/A	FluxCurrent Feedback	REAL	Actual flux current that is applied to the axis based on current sensor feedback.
N/A	N/A	FluxCurrentError	REAL	Error between commanded and actual current that is the output of the flux-producing, d-axis, current loop summing junction.
N/A	N/A	OperativeCurrent Limit	REAL	Represents the operative current limit that is based on multiple limit sources.
TorqueLimit Source	DINT	<i>Equivalent:</i> CurrentLimit Source	DINT	Represents the operative source of a current limit if a current limit condition occurs.
N/A	N/A	SlipCompensation	REAL	Indicates the actual amount of slip compensation currently being applied.
N/A	N/A	OutputFrequency	REAL	The Output Frequency attribute is the time averaged output frequency that is applied to motor. Frequency value is in terms of electrical cycles.
N/A	N/A	OutputCurrent	REAL	The Output Current attribute is the total time averaged output current applied to motor.
N/A	N/A	OutputVoltage	REAL	The Output Voltage attribute is the total time averaged phase-to- phase output voltage that is applied to motor.
N/A	N/A	OutputPower	REAL	The Output Power attribute is the total time averaged output power of the motor. This value is based on the product of the Torque Reference signal and the Velocity Feedback.
DriveCapacity	REAL	<i>Equivalent:</i> InverterCapacity	REAL	The Inverter Capacity attribute is the real-time estimate of the continuous rated inverter thermal capacity that is used during operation that is based on the inverter thermal model. A value of 100% indicates that the inverter is being used at 100% of rated capacity as determined by the continuous current rating of the inverter.
PowerCapacity	REAL	<i>Equivalent:</i> Converter Capacity	REAL	The Converter Capacity attribute is the real-time estimate of the continuous rated converter thermal capacity that is used during operation that is based on the converter thermal model. A value of 100% indicates that the converter is being used at 100% of rated capacity as determined by the continuous current rating of the converter.
N/A	N/A	DigitalInputs	DINT	The Digital Inputs attribute is a 32-bit word with bits assigned by the vendor to general-purpose digital inputs.
N/A	N/A	PositionTrim	REAL	The Position Trim attribute is an additional position command added to the Position Command to generate the Position Reference signal into the position loop-summing junction.
VelocityOffset	REAL	<i>Equivalent:</i> VelocityTrim	REAL	Additional velocity command added to the velocity loop-summing junction.
Acceleration Command	REAL	<i>Equivalent:</i> AccelerationTrim	REAL	Additional acceleration command added to the acceleration loop- summing junction.
TorqueOffset	REAL	<i>Equivalent:</i> TorqueTrim	REAL	Additional torque command added to the torque input summing junction.
N/A	N/A	VelocityFeed forwardGain	REAL	The Velocity Feedforward Gain attribute multiplies the Velocity Feedforward Command signal to form the Velocity Feedforward Command that is applied to the velocity loop-summing junction.
N/A	N/A	Acceleration FeedforwardGain	REAL	The Acceleration Feedforward Gain attribute is a value that multiplies the Acceleration Fine Command signal to form the Acceleration Feedforward Command that is applied acceleration loop summing junction.

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
N/A	N/A	PositionLoop Bandwidth	REAL	The Position Loop Bandwidth attribute determines the proportional gain, Kpp, of the position loop that multiplies the Position Error signal. This value represents the unity gain bandwidth of the position loop beyond which the position loop is ineffective.
N/A	N/A	PositionIntegrator Bandwidth	REAL	The Position Integrator Bandwidth attribute determines the position loop integral gain, Kpi, which together with the Kpp, multiplies the integrated Position Error signal. This value represents the bandwidth of the position integrator beyond which the integrator is ineffective. A value of 0 for this attribute disables the integrator.
N/A	N/A	VelocityLoop Bandwidth	REAL	The Velocity Loop Bandwidth attribute is a value that determines the proportional gain, Kvp, of the velocity loop that multiplies the Velocity Error signal. This value represents the unity gain bandwidth of the velocity loop.
N/A	N/A	VelocityIntegrator Bandwidth	REAL	The Velocity Integrator Bandwidth attribute determines the velocity loop integral gain, Kvi, which together with the Kvp, multiplies the integrated Velocity Error signal. This value represents the bandwidth of the velocity integrator beyond which the integrator is ineffective. A value of 0 for this attribute disables the integrator.
N/A	N/A	LoadObserver Bandwidth	REAL	The Load Observer Bandwidth attribute determines the proportional gain, Kop, of the load observer. This value represents the unity gain bandwidth of the load observer.
N/A	N/A	LoadObserver IntegratorBandwidth	REAL	The Load Observer Integrator Bandwidth attribute determines the load observer integral gain, Koi, which together with the Kop, multiplies the integrated error signal within the observer. This value represents the bandwidth of the integrator beyond which the integrator is ineffective. A value of 0 for this attribute disables the integrator.
N/A	N/A	TorqueLimit Positive	REAL	This positive value determines the maximum positive torque that can be applied to the motor. If the device attempts to exceed this value, the torque command is clamped to this value.
N/A	N/A	TorqueLimit Negative	REAL	This negative value determines the most negative torque value that can be applied to the motor. If the device attempts to apply a more negative torque than this limit, the torque command is clamped to this value.
N/A	N/A	VelocityLowPass FilterBandwidth	REAL	The Velocity Low Pass Filter Bandwidth attribute controls the bandwidth of the Low Pass Filter applied to the Velocity Error signal. The recommended implementation is a two-pole IIR filter. A value of 0 for this attribute disables this feature.
N/A	N/A	TorqueLowPass FilterBandwidth	REAL	Break frequency for the second order low pass filter that is applied to torque reference signal.
N/A	N/A	SystemInertia	REAL	Torque or force scaling gain value that converts commanded acceleration into equivalent rated torque/force. Properly set, this value represents the total system inertia or mass.
N/A	N/A	Current Disturbance	REAL	Injected current command that produces torque that is used to excite the motor as part of Frequency Analysis service.
N/A	N/A	DigitalOutputs	DINT	The Digital Outputs attribute is a 32-bit word with bits assigned by the vendor to general-purpose digital outputs.
N/A	N/A	AnalogOutput1	REAL	The Analog Output 1 attribute is a general-purpose analog output 1 level.
N/A	N/A	AnalogOutput2	REAL	The Analog Output 1 attribute is a general-purpose analog output 2 level.
MarkerDistance	REAL	N/A	N/A	Marker Distance in Position Units.

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description			
PosDynamicTorqueLimit	REAL	N/A	N/A	The currently operative m magnitude. It is the lowe drive at a given time, incl limit, user current limit, a limit.	st value o uding: arr	f all torqu plifier pe	e/current limits in the ak limit, motor peak
NegDynamic TorqueLimit	REAL	N/A	N/A	The currently operative ne magnitude. It is the lower drive at a given time, incl limit, user current limit, a limit.	st value o uding: arr	f all torqu Iplifier pe	e/current limits in the ak limit, motor peak
				The status bits for your se	rvo drive.		
				Bit	No.	Data Type	Description
				- no tag -	00	DINT	Servo Action Status
				- no tag -	01	DINT	Drive Enable Status
				- no tag -	02	DINT	Axis Shutdown Status
				ProcessStatus	03	DINT	Process Status
				Reserved	04, 05	N/A	Reserved
				HomeInputStatus	06	DINT	Home Input Status
	DINT N/A			Reg1InputStatus	07	DINT	Registration 1 Input Status
		N/A	N/A	Reg2InputStatus	08	DINT	Registration 12Input Status
				PosOvertravelInputStatus	09	DINT	Positive Overtravel Input Status
DriveStatus				NegOvertravelInputStatus	10	DINT	Negative Overtravel Input Status
		N/N		EnableInputStatus	11	DINT	Enable Input Status
				AccelLimitStatus	12	DINT	Accel Limit Status
				AbsoluteReferenceStatus	13	DINT	Absolute Reference Status
				Reserved	14, 15	N/A	Reserved
				VelocityLockStatus	16	DINT	Velocity Lock Status
				VelocityStandstillStatus	17	DINT	Velocity Standstill Status
				VelocityThresholdStatus	18	DINT	Velocity Threshold Status
				TorqueThresholdStatus	19	DINT	Torque Threshold Status
				TorqueLimitStatus	20	DINT	Torque Limit Status
				VelocityLimitStatus	21	DINT	Velocity Limit Status
				PosLockStatus	22	DINT	Position Lock Status
				Reserved	23 31	N/A	Reserved
ProcessStatus	BOOL	N/A	N/A	Process Status			
BusReadyStatus	BOOL	N/A	N/A	Bus Ready Status			
AbsoluteReferenceStatus	BOOL	N/A	N/A	Absolute Reference Statu	Absolute Reference Status		
SafeOffModeActiveStatus	BOOL	N/A	N/A	Safe-off Mode Active Stat	us		

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
PowerLimitStatus	BOOL	N/A	N/A	Power Limit Status
LowVelocity ThresholdStatus	BOOL	N/A	N/A	Low Velocity Threshold Status
HighVelocity ThresholdStatus	BOOL	N/A	N/A	High Velocity Threshold Status
N/A	N/A	CIPAxisState	INT	Bitmap:0 = Initializing1 = Pre-Charge2 = Stopped3 = Starting4 = Running5 = Testing6 = Stopping7 = Aborting8 = Faulted9 = Start Inhibited10 = Shutdown11 = Axis Inhibited12 = Not Grouped13 = No Module14255 = Reserved
N/A	N/A	CIPAxisStatus	DINT	Bitmap:0 = Local Control1 = Alarm2 = DC Bus Up3 = Power Structure Enabled4 = Motor Flux Up5 = Tracking Command6 = Position Lock7 = Velocity Lock8 = Velocity Standstill9 = Velocity Threshold10 = Velocity Limit11 = Acceleration Limit12 = Deceleration Limit13 = Torque Threshold14 = Torque Limit15 = Current Limit16 = Thermal Limit17 = Feedback Integrity18 = Shutdown19 = In Process2031 = Reserved
N/A	N/A	LocalControl Status	BOOL	This bit is set if axis is taking command reference and services from local interface instead of the remote (Integrated Motion on the EtherNet/IP network) interface.
N/A	N/A	AlarmStatus	BOOL	This bit is set if the axis has detected one or more exception conditions that are configured to generate an alarm.
N/A	N/A	DCBusUpStatus	BOOL	This bit is set if DC Bus has charged up to an operational voltage level.
N/A	N/A	PowerStructure EnabledStatus	BOOL	This bit is set if the axis amplifier is energized and capable to generate motor flux and torque.
N/A	N/A	MotorFluxUp Status	BOOL	This bit is set if motor flux for an induction motor has reached an operational level.

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
N/A	N/A	Tracking CommandStatus	BOOL	This bit is set if the axis control structure is now actively tracking the command reference from motion planner.
AccelLimitStatus	BOOL	AccelerationLimit Status	BOOL	This bit is set if the acceleration reference signal is being limited by the Acceleration Limiter.
N/A	N/A	DecelerationLimit Status	BOOL	This bit is set if the acceleration reference signal is being limited by the Deceleration Limiter.
N/A	N/A	CurrentLimit Status	BOOL	This bit is set if the command current, Iq, is being limited by the Current Vector Limiter.
N/A	N/A	ThermalLimit Status	BOOL	This bit is set if Current Vector Limit condition of the axis is being limited by any of the Thermal Models of the axis.
N/A	N/A	FeedbackIntegrity Status	BOOL	This bit, when set, indicates that the feedback device is accurately reflecting changes to axis position. Also, there have been no conditions detected that would compromise the quality of the feedback position value. The bit is set at power-up after the feedback device passes any power-up self-test required. If Feedback Integrity is cleared, the Axis Homed Status attribute is also cleared. This clearing prevents Soft Overtravel from checking if during operation a feedback exception occurs that could affect the fidelity of axis position, the bit is immediately cleared. The bit remains clear until the drive executes a fault reset, or you power cycle the drive. The drive generates Fault Resets, or the resets can be initiated by the controller via motion instructions. The Feedback Integrity bit behavior applies to both absolute and incremental feedback device operation.
N/A	N/A	CIPShutdown Status	BOOL	This bit is set when the axis is in the shutdown state or in the faulted state but would transition to the shutdown state if the faults were cleared.
N/A	N/A	InProcessStatus	BOOL	This bit is set for the duration of an active process. An example of active process is an operation that is initiated by a Run Motor Test, Run Hookup Test, or Run Inertia Test request service.
N/A	N/A	CIPAxisStatusRA	DINT	031 = Reserved
N/A	N/A	CIPAxislOStatus	DINT	Bitmap: 0 = Regenerative Power Input Status 131 = Reserved
Reg1InputStatus	BOOL	Registration1Input Status	BOOL	Registration 1 Input Status
Reg2InputStatus	BOOL	Registration2Input Status	BOOL	Registration 2 Input Status
PosOvertravel InputStatus	BOOL	PositiveOvertravel InputStatus	BOOL	Positive Overtravel Input Status
NegOvertravel InputStatus	BOOL	Negative OvertravelInputStatus	BOOL	Negative Overtravel Input Status
N/A	N/A	Feedback1 ThermostatStatus	BOOL	Feedback 1 Thermostat Status
N/A	N/A	ResistiveBrake OutputStatus	BOOL	Resistive Brake Output Status
N/A	N/A	MechanicalBrake OutputStatus	BOOL	Mechanical Brake Output Status
N/A	N/A	CIPAxisIOStatus RA	DINT	031 = Reserved
N/A	N/A	Regenerative PowerInputStatus	BOOL	This bit represents the logical state of the Regenerative Power Input

AXIS_SERVO_DRIVE Sercos Axis	Туре	AXIS_CIP_DRIVE EtherNet/IP Axis	Туре	Description
N/A	N/A	CIPStartInhibits	INT	Bitmap:1 = Axis Enable Input2 = Motor Not Configured3 = Feedback Not Configured415 = Reserved
N/A	N/A	AxisEnableInput Inhibit	BOOL	Axis Enable Input is not active.
N/A	N/A	MotorNot ConfiguredInhibit	BOOL	The associated motor has not been configured for use.
N/A	N/A	FeedbackNot ConfiguredInhibit	BOOL	The associated feedback device has not been configured.
N/A	N/A	CIPStartInhibits RA	INT	Bitmap:1 = Volts Hertz Curve Definition Inhibit2 = Motor Feedback Required Inhibit3 = Speed Limit Configuration Inhibit4 = Torque Prove Configuration Inhibit5 = Safe Torque Off Inhibit6 = Safety Reset Required Inhibit815 = Reserved
N/A	N/A	VoltsHertzCurve DefinitionInhibit	BOOL	Conflict exists in the V/Hz curve definition.
N/A	N/A	MotorFeedback RequiredInhibit	BOOL	Cannot run using the selected motor control mode with Primary Feedback or Alternate Feedback set as open loop.
N/A	N/A	SpeedLimit ConfigurationInhibit	BOOL	Speed Ref Limit Conflict, either Minimum Forward Speed Limit exceeds Maximum Forward Speed Limit, or Minimum Reverse Speed Limit exceeds Maximum Reverse Speed Limit.
N/A	N/A	TorqueProve ConfigurationInhibit	BOOL	When Torque Prove Config is enabled, Control Mode, Feedback Mode, Motor Feedback Type, and Motor Option Configuration are properly set.
N/A	N/A	Safe Torque Off Inhibit	BOOL	The safety function has disabled the power structure.
N/A	N/A	SafetyReset RequiredInhibit	BOOL	Toggle the safety reset input before the safety board allows motion again.
N/A	N/A	SafetyNot ConfiguredInhibit	BOOL	The embedded safety function of the drive has not been configured.

Appendix G – Axis Exceptions

This section highlights some of the differences in axis exceptions between Sercos axes and EtherNet/IP axes. Some exceptions in a Sercos axis are not applicable to an EtherNet/IP axis, and vice versa. See the Integrated Motion on the EtherNet/IP Network Reference Manual, publication <u>MOTION-RM003</u>, for a comprehensive list of EtherNet/IP Axis Attributes.

Axis Exceptions

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	MotionFault	BOOL	If the Motion Fault bit is set, it indicates that there is one or more fault conditions have occurred related to the Motion Planner function. The specific fault conditions can then be determined through access to the Motion Fault attribute of the associated axis.
<i>Equivalent:</i> GuardFaultExists	GuardFault	BOOL	If the Guard Fault bit is set, it indicates that there is one or more fault conditions that have occurred related to the GuardMotion [™] safety function. The specific fault conditions can then be determined through access to the Guard Motion attribute of the associated axis. Guard Faults are only applicable if the drive device is equipped with Guard Safety functionality.
N/A	InitializationFault	BOOL	The Initialization Fault bit is set when initialization of an Integrated Motion on the EtherNet/IP network drive fails for any reason. Specific information concerning the Initialization Fault is found in the standard CIP Initialization attribute, or manufacturer-specific CIP Initialization Fault – RA, and CIP Initialization Fault – manufacturer attributes associated with the CIP Drive axis data types.
N/A	APRFault	BOOL	The APR (Absolute Position Recovery) Fault bit is set when during axis configuration the system is not able to recover the absolute position of the axis. Specific information concerning the APR Fault is found in the standard APR Fault attribute, or manufacturer-specific APR Fault – RA, and APR Fault – manufacturer attributes associated with the CIP Drive axis data types.
N/A	MotionAlarmStatus	DINT	These two attributes collect the fault and alarm exception conditions that are associated with the Motion Planner. When the controller detects one of the listed excepted conditions, the condition is indicated as a Fault or Alarm according to the associated Motion Exception Action attribute value. In general, Alarms are considered warnings by the control system while Faults result in some form of action to stop the axis.
N/A	SoftTravelLimitPositiveAlarm	BOOL	This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Positive attribute value in the positive direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits. However, any attempt to move the axis beyond the Soft Travel Limit - Positive value by using a motion instruction results in an instruction error. As soon as the axis is moved back within the specified soft travel limits, the corresponding Soft Travel Limit - Positive fault bit is automatically cleared. However the soft travel fault persists through any attempt to clear it while the axis position is still beyond the Soft Travel Limit - Positive value with the axis enabled.
N/A	SoftTravelLimitNegativeAlarm	BOOL	This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Negative attribute value in the negative direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits. However, any attempt to move the axis beyond the Soft Travel Limit - Negative value by using a motion instruction results in an instruction error. As soon as the axis is moved back within the specified soft travel limits, the corresponding Soft Travel Limit - Negative fault bit is automatically cleared. However the soft travel fault persists through any attempt to clear it while the axis position is still beyond the Soft Travel Limit - Negative value with the axis enabled.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	MotionFaultStatus	DINT	These two attributes collect the fault and alarm exception conditions that are associated with the Motion Planner. When the controller detects one of the listed excepted conditions, the condition is indicated as a Fault or Alarm according to the associated Motion Exception Action attribute value. In general, Alarms are considered warnings by the control system while Faults result in some form of action to stop the axis.
<i>Equivalent:</i> PosSoftOvertravel	SoftTravelLimitPositiveFault	BOOL	This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Positive attribute value in the positive direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits. However, any attempt to move the axis beyond the Soft Travel Limit - Positive value by using a motion instruction results in an instruction error. As soon as the
Fault			axis is moved back within the specified soft travel limits, the corresponding Soft Travel Limit - Positive fault bit is automatically cleared. However the soft travel fault persists through any attempt to clear it while the axis position is still beyond the Soft Travel Limit - Positive value with the axis enabled.
Equivalent:			This exception condition occurs when Soft Travel Checking is enabled and when actual position has exceeded the configured Soft Travel Limit - Negative attribute value in the negative direction. If the Motion Exception Action for this bit is set for Stop Planner, the faulted axis can be moved or jogged back inside the soft travel limits.
NegSoftOvertravel Fault	SoftTravelLimitNegativeFault	BOOL	However, any attempt to move the axis beyond the Soft Travel Limit - Negative value by using a motion instruction results in an instruction error. As soon as the axis is moved back within the specified soft travel limits, the corresponding Soft Travel Limit - Negative fault bit is automatically cleared. However the soft travel fault persists through any attempt to clear it while the axis position is still beyond the Soft Travel Limit - Negative value with axis enabled.
ModuleFaults	ModuleFaults	DINT	This bit field is a roll-up of module scoped fault conditions that can include synchronization faults that are detected on either side of the Integrated Motion on the EtherNet/IP network connection. All defined Node Fault Codes are mapped into bits in this attribute.
ControlSyncFault	ControlSyncFault	BOOL	If this bit is set, the controller lost communication with the motion module and missed several position updates in a row. The controller can miss up to four position updates. After that, the Control Sync Fault bit is set. The motion module can fault later or can already be faulted. For a consumed axis, this bit means that communication is lost with the producing controller. This bit clears when communication is re-established.
SERCOSRingFault	N/A	BOOL	If this bit is set, there is a problem on the Sercos ring; that is, the light has been broken or a drive has been powered down.
N/A	ModuleConnFault	BOOL	The Module Connection Fault bit indicates that the CIP Motion drive to controller connection from the controller has timed out.
N/A	ConnFormatFault	BOOL	This fault code indicates that an error has occurred in the data format between the controller and the device, for example, a Format Revision mismatch.
N/A	LocalModeFault	BOOL	The Local Mode Fault is set when the controller is locked in Local Mode operation.
N/A	CPUWatchdogFault	BOOL	The Processor Watchdog Fault code indicates that the processor that is associated with the device node has experienced an excessive overload condition that has tripped the associated processor watchdog mechanism.
N/A	ClockJitterFault	BOOL	The Clock Jitter Fault bit is set when there is excessive clock jitter between the controller and the motion device.
N/A	CyclicReadFault	BOOL	The Cyclic Read Fault is set when the controller detects a runtime error that is associated with the Cyclic Read mechanism.
N/A	CyclicWriteFault	BOOL	The Cyclic Write Fault is set when the controller detects a runtime error that is associated with the Cyclic Write mechanism.

Axis Exce	eptions	(Continue	ed)
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AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	ClockSkewFault	BOOL	The Clock Skew Fault bit indicates that the motion device has detected significant difference between the System Time of the device and the System Time of the controller. The difference prevents the device from switching to synchronous operation after a time-out period.
N/A	ControlConnFault	BOOL	The Control Connection Loss fault bit indicates that the Integrated Motion on the EtherNet/IP network C-to-D connection from the controller has timed out.
N/A	ClockSyncFault	BOOL	The Clock Sync Fault bit indicates that the local clock of the motion device has lost synchronization with the master clock for an extended period of time (4060 seconds) during synchronous operation. This fault condition is an indication that the local IEEE 1588 clock has lost synchronization with the master and is not able to resynchronize within the allotted timeout (4060 seconds).
N/A	LogicWatchdogFault	BOOL	The Logic Watchdog Fault bit indicates that an auxiliary logic component, for example, FPGA, or ASIC, associated with the device node has experienced an excessive overload condition that has tripped the associated logic watchdog mechanism.
N/A	DuplicateAddressFault	BOOL	The Duplicate Address Fault bit indicates that a motion device node has been detected on the network that uses the same Node Address as this device node. For Ethernet, this address would be the IP address of the device.
N/A	ModuleAlarmStatus	DINT	This bit field is a roll-up of module scoped alarm conditions that can include synchronization alarms that are detected on either side of the Integrated Motion on the EtherNet/IP network connection. All defined Node Alarm Codes are mapped into bits in this attribute.
N/A	ControlSyncAlarm	BOOL	If this bit is set, the controller lost communication with the motion module and missed several position updates in a row. The controller can miss up to four position updates. After that, the Control Sync Fault bit is set. The motion module can fault later or can already be faulted. For a consumed axis, this bit means that communication is lost with the producing controller. This bit clears when communication is re-established.
N/A	ModuleSyncAlarm	BOOL	If this bit is set, the motion module lost communication with the controller and missed several position updates in a row. The motion module can miss up to four position updates. After that, the motion module shuts down. This bit clears when communication is re-established.
N/A	TimerEventAlarm	BOOL	If this bit is set, the motion module has a problem with its timer event that synchronizes the servo loop of the module to the master time base of the chassis (that is, Coordinated System Time). To clear this bit, reconfigure the motion module.
N/A	ProcessorOverloadAlarm	BOOL	The Processor Overload Alarm bit indicates that the host processor associated with motion device is experiencing overload conditions that can lead to a fault.
N/A	ClockJitterAlarm	BOOL	The Clock Jitter Alarm bit indicates that the Sync Variance has exceeded the Sync Threshold while the motion device is running in Sync Mode.
N/A	OutOfRangeAlarm	BOOL	The Out of Range Alarm bit is set when the drive determines that a Cyclic Write attribute value is out of range.
N/A	ClockSkewAlarm	BOOL	The Clock Skew Alarm bit indicates that the motion device has detected significant difference between the System Time of the device and the System Time of the controller. The difference prevents the device from switching to synchronous operation.
AxisFault	AxisFault		A fault exists on an axis.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
PosHardOvertravel Fault	<i>Equivalent:</i> HardwareOvertravelPositive Fault	BOOL	Set if the axis moves beyond the current position limits as established by hardware overtravel limit switches mounted on the equipment. This fault can only occur when the drive is in the enabled state and the Hard Overtravel Checking bit is set in the Fault Configuration Bits attribute. If the Hard Overtravel Fault Action is set for Stop Command, the faulted axis can be moved or jogged back inside the soft overtravel limits. However, any attempt to move the axis beyond the hard overtravel limit switch by using a motion instruction results in an instruction error. To recover from this fault, the axis must be moved back within normal operation limits of the equipment and the limit switch closed. This fault condition is latched and requires execution of a Motion Axis Fault Reset (MAFR) or Motion Axis Shutdown Reset (MASR) instruction to clear. Any attempt to clear the fault while the overtravel limit switch is still open and
MotFeedbackFault	<i>Equivalent:</i> FeedbackSignalLossFLFault	BOOL	 the drive is enabled is unsuccessful. Set for the A Quad B feedback device when: The differential electrical signals for one or more of the feedback channels (for example, A + and A-, B + and B-, or Z + and Z-) are at the same level (both high or both low). Under normal operation, the differential signals are always at opposite levels. The most common cause of this situation is a broken wire between the feedback transducer and the servo module or drive. Loss of feedback 'power' or feedback 'common' electrical connection between the servo module or drive and the feedback device. The controller latches this fault. Use a Motion Axis Fault Reset (MAFR) or Motion Axis Shutdown Reset (MASR) instruction to clear the fault.
MotFeedback NoiseFault	<i>Equivalent:</i> FeedbackSignalNoiseFLFault	BOOL	 Set when there is noise on the signal lines of the feedback device. For example, simultaneous transitions of the feedback A and B channels of an A Quad B are referred to generally as feedback noise. Feedback noise is caused by loss of quadrature in the feedback device, or radiated common-mode noise signals that the feedback device wiring picks up. You can see both of these noises on an oscilloscope. To troubleshoot the loss of channel quadrature, look for these things: Physical misalignment of the feedback transducer components. Excessive capacitance (or other delays) on the encoder signals. Proper grounding and shielding usually cures radiated noise problems. The controller latches this fault. Use a Motion Axis Fault Reset (MAFR) or Motion Axis Shutdown Reset (MASR) instruction to clear the fault.
AuxFeedbackFault	N/A	BOOL	 Set for an auxiliary feedback source when: The differential electrical signals for one or more of the feedback channels (for example, A+ and A-, B+ and B-, or Z+ and Z-) are at the same level (both high or both low). Under normal operation, the differential signals are always at opposite levels. The most common cause of this situation is a broken wire between the feedback transducer and the servo module or drive. Loss of feedback 'power' or feedback 'common' electrical connection between the servo module or drive and the feedback device. The controller latches this fault. Use a Motion Axis Fault Reset (MAFR) or Motion Axis Shutdown Reset (MASR) instruction to clear the fault.
AuxFeedbackNoise Fault	N/A	BOOL	Set when there is noise on the signal lines of the feedback device. For example, simultaneous transitions of the feedback A and B channels of an A Quad B are referred to generally as feedback noise. Feedback noise (shown below) is most often caused by loss of quadrature in the feedback device itself or radiated common-mode noise signals being picked up by the feedback device wiring. You can see both of these on an oscilloscope. To troubleshoot the loss of channel quadrature, look for these things: • Physical misalignment of the feedback transducer components. • Excessive capacitance (or other delays) on the encoder signals. Proper grounding and shielding usually cures radiated noise problems. The controller latches this fault. Use a Motion Axis Fault Reset (MAFR) or Motion Axis Shutdown Reset (MASR) instruction to clear the fault.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
DriveEnableInput Fault	<i>Equivalent:</i> EnableInputDeactivatedFault	BOOL	 This fault would be declared if either one of two possible conditions occur: 1. If an attempt is made to enable the axis (typically via MSO or MAH instruction) while the Drive Enable Input is inactive. 2. If the Drive Enable Input transitions from active to inactive while the axis is enabled. This fault can only occur when the Drive Enable Input Fault Handling bit is set in the Fault Configuration Bits attribute. If the Drive Enable Input Fault Action is set for Stop Command and the axis is stopped because of a Drive Enable Input Fault, the faulted axis cannot be moved until the fault is cleared. Any attempt to move the axis in the faulted state by using a motion instruction results in an instruction error. If the Drive Enable Fault Action setting is Status Only or Stop Command and an attempt is made to enable the axis (typically via MSO or MAH instruction) while the Drive Enable Input Fault. When the Drive Enable Fault Action setting is Stop Command, instructions that both enable the axis and initiate motion (MAH, MRAT, MAHD) abort the motion process leaving the instruction with both the IP and PC bits clear. This fault condition is latched and requires execution of an explicit MAFR (Motion Axis Fault Reset) or MASR (Motion Axis Shutdown Reset) instruction to clear. Any attempt to clear the fault while the drive enable input fault may be cleared with the drive enable input inactive if the drive is disabled. If the Drive Enable Input Checking bit is clear, then the state of the Drive Enable Input fault would be declared in any of the above conditions.
CommonBusFault	<i>Equivalent:</i> DCCommonBusFault	BOOL	The drive shuts down if you give it 3-phase power while it is configured for Common Bus Follower mode. If that happens, this bit turns on.
PreCharge OverloadFault	<i>Equivalent:</i> ConverterPreCharge OverloadFLFault	BOOL	The pre-charge resistor of the drive gets too hot if you cycle 3-phase power too many times. If that happens, this bit turns on.
GuardFaultExists	<i>Equivalent:</i> GuardFault	BOOL	If the Guard Fault bit is set, it indicates that one or more fault conditions have occurred related to the embedded Guard Motion safety function of the drive. The specific fault conditions can then be determined through access to the Guard Fault attribute of the associated axis. Guard Faults are applicable only if the drive device is equipped with hardwired guard safety functionality.
GroundShortFault	<i>Equivalent:</i> ConverterGroundCurrentFL Fault	BOOL	When the drive detects an imbalance in the DC bus supply current, the Ground Short Fault bit is set, indicating that current is flowing through an improper ground connection.
DriveHardFault	N/A	BOOL	Set when the drive detects a serious hardware fault. NOTE: The Axis_CIP_Drive structure provides detailed fault, alarm, and inhibit tags to assist you to diagnose a failure.
OverSpeedFault	<i>Equivalent:</i> MotorOverspeedFLFault	BOOL	Set when the speed of the axis as determined from the feedback has exceeded the over speed limit, which is typically set to 150% of configured velocity limit for the motor.
OverloadFault	N/A	BOOL	When the load limit of the motor/drive is first exceeded, the Overload warning bit is set. If the condition persists, the Overload fault is set. Often this bit is tied into the IT limit of the drive. NOTE: The Axis_CIP_Drive structure provides independent overload tags for all components of the servo system instead of consolidating them into one tag.
DriveOvertemp Fault	N/A	BOOL	Set when the temperature of the drive exceeds the drive shutdown temperature. NOTE: The Axis_CIP_Drive structure provides specific fault and alarm tags for the converter, inverter, and bus regulator to provide more detailed information than this single tag.
MotorOvertemp Fault	<i>Equivalent:</i> MotorOvertemperatureFLFault	BOOL	Set when the temperature of the motor exceeds the motor shutdown temperature.
DriveCoolingFault	N/A	BOOL	Set when the ambient temperature surrounding the control circuitry of the drive temperature exceeds the drive ambient shutdown temperature.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
DriveControl VoltageFault	<i>Equivalent:</i> ModuleVoltageMismatchFault	BOOL	Set when the power supply voltages associated with the drive circuitry fall outside of acceptable limits.
FeedbackFault	<i>Equivalent:</i> FeedbackDeviceFault	BOOL	 Set when one of the feedback sources that are associated with the drive axis has a problem that prevents the drive from receiving accurate or reliable position information from the feedback device. Set when one of the feedback sources for the axis cannot send accurate or reliable position information because there is a problem. For AXIS_SERVO axis, possible problems are: The differential electrical signals for one or more of the feedback channels (for example, A+ and A-, B+ and B-, or Z+ and Z-) are at the same level (both high or both low). Under normal operation, the differential signals are always at opposite levels. The most common cause of this situation is a broken wire between the feedback transducer and the servo module or drive. Loss of feedback power or common electrical connection between the servo module or drive and the feedback device. The controller latches this fault. Use a Motion Axis Fault Reset (MAFR) or Motion Axis Shutdown Reset (MASR) instruction to clear the fault.
CommutationFault	<i>Equivalent:</i> MotorCommutationFault	BOOL	Set when the commutation feedback source that is associated with the drive axis has a problem that prevents the drive from receiving accurate or reliable motor shaft information to perform commutation.
DriveOvercurrent Fault	<i>Equivalent:</i> InverterOvercurrentFault	BOOL	Set when drive output current exceeds the predefined operating limits for the drive. NOTE: As output current is the domain specifically of the inverter, the Axis_CIP_Drive structure indicates it as such rather than the generic drive label.
DriveOvervoltage Fault	<i>Equivalent:</i> BusOvervoltageFLFault	BOOL	Set when drive DC bus voltage exceeds the predefined operating limits for the bus. NOTE: The Axis_CIP_Drive structure clearly indicates that this fault is specifically representing the DC bus voltage rather than the inverter or converter voltage.
DriveUndervoltage Fault	<i>Equivalent:</i> BusUndervoltageFLFault	BOOL	Set when drive DC bus voltage is below the predefined operating limits for the bus. NOTE: The Axis_CIP_Drive structure clearly indicates that this fault is specifically representing the DC bus voltage rather than the inverter or converter voltage.
PowerPhaseLoss Fault	<i>Equivalent:</i> ConverterACSinglePhaseLoss Fault	BOOL	Set when the drive detects that one or more of the three power line phases is lost from the 3-phase power inputs. NOTE: The Axis_CIP_Drive structure indicates that this fault is specifically representing the input power rather than the output power.
PositionErrorFault	<i>Equivalent:</i> ExcessivePositionErrorFault	BOOL	Set when the axis position error exceeds the Position Error Tolerance. This fault can only occur when the drive is in the enabled state. The controller latches this fault. Use a Motion Axis Fault Reset (MAFR) or Motion Axis Shutdown Reset (MASR) instruction to clear the fault.
SercosFault	N/A	BOOL	Set when either a requested Sercos procedure fails to execute properly or the associated drive node has detected a Sercos communication fault. NOTE: The Axis_CIP_Drive structure contains similar faults and alarms to describe the health of the Ethernet communications link, but there is no need for a Sercos fault indication.
<i>Equivalent:</i> OverSpeedFault	MotorOverspeedFLFault	BOOL	Motor speed has exceeded its maximum limit given by the Motor Overspeed Factory Limit attribute associated with the motor type.
N/A	MotorOverspeedULFault	BOOL	Motor speed has exceeded the user-defined speed limit given by Motor Overspeed User Limit.
<i>Equivalent:</i> MotorOvertemp Fault	MotorOvertemperatureFLFault	BOOL	Motor temperature has exceeded its factory set temperature limit given by Motor Overtemperature Factory Limit, or the integral motor thermal switch has tripped.
N/A	MotorOvertemperatureULFault	BOOL	Motor temperature has exceeded the user-defined temperature limit given by Motor Overtemperature User Limit.
N/A	MotorThermalOverloadFLFault	BOOL	Motor thermal model has exceeded its factory set thermal capacity limit given by Motor Thermal Overload Factory Limit.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	MotorThermalOverloadULFault	BOOL	Motor thermal model has exceeded its user-defined thermal capacity given by Motor Thermal Overload User Limit.
<i>Equivalent:</i> DriveOvercurrent Fault	InverterOvercurrentFault	BOOL	Inverter current has exceeded the factory set peak or instantaneous current limit.
N/A	InverterOvertemperatureFL Fault	BOOL	Inverter temperature has exceeded its factory set temperature limit given by Inverter Overtemperature Factory Limit.
N/A	InverterOvertemperatureUL Fault	BOOL	Inverter temperature has exceeded the user-defined temperature limit given by Inverter Overtemperature User Limit.
N/A	InverterThermalOverloadFL Fault	BOOL	Inverter thermal model has exceeded its factory set thermal capacity limit given by Inverter Thermal Overload Factory Limit.
N/A	InverterThermalOverloadUL Fault	BOOL	Inverter thermal model has exceeded its user-defined thermal capacity given by Inverter Thermal Overload User Limit.
<i>Equivalent:</i> GroundShortFault	ConverterGroundCurrentFL Fault	BOOL	Ground Current has exceeded its factory set current limit by Converter Ground Current Factory Limit.
N/A	ConverterGroundCurrentUL Fault	BOOL	Ground Current has exceeded user-defined limit given by Converter Ground Current User Limit.
N/A	ConverterOvertemperatureFL Fault	BOOL	Converter temperature has exceeded its factory set temperature limit given by Converter Overtemperature Factory Limit.
N/A	ConverterOvertemperature ULFault	BOOL	Converter temperature has exceeded the user-defined temperature limit given by Converter Overtemperature User Limit.
N/A	ConverterThermalOverloadFL Fault	BOOL	Converter thermal model has exceeded its factory set thermal capacity limit given by Converter Thermal Overload Factory Limit.
N/A	ConverterThermalOverloadUL Fault	BOOL	Converter thermal model has exceeded its user-defined thermal capacity given by Converter Thermal Overload User Limit.
N/A	ConverterACPowerLossFault	BOOL	Multiple AC phases have been lost on the AC line to the converter.
<i>Equivalent:</i> PowerPhaseLoss Fault	ConverterACSinglePhaseLoss Fault	BOOL	One AC phase was lost on the AC line to the converter.
N/A	ConverterACPhaseShortFault	BOOL	A short has been detected between an AC phase and another AC phase or ground.
N/A	ConverterPreChargeFault	BOOL	A problem has been detected in the Converter's Pre-Charge circuitry preventing the DC Bus from charging to an acceptable voltage level.
N/A	BusRegulatorOvertemperatureFLFault	BOOL	Bus Regulator temperature has exceeded its factory set temperature limit given by Bus Regulator Overtemperature Factory Limit.
N/A	BusRegulatorOvertemperatureULFault	BOOL	Bus Regulator temperature has exceeded the user-defined temperature limit given by Bus Regulator Overtemperature User Limit.
N/A	BusRegulatorFault	BOOL	The bus regulator (shunt) module in a multi-axis system has a failed.
<i>Equivalent:</i> DriveUndervoltageFault	BusUndervoltageFLFault	BOOL	DC Bus voltage level is below the factory set limit given by Bus Undervoltage Factory Limit.
N/A	BusUndervoltageULFault	BOOL	DC Bus voltage level is below user-defined limit given by Bus Undervoltage User Limit.
<i>Equivalent:</i> Drive OvervoltageFault	BusOvervoltageFLFault	BOOL	DC Bus voltage level is above the factory set limit given by Bus Overvoltage Factory Limit.
N/A	BusOvervoltageULFault	BOOL	DC Bus voltage level is above user-defined limit given by Bus Overvoltage User Limit.
N/A	BusPowerLossFault	BOOL	DC Bus voltage level is below the Bus Power Loss Threshold for more than the timeout period-specified Bus Power Loss Time value.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	BusPowerBlownFuseFault	BOOL	DC Bus power loss due to blown fuse.
<i>Equivalent:</i> MotFeedbackNoiseFault	FeedbackSignalNoiseFLFault	BOOL	Noise induced A/B channel state changes (illegal states) from a feedback device were detected by the drive. Specifically, the number of these noise events that have occurred on this channel has exceeded the Feedback Noise Factory Limit. The offending feedback channel number is encoded in the associated Fault/ Alarm Sub Code.
N/A	FeedbackSignalNoiseULFault	BOOL	Noise induced A/B channel state changes (illegal states) from a feedback device were detected on a feedback channel. Specifically, the number of these noise events that have occurred on this channel has exceeded the Feedback Noise User Limit. The offending feedback channel number is encoded in the associated Fault/ Alarm Sub Code.
<i>Equivalent:</i> MotFeedback Fault)	FeedbackSignalLossFLFault	BOOL	One or more A/B channel signals from a feedback device are open, shorted, missing, or severely attenuated. Specifically, the detected voltage levels of the signals are below the Feedback Loss Factory Limit. The offending feedback channel number is encoded in the associated Fault/ Alarm Sub Code.
N/A	FeedbackSignalLossULFault	BOOL	One or more A/B channel signals from a feedback device are open, shorted, missing, or severely attenuated. Specifically, the detected voltage levels of the signals are below the Feedback Loss User Limit. The offending feedback channel number is encoded in the associated Fault/ Alarm Sub Code.
N/A	FeedbackDataLossFLFault	BOOL	The number of consecutive missed or corrupted serial data packets over the serial data channel from a feedback device has exceeded the Feedback Data Loss Factory Limit. The offending feedback channel number is encoded in the associated Fault/Alarm Sub Code.
N/A	FeedbackDataLossULFault	BOOL	The number of consecutive missed or corrupted serial data packets over the serial data channel from a feedback device has exceeded the Feedback Data Loss User Limit. The offending feedback channel number is encoded in the associated Fault/Alarm Sub Code.
<i>Equivalent:</i> FeedbackFault	FeedbackDeviceFault	BOOL	The feedback device has detected an internal error.
<i>Equivalent:</i> PosHard OvertravelFault	HardwareOvertravelPositive Fault	BOOL	Axis moved beyond the physical travel limits in the positive direction and activated the Positive Overtravel limit switch.
<i>Equivalent:</i> NegHard OvertravelFault	HardwareOvertravelNegative Fault	BOOL	Axis moved beyond the physical travel limits in the negative direction and activated the Negative Overtravel limit switch.
<i>Equivalent:</i> PositionErrorFault	ExcessivePositionErrorFault	BOOL	The Position Error value of the position control loop has exceeded the configured value for Position Error Tolerance.
N/A	ExcessiveVelocityErrorFault	BOOL	The Velocity Error value of the velocity control loop has exceeded the configured value for Velocity Error Tolerance.
N/A	OvertorqueLimitFault	BOOL	Motor torque has risen above user-defined maximum torque level given by Overtorque Limit.
N/A	UndertorqueLimitFault	BOOL	Motor torque has dropped below user-defined minimum torque level given by Undertorque Limit.
N/A	IllegalControlModeFault	BOOL	Controller has specified an unsupported Control Mode or Feedback Mode
<i>Equivalent:</i> DriveEnableInput Fault	EnableInputDeactivatedFault	BOOL	Enable has been deactivated while the axis is in Running state.
N/A	ControllerInitiatedFault	BOOL	Exception generated specifically by controller.
N/A	ExternalInputFault	BOOL	Exception generated by external input to device.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	CIPAxisFaultsRA	LINT	A bit map that represents the state of all manufacturer-specific runtime faults. Fault bits when set are latched until a fault reset occurs. A fault reset clears the runtime fault bits, but the bits set again immediately if the underlying exception condition is still present. Any exceptions whose Axis Exception Action is configured to ignore or report as alarms do not appear in this attribute.
N/A	CommutationStartupFault	BOOL	The self-sensing commutation startup algorithm failed.
N/A	MotorVoltageMismatchFault	BOOL	The motor voltage is incompatible with the applied drive voltage.
N/A	FeedbackFilterNoiseFault	BOOL	Excessive levels of noise have been detected by the digital feedback filter.
N/A	FeedbackBatteryLossFault	BOOL	The battery voltage on a battery-backed motor encoder is low enough such that absolute position is not longer available.
N/A	FeedbackBatteryLowFault	BOOL	The battery voltage on a battery-backed motor encoder is below a caution level.
N/A	FeedbackIncrementalCountErrorFault	BOOL	The periodic check of the incremental encoder position against the absolute encoder position or Hall edges indicates they are out of tolerance.
N/A	ControlModuleOvertemperatureFLFault	BOOL	Kinetix drives: The control module temperature has exceeded its limit. PowerFlex 755 drives: The temperature sensor on the Main Control Board detected excessive heat.
N/A	ControlModuleOvertemperature ULFault	BOOL	The control module temperature has exceeded a user-defined limit given by Control Module Overtemperature User Limit. Factory limit due to excessive power cycling.
<i>Equivalent:</i> PreCharge OverloadFault	ConverterPreChargeOverloadFL Fault	BOOL	Converter estimates that the pre-charge circuit has exceeded its limit.
N/A	ConverterPreChargeOverloadUL Fault	BOOL	Converter estimates that the pre-charge circuit has exceeded its user-defined limit given by Converter Pre-charge Overload User Limit due to excessive power cycling.
N/A	ExcessiveCurrentFeedback OffsetFault	BOOL	Current in one or more phases has been lost or remains below a preset level.
N/A	RegenerativePowerSupplyFault	BOOL	The hardware Regeneration OK input was deactivated while the drive was enabled.
N/A	PWMFrequencyReducedFault	BOOL	Carrier Frequency foldback due to excessive Junction Temperature.
N/A	CurrentLimitReducedFault	BOOL	Current Limit reduced due to excessive Junction Temperature or due to Overload Protection.
N/A	TorqueProveFault	BOOL	Actual feedback indicates error in torque proving.
N/A	DecelOverrideFault	BOOL	The drive is not following a commanded deceleration because it is attempting to limit bus voltage.
N/A	PreventativeMaintenanceFault	BOOL	Component has reached lifetime limit.
N/A	MotorTestFault	BOOL	Motor Test procedure has failed.
N/A	HardwareConfigurationFault	BOOL	Error related to the tracking of optional hardware installation.
N/A	FirmwareChangeFault	BOOL	Errors or forced configuration changes relating to firmware update.
<i>Equivalent:</i> CommonBusFault	DCCommonBusFault	BOOL	Error has been detected related to Common Bus operation.
N/A	RuntimeErrorFault	BOOL	Runtime Assertions detected.
N/A	BackplaneCommunicationError Fault	BOOL	Error in communicating over the modular backplane.
N/A	SafetyModuleCommunication ErrorFault	BOOL	Error in communicating to the Safety module.
N/A	ProductSpecificFault	BOOL	Product Specific (exotic) exceptions by Sub Code.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	CIPAxisAlarms	LINT	A bit map that represents the current state of all standard alarm conditions. The bit map is identical to that of the Std. CIP Axis Exceptions attribute. Only exception conditions whose Axis Exception Action is configured to report as an alarm appear in this attribute, and will not be reported in the CIP Axis Faults attribute. Alarm bits when set are not latched and will clear as soon as the underlying exception condition is corrected.
N/A	MotorCommutationAlarm	BOOL	Permanent magnet motor commutation problem detected. Example would be an illegal state "111" or "000" for UVW commutation signals, S1, S2, and S3.
N/A	MotorOverspeedFLAlarm	BOOL	Motor speed has exceeded its maximum limit given by the Motor Overspeed Factory Limit attribute associated with the motor type.
N/A	MotorOverspeedULAlarm	BOOL	Motor speed has exceeded the user-defined speed limit given by Motor Overspeed User Limit.
N/A	MotorOvertemperatureFL Alarm	BOOL	Motor temperature has exceeded its factory set temperature limit given by Motor Overtemperature Factory Limit, or the integral motor thermal switch has tripped.
N/A	MotorOvertemperatureUL Alarm	BOOL	Motor temperature has exceeded the user-defined temperature limit given by Motor Overtemperature User Limit.
N/A	MotorThermalOverloadFL Alarm	BOOL	Motor thermal model has exceeded its factory set thermal capacity limit given by Motor Thermal Overload Factory Limit.
N/A	MotorThermalOverloadUL Alarm	BOOL	Motor thermal model has exceeded its user-defined thermal capacity given by Motor Thermal Overload User Limit.
N/A	InverterOvercurrentAlarm	BOOL	Inverter current has exceeded the factory set peak or instantaneous current limit.
N/A	InverterOvertemperatureFL Alarm	BOOL	Inverter temperature has exceeded its factory set temperature limit given by Inverter Overtemperature Factory Limit.
N/A	InverterOvertemperatureUL Alarm	BOOL	Inverter temperature has exceeded the user-defined temperature limit given by Inverter Overtemperature User Limit.
N/A	InverterThermalOverIoadFL Alarm	BOOL	Inverter thermal model has exceeded its factory set thermal capacity limit given by Inverter Thermal Overload Factory Limit.
N/A	InverterThermalOverIoadUL Alarm	BOOL	Inverter thermal model has exceeded its user-defined thermal capacity given by Inverter Thermal Overload User Limit.
N/A	ConverterGroundCurrentFL Alarm	BOOL	Ground Current has exceeded its factory set current limit given by Converter Ground Current Factory Limit.
N/A	ConverterGroundCurrentUL Alarm	BOOL	Ground Current has exceeded user-defined limit given by Converter Ground Current User Limit.
N/A	ConverterOvertemperatureFL Alarm	BOOL	Converter temperature has exceeded its factory set temperature limit given by Converter Overtemperature Factory Limit.
N/A	ConverterOvertemperatureUL Alarm	BOOL	Converter temperature has exceeded the user-defined temperature limit given by Converter Overtemperature User Limit.
N/A	ConverterThermalOverloadFL Alarm	BOOL	Converter thermal model has exceeded its factory set thermal capacity limit given by Converter Thermal Overload Factory Limit.
N/A	ConverterThermalOverloadUL Alarm	BOOL	Converter thermal model has exceeded its user-defined thermal capacity given by Converter Thermal Overload User Limit.
N/A	ConverterACPowerLossAlarm	BOOL	Multiple AC phases have been lost on the AC line to the converter.
N/A	ConverterACSinglePhaseLoss Alarm	BOOL	One AC phase has been lost on the AC line to the converter.
N/A	ConverterACPhaseShortAlarm	BOOL	A short has been detected between an AC phase and another AC phase or ground.
N/A	ConverterPreChargeAlarm	BOOL	A problem has been detected in the Converter's Pre-Charge circuitry preventing the DC Bus from charging to an acceptable voltage level.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	BusRegulatorOvertemperature FLAlarm	BOOL	Bus Regulator temperature has exceeded its factory set temperature limit given by Bus Regulator Overtemperature Factory Limit.
N/A	BusRegulatorOvertemperature ULAlarm	BOOL	Bus Regulator temperature has exceeded the user-defined temperature limit given by Bus Regulator Overtemperature User Limit.
N/A	BusRegulatorThermalOverload FLAlarm	BOOL	Bus Regulator thermal model has exceeded its factory set thermal capacity limit given by Bus Regulator Thermal Overload Factory Limit.
N/A	BusRegulatorThermalOverload ULAlarm	BOOL	Bus Regulator thermal model has exceeded its user-defined thermal capacity given by Bus Regulator Thermal Overload User Limit.
N/A	BusRegulatorAlarm	BOOL	The bus regulator (shunt) module in a multi-axis system has failed.
N/A	BusUndervoltageFLAlarm	BOOL	DC Bus voltage level is below the factory set limit given by Bus Undervoltage Factory Limit.
N/A	BusUndervoltageULAlarm	BOOL	DC Bus voltage level is below user-defined limit given by Bus Undervoltage User Limit.
N/A	BusOvervoltageFLAlarm	BOOL	DC Bus voltage level is above the factory set limit given by Bus Overvoltage Factory Limit.
N/A	BusOvervoltageULAlarm	BOOL	DC Bus voltage level is above user-defined limit given by Bus Overvoltage User Limit.
N/A	BusPowerLossAlarm	BOOL	DC Bus voltage level is below the Bus Power Loss Threshold for more than the timeout period-specified Bus Power Loss Time value.
N/A	BusPowerBlownFuseAlarm	BOOL	DC Bus power loss due to blown fuse.
N/A	FeedbackSignalNoiseFLAlarm	BOOL	Noise induced A/B channel state changes (illegal states) from a feedback device were detected by the drive. Specifically, the number of these noise events that have occurred on this channel has exceeded the Feedback Noise Factory Limit. The offending feedback channel number is encoded in the associated Fault/ Alarm Sub Code.
N/A	FeedbackSignalNoiseULAlarm	BOOL	Noise induced A/B channel state changes (illegal states) from a feedback device were detected on a feedback channel. Specifically, the number of these noise events that have occurred on this channel has exceeded the Feedback Noise User Limit. The offending feedback channel number is encoded in the associated Fault/Alarm Sub Code.
N/A	FeedbackSignalLossFLAlarm	BOOL	One or more A/B channel signals from a feedback device are open, shorted, missing, or severely attenuated. Specifically, the detected voltage levels of the signals are below the Feedback Loss Factory Limit. The offending feedback channel number is encoded in the associated Fault/Alarm Sub Code.
N/A	FeedbackSignalLossULAlarm	BOOL	One or more A/B channel signals from a feedback device are open, shorted, missing, or severely attenuated. Specifically, the detected voltage levels of the signals are below the Feedback Loss User Limit. The offending feedback channel number is encoded in the associated Fault/Alarm Sub Code.
N/A	FeedbackDataLossFLAlarm	BOOL	The number of consecutive missed or corrupted serial data packets over the serial data channel from a feedback device has exceeded the Feedback Data Loss Factory Limit. The offending feedback channel number is encoded in the associated Fault/Alarm Sub Code.
N/A	FeedbackDataLossULAlarm	BOOL	The number of consecutive missed or corrupted serial data packets over the serial data channel from a feedback device has exceeded the Feedback Data Loss User Limit. The offending feedback channel number is encoded in the associated Fault/Alarm Sub Code.
N/A	FeedbackDeviceAlarm	BOOL	The feedback device has detected an internal error.
N/A	HardwareOvertravelPositive Alarm	BOOL	Axis moved beyond the physical travel limits in the positive direction and activated the Positive Overtravel limit switch.
N/A	HardwareOvertravelNegative Alarm	BOOL	Axis moved beyond the physical travel limits in the negative direction and activated the Negative Overtravel limit switch.
N/A	ExcessivePositionErrorAlarm	BOOL	The Position Error value of the position control loop has exceeded the configured value for Position Error Tolerance.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	ExcessiveVelocityErrorAlarm	BOOL	The Velocity Error value of the velocity control loop has exceeded the configured value for Velocity Error Tolerance.
N/A	OvertorqueLimitAlarm	BOOL	Motor torque has risen above user-defined maximum torque level given by Overtorque Limit.
N/A	UndertorqueLimitAlarm	BOOL	Motor torque has dropped below user-defined minimum torque level given by Undertorque Limit.
N/A	IllegalControlModeAlarm	BOOL	Controller has specified an unsupported Control Mode or Feedback Mode.
N/A	EnableInputDeactivatedAlarm	BOOL	Enable has been deactivated while the axis is in Running state.
N/A	ControllerInitiatedAlarm	BOOL	Exception generated specifically by controller.
N/A	ExternalInputAlarm	BOOL	Exception generated by external input to device.
N/A	CIPAxisAlarmsRA	LINT	A bit map that represents the current state of all manufacturer-specific alarm conditions. Only exception conditions whose Axis Exception Action is configured to report as an alarm appear in this attribute, and will not be reported in the CIP Axis Faults attribute. Alarm bits when set are not latched and will clear as soon as the underlying exception condition is corrected.
N/A	CommutationStartupAlarm	BOOL	The self-sensing commutation startup algorithm failed.
N/A	MotorVoltageMismatchAlarm	BOOL	The motor voltage is incompatible with the applied drive voltage.
N/A	FeedbackFilterNoiseAlarm	BOOL	Excessive levels of noise have been detected by the digital feedback filter.
N/A	FeedbackBatteryLossAlarm	BOOL	The battery voltage on a battery-backed motor encoder is low enough such that absolute position is not longer available.
N/A	FeedbackBatteryLowAlarm	BOOL	The battery voltage on a battery-backed motor encoder is below a caution level.
N/A	FeedbackIncrementalCount ErrorAlarm	BOOL	The periodic check of the incremental encoder position against the absolute encoder position or Hall edges indicates they are out of tolerance.
N/A	ControlModuleOvertemperature FLAIarm	BOOL	Kinetix: The control module temperature has exceeded its limit. PF755: The temperature sensor on the Main Control Board detected excessive heat.
N/A	ControlModuleOvertemperature ULAlarm	BOOL	The control module temperature has exceeded a user-defined limit given by Control Module Overtemperature User Limit.
N/A	ConverterPreChargeOverload FLAIarm	BOOL	Converter estimates that the pre-charge circuit has exceeded its factory limit due to excessive power cycling.
N/A	ConverterPreChargeOverload ULAlarm	BOOL	Converter estimates that the pre-charge circuit has exceeded its user-defined limit given by Converter Pre-charge Overload User Limit due to excessive power cycling.
N/A	ExcessiveCurrentFeedback OffsetAlarm	BOOL	Current in one or more phases has been lost or remains below a preset level.
N/A	RegenerativePowerSupplyAlarm	BOOL	The hardware Regeneration OK input was deactivated while the drive was enabled.
N/A	PWMFrequencyReducedAlarm	BOOL	Carrier Frequency foldback due to excessive Junction Temperature.
N/A	CurrentLimitReducedAlarm	BOOL	Current Limit reduced due to excessive Junction Temperature or due to Overload Protection.
N/A	TorqueProveAlarm	BOOL	Actual feedback indicates error in torque proving.
N/A	DecelOverrideAlarm	BOOL	The drive is not following a commanded deceleration because it is attempting to limit bus voltage.
N/A	PreventativeMaintenanceAlarm	BOOL	Component has reached lifetime limit.
N/A	MotorTestAlarm	BOOL	Motor Test procedure has failed.
N/A	HardwareConfigurationAlarm	BOOL	Error related to the tracking of optional hardware installation.
N/A	FirmwareChangeAlarm	BOOL	Errors or forced configuration changes relating to firmware update.
N/A	DCCommonBusAlarm	BOOL	Error has been detected related to Common Bus operation.

Axis Exceptions	(Continued)
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AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	RuntimeErrorAlarm	BOOL	Runtime Assertions detected.
N/A	BackplaneCommunicationError Alarm	BOOL	Error in communicating over the modular backplane.
N/A	SafetyModuleCommunication ErrorAlarm	BOOL	Error in communicating to the Safety module.
N/A	ProductSpecificAlarm	BOOL	Product Specific (exotic) exceptions by Sub Code.
N/A	CIPInitializationFaults	DINT	A bit map that represents the state of all standard initialization faults. These faults prevent any motion, and do not have configurable fault actions. Examples of initialization faults are corrupted memory data, calibration errors, firmware startup problems, or an invalid configuration attribute value. Initialization faults cannot be cleared with a Fault Reset service, although a power-cycle provides a new attempt at initialization.
N/A	BootBlockChecksumFault	BOOL	Checksum or CRC error for Boot Block of Integrated Motion on the EtherNet/IP network device detected as part of self-test.
N/A	MainBlockChecksumFault	BOOL	Checksum or CRC error for Main Block of Integrated Motion on the EtherNet/IP network device detected as part of self-test.
N/A	NonvolatileMemoryChecksum Fault	BOOL	Checksum or CRC error for NV Memory of Integrated Motion on the EtherNet/IP network device detected as part of self-test.
N/A	CIPInitializationFaultsRA	DINT	A bit map that represents the state of all Rockwell Automation specific initialization faults. These faults prevent any motion, and do not have configurable fault actions. Examples of initialization faults are corrupted memory data, calibration errors, firmware startup problems, or an invalid configuration attribute value. Initialization faults cannot be cleared with a Fault Reset service, although a power-cycle provides a new attempt at initialization.
N/A	FeedbackDataCorruptionFault	BOOL	Smart Encoder Data Corruption detected.
N/A	FeedbackDataRangeFault	BOOL	Data within a motor data blob is out of range.
N/A	FeedbackCommunication StartupFault	BOOL	Communications with a smart encoder could not be established.
N/A	FeedbackAbsoluteOverspeed Fault	BOOL	Excessive speed was detected in the battery-backed encoder while power was off.
N/A	FeedbackAbsolutePowerOff TravelFault	BOOL	The power-off travel range of the battery-backed encoder has been exceeded.
N/A	FeedbackAbsoluteStartup SpeedFault	BOOL	The absolute encoder was not able to accurately determine the position after power-up due to speed greater than 100 RPM.
N/A	CommutationOffset UninitializedFault	BOOL	The commutation offset stored in a third-party motor has not been initialized.
N/A	InvalidFPGAImageFault	BOOL	The FPGA image is incompatible with hardware operation.
N/A	InvalidBoardSupportPackage Fault	BOOL	The board support package is incompatible with hardware operation.
N/A	InvalidSafetyFirmwareFault	BOOL	The safety firmware is not compatible with the drive firmware, or the main safety firmware is missing.
N/A	PowerBoardFault	BOOL	Power Board checksum error.
N/A	IllegalOptionCardFault	BOOL	The Main Control Board has detected an illegal option installed in the port.
N/A	OptionStorageChecksumFault	BOOL	Option data storage checksum failed.
<i>Equivalent:</i> DriveControlVoltageFault	ModuleVoltageMismatchFault	BOOL	IAM detects a voltage rating mismatch on the modular backplane.
N/A	UnknownModuleFault	BOOL	Unknown module is detected on the modular backplane.
N/A	FactoryConfigurationErrorFault	BOOL	Factory Configuration Data is missing or invalid.

AXIS_SERVO_DRIVE	AXIS_CIP_DRIVE	Туре	Description
N/A	IllegalAddressFault	BOOL	AM Node Address is out of range (>254).
N/A	SeriesMismatchFault	BOOL	Sercos AMs have been detected by the CIP IAM.
N/A	OpenSlotFault	BOOL	IAM detects an open slot on the modular backplane.
N/A	CIPStartInhibits	INT	A bit map that specifies the current state of all standard conditions that inhibits starting of the axis.
N/A	AxisEnableInputInhibit	BOOL	Axis Enable Input is not active.
N/A	MotorNotConfiguredInhibit	BOOL	The associated motor has not been configured for use.
N/A	FeedbackNotConfiguredInhibit	BOOL	The associated feedback device has not been configured for use.
N/A	CIPStartInhibitsRA	INT	A bit map that specifies the current state of all Rockwell Automation specific conditions that inhibits starting of the axis.
N/A	VoltsHertzCurveDefinition Inhibit	BOOL	Conflict exists in the V/Hz curve definition.
N/A	MotorFeedbackRequiredInhibit	BOOL	Can't run using the selected motor control mode with Primary Feedback or Alternate Feedback set as open loop.
N/A	SpeedLimitConfiguration Inhibit	BOOL	Speed Ref Limit Conflict, either Minimum Forward Speed Limit exceeds Maximum Forward Speed Limit, or Minimum Reverse Speed Limit exceeds Maximum Reverse Speed Limit.
N/A	TorqueProveConfiguration Inhibit	BOOL	When Torque Prove Config is enabled, Control Mode, Feedback Mode, Motor Feedback Type, and Motor Option Configuration must be properly set.
N/A	SafeTorqueOffInhibit	BOOL	The safety function has disabled the power structure.
N/A	SafetyResetRequiredInhibit	BOOL	The safety reset input needs to be toggled before the safety board will allow motion again.
N/A	SafetyNotConfiguredInhibit	BOOL	The embedded safety function of the drive has not been configured.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description	
Kinetix 6200 and Kinetix 6500 Modular Multi-axis Servo Drives User Manual, publication <u>2094-UM002</u>	Provides detailed information about the Kinetix 6200 and Kinetix 6500 drives.	
Kinetix 6200 and Kinetix 6500 Safe Speed Monitoring Multi-axis Servo Drives Safety Reference Manual, publication <u>2094-RM001</u>	Information on how to wire, configure, and troubleshoot the safe-speed features of your Kinetix 6200 and Kinetix 6500 drives.	
Integrated Motion on the EtherNet/IP Network: Configuration and Startup User Manual, publication MOTION-UM003	Information on how to configure and troubleshoot your ControlLogix and CompactLogix EtherNet/IP network modules.	
Kinetix Motion Control Selection Guide, publication <u>GMC-SG001</u>	Overview of Kinetix servo drives, motors, actuators, and motion accessories that are designed to help make initial decisions for the motion control products that are best suited for your system requirements.	
Integrated Motion on the EtherNet/IP: 8 Axis Basic Linear/Ring Drawing, publication <u>IASIMP-QR020</u>	Provides an example of an integrated motion on EtherNet/IP 8 axis basic linear/ring network.	
Integrated Motion on the EtherNet/IP Network Reference Manual, publication MOTION-RM003	Provides a programmer with details about the AXIS_CIP_DRIVE motion control axis attributes and the Logix Designer application Control Modes.	
ControlLogix 5580 Controllers User Manual, publication <u>1756-UM543</u>	Provides detailed information about the ControlLogix 5580 controllers.	
Kinetix 5700 Servo Drives User Manual, publication 2198-UM002	Provides detailed information about the Kinetix 5700 servo drives.	
Motion System Tuning Application Technique, publication MOTION-AT005	Provides detailed information about tuning motion systems.	
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.	
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.	

You can view or download publications at <u>http://www.rockwellautomation.com/global/literature-library/</u> <u>overview.page</u>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support- now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct- dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

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