Danaher Motion

SERVO**STAR**® S
SERVO**STAR**® CD

Setup and Reference Guide

KOLLMORGEN

giving our customers freedom of design

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Record of Manual Revisions

ISSUE NO.	DATE	BRIEF DESCRIPTION OF REVISION
1	12/31/00	Initial release
2	03/30/01	Added new commands and enhancement information for new firmware version
3	06/30/01	Corrected Product Family Control Specifications table
4	09/12/01	Added information for new firmware version
5	12/07/01	Added Danaher information
6	03/01/02	Updated HOMETYPE, INxMODE, and PFBOFF

Copyright Information

NOTICE:

Safety Instructions

Only qualified personnel are permitted to transport, assemble, use, and maintain this equipment. Properly qualified personnel are those who are familiar with the transport, assembly, installation, use and operation of motors, and who have the appropriate qualifications for their jobs. The qualified personnel must know and observe the following standards and regulations:

IEC 364 resp. CENELEC HD 384 or DIN VDE 0100
IEC report 664 or DIN VDE 0110
National regulations for safety and accident prevention or VBG 4

Read all available documentation before assembling and using. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements.

It is vital that all system components are connected to earth ground. Electrical safety is provided through a low-resistance earth connection.

SERVO**STAR** products contain electrostatically-sensitive components that can be damaged by incorrect handling. Avoid contact with high insulating materials (artificial fabrics, plastic film, etc.). Place the product on a conductive surface. Ground yourself (discharge any possible static electricity build-up) by touching an unpainted, metal, grounded surface before touching the equipment.

Keep all covers and cabinet doors shut during operation. Otherwise, potential hazards could cause severe personal injury or damage to the product.

Be aware that during operation, the product has electrically charged components and hot surfaces. Control and power cables can carry a high voltage, even when the motor is not rotating.

Never disconnect or connect the product while the power source is energized to avoid electric arcing and hazards to personnel and electrical contacts.

After removing the power source from the equipment, wait at least 10 minutes before touching or disconnecting sections of the equipment that normally carry electrical charges (e.g., capacitors, contacts, screw connections). To be safe, measure the electrical contact points with a meter before touching the equipment.

Safety symbols indicate a potential for personal injury or equipment damage if the recommended precautions and safe operating practices are not followed. Read and be familiar with the safety notices in this manual before attempting installation, operation, or maintenance to avoid serious bodily injury, damage to the equipment, or operational difficulty. The safety symbols are:

"**Warning**" identifies hazards that could result in personal injury or death.

"**Caution**" identifies hazards that could result in personal injury or equipment damage.

"**Note**" identifies information required for your understanding or use of the equipment.

Directives and Standards

SERVO**STAR** products have been successfully tested and evaluated to meet UL/cUL 508C for U. S. and Canadian markets. This standard outlines the minimum requirements for electrically operated power conversion equipment (frequency converters and Servo amplifiers), which are intended to eliminate the risk of fire, electric shock, or injury to persons, being caused by such equipment.

CE Mark Conformance

The Electromagnetic Compatibility (EMC) of a system is identified in two parts: emissions and immunity. Emissions are the generation of EMI (electromagnetic interference) and immunity is the susceptibility levels of the equipment. Limits are derived from generic standards EN55081-2 and EN55082-2 for heavy industrial environment. The SERVO**STAR** drives and BUS modules have been tested for radiated emissions, conducted emissions, EFT, ESD, surge, conducted immunity, and radiated immunity. These tests have been in accordance with EN55011, EN61000-4-2, ENV50140, IEC 1000-4-4, EN61000-4-5, and ENV50141.

Servo drives are incorporated in electrical plants and machines for industrial use. When servo drives are built into machines or plants, the operation of the drive is prohibited until the machine or plant meets the requirements of the EC Directive on Machines 89/392/EEC and the EC Directive on EMC (89/336/EEC). EN 60204 and EN 292 must be met. In connection with the Low Voltage Directive 73/23/EEC, the harmonized standards of the EN 50178 series are applied to the amplifiers, together with EN 60439-1, EN 60146 and EN 60204. The manufacturer of the machine or plant is responsible for ensuring that they meet the limits required by the EMC regulations. Advice on the correct installation for EMC (shielding, grounding, arrangement of filters, treatment of connectors and the lay out of cabling) can be found in this document Conformance with the EC Directive on EMC 89/336/EEC and the Low Voltage Directive 73/23/EEC is mandatory for the supply of servo drives within the European Community.

The servo drives have been tested by an authorized testing laboratory in a defined configuration with the system components; described in this documentation. Kollmorgen is not responsible for any divergence from the configuration and installation described in this documentation and is not responsible for the performance of new measurements or ensuring that regulatory requirements are met. SERVO**STAR** drives and systems have been successfully tested and evaluated to the limits and requirements of the EC Directive on EMC (89/336/EEC) and the EC Directive on low voltage (72/73/EEC). The products have been evaluated to EN50178 and EN60204 as a component of a machine and other relevant standards.

Contents

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INSTALLATION PROCEDURE

This *Setup and Reference Guide* includes information on drive communication, command syntax, and other useful information. It is provided to get your system up and operational.

The full-size (8 ½" x 11") *SERVO**STAR**® S and CD Installation Manual*, *VARCOM Manual*, *CE Manual*, and *IDN Reference Manual* can be found on the PSP CD-ROM in the SERVO**STAR**® S and CD section in .PDF format. Feel free to print these documents as necessary for your support needs. Be sure to also check the website at www.MotionVillage.com for the latest updates to the documentation.

The PSP CD-ROM has an ergonomic, graphical user interface (GUI) program called **MOTIONLINK**, that is used for monitoring and configuring the drive.

These installation steps are provided to assist you in getting your SERVO**STAR** S or SERVO**STAR** CD installed and operational. For additional information, refer to the *SERVO**STAR**® S and SERVO**STAR**® CD Installation Manual*.

High voltage can be hazardous to personnel and equipment. Be sure a qualified electrician works on this equipment. To ensure safety, follow all national and local codes during installation as well as the safety precautions outlined in the front of this documentation.

1. Open the box(es) and remove all the contents. Check to ensure there is no visible damage to any of the equipment.
2. Mount the SERVO**STAR** S or SERVO**STAR** CD to the back panel. Refer to the appropriate Outline Dimensions. ***Metal-to-metal contact is important for electrical noise control!***
3. Wire the SERVO**STAR** S or SERVO**STAR** CD according to the appropriate System Wiring Diagram.
4. Connect solid earth ground to frames of all components.
5. Wire the main power (115/230 VAC).
   A. For S-Series product: Wire the logic and DC Bus power from power supply to drive modules.
   B. For CDxx260 and CDxx261 product wire the 24 volt supply to the connector at the top of the drive.
6. Wire user I/O at connector C3: At a minimum, 24 volts must be brought in to the enable circuit. Be certain that connector C3 is inserted correctly.
7. Wire the motor and feedback. Refer to the Feedback Wiring Diagram for additional information.
8. Wire Regen Resistor kit, if applicable.
9. Verify that all wiring is correct.
10. Verify that earth grounds are connected.
11. Verify all electrical and safety codes are met.
12. Connect the serial cable between connector C2 and PC.
    Refer to the appropriate System Wiring Diagram.
13. Install **MOTIONLINK** on the PC. Refer to the *SERVO**STAR**® S and SERVO**STAR**® CD Installation Manual* for detailed information.

Startup processes can cause motor motion. Be certain that all applicable safety precautions are taken to prevent harm to personnel or damage to equipment.

14. Using the Startup Wizard in **MOTIONLINK**:
    A. Configure the SERVO**STAR** S or SERVO**STAR** CD for your particular motor, if this was not configured at the factory. Refer to the *SERVO**STAR**® S and SERVO**STAR**® CD Installation Manual* for information on the **MOTIONLINK** Startup Wizard.
    B. Enable the system.

FIRMWARE UPDATES

If your unit has the following label:

It requires firmware version 4.0.0 or higher. Other unit types will work with all firmware versions.

Firmware version 4.0.0 and higher is not compatible with the older versions of IGNITE (firmware loading software). Attempting to load incompatible firmware results in the IGNITE program generating an error.

BONDING

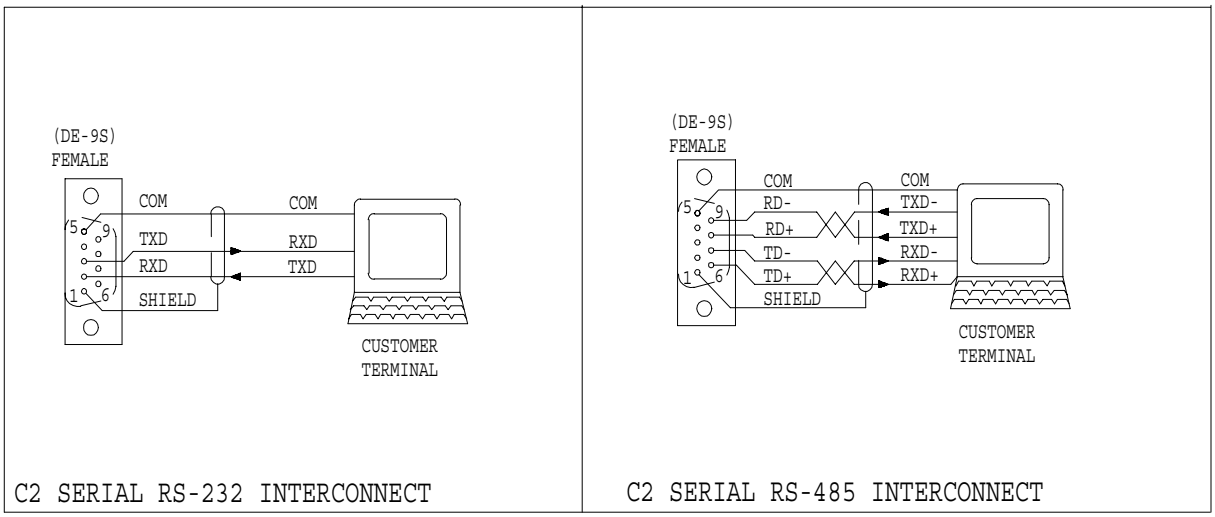
The proper bonding of shielded cables is imperative for minimizing noise emissions and increasing immunity levels of the drive system and reduces the impedance between the cable shield and the back panel. Kollmorgen recommends that all shielded cables be bonded to the back panel.

Power input wiring does not require shielding (screening) if the power is fed to the cabinet (enclosure) via metallized conduit. If the metallized conduit is used with proper high frequency grounds, bonding technology, and recommended wire routing, the power input wire shielding has no affect. In the event that metallized conduit is not used, shielded cable is required on the power input wires and proper bonding technologies should be implemented.

The motor and feedback cables should have the shield exposed as close to the drive as possible. This exposed shield can be bonded to the back panel.

SERIAL COMMUNICATION WIRING DIAGRAM

NOTE: Do NOT connect unused pins!



SERVOSTAR CX HARDWARE SPECIFICATIONS

Amplifier Model		Cx03	Cx06	Cx10
Unit Weight	Lbs./Kgs.	3.56/1.61	4.9/2.22	5.94/2.69
Mounting Hardware	English (Metric)	10-32 (M4)		
	Applied Torque	20 lb-in. (2.26 Nm.)		
Connection Hardware	Line Screw Size/Torque	M3.5/12 lb-in. (1.35 Nm.)		
	BUS Screw Size/Torque			
	Motor Screw Size/Torque			
	Ground Screw Size/Torque			
Wire Size (AWG#)	Control Logic (AWG/ mm^2)	16 / 1.5		
	Motor Line (AWG/ mm^2)	14 / 2.5		
	Main Input (AWG/ mm^2)	14 / 2.5	12 / 4	
	Configurable I/O wire gauge	22-18 AWG (0.3-0.75 mm^2) Ferrules recommended: 18 AWG Type H0 - 75/14 Weidmuller 4629.0 or equivalent 20 AWG Type H0 - 5/14 Weidmuller 6907.0 or equivalent 22 AWG Type H0 – 34/12 Weidmuller 90257.7 or equivalent		
	Spade Terminals	16/14 AWG (1.5 mm^2): Hollingsworth XSS0954S OR SS20947SF or equivalent 12/10 AWG (4-6 mm^2): Hollingsworth XSS20836 OR SS20832F or equivalent		
Clearance Distance	Side-to-Side	0.5in (12.7mm)		
	Top/Bottom	2.5in (63.5mm)		
Mating Connector Hardware	CK100 Kit	Includes: C1, C2, C4, C7 (plus 2 ft./0.69 m. of stranded bus ribbon), C8		
	C3	Kollmorgen #: A-93899-013 Vendor Info: Weidmuller BL3.5/13 Cat.No. 161574		
	C5	Kollmorgen #: A-81014-004 Vendor Info: PCD ELFP04110		
	Connector Screw Torque	2.25 lb-in. (0.25 m.)		
	24 V Logic (optional)	Kollmorgen #:A-81014-002 Vendor Info: PCD ELFP02210		

SERVOSTAR SX HARDWARE SPECIFICATIONS

Amplifier Model		Sx03	Sx06	Sx10	Sx20	Sx30	Sx55	Sx85
Unit Weight	lbs / Kgs	6.3/2.85		7.3 / 3.3	9.9/4.5	11.5 / 5.2	14.3 / 6.5	19.7 / 9.0
Mounting Hardware	English (Metric)	10-32 (M4)						
	Applied Torque	20 lb-in (2.26 Nm.)						
Connection Hardware	BUS Screw Size/Torque	6-32/12lb-in (1.35 Nm.)						
	Motor Screw Size/Torque	6-32/12lb-in (1.35 Nm.)				10-32/20lb-in (2.26 Nm.)		M5/20lb-in.
	Ground Screw Size/Torque	M4/12lb-in (1.35 Nm.)				10-32/20lb-in (2.26 Nm.)		Box Lug
Wire Size (AWG#)	Control Logic (AWG/ mm^2)	18/0.75				M4/20lb-in		M5/20 lb-in.
	Motor Line (AWG/ mm^2)	14/0.25		10/4		8/10	4/25	2/35
	Configurable I/O wire gauge	22-18 AWG (0.3-0.75mm^2) Ferrules recommended: 18 AWG Type H0 - 75/14 Weidmuller 4629.0 or equivalent 20 AWG Type H0 - 5/14 Weidmuller 6907.0 or equivalent 22 AWG Type H0 – 34/12 Weidmuller 902577 or equivalent						
	Spade Terminals	16/14 AWG (1.5 mm^2): Hollingsworth XSS0954S or SS20947SF 12/10 AWG (4-6 mm^2): Hollingsworth XSS20836 or SS20832F						
Clearance Distance	Side-to-Side	No Distance Required						
	Top/Bottom	2.5 in (63.5 mm.)						
Mating Connector Hardware	CK100 Kit	Includes: C1, C2, C4, C7 (plus 2ft / 0.25m of stranded bus ribbon), C8						
	C3	Kollmorgen #: A-93899-013 Vendor Info: Weidmuller BL3.5/13 Cat.No. 161574						
	C5	Kollmorgen #: A-81014-004 Vendor Info: PCD ELFP04110						
	Connector Screw Torque	2.25 lb-in.						

BUS MODULE HARDWARE SPECIFICATIONS

BUS Module Model		PA-LM	PA08	PA14	PA28	PA50	PA75	PA85
Unit Weight	Lb./Kg.	2.5/1.32	4.74/2.16	8.18/3.72	14.32/6.51		14.52/6.6	15/6.8
Mounting Hardware	English (Metric)	10-32 (M4)						
	Applied Torque	20 lb-in. (2.26 Nm)						
Connection Hardware	Line Screw Size/Torque		6-32/ 12 lb-in (1.35 Nm.)	10-32/ 12 lb-in. (1.35 Nm.)		M5/ 20 lb-in. 2.26 Nm.)		Box Lug
	BUS Screw Size/Torque							M5/ 20 lb-in. (2.26 Nm.)
	Ground Screw Size/Torque	M4/12 lb-in. (1.35 Nm.)						
	Control Logic	18/0.75						
	Main Input (gauge based on 90°C wire)		14/2.5	12/4	8/6	6/16	2/35	2/35
Wire Size AWG#/mm^2	BUS bar wire		14/2.5	12/4	8/6	6/16	2/35	2/35
	Spade Terminals	16/14 AWG (1.5 mm^2): Hollingsworth XSS0954S OR SS20947SF or equiv. 12/10 AWG (4-6 mm^2): Hollingsworth XSS20836 OR SS20832F or equiv.						
Clearance Distance	Side-to-Side	No Distance Required						
	Top/Bottom	63.5 mm. (2.5 in.)						
Mating Connectors	CK100 Kit	Includes: C1, C2, C4, C7 (plus 2' of stranded bus ribbon), C8						
	C6	Kollmorgen #: A-81014-002 Vendor Info: PCD ELFP02110						
	C7	Kollmorgen #: A-81014-004 Vendor Info: PCD ELFP04110						
	C8	Kollmorgen #: A-81014-003 Vendor Info: PCD ELFP03110						
	Connector Screw Torque	2.25 lb-in. (.25 Nm.)						

CX ELECTRICAL SPECIFICATIONS

Product Model		Cx03*	Cx06*	Cx10
Main Input Power	Voltage (VAC_{L-L}) Nominal ±10%	110 to 230		230
	115VAC	1ϕ or 3ϕ		3ϕ only
	230VAC	1ϕ or 3ϕ		3ϕ only
	Line Frequency	47-63		
	KVA at 115	0.44 (1ϕ) 0.6 (3ϕ)	0.89 (1ϕ) 1.1 (3ϕ)	2.4 (3ϕ only)
	KVA at 230 VAC	0.88 (1ϕ) 1.4 (3ϕ)	1.8 (1ϕ) 2.8 (3ϕ)	4.6 (3ϕ only)
	Continuous Current (amps)	6.2 (1ϕ) 4 (3ϕ)	10 (1ϕ) 7.8 (3ϕ)	13 (3ϕ only)
	Peak Current (amps) for 500 mSec	18.6 (1ϕ) 12 (3ϕ)	30 (1ϕ) 23.4 (3ϕ)	26 (3ϕ only)
	Peak Current (amps) for 2Sec	12.4 (1ϕ) 8 (3ϕ)	20 (1ϕ) 15.6 (3ϕ)	26 (3ϕ only)
	Line Fuses (FRN-R, LPN, or equiv.)	10	20	25
Logic Input Power CxXX26X Models ONLY	+24 VDC Ext. Logic Voltage (volts)	22 to 27		
	+24 VDC Ext. Logic Current (amps sink)	1.5		
	+24 VCD Ext. Logic Current (amps max surge)	2.6		
SoftStart	Max. Surge Current (amps)	30		
	Max. Charge Time (sec)	0.25		
Protection Functions	Fault Contact Rating	1A		
	Fault Contact Closing Period (mSec)	Close = 3 mS, Open = 2 mS		
	OverTemperature trip	80°C (176°F)		
Rated Main Output (Ma, Mb, Mc)	Continuous Power (KVA) at 115VAC Line Input (45°C (113°F) Ambient)	0.35 (1ϕ) 0.55 (3ϕ)	0.7 (1ϕ) 1.1 (3ϕ)	1.8 (3ϕ)
	Continuous Power (KVA) at 230VAC Line Input (45°C (113°F) Ambient)	0.7 (1ϕ) 1.1 (3ϕ)	1.4 (1ϕ) 2.2 (3ϕ)	3.5 (3ϕ)
	Continuous Current (Arms)	3	6	10
	Peak Current (Arms) for 500 mSec	9	18	20
	Peak Current (Arms) for 2 Sec	6	12	20
	PWM Frequency (kHz)	16	8	8
	PWM Motor Current Ripple (kHz)	32	16	16
	Form Factor (rms/avg)	≤1.01		
Protective Functions	UnderVoltage Trip (nominal)	90 VDC		
	OverVoltage Trip	430 VDC		
	OverTemperature Trip	80°C (176°F)		
	Internal heat dissipation (watts)	60	80	132
Environment	Operation temperature	5°C (41°F)to 45°C (113°F)		
	Storage temperature	0°C (32°F) to 70°C (158°F)		
	Ambient humidity	10% to 90%		
	Atmosphere	without corrosive gasses or dust		
	Altitude	Derate 5% per 1000 ft. (300m) above 3300 ft. (1000m)		
	Vibration	0.5 g		

NOTE: Model Numbers Cx0x200 are single phase only!

SX ELECTRICAL SPECIFICATIONS

Product Model		Sx03	Sx06	Sx10	Sx20	Sx30	Sx55	Sx85
Main Input (BUS+ / BUS-)	BUS (VDC)	125 to 360			260 to 360			
	Rated Power at DC (kW)	0.63-1.4	1.26-2.79	1.96-4.34	8.68	13.33	24.45	37.20
Rated Main Output (MA, MB, MC)	Continuous Power (KVA) at 165 VDC BUS Input (45°C Ambient)	0.55	1.1	1.6	N/A	N/A	N/A	N/A
	Continuous Power (KVA) at 325 VDC BUS Input (45°C Ambient)	1.1	2.2	3.6	7.2	11	20	33.8
	Continuous Current (Arms)	3	6	10	20	30	55	85
	Peak Current (Arms) for 500mSec	6	12	20	40	60	110	170
	Peak Current (Arms) for 2Sec	6	12	20	40	60	110	170
	PWM Frequency (kHz)	16			8			
	PWM Motor Current Ripple (kHz)	32			16			
	Form Factor (rms/avg)	≤1.01						
Control Input (Sinking)	+8 VDC Supply Voltage	7.3 to 8.5						
	±15 VDC Supply Voltage	14.3 to 15.5						
	+8 VDC Supply Current (amps)	1.1						
	±15 VDC Supply Current (amps)	0.37		0.38	0.5	0.47	0.66	0.87
Protective Functions	UnderVoltage Trip (on power-up)	90 VDC			255 VDC			
	UnderVoltage Trip (nominal)	90 VDC			125 VDC			
	OverVoltage Trip	430 VDC						
	OverTemperature Trip	118°C			90°C			
Environment	Internal heat dissipation in 45°C (113°F) ambient at continuous current (not including regen)	37 W	84 W	120 W	240 W	254 W	465 W	675 W
	Operation temperature	0°C (32°F) to 45°C (113°F)						
	Storage temperature	-20°C (-4°F)to 70°C (158°F)						
	Humidity (non-condensing)	10% to 90%						
	Atmosphere	without corrosive gasses or dust						
	Altitude	Derate 5% per 1000 ft. above 3300 ft.						
	Vibration	0.5 g						

BUS MODULE ELECTRICAL SPECIFICATIONS

Product Model		PA-LM	PA08	PA14	PA28	PA50	PA75	PA85
Main Input Power	Voltage (VAC_{L-L}) Nominal ±10%		110-240	110-120	208-240			
	115VAC 1ϕ and 3ϕ		1/3	1/3				
	230VAC 1ϕ and 3ϕ		1/3		1/3	3		
	Line Frequency		47-63					
	KVA @ 115 VAC		0.92 (1ϕ) 1.6 (3ϕ)	1.6 (1ϕ) 2.8 (3ϕ)				
	KVA at 230 VAC		1.8 (1ϕ) 3.2 (3ϕ)		3.2 (1ϕ) 11.2 (3ϕ)	20 (3ϕ)	30 (3ϕ)	34 (3ϕ)
	115 VAC Continuous Current (amps)		8 (1ϕ) 8 (3ϕ)	14 (1ϕ) 14 (3ϕ)				
	230 VAC Continuous Current (amps)		8 (1ϕ) 8 (3ϕ)		14 (1ϕ) 28 (3ϕ)	50 (3ϕ)	75 (3ϕ)	85 (3ϕ)
	115 VAC Peak Current (amps) for 2sec/50msec		12 (1ϕ) 16 (3ϕ)	1ϕ:21/28 3ϕ:28/42				
	230 VAC Peak Current (amps) for 2sec/50msec during normal operation		1ϕ: 12/16 3ϕ: 16/24		1ϕ: 21/28 3ϕ: 56/84	3ϕ: 75/100	3ϕ: 115/150	3ϕ: 130/170
	Line Fuses (FRN, LPN, etc.)		10	20	35	60	80	100

Product Model		PA-LM	PA08	PA14	PA28	PA50	PA75	PA85
Main Output Power (Source)	DC BUS Voltage (Nom.l)		140/310	140	310	310	310	310
	kW at 115 VAC Line Input		0.67 (1ϕ) 1.24 (3ϕ)	1.1 (1ϕ) 2.1 (3ϕ)				
	kW at 230 VAC Line Input		1.3 (1ϕ) 2.48 (3ϕ)		2.0 (1ϕ) 8.7 (3ϕ)	15.5 (3ϕ)	23.3 (3ϕ)	26.4 (3ϕ)
Logic Input Power	Voltage (AC) Nom. ±10%	110 to 120			208 to 240			
	Max. Current 1ϕ (amps)	1	1	1	1	1	1	1
	Line Frequency	47-63	47-63	47-63	47-63	47-63	47-63	47-63
	Internal Fuse (amps) (internal)	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Logic Output Power (Source)	+8VDC Supply Voltage	+7.25 VDC to +8.5 VDC						
	+8 VDC Supply Current (amps)	2.2	2.2	2.2	4.4	4.4	4.4	4.4
	15 V Supply Voltage (±VDC)	14.25 to 16						
	15 V Supply Current (amps)	0.8	0.8	0.8	2.4	2.4	2.4	2.4
	Internal Fuses (amps) (±15V/+8 V)	1.5/3.5	1.5/3.5	3.5/7	3.5/7	3.5/7	3.5/7	3.5/7
	Max # Sourced Drives	**Refer to Bus Module Sizing Application Note**						
SoftStart	115 VAC Turn-Off Level (power-up)		70	70				
	115 VAC Turn-On Level (normal)		50	50				
	230 VAC Turn-Off Level (power-up)		70		125	125	125	125
	230 VAC Turn-On Level (normal)		50		112	35	35	35
	Max. Surge Current during power application		30 A	20 A	50 A	40 A	40 A	40 A
	Max. Charge Time (sec)		0.75	0.25		0.5	0.75	0.85
Protection Functions	Fault Contact Rating			1 Amp max. at 115 VAC (±15%)				
	Fault Contact Closing Period			250 ms				
	OverTemperature trip			90°C (194°F)				
Environment	Internal heat dissipation	7	45	70	130	200	275	294
	Operation temperature	5°C (41°F) to 45°C (113°F)						
	Storage temperature	0°C (32°F) to 70°C (158°F)						
	Ambient humidity	10% to 90%						
	Atmosphere	without corrosive gasses or dust						
	Altitude	Derate 5% per 1000 ft. above 3300 ft.						
	Vibration	0.5 g						

CX REGEN INFORMATION

Product Model		Cx03	Cx06	Cx10
External Shunt Regulator	Peak current (amps)	20		
	Minimum resistance (ohms)	20		
	Watts	200		
Application Information	Capacitance (Farads)	.00082	.00164	
	BUS Voltage (nominal) (VDC)	325		
	V_{HYS} (Regen circuit turn-off) (VDC)	370		
	V_{MAX} (Regen circuit turn-on) (VDC)	390		
External Regen Kits	ERH-26	✔	✔	✔

See the SERVOSTAR® S/CD-Series Regeneration Requirements Application Note on the PSP CD-ROM for guidance on application sizing of Regen Kits.

BUS MODULE REGEN INFORMATION

Product Model		PA08	PA14	PA28	PA50	PA75	PA85
Internal Shunt Regulator	Peak current (amps)		30	32			
	Resistance (ohms)		7.5	12.5			
	Watts		40	40			
	Fuse Rating (amps)(internal)		7	8			
External Shunt Regulator	Peak current (amps)		40	45	100	200	200
	Minimum resistance (ohms)		4.25	8.8	4.5	2.2	2.2
	Watts		300	400	1000	2000	2000
Application Information	Capacitance (Farads)	0.00165	0.00165	0.00198	0.00392	0.00504	0.00504
Internal Regen	BUS Voltage (nom.) (VDC)	325					
	V_{HYS} (Regen turn-off) (VDC)	370					
	V_{MAX} (Regen turn-on) (VDC)	390					
	Resistance (ohms)		12.5	12.5			
	Power Rating (Watts)		40	40			
External Regen Kits	ER-20				✔	✔	✔
	ER-21				✔	✔	✔
	ER-22					✔	✔
	ER-23					✔	✔
	ER-30		✔	✔			
	ERH-40		✔	✔			

**** For guidance on application sizing of Regen Kits, see the SERVOSTAR® S/CD-Series Regeneration Requirements Application Note on the PSP CD-ROM.***

PRODUCT FAMILY CONTROL SPECIFICATIONS

Product Model		Control Specifications
Current Loop	Update Rate	62.5 µS (16 kHz)
	Bandwidth	<2000 Hz
Commutation Loop	Update Rate	62.5 µS (16 kHz)
	Max. Commutation Frequency	400Hz
	Output Waveform	Sinusoidal
Velocity Loop	Update Rate	250 µS (4k Hz)
	Bandwidth	<400 Hz
	Speed Command Resolution	Serial: 1 RPM / Analog: (1/6554) * VMAX
	Long-term Speed Regulation	0.01% (µP clock tolerance)
Position Loop	Update Rate	500 µS (2 kHz)
I/O Connector (C3 by pinout)		
Analog Input (2, 3)	Absolute Maximum Voltage	13 V differential
	Input Resolution	14 Bit/1.2
	Sensitivity	1.53 mV min
	Voltage Range	-10V to +10V = -120% Motor rated speed to +120% Motor rated speed (Adjustable Vscale parameter)
	Input Impedance/CMR	> 10 KΩ/50 dB
	Long-term Drift	100 ppm (0.075%/°C)
Fault Output Relay (5, 6)	Max Capacity	1 A at 24 VDC
Remote Enable (7, 8) Configurable Inputs(7, 9, 10, 11)	Bandwidth	2.5 kHz (Opto-isolated)
	Input Voltage Range	12 V to 24 V Nominal (bi-directional)
	Min. On/Max. Off	10 V/1 V
	Current Demand per Input	20 mA (max)
Configurable Digital Output (7, 12)	Output Voltage (max.)	0 V to 48 V Nominal – bi-directional (Open Collector)
	(Min. On)	1V
	Max. Output Current	60 mA
Configurable Analog Output (13, 4)	Max. Output Current	1 mA (1 KΩ internal series resistance)
	Sensitivity / Resolution	4.9 mV/12 Bit
	Voltage Range	-10 V to +10V
A/B/I & Complements (1, 2, 4, 5, 7, 8)	Output Voltage (high level) at 25°C	2.5 V min. at 20mA Differential
	RS 485 Line Drive Type	DS26C31TM
Remote Encoder Input (C8 by pinout)		
A/B/I & Complements (1, 2 ,4, 5, 7, 8)	Input Voltage at 25°C	±5 V Differential
	Input Sensitivity	±0.2V
	Input Impedance	100Ω
	RS 485 Line Receiver Type	SN75173

See the section on Position Loop in Section 6 for features using this input.

Note: A flyback diode is necessary for inductive loads connected across the 01 output.

PINOUT CONNECTORS

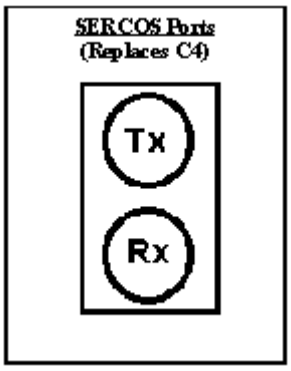
C1: Communications Connector	
Pin	**Function**
1	Shield
2	REC (RXD) (RS232)
3	XMIT (TXD) (RS232)
4	Reserved DO NOT CONNECT
5	Common
6	TxD+ (RS485)
7	TxD- (RS485)
8	RxD+ (RS485)
9	RxD- (RS485)

C3: User I/O Connector	
Pin	**Function**
1	Analog Signal Shield
2	Analog Differential Input + (High)
3	Analog Differential Input - (Low)
4	DC Reference for ANOUT*
5	Fault Output Relay Contact
6	Fault Output Relay Contact
7	+24V Input (Common Rail for return pins 8,9,10,11)
8	Remote Enable Input
9	Configurable Input(See IN)
10	Configurable Input (See IN2)
11	Configurable Input (See IN3)
12	Configurable Output (See O1)
13	*Configurable Output (See ANOUT)

*** Internal DC common for ANOUT Reference. It is also used to tie electronic equipment commons together (inside the drive) to prevent excessive common mode voltage from destroying I/O (internally-fused).**

C4: Encoder Equivalent Output	
Pin	**Function**
1	Channel A Output + (High)
2	Channel A Output - (Low)
3	DC Common
4	Channel B Output + (High)
5	Channel B Output - (Low)
6	Shield
7	Index Output + (High)
8	Index Output - (Low)
9	Shield

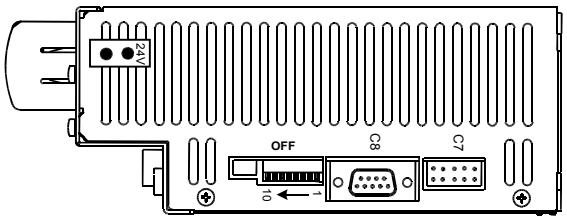
C2: Feedback Connector			
Pin	**Resolver**	**Encoder**	**Sine Encoder**
1	Sine High	A	A
2	Sine Low	/A	/A
3	Shield	Shield	Shield
4	Cosine High	B	B
5	Cosine Low	/B	/B
6	Shield	Shield	Shield
7		E5V Return	E5V Return
8		E5V Return	E5V Return
9		H1B	H1B(/C) (/Data)
10		H2B	H2B(/D) (/Clock)
11		H3B	H3B
12	Shield	Shield	Shield
13	Thermostat High	Thermostat High	Thermostat High
14	Shield	Shield	Shield
15	Ref. High Out	Index	Index
16	Ref. Low Out	/Index	/Index
17	Shield	Shield	Shield
18		E5V Supply	E5V Supply
19		E5V Supply	E5V Supply
20		E5V Supply	E5V Supply
21	Shield	Shield	Shield
22		H1A	H1A (C) (Data)
23		H2A	H2A (D) (Clock)
24		H3A	H3A
25	Thermostat Low	Thermostat Low	Thermostat Low



Notes for DIP switch:
The 10 position DIP switch is provided for drive configuration. The first 6 switches control communications parameters and are read only at power up. Any changes in these settings will require cycling the power. The other two switch functions (7, 8) control the motor operation and are monitored in real-time. This switch provides the following functions:

- MultiDrop Address Select: Switches 1 through 5 set the drive's address. A drive having address 0 powers up in the addressed state. If these five switches are set to anything but 0, the drive will assume an address code indicated by the switch settings.
- Baud Rate: Switch 6 sets the Serial/SERCOS baud rate to either 9600/2M (switch off) or 19200/4M (switch on).
- Position Hold: Activating switch 7 causes the drive to enter a position hold mode. The condition is enunciated to the user by a flashing status display. The display maintains its current OPMODE code. If the drive is running during a HOLD command detection, the motor will ramp to a stop at the DECSTOP rate.
- Enable: Switch 8 is an input to the drive enable circuitry and can be used to force the drive to a disabled state.
- SERCOS Power Level: Functions only on SERCOS interface™ products. If switch 9 is set to 0, the SERCOS transmitter uses a low power setting so the receiver is not overdriven when using short cables. Long cables require more power.
- Factory Reserved: Must be set to 0.

Note: Setting the switch to "1" means "Closed" or "On".

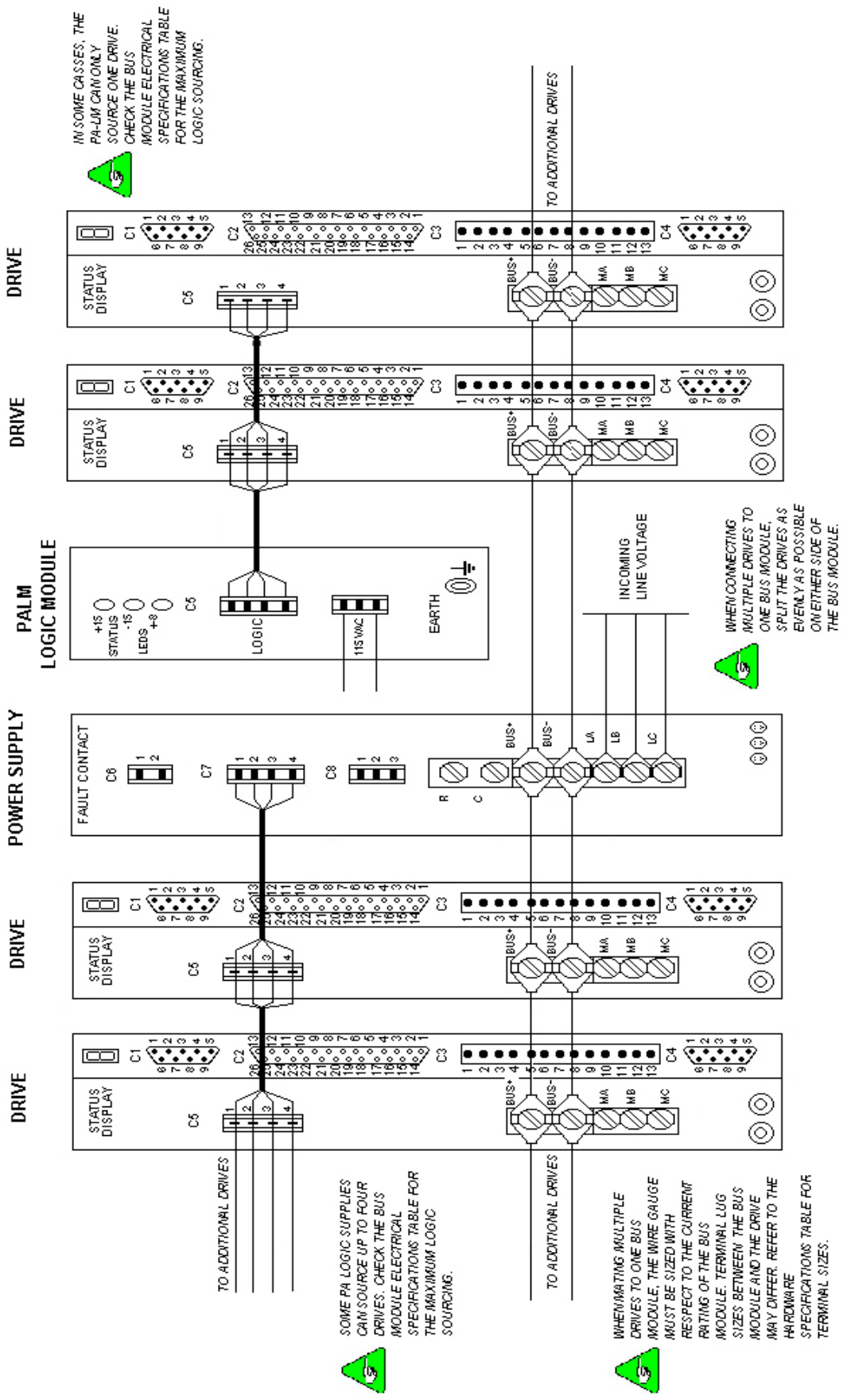


DIP (Configuration) Switch		
Switch	**Function**	**Settings**
1	MultiDrop Addressing	Bit 0 of MultiDrop Address (LSB)
2		Bit 1 of MultiDrop Address
3		Bit 2 of MultiDrop Address
4		Bit 3 of MultiDrop Address
5		Bit 4 of MultiDrop Address (MSB)
6	Serial/SERCOS Baud Rate	0 = 9600 (2M) 1 = 19200 (4M)
7	HOLD Mode Switch	0 = Hold Mode Inactive 1 = Hold Mode Active
8	Drive Enable / Disable	0 = Drive Enable 1 = Drive Disable
9	SERCOS Transmit Power	0 = Low Power 1 = High Power
10	Factory Reserved	Must Be set to 0

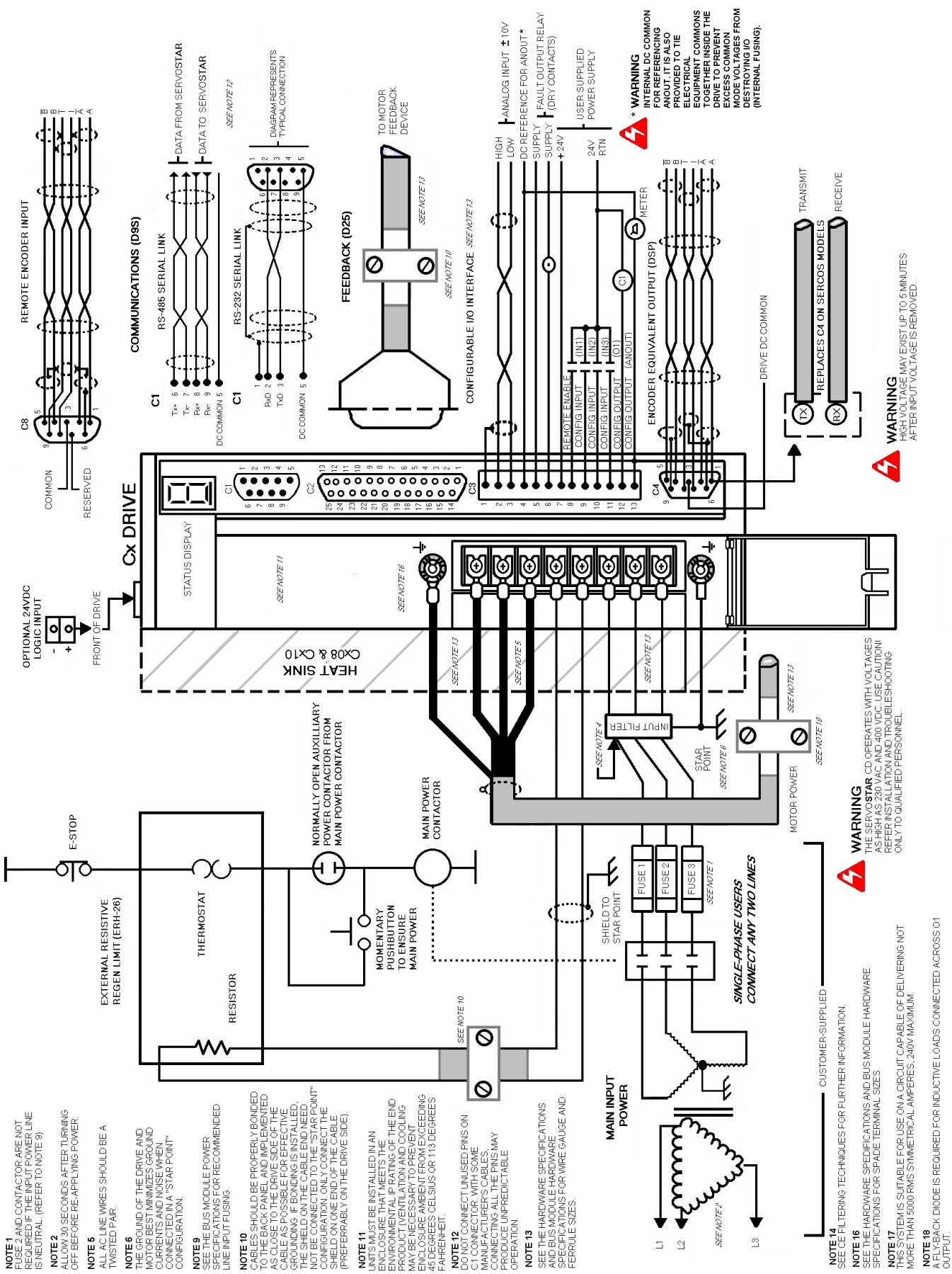
C7: MultiDrop Communications
Type: 10 Pin (0.1"x 0.1") Female Ribbon Cable. Connector and cable are included in the optional CK100 kit.
This connector functions only when using the RS232 interface. It will NOT function using RS485.

C8: Remote Encoder Input	
Pin	**Function**
1	A Input + (High)
2	A Input - (Low)
3	DC Common
4	B Input + (High)
5	B Input - (Low)
6	Shield Connection
7	Reserved
8	Index +
9	Index -

BUS MODULE – PA-LM (MULTIPLE SX UNITS)



CX SYSTEM WIRING DIAGRAM



NOTE 1
FUSE 2 AND CONTACTOR ARE NOT REQUIRED IF THE INPUT POWER LINE IS NEUTRAL. (REFER TO NOTE 9)

NOTE 2
ALLOW 30 SECONDS AFTER TURNING OFF BEFORE RE-APPLYING POWER.

NOTE 5
ALL AC LINE WIRES SHOULD BE A TWISTED PAIR.

NOTE 6
THE GROUND OF THE DRIVE AND MOTOR BEST MINIMIZES GROUND CURRENTS AND NOISE WHEN CONNECTED IN A "STAR POINT" CONFIGURATION.

NOTE 9
SEE THE BUS MODULE POWER SPECIFICATIONS FOR RECOMMENDED LINE INPUT FUSING.

NOTE 10
CABLES SHOULD BE PROPERLY BONDED TO THE BACK PANEL AND IMPLEMENTED AS CLOSE TO THE DRIVE SIDE OF THE CABLE AS POSSIBLE FOR EFFECTIVE GROUNDING. IF BONDING IS INSTALLED, THE SHIELD ON THE CABLE END NEED NOT BE CONNECTED TO THE "STAR POINT" CONFIGURATION. ONLY CONNECT THE SHIELD ON ONE END OF THE CABLE (PREFERRABLY ON THE DRIVE SIDE).

NOTE 11
UNITS MUST BE INSTALLED IN AN ENCLOSURE THAT MEETS THE ENVIRONMENTAL IP RATING OF THE END PRODUCT (VENTILATION AND COOLING MAY BE NECESSARY TO PREVENT ENCLOSURE AMBIENT FROM EXCEEDING 45 DEGREES CELSIUS OR 113 DEGREES FAHRENHEIT.

NOTE 12
DO NOT CONNECT UNUSED PINS ON C1 CONNECTOR WITH SOME MANUFACTURER'S CABLES, CONNECTING ALL THE PINS MAY PRODUCE UNPREDICTABLE OPERATION.

NOTE 13
SEE THE HARDWARE SPECIFICATIONS AND BUS MODULE HARDWARE SPECIFICATIONS FOR WIRE GAUGE AND FERRULE SIZES.

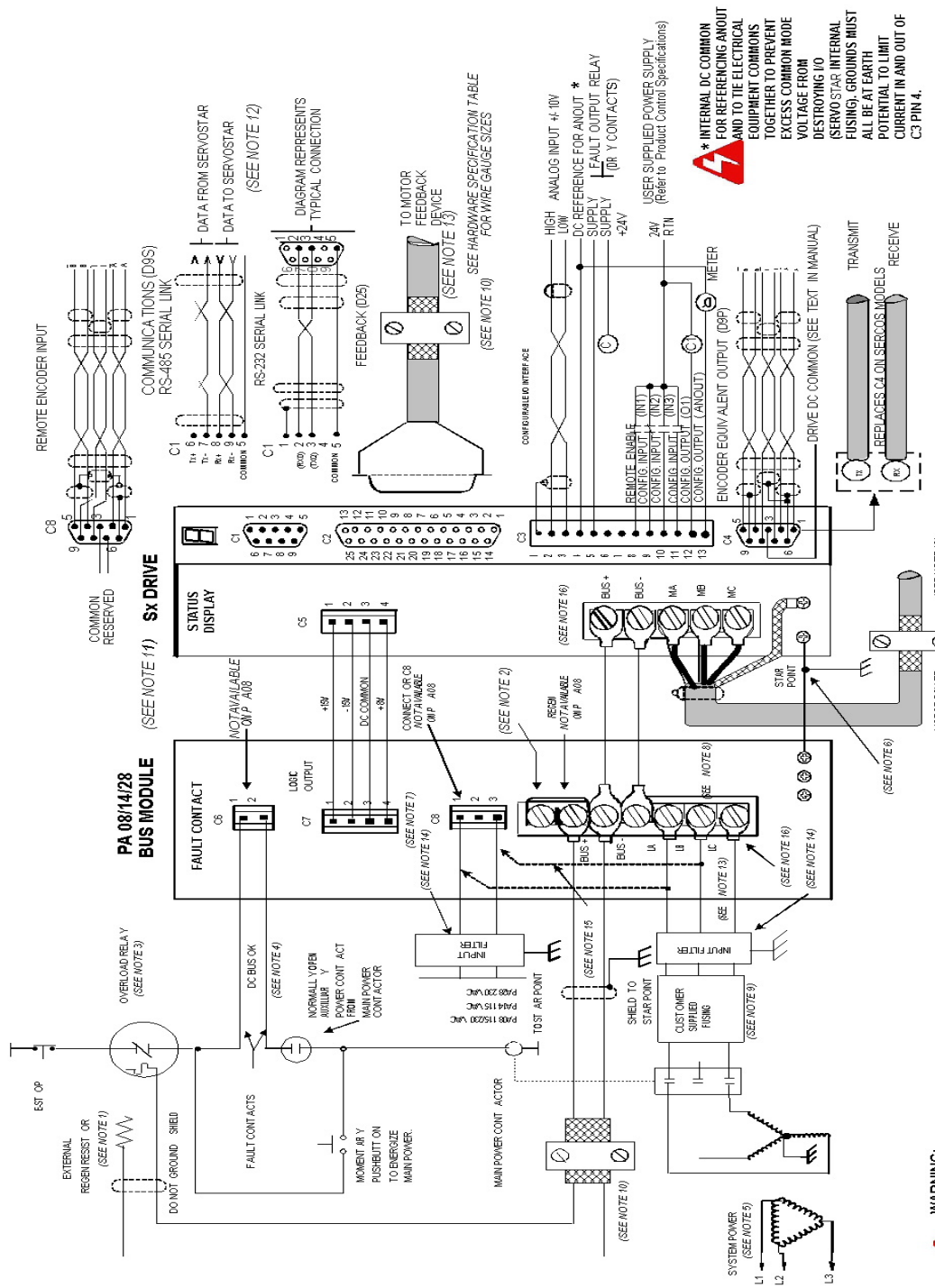
NOTE 14
SEE CE FILTERING TECHNIQUES FOR FURTHER INFORMATION.

NOTE 16
SEE THE HARDWARE SPECIFICATIONS AND BUS MODULE HARDWARE SPECIFICATIONS FOR SPADE TERMINAL SIZES.

NOTE 17
THIS SYSTEM IS SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN 5000 RMS SYMMETRICAL AMPERES, 240V MAXIMUM.

NOTE 18
A FLY-BACK DIODE IS REQUIRED FOR INDUCTIVE LOADS CONNECTED ACROSS 01 OUTPUT.

SX WITH PA08,14, OR 28 SYSTEM WIRING DIAGRAM



Note 1
The resistor is connected to high voltage. Please ensure sufficient electrical clearance when mounting. The resistor may become very hot during operation. Do not mount near materials that are flammable or damaged by heat. Ventilation may be required. Each kit has different series and parallel resistor connections to obtain specific resistance and power rating.

Note 2
When using internal regen, leave the jumper installed between terminals "R" and "C". Remove these jumpers when using an external regen kit.

Note 3
A thermal overload relay is supplied in the regen resistor kit. The thermal overload relay was sized for the resistance and power rating of the resistor. The output contacts of the relay must be wired to drop power to the main power contactor during a fault condition, as shown in the drawing. Do not wire Logic Control power through the main power contactor. Control power should not be removed if the BUS Module's fault contacts are open as this resets the fault LEDs.

Note 4
The fault contacts must be wired in series with the overload relay as shown in the drawing. This contact is normally open and closes after application of control and main power. This contact opens in fault conditions.
*Attempting to enable the drive before BUS OK becomes active causes the BUS Module to remain inactive.

Note 5
The transformer may be omitted if correct voltage source is applied.

Note 6
The ground of the BUS Module, drive, and motor best minimizes ground currents and noise when connected in a "star point" configuration.

Note 7
See the BUS Module Power Specifications to determine the maximum number of drives that can be sourced by the logic supply.

Note 8
The BUS Module line inputs are not phase sensitive.

Note 9
See the BUS Module Power Specifications for recommended line input fusing.

Note 10
Cables should be properly bonded to the back panel and implemented as close to the drive side of the cable as possible for effective grounding. If bonding is installed, the shield on the cable end does not need to be connected to the "star point" configuration. Only connect the shield on one end of the cable (preferably on the drive side).

Note 11
Units must be installed in an enclosure that meets the environmental IP rating of the end product (ventilation or cooling may be necessary to prevent enclosure ambient from exceeding 45°C or 113°F).

Note 12
Do not connect unused pins on C1 connector. Some manufacturers' cables connecting all the pins may produce unpredictable operation.

Note 13
See SERVO **STAR** Sx Hardware Specifications and the BUS Module Hardware Specifications for wire gauge and ferrule sizes.

Note 14
See CE Filtering Techniques for further information.

Note 15
Control logic input can be tapped directly off the main line input. If this source is used, the main line power is lost and all communication functions to the drive cease.

Note 16
See SERVO **STAR** Sx Hardware Specifications and the BUS Module Hardware Specifications for spade terminal sizes.

Note 17
This system is suitable for use on a circuit capable of delivering not more than 5000 RMS symmetrical amperes, 240 V maximum.

Sx with PA50, 75, or 85 System Wiring Diagram

Note 1
The resistor is connected to high voltage. Please ensure sufficient electrical clearance when mounting. The resistor may become very hot during operation. Do not mount near materials that are flammable or damaged by heat. Ventilation may be required. Each kit has different series and parallel resistor connectors to obtain specific resistance and power rating.

Note 3
A thermal overload relay is supplied in the regen resistor kit. The thermal overload relay was sized for the resistance and power rating of the resistor. The output contacts of the relay must be wired to drop power to the main power contactor during a fault condition, as shown in the drawing. Do not wire Logic Control power through the main power contactor. Control power should not be removed if the BUS Module's fault contacts are open as this resets the fault LEDs.

Note 4
The fault contacts must be wired in series with the overload relay as shown in the drawing. This contact is normally open and closes after application of control and main power. This contact opens in fault conditions.
*Attempting to enable the drive before BUS OK becomes active causes the BUS Module to remain inactive.

Note 5
The transformer may be omitted if correct voltage source is applied.

Note 6
The ground of the BUS Module, drive, and motor best minimizes ground currents and noise when connected in a "star point" configuration.

Note 7
See the BUS Module Power Specifications to determine the maximum number of drives that can be sourced by the logic supply.

Note 8
The BUS Module line inputs are not phase sensitive.

Note 9
See the BUS Module Power Specifications for recommended line input fusing.

Note 10
Cables should be properly bonded to the back panel and implemented as close to the drive side of the cable as possible for effective grounding. If bonding is installed, the shield on the cable end does not need to be connected to the "star point" configuration. Only connect the shield on one end of the cable (preferably on the drive side).

Note 11
Units must be installed in an enclosure that meets the environmental IP rating of the end product (ventilation or cooling may be necessary to prevent enclosure ambient from exceeding 45°C or 113°F).

Note 12
Do not connect unused pins on C1 connector. Some manufacturers' cables connecting all the pins may produce unpredictable operation.

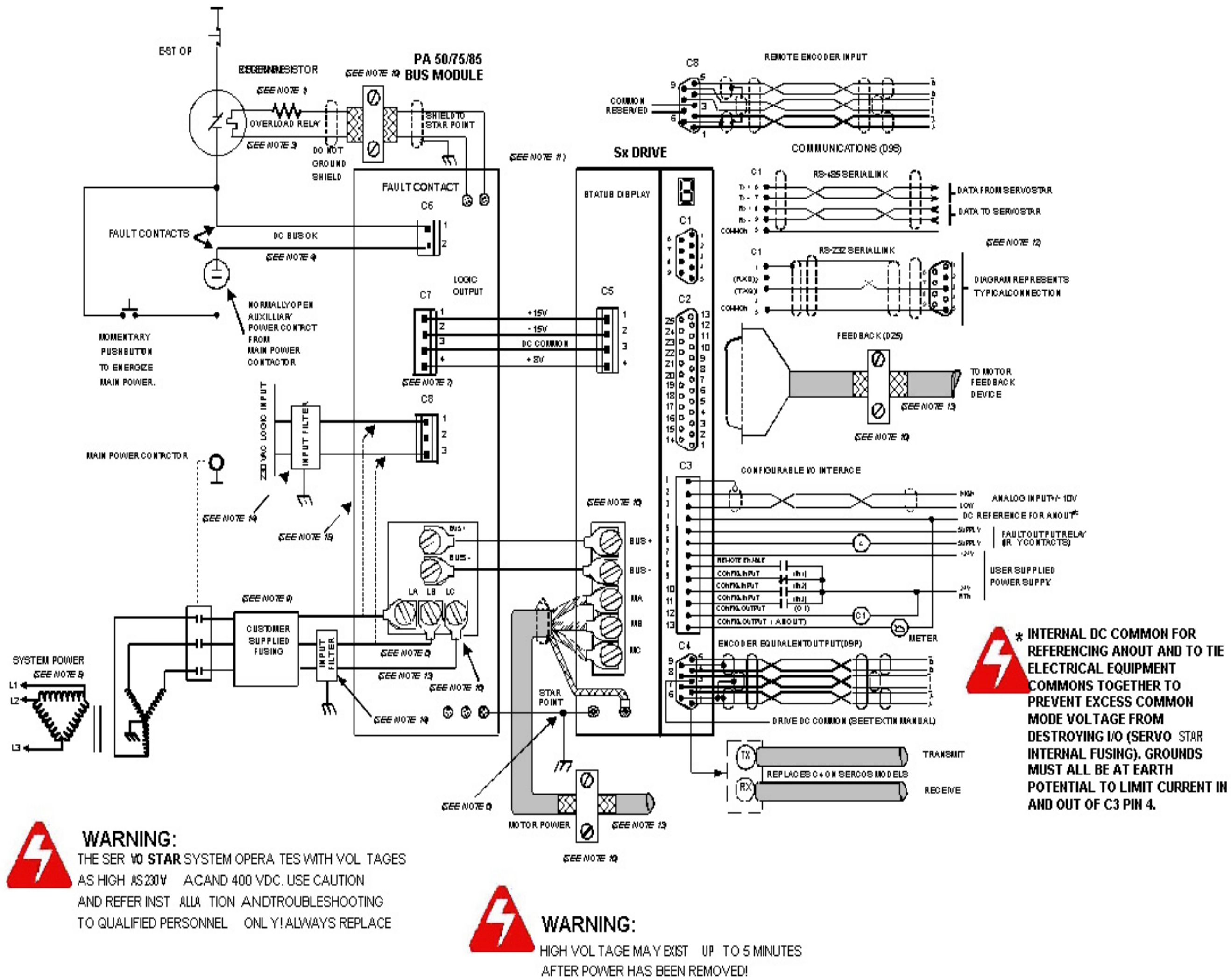
Note 13
See the SERVO STAR Sx Hardware Specifications and the BUS Module Hardware Specifications for wire gauge and ferrule sizes.

Note 14
See CE Filtering Techniques for further information.

Note 15
Control logic input can be tapped directly off the main line input. If this source is used, the main line power is lost and all communication functions to the drive cease.

Note 16
See the SERVO STAR Sx Hardware Specifications and the BUS Module Hardware Specifications for spade terminal sizes.

Note 17
This system is suitable for use on a circuit capable of delivering not more than 5000 RMS symmetrical amperes, 240 V maximum.



CX FILTER AND BONDING DIAGRAM

Note 1
Input power enters enclosure from metal conduit. This eliminates the need for shielded input power cable.

Note 2
Single point ground. A bus bar (ground bus) is an excellent way to achieve this.

Note 3
High frequency ground between non-conductive back panel and enclosure. Also, a high frequency ground is required between the enclosure and earth ground.

Note 4
EMI filter grounding. Safety grounds must be provided on the filters. Hazard potentials exist even when the power is off because of the capacitors internal to the filters.

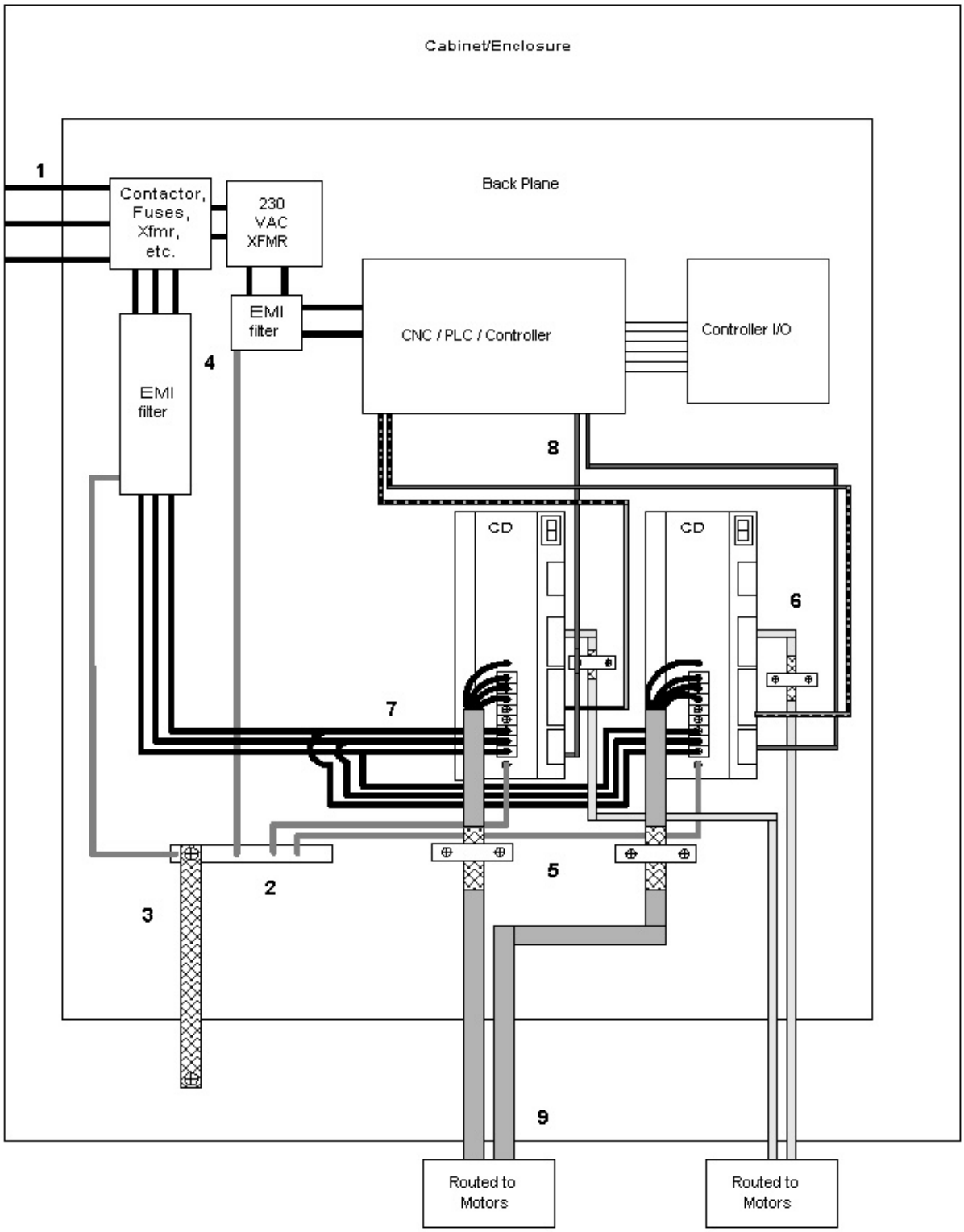
Note 5
Bonding of motor cables. The use of armored (screened) motor cables bonded as close to the drive as possible are essential for CE compliance and strongly recommended to better the overall performance and reliability of the system.

Note 6
Feedback cable bonding is required for CE compliance. As with the motor cables, the feedback cables should be bonded to the back panel. This bonding does two things. First, it cuts down radiation from the drive, which may be in the form of high frequency energy resulting from internal processor clocks. Second, it provides immunity for the drive. Since the feedback device is located internal to the motor, it is going to pick up some noise currents and transmit them along the feedback cable. The bonding directs the currents from the shield of the feedback cable to back panel ground. This reduces the amount of noise entering the drive.

Note 7
AC power lines that must be routed past other lines (such as motor cables or I/O lines) should cross at a 90° angle. This minimizes the coupling effect. Additionally, the power lines should be routed as close to the back panel as possible. Any noise currents on the lines are capacitively coupled to the ground plane and not to other lines.

Note 8
Control (I/O) signals should be kept separate from all power and motor cables, if possible. Keep control wiring as short as possible and use screened wire. Bonding is also recommended but not required for CE compliance. A separation distance of 20 cm. (8 in.) is sufficient in most cases. Where control cables must cross power cables, they should cross at a 90° angle.

Note 9
Motor cables and feedback cables exiting the cabinet going to the motor should be separated as much as possible. Ideally, the use of separate conduits provides good isolation, which can limit coupling of noise from motor to feedback cables.



SX FILTER AND BONDING DIAGRAM

Note 1
Input power enters enclosure from metal conduit. This eliminates the need for shielded input power cable.

Note 2
Single point ground. A bus bar (ground bus) is an excellent way to achieve this.

Note 3
High frequency ground between non-conductive back panel and enclosure. Also, a high frequency ground is required between the enclosure and earth ground.

Note 4
Bonding of the motor cables. The use of armored (screened) motor cables that are bonded as close to the drive as possible is essential for CE compliance and strongly recommended to better the overall performance and reliability of the system.

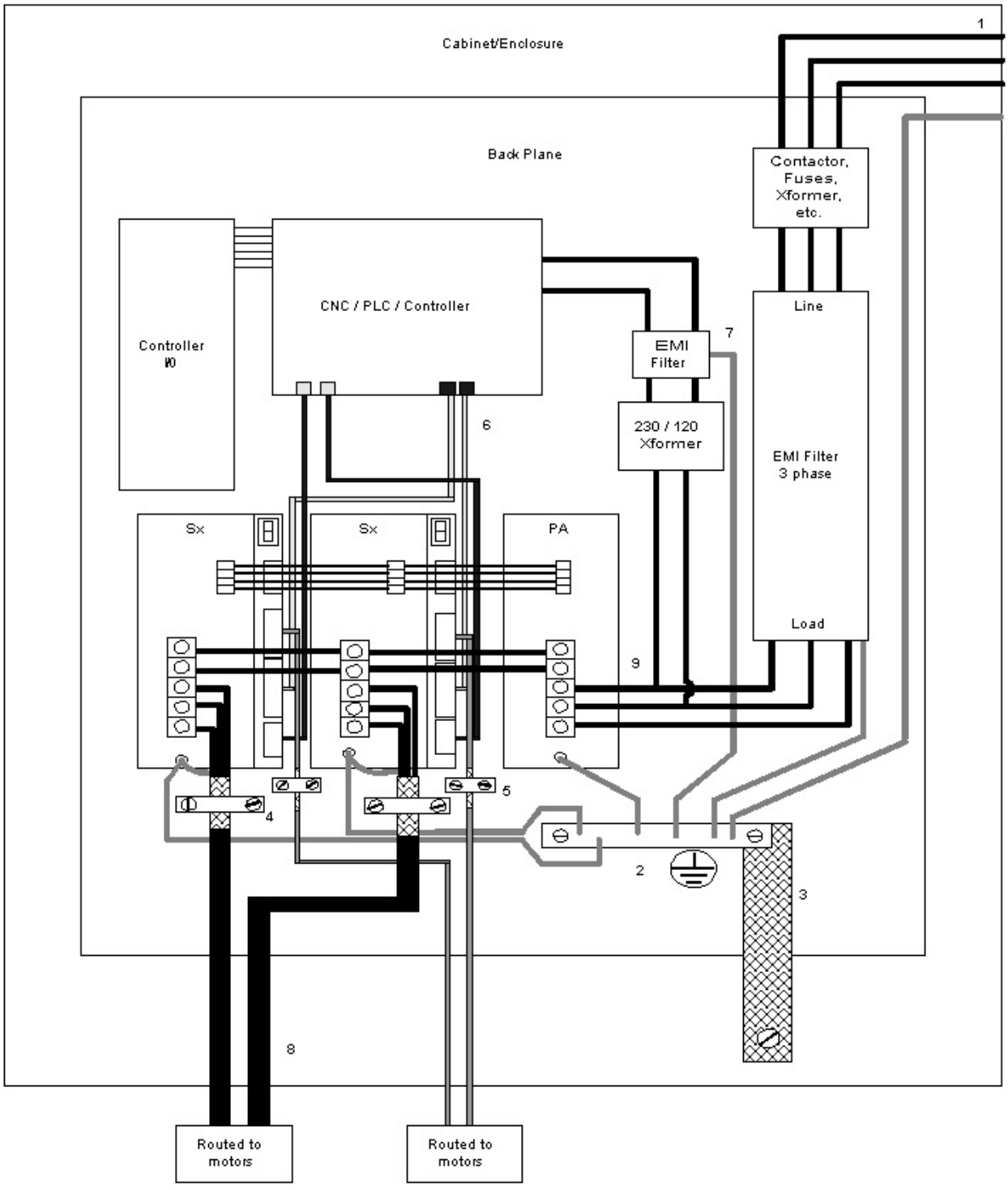
Note 5
Screened and bonded feedback cabling is recommended for increased immunity and lower risk of radiation. Since the motor cable and feedback cable are in close proximity at the motor, this feedback cable bonding is necessary. Also, separate the feedback and motor cables as much as possible. This decreases the chances of the feedback signals getting corrupted.

Note 6
Control signals (I/O) should be kept separate from all power and motor cables. Keep all control wiring as short as possible and use screened wire. A separation distance of 20cm (8in) is sufficient in most cases. Where control cables must cross power cables, they should cross at a 90° angle.

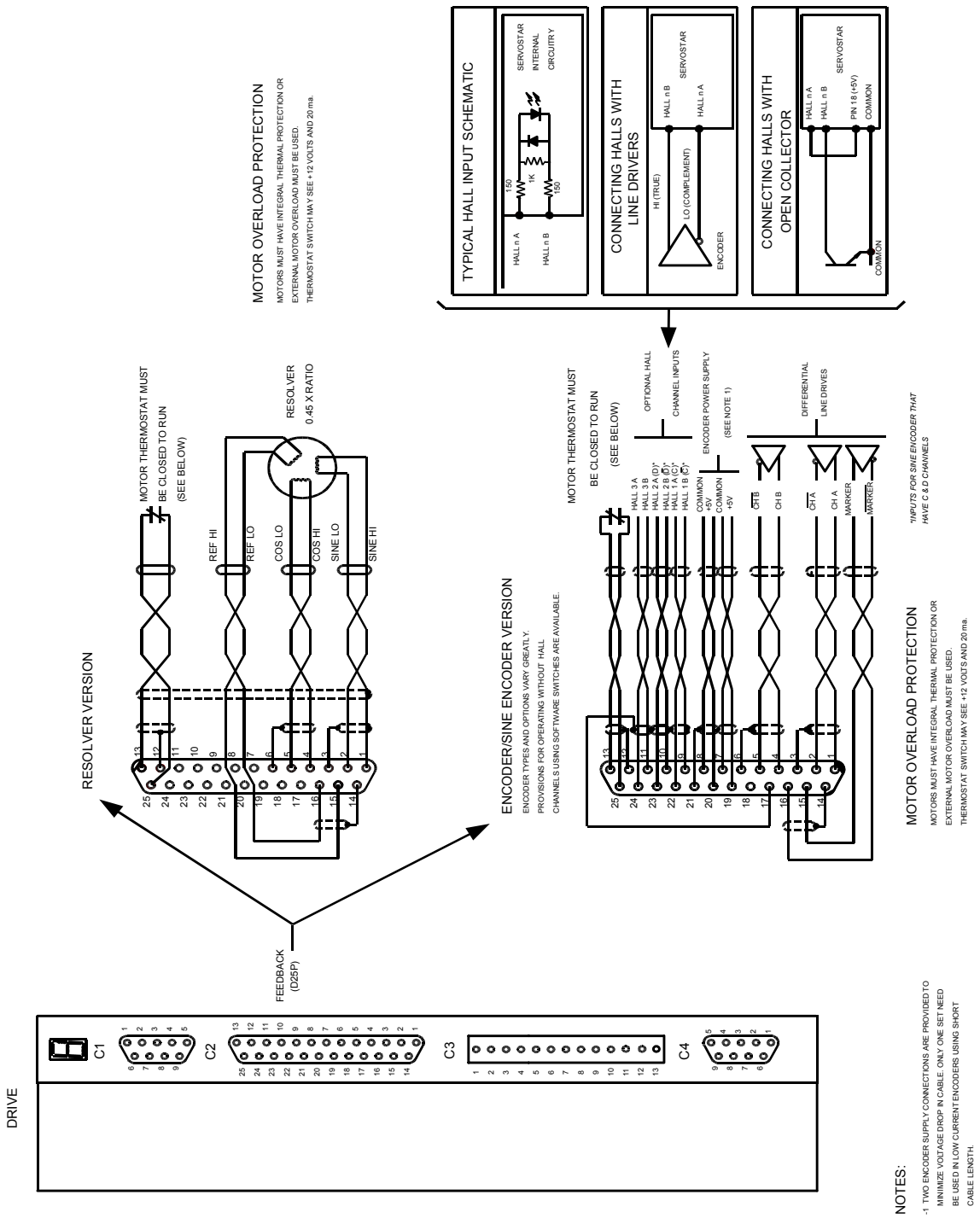
Note 7
Connect safety grounds to filters. This is critical to keep ground currents from causing personal injury.

Note 8
Where motor cables exit enclosure, keep in separate wire-way or conduit from feedback and other control wiring. A separation distance of 20 cm, or 8 in, is sufficient.

Note 9
Input power wires should be kept clear of I/O and signal wires.



SYSTEM FEEDBACK DIAGRAM



COMMANDS/VARIABLES BY FUNCTION

ANALOG INPUT-RELATED

ANDB	ANDG	ANIN	ANOFF	*ANZERO*
GEARI	GEARO	ISCALE	PMIN	VSCALE

COMMUNICATIONS

ACKMODE	ADDR	ECHO	MSG	PROMPT

CONFIGURABLE I/O

ANOUT	ENCOUT	ENCOUTO	IN	IN1
IN1MODE	IN2	IN2MODE	IN3	IN3MODE
MSINFRQ	O1	O1MODE	O1RST	O1TRIG
SININTOUT				

CURRENT VARIABLES AND COMMANDS

CONFIG	DICONT	DIPEAK	FOLD	FOLDMODE
FOLDTIME	I	IA	IC	ICMD
ICONT	IENCSTART	IFRIC	IGRAV	ILIM
ILIM2	IMAX	ISCALE	ISTOP	IZERO
MFOLD	MFOLDD	MFOLDDIS	MFOLDR	MFOLDT
MICONT	MIPEAK	*T*		

DRIVE AND MOTOR STATUS

ACTIVE	CCWLIM	CWLIM	DIP	DRIVEOK
ERR	*FLTCLR*	*FLTHIST*	READY	RELAY
SERIALNO	STAT	STATUS	THERM	TRUN
VER				

DRIVE CONFIGURATION AND MODES

ACTFAULT	COMPMODE	DIP	DIR
FILTMODE	GEAR	GEARI	GEARMODE
GEARO	HOLD	LIMDIS	OPMODE
PCMDMODE	PROFMODE	RELAYMODE	STOPMODE
THERMODE	THERMTIME	THERMTYPE	UNITS
UVMODE	UVRECOVER	UVTIME	ZERO

DRIVE ENABLING AND DISABLING

ACTIVE	DIPEN	DRIVEOK	*DIS*	*EN*
K	READY	REMOTE	*S*	*STOP*
SWEN				

DRIVE PARAMETERS

DICONT	DIPEAK	*ERR*	*FLTCLR*	*FLTHIST*
VBUS				

FEEDBACK RELATED

DUALFB	*ENCINIT*	ENCINITST	ENCOUT
ENCOUTO	*ENCSTART*	HALLS	HWPOS
IENCSTART	MENCOFF	MENCRES	MENCTYPE
MFBDIR	MHINVA	MHINVB	MHINVC
MPHASE	MRESPOLES	MSINFRQ	MSININT
PFB	PFBOFF	PRD	RDRES
SININTOUT	XENCRES		

GEARING-RELATED PARAMENTERS

GEAR	GEARI	GEARMODE	GEARO	PCMD
PE	PEXT	PEXTOFF		

LOOP COMPENSATION AND GAINS

ANDG	BW	COMPFILT	COMPMODE	FILTMODE
GP	GPAFR	GPAFR	GPD	GPI
GPISATIN	GPISATOUT	GPVFR	GV	GVI
KV	KVI	KVFR	LMJR	LPFHZ1
LPFHZ2	MJ	MLGAINP	MLGAINZ	MTANGLC
MTANGLP	MVANGLF	MVANGLH	NOTCHBW	NOTCHHZ
REFRESH	TF	*TUNE*	VD	VEXT
VF	VH	VR		

MOTION CONTROL PARAMETERS

ACC	CCWLIM	CWLIM	DEC	DECSTOP
DIR	DISSPEED	DISTIME	INPOS	LIMDIS
OPMODE	PEINPOS	PROFMODE	PROFSCRV	STOPMODE

MOTOR VARIABLES AND COMMANDS

MBEMF	MBEMFCOMP	MENCOFF	MENCRES	MENCTYPE
MHINVA	MHINVB	MHINVC	MICONT	MIPEAK
MJ	MLGAINC	MLGAINP	MLGAINZ	*MLIST*
MLMIN	MOTOR	MOTORTYPE	MPHASE	MPITCH
MPOLES	MRESPOLES	MSININT	MSPEED	MTANGLC
MTANGLP	MVANGLF	MVANGLH		

POSITION VARIABLES AND COMMANDS

DUALFB	HOMESPD	HOMESTATE	HOMETYPE	HWPOS
INPOS	MA	MAPOS	MASPEED	*MH*
MI	MIDIST0	MIDIST1	MIDIST2	MIDIST3
MISPEED0	MISPEED1	MISPEED2	MISPEED3	PCMD
PCMDMODE	PE	PEINPOS	PEMAX	PFB
PLIM	PMAX	PMIN	PRD	PSCALE
STOPPED				

READ AND WRITE SWITCH VARIABLES

ACTFAULT	COMPFILT	DIR	ECHO	GEAR
HOLD	LIMDIS	MFOLDDIS	MHINVA	MHINVB
MHINVC	MSG	O1	PCMDMODE	PLIM
PROMPT	RELAYMODE	THERMTYPE	UNITS	UVRECOVER
ZERO				

READ AND WRITE SWITCH MODE VARIABLES

ACKMODE	ANOUT	AVGTIME	COMPMODE	ENCOUT
ENCOUTO	FILTMODE	FOLDMODE	GEARMODE	GETMODE
HOMETYPE	IN1MODE	IN2MODE	IN3MODE	MENCTYPE
MFBDIR	MOTORTYPE	MPOLES	MRESPOLES	MSINFRQ
O1MODE	OPMODE	PCMDMODE	PROFMODE	SININTOUT
STOPMODE	THERMODE	UVMODE		

READ AND WRITE VARIABLES

ACC	ANDB	ANDG	ANOFF	BW
DEC	DECSTOP	DISSPEED	DISTIME	FOLDTIME
GEAR	GEARI	GEARO	GP	GPAFR
GPAFR2	GPD	GPI	GPISATIN	GPISATOUT
GPVFR	GV	GVI	HOMESPD	ICONT
IENCSTART	IFRIC	IGRAV	ILIM	ILIM2
IN	ISCALE	ISTOP	IZERO	KV
KVFR	KVI	LMJR	LPFHZ1	LPFHZ2
MAPOS	MASPEED	MBEMF	MBEMFCOMP	MENCOFF
MENCRES	MFOLDD	MFOLDR	MFOLDT	MICONT
MIDIST0	MIDIST1	MIDIST2	MIDIST3	MIPEAK
MISPEED0	MISPEED1	MISPEED2	MISPEED3	MJ
MLGAINP	MLGAINZ	MLMIN	MOTOR	MPHASE
MPITCH	MSININT	MSPEED	MTANGLC	MTANGLP
MVANGLF	MVANGLH	NOTCHBW	O1RST	O1TRIG
PEINPOS	PEMAX	PEXTOFF	PFBOFF	PMAX
PMIN	PROFSCRV	PSCALE	RECTRIG	TF
THERMTIME	UVTIME	VBUS	VD	VF
VH	VLIM	VOSPD	VR	VSCALE
XENCRES				

READ-ONLY SWITCH MODE VARIABLES

DIP	ENCINITST	HALLS	HOMESTATE	ILSBMODE	IN	RDRES

READ-ONLY SWITCH VARIABLES

CCWLIM	CWLIM	DIPEN	DRIVEOK	FOLD
IN1	IN2	IN3	MFOLD	READY
RECDONE	RECING	RECRDY	RELAY	REMOTE
STOPPED	SWEN	THERM		

READ-ONLY VARIABLES

ADDR	ANIN	DICONT	DIPEAK	HWPOS
I	IA	IC	ICMD	IMAX
PCMD	PE	PEXT	PFB	PRD
STAT	STATUS	TRUN	V	VCMD
VE	VER	VEXT	VMAX	

VARIABLE RECORDING AND PLAYING

AVGTIME	*GET*	GETMODE	RECDONE	RECING
RECOFF	*RECORD*	RECRDY	RECTRIG	*STEP*

VARIABLE SETTING AND CLEARING

CLREEPROM	*DUMP*	LIST	*LOAD*	*MLIST*
RSTVAR	*SAVE*			

VELOCITY VARIABLES AND COMMANDS

ACC	DEC	DECSTOP	ILSBMODE	*J*
MSPEED	PROFSCRV	*S*	*STOP*	V
VCMD	VE	VEXT	VLIM	VMAX
VOSPD	VSCALE			

VARIABLE/COMMAND SET

ACC

Sets the drive acceleration rate. This variable is only asserted when linear ramp control is selected (PROFMODE = 1 and OPMODE = 0, 1, 4, or 8). For firmware versions (VER) prior to 3.1.0, the range of this variable was 1 to 399,987.

Firmware Versions: All
Range: 10 to 400,000
Opmodes: 0, 1, 4, 8
Type: variable (R/W)
Default: 400,000
Drive Status: EN/DIS
Units: rotary: RPM / sec
linear: mm/sec/sec
EEPROM: Yes

ACKMODE

Sets the communication safety level of the drive. The range of values is 0, 1, or 2.

0 = No safety procedures or error messages
1 = Drive responds with ACK or NAK after every message
2 = Same as 1 with an added Block Check Character (BCC or checksum) attached to the end of every message

ACKMODE must be set to 0 for** MOTIONLINK **to function properly.

Firmware Versions: All
Range: 0 - 2
Opmodes: All
Type: switch mode (R/W)
Default: 400,000
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

ACTFAULT

Defines how to handle the DISABLE procedure when a fault occurs.

0 = disable the drive immediately
1 = follow an Active Disable procedure (similar to the "S" cmd - see also DECSTOP, DISSPEED, DISTIME, and O1MODE=5)

The drive is always disabled immediately in the event of a feedback loss fault to prevent the drive from "running away."

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

ACTIVE

Displays if the drive is enabled and power is applied to the motor. This flag is the overAll readiness indicator of the drive.

0 = drive is inactive
1 = drive is active and ready to operate

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R)
Default: N/A
Drive Status: EN/DIS
Units: N/A
EEPROM: No

ADDR

Displays the position of the drive address switches (switches 1-4 or 1-5, depending upon firmware version, of the DIP switch) located on the top of the drive.

Firmware Versions: All
Range: 0 to 15
(firmware versions prior to 2.0.0)
0 to 31
(firmware versions 2.0.0 and later)
Type: variable (R)
Default: hardware defined
Opmodes: All
Units: N/A
Drive Status: EN/DIS
EEPROM: No

ANDB

Sets the dead band of the analog input signal. If the absolute value of the analog input signal is less than this value, no analog command signal is generated.

Firmware Versions: All
Range: 0 to 10,000
Opmodes: 1,3,8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: milliVolts
EEPROM: No

ANDG

Enables the drive's dual gain algorithm. The dual gain algorithm effectively increases the resolution of the command input from 14 to 15 bits under 4v of input.

0 - No dual gain
1 - Dual gain hysteresis algorithm
2 - Dual gain linear combination algorithm

Firmware Versions: 2.1.0 and later
Range: 0 to 2
Opmodes: 1,3,8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

ANIN

Displays the analog input value after being filtered by ANOFF and ANDB. The AVGTIME variable effects the time-averaging of this variable.

Firmware Versions: All
Range: -22,500 to 22,500
Opmodes: All
Type: variable (R)
Default: N/A
Drive Status: EN/DIS
Units: milliVolts
EEPROM: No

ANLPFHZ

Sets a filter rate (corner frequency) for the analog input filter. This is a simple single pole filter, which is always present. The filter rate adjusts automaticAlly as the analog input sampling rate changes for different operational modes. A value of 10,000 = unity gain (no filter).

Firmware Versions: 2.1.0 and later
Range: 1 to 10,000
Opmodes: 1,3,8
Type: variable (R/W)
Default: 10,000
Drive Status: EN/DIS
Units: Hz
EEPROM: Yes

ANOFF

Sets the analog offset which is added to the analog input command to the drive. This is used to compensate for the analog input signal (ANIN) offset or drift.

Firmware Versions: All
Range: -10,000 to 10,000
Opmodes: 1,3,8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: milliVolts
EEPROM: Yes

ANOUT

Sets the source for the analog output feature at user connector C3 pin 13.

0 - Tachometer (vel. feedback V) scaled identical to VSCALE with an update rate of 250 µSec.
1 - I monitor (equivalent current) scaled identical to ISCALE with an update rate of –10 mSec (this variable is calculated in background loop).
2 - Velocity Error, VE, scaled identical to VSCALE with an update rate of 250 µSec.
3 - Torque Command Output Scaled to ISCALE with an update rate of 500 µSec.
4 – Reserved – no update rate.
5 - Position following error, PE, scaled to PSCALE with an update rate of 500 µSec.
6 - not used – with a minimum update rate of 500 µSec.
7 - not used with an update rate of 62.5 µSec.
8 - Position feedback, PFB, scaled to PSCALE with an update rate of 500 µSec.
9 - Velocity controller output (before injecting PRB/HC), scaled to VSCALE with an update rate of 250 µSec.

Firmware Versions: 2.1.0 and later **Type:** switch mode (R/W) **Units:** N/A
Range: 0 to 5 **Default:** 0 **EEPROM:** Yes
Opmodes: All **Drive Status:** EN/DIS

ANZERO

Causes the drive to zero the analog offset. A sample of the motor analog input command is averaged over 64 samples, and the value of ANOFF is set to zero out the analog input command. This command may need to be executed more than once to achieve zero offset, and ANOFF will probably be modified.

Firmware Versions: All **Command Syntax:** ANZERO
Opmodes: All **Drive Status:** EN/DIS

AUTOHOME

Defines the homing behavior on power-up.

0 = No homing on power-up (default).
1 = Try to perform homing on power-up. Does not continue if the homing cannot be executed.
2 = Try to perform homing on power-up. Continue trying until homing process is executed.

Firmware Versions: 3.7.0 and later **Opmodes:** 8 **EEPROM:** Yes
Range: 0 to 2 **Default:** 0

AUTONULL

Automatic calibration of the current loop at drive enable. To accomplish this it applies zero volts to the motor for 50mS - hence, the motor must be at or near rest or the results can be unpredictable. AUTONULL selects new current sensor zeroing method.

Firmware Versions: 3.4.2 **EEPROM:** Yes
Range: 0 (Old method), 1 (Zero on enable) **Default:** 0

AVGTIME

Sets the variable averaging time period. This variable is expressed as multiples of the servo update period (Ts), which is 500 microseconds. A value of 0 for AVGTIME causes requested variable values to be returned as instantaneous values. AVGTIME affects the time averaging of ANIN, I, ICMD, V, VCMD.

AVGTIME has no effect on variables that are sampled using the RECORD command and MOTIONLINK's PC Scope Screen.

Firmware Versions: All
Range: 0, 2, 4, 8, 16, 32, or 64
Opmodes: All
Type: switch mode (R/W)
Default: 0
Drive Status: EN/DIS
Units: Ts (500 microseconds)
EEPROM: Yes

BW

Sets the desired velocity control loop bandwidth. This variable only affects the system when using the Standard Pole-Placement controller in velocity mode (COMPMODE = 2 or 4 and OPMODE = 0 or 1). With COMPMODE=2, BW is limited to 200 Hz; with COMPMODE=4, BW can extend to 400 Hz. Note that COMPMODE=4 is only available in firmware versions 2.1.0 and later.

Firmware Versions: All
Range: 10 to 200 (COMPMODE=2)
10 to 400 (COMPMODE=4)
Type: variable (R/W)
Default: 20
Opmodes: 0,1,4,8
Units: Hz
Drive Status: EN/DIS
EEPROM: Yes

CCWLIM

Displays the state of the external counter clockwise (CCW) limit switch input (see also CWLIM, IN1-IN3, IN1MODE-IN3MODE).

0 = switch closed, CCW limit not reached
1 = switch open, CCW limit reached

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch(R)
Default: hardware defined
Drive Status: EN/DIS
Units: N/A
EEPROM: No

CLREEPROM

Clears the non-volatile memory (EEPROM) in the drive. The drive null's the EEPROM and recovers from a NVRAM error and assumes a no-comp state. A complete drive configuration procedure (see section 5) then has to be initiated before resuming drive operation. This command is the only method of resetting the run time clock (see TRUN).

Firmware Versions: All
Opmodes: All
Command Syntax: CLREEPROM
Drive Status: DIS

COMPFILT

COMPFILT is a switch variable that enables and disables a 400 Hz low pass filter in the velocity feedback loop. The filter will automatically be disabled if COMPMODE is set equal to 4. COMPFILT retains its value regardless of whether the COMPMODE setting is enabling and disabling the filter.

Firmware Versions: 2.1.0 and later
Range: 0 (OFF), 1 (ON)
Opmodes: 0,1,4,8
Type: switch(R/W)
Default: 1
Drive Status: DIS
Units: N/A
EEPROM: No

COMPMODE

Sets the velocity controller type for OPMODE 0 or 1 according to the following table.

COMPMODE	Controller Type	Loop Variables
0	PI	GV, GVI
1	PDFF	KV, KVI, KVFR
2	Standard Pole Placement (low-frequency)	BW, MJ, LMJR, TF
3	Advanced Pole Placement	VD, VF, VH, VR
4	Standard Pole Placement (high-frequency)	BW, MJ, LMJR, TF

COMPMODE 3 is not available in version 1 firmware.
COMPMODE 4 is available in firmware versions 2.1.0 and later.

Firmware Versions: see Note
Range: 0 to 4
Opmodes: 0,1,4,8
Type: switch mode (R/W)
Default: 2
Drive Status: DIS
Units: N/A
EEPROM: Yes

CONFIG

Configures the current control loops after motor data has been entered. Executing this command tells the drive that All motor data parameters have been entered and that it is time for the drive to configure its control loops using the motor data.

When certain drive or motor variables are entered, they will cause the drive to enter a non-compensated (no-comp) state. The LED display will flash a minus sign. In this case, a CONFIG command is required. This also occurs when CLREEPROM is executed.

Firmware Versions: All
Opmodes: All
Command Syntax: CONFIG
Drive Status: DIS

CONVERT

Converts the internal velocity structure, designed at any of the COMPMODEs, to the external structure variables (VD, VH, VR, VF, VFI), overriding previous values.

Firmware Versions: 3.4 and later
Opmodes: 0,1,4,8
Command Syntax: CONVERT
Drive Status: EN/DIS

CWLIM

Displays the state of the external clockwise (CW) limit switch input (see also CCWLIM, IN1-IN3, IN1MODE-IN3MODE).

0 = switch closed, CW limit not reached
1 = switch open, CW limit reached

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R)
Default: hardware defined
Drive Status: EN/DIS
Units: N/A
EEPROM: No

DEC

Sets the deceleration rate of the drive. This variable only affects the drive when linear ramp control and velocity mode are selected (PROFMODE = 1 and OPMODE = 0, 1, 4, or 8). For firmware versions (VER) prior to 3.1.0, the range of this variable was 1 to 399,987.

Firmware Versions: All
Units: rotary: RPM / sec
linear: mm/sec/sec
Type: variable (R/W)
Range: 10 to 400,000
Default: 20
Opmodes: 0,1,4,8
Drive Status: EN/DIS
EEPROM: Yes

DECSTOP

DECSTOP is a deceleration that is used by drive commands that require a faster than usual stop. This DECSTOP value is used instead of DEC in the following instances: end-travel limits, HOLD, S, and a fault occurrence with ACTFAULT = 1. See also DISSPEED and DISTIME.

Firmware Versions: All
Units: rotary: RPM * 1000/sec
linear: mm/sec/sec
Type: variable (R/W)
Range: 1 to 32767
Default: 5000
Opmodes: All
Drive Status: EN/DIS
EEPROM: Yes

DICONT

Defines the continuous rated current for the drive (sinusoidal RMS). This is a hardware-defined read-only variable that is detected automaticAlly by the drive.

DICONT is usuAlly 50% of DIPEAK, the peak current of the drive (this will not be true in many cases with the ServoStar CD). In a given application, the drive may be configured to a lower rating than DICONT by setting the value of ICONT to the desired rating.

Firmware Versions: All
Range: 10 to 1100
Opmodes: All
Type: variable (R)
Default: hardware/user defined
Drive Status: EN/DIS
Units: amperes * 0.1
EEPROM: Yes

DIP

Displays the settings of the DIP switches located on top of the drive. This variable returns a series of 1's and 0's for each of the switches, with a comma inserted in the middle for clarity. Switch 10 is the leftmost digit, and switch 1 is the rightmost.

In firmware versions prior to 2.0.0, there were only 8 DIP switches and no comma was printed out.

Firmware Versions: All
Range: 00000000-11111111
(firmware versions prior to 2.0.0)
00000,00000-11111,11111
(firmware 2.0.0 and later)
Type: switch mode (R)
Default: 20
Opmodes: All
Units: 1=ON, 0=OFF
Drive Status: EN/DIS
EEPROM: No

DIPEAK

Defines the peak rated current of the drive (sinusoidal RMS). This is a hardware-defined read-only variable that will be set to a value of (DICONT * 2), except in the ServoStar CD, where it may be different. DIPEAK sets the 100% reference for many other current variables.

Firmware Versions: All
Range: 20 to 2200
Opmodes: All
Type: variable (R)
Default: DICONT * 2
Drive Status: EN/DIS
Units: amperes * 0.1
EEPROM: Yes

DIPEN

Displays the state of the Dip Switch Enable status (switch number 8 of the DIP switches on top of the drive). This variable has to be set=1 (switch set OFF) to Allow the drive to be enabled.

Firmware Versions: All
Range: 0 (disabled), 1 (enabled)
Opmodes: All
Type: switch (R)
Default: hardware defined
Drive Status: EN/DIS
Units: N/A
EEPROM: No

DIR

Sets the direction (inversion) of many different parameters with respect to the rotation of the motor; as viewed looking at the end of the shaft.

Variable Syntax: DIR *<first parameter> <second parameter> <third parameter>*

This variable switch was greatly expanded for SERCOS use with the introduction of firmware version 3.4.0. Historically, it was a two-position switch with the following definition:

0 = positive motion is counter-clockwise (CCW)

1 = positive motion is clockwise (CW)

For Non-SERCOS Users:

Only the first parameter should be used to affect performance; and even then, only the parameters 0 or 1. Therefore, the standard user need only configure the first parameter (0 for CCW and 1 for CW) to control All three loops simultaneously. If you query the variable, All three parameters are communicated even though only one was changed. Just leave the second and third at their default settings.

Parameter	Position	Velocity	Torque
0	1	1	1
1	0	0	0

For SERCOS Users:

The SERCOS interface only affects the position command and position feedback polarities.

First Parameter: sets the direction (inversion) of the Position command, Velocity command, and Torque command.

Parameter	Position	Velocity	Torque
0	1	1	1
1	0	0	0
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	0	0	1

Second Parameter: sets the direction (inversion) of the External Position feedback, Motor Position feedback, Velocity feedback, Torque feedback.

Parameter	External	Motor	Velocity	Torque
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

Third Parameter: sets the direction (inversion) of the Position Additive command, Velocity Additive command, Torque Additive command. This parameter is currently not supported.

Firmware Versions: All
Range: Refer to tables
Opmodes: All
Type: switch (R/W)
Default: 1, 0, 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

DIS

Disables the drive. Software servo loops are halted and power is disconnected from the motor. The function is immediate, and the motor may coast.

Firmware Versions: All
Opmodes: All
Command Syntax: DIS
Drive Status: EN/DIS

DISSPEED

Sets the speed window for the Active Disable function. The Active Disable function ramps the motor to zero speed using DECSTOP. DISSPEED is compared to the actual motor speed, and if the speed is less than this value, the active disable timer (DISTIME) will begin timing. Once the timer times out, the drive disables. See also ACTFAULT, DECSTOP, DISTIME, and O1MODE=5.

Firmware Versions: 2.1.0 and later
Units: rotary: RPM
linear: mm/sec/sec
Type: variable (R/W)
Range: 0 to 14,999
Default: 50 RPM
Opmodes: All
Drive Status: EN/DIS
EEPROM: Yes

DISTIME

Sets the amount of time to wait after motor speed goes below DISSPEED before the drive is disabled in the Active Disable process. Once motor speed goes below DISSPEED, the drive waits for the time period specified by DISTIME, and then disables the drive. See also ACTFAULT, DECSTOP, DISSPEED, and O1MODE=5.

Firmware Versions: 2.1.0 and later | **Type:** variable (R/W) | **Units:** millisecond * 0.1
Range: 0 to 65535 | **Default:** 100 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

DIVISIONS

Sets the number of divisions used for indexing (divides PROTARY).

Only used when MODMODE = 1

Firmware Versions: 3.7.0 and later | **Range:** 2 to 32767 | **EEPROM:** Yes
Default: 4 | -2 to -32767

DRIVEOK

Displays the status of the drive faults.

0 = faults exist
1 = no faults exist

Firmware Versions: All | **Type:** switch (R/W) | **Units:** N/A
Range: 0, 1 | **Default:** N/A | **EEPROM:** No
Opmodes: All | **Drive Status:** EN/DIS

DUMP

Transmits all variables and their settings to the serial port terminal. This command actually outputs the EEPROM contents of the drive to the serial port, where the variables can then be reviewed or saved to a variable file (*.SSV).

Firmware Versions: All | **Command Syntax:** DUMP
Opmodes: All | **Drive Status:** EN/DIS

DUALFB

Enables/disables the reading of an external feedback signal through the C8 connector.

0 = no dual loop
1 = dual loop without checking for external feedback fault
2 = dual loop with checking for external feedback fault

The fault options above can relate to a line break; however, the motor must be in motion for this detection to occur. It can also indicate a wrong XENDIR parameter.

Firmware Versions: 3.3 and later | **Type:** switch (R/W) | **Units:** N/A
Range: 0, 1, 2 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 8 | **Drive Status:** DIS

ECHO

Enables/disables serial port character echo. If echo is enabled, characters received via the serial port are echoed back to the serial port and displayed on the **MOTIONLINK** monitor or terminal.

0 = serial port echo disabled
1 = serial port echo enabled

ECHO = 1 is needed for proper operation of** MOTIONLINK**.

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 1
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

EN

Initiates a software enable of the drive. This command first attempts to reset any existing fault conditions, then sets SWEN to 1. If READY, REMOTE, and DIPEN are equal to one, then the drive becomes ACTIVE. Checking the value of ACTIVE will inform the user whether or not an EN command successfully enabled the drive.

Firmware Versions: All
Opmodes: All
Command Syntax: EN
Drive Status: EN/DIS

ENCINIT

Triggers the encoder initialization process for type 0-2 and type 7 encoders (see MENCTYPE). The initialization process requires rotating the motor until the encoder index is found, whereupon the drive will set the value of MENCOFF.

If the drive is enabled and in Opmode 0, the jog command can be used to rotate the motor. When the encoder index is encountered, the drive will set the value of MENCOFF. In this case, the status of the ENCINIT function is observed using the switch variable ENCINITST.

Firmware Versions: All
Opmodes: All
Command Syntax: ENCINIT
Drive Status: DIS

ENCINITST

Displays the status of the encoder initialization function (see ENCINIT). This variable is reset to 0 when manually set to the index position (see MENCOFF).

0 = initialization process has not begun
1 = encoder initialization is in progress
2 = encoder initialization has been completed

Firmware Versions: All
Range: 0, 1, 2
Opmodes: All
Type: switch mode (R)
Default: N/A
Drive Status: EN/DIS
Units: N/A
EEPROM: No

ENCOUT

Sets the resolution (number of lines) of the encoder equivalent output channel for resolver based systems only. For encoder-based systems, this variable is read-only and is set equal to MENCRES (for firmware versions prior to 3.3.0) or MENCRES / ENCOUTO (for firmware versions 3.3.0 and later). For sine encoder-based systems, this variable is read-only and is set equal to MENCRES * SININTOUT / ENCOUTO.

ENCOUT values of 2048 and 4096 are available only when VLIM < 6100 RPM (RDRES = 14 or RDRES = 16). ENCOUT values of 8192 and 16384 are available only when VLIM <=1500 RPM (RDRES = 16). In the majority of resolvers, one electrical revolution = one mechanical revolution.

Firmware Versions: All
Units: lines per electrical rev. of the resolver
Type: switch mode (R/W)
Range: 512, 1024, 2048, 4096, 8192, or 16384
Default: 1024
Opmodes: All
Drive Status: DIS
EEPROM: Yes

ENCOUTO

Sets the value of a scale-down factor only for the encoder equivalent output channel (ENCOUT) for encoder- and sine encoder-based systems. For encoder-based systems with firmware versions 3.3.0 or later, ENCOUT = MENCRES / ENCOUTO. For sine encoder-based systems, ENCOUT = MENCRES * SININTOUT / ENCOUTO.

Firmware Versions: All
Range: 1, 2, 4, 8, 16
Opmodes: All
Type: switch mode (R)
Default: 1
Drive Status: DIS
Units: N/A
EEPROM: Yes

ENCSTART

Triggers the encoder initialization process for encoder types 1-4 and 6 (see MENCTYPE). In the initialization process, the drive rotates the motor to a known electrical position by placing IENCSTART current from the motor B terminal to the motor C terminal. If the encoder index is encountered (for type 1 and 2 encoders), the process terminates immediately. The ENCSTART process is initiated by doing the following:

15. With the drive disabled, type the command “ENCSTART”.
16. Enable the drive. The current will be placed on the motor terminals and the initialization process will be completed after the drive enable occurs.

Enable is inhibited until this command is executed (for encoder types 1 and 3). The Status Display will flash the current OPMODE at 3 Hz as a visual indicator that the encoder is not initialized yet.

Firmware Versions: All
Opmodes: All
Command Syntax: ENCSTART
Drive Status: DIS

ERR

Displays the last error detected by the drive. A numeric code and a short explanatory string are output to the serial port (if MSG = 1). The error buffer is cleared when the drive undergoes a transition from disabled (DIS) to enabled (EN).

Firmware Versions: All **Command Syntax:** ERR
Opmodes: All **Drive Status:** EN/DIS

FILTMODE

Sets the velocity loop filter mode.

0 No LPF.
1 A single first order filter. Cutoff frequency is LPFHZ1.
2 Two first order filters. Cutoff frequencies are LPFHZ1 and LPFHZ2.
3 Notch filter. Frequency NOTCHHZ, bandwidth NOTCHBW.
Available only if firmware version (VER) is 3.1.0 or greater.

The filters affect the PI, PDFF, and standard pole placement controllers (COMPMODES 0-2 and 4), and are ignored in the advanced pole placement controller (COMPMODE=3).

Firmware Versions: All **Type:** switch mode (R/W) **Units:** N/A
Range: 0, 1, 2 **Default:** 0 **EEPROM:** Yes
Opmodes: 0,1,4,8 **Drive Status:** EN/DIS

FLTCLR

Clears the fault history buffer, which contains up to 10 faults.

Firmware Versions: All **Command Syntax:** FLTCLR
Opmodes: All **Drive Status:** EN/DIS

FLTHIST

Causes the drive to transmit the fault history buffer to the serial port. The most recent fault is sent first. Up to 10 fault messages will be output by the drive, with each fault message followed by a CR-LF. A time stamp in the format of hours:minutes is displayed along with each fault, indicating the time at which the fault occurred (refer to TRUN for more time stamp info).

Firmware Versions: All **Command Syntax:** FLTHIST
Opmodes: All **Drive Status:** EN/DIS

FOLD

Displays the status of the drive foldback circuit. When the system current level exceeds ICONT for too long, the drive enters foldback mode, FOLD changes from 0 to 1, and the drive current is limited gradually (in exponential fashion) to the value of ICONT. See also FOLDMODE, MFOLD, MFOLDD, MFOLDDIS, MFOLDR, and MFOLDT.

0 = drive foldback OFF
1 = drive foldback ON

Firmware Versions: All **Type:** switch (R) **Units:** N/A
Range: 0, 1 **Default:** 0 **EEPROM:** No
Opmodes: All **Drive Status:** EN/DIS

FOLDMODE

Sets the mode for drive current foldback and motor current foldback operation. See also FOLD, MFOLD, MFOLDD, MFOLDDIS, MFOLDR, and MFOLDT.

0 = normal foldback from ILIM to ICONT
1 = foldback to ICONT and issue fault after FOLDTIME
2 = issue fault immediately upon detection

Firmware Versions: All | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0, 1, 2 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

FOLDTIME

Sets the time since foldback detection to foldback fault latch (for FOLDMODE=1 only).

0 = normal foldback from ILIM to ICONT.

Firmware Versions: 2.1.0 and later | **Type:** variable (R/W) | **Units:** seconds
Range: 1 to 300 | **Default:** 30 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

GEAR

Enables and disables electronic gearing. The GEAR command is an immediate command (causes immediate gearing) unless INxMODE is selected to Allow hardware control. If INxMODE is selected to control this function, this serial command must be 1 and the INx input must be on to enable the gear function. The GEAR function is a velocity-lock function so any bits lost during unlock time or ramp-to-speed are lost.

Firmware Versions: 2.1.0 and later | **Type:** switch (R/W) | **Units:** N/A
Range: 0 (OFF), 1 (ON) | **Default:** 1 | **EEPROM:** Yes
Opmodes: 4 | **Drive Status:** EN/DIS

GEARI

Specifies the number of teeth on the input "gear" for the Gearing mode.

Firmware Versions: 2.1.0 and later | **Type:** variable (R/W) | **Units:** N/A
Range: -32767 to + 32767 | **Default:** 1 | **EEPROM:** Yes
Opmodes: 4 | **Drive Status:** EN/DIS

GEARMODE

This is a switch mode variable that specifies the operation of electronic gearing for OPMODE 4:

- **GEARMODE = 0 - Encoder Follower, Flex I/O (Connector C3) Inputs:** The encoder input channel is decoded as a quadrature input, scaled through GEARI / GEARO, and becomes the position command for the motor. The digital I/O ("Flex I/O") inputs serve as the encoder input channel (see Note below for clarification).
- **GEARMODE = 1 - Pulse and Direction, Flex I/O (Connector C3) Inputs:** The encoder input channel A counts positive edges and becomes the position command. The encoder input channel B level dictates if the counter will count up or down. Channel B low drives motor in CW direction. The digital I/O ("Flex I/O") inputs serve as the encoder input channel (see Note below for clarification).
- **GEARMODE = 2 - Up/Down Mode, Flex I/O (Connector C3) Inputs:** The encoder input channel is configured as a counter to command the motor's position. Positive edges on the A channel increments the counter (motor CW) while positive edges on the encoder input channel B decrements the counter (motor CCW). The digital I/O ("Flex I/O") inputs serve as the encoder input channel (see Note below for clarification).
- **GEARMODE = 3 - Encoder Follower, Remote Encoder (Connector C8) Inputs:** The encoder input channel is decoded as a quadrature input, scaled through GEARI / GEARO, and becomes the position command for the motor. The remote encoder ("handwheel") inputs serve as the encoder input channel (see Note below for clarification).
- **GEARMODE = 4 - Pulse and Direction, Remote Encoder (Connector C8) Inputs:** The encoder input channel A counts positive edges and becomes the position command. The encoder input channel B level dictates if the counter will count up or down. Channel B low drives motor in CW direction. The remote encoder ("handwheel") inputs serve as the encoder input channel (see Note below for clarification).
- **GEARMODE = 5 - Up/Down Mode, Remote Encoder (Connector C8) Inputs:** The encoder input channel is configured as a counter to command the motor's position. Positive edges on the A channel increments the counter (motor CW) while positive edges on the encoder input channel B decrements the counter (motor CCW). The remote encoder ("handwheel") inputs serve as the encoder input channel (see Note below for clarification).

If GEARMODE = 0-2, encoder A/B inputs are received via the digital "Flex I/O" inputs on connector C3 (see INx and INxMODE descriptions); if GEARMODE = 3-5, encoder A/B inputs are received via the remote encoder (sometimes cAlled "handwheel") inputs on connector C8.

Each of these modes are subject to: GEARI, GEARO, GEAR, and DIR.

Firmware Versions: 2.1.0 and later | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 5 | **Default:** 3 | **EEPROM:** Yes
Opmodes: 4 | **Drive Status:** DIS

GEARO

Specifies the number of teeth on the output "gear" for the Gearing mode.

Firmware Versions: 2.1.0 and later | **Type:** variable (R/W) | **Units:** teeth
Range: 1 to 32767 | **Default:** 1 | **EEPROM:** Yes
Opmodes: 4 | **Drive Status:** EN/DIS

GET

Causes all recorded variables to be transmitted to the serial port for use with PC Scope. The data format is defined by the variable GETMODE. See also RECORD.

Firmware Versions: All
Command Syntax: GET
Opmodes: All
Drive Status: EN/DIS

GETMODE

Sets the mode of data transfer from the drive to the host when using the GET command.

0 = ASCII data transfer format
1 = ASCII-HEX data transfer format
2 = BINARY data transfer format (fastest)

GETMODE=0 is needed for operation of MOTIONLINK.

Firmware Versions: All
Type: switch mode (R/W)
Units: N/A
Range: 0, 1, 2
Default: 0
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

GP

Sets the proportional gain for the position loop. Executing the TUNE command successfully may change the value of this parameter.

Firmware Versions: 2.1.0 and later
Type: variable (R/W)
Opmodes: 4,8
Units: rotary: 0.01 kRPM/rev
linear: 0.01 m/min/mm
Range: 1 to 7000
Default: calculated
Drive Status: EN/DIS
EEPROM: Yes

GPAFR

This is a position loop feedforward acceleration gain term (see also GPAFR2). This term is applied in the position loop and is used to create an acceleration feedforward input to the current loop.

Firmware Versions: 3.1.0 and later
Type: variable (R/W)
Units: 0.1%
Range: 0 to 2000
Default: 0
EEPROM: Yes
Opmodes: 4,8
Drive Status: EN/DIS

GPAFR2

This is a second position loop feedforward acceleration gain term (see GPAFR). This term is applied in the position loop and is used to create an acceleration feedforward input to the velocity loop.

Prior to firmware version 3.2.0, the range was 0 to 2000.

Firmware Versions: 3.1.0 and later
Type: variable (R/W)
Units: 0.1%
Range: -10,000 to +10,000
Default: 0
EEPROM: Yes
Opmodes: 4,8
Drive Status: EN/DIS

GPD

Sets the derivative gain for the Proportional-Integral-Derivative (PID) compensator in the position loop.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** N/A (1000=unity gain)
Range: 0 to 32767 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 4,8 | **Drive Status:** EN/DIS

GPI

Sets the integral gain for the Proportional-Integral-Derivative (PID) compensator in the position loop. Setting this value = 10,000 means that GPI=GP (expressed mathematically, the internal PID gain used by the drive processor equals GP*GPI/10000).

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** N/A
Range: 0 to 10000 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 4,8 | **Drive Status:** EN/DIS

GPISATIN

Limits the input of the position loop integrator by setting the input saturation. When used in concert with GPISATOUT, this variable enables the operator to make the position loop integrator effective near the target position, whereas far from the target position, the integrator is not dominant in the loop dynamics.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** feedback counts
Range: 0 to 1,000,000 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 4,8 | **Drive Status:** EN/DIS

GPISATOUT

Limits the output of the position loop integrator by setting the output saturation. When used in concert with GPISATIN, this variable enables the operator to make the position loop integrator effective near the target position, whereas far from the target position, the integrator is not dominant in the loop dynamics.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** feedback counts
Range: 0 to 1,000,000 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 4,8 | **Drive Status:** EN/DIS

GPVFR

This is a position loop feedforward velocity gain term. This term is applied in the position loop and is used to create a feedforward input to the velocity loop.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** 0.1%
Range: 0 to 2000 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 4,8 | **Drive Status:** EN/DIS

GV

Sets the proportional gain for the Proportional Integral Velocity Control Loop (PI loop; COMPMODE = 0). Executing the TUNE command successfully may change the value of this parameter.

Firmware Versions: All
Range: 0 to 1,000,000,000 (firmware versions 3.3.0 and later)
0 to 65,535 (firmware versions 2.2.0 to 3.2.1)
0 to 32,767 (firmware versions up to 2.2.0)
Default: 500
Units: N/A
EEPROM: Yes
Opmodes: 0,1,4,8
Drive Status: EN/DIS
Type: variable (R/W)

GVI

Sets the velocity integral gain for the Proportional Integral Velocity Control Loop (PI loop; COMPMODE = 0). Executing the TUNE command successfully may change the value of this parameter.

Firmware Versions: All
Range: 0 to 65535
Opmodes: 0,1,4,8
Type: variable (R/W)
Default: 20
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

HALLS

Returns the hall switch values (encoder feedback option only). The switch values are displayed as a three-bit code in the sequence C-B-A.

Firmware Versions: All
Range: 000 to 111
Opmodes: 2 and 3
Type: switch mode (R)
Default: N/A
Drive Status: EN/DIS
Units: bits
EEPROM: No

HCMODE

Selects the harmonic correction mode of operation.

0 – Disabled
1 – Harmony HC1 corrects position feedback used for velocity (resolver systems), harmonics HC2, HC3 summed and correct the torque command.
2 – All harmonies are summed and used for torque correction.
3 – All harmonies are summed and used for resolver feedback correction (for velocity only.)
4 – Harmony HC1 and HC2 are summed to correct position feedback used for velocity (resolver systems,) harmony HC3 corrects the torque command.

This command does not operate in torque Opmodes (2 and 3).

Firmware Versions: 3.4 and later
Range: 0 to 4
Opmodes: 0, 1, 4, 5, 6, 7, 8
Type: switch (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: No

HC1

Defines the properties of correction harmony number 1.

Syntax: HC1<*harmonic number*> <*phase offset*> <*amplitude*>

<*harmonic number*> sets the number of cycles per resolver cycle (resolver system) or per motor revolution (encoder system.)

<*phase offset*> relative to resolver zero (resolver system) or PRD zero (encoder system.)

<*amplitude*> specifies the amplitude of the harmony in internal counts at the injection point.

Units:
<*harmonic number*>: N/A
<*phase offset*>: degrees (PRD cycle = 360º)
<*amplitude*>: counts

Type: variable (R/W)

EEPROM: Yes

Range: Versions 3.7.0 and below:
<*harmonic number*>: 1 to 1000
<*phase offset*>: 0 to 359
<*amplitude*>: 0 to 16384
Versions 4.0.1 and later:
<*harmonic number*>: 1 to 8192
<*phase offset*>: 0 to 359
<*amplitude*>: 0 to 16384

Default:
<*harmonic number*>: 2
<*phase offset*>: 0
<*amplitude*>: 0

Opmodes: All

Drive Status: EN/DIS

HC2

Defines the properties of correction harmony number 2.

Syntax: HC2<*harmonic number*> <*phase offset*> <*amplitude*>

<*harmonic number*> sets the number of cycles per resolver cycle (resolver system) or per motor revolution (encoder system.)

<*phase offset*> relative to resolver zero (resolver system) or PRD zero (encoder system.)

<*amplitude*> specifies the amplitude of the harmony in internal counts at the injection point.

Units:
<*harmonic number*>: N/A
<*phase offset*>: degrees (PRD cycle = 360º)
<*amplitude*>: counts

Type: variable (R/W)

EEPROM: Yes

Range: Versions 3.7.0 and below:
<*harmonic number*>: 1 to 1000
<*phase offset*>: 0 to 359
<*amplitude*>: 0 to 16384
Versions 4.0.1 and later:
<*harmonic number*>: 1 to 8192
<*phase offset*>: 0 to 359
<*amplitude*>: 0 to 16384

Default:
<*harmonic number*>: 2
<*phase offset*>: 0
<*amplitude*>: 0

Opmodes: All

Drive Status: EN/DIS

HC3

Defines the properties of correction harmony number 3.

Syntax: HC3<*harmonic number*> <*phase offset*> <*amplitude*>

<*harmonic number*> sets the number of cycles per resolver cycle (resolver system) or per motor revolution (encoder system.)

<*phase offset*> relative to resolver zero (resolver system) or PRD zero (encoder system.)

<*amplitude*> specifies the amplitude of the harmony in internal counts at the injection point.

Units:
<*harmonic number*>: N/A
<*phase offset*>: degrees (PRD cycle = 360º)
<*amplitude*>: counts

Type: variable (R/W)

EEPROM: Yes

Range: Versions 3.7.0 and below:
<*harmonic number*>: 1 to 1000
<*phase offset*>: 0 to 359
<*amplitude*>: 0 to 16384
Versions 4.0.1 and later:
<*harmonic number*>: 1 to 8192
<*phase offset*>: 0 to 359
<*amplitude*>: 0 to 16384

Default:
<*harmonic number*>: 2
<*phase offset*>: 0
<*amplitude*>: 0

Opmodes: All

Drive Status: EN/DIS

HOLD

Sets a flag indicating whether or not the drive should enter the position-hold mode. When activated, the motor will decelerate to zero speed at the DECSTOP rate and switch modes to hold the motor shaft at its present position. This variable may be set either by serial communication, by asserting both limit switches (CWLIM and CCWLIM), or by setting DIP switch number 7, or during active disable. The Status Display will flash the current OPMODE as a visual indicator that the drive is in the HOLD mode.

Firmware Versions: All
Range: 0, 1
Opmodes: All

Type: switch (R/W)
Default: 0
Drive Status: EN/DIS

Units: N/A
EEPROM: No

HOMESPD

Sets the homing speed and direction (first time initialize) for INxMODE 10-12 and the MH command. A positive speed is CW.

Firmware Versions: 3.1.0 and later
Units: rotary: RPM
linear: mm/sec

Type: variable (R/W)
Range: -VMAX to VMAX
Default: 100

Opmodes: 8
Drive Status: EN/DIS
EEPROM: Yes

HOMESTATE

Returns the status of the homing function. This variable can be polled during homing to track the homing status. A homing process may not go through all of the steps listed below, which are a chronological listing of the steps taken during a full homing procedure that begins when homing is initiated with a home switch that is already pressed. When this process is complete, home or absolute machine zero is known and PFB=0. See MH, HOMESPD, HOMETYPE, and IN1MODE-IN3MODE.

0 = no drive controlled homing has been initiated.
1 = homing started; moving away from pressed home switch.
2 = waiting for home switch to clear; drive will stop when it does.
3 = home switch has cleared; check if drive is stopped.
4 = home search; move towards home switch.
5 = waiting for home switch to be pressed; drive will stop.
6 = home switch detected; check if motor is stopped.
7 = after motion stops, motor will go home.
8 = check if motor is at home.
9 = motor is at home, waiting for in-position.
10 = homing is complete.
11 = homing process was interrupted during execution.
12 = homing was canceled, waiting for the motor to stop (SERCOS only).

Firmware Versions: 3.1.0 to 3.3.0, 3.4.2 and later.
For Firmware Versions 3.4.0 and 3.4.1 contact Customer Support for a comprehensive definition of HOMESTATE

EEPROM: N/A

Type: switch mode (R)
Range: 0 to 12
Default: N/A
Units: N/A
Drive Status: EN/DIS
Opmodes: 8

HOMETYPE

Defines the type of homing function performed. This variable takes on a different meaning depending on the type of positioning selected (using PCMDMODE). In the following descriptions, "Home switch" refers to a digital input (IN1-IN3) that has been configured as a home switch by setting INxMODE = 10. "Marker" refers to an encoder's index pulse or a resolver zero point:

In Serial Position Mode

(PCMDMODE = 0; also see MH; PFB is normalized to zero after the home search):

0 homing with home switch and marker (PFB = 0).
1 homing with home switch only (PFB = 0).
2 homing with marker only (PFB = 0).
3 present position is home on the rising edge of IN1, IN2, or IN3 with the corresponding INxMODE value set to 12 (PFB = 0).
4 homing on marker with every drive enable, MH command, or on the rising edge of IN1-IN3 with the corresponding INxMODE set equal to 12 (PFB = 0).
5 homing on marker with every MH command, or on the rising edge of IN1-IN3 with the corresponding INxMODE set equal to 12 (PFB = 0).
6 homing with home switch and marker (PFB = 0) on every MH command (firmware versions 3.3.0 and later).
7 homing with home switch only (PFB = 0) on every MH command (firmware versions 3.3.0 and later).

For HOMETYPE 0 to 3, the first execution of the homing command initiates a search for absolute machine zero. Executing successive homing commands causes an absolute move to zero position without searching for machine zero. For HOMETYPE 4 to 7, the drive searches for absolute machine zero on every home command, whether absolute machine zero has previously been detected or not.

In Analog Position Mode

(PCMDMODE = 1):

HOMETYPES 0 to 7: same as for Serial Position Mode. When homing is complete, PFB is normalized (set equal to 0) at the current value of the analog input (ANIN). Example: when homing is complete, if 2 volts are present at the analog input, then PFB will be set equal to 0 at 2 volts of input.

HOMETYPES 50 to 57: same as 0-7, except that when homing is complete, PFB is NOT normalized at the current value of ANIN. Instead, PFB is normalized at 0 volts input. * **Caution!** If there is a voltage on the analog input other than 0v and the drive is enabled, the motor will see this as a "command to move" and move to the position specified by the analog input voltage.

Firmware revision information: prior to firmware version 3.3.0, only Analog Position Mode HOMETYPES 0 and 3 were available.

Firmware Versions: 3.1.0 and later
Range: 0 to 7
(analog and serial position modes)
50-57
(analog position mode only)

Type: switch mode (R/W)
Default: 0

Drive Status: EN/DIS

Units: N/A
EEPROM: Yes

Opmodes: 8

HSAVE

Copies MPHASE, PFBOFF and ZPOS into the EnDat encoder memory. Care must be taken when overwriting the MPHASE variable as runaway conditions are possible with incorrect values. HSAVE is applicable only when MENCTYPE=9.

Firmware Versions: 3.6.0 and later **Command Syntax:** HSAVE
Opmodes: All **Drive Status:** EN/DIS

HWPOS

Displays the position feedback directly from the feedback hardware counter. For resolver-based systems, HWPOS will range from 0 to 65,535 per electrical revolution of the resolver (the number of electrical resolver revolutions per each mechanical revolution is calculated by dividing the number of resolver poles by 2 - see MRESPOLES). The resolution of HWPOS is based on RDRES:

RDRES = 12, resolution of HWPOS = 16
RDRES = 14, resolution of HWPOS = 4
RDRES = 16, resolution of HWPOS = 1

For encoder-based systems, HWPOS will return the encoder counter content, which is based on quadrature pulse input and will range from 0 to 65535, with a resolution of 32.

Firmware Versions: 2.0.0 and later **Type:** variable (R) **Units:** counts
Range: 0 to 65,535 **Default:** N/A **EEPROM:** No
Opmodes: All **Drive Status:** EN/DIS

I

Displays the motor current. The AVGTIME variable determines the averaging of this variable, except when recorded for graphical display by **MOTIONLINK**, in which case it is not averaged.

Firmware Versions: All **Type:** variable (R) **Units:** % of DIPEAK * 0.1
Range: 0 to 2000 **Default:** N/A **EEPROM:** No
Opmodes: All **Drive Status:** EN/DIS

IA

Displays the motor's A phase current. AVGTIME does not affect this variable.

Firmware Versions: All **Type:** variable (R) **Units:** % of DIPEAK * 0.1
Range: -1000 to 1000 **Default:** N/A **EEPROM:** No
Opmodes: All **Drive Status:** EN/DIS

IC

Displays the motor's C phase current. AVGTIME does not affect this variable.

Firmware Versions: All **Type:** variable (R) **Units:** % of DIPEAK * 0.1
Range: -1000 to 1000 **Default:** N/A **EEPROM:** No
Opmodes: All **Drive Status:** EN/DIS

ICMD

Displays the Current (Torque) command to the current controller. This variable is equivalent to the Analog Input (ANIN) in OPMODE 3, to the Torque Command (T) in OPMODE 2, and to the output of the velocity controller in OPMODE 0 or 1. The AVGTIME variable affects averaging of this variable, except when recorded for graphical display by **MOTIONLINK**, in which case it is not averaged.

Firmware Versions: All
Type: variable (R)
Units: % of DIPEAK * 0.1
Range: -1000 to 1000
Default: N/A
EEPROM: No
Opmodes: All
Drive Status: EN/DIS

ICONT

Sets the system continuous current. This variable is used in the foldback algorithm (see FOLD and FOLDMODE). The default value of this variable is the minimum of DICONT (Drive Continuous Current) and MICONT (Motor Continuous Current), unless that value exceeds IMAX, in which case ICONT is set equal to IMAX. This variable is reset to its default whenever DICONT or MICONT is changed. You can override the default.

Firmware Versions: All
Type: variable (R/W)
Units: % of DIPEAK * 0.1
Range: 0 to IMAX
Default: min of DICONT and MICONT
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

IENCSTART

Sets the maximum current for the ENCSTART encoder initialization process.

Firmware Versions: All
Type: variable (R/W)
Units: % of MICONT
Range: 1 to 100
Default: 25
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

IFRIC

This is the Coulomb Friction constant for the current loop.

Firmware Versions: 2.1.0 and later
Type: variable (R/W)
Units: % of DIPEAK
Range: 0 to 500
Default: 0
EEPROM: Yes
Opmodes: 8
Drive Status: EN/DIS

IGRAV

This is the Gravity constant for the current loop.

Firmware Versions: 2.1.0 and later
Type: variable (R/W)
Units: % of DIPEAK
Range: -500 to 500
Default: 0
EEPROM: Yes
Opmodes: 8
Drive Status: EN/DIS

ILIM

Sets the application current limit, Allowing the user to limit the drive's peak current. This variable limits the current command that will be accepted from the user (using the T command in Opmode 2) or issued by the control loops (in Opmodes 0, 1, 3, and 4). This variable is an independent variable that is not calculated from hardware parameters and is not tied to any other variables. ILIM is similar to VLIM (which is used in Opmodes 0 and 1) and can be used to protect delicate load equipment.

Firmware Versions: All | **Type:** variable (R/W) | **Units:** % of DIPEAK * 0.1
Range: 0 to IMAX | **Default:** IMAX | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

ILIM2

This variable is used to define a new current limit value for INxMODE 8. This variable functions in similar fashion to ILIM if INxMODE = 8 and the corresponding INx input = 1.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** % of DIPEAK * 0.1
Range: 0 to IMAX | **Default:** 0.1 * IMAX | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

ILSBMODE

(Relevant for resolver feedback only.) Sets the mode of operation of the inter-LSB algorithm, which interpolates feedback between least significant bits (LSB's) of the resolver. Enabling this algorithm will improve performance when the RDRES resolution is low (12 bits), BW is high, and the commanded velocity is low.

ILSBMODE = 0; algorithm disabled
ILSBMODE = 1; enabled for velocity feedback.
ILSBMODE = 2; enabled for velocity and position feedback

Firmware Versions: 2.1.0 and later | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0, 1, 2 | **Default:** 2 | **EEPROM:** Yes
Opmodes: 0,1,4,8 | **Drive Status:** DIS

IMAX

Displays the system current maximum for a drive and motor combination. This variable is actually the minimum of the drive Peak Current (DIPEAK) and the Motor Peak Current (MIPEAK).

Firmware Versions: All | **Type:** variable (R) | **Units:** % of DIPEAK *0.1
Range: 0 to 1000 | **Default:** min of DIPEAK & MIPEAK | **EEPROM:** No
Opmodes: All | **Drive Status:** EN/DIS

IN

Returns the state of the three digital inputs (IN1, IN2, IN3) in a three-character string. The leftmost bit represents IN1 and the rightmost bit represents IN3.

Firmware Versions: 3.1.0 and later **Type:** switch mode (R) **Units:** N/A
Range: 000 to 111 (0=OFF, 1=ON) **Default:** N/A **EEPROM:** N/A
Opmodes: All **Drive Status:** EN/DIS

IN1

This is used to read the state of the hardware input on user connector C3 Pin 9.

Firmware Versions: 2.1.0 and later **Type:** switch (R) **Units:** N/A
Range: 0 (OFF), 1=(ON) **Default:** N/A **EEPROM:** N/A
Opmodes: All **Drive Status:** EN/DIS

IN1MODE

IN1MODE sets the functionality of the IN1 input. The function list is:

IN1MODE=0: No function*
IN1MODE=1: CW limit switch*
IN1MODE=2: CCW limit switch*
IN1MODE=3: Gear disable input (All GEARMODE values)*
IN1MODE=4: Gear mask input (All GEARMODE values)*
IN1MODE=5: Gear A input (GEARMODE = 0-2)*
IN1MODE=6: Gear B input (GEARMODE = 0-2)*
IN1MODE=7: Trigger incremental move / jog **
IN1MODE=8: Use second current limit (ILIM2)**
IN1MODE=9: Switch OPMODE from 1 to 3**
IN1MODE=10: Home switch**
IN1MODE=11: Reserved
IN1MODE=12: Search for absolute machine zero/Move to absolute machine zero (home)**
IN1MODE=13: Trigger absolute move (MAPOS at MASPEED)**
IN1MODE=14: Binary MIDIST / MISPEED selection code MSB**
IN1MODE=15: Binary MIDIST / MISPEED selection code LSB**
IN1MODE=16: Reserved
IN1MODE=17: Trigger active disable (see DISSPEED)*
IN1MODE=18: Control fault relay** (see Notes below)
IN1MODE=19: Hold position*
IN1MODE=20: When OPMODE=1, an active input switches to OPMODE=4 (must be disabled or 0 velocity)
IN1MODE=21: Trigger incremental move *** (see Notes below)
IN1MODE=22: Triggers incremental move when MODMODE=1. Distance = (PROTARY / DIVISIONS)****
IN1MODE=23: Trigger incremental move when MODMODE=1. Distance = (2 * PROTARY / DIVISIONS)****
IN1MODE=24: Change OPMODE 8 to OPMODE 4 using digital input.****
IN1MODE=25: Upon transition from 0 to 1, the faults are cleared if REMOTE=0 or SWEN=0.*****

* available in firmware versions 2.1.0 and later
** available in firmware versions 3.1.0 and later
*** available in firmware versions 3.5.0 and later
**** available in firmware versions 4.0.0 and later
***** available in firmware versions 4.1.8 and later

Notes:

- **IN1MODE = 7** operation: If the drive is in OPMODE 8 (positioning), an input with IN1MODE=7 can be used to trigger an incremental move (MI), using the variables MIDIST0-3, MISPEED0-3. Refer to the descriptions for those variables, as well as the description of MH, for more information. If the drive is in OPMODE 1 (analog velocity), an input with IN1MODE =7 can be used to trigger a jog at a speed entered in MISPEED0-3. See the description of MISPEED0 for more details.IN1MODE 7 can be activated while the motor is in motion. This causes the motor to begin the next index immediately after completing the previous index (called "look-ahead-buffering").
- **IN1MODE = 9** operation: If the drive is in OPMODE 1 (analog velocity) and IN1MODE is 9, then witching the related IN1 input to '1' causes the drive to switch to OPMODE 3 (analog current). Switching the IN1 input back to '0' will cause the drive to switch back to OPMODE 1 (analog velocity). The LED display of OPMODE will change according to the user input, but the serial response to a prompt for OPMODE will return 1. The OPMODE change can happen when the drive is enabled, therefore the user must make the switch with zero command.
- **IN1MODE = 12** operation: Execute HOMETYPE (see note in HOMETYPE). Moves are performed at velocity equal to HOMESPD.
- **IN1MODE = 18**: if input = 0, the fault relay will open. If input = 1, the fault relay operates as normal.
- **IN1MODE=21**: The same function as IN1MODE=7 except that IN1MODE=21 ignores input signals until the motor has completed in prior index (comes to rest). There is no "look-ahead-buffering."
- **IN1MODE=22**: The motion velocity is MISPEED0. There is no movement unless in rotary mode (MODMODE=1). The direction depends on the sign of DIVISIONS and on the value of DIR.
- **IN1MODE=23**: The motion velocity is MISPEED0. There is no movement unless in rotary mode (MODMODE=1). The direction depends on the sign of DIVISIONS and on the value of DIR.
- **IN1MODE=24:** With the drive starting in the position-mode (OPMODE=8) with the INPUT = Low; a Low --> High transition of the INPUT changes the drive to the gearing-mode (OPMODE=4); with a High --> Low transition, the drive is changed back to the position-mode (OPMODE=8). These OPMODE changes occur when the drive is enabled or disabled.

Firmware Versions: see above	**Type:** switch mode (R/W)	**Units:** N/A
Range: 0 to 24	**Default:** 1	**EEPROM:** N/A
Opmodes: dependent	**Drive Status:** EN/DIS	

IN2

This is used to read the state of the hardware input on user connector C3 Pin 10.

Firmware Versions: 2.1.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0 (OFF), 1=(ON) | **Default:** N/A | **EEPROM:** N/A
Opmodes: All | **Drive Status:** EN/DIS

IN2MODE

IN2MODE sets the functionality of the IN2 input. The function list is:

IN2MODE=0: No function*
IN2MODE=1: CW limit switch*
IN2MODE=2: CCW limit switch*
IN2MODE=3: Gear disable input (All GEARMODE values)*
IN2MODE=4: Gear mask input (All GEARMODE values)*
IN2MODE=5: Gear A input (GEARMODE = 0-2)*
IN2MODE=6: Gear B input (GEARMODE = 0-2)*
IN2MODE=7: Trigger incremental move / jog **
IN2MODE=8: Use second current limit (ILIM2)**
IN2MODE=9: Switch OPMODE from 1 to 3**
IN2MODE=10: Home switch**
IN2MODE=11: Reserved
IN2MODE=12: Search for absolute machine zero/Move to absolute machine zero (home)**
IN2MODE=13: Trigger absolute move (MAPOS at MASPEED)**
IN2MODE=14: Binary MIDIST / MISPEED selection code MSB**
IN2MODE=15: Binary MIDIST / MISPEED selection code LSB**
IN2MODE=16: Reserved
IN2MODE=17: Trigger active disable (see DISSPEED)*
IN2MODE=18: Control fault relay** (see Notes below)
IN2MODE=19: Hold position*
IN2MODE=20: When OPMODE=1, an active input switches to OPMODE=4 (must be disabled or 0 velocity)
IN2MODE=21: Trigger incremental move *** (see Notes below)
IN2MODE=22: Triggers incremental move when MODMODE=1. Distance = (PROTARY / DIVISIONS)****
IN2MODE=23: Trigger incremental move when MODMODE=1. Distance = (2 * PROTARY / DIVISIONS)****
IN2MODE=24: Change OPMODE 8 to OPMODE 4 using digital input.****
IN2MODE=25: Upon transition from 0 to 1, the faults are cleared if REMOTE=0 or SWEN=0.*****

* available in firmware versions 2.1.0 and later
** available in firmware versions 3.1.0 and later
*** available in firmware versions 3.5.0 and later
**** available in firmware versions 4.0.0 and later
***** available in firmware versions 4.1.8 and later

Notes:

- **IN2MODE = 7** operation: If the drive is in OPMODE 8 (positioning), an input with IN2MODE=7 can be used to trigger an incremental move (MI), using the variables MIDIST0-3, MISPEED0-3. Refer to the descriptions for those variables, as well as the description of MH, for more information. If the drive is in OPMODE 1 (analog velocity), an input with IN2MODE =7 can be used to trigger a jog at a speed entered in MISPEED0-3. See the description of MISPEED0 for more details.IN2MODE 7 can be activated while the motor is in motion. This causes the motor to begin the next index immediately after completing the previous index (called "look-ahead-buffering").
- **IN2MODE = 9** operation: If the drive is in OPMODE 1 (analog velocity) and IN2MODE is 9, then witching the related IN2 input to '1' causes the drive to switch to OPMODE 3 (analog current). Switching the IN2 input back to '0' will cause the drive to switch back to OPMODE 1 (analog velocity). The LED display of OPMODE will change according to the user input, but the serial response to a prompt for OPMODE will return 1. The OPMODE change can happen when the drive is enabled, therefore the user must make the switch with zero command.
- **IN2MODE = 12** operation: Execute HOMETYPE (see note in HOMETYPE). Moves are performed at velocity equal to HOMESPD.
- **IN2MODE = 18**: if input = 0, the fault relay will open. If input = 1, the fault relay operates as normal.
- **IN2MODE=21**: The same function as IN2MODE=7 except that IN2MODE=21 ignores input signals until the motor has completed in prior index (comes to rest). There is no "look-ahead-buffering."
- **IN2MODE=22**: The motion velocity is MISPEED0. There is no movement unless in rotary mode (MODMODE=1). The direction depends on the sign of DIVISIONS and on the value of DIR.
- **IN2MODE=23**: The motion velocity is MISPEED0. There is no movement unless in rotary mode (MODMODE=1). The direction depends on the sign of DIVISIONS and on the value of DIR.
- **IN1MODE=24:** With the drive starting in the position-mode (OPMODE=8) with the INPUT = Low; a Low --> High transition of the INPUT changes the drive to the gearing-mode (OPMODE=4); with a High --> Low transition, the drive is changed back to the position-mode (OPMODE=8). These OPMODE changes occur when the drive is enabled or disabled.

Firmware Versions: see above | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 24 | **Default:** 2 | **EEPROM:** N/A
Opmodes: dependent | **Drive Status:** EN/DIS

IN3

This is used to read the state of the hardware input on user connector C3 Pin 11.

Firmware Versions: 2.1.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0 (OFF), 1=(ON) | **Default:** N/A | **EEPROM:** N/A
Opmodes: All | **Drive Status:** EN/DIS

IN3MODE

IN3MODE sets the functionality of the IN3 input. The function list is:

IN3MODE=0: No function*
IN3MODE=1: CW limit switch*
IN3MODE=2: CCW limit switch*
IN3MODE=3: Gear disable input (All GEARMODE values)*
IN3MODE=4: Gear mask input (All GEARMODE values)*
IN3MODE=5: Gear A input (GEARMODE = 0-2)*
IN3MODE=6: Gear B input (GEARMODE = 0-2)*
IN3MODE=7: Trigger incremental move / jog **
IN3MODE=8: Use second current limit (ILIM2)**
IN3MODE=9: Switch OPMODE from 1 to 3**
IN3MODE=10: Home switch**
IN3MODE=11: Reserved
IN3MODE=12: Search for absolute machine zero/Move to absolute machine zero (home)**
IN3MODE=13: Trigger absolute move (MAPOS at MASPEED)**
IN3MODE=14: Binary MIDIST / MISPEED selection code MSB**
IN3MODE=15: Binary MIDIST / MISPEED selection code LSB**
IN3MODE=16: Reserved
IN3MODE=17: Trigger active disable (see DISSPEED)*
IN3MODE=18: Control fault relay** (see Notes below)
IN3MODE=19: Hold position*
IN3MODE=20: When OPMODE=1, an active input switches to OPMODE=4 (must be disabled or 0 velocity)
IN3MODE=21: Trigger incremental move *** (see Notes below)
IN3MODE=22: Triggers incremental move when MODMODE=1. Distance = (PROTARY / DIVISIONS)****
IN3MODE=23: Trigger incremental move when MODMODE=1. Distance = (2 * PROTARY / DIVISIONS)****
IN3MODE=24: Change OPMODE 8 to OPMODE 4 using digital input.****
IN3MODE=25: Upon transition from 0 to 1, the faults are cleared if REMOTE=0 or SWEN=0.*****

* available in firmware versions 2.1.0 and later
** available in firmware versions 3.1.0 and later
*** available in firmware versions 3.5.0 and later
**** available in firmware versions 4.0.0 and later
***** available in firmware versions 4.1.8 and later

Notes:

- **IN3MODE = 7** operation: If the drive is in OPMODE 8 (positioning), an input with IN3MODE=7 can be used to trigger an incremental move (MI), using the variables MIDIST0-3, MISPEED0-3. Refer to the descriptions for those variables, as well as the description of MH, for more information. If the drive is in OPMODE 1 (analog velocity), an input with IN3MODE =7 can be used to trigger a jog at a speed entered in MISPEED0-3. See the description of MISPEED0 for more details.IN3MODE 7 can be activated while the motor is in motion. This causes the motor to begin the next index immediately after completing the previous index (called "look-ahead-buffering").

- **IN3MODE = 9** operation: If the drive is in OPMODE 1 (analog velocity) and IN3MODE is 9, then witching the related IN3 input to '1' causes the drive to switch to OPMODE 3 (analog current). Switching the IN3 input back to '0' will cause the drive to switch back to OPMODE 1 (analog velocity). The LED display of OPMODE will change according to the user input, but the serial response to a prompt for OPMODE will return 1. The OPMODE change can happen when the drive is enabled, therefore the user must make the switch with zero command.
- **IN3MODE = 12** operation: Execute HOMETYPE (see note in HOMETYPE). Moves are performed at velocity equal to HOMESPD.
- **IN3MODE = 18**: if input = 0, the fault relay will open. If input = 1, the fault relay operates as normal.
- **IN3MODE=21**: The same function as IN3MODE=7 except that IN3MODE=21 ignores input signals until the motor has completed in prior index (comes to rest). There is no "look-ahead-buffering."
- **IN3MODE=22**: The motion velocity is MISPEED0. There is no movement unless in rotary mode (MODMODE=1). The direction depends on the sign of DIVISIONS and on the value of DIR.
- **IN3MODE=23**: The motion velocity is MISPEED0. There is no movement unless in rotary mode (MODMODE=1). The direction depends on the sign of DIVISIONS and on the value of DIR.
- **IN1MODE=24:** With the drive starting in the position-mode (OPMODE=8) with the INPUT = Low; a Low --> High transition of the INPUT changes the drive to the gearing-mode (OPMODE=4); with a High --> Low transition, the drive is changed back to the position-mode (OPMODE=8). These OPMODE changes occur when the drive is enabled or disabled.

Firmware Versions: see above | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 24 | **Default:** 3 | **EEPROM:** N/A
Opmodes: dependent | **Drive Status:** EN/DIS

INDEXPOS

Determines the position of the marker signal in the encoder simulation for resolver based systems.

Firmware Versions: 3.4.0 and later | **Type:** variable | **Units:** N/A
Range: 0, 45, 90, 135, 180, 225, 270, 315 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

ININV1

Invert user input #1 C3 pin 9.
0 – user input not inverted.
1 – user input inverted.

Firmware Versions: 3.4.0 and later | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0, 1 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:**

ININV2

Invert user input #2 C3 pin 10.
0 – user input not inverted.
1 – user input inverted.

Firmware Versions: 3.4.0 and later | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0, 1 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:**

ININV3

Invert user input #3 C3 pin 11.
0 – user input not inverted.
1 – user input inverted.

Firmware Versions: 3.4.0 and later | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0, 1 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:**

INITMODE

Sets the type of initialization for the ENCSTART encoder initialization process.
0 – soft exponential ramp (motor will rotate CW and CCW several times, fault occurs if unsuccessful)
1 – hard step (motor jerks into position, fault occurs if unsuccessful)

When using either option, disconnect the load from the motor shaft. Option 0 rotates the load in both directions and may be undesirable for the application. Option 1 suddenly jerks the motor into position and could cause damage to the load or surrounding environment.

Firmware Versions: 3.4.0 and later | **Type:** variable (R/W) | **Units:** N/A
Range: 0, 1 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

INPOS

Indicates if the actual position (PFB) is following the commanded position (PCMD) within the following error set by PEINPOS.
0 – not in position
1 – in position

Firmware Versions: 2.1.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0, 1 | **Default:** N/A | **EEPROM:** N/A
Opmodes: 4,8 | **Drive Status:** EN/DIS

ISCALE

Is an analog current scale factor that scales (1) the analog input ANIN for OPMODE 3 (analog torque mode), and (2) the analog output for ANOUT=1 or 3. The value entered is the motor current per 10 volts of analog input or output. This variable may be either higher or lower than 100%, but the actual analog I/O will be limited by the application current limit (ILIM).

Firmware Versions: All
Type: variable (R/W)
Units: (% DIPEAK*0.1) /10V
Range: 100 to 10,000
Default: 1250 for the SERVO**STAR** S
833 for the SERVO**STAR** CD
EEPROM: Yes
Opmodes: 3
Drive Status: EN/DIS

ISTOP

Sets the current command for the braking function. See STOPMODE.

Firmware Versions: 2.1.0 and later
Type: variable (R/W)
Units: % of DIPEAK *0.1
Range: 0 to IMAX
Default: DICONT
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

IZERO

Sets the C-B phase current for ZERO Mode (A=0). See ZERO.

Firmware Versions: All
Type: variable (R/W)
Units: % of MICONT
Range: 1 to 100
Default: 25
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

J

Sets the continuous jog speed and initiates motion at that speed if the motor is currently enabled (see EN and REMOTE) in OPMODE 0. J is set to 0 whenever the drive is disabled or enabled, or the operational mode is changed to prevent the motor from moving when enabled. The J command has an optional parameter of 'for-time', in milliseconds. Not available when the drive is in Hold mode.

Firmware Versions: All
Command Syntax: J *[speed] {time}*
Opmodes: 0
speed (required) = -VLIM to +VLIM in RPM (rotary)
Drive Status: EN
or mm/sec (linear)
time (optional) = 0 to 32767 in milliseconds

K

K is the same as the disable command (DIS) and provides a one-key hot-button. The drive is disabled and the motor may coast when this command is issued.

Firmware Versions: All
Command Syntax: K
Opmodes: All
Drive Status: EN/DIS

KV

KV is a tuning variable which sets the proportional gain for the Pseudo Derivative Feedback with Feed-Forward Velocity Control Loop (PDFF loop; COMPMODE = 1). This variable is set manually by the user. Executing the TUNE command successfully may change the value of this parameter.

Firmware Versions: All
Range: 0 to 1,000,000,000 (firmware versions 3.3.0 and later)
0 to 65,535 (firmware versions 2.2.0 to 3.2.1)
0 to 32,767 (firmware versions up to and including 2.1.0)
Drive Status: EN/DIS
Units: N/A
Type: variable (R/W)
Default: 1000
Opmodes: 0, 1, 4, 8
EEPROM: Yes

KVFR

KVFR is a tuning variable which sets the feed-forward to feedback gain ratio for the Pseudo Derivative Feedback with Feed-Forward Velocity Control Loop (PDFF loop; COMPMODE = 1). This variable is set manually by the user. Executing the TUNE command successfully may change the value of this parameter.

Firmware Versions: All
Range: 0 to 1000
Opmodes: 0,1,4,8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: % *0.1
EEPROM: Yes

KVI

KVI is a tuning variable which sets the integral gain for the Pseudo Derivative Feedback with Feed-Forward Velocity Control Loop (PDFF loop; COMPMODE = 1). This variable is set manually by the user. Executing the TUNE command successfully may change the value of this parameter.

Firmware Versions: All
Range: 0 to 65535
Opmodes: 0,1,4,8
Type: variable (R/W)
Default: 1000
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

LIMDIS

Enables/disables the End Travel Limit function. This function only pertains to units with the limit switch option.

0 = limit switch function enabled
1 = limit switch function disabled; LED decimal point flashes

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

LIST

Dumps a list of valid commands and variables to the serial port. Only the names of variables are transmitted, not values. Note that some factory variables and commands, not intended for use by the user, may be printed. **Do not** use commands and variables that are not described in this guide.

Firmware Versions: All
Command Syntax: LIST
Opmodes: All
Drive Status: EN/DIS

LMJR

Sets the ratio of the estimated Load Moment of Inertia (LMJ) relative to the Motor Moment of Inertia (MJ). The variables LMJR and MJ and the required closed loop bandwidth (BW) are used for the Velocity Control Loop design in the Standard Pole-Placement controller (COMPMODE = 2 or 4). Executing the TUNE command successfully may change the value of this parameter.

Firmware Versions: All
Type: variable (R/W)
Units: percent of MJ
Range: 0 to 10,000
Default: 0
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

LOAD

Loads all variables saved in the EEPROM into system RAM. This command is automatically executed on power-up.

Firmware Versions: All
Command Syntax: LOAD
Opmodes: All
Drive Status: DIS

LPFHZ1

Sets the cutoff frequency of the first Low Pass Filter (LPF) used in the velocity loop. This variable only affects the system when FILTMODE = 1 or 2.

Firmware Versions: All
Type: variable (R/W)
Units: Hz
Range: 20 to 800, steps of 20 (20, 40, ..., 800)
Default: 500
EEPROM: Yes
Opmodes: 0,1,4,8
Drive Status: EN/DIS

LPFHZ2

Sets the cutoff frequency of the second Low Pass Filter (LPF) used in the velocity loop. This variable only affects the system when FILTMODE = 2.

Firmware Versions: All
Type: variable (R/W)
Units: Hz
Range: 20 to 800, steps of 20 (20, 40, ..., 800)
Default: 500
EEPROM: Yes
Opmodes: 0,1,4,8
Drive Status: EN/DIS

MA

This command (Serial Move Absolute) moves to the specified position at the specified speed. Motion could occur in either direction, depending upon the relationship between the starting position and the commanded position. The current position of the motor can be read using PFB.

The optional flag *[in pos ack]* enables the operator to direct the drive to indicate when the commanded move is completed. When this flag is set to 1, the drive, upon completion of the commanded move, will output an exclamation point (!) over the serial port. The exclamation point is tied to the STOPPED flag and will be issued when STOPPED transitions from 0 to 1.

Position is in feedback counts. Issuing an MA command while the motor is not stopped causes the command to be buffered. <*velocity*> is always given in RPM or mm/sec and is not affected by Units. See INPOS, MI, PCMD, PEINPOS, PFB, and STOPPED.

in pos ack = 0: do not indicate when move is complete
in pos ack = 1: indicate when move is complete

Firmware Versions: 3.1.0 and later **Command Syntax:** MA <*position*> <*velocity*> *[in pos ack]*
Opmodes: 8 **Range:** <*position*> -LONG to LONG (feedback counts)*
Drive Status: EN <*velocity*> 1 to VMAX (rpm or mm/sec)
*[in pos ack]*0 or 1 (optional)

Example:

MA 10000 1000 (Move to absolute position 10,000 at a speed of 1,000 RPM)
MA -5000 100 1 (Move to absolute position -5000 at a speed of 100 RPM; transmit a (!) to the serial port when the move is completed)

Actual move distance (position about to be commanded – present commanded position) must not exceed ±2,147,482,647 counts or the motion occurs in the opposite direction.

For very slow moves, set VLIM as low as possible before setting <velocity> less than 1 in MA and MI. This can only be set in firmware version 3.7.0 and higher.

MAPOS

Sets the absolute position for IN1MODE=13, or IN2MODE=13, or IN3MODE=13. Position is in counts, where 65536 counts represent one motor revolution for resolver systems, and 4*MENCRES counts represents on motor revolution for encoder systems.

When IN1MODE, IN2MODE, or IN3MODE is set equal to 13, and the associated digital input (IN1, IN2, or IN3) goes high, the drive moves to MAPOS at a speed of MASPEED.

Firmware Versions: 3.1.0 and later **Type:** variable (R/W) **Units:** counts
Range: - 2,147,483,647 to + 2,147,483,647 * **Default:**0 **EEPROM:** Yes
Opmodes: 8 **Drive Status:** EN/DIS

Actual move distance (position about to be commanded – present commanded position) must not exceed ±2,147,482,647 counts or the motion occurs in the opposite direction.

MASPEED

Sets the move speed (unsigned) for IN1MODE=13, or IN2MODE=13, or IN3MODE=13.

When IN1MODE, IN2MODE, or IN3MODE is set equal to 13, and the associated digital input (IN1, IN2, or IN3) goes high, the drive will move to MAPOS at a speed of MASPEED.

Firmware Versions: 3.1.0 and later
Range: 1 to VMAX
Opmodes: 8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: Yes

MBEMF

Displays the motor's back EMF constant. This value is used for current loop controller design. This variable requires a CONFIG command when changed.

Firmware Versions: 3.1.0 and later
Range: 1 to 3900
Opmodes: All
Type: variable (R/W)
Default: motor data
Drive Status: DIS
Units: rotary: (V_{RMS}) / kRPM
linear: (V_{Peak}) / (m/sec)
EEPROM: Yes

MBEMFCOMP

Sets a back EMF compensation percentage value. This variable affects the amount of back EMF compensation that is applied to the motor command.

For firmware version, 2.0.0, this variable was called BEMFCOMP.

Firmware Versions: 2.0.1 and later
Range: 1 to 130
Opmodes: All
Type: variable (R/W)
Default: 50, or motor data
Drive Status: EN/DIS
Units: percent
EEPROM: Yes

MENCOFF

Sets the encoder index position (encoder feedback systems only). This variable is expressed in units of encoder counts after quadrature, and the range is from 0 to (4 * encoder resolution - 1), or (4 * MENCRES - 1). This variable can be set automatically using ENCINIT.

Firmware Versions: All
Range: 0 to (4*MENCRES) – 1
Opmodes: All
Type: variable (R/W)
Default: motor data (120 degrees if undefined)
Units: encoder counts/mechanical motor rev
EEPROM: Yes
Drive Status: EN/DIS

MENCRES

Displays the resolution of the motor encoder (encoder feedback systems only) in number of lines per revolution of the motor. Note that the number of encoder counts per revolution is obtained by multiplying MENCRES by 4. This variable requires a CONFIG command when changed.

Prior to firmware version 3.2.0, the lowest valid value for MENCRES was 100.

Firmware Versions: All
Range: 1 to 10,000,000
Opmodes: All
Type: variable (R/W)
Default: motor data
Drive Status: DIS
Units: rotary: lines/motor rev
linear: lines/pitch
EEPROM: Yes

MENCTYPE

Sets the motor encoder type. When this variable is changed on an encoder-based system, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG). In version 1 firmware prior to 1.2.0, MENCTYPE=0 is assumed. This variable may take value from 0 to 9.

DIGITAL ENCODER OPTIONS				
MENCTYPE	**A/Bquad**	**Marker Pulse**	**Hall Effects**	**Firmware Versions**
0	√	√	√	All
1	√	√		All
2	√	√		All
3	√			All
4	√			All
5			√	4.1.8 and later
6	√		√	All
SINE ENCODER OPTIONS				
0	√	√	√	3.4.0 and later
7	√	√	C/D Channels	3.4.0 and later
8	√		C/D Channels	3.4.0 and later
9	√		Endat	3.4.0 and later

MENCTYPE 0 can be used with both the Digital and Sine option. The drive automatically senses the Sine Encoder board and make the appropriate adjustments.

All MENCTYPEs applicable for incremental encoders are applicable for sine encoders. This also includes the "wake-and-shake" initialization.

INITIALIZATION METHODS	
MENCTYPE	**Method of Initialization**
0	Initialization is automatic upon power-up. Marker pulse location may be performed using the ENCINIT command to locate the marker.
1	Initialization is required and is triggered by the ENCSTART command. This may optionAlly be followed by marker pulse location using the ENCINIT command.
2	Initialization is required and is triggered on power up (when the drive is enabled) or by using ENCSTART. This may optionAlly be followed by marker pulse location using the ENCINIT command.
3	Initialization is required and is triggered by the ENCSTART command.
4	Initialization is required and is triggered on power up (when the drive is enabled) or by using the ENCSTART command.
5	Halls only (version 4.1.8 and higher).
6	Initialization is automatic upon power-up.
7	Initialization is automatic upon power-up. Marker pulse location may be performed using the ENCINIT command to locate the marker.
8	Initialization is automatic upon power-up.
9	Initialization is automatic upon power-up.

All initializations above are completely automatic when using standard Kollmorgen motors.

For MENCTYPE 0-2 and 7, ENCINIT should be performed where MENCOFF is unknown.

Firmware Versions: All | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 9 | **Default:** motor data (0 if undefined) | **Drive Status:** DIS
Opmodes: All | **EEPROM:** Yes

MFBDIR

Sets the motor feedback direction. This switch is used during the Autoconfig process (see ACONFIG). If Phase 5 of Autoconfig (Direction test) fails, MFBDIR can be used to switch the motor feedback direction. The range is 0 to 3:

MFBDIR = 0: normal commutation direction, normal velocity direction.
MFBDIR = 1: inverted commutation direction, normal velocity direction.
MFBDIR = 2: normal commutation direction, inverted velocity direction.
MFBDIR = 3: inverted commutation direction, inverted velocity direction.

If the motor leads/motor stator are phased incorrectly, then setting MFBDIR=1 will solve the problem. If the feedback device is connected/phased incorrectly, you have to set MFBDIR=3, which changes both the commutation and velocity loop directions.

Firmware Versions: 3.3.0 and later | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 3 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** DIS

MFOLD

Displays the status of the motor foldback circuit. When the system current level exceeds MICONT for too long, the drive enters motor foldback mode, MFOLD changes from 0 to 1, and the drive current is limited gradually (in exponential fashion) to the value of MICONT. See also FOLD, FOLDMODE, MFOLDD, MFOLDDIS, MFOLDR, and MFOLDT.

0 = motor foldback OFF (inactive)
1 = motor foldback ON (drive is limiting output current)

Firmware Versions: 3.2.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0, 1 | **Default:** 0 | **EEPROM:** No
Opmodes: All | **Drive Status:** EN/DIS

MFOLDD

Sets the delay time for motor foldback. This is the amount of time that the system current can exceed MICONT before the drive will enter the motor foldback state. The time units assume a worst-case scenario where the drive is applying MIPEAK current. A current level of less than MIPEAK can be allowed for a longer time. See FOLD, FOLDMODE, MFOLD, MFOLDDIS, MFOLDR, and MFOLDT.

Firmware Versions: 3.2.0 and later | **Type:** variable (R/W) | **Units:** seconds at MIPEAK
Range: 1 to 2400 | **Default:** 1200 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

MFOLDDIS

enables/disables the motor current foldback function. See also FOLD, FOLDMODE, MFOLD, MFOLDD, MFOLDR, and MFOLDT.

0 = enable motor foldback function
1 = disable motor foldback function

Firmware Versions: 3.2.0 and later | **Type:** switch (R/W) | **Units:** N/A
Range: 0, 1 | **Default:** 1 (disabled) | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

MFOLDR

Sets the recovery time for motor foldback. After the drive enters the motor foldback state (MFOLD=1), and the current folds back to MICONT, this is the amount of time that the current is held at MICONT or below before it is allowed to exceed MICONT again. See FOLD, FOLDMODE, MFOLD, MFOLDD, MFOLDDIS, and MFOLDT.

Firmware Versions: 3.2.0 and later | **Type:** variable (R/W) | **Units:** seconds
Range: 900 to 3600 | **Default:** 1800 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

MFOLDT

Sets the time constant for motor foldback. After the drive enters the motor foldback state (MFOLD=1), this variable defines how long it takes the drive to reduce the system current level to MICONT. See FOLD, FOLDMODE, MFOLD, MFOLDD, MFOLDDIS, and MFOLDR.

Firmware Versions: 3.2.0 and later | **Type:** variable (R/W) | **Units:** seconds
Range: 1 to 1200 | **Default:** 600 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

MH

This command (Move Home) causes the motor to move to the home position. HOMESPD controls the speed. HOMETYPE defines the type of homing sequence, while HOMESTATE gives the homing status and describes the homing process further.

After power up, or after a feedback loss fault, the first issue of this command causes a search for home. Further issues of this command causes a move to home position (equivalent to MA 0 command). HOMESPD controls the speed and direction of the search. PFB is normalized to 0 after completion.

The optional flag *[in pos ack]* enables you to direct the drive to indicate when the commanded MOVE is completed. When this flag is set to 1, the drive, upon completion of the commanded MOVE, outputs an exclamation point (!) over the serial port. The exclamation point is tied to the STOPPED flag and is issued when STOPPED transitions from 0 to 1.

Homing Process Using MH command:

- Issue MH command via serial port
- If home switch is already pressed (see IN1MODE = 10). The drive moves in the opposite homing direction, until home switch is released.
- If home switch is not already pressed, the drive move in the homing direction, until home switch is pressed.
- Drive captures position of first index (or resolver 0) past switch.
- Drive decelerates to stop using DEC.
- Drive goes back to home position using ACC, DEC, and HOMESPD (in firmware versions 3.3.0 and later, the speed is MISPEED0). Drive resets the absolute position (PFB) to 0.

Homing Process using digital I/O (see descriptions for INx and INxMODE 10 and 12):
When Home Input is activated for the first time after power-up:

- If home switch is already pressed (see INxMODE = 10), the drive moves in the opposite homing direction, until home switch is released.
- If home switch is not already pressed, drive moves in the homing direction, until home switch is pressed.
- Drive captures position of first index (or resolver 0) past switch.
- Drive decelerates at DEC to stop.
- Drive goes back to home position using ACC, DEC, and HOMESPD (in firmware versions 3.3.0 and later, the speed is MISPEED0).
- Drive resets the absolute position (PFB) to 0

Otherwise:

- Drive moves to absolute 0 at HOMESPD.
  in pos ack = 0: do not indicate when move is complete
  in pos ack = 1: indicate when move is complete

Firmware Versions: 3.1.0 and later
Opmodes: 8
Drive Status: EN
Command Syntax: MH *[in pos ack]*
Range: *[in pos ack]* 0 or 1 (optional)

MHINVA

MHINVA is a variable which applies to encoder-based systems which use hall switches to commutate. This variable inverts the hall sensor A feedback, causing the system to read the 'A' hall channel as inverted data.

MHINVA = 0: do not invert hall A
MHINVA = 1: invert hall A

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 0
Drive Status: DIS
Units: N/A
EEPROM: Yes

MHINVB

MHINVB is a variable which applies to encoder-based systems which use hall switches to commutate. This variable inverts the hall sensor B feedback, causing the system to read the 'B' hall channel as inverted data.

MHINVB = 0: do not invert hall B
MHINVB = 1: invert hall B

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 0
Drive Status: DIS
Units: N/A
EEPROM: Yes

MHINVC

MHINVC is a variable which applies to encoder-based systems which use hall switches to commutate. This variable inverts the hall sensor C feedback, causing the system to read the 'C' hall channel as inverted data.

MHINVC = 0: do not invert hall C
MHINVC = 1: invert hall C

Firmware Versions: All
Type: switch (R/W)
Units: N/A
Range: 0, 1
Default: 0
EEPROM: Yes
Opmodes: All
Drive Status: DIS

MI

This command (Serial Move Incremental) incrementally moves the specified distance at the specified speed. A positive incremental move occurs in the direction determined by the variable DIR, and a negative incremental move occurs in the opposite direction.

The optional flag *[in pos ack]* enables the operator to direct the drive to indicate when the commanded move is completed. When this flag is set to 1, the drive, upon completion of the commanded move, outputs an exclamation point (!) over the serial port. The exclamation point is tied to the STOPPED flag and is issued when STOPPED transitions from 0 to 1.

Position is in feedback counts. Issuing an MI command while the motor is not stopped causes the command to be buffered for later execution. No more than one command is buffered. <*velocity*> is always given in RPM or mm/sec and is not affected by Units. See INPOS, MA, PCMD, PEINPOS, PFB, STOPPED.

in pos ack = 0: do not indicate when move is complete
in pos ack = 1: indicate when move is complete

Firmware Versions: 3.1.0 and later
Command Syntax: MI <*pos*> <*vel*> *[in pos ack]*
Opmodes: 8
Range: <*pos*> LONG to LONG (feedback counts)
Drive Status: EN
<*vel*> 1 to VMAX (rpm or mm/sec)
[in pos ack] 0 or 1 (optional)

Example:

MI 10000 1000	(move 10,000 counts in the positive direction at a speed of 1,000 RPM)
MI -10000 100 1	(move 10,000 counts in the negative direction at a speed of 100 RPM; transmit a (!) to the serial port when the move is completed)

For very slow moves, set VLIM as low as possible before setting <velocity> less than 1 in MI and MA. This can only be set in firmware version 3.7.0 and higher.

MICONT

Sets the motor's continuous rated current. When this variable is changed, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All
Type: variable (R/W)
Units: amperes RMS*0.1
Range: 1 to 1750
Default: motor data
EEPROM: Yes
Opmodes: All
Drive Status: DIS

MIDIST0

MIDIST0, with MIDIST1, MIDIST2, and MIDIST3, set four possible index distances for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

The user selects an MIDISTx / MISPEEDx pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third digital input to INxMODE=7 and transitioning that input from low to high. When the INxMODE input goes high, the move will be initiated.

Position is in counts, where 65536 counts represent one motor revolution for resolver systems, and 4*MENCRES counts represents on motor revolution for encoder systems. See MISPEED0.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** counts
Range: -2,147,483,647 to +2,147,483,647 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 8 | **Drive Status:** EN/DIS

MIDIST1

MIDIST1, with MIDIST0, MIDIST2, and MIDIST3, set four possible index distances for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

The user selects an MIDISTx / MISPEEDx pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third digital input to INxMODE=7 and transitioning that input from low to high. When the INxMODE input goes high, the move will be initiated.

Position is in counts, where 65536 counts represent one motor revolution for resolver systems, and 4*MENCRES counts represents on motor revolution for encoder systems. See MISPEED1.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** counts
Range: -2,147,483,647 to +2,147,483,647 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 8 | **Drive Status:** EN/DIS

MIDIST2

MIDIST2, with MIDIST0, MIDIST1, and MIDIST3, set four possible index distances for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

The user selects an MIDISTx / MISPEEDx pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third digital input to INxMODE=7 and transitioning that input from low to high. When the INxMODE input goes high, the move will be initiated.

Position is in counts, where 65536 counts represent one motor revolution for resolver systems, and 4*MENCRES counts represents on motor revolution for encoder systems. See MISPEED2.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** counts
Range: -2,147,483,647 to +2,147,483,647 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 8 | **Drive Status:** EN/DIS

MIDIST3

MIDIST3, with MIDIST0, MIDIST1, and MIDIST2, set four possible index distances for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

The user selects an MIDISTx / MISPEEDx pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third

digital input to INxMODE=7 and transitioning that input from low to high. When the INxMODE input goes high, the move will be initiated.

Position is in counts, where 65536 counts represent one motor revolution for resolver systems, and 4*MENCRES counts represents on motor revolution for encoder systems. See MISPEED3.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** counts
Range: -2,147,483,647 to +2,147,483,647 | **Default:** 0 | **EEPROM:** Yes
Opmodes: 8 | **Drive Status:** EN/DIS

MIPEAK

Sets the motor's peak rated current. When this variable is changed, the drive entesr a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All | **Type:** variable (R/W) | **Units:** amperes RMS*0.1
Range: 3 to 3500 | **Default:** motor data | **EEPROM:** Yes
Opmodes: All | **Drive Status:** DIS

MISPEED0

MISPEED0, with MISPEED1, MISPEED2, and MISPEED3, set four possible index speeds for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

Opmode 8 operation: You select an MIDIST0 / MISPEED0 pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input goes high, the move is initiated.

In firmware versions 3.3.0 and later, when homing is performed (see MH, HOMESPD, HOMESTATE, and HOMETYPE), MISPEED0 sets the velocity at which the drive returns to home after finding home.

Opmode 1 operation: You select a MISPEED0 velocity using two digital inputs configured to INxMODEs 14 and 15. A JOG is then triggered for the selected speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input is high, the JOG command is issued, and when the INxMODE input is low, the JOG is not performed.

PROFMODE affects the JOG command issued in this scenario. If you select MISPEED0 and then set MISPEED0=0, an analog input JOG command can be given, as is normal for OPMODE 1 operation.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** rotary: RPM
linear: mm/sec
Range: -VLIM to +VLIM | **Default:** 100 | **EEPROM:** Yes
Opmodes: 1,8 | **Drive Status:** EN/DIS

MISPEED1

MISPEED1, with MISPEED0, MISPEED2, and MISPEED3, set four possible index speeds for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

Opmode 8 operation: You select an MIDIST0 / MISPEED0 pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input goes high, the move is initiated.

In firmware versions 3.3.0 and later, when homing is performed (see MH, HOMESPD, HOMESTATE, and HOMETYPE), MISPEED0 sets the velocity at which the drive returns to home after finding home.

Opmode 1 operation: You select a MISPEED0 velocity using two digital inputs configured to INxMODEs 14 and 15. A JOG is then triggered for the selected speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input is high, the JOG command is issued, and when the INxMODE input is low, the JOG is not performed.

PROFMODE affects the JOG command issued in this scenario. If you select MISPEED0 and then set MISPEED0=0, an analog input JOG command can be given, as is normal for OPMODE 1 operation.

Firmware Versions: 3.1.0 and later
Range: -VLIM to +VLIM
Opmodes: 1,8

Type: variable (R/W)
Default: 100
Drive Status: EN/DIS

Units: rotary: RPM
linear: mm/sec
EEPROM: Yes

MISPEED2

MISPEED2, with MISPEED0, MISPEED1, and MISPEED3, set four possible index speeds for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

Opmode 8 operation: You select an MIDIST0 / MISPEED0 pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input goes high, the move is initiated.

In firmware versions 3.3.0 and later, when homing is performed (see MH, HOMESPD, HOMESTATE, and HOMETYPE), MISPEED0 sets the velocity at which the drive returns to home after finding home.

Opmode 1 operation: You select a MISPEED0 velocity using two digital inputs configured to INxMODEs 14 and 15. A JOG is then triggered for the selected speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input is high, the JOG command is issued, and when the INxMODE input is low, the JOG is not performed.

PROFMODE affects the JOG command issued in this scenario. If you select MISPEED0 and then set MISPEED0=0, an analog input JOG command can be given, as is normal for OPMODE 1 operation.

Firmware Versions: 3.1.0 and later
Range: -VLIM to +VLIM
Opmodes: 1,8
Type: variable (R/W)
Default: 100
Drive Status: EN/DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: Yes

MISPEED3

MISPEED3, with MISPEED0, MISPEED1, and MISPEED2, set four possible index speeds for triggering via a digital input (IN1, IN2, or IN3) set to INxMODE 7. The other two inputs must be configured to INxMODE 14 and 15.

Opmode 8 operation: You select an MIDIST0 / MISPEED0 pair using two digital inputs that are configured to INxMODEs 14 and 15. An incremental move (MI) is then triggered for the selected distance and speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input goes high, the move is initiated.

In firmware versions 3.3.0 and later, when homing is performed (see MH, HOMESPD, HOMESTATE, and HOMETYPE), MISPEED0 sets the velocity at which the drive returns to home after finding home.

Opmode 1 operation: You select a MISPEED0 velocity using two digital inputs configured to INxMODEs 14 and 15. A JOG is then triggered for the selected speed by configuring the third digital input to INxMODE=7 and setting that input high. When the INxMODE input is high, the JOG command is issued, and when the INxMODE input is low, the JOG is not performed.

PROFMODE affects the JOG command issued in this scenario. If you select MISPEED0 and then set MISPEED0=0, an analog input JOG command can be given, as is normal for OPMODE 1 operation.

Firmware Versions: 3.1.0 and later
Range: -VLIM to +VLIM
Opmodes: 1,8
Type: variable (R/W)
Default: 100
Drive Status: EN/DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: Yes

MJ

Sets the motor's rotor inertia (rotary motors) or motor coil mass (linear motors, MOTORTYPE=2). The Motor rotor inertia (MJ) and the Load moment of inertia ratio (LMJR) define the total system moment of inertia. The variables LMJR and MJ and the required closed loop bandwidth (BW) are used for the Velocity Control Loop design in the Standard Pole-Placement controller (COMPMODE = 2 or 4).

Firmware Versions: All
Range: 1 to 2,000,000,000
Opmodes: All
Type: variable (R/W)
Default: motor data
Drive Status: DIS
Units: rotary: Kg $*m^2 *10^{-6}$
linear: grams
EEPROM: Yes

MLGAINC

Sets the current loop adaptive gain value at continuous motor current (MICONT). MLGAINC, MLGAINP, and MLGAINZ define the adaptive gain algorithm that is based on motor current.

The current-based adaptive gain algorithm is a gain calculation method that increases current loop stability by reducing the current loop gain as the motor current increases. The current-based adaptive gain algorithm is set up by defining the gains at peak motor current (MLGAINP), at continuous motor current (MLGAINC), and at zero motor current (MLGAINZ). All other gains between zero, continuous, and peak current are interpolated linearly.

This variable should typically be set to the midpoint of MLGAINZ and MLGAINP. When this variable is changed, the drive will enter a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All | **Type:** variable (R/W) | **Units:** % * 10
Range: 1 to 100 | **Default:** 8 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** DIS

MLGAINP

Sets the current loop adaptive gain value at peak motor current (MIPEAK). MLGAINC, MLGAINP, and MLGAINZ define the adaptive gain algorithm that is based on motor current.

The current-based adaptive gain algorithm is a gain calculation method that increases current loop stability by reducing the current loop gain as the motor current increases. The current-based adaptive gain algorithm is set up by defining the gains at peak motor current (MLGAINP), at continuous motor current (MLGAINC), and at zero motor current (MLGAINZ). All other gains between zero, continuous, and peak current are interpolated linearly.

This variable is typically set to 4 for motors that do not have a lot of iron in their construction and peak currents within the boundaries of the drive. If the motor is rated for much more than what the drive can deliver or if there is a lot of iron in the motor, saturation has less of an effect, and there may be an opportunity to increase this variable. The range for this variable is typically 4 to 7. When this variable is changed, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All | **Type:** variable (R/W) | **Units:** % * 10
Range: 1 to 100 | **Default:** 4 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** DIS

MLGAINZ

Sets the current loop adaptive gain value at zero motor current. MLGAINC, MLGAINP, and MLGAINZ define the adaptive gain algorithm that is based on motor current.

The current-based adaptive gain algorithm is a gain calculation method that increases current loop stability by reducing the current loop gain as the motor current increases. The current-based adaptive gain algorithm is set up by defining the gains at peak motor current (MLGAINP), at continuous motor current (MLGAINC), and at zero motor current (MLGAINZ). All other gains between zero, continuous, and peak current are interpolated linearly.

This variable is typically set to 10, resulting in 100% gain. When this variable is changed, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All
Type: variable (R/W)
Units: % *10
Range: 1 to 100
Default: 10
EEPROM: Yes
Opmodes: All
Drive Status: DIS

MLIST

Dumps all motor variables and their values to the serial port.

Firmware Versions: All
Command Syntax: MLIST
Opmodes: All
Drive Status: EN/DIS

MLMIN

Sets the motor's minimum line-to-line inductance. This variable is used for current loop controller design and as an input to the Torque Angle Control algorithms. When this variable is changed, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All
Type: variable (R/W)
Units: millihenries *10 –2
Range: 1 to 32767
Default: motor data
EEPROM: Yes
Opmodes: All
Drive Status: DIS

MODMODE

Causes the rotary mode to be enabled. See the Rotary Mode Application Note for further details.

0 = disabled
1 = enabled

Firmware Versions: 3.6.4 and higher
Type: switch (R/W)
Units: N/A
Range: 0, 1
Default: 0
EEPROM: Yes
Opmodes: 8
Drive Status: EN/DIS

MOTOR

MOTOR is the name of the motor connected to the drive. The motor string variable MUST BE PRECEDED BY DOUBLE QUOTES (“) when entered.

Firmware Versions: All
Type: string variable (R/W)
Units: N/A
Range: 10 characters
Default: motor data
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

MOTORTYPE

Sets the drive control algorithms to different motor types as follows:

MOTORTYPE=0: permanent magnet rotary motor
MOTORTYPE=1: reserved; do not use
MOTORTYPE=2: permanent magnet linear motor

Firmware Versions: 2.1.0 and later
Range: 0 to 2
Opmodes: All
Type: switch mode (R/W)
Default: 0
Drive Status: DIS
Units: N/A
EEPROM: Yes

MPHASE

Defines the resolver or encoder phase relative to the "standard" commutation table. This variable is used to compensate for resolver offset and should be set to 0, if there is no resolver offset.

Changing MPHASE will** not **change the value of PRD or HWPOS, nor does it create a physical change in the position of the motor shaft - it merely shifts the internal commutation table.

Firmware Versions: All
Range: 0 to 359
Opmodes: All
Type: variable (R/W)
Default: motor data
Drive Status: DIS
Units: Electrical degrees
EEPROM: Yes

MPITCH

MPITCH is a variable for use with linear motors (MOTORTYPE = 2). It defines the pole-pitch (length in millimeters of one electrical cycle - 360 electrical degrees) of the motor and allows the drive to calculate other variables (such as velocity). The drive assumes a 'no-comp' state after an entry of this parameter and requires the CONFIG command.

Firmware Versions: 2.1.0 and later
Range: 1 to 500
Opmodes: All
Type: variable (R/W)
Default: 16
Drive Status: DIS
Units: mm per 360 electrical degrees
EEPROM: Yes

MPOLES

Sets the number of motor poles. This variable is used for commutation control and represents the number of individual magnetic poles of the motor (not pole pairs). When this variable is changed, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG). When MOTORTYPE=2, this variable is forced to a value of 2.

Firmware Versions: All
Range: 2, 4, 6, 8, ... , 78,80
Opmodes: All
Type: switch mode (R/W)
Default: motor data
Drive Status: DIS
Units: poles
EEPROM: Yes

MRESPOLES

Sets the number of individual poles in the feedback device. This variable is used for the commutation function, as well as for velocity feedback scaling and represents the number of individual poles, not pole pairs. When this variable is changed on a resolver system, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All
Range: 2, 4, 6, 8, 12, 14, 16, ... 64 (resolver-based)
0, 2, 4, 6, 8, 12, 14, 16, …. 64 (encoder-based)
Type: switch mode (R/W)
Default: motor data
Opmodes: All
Units: poles
EEPROM: Yes
Drive Status: DIS

MSG

Enables and disables the sending of error messages from the drive to the serial port.

0 = disable messages
1 = enable messages

MSG = 1 is needed for proper operation of MOTIONLINK.

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 1
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

MSININT

MSININT is used with the sine encoder option and sets the interpolation level of the drive.

Firmware Versions: 3.2.0
(3.3.0 or higher Variable is automatically set to 256)
Range: 1, 2, 4, 8, 16, 32, 64,128,256
(Endat encoders in 3.4 firmware)
256 only (for All other sine encoders)
Type: switch mode (R/W)
Default: 256
Opmodes: All
Units: bits
EEPROM: Yes
Drive Status: DIS

MSINFRQ

MSINFRQ is used with the sine encoder option and sets the maximum frequency limit of the encoder equivalent output. If the encoder equivalent output exceeds the value set by this variable, it becomes inaccurate and a burst overflow fault is generated.

0 = ignore burst overflow fault
1 = 2.5 MHz
2 = 1.25 MHz
3 = 625 KHz
4 = 312 KHz

Firmware Versions: 3.3.0 and higher
Range: 0 to 4
Opmodes: All
Type: switch mode (R/W)
Default: 1
Drive Status: DIS
Units: N/A
EEPROM: Yes

MSPEED

Defines the maximum recommended velocity of the Motor. When this variable is changed, the drive enters a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All
Range: 10 to 32767
Opmodes: All
Type: variable (R/W)
Default: motor data
Drive Status: DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: Yes

MTANGLC

Sets the value of the torque-related commutation angle advance at the motor's continuous current rating (MICONT). This variable helps increase reluctance torque. For surface magnet motors, a typical value is 5. For motors with embedded magnets, a typical value is 8 to 10.

Firmware Versions: All
Range: 0 to 45
Opmodes: All
Type: variable (R/W)
Default: 10
Drive Status: EN/DIS
Units: electrical degrees
EEPROM: Yes

MTANGLP

Sets the value of the torque-related commutation angle advance at the motor's peak current (MIPEAK). This variable helps increase reluctance torque. For surface magnet motors, a typical value is 10. For motors with embedded magnets, a typical value is 23 to 25.

Firmware Versions: All | **Type:** variable (R/W) | **Units:** electrical degrees
Range: 0 to 45 | **Default:** 23 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

MVANGLF

Sets the value of the velocity-related commutation angle advance to be used when the motor is operating at motor max speed (MSPEED). Between MSPEED/2 RPM and MSPEED, the angle advance is linearly interpolated based on MVANGLH and MVANGLF.

When a CLREEPROM command is issued, MVANGLF is set to a value of 10. If a CONFIG command is then issued, MVANGLF is set to a default value based on MSPEED and MPOLES. Once you enter a value for MVANGLF, it keeps that value and is not changed if a CONFIG is executed.

Firmware Versions: All | **Type:** variable (R/W) | **Units:** electrical degrees
Range: 0 to 90 | **Default:** calculated for motor data | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

MVANGLH

Sets the value of the velocity-related commutation angle advance to be used when the motor is operating at half of the motor max speed (MSPEED). Between 0 RPM and half of MSPEED, the angle advance is linearly interpolated based on MVANGLH.

When a CLREEPROM command is issued, MVANGLH is set to a value of 5. If a CONFIG command is then issued, MVANGLH is set to a default value based on MSPEED and MPOLES. Once you enter a value for MVANGLH, it keeps that value and is not changed if a CONFIG is executed.

Firmware Versions: All | **Type:** variable (R/W) | **Units:** electrical degrees
Range: 0 to 90 | **Default:** calculated for motor data | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

NOTCHBW

Sets the bandwidth of the notch filter used in the velocity loop. Affects the system only when FILTMODE=3.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** Hz
Range: 1 to 100 | **Default:** 1 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

NOTCHHZ

Sets the center frequency of the notch filter used in the velocity loop. Affects the system only when FILTMODE=3.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** Hz
Range: 30 to 1000 | **Default:** 500 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

O1

O1 is used to read or write the state of the hardware output on user connector C3 Pin 12. See also O1MODE.

0 = OFF
1 = ON

Writing O1 in certain O1MODE conditions does not stop the drive from resetting the output according to drive conditions.

Firmware Versions: 2.1.0 and later
Range: 0, 1
Opmodes: All

Type: switch (R/W)
Default: N/A
Drive Status: EN/DIS

Units: N/A
EEPROM: N/A

O1MODE

A switch mode variable used to define the function of O1:

0 - Disabled
1 - O1 goes on when absolute motor speed is above 01TRIG speed.
2 - O1goes on when the absolute actual output current is above O1TRIG current.
3 - O1 goes on when drive is in FOLDBACK.
4 - O1 goes on when absolute motor speed is above O1TRIG but less than O1RST.
5 - Brake Mode: O1 is OFF only when (1) drive is disabled or (2) during an active disable sequence, when actual motor speed has dropped below DISSPEED, but DISTIME timer has not timed out yet. O1 is ON when the drive is enabled.
6 - Motion Complete Output: O1 is tied to STOPPED switch.
7 - In Position Output: O1 is tied to INPOS.
8 - Zero Speed Detect: O1 on if absolute motor speed < O1TRIG.
9 - Programmable Limit Switch: O1 goes on if O1TRIG < PFB < O1RST (firmware versions 3.2.0 and later).
10 - Active: O1 goes on if drive is active (firmware versions 3.1.0 and later).
11 – O1 is 1 after initialization is completed or when the commutation is aligned to the motor. In resolver based systems the output is always 1 if there is no feedback loss fault.
12 – The output is active when the SERCOS ring is broken and the drive does not receive data. The output is inactive when the SERCOS telegrams are received by the drive (firmware version 4.1.4 and later).

O1 at 0 indicates if encoder initialization is incomplete or feedback loss is detected.

Firmware Versions: 2.1.0 and later
Range: 0 to
Opmodes: All

Type: switch mode (R/W)
Default: 6
Drive Status: EN/DIS

Units: N/A
EEPROM: Yes

O1RST

A variable used to define the reset level for O1MODE. Range is dependent on O1MODE:

0 - N/A
1 - N/A
2 - N/A
3 - N/A
4 - Absolute: 0 - 15000 RPM (0 - 250*MPITCH mm/sec for linear)
5 - Absolute: 0 - 15000 RPM (0 - 250*MPITCH mm/sec for linear)
6 - N/A
7 - N/A
8 - N/A
9 - (-2,147,483,647) to 2,147,483,647 counts
10 - N/A

Firmware Versions: 2.1.0 and later | **Type:** variable (R/W) | **Units:** RPM or mm/sec
Range: 0 to 10 (see above) | **Default:** VOSPD | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

O1TRIG

A variable used to define the trip level for O1MODE. Range is dependent on O1MODE:

0 - N/A
1 - Absolute: 0 to 15000 RPM (mm/sec for linear motors)
2 - Absolute: 0 to 1000 (0.1 percent of DIPEAK)
3 - N/A
4 - Absolute: 0 to 15000 RPM (mm/sec for linear motors)
5 - N/A
6 - N/A
7 - N/A
8 - Absolute: 0 to 15000 RPM (mm/sec for linear motors)
9 - (-2,147,483,647) to 2,147,483,647 counts
10 - N/A

Firmware Versions: 2.1.0 and later | **Type:** variable (R/W) | **Units:** see above
Range: 0 to 10 (see above) | **Default:** 1000 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

OPMODE

Sets the operational mode for the drive. The drive can be configured as a velocity, torque loop, pulse following (gearing), or position controller.

Opmode	Description	See Also
0	Serial Velocity	J, COMPMODE, PROFMODE, S, STOP
1	Analog Velocity	VSCALE, COMPMODE, S, PROFMODE
2	Serial Torque	T, S, STOP
3	Analog Torque	ISCALE, S
4	Gearing	GEAR, GEARI, PEXT, GEARMODE, XENCRES
8	Positioning	PCMDMODE, MA, MI, MH, PROFMODE, S

Opmode 4 available only in firmware versions 2.1.0 and later.
Opmode 8 available only in firmware versions 3.1.0 and later.

Firmware Versions: All (see table above) **Type:** switch mode (R/W) **Units:** N/A
Range: 0, 1, 2, 3, 4, 8 **Default:** 1 **EEPROM:** Yes
Opmodes: All **Drive Status:** DIS

PCMD

Returns the position command as output by the profile generator. PCMD is expressed in counts.

Firmware Versions: 3.1.0 and later **Type:** variable (R) **Units:** counts
Range: -2,147,483,647 to +2,147,483,647 **Default:** N/A **EEPROM:** N/A
Opmodes: 4, 8 **Drive Status:** EN/DIS

PCMDMODE

A switch mode variable which can change the flow of data in the position loop according to the following arguments:

0 = Normal operation: Command comes from profile generator, feedback comes from motor. PCMDMODE must be set to 0 to generate move commands via the serial port.
1 = Analog Position Mode: Absolute position command comes from the analog input port, feedback from the motor.

Firmware Versions: 3.2.0 and later **Type:** switch (R) **Units:** N/A
Range: 0, 1 **Default:** 0 **EEPROM:** Yes
Opmodes: 8 **Drive Status:** DIS

PE

Displays the position following error. If this value is greater than PEMAX, then the drive will be disabled. Position is in counts.

Firmware Versions: 2.1.0 and later **Type:** variable (R) **Units:** N/A
Range: -2,147,483,647 to +2,147,483,647 **Default:** N/A **EEPROM:** N/A
Opmodes: 4, 8 **Drive Status:** EN/DIS

PEINPOS

Sets the threshold position error for the INPOS flag. If PE is less than PEINPOS, the INPOS switch is set, indicating that the drive is in position (see INPOS). If PE is greater than PEINPOS, the INPOS switch is not set. Position is in counts.

Firmware Versions: 2.1.0 and later
Range: 0 to 32767
Opmodes: 4, 8
Type: variable (R/W)
Default: 100
Drive Status: EN/DIS
Units: counts
EEPROM: Yes

PEMAX

Sets the maximum allowable following error (OPMODEs 4 and 8). If the error exceeds this value, the drive is disabled on fault. PEMAX = 0 disables this function. Position is in counts.

Firmware Versions: 2.1.0 and later
Range: 0 to 2,147,483,647
Opmodes: 4, 8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: counts
EEPROM: Yes

PEXT

Displays the accumulated position feedback from the external encoder. This variable is similar to PFB for the resolver feedback.

Firmware Versions: 2.1.0 and later
Range: -2,147,483,647 to +2,147,483,647
Opmodes: All
Type: variable (R)
Default: N/A
Drive Status: EN/DIS
Units: counts
EEPROM: N/A

PEXTOFF

An offset that is added to the internal accumulated position feedback from the external encoder to give the value of PEXT.

Firmware Versions: 2.1.0 and later
Range: -2,147,483,647 to +2,147,483,647
Opmodes: All
Type: variable (R/W)
Default: N/A
Drive Status: EN/DIS
Units: counts
EEPROM: No

PFB

Displays the cumulative position feedback from the feedback device. Prior to firmware version 2.0.0, PFB had the same definition as HWPOS. For firmware versions 2.0.0 and later, PFB was extended into a cumulative counter.

Firmware Versions: All
Range: -2,147,483,647 to +2,147,483,647
Opmodes: All
Type: variable (R)
Default: N/A
Drive Status: EN/DIS
Units: counts
EEPROM: No

PFBOFF

A feedback offset that is added to the internal cumulative position counter to give the value of PFB. This offset can be used to offset absolute machine zero.

Firmware Versions: 2.0.0 and later
Range: -2,147,483,647 to +2,147,483,647
Opmodes: All
Type: variable (R/W)
Default: N/A
Drive Status: EN/DIS
Units: counts
EEPROM: No

PLIM

A switch mode variable that controls operation of the software position limits PMAX and PMIN:

0 = Software position limits disabled

1 = Drive disables when a soft position limit is exceeded (Caution! Motor may coast)

2 = drive decelerates to a stop at DECSTOP deceleration when a soft position limit is exceeded. Drive remains enabled and only allows motion in opposite direction.

Firmware Versions: 3.1.0 and later | **Type:** switch (R/W) | **Units:** N/A
Range: 0 to 2 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

PMAX

Sets the maximum allowable position for the motor shaft. Position is expressed in counts and is read using PFB. If position exceeds PMAX (PFB > PMAX), an overtravel fault is generated. A fault is generated only if PLIM is set to a nonzero value.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** counts
Range: -2,000,000,000 to +2,000,000,000 | **Default:** 2,000,000,000 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

PMIN

Sets the minimum allowable position for the motor shaft. Position is expressed in counts and is read using PFB. If position goes below PMIN (PFB < PMIN), an overtravel fault is generated. A fault is generated only if PLIM is set to a nonzero value.

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** counts
Range: -2,000,000,000 to +2,000,000,000 | **Default:** 2,000,000,000 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

PRD

Displays the absolute position feedback of the hardware feedback device (for both resolver and encoder based systems). PRD increments from 0 to 65,535 throughout the course of one mechanical motor shaft revolution (360 degrees). The range of PRD does not change. Its resolution for resolver feedback systems is dependent upon the value of RDRES:

RDRES = 12, resolution of PRD = 16.
RDRES = 14, resolution of PRD = 4.
RDRES = 16, resolution of PRD = 1.

For encoder-based systems, until the encoder has been initialized, PRD is uninitialized and its value is not useful or meaningful. For information on encoder initialization requirements according to the type of encoder, see MENCTYPE, ENCINIT, and ENCINITST.

Firmware Versions: All | **Type:** variable (R) | **Units:** counts
Range: 0 to 65,535 | **Default:** N/A | **EEPROM:** No
Opmodes: All | **Drive Status:** EN/DIS

PROFMODE

Selects the acceleration and deceleration algorithm used by the drive (profile mode). Note that PROFMODE is associated with ACC and DEC but may not affect ramping depending upon the values of ACTFAULT, STOP, and DECSTOP.

0 = No acceleration and deceleration ramp limits
1 = Linear acceleration and deceleration ramp limits
2 = S-curve accel/decel in Positioning Opmode 8 only (firmware versions 3.3.0 and later - see PROFSCRV).

Firmware Versions: All
Range: 0 to 2
Opmodes: 0,1,4,8
Type: switch mode (R/W)
Default: 0
Drive Status: DIS
Units: N/A
EEPROM: Yes

PROFSCRV

Defines the S-curve acceleration time (when PROFMODE=2) relative to the trapezoidal, or linear, acceleration time of PROFMODE=1. Setting PROFMODE=2 and setting the value of PROFSCRV to a non-zero value introduces S-curve acceleration, which is a smoothing of the acceleration that occurs when a positional move is initiated. The tradeoff is that peak accelerations and horsepower requirements are higher when using S-curving than when linear profiling (PROFMODE=1) is used.

0 = S-curve acceleration time is equal to the trapezoidal acceleration time (ACC applies to both acceleration and deceleration).
100 = S-curve acceleration time is equal to twice the trapezoidal acceleration time.

Firmware Versions: 3.3.0 and later
Range: 0 to 100
Opmodes: 8
Type: variable (R/W)
Default: 50
Drive Status: DIS
Units: percent
EEPROM: Yes

PROMPT

Enables and disables the serial port prompt (-->) output by the drive after each message.

0 = disable the prompt
1 = enable the prompt

PROMPT = 1 is needed for proper operation of MOTIONLINK.

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 1
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

PROTARY

Defines the modulo values of PFB and PCMD. See DIVISIONS.

Firmware Versions: 3.6.4 and later
Range: 1000 to 2^{30}
Default: 2^{21} (2048 Sine Encoder Modulo)
Type: variable (0 to Long)
Drive Status: EN/DIS
EEPROM: Yes
Opmodes: 8

PSCALE

A position scale factor that scales the analog output, ANOUT=5 or 8, to PE or PFB. The value entered is the motor position movement in counts per 10 volts of output.

Firmware Versions: 3.2.0 and later
Type: variable (R/W)
Units: counts per 10 volts
Range: 10 to 2,147,483,647
Default: 2048
EEPROM: Yes
Opmodes: 1
Drive Status: EN/DIS

RDRES

Displays the resolver resolution on resolver-based systems. RDRES is a read-only variable automatically calculated in order to achieve maximum resolution. The setting is based on VLIM, which is the maximum application velocity. The relationship between VLIM and RDRES is given below:

If (VLIM ≥ 6101) then RDRES = 12
If (1501 ≤ VLIM ≤ 6100) then RDRES = 14
If (VLIM ≤ 1500) then RDRES = 16

Firmware Versions: All
Type: switch mode (R)
Units: bits
Range: 12, 14, or 16
Default: N/A
EEPROM: No
Opmodes: All
Drive Status: EN/DIS

READY

A flag indicating the status of the software enable. READY = 1 means that there are no faults (DRIVEOK = 1) and a communication enable request has been commanded (SWEN = 1). An external Remote Enable (REMOTE = 1) and a Dip Switch Enable (DIPEN = 1) are still required to enable the drive (ACTIVE = 1).

0 = faults exist or SWEN = 0
1 = no faults exist and SWEN = 1

Firmware Versions: All
Type: switch (R)
Units: N/A
Range: 0, 1
Default: N/A
EEPROM: No
Opmodes: All
Drive Status: EN/DIS

RECDONE

Indicates whether or not the RECORD command is complete and data is available.

0 = recording not finished
1 = recording done; data available

Firmware Versions: All
Type: switch (R)
Units: N/A
Range: 0, 1
Default: 0
EEPROM: No
Opmodes: All
Drive Status: EN/DIS

RECING

Indicates if data recording is in progress.

0 = recording not in progress
1 = recording in progress

Firmware Versions: All
Type: switch (R)
Units: N/A
Range: 0, 1
Default: 0
EEPROM: No
Opmodes: All
Drive Status: EN/DIS

RECOFF

Used to cancel/reset a recording process that has been armed but has not triggered.

State before RECOFF:

RECRDY=0
RECING=1
RECDONE=0.

State after RECOFF:

RECRDY=1
RECING=0
RECDONE=0.

Firmware Versions: All
Opmodes: All

Command Syntax: RECOFF
Drive Status: EN/DIS

RECORD

Captures realtime variables to memory for retrieval or display using the GET command or the **MOTIONLINK** PC Scope function. RECORD must be set up before the RECTRIG command is used.

Variables that are recorded using this method are NOT averaged using AVGTIME.

1024 four-word buffers are available for use by the RECORD command, where one "word" is defined as 16 bits. Most variables in the SERVO**STAR** are one word in size, but some are two words. You can record up to three variables, as long as the total size of the three variables does not exceed 4 words. The SERVO**STAR** records the following variables:

Variable	**(Size)**	**Variable**	**(Size)**
ANIN*	(1 word)	PCMD*	(2 words)
I	(2 words)	PE*	(2 words)
IA	(1 word)	PEXT*	(2 words)
IC	(1 word)	PFB*	(2 words)
ICMD	(1 word)	PRD	(1 word)
IN1*	(1 word)	STOPPED*	(1 word)
IN2*	(1 word)	V	(1 word)
IN3*	(1 word)	VCMD	(1 word)
INPOS*	(1 word)	VEXT*	(1 word)
O1*	(1 word)		

* Added in firmware version 3.2.0

For example, a combination of V, VCMD, and VEXT is valid for recording, because it only takes up 3 words of memory. However, a combination of PCMD, PE, and PEXT (6 words total) cannot be recorded, because it exceeds the 4 words of memory.

The RECORD command also defines the time period between each consecutive recorded data point and the variable names (up to three) being recorded. An additional parameter defines the number of recorded data points for each variable (up to 1024). Once they are recorded, variables are retrieved with the GET command. See RECTRIG, RECDONE, RECING, and RECRDY switch variables.

System variables must be preceded by a double-quote (").

Command Syntax:RECORD *[sample time] [num points] [VAR1] {VAR2} {VAR3}*
Firmware Versions: All **Example:** RECORD 10 100 "VCMD "V "PRD
(record 100 points for VCMD, V, and PRD every 5 milliseconds)
Range/Units: *[sample time]*:1 to 10,000(* 0.5 milliseconds)
[num points]: 1 to 1024 (1, 2, 4, 8, … 512, 1024)
[VARn]: a system variable, by ASCII (text) name
Opmodes: All **Drive Status:** EN/DIS

RECRDY

Indicates the ready status of the RECORD function. This variable can be polled after a RECORD command is issued to determine if the system is waiting for RECTRIG.

0 = RECTRIG has been received and record function is armed
1 = record function is waiting to be armed by RECTRIG command

Firmware Versions: All **Type:** switch (R) **Units:** N/A
Range: 0, 1 **Default:** 1 **EEPROM:** No
Opmodes: All **Drive Status:** EN/DIS

RECTRIG

Sets up the trigger mechanism for the RECORD function. RECORD must be set up before a RECTRIG command is issued. Four parameters are required to set up RECTRIG: Mode, Level, Location, and Direction.

1. **MODE** is a string variable that specifies the parameter that will be used to trigger recording. Mode can be a variable name or a triggering condition. Mode determines what other parameters must be entered in order to completely set up the trigger. Mode must be preceded by a double-quote when entered, as shown in the following table, which tells what other parameters are required (LEVel, LOCation, and DIRection) depending upon the selected Mode.
2. **LEVEL** specifies the value that the variable defined by Mode must reach for recording to begin.
3. **LOCATION** specifies how many data points to save before the trigger in the Recording buffer (see the RECORD command for a description of the 1024 data points that are available). When recorded data is retrieved and displayed, the trigger point's location in the 1024-point buffer will be at the place specified by Location.
4. **DIRECTION** has two meanings depending upon the type of Mode parameter that is used. For Mode variables (PRD, IA, IC, etc. - see below), it defines the direction the variable value must be changing when it crosses Level in order to trigger recording (1 = increasing, 0 = decreasing). For Mode switch inputs (CW, CCW, etc. - see below) it defines the logic level the input must achieve in order to trigger recording (1 = HI, 0 = LOW).

Required RECTRIG Parameters Based on MODE Parameter				
MODE	**DESCRIPTION**	**LEV**	**LOC**	**DIR**
"IA	Trigger on Phase A Current	√	√	√
"IC	Trigger on Phase C Current	√	√	√
"ICMD	Trigger on Current Cmd	√	√	√
"PCMD*	Trigger on Position Cmd	√	√	√
"PFB*	Trigger on Position Fdback	√	√	√
"PRD	Trigger on PRD	√	√	√
"V	Trigger on Velocity	√	√	√
"VCMD	Trigger on Velocity Cmd	√	√	√
"CCW	Trigger on CCWLIM Sw	X	√	√
"CW	Trigger on CWLIM Sw	X	√	√
"IN1*	Trigger on IN1 Input	X	√	√
"IN2*	Trigger on IN1 Input	X	√	√
"IN3*	Trigger on IN1 Input	X	√	√
"O1*	Trigger on O1 Output	X	√	√
"RMT	Trigger on REMOTE Input	X	√	√
"CMD	Trigger on Next Command	X	√	X
"IMM	Trigger Immediately	X	X	X

* = firmware versions 3.2.0 and later

√ = Required Parameter

X = Don't care. Something must be entered to make the command work, but it does not matter what is entered.

Syntax:RECTRIG *[mode] [level] [location] [direction]*

Firmware Versions: All

Example: RECORD 10 100 "VCMD "V "PRD
(record 100 points for VCMD, V, and PRD every 5 milliseconds)

Range/Units: *[mode]*:see table above
[level]: depends upon the mode variable (range of PRD levels is 0-65535. All others are -32768 to 32767)
[location]: 0 - 1023
[direction]: 0 or 1

Type: variable (R/W)

Default: *[level]:* 0
[location]: 0
[direction]: 1

Opmodes: All

EEPROM: No

Drive Status: EN/DIS

REFRESH

A command used when tuning the drive for COMPMODE 3. With the Advanced Pole Placement algorithm utilized in the drive, the interaction of the variables is too dramatic to Allow variables to be changed one by one. Therefore, as pole placement algorithm vector variables (VD, VF, VH, and VR) are entered, the new values are buffered without changing the actual values used by the control loops.

Once all desired new values have been entered, you enter a REFRESH command, and all vector variables are written to the control loops simultaneously.

Firmware Versions: All

Command Syntax: REFRESH

Opmodes: 0, 1

Drive Status: EN/DIS

RELAY

Indicates the status of the Fault / Drive Up Relay.

0 = relay open

1 = relay closed

Firmware Versions: All | **Type:** switch (R) | **Units:** N/A

Range: 0, 1 | **Default:** hardware defined | **EEPROM:** No

Opmodes: All | **Drive Status:** EN/DIS

RELAYMODE

Sets the operation of the Drive Up / Drive Ready Relay.

0 = relay will be closed when no faults exist

1 = relay will be closed when ACTIVE equals 1

2 = during Active Disable, relay will open when the fault occurs (it will not wait until DISTIME times out).

Firmware Versions: All | **Type:** switch (R/W) | **Units:** N/A

Range: 0, 1 | **Default:** 0 | **EEPROM:** Yes

Opmodes: All | **Drive Status:** EN/DIS

REMOTE

Indicates the state of the external hardware enable input line. When REMOTE is set to 1, the software is ready (READY = 1), and Dip Switch 8 is set to OFF (DIPEN = 1), the drive is Enabled (ACTIVE = 1).

0 = remote enable input off

1 = remote enable input on

Firmware Versions: All | **Type:** switch (R) | **Units:** N/A

Range: 0, 1 | **Default:** hardware defined | **EEPROM:** No

Opmodes: All | **Drive Status:** EN/DIS

RSTVAR

Sets all variables, switch variables, and switch mode variables to their factory default settings. These settings are stated within this document under the variable DEFAULT category. The default values of variables loaded from a motor data file cannot be predicted and are denoted "motor data" in the DEFAULT category.

Default Values				
ACC = 400,000	ACKMODE = 0	ACTFAULT = 0	ANDB = 0	ANDG = 0
ANOFF = 0	ANOUT = 0	AVGTIME = 0	BW = 20	COMPFILT = 1
COMPMODE = 2	DEC = 400,000	DIR = 1	DISSPEED = 50	DISTIME = 100
ECHO = 1	ENCOUT = 1024	ENCOUTO = 1	FILTMODE = 0	FOLDMODE = 0
FOLDTIME = 30	GEAR = 1	GEARI = 1	GEARMODE = 3	GEARO = 1
GETMODE = 0	GPAFR = 0	GPAFR2 = 0	GPD = 0	GPI = 0
GPISATIN = 0	GPISATOUT = 0	GPVFR = 0	GV = 500	GVI = 20
HOMESPD = 100	HOMETYPE = 0	IENCSTART = 25	IFRIC = 0	IGRAV = 0
ILIM = IMAX	ILIM2 = 100	ILSBMODE = 2	IN1MODE = 1	IN2MODE = 2
IN3MODE = 3	ISCALE = 1250	ISTOP = DICONT	IZERO = 20	KV = 1000
KVI = 1000	KVFR = 0	LIMDIS = 0	LMJR = 0	MPFHZ1 = 500
LPFHZ2 = 500	MAPOS = 0	MASPEED = 0	MFBDIR = 0	MFOLDD = 1200
MFOLDDIS = 0	MFOLDR = 1800	MFOLDT = 600	MIDIST0 = 0	MIDIST1 = 0
MIDIST2 = 0	MIDIST3 = 0	MISPEED0 = 100	MISPEED1 = 100	MISPEED2 = 100
MISPEED3 = 100	MPHASE = 0	MSG = 1	MSINFRQ = 1	NOTCHBW = 1

Default Values				
NOTCHHZ = 500	O1MODE = 6	O1RST = VOSPD	O1TRIG = 1000	OPMODE = 1

Default Values				
PCMDMODE = 0	PEMAX = 0	PLIM = 0	PMAX = 2,000,000,000	PMIN = 2,000,000,000
PROFMODE = 0	PROFSCRV = 50	PROMPT = 1	RELAYMODE = 0	SININTOUT = 1
STOPPED = 0	TF = 100	THERMODE = 0	THERMTIME = 30	THERMTYPE = 0
UNITS = 0	UVMODE = 0	UVTIME = 30	UVRECOVER = 0	VD = 0
VF = 1,000,000	VH = 0	VLIM = VMAX	VOSPEED = 1.2 * VLIM	VR = 0
XENCDIR = 0	XENCRES = 1024			

Firmware Versions: All
Opmodes: 0, 1
Command Syntax: RSTVAR
Drive Status: DIS

S

Stops motor motion in all OPMODES. Deceleration ramp control is always used, using the rate specified by DECSTOP. After the profile generator reaches 0 speed, the drive waits for the time period specified by DISTIME and disables the drive.

This command is a one-key hot button, similar to the K command, but with an active stop function controlled by the drive (no coasting of the motor occurs, as is possible with the K command).

Firmware Versions: All
Opmodes: 0, 1
Command Syntax: S
Drive Status: EN/DIS

SAVE

Copies all system configuration variables from working RAM to non-volatile memory (EEPROM). This command must be executed in order to retain setting changes during power cycling. The SAVE command takes about 2 seconds to execute.

Firmware Versions: All
Opmodes: 0, 1
Command Syntax: SAVE
Drive Status: EN/DIS

SERIALNO

Indicates the serial number of the drive in which the firmware is installed. This variable is password protected. This variable is included in the VER string.

Firmware Versions: All
Range: 10 ASCII characters
Opmodes: All
Type: string variable (R)
Default: blanks
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

SININTOUT

Sets an interpolation factor of the sine encoder board for the equivalent encoder output. For sine encoder systems, the encoder output value (ENCOUT) = MENCRES * SININTOUT / ENCOUTO.

Firmware Versions: 3.3.0 and later
Range: 1, 2, 4, 8, 16, 32, 64, 128
Opmodes: All
Type: switch mode (R/W)
Default: 1
Drive Status: DIS
Units: N/A
EEPROM: Yes

STAT

Outputs a drive status summary word to the serial port. The summary word is in ASCII-hex format, prefixed by the letter 'H.'. See STATUS for information on how to obtain more detailed drive status information. The format of the STAT word is described in the following table.

Bit #	Function	Convention
0 (LSB)	Disable Status	1 = drive is DISabled 0 = drive is ENabled
1	Fault Status	1 = fault exists 0 = no fault exists
2	Safety Status	1 = safety feature triggered/inactive* 0 = drive is safe
3	Special Mode Status	1 = Step, Burnin, or Zero is active 0 = normal
4**	Hold Mode Status**	1 = drive is in Hold mode, In Position, or Stopped 0 = drive is not in Hold mode
5-15	not used	

*CWLIM=1, CCWLIM=1, LIMDIS=1, THERMODE=1 or 2, or FOLD=1, or (PLIM>0 and PFB>PMAX), or (PLIM>0 and PFB<PMIN).

** Prior to firmware version 2.0.0, Bit 4 was undefined.

Firmware Versions: All
Range: see above
Opmodes: All
Type: variable (R)
Default: N/A
Drive Status: DIS
Units: N/A
EEPROM: No

STATUS

Outputs the drive status detail words to the serial port. Five words are transferred in ASCII-HEX format, with each word preceded by the letter "H." The words are separated by a space.

The following tables break the status words down bit by bit (bit 15 = MSB; bit 0 = LSB; n/u = not used). For all bits, 0=false and 1=true.

STATUS Word 1: Disable Status Word	
If the drive is disabled (Bit 0 of the STAT word = 1), the process(es) which have caused that disable condition will have their bits set to 1 in this word.	
Bit #	**Description**
0 (LSB)	Remote disable (REMOTE = 0)
1	Software disable (SWEN = 0)
2	DIP switch disable (DIPEN = 0)
3	Fault disable
4	Velocity loop design failure
5	Encoder not initialized
6-15	not used

STATUS Word 2: Fault Status Word	
If a fault exists (Bit 1 of the STAT word = 1), the fault(s) which exist(s) will have the corresponding bits set to 1 in this word.	
Bit #	**Description**
0 (LSB)	Drive over temperature
1	Over voltage condition
2	Over current condition
3	Feedback loss
4	Under voltage condition
5	Motor over temperature
6	Analog supply fault
7	Over speed condition
8	EEPROM fault
9	EEPROM checksum fault
10	No comp (compensation) for the motor
11	Foldback condition
12	not used
13	Overtravel fault
14	Position deviation fault
15	not used

STATUS Word 3: Safety Status Word	
If safety of the drive is compromised (Bit 2 of the STAT word = 1), the condition which is causing that state has its corresponding bit set to 1 in this word.	
Bit #	**Description**
0 (LSB)	CWLIM = 1 (motor has reached CW travel limit)
1	CCWLIM = 1 (motor has reached CCW travel limit)
2	LIMDIS = 1 (limit switch function disabled by user)
3	THERMODE = 1, 2, 3 (set to non-zero by the user)
4	FOLD = 1 (drive current foldback mode)
5*	LIMDIS=0 & CW switch not routed (INxMODE 1)
6*	LIMDIS=0 & CCW switch not routed (INxMODE 2)
7***	Positive Overtravel (PFB > PMAX) with PLIM > 0
8***	Negative Overtravel (PFB < PMIN) with PLIM > 0
9****	MFOLD = 1 (motor current foldback mode)
10-15	not used

STATUS Word 4: Special Mode Status Word	
If the drive is in a special operating mode (Bit 3 of the STAT word = 1), the special mode that the drive is in has its corresponding bit set to 1 in this word.	
Bit #	**Description**
0 (LSB)	Drive is in Step mode (see STEP)
1	Drive is in Burnin mode (factory function)
2	Drive is in Zeroing mode (see ZERO)
3-15	not used

STATUS Word 5: Hold Mode Status Word	
If the drive is in Hold mode (Bit 4 of the STAT word = 1), the condition which caused the drive to enter Hold mode has its corresponding bit set to 1 in this word).	
Bit #	**Description**
0 (LSB)	User request (user set HOLD = 1)
1	DIP switch setting (DIP switch 7 = 1)
2	Drive is in Active disable state
3	Limit switch(es) tripped: 1. velocity command is in direction of tripped switch in opmode 0 or 1 with drive enabled; or 2. both limit switches are activated
4**	User input switch hold (INxMODE=19)
5**	Internal hold request during homing process.
6-10	not used
11++	Analog position hold before homing
12-15	not used

Firmware Versions: All, with exceptions:
*-versions 2.1.0 and later
**-versions 3.0.0 and later
*** - versions 3.1.0 and later
**** - versions 3.2.0 and later
++ - versions 3.3.0 and later

Type: variable (R)

Range: see above

Default: N/A
Units: N/A

Opmodes: All

Drive Status: EN/DIS

EEPROM: No

STATUS2

Outputs drive status detail words to the serial port. Four words are transferred in ASCII-HEX format, with each word preceded by the letter "H."

The following tables break the status words down bit by bit (bit 15 = MSB; bit 0 = LSB; n/u = not used). For all bits, 0=false and 1=true.

STATUS2 Word 1: Feedback Loss Status Word	
If the drive has experienced a feedback loss fault (Bit 3 of STATUS Word 2 = 1), the condition which caused that fault will have its bit set to 1 in this word.	
Bit #	**Description**
0 (LSB)	Resolver line break
1	Resolver/Digital Converter Error bit (following err)
2	Sine encoder initialization failed
3	Line break of encoder A/B input
4	Line break of encoder index input
5	Illegal halls state
6	Line break of encoder C/D input (sine encoder)
7	A/B lines out of range (sine encoder)
8	Burst overflow (sine encoder)
9*	External feedback line break
10-15	not used

STATUS2 Word 2: Analog Supply Fault Status Word	
If the drive has experienced an analog supply fault (Bit 6 of STATUS Word 2 = 1), the condition which caused that fault will have its bit set to 1 in this word.	
Bit #	**Description**
0 (LSB)	Positive analog supply fault
1	Negative analog supply fault
2-15	not used

STATUS2 Word 3: Position Deviation and Over Travel Fault Status Word	
Bit #	**Description**
0	Internal Numerical Position Deviation
1	Pos. Error (PE) exceeded max PE limit (PEMAX)
2	Positive Overtravel (PFB > PMAX) with PLIM=1
3	Negative Overtravel (PFB < PMIN) with PLIM=1
4-15	Reserved

STATUS2 Word 4: Limit Switches Status Word	
If the drive has experienced a limit switch fault (Bit 3 of STATUS Word 5 = 1), the condition which caused that fault will have its bit set to 1 in this word.	
Bit #	**Description**
0 (LSB)	CW Limit Switch tripped (CWLIM=1)
1	CCW Limit Switch tripped (CCWLIM=1)
2-15	not used

STATUS2 Word 5: Encoder Initialization Status Word (added in firmware version 3.3.0)	
If the drive has experienced a fault during encoder initiali-zation (Bit 5 of STATUS Word 1 = 1), the condition which caused that fault will have its bit set to 1 in this word.	
Bit #	**Description**
0 (LSB)	MENCRES, MPOLES or low IENCSTART failure
1	Phase A current mismatch
2	Phase C current mismatch
3	Limit switch tripped
4-15	not used

STATUS2 Word 6: Over speed Status Word (added in firmware version 3.3.0)	
This status word details the cause of over speed fault.s.	
Bit #	**Description**
0 (LSB)	velocity feedback > VOSPD
1	velocity feedback > 1.8*VLIM
2-15	not used

* - firmware version 3.3.0 and later

Firmware Versions: 2.1.0 and later
Range: see above
Opmodes: All

Type: variable (R)
Default: N/A
Drive Status: DIS

Units: N/A
EEPROM: No

STEP

Generates a step or square wave velocity command. This command is intended to be used to record the drive response after the RECTRIG has been set up to define the trigger as occurring after the next command. This command takes 2, 3, or 4 parameters.

- When 2 parameters are used, the drive is issued a STEP command with a specified duration ("duration1") and velocity ("velocity1").
- When 3 parameters are used, the command becomes a repeating square wave which includes a zero velocity cycle whose duration is specified by the third parameter ("duration2").
- When 4 parameters are used, the square wave command will run for the time specified by "duration1" at the speed specified by "velocity1," then will run for the time specified by "duration2" at the speed specified by "velocity2." This motion then repeats.

You can terminate the command by entering S, K, DIS, or a Jog (J) command. This command is prohibited while in Hold mode.

Firmware Versions: All
Command Syntax: STEP *[duration1] [velocity1] {<duration2> <velocity2>}*
Range: *[durationN]:* 0 to 32767 *[velocityN]:* -VLIM to +VLIM
Units: *[durationN]* milliseconds *[velocityN]:* rotary: RPM, linear: mm/sec
Opmodes: 0
Drive Status: EN

STOP

Stops motion in OPMODE 0 (J and STEP commands) or 2 (T command). Unlike the S and K commands, the drive is not disabled using the STOP command. Deceleration ramp control is used in OPMODE 0, if PROFMODE is set to 1. The deceleration rate is stored in the variable DEC. If this command is invoked in Opmode 1 or 3, it is ignored.

Firmware Versions: All
Command Syntax: STOP
Opmodes: 0, 2
Drive Status: EN

STOPMODE

Sets the mode of dynamic braking operation. See also ISTOP.

0 = no braking operation (default).
1 = brake on fault only.
2 = brake on fault and/or drive disable.

Faults do not include Over Voltage or Power Stage Faults!

Firmware Versions: 2.1.0 and later
Type: switch mode (R/W)
Units: N/A
Range: 0 to 2
Default: 0
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

STOPPED

A read-only switch that indicates the status of a move command (MA, MI, or MH) issued by the profile generator in Opmode 8. This bit will read 1 when a move is complete and the next move command can be issued. It will read 0 when a move is in progress.

0 = move in progress.

1 = move complete; next move command can be issued.

Firmware Versions: 3.1.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0, 1 | **Default:** N/A | **EEPROM:** N/A
Opmodes: 8 | **Drive Status:** EN/DIS

SWEN

A software enable switch that defines the status of the serial port Enable (EN) request. If SWEN is set to 1, and there are no faults (DRIVEOK = 1), then switch variable READY is set = 1.

0 = software disabled (DIS, K, or S command has been issued)

1 = software enabled (EN command has been issued)

Firmware Versions: 3.1.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0, 1 | **Default:** 1 (analog drives), 0 (SERCOS) | **EEPROM:** No
Opmodes: All | **Drive Status:** EN/DIS

T

Used to set commanded current in OPMODE 2 (Serial Torque Mode). This command is subject to current limits, clamps, and digital filtering, and it is set to zero whenever the drive is enabled or disabled. The range of this value is -1000 to 1000, but the value entered by the user cannot exceed ILIM. An S, STOP, DIS, or K command, or change of operating mode zeros the value of T.

Firmware Versions: All | **Command Syntax:** T *[current]* (where -1000 ≤current ≤ 1000)
Range: -ILIM to +ILIM | **Units:** % of DIPEAK*0.1
Opmodes: 2 | **Drive Status:** EN

TESTLED

Used to put the drive into a Status LED test mode. In this test mode, all of the segments of the LED will illuminate for approximately half a second and then return to normal.

Firmware Versions: All | **Command Syntax:** TESTLED
Opmodes: All | **Drive Status:** DIS

TF

Sets the damping factor for the velocity loop when using COMPMODE 2 or COMPMODE 4 (Standard Pole Placement). A value of 100 is backward compatible to All previous firmware. As TF approaches zero, overshoot is diminished while sacrificing some tracking ability. As TF approaches 200, the system may overshoot more but will have excellent steady-state tracking ability. Successful execution of the TUNE command may result in this parameter being changed.

Firmware Versions: 3.1.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0 to 200 | **Default:** 100 | **EEPROM:** Yes
Opmodes: 0,1,4,8 | **Drive Status:** EN/DIS

THERM

Indicates the state of the motor thermostat input.

0 = thermostat input closed (normal)

1 = thermostat input open (overheat condition)

Firmware Versions: 3.1.0 and later | **Type:** switch (R) | **Units:** N/A
Range: 0, 1 | **Default:** hardware defined | **EEPROM:** No
Opmodes: All | **Drive Status:** EN/DIS

THERMODE

Determines the operation of the drive when the Motor Thermostat Input (THERM) opens.

0 = disable drive and open fault relay immediately

1 = disable drive after 2 minutes; open fault relay immediately

2 = do not disable drive; open fault relay immediately

3 = ignore thermostat input

4 = issue warning; no other action*

5 = issue warning, open fault relay after THERMTIME elapses*

* Firmware versions 3.1.0 and later

Opening the fault relay sets RELAY=0.

Firmware Versions: All | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 5 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

THERMTIME

Sets the number of seconds the drive waits after motor over-temperature detection before it opens the fault relay (THERMODE = 5 only).

Firmware Versions: 3.1.0 and later | **Type:** variable (R/W) | **Units:** seconds
Range: 1 to 300 | **Default:** 30 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

THERMTYPE

Sets the motor temperature sensor type:

0 = PTC (Positive Temperature Coefficient)

1 = NTC (Negative Temperature Coefficient)

Firmware Versions: 3.1.0 and later | **Type:** switch (R/W) | **Units:** seconds
Range: 0, 1 | **Default:** 0 | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

TRUN

Provides a relative incremental run time counter. Error log stamps include the value of this counter at the time of the error. The clock is a very coarse counter and is incremented every 15 minutes. It is intended for use by factory Quality Assurance Program personnel. This clock has a resolution of 15 minutes and is reset only when the CLREEPROM command is used.

Firmware Versions: All | **Type:** variable (R) | **Units:** hours: minutes
Range:0000:00 to 9999:45 | **Default:** N/A | **EEPROM:** Yes
Opmodes: All | **Drive Status:** EN/DIS

TUNE

Tunes the system for the given drive and load conditions. Velocity steps are performed in closed loop while maintaining position and velocity constraints in order to capture the system dynamics and set tuning constants accordingly.

Motor rotations are performed in OPMODE 0, with a bandwidth of 10 Hz. Successful termination of this command will set the value of LMJR (COMPMODE = 2 or 4) and will change the control variables of the PI (COMPMODE = 0) and PDFF (COMPMODE = 1) controllers accordingly. Successful termination of this command may change BW, LMJR, GP, GV, GVI, KV, KVI, KVFR, FILTMODE, and TF.

The command may take a few seconds to execute. This command may not always be successful, in which case the tuning variables must be set manually. Unsuccessful termination may result due to current saturation, a motor that cannot rotate, or an unsuccessful controller design. For successful termination, it is required that VLIM is greater than or equal to 500 RPM, and VMAX is greater than or equal to 1160 RPM.

This command takes three optional parameters: bandwidth, direction, and speed. Bandwidth can range from 10 to 100 Hz (the default is the current bandwidth BW). Direction is equal to 0, 1, or 2 (0 = bi-directional rotation, which is the default, 1 = CW rotation only, 2 = CCW rotation only). Speed must be greater than 350 RPM, and its default is the minimum of 500, (0.7 * VLIM), and (0.3 * VMAX).

Recommendations:

1. Use low bandwidth for tuning and increase the bandwidth (using BW), if desired, after tuning is successful;
2. Execute a SAVE after the TUNE command has executed successfully in order to write new gain parameters to EEPROM;
3. The higher the TUNE speed, the more accurate the process is.

This command not available in version 1.0.0 & 1.0.1 firmware.

Firmware Versions: All

Command Syntax: TUNE *[bw] [dir] [speed]*
bw = bandwidth in Hz (10 to 100)
dir = 0, 1, 2 (0=bidir, 1=CW, 2=CCW)
speed = speed used during TUNE in RPM (rotary) or mm/sec (linear) (350 to 0.7 * VLIM)

Opmodes: All

Drive Status: EN/DIS

UNITS

Defines whether physical units or internal bits are used. This variable is relevant mainly for Current, Velocity, Acceleration and Analog Input variables, in order to Allow more precise definitions while using the internal bits of the Integer variables. It is recommended that most users use the physical units.

0 = use physical units
1 = use internal units

The descriptions in this guide use the physical units. Variables that may be defined using internal units are listed in the following table, along with their internal unit ranges and units. UNITS, whether user or internal, do not affect the velocity of MA or MI.

INTERNAL VARIABLE UNITS		
Variable	**Range**	**Internal Units**
ANDB	0 to 16383 bits	1 bit = 10V / 16384
ANIN	-16383 to 16383 bits	1 bit = 10V / 16384
ANOFF	-16383 to 16383 bits	1 bit = 10V / 16384
I	0 to 65535 bits	32768 bits = DIPEAK * (√2/0.8)
IA	-32767 to 32767 bits	32768 bits = DIPEAK * (√2 / 0.8)
IC	-32767 to 32767 bits	32768 bits = DIPEAK * (√2 / 0.8)
ICMD	-32767 to 32767 bits	32768 bits = DIPEAK * (√2 / 0.8)
ICONT	0 to IMAX bits	32768 bits = DIPEAK * (√2 / 0.8)
ILIM	0 to IMAX bits	32768 bits = DIPEAK * (√2 / 0.8)
IMAX	0 to 32767 bits	32768 bits = DIPEAK * (√2 / 0.8)
J <vel> <time>	vel:-16383 to 16383 time:0 to 32767	vel:1 bit = VLIM / 16384 time:1 bit = 0.5 ms
STEP<period> <speed>	Period :0 to 32767 Speed :-16363 to +16383	period: milliseconds speed: VLIM / 16384
T	-ILIM to ILIM	32768 bits = DIPEAK * (√2 / 0.8)
V	-32767 to 32767	1 bit = VLIM / 16384
VCMD	-VLIM to VLIM	1 bit = VLIM / 16384
VE	-16383 to 16383	1 bit = VLIM / 16384

Firmware Versions: All
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

UVMODE

Defines how the drive will respond to an under-voltage (UV) fault:

0 = latch fault immediately, display flashing “u”.
1 = display steady “u”. Warning only, with no fault latch.
2 = display steady “u” - after UVTIME elapses, latch fault relay.

If UVMODE= 1 or 2, and the drive is disabled, the UV fault is ignored.

Firmware Versions: 3.1.0 and later
Range: 0 to 2
Opmodes: All
Type: switch mode (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

UVRECOVER

Defines how the drive will recover from an under-voltage (UV) fault:

0 = recover by toggling drive from disable to enable condition after the UV condition clears

1 = automatically recover when the UV condition clears

Firmware Versions: 3.1.0 and later
Range: 0, 1
Opmodes: All
Type: switch (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

UVTIME

Sets the amount of time an under-voltage warning is displayed ("u") before it is latched when UVMODE=2.

Firmware Versions: 3.1.0 and later
Range: 1 to 300
Opmodes: All
Type: variable (R/W)
Default: 30
Drive Status: EN/DIS
Units: seconds
EEPROM: Yes

V

Displays the velocity as calculated from the hardware feedback (resolver or encoder). The velocity that is displayed is subject to averaging by the variable AVGTIME, except when it is recorded for graphical display by **MOTIONLINK**, in which case it is not averaged.

Firmware Versions: All
Range: -15000 to 15000
Opmodes: All
Type: variable (R)
Default: N/A
Drive Status: EN/DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: No

VBUS

Sets the drive bus voltage. This variable is used for current controller design. VBUS also affects the value of VMAX (see VMAX). When this variable is changed, the drive will enter a no-comp state, requiring a CONFIG command (see CONFIG).

Firmware Versions: All
Range: 10 to 850
Opmodes: All
Type: variable (R/W)
Default: 325
Drive Status: DIS
Units: volts
EEPROM: Yes

VCMD

Displays the Velocity command to the velocity controller. This value is equivalent to the Analog Input (ANIN) in OPMODE 1, to the Jog Command (J) in OPMODE 0, and the output of the position controller gearing (OPMODE 4), positioning (OPMODE 8), and Hold Position mode (HOLD=1). This variable is averaged, based on the AVGTIME, when it is requested via the serial port. It is not averaged when it is recorded for graphical display.

Firmware Versions: All
Range: -VLIM to +VLIM
Opmodes: 0,1,4,8
Type: variable (R)
Default: N/A
Drive Status: EN/DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: No

VD

A vector variable that sets the D (forward path) polynomial of the Advanced Pole-Placement velocity controller (COMPMODE = 3). The vector defined by this variable includes five integers that represent the polynomial coefficients and a shift parameter that scales the polynomial. If this variable is changed, a REFRESH command is required.

Prior to firmware version 2.1.0, this command mnemonic was "D".

Firmware Versions: 2.1.0 and later (previously D)
Opmodes: 0,1,4,8
Type: vector variable (R/W)
Default: 0 (all parameters)
EEPROM: Yes

Syntax: VD *[vector1] [vector2] [vector3] [vector5] [scale]*
Range: *[vectorN]* -32768 to 32767
[scale] 0 to 15
Units: N/A
Drive Status: EN/DIS
Example: VD 100 200 300 400 500 1

VE

Displays the velocity error, which is the difference between the commanded motor velocity (VCMD) and the actual motor velocity (V). This value is an instantaneous reading.

Firmware Versions: All
Range: -32768 to 32767
Opmodes: 0,1,4,8

Type: variable (R)
Default: N/A
Drive Status: EN/DIS

Units: rotary: RPM
linear: mm/sec
EEPROM: No

VER

Indicates the version of the drive firmware in use. This variable also displays other pertinent information such as the drive name, current ratings, TRUN, etc. The VER variable has two optional parameters: requesting VER 1 returns feedback type encoder or resolver, and VER 2 returns the firmware version.

Firmware Versions: All
Range: VER {1 or 2}
Opmodes: All

Type: string variable (R)
Default: N/A
Drive Status: EN/DIS

Units: N/A
EEPROM: No

VEXT

Displays the instantaneous velocity feedback as calculated from the external encoder input channel. The command uses XENCRES to calculate velocity. This variable is similar to V for the motor feedback. This variable is subject to AVGTIME

Firmware Versions: 2.1.0 and later
Range: -32767 to +32767
Opmodes: All

Type: variable (R)
Default: N/A
Drive Status: EN/DIS

Units: rotary: RPM
linear: mm/sec
EEPROM: N/A

VF

A vector variable that defines the filter at the output of the Advanced Pole-Placement velocity controller (COMPMODE = 3). The vector defined by this variable includes five integers that represent the polynomial coefficients, and two shift parameters, one that scales each polynomial. If this variable is changed, a REFRESH command is required.

Filter structure: (b0 + b1*z-1 + b2*z-2) / (1 + a1*z-1 +a2*z-2).

Firmware Versions: 3.1.0 and later
Opmodes: 0,1,4,8
Type: vector variable (R/W)
Default: 1 0 0 0 0 0 0
EEPROM: Yes
Syntax: VF *[b0] [b1] [b2] [bshift] [a1] [a2] [ashift]*
Range: *[aN], [bN]* 32767 to -32768
[ashift]], [bshift] 0 to 32767
Units: N/A
Drive Status: EN/DIS
Example: VF 100 200 300 4 500 600 7

VFI

A vector variable that defines the filter at the input of the Advanced Pole-Placement velocity controller (COMPMODE = 3). The vector defined by this variable includes five integers that represent the polynomial coefficients, and two shift parameters, one that scales each polynomial. If this variable is changed, a REFRESH command is required.

Filter structure: (b0 + b1*z-1 + b2*z-2) / (1 + a1*z-1 +a2*z-2).

Firmware Versions: 3.2.0 and later
Opmodes: 0,1,4,8
Type: vector variable (R/W)
Default: 1 0 0 0 0 0 0
EEPROM: Yes
Syntax: VFI *[b0] [b1] [b2] [b_shr] [a1] [a2] [a_shr]*
Range: *[aN], [bN]* 32767 to -32768
[a_shr], [[b_shr] 0 to 32767
Units: N/A
Drive Status: EN/DIS
Example: VF 100 200 300 4 500 600 7

VH

A vector variable that defines the H (feedback path) polynomial of the Advanced Pole-Placement velocity controller (COMPMODE = 3). The vector defined by this variable includes four integers that represent the polynomial coefficients, and four shift parameters, one that scales each polynomial. If this variable is changed, a REFRESH command is required.

Prior to firmware version 2.1.0, this command mnemonic was "H".

Firmware Versions: 3.2.0 and later
Opmodes: 0,1,4,8
Type: vector variable (R/W)
Default: 0 (all parameters)
EEPROM: Yes
Syntax: VH *[h0] [h0shift] [h1] [h1shift] [h3] [h3shift]*
Range: *[hN]* = -2,147,483,647 to 2,147,483,647
*[*hNshift*]* = 0 to 32767
Units: N/A
Drive Status: EN/DIS
Example: VF 100 200 300 4 500 600 7

VLIM

Sets the application velocity limit, Allowing the user to limit the motor's peak velocity. VLIM limits the velocity command that will be accepted from the user (using the J command in Opmode 0) or issued by the control loops (in Opmode 1). VLIM is an independent variable that is not calculated from hardware parameters and is not tied to any other variables. VLIM is similar to ILIM (used in Opmodes 2 & 3) and can be used to protect delicate load equipment. For rotary motors, VLIM > 6100 only if ENCOUT ≤ 1024, and VLIM > 1500 only if ENCOUT ≤ 4096.

Firmware Versions: All
Range: 10 to VMAX
Opmodes: 0,1,4,8
Type: variable (R/W)
Default: VMAX
Drive Status: DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: N/A

VMAX

Displays the system velocity maximum for a drive and motor combination. This variable is based on drive and motor hardware parameters and is set equal to the MINIMUM of the five following values:

1.) MSPEED
2.) (VBUS * 0.707 / MBEMF) * 1000
3.) 24,000
4.) 180,000,000 / MENCRES (encoder-feedback systems only)
5.) 192,000 / MRESPOLES (resolver system, MRESPOLES>8)

24,000 is the highest value VMAX can take. VMAX is used to limit VLIM and VOSPD.

Firmware Versions: All
Range: 10 to 24,000
Opmodes: 0,1,4,8
Type: variable (R)
Default: see above
Drive Status: DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: Yes

VOSPD

Sets the overspeed trip limit for the motor. The drive is disabled with an error condition when the drive velocity exceeds this limit. The default value of this variable is 20% above the system velocity maximum (VMAX), but can be reduced by the user during regular motor operation for protection.

Firmware Versions: All
Range: 10 to (1.2 * VMAX)
Opmodes: All
Type: variable (R/W)
Default: VMAX * 1.2
Drive Status: DIS
Units: rotary: RPM
linear: mm/sec
EEPROM: Yes

VOSPDENS

Sets the sensitivity parameter.

Firmware Versions: 4.1.8 and later
Range: 1 to 40
Opmodes: All
Type: variable (R/W)
Default: 20
Drive Status:
Units:
EEPROM: Yes

VR

A vector variable that defines the R (feed-forward path) polynomial of the Advanced Pole-Placement velocity controller (COMPMODE = 3). This vector includes three integers that represent the polynomial coefficients and three shift parameters, one that scales each polynomial. If this variable is changed, a REFRESH command is required.

Prior to firmware version 2.1.0, this command mnemonic was "R".

Firmware Versions: 2.1.0 and later (previously R)
Opmodes: 0,1,4,8

Type: vector variable (R/W)
Default: 0 (all parameters)
EEPROM: Yes

Syntax: VR *[r0] [r0shift] [r1] [r1shift] [r2] [r2shift]*
Range: *[rNvector]* = -2,147,483,647 to 2,147,483,647
*[*rNshift*]* = 0 to 32767
Units: N/A
Drive Status: EN/DIS
Example: VR 10000 2 30000 4 50000 6

VSCALE

An analog velocity scale factor that scales (1) the analog input ANIN for OPMODE 1 (analog torque mode), and (2) the analog output for ANOUT=0 or 2. The value entered is the motor velocity per 10 volts of analog input or output. This variable may be either higher or lower than the application velocity limit (VLIM), but the actual analog I/O will be limited by VLIM.

Firmware Versions: All
Range: 10 to (1.2 * VMAX)
Opmodes: 1

Type: variable (R/W)
Default: VLIM / 0.8
Drive Status: EN/DIS

Units: rotary: RPM / 10V
linear: mm/sec / 10V
EEPROM: Yes

XENCDIR

Sets the direction defined as positive rotation for the external encoder input.

0 = normal
1 = inverted

Firmware Versions: 2.1.0 and later
Range: 0, 1
Opmodes: All

Type: variable (R/W)
Default: 0
Drive Status: DIS

Units: N/A
EEPROM: Yes

XENCRES

Sets the resolution of the external encoder input channel and is used to calculate VEXT.

Firmware Versions: 2.1.0 and later
Range: 100 to 10,000,000
Opmodes: All

Type: variable (R/W)
Default: 1024
Drive Status: DIS

Units: Lines per revolution
EEPROM: Yes

ZERO

Enables and disables Resolver/Encoder Zeroing Mode. If Zeroing Mode is enabled, the drive rotates the motor to an electrical null by placing IZERO current from the motor C terminal to the B terminal.

0 = zeroing mode disabled
1 = zeroing mode enabled (puts the drive in OPMODE 2)

Firmware Versions: All
Range: 0,1
Opmodes: All

Type: switch (R/W)
Default: 0
Drive Status: EN/DIS

Units: N/A
EEPROM: No

ZPOS

Is applicable only if MENCTYPE=9 (EnDat encoder). It is used to move the location of the encoder equivalent output marker channle relative to the motor shaft position.

The range accepts all data, but you must limit it to MENCRES * SININTOUT.

Firmware Versions: 3.6.0 and later
Range: 0 to 2^{31}
Opmodes: All
Drive Status: EN/DIS

Type: variable (R/W)
Default: 0
Units: SININTOUT
EEPROM: Yes (Encoder,must use HSAVE)

TROUBLESHOOTING

FATAL FAULT ERROR CODES

Fatal Fault Error Codes			
Status Display	**Err#**	**Fault Message**	**Possible Cause**
t	1	Power stage OverTemp	overload, fan malfunction, power stage failure
o	2	OverVoltage	excessive decel rate*
P	3	OverCurrent	power stage surge current*
r0	4.0	External feedback fault	Feedback signal through C8 not correctly detected
r1	4.1	Resolver line break	break in resolver feedback detected
r2	4.2	RDC error	fault in resolver-to-digital converted detected
r3	4.3	Sine Encoder init fail	sine encoder card has not initialized properly
r4	4.4	A/B line break	break in encoder A/B input lines detected
r5	4.5	Index line break	break in encoder index line
r6	4.6	Illegal halls	illegal hall combination detected
r7	4.7	C/D line break	break in sine encoder C/D line detected
r8	4.8	A/B out of range	sine encoder A/B level out of range
r9	4.9	Burst pulse overflow	sine encoder fault
r10		Endat Communication Fault	Serial communication to the Endat failed
u	5	Under voltage	bus voltage is too low
H	6	Motor over temperature	motor overload caused overheating
A1	7.1	Positive analog supply fail	Failure in +12V supply
A2	7.2	Negative analog supply fail	Failure in -12V supply
J	8	OverSpeed	velocity ≥ VOSPD
J1	8.1	OverSpeed	Velocity ≥ 1.8 x VLIM
E	9	EEPROM failure	Faulty EEPROM
e	10	EEPROM checksum fail	EEPROM checksum invalid on power up*
F	12	Foldback	System in FoldBack mode
d5	14.1	Positive over travel fault	PFB exceeded PMAX with PLIM=1
d6	14.2	Negative over travel fault	PFB exceeded PMIN with PLIM=1
d1	15.1	Numeric position deviation	Internal fault
d2	15.2	Excessive position deviation	PE > PEMAX
c	16	Communication interface	A communications fault has occurred

*These faults can only be cleared by cycling power

NON-FATAL ERROR CODES

Non-Fatal Error Codes		
Error Message	**Err #**	**Possible Cause**
No Error	0	no error was recorded
Unknown Command	20	Undefined command
Unknown Variable	21	undefined variable name
Checksum error	22	error on comm. message checksum (ACKMODE 2)
Drive Active	23	drive needs to be inactive for the requested command or variable
Drive Inactive	24	drive needs to be active for the requested command or variable
Value out of range	25	variable value out of range
Negative Number	26	variable must be ≥ 0
Not in proper Opmode	27	not in correct Opmode for specified command
Syntax Error	28	communication message syntax error
Tune Failed	33	auto tuning failed
Bad Bandwidth	34	AutoTuning BW is out of range
Bad Stability	35	bad stability
Not programmable	36	variable is read-only
Current loop design failed	37.01	CONFIG failed due to current loop design failure
MENCRES out of range	37.02	CONFIG failed due to MENCRES
MENCOFF out of range	37.03	CONFIG failed due to MENCOFF
MSPEED out of range	37.04	CONFIG failed due to MSPEED
MBEMF out of range	37.05	CONFIG failed due to MBEMF
MJ out of range	37.06	CONFIG failed due to MJ
ACC out of range	37.07	CONFIG failed due to ACC
DEC out of range	37.08	CONFIG failed due to DEC
DECSTOP out of range	37.09	CONFIG failed due to DECSTOP
VLIM out of range	37.10	CONFIG failed due to VLIM
VOSPD out of range	37.11	CONFIG failed due to VOSPD
VSCALE out of range	37.12	CONFIG failed due to VSCALE
O1TRIG out of range	37.13	CONFIG failed due to O1TRIG
O1RST out of range	37.14	CONFIG failed due to O1RST
DISSPEED out of range	37.15	CONFIG failed due to DISSPEED
MENCTYPE out of range	37.16	CONFIG failed due to MENCTYPE
Communication error	38	Error at physical comm. layer
Not in proper COMPMODE	39	The REFRESH command was given with COMPMODE ≠ 3
EXT velocity param warning	40	D, H, R parameters for COMP-MODE 3 do not have the proper relationship to each other.
Vel loop design failed	41	The velocity loop can't be con-figured with given parameters
Invalid EEPROM	42	The EEPROM test failed
Recording active	43	The requested command cannot be executed because it conflicts with a recording in progress
Rec data not available	44	No data are available for the GET command
EEPROM is empty	45	Data cannot be loaded because the EEPROM is empty
Argument must be binary	46	Variable argument must be a power of 2

Non-Fatal Error Codes		
Error Message	**Err #**	**Possible Cause**
Burnin is active	47	The requested function cannot be executed during Burnin (a factory function)
Burnin is not active	48	Burnin (factory function) cannot be stopped if it is not active
Conflicts with ENCOUT	49	The requested value for VLIM conflicts with ENCOUT.
Conflicts with VLIM	50	The requested value for ENCOUT conflicts with VLIM.
Not available	51	The requested variable value is not available; refer to the description of the variable in section 1 to determine why.
Drive is in Hold mode	52	Motion was requested with the drive in Hold mode
Limit Switch Hold	53	Drive is in Hold mode due to limit switch being tripped
Command Into Limit	54	Requested motion is in direction of tripped limit switch
Drive is in Zero Mode	55	Motion requested while in Zero mode
Motor is Jogging	56	Tune cmd cannot be executed because motor is jogging
Argument not divisible by 20	57	Argument must be a multiple of 20 to be accepted
Encoder Initialization Process Active	58	A command cannot be executed because it has been requested while the encoder initialization process is active
Tune failed-no rotation	60	Tune cmd failed because motor could not rotate
Tune failed-current sat	62,66 70,74	Tune cmd failed because the current loop saturated
Tune failed-no vel design	63,67 71,75	Tune cmd failed because the vel loop could not be designed
Disable During Tune	76	Tune cmd failed because drive was disabled while tuning
Hold During Tune	77	Tune cmd failed because drive entered Hold mode while tuning
Low Velocity Limits	78	Tune cmd failed because VLIM is too low
Use Lower Bandwidth	79	Tune cmd requires a lower bandwidth in order to execute
Drive in Dual Feedback mode	80	Command cannot be accepted because dual feedback is active
Drive is in Gear mode	81	Command cannot be accepted because drive is in gear mode
Functionality is occupied	82	Selected INxMODE function is already assigned to another INxMODE
Warning: A/B Line not routed	83	Selected GEARMODE requires A/B inputs to be routed using INxMODE 5 and 6.
Warning: Limit sw not routed	84	Limit switches must be routed using INxMODE 1 and 2.
Move is pending	85	The last ordered move command has not been completed yet.
Incorrect password	90	The password entered by the user was incorrect
Password protected	91	The command or variable requested by the user is password protected and intended for factory use only
Capture during homing	92	A position capture occurred during homing
Homing during capture	93	A homing request was made during position capture

Non-Fatal Error Codes		
Error Message	**Err #**	**Possible Cause**
Capture process not done	94	The requested command can't be processed due to pos capture not being complete
Capture process not active	95	The requested command can't be processed due to pos capture not being active
Capture process not enabled	96	Position capture cannot be executed
ENCSTART while ACONFIG	97	
SERCOS test failure	999	

NO MESSAGE FAULTS

No Message Faults					
Display	**Flashing**	**Steady State**	**Fatal**	**Non-Fatal**	**Fault Description**
≡	✓		✓		Watchdog (DSP)
≡		✓	✓		Watchdog (HPC)
-1	✓		✓		No Compensation
-2	✓		✓		Invalid Velocity Control
-3	✓		✓		Encoder not Initialized on attempt to enable
-4	✓		✓		Encoder Initialization failure
-5	✓		✓		AutoConfig failure
L 1	✓			✓	Hardware CW limit switch open
L 2	✓			✓	Hardware CCW limit switch open
L 3	✓			✓	Hardware CW and CCW limit switches open
L 4	✓			✓	Software CW limit switch is tripped (PFB>PMAX & PLIM=2)
L 5	✓			✓	Software CCW limit switch is tripped (PFB<PMIN & PLIM=2)
A 3	✓		✓		Positive and negative analog supply fail
I		✓	✓		RAM failure (during init)
c		✓	✓		EPROM checksum (during init)
E101	✓				Altera load failure (during init)
E102	✓				Altera DPRAM failure (during init)
E103	✓				DSP load fail (during init)
E104	✓				DSP alive failure (during init)
8	✓				Test LED
b	✓				Indexed position with zero velocity

SUPPORT

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