Danaher Motion

SERVO**STAR**® PD

VarCom Reference Guide

KOLLMORGEN

giving our customers freedom of design

M-SS-011-0402

Firmware Version 6.3.3 and before

Record of Manual Revisions

Issue No.	Date	Brief Description Of Revision
1	10/31/01	Initial Release
2	09/30/02	Updated information and added new commands for new firmware release
3	02/28/2003	Updated information and added new commands for new firmware release

Copyright Information

Table of Contents

Commands and Variables by Function

ANALOG INPUT-RELATED

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

COMMUNICATIONS

ACKMODE	ADDR	DUALFB	MSG	PROMPT

CONFIGURABLE I/O

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

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

ACONFIG	ACONFIGST	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	PFB	PFBOFF
PRD	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	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

ACONFIG	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	AVGTIME	COMPMODE	ENCOUT	ENCOUTO
FILTMODE	FOLDMODE	GEARMODE	GETMODE	HOMETYPE
IN1MODE	IN2MODE	IN3MODE	MENCTYPE	MFBDIR
MOTORTYPE	MPOLES	MRESPOLES	O1MODE	OPMODE
PCMDMODE	PROFMODE	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	MENCRES
MFOLDD	MFOLDR	MFOLDT	MICONT	MIDIST0
MIDIST1	MIDIST2	MIDIST3	MISPEED0	MISPEED1
MISPEED2	MISPEED3	MIPEAK	MJ	MLGAINP
MLGAINZ	MLMIN	MOTOR	MPHASE	MPITCH
MSPEED	MTANGLC	MTANGLP	MVANGLF	MVANGLH
NOTCHBW	O1RST	O1TRIG	PEINPOS	PEMAX
PEXTOFF	PFBOFF	PMAX	PMIN	PROFSCRV
PSCALE	RECTRIG	TF	THERMTIME	UVTIME
VBUS	VOSPD	VR	VSCALE	XENCRES

READ-ONLY SWITCH MODE VARIABLES

DIP	ENCINITST	HALLS	HOMESTATE	ILSBMODE
IN	RDRES			

READ-ONLY SWITCH VARIABLES

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

READ-ONLY VARIABLES

ACONFIGST	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 and Command List

FORMAT

The command and variable descriptions presented here are in alphabetical order. Command and variable descriptions utilize different formats, as described below.

COMMAND

This is the format of a command name.

VARIABLE

This is the format of a variable name.

Variable and Command Information

You can set variable and command values by typing in the name of the variable followed by a new value for the variable, separated by an equals sign or one or more spaces. Just typing in the name of a variable without a new value will cause the SERVO**STAR** to output the current value of that variable to the serial port.

Firmware Versions: tells what firmware versions the variable is implemented in. To check your drive's firmware version, use the VER command.

Type: switch variable, switch mode variable, (standard) variable, or vector variable. Switch variables can be toggled between two different states (0/1, on/off, etc.). Switch mode variables are state variables used to select one of more than two states (for example, opmode is a switch mode variable that selects one of 6 Opmodes: 0-4, 8). Standard variables are set to an integer value within a given range.

Vector variables are special variables that are used for the Advanced Pole Placement compensator (see COMPMODE 3) and require the use of the REFRESH command when changed.

All variables are classified as read-only (R) or read/write (R/W).

Range: defines the range of valid values for the variable.

Units: defines the units of the variable. Note that to get the final value of the variable, including its units, you multiply its value by its units. Example: the units of MICONT are "amperes * 0.1." If MICONT = 200, then its value is 200 * amperes * 0.1 = 20 amperes.

Default: defines the default value of the variable. If this field says "motor data," then the default value is entered from a motor data file (using **MOTIONLINK**'s Motor Configuration Screen) or a motor data sheet. Most variables are reset to their defaults by using the RSTVAR command.

Opmodes: (0-4, 8) indicates in which operational modes (opmodes) the variable is used (see the description for the variable OPMODE). Most variables can be set in any opmode, but they only have an effect in the opmodes listed here.

Drive Status: (EN, DIS, or EN/DIS) indicates the drive state in which the command can be used (EN=enabled; DIS=disabled; EN/DIS=either).

EEPROM: (Yes or no) specifies whether or not a variable can be stored in non-volatile memory (EEPROM). If a variable is stored in EEPROM, it is "remembered" by the SERVO**STAR** when the drive is powered down and back up. Refer to the SAVE command for more information.

VARIABLE AND 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).

Firmware Versions: All
Range: 10 to 400,000
1 to 399,987 (firmware versions prior to 3.1.0)
Opmodes: 0, 1, 4, 8

Type: variable (R/W)
Drive Status: EN/DIS
EEPROM: Yes

Default: 400,000
Units: rotary: RPM / sec
linear: mm/sec/sec

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

ACONFIG

Enables and disables the Autoconfig process.

0 = disable the Autoconfig process
1 = enable the Autoconfig process

The Autoconfig process tests motor and feedback wiring connections using a series of 6 tests for resolver-based systems and 8 tests for encoder based systems. To execute the Autoconfig process, the user must first disable the drive, then set ACONFIG=1, and then enable the drive. The process then executes. The steps of the process are:

Phase 1 Forced commutation - this phase rotates the motor.
Phase 2 No movement test - if the motor doesn't move, there might be a problem with the motor leads.
Phase 3 Phase current test - checks to see if the motor leads are connected properly.
Phase 4 Counts per cycle test- For accuracy, checks MENCRES/MPOLES (encoder systems) or 65536 * MRESPOLES/MPOLES (resolver systems)
Phase 5 Direction test - may fail if two motor lead wires are switched. User can change the value of MFBDIR to compensate for failure. See MFBDIR for more details on correcting a failure in this phase.
Phase 6 Resolution accuracy test - moves the motor 4 revolutions. This phase may change the value of MPHASE.
Phase 7 Hall switch test (encoders with halls only) - may fail if hall switches are improperly connected. This phase may change the value of MPHASE or MHINVA/B/C to compensate for incorrect results.
Phase 8 Find index test (encoders only) - moves the motor one revolution and searches for index pulse.

Firmware Versions: 3.3.0 and later
Range: 0, 1
Opmodes: All

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

Units: N/A
EEPROM: No

ACONFIGST

Gives the status for the Autoconfig process. This variable includes four values: the current phase that is being run, a bit array that includes a status of the process phases (0 - not done yet or failed, 1 - succeeded) and two result variables for phases 4 and 6, one is the expected MENCRES / MPOLES (encoder systems) or 65536 * MRESPOLES / MPOLES (resolver systems), and the second is the measured MENCRES / MPOLES (encoder systems) or 65536 * MRESPOLES / MPOLES (resolver systems) during the process. For more information, see ACONFIG and MFBDIR.

Syntax: ACONFIGST <*bit array*> <*phase*> <*expected*> <*measured*>

Here is a list of the bits in the <bit array> variable:

Bit number	Description
0	Phase 1 (Forced commutation) success/failure (always successful)
1	Phase 2 (No movement) success/ failure
2	Phase 3 (Phase currents) success/ failure
3	Phase 4 (Counts per cycle) success/ failure
4	Phase 5 (direction) success/ failure
5	Phase 6 (Accurate resolution) success/ failure
6	Phase 6 (Accurate resolution) MPHASE change/ no change
7	Phase 7 (Hall switches) success/ failure
8	Phase 7 (Hall switches) MPHASE, MHINVx change/ no change
9	Phase 8 (Find index) success/ failure
10	Phase 8 (Find index) MENCOFF change/ no change
15	Process is running/ process is not running

- In the success/ failure bits: ‘1’ is success, ‘0’ is failure or not done yet.
- In the change/ no change bits: ‘1’ means there was a change, ‘0’ means there was no change.
- In bit no. 15, ‘1’ means that the process is running, ‘0’ means the process is not running.

Firmware Versions: 3.3.0 and later
Range: <*bit array*> (see table)
<*phase*> : 0 to 8
<*expected*> : long
<*measured*> : long
Type: variable (R)
Default: 0, 0, 0, 0
Opmodes: All
Units: N/A
Drive Status: EN/DIS
EEPROM: N/A

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 S - see 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 through 4 or 1 through 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 **Type:** variable (R/W) **Units:** milliVolts
Range: -10,000 to 10,000 **Default:** 0 **EEPROM:** Yes
Opmodes: 1,3,8 **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 **Type:** switch mode (R/W) **Units:** Ts (500 microseconds)
Range: 0, 2, 4, 8, 16, 32, or 64 **Default:** 0 **EEPROM:** Yes
Opmodes: All **Drive Status:** EN/DIS

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

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

* Available in version 1 firmware.

**Available in firmware versions 2.1.0 and later.

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

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 **Command Syntax:** CONFIG
Opmodes: All **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 **Command Syntax:** CONVERT
Opmodes: 0,1,4,8 **Drive Status:** EN/DIS

CWLIM

Displays the state of the external clockwise (CW) limit switch input.

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

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

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).

Firmware Versions: All
Type: variable (R/W)
Default: 20
Opmodes: 0,1,4,8
Units: rotary: RPM / sec
linear: mm/sec/sec
Range: 10 to 400,000
1 to 399,987 (firmware versions prior to 3.1.0)
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.

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. 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 is set to a value of (DICONT * 2).

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

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

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)

If the drive is in any operation mode other than OPMODE 5 (SERCOS), only the first parameter should be used to affect performance; and even then only the parameters 0 or 1 (Refer to the first table below). 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 will be communicated even though only one was changed. Just leave the second and third at their default settings.

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

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 **Command Syntax:** DIS
Opmodes: All **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.

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

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
Default: 4
Range: 2 to 32767
-2 to -32767
EEPROM: Yes

DRIVEOK

Displays the status of the drive faults.

0 = faults exist
1 = no faults exist

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

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

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
Opmodes: All
Command Syntax: DUMP
Drive Status: EN/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, the drive becomes ACTIVE. Checking the value of ACTIVE indicates 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 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

ENCOUTMOD

Queries or sets the encoder simulation signal format.

When set to **0**, the encoder simulation signal has the A-quad-B format with A leading B for positive rotation.

When set to **1**, the encoder simulation signal has a puylse up/down format. When motion is positive, an encoder pulse train is generated on the A signal and no signal is generated on the B signal. When motion is negative, an encoder pulse train is generated on the B signal and the A signal is forced low.

Firmware Versions: 6.2.0 and higher
Units: N/A
Type: switch variable (R/W)
Range: 0, 1
Default: 0
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:

1. With the drive disabled, type: ENCSTART
2. Enable the drive. The current is placed on the motor terminals and the initialization process is completed after the drive enable occurs.

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

Firmware Versions: All **Command Syntax:** ENCSTART
Opmodes: All **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 (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 are 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.

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.

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

Transmits all recorded variables to the serial port for use with PC Scope. The data format is defined by GETMODE.

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

GP

Sets the proportional gain for the position loop. Successfully executing TUNE may change the value of this parameter.

Firmware Versions: 2.1.0 and later
Units: rotary: 0.01 kRPM/rev
linear: 0.01 m/min/mm
Type: variable (R/W)
Range: 1 to 7000
Default: calculated
Opmodes: 4,8
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
Range: 0 to 2000
Opmodes: 4, 8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: 0.1%
EEPROM: Yes

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.

Firmware Versions: 3.1.0 and later
Range: -10,000 to +10,000
0 to 2000 (firmware versions prior to version 3.2.0)
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: 0.1%
EEPROM: Yes
Opmodes: 4, 8

GPD

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

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

GPI

Sets the integral gain for the Proportional-Integral-Derivative (PID) compensator in the position loop. Setting this value to 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
Range: 0 to 10000
Opmodes: 4,8
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

GPISATIN

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

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

GPISATOUT

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

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

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

GV

Sets the proportional gain for the Proportional Integral Velocity Control Loop (PI loop; COMPMODE = 0). Successfully executing TUNE 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). Successfully executing TUNE 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
Type: switch mode (R)
Units: bits
Range: 000 to 111
Default: N/A
EEPROM: No
Opmodes: All
Drive Status: EN/DIS

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

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 can enter the position-hold mode. When activated, the motor decelerates to zero speed at the DECSTOP rate and switches 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 flashes 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. 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 initial homing searches for home and successive homing commands go back to home. For HOMETYPE 4 to 7, the drive searches for home on every home command, whether home 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
Opmodes: All
Command Syntax: HSAVE
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
Range: 0 to 65,535
Opmodes: All
Type: variable (R)
Default: N/A
Drive Status: EN/DIS
Units: counts
EEPROM: No

I

Displays the motor current. The AVGTIME variable determines the average of this variable, except when recorded for graphical display by **MOTIONLINK** (it is not averaged).

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

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** (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: All
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: All
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 left-most bit represents IN1 and the right-most 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 home switch / Move to home switch**
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: Clear faults when transitioning from 0 to 1.*****
IN1MODE=26: Change EEO output when transitioning from 0 to 1.*****

* 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 6.3.3 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: the first time this mode is triggered, the drive will search for home. Subsequent triggers cause a move to home. 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**: When the drive is in OPMODE=8 and the input is active, the mode is changed to OPMODE=4 (gearing), even when the drive is disabled. When the input is inactive, OPMODE is returned to OPMODE=8. Be sure to perform the OPMODE changes at zero speed. Otherwise, counts might be lost.
- **IN1MODE=25**: When transitioning from 0 to 1, the faults are cleared if REMOTE=0 or SWEN=0.
- **IN1MODE=26**: When transitioning from 0 to 1, the number of counts represneted by PFB are output on the Equivalent Encoder Output, interrupting the regular generation of equivalent encoder output pulses. The digital output (O1) is set high if O1MODE=13. At the end of the generation of the PFB pulses, the equivalent encoder output reverts to generating the encoder pulses and the digital output is set low.

Firmware Versions: see above | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 26 | **Default:** 0 | **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 home switch / Move to home switch**
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: Clear faults when transitioning from 0 to 1.*****
IN2MODE=26: Change EEO output when transitioning from 0 to 1.*****

* 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 6.3.3 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: the first time this mode is triggered, the drive will search for home. Subsequent triggers cause a move to home. 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.
- **IN2MODE=24**: When the drive is in OPMODE=8 and the input is active, the mode is changed to OPMODE=4 (gearing), even when the drive is disabled. When the input is inactive, OPMODE is returned to OPMODE=8. Be sure to perform the OPMODE changes at zero speed. Otherwise, counts might be lost.
- **IN2MODE=25**: When transitioning from 0 to 1, the faults are cleared if REMOTE=0 or SWEN=0.
- **IN2MODE=26**: When transitioning from 0 to 1, the number of counts represneted by PFB are output on the Equivalent Encoder Output, interrupting the regular generation of equivalent encoder output pulses. The digital output (O1) is set high if O1MODE=13. At the end of the generation of the PFB pulses, the equivalent encoder output reverts to generating the encoder pulses and the digital output is set low.

Firmware Versions: see above | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 26 | **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 home switch / Move to home switch**
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: Clear faults when transitioning from 0 to 1.*****
IN3MODE=26: Change EEO output when transitioning from 0 to 1.*****

* 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 6.3.3 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: the first time this mode is triggered, the drive will search for home. Subsequent triggers cause a move to home. 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.
- **IN3MODE=24**: When the drive is in OPMODE=8 and the input is active, the mode is changed to OPMODE=4 (gearing), even when the drive is disabled. When the input is inactive, OPMODE is returned to OPMODE=8. Be sure to perform the OPMODE changes at zero speed. Otherwise, counts might be lost.
- **IN3MODE=25**: When transitioning from 0 to 1, the faults are cleared if REMOTE=0 or SWEN=0.
- **IN3MODE=26**: When transitioning from 0 to 1, the number of counts represneted by PFB are output on the Equivalent Encoder Output, interrupting the regular generation of equivalent encoder output pulses. The digital output (O1) is set high if O1MODE=13. At the end of the generation of the PFB pulses, the equivalent encoder output reverts to generating the encoder pulses and the digital output is set low.

Firmware Versions: see above | **Type:** switch mode (R/W) | **Units:** N/A
Range: 0 to 26 | **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
Range: 0, 1
Opmodes: All
Type: switch mode (R/W)
Default: 0
Drive Status:
Units: N/A
EEPROM: Yes

INITGAIN

Sets the gain for the encoder initialization process controller.

Firmware Versions: 6.3.0 and later
Range: 100 to 10,000
Opmodes: All
Type: variable (R/W)
Default: 1000
Drive Status: DIS
Units: N/A
EEPROM: Yes

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)

2 – encoder initialization using a commutation-lock algorithm, resulting in minimal motor movement only.

When using either option 0 or 1, 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
Range: 0, 1, 2
Opmodes: All
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: Yes

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
Range: 0, 1
Opmodes: 4,8
Type: switch (R)
Default: N/A
Drive Status: EN/DIS
Units: N/A
EEPROM: N/A

ISCALE

Is an analog current scale factor that scales the analog input ANIN for OPMODE 3 (analog torque mode). 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 is limited by the application current limit (ILIM).

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

ISTOP

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

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

IZERO

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

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

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
Opmodes: 0
Drive Status: EN
Command Syntax: J *[speed] {time}*
speed (required) = -VLIM to +VLIM in RPM (rotary) 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
Opmodes: All
Command Syntax: K
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 **Type:** variable (R/W) **Units:** N/A
Range: 0 to 65535 **Default:** 1000 **EEPROM:** Yes
Opmodes: 0,1,4,8 **Drive Status:** EN/DIS

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

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.

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

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
Opmodes: 8
Drive Status: EN
Command Syntax: MA <*position*> <*velocity*> *[in pos ack]*
Range: <*position*> -LONG to LONG (feedback counts)
<*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)

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

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 will enter 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			√	reserved
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 Encoder option. The drive automatically senses the Sine Encoder board and make the appropriate adjustments.

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	Reserved for later introduction
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 Danaher Motion Kollmorgen motors.

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

Firmware Versions: All
Range: 0 to 9 (5 is reserved for future)
Opmodes: All

Type: switch mode (R/W)
Default: motor data
(0 if undefined)

Units: N/A
Drive Status: DIS
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
Range: 0 to 3
Opmodes: All
Type: switch mode (R/W)
Default: 0
Drive Status: DIS
Units: N/A
EEPROM: Yes

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

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
Range: 1 to 2400
Opmodes: All
Type: variable (R/W)
Default: 1200
Drive Status: EN/DIS
Units: seconds at MIPEAK
EEPROM: Yes

MFOLDDIS

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

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

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
Opmodes: 8
Drive Status: EN

Command Syntax: MI <*pos*> <*vel*> *[in pos ack]*
Range: <*pos*> LONG to LONG (feedback counts)
<*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)

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
Range: 1 to 1750
Opmodes: All

Type: variable (R/W)
Default: motor data
Drive Status: DIS

Units: amperes RMS*0.1
EEPROM: Yes

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
Range: -2,147,483,647 to +2,147,483,647
Opmodes: 8

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

Units: counts
EEPROM: Yes

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.

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.

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.

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

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 MIDIST1/MISPEED1 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.

Opmode 1 operation: You select a MISPEED1 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 MISPEED1 and then set MISPEED1=0, an analog input JOG command can be given, as is normal for OPMODE 1 operation.

In firmware versions 3.3.0 and later, when homing is performed (see MH, HOMESPD, HOMESTATE, and HOMETYPE), MISPEED1 sets the velocity at which the drive returns to home after finding home.

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 MIDIST2/MISPEED2 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.

Opmode 1 operation: You select a MISPEED2 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 MISPEED2 and then set MISPEED2=0, an analog input JOG command can be given, as is normal for OPMODE 1 operation.

In firmware versions 3.3.0 and later, when homing is performed (see MH, HOMESPD, HOMESTATE, and HOMETYPE), MISPEED2 sets the velocity at which the drive returns to home after finding home.

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 MIDIST3/MISPEED3 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.

Opmode 1 operation: You select a MISPEED3 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 MISPEED3 and then set MISPEED3=0, an analog input JOG command can be given, as is normal for OPMODE 1 operation.

In firmware versions 3.3.0 and later, when homing is performed (see MH, HOMESPD, HOMESTATE, and HOMETYPE), MISPEED3 sets the velocity at which the drive returns to home after finding home.

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 enters a no-comp state, requiring a CONFIG command (see CONFIG).

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

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

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

Enables the rotary mode.

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

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 360º elec.
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)
Type: switch mode (R/W)
Units: bits
Range: 1, 2, 4, 8, 16, 32, 64,128,256
(Endat encoders in 3.4 firmware)
256 only (for All other sine encoders)
Default: 256
EEPROM: Yes
Opmodes: All
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
Type: switch mode (R/W)
Units: N/A
Range: 0 to 4
Default: 1
EEPROM: Yes
Opmodes: All
Drive Status: DIS

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
Type: variable (R/W)
Units: rotary: RPM
linear: mm/sec
Range: 10 to 32767
Default: motor data
Opmodes: All
Drive Status: DIS
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
Type: variable (R/W)
Units: electrical degrees
Range: 0 to 45
Default: 10
EEPROM: Yes
Opmodes: All
Drive Status: EN/DIS

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

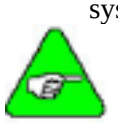
Writing O1 in certain O1MODE conditions does not stop the drive from resetting the output according to drive conditions.

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

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.



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

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

PEMAX

Sets the maximum allowable following error (OPMODE's 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
Type: variable (R/W)
Units: counts
Range: 0 to 2,147,483,647
Default: 0
EEPROM: Yes
Opmodes: 4, 8
Drive Status: EN/DIS

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

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

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

PFBOFF

A feedback offset that is added to the internal cumulative position counter to give the value of PFB.

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

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

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 **Type:** variable (R/W) **Units:** percent
Range: 0 to 100 **Default:** 50 **EEPROM:** Yes
Opmodes: 8 **Drive Status:** DIS

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

PROTARY

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

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

PSCALE

A position scale factor that scales the analog input when working in analog position mode (OPMODE=8; PCMDMODE=1). 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: 8
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
Range: 0, 1
Opmodes: All

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

Units: N/A
EEPROM: No

RECOFF

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

State before RECOFF:	State after RECOFF:
RECRDY=0	RECRDY=1
RECING=1	RECING=0
RECDONE=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 GET or **MOTIONLINK**'s 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 are one word in size, but some are two words. You can record up to three variables, as long as the total size does not exceed 4 words. The SERVO**STAR** records the following variables:

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

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

Command Syntax:RECORD *[sample time] [num points] [VAR1] {VAR2} {VAR3}*
Firmware Versions: All
Opmodes: All

Example: RECORD 10 100 "VCMD "V "PRD
(record 100 points for VCMD, V, and PRD every 5 milliseconds)
Drive Status: EN/DIS

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

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 table) 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. Enter something 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
Opmodes: All
[direction]: 1
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

RESBW

Sets the cut-off frequency of the filter.

Firmware Versions: Version 6.33 and higher
Range: 300, 600, 1200
Opmodes: All
Type: switch mode (R/W)
Default: 600
Drive Status: DIS
Units: Hz
EEPROM: No

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

SININT

Sets the sine calibration process.

Firmware Versions: 6.2.0 and higher
Range: N/A
Opmodes: All
Type: Command
Default: 0
Drive Status: DIS
Units: N/A
EEPROM: No

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

SININTST

Queries the status of the sine calibration process. This possible values are:

- **0 = no request**
- **1 = process running**
- **2 = motor velocity too high** The sine frequency cannot exceed 250Hz. When speed is reduced, the status returns to 1 (running).
- **3 = process complete**
- **4 = defaults loaded** Defaults are loaded when the calibration process has never been performed (in a new drive).
- **5 = internal failure**

Firmware Versions: 6.2.0 and higher
Range: 0 to 5
Opmodes: All
Type: Standard Variable (Read-Only)
Default: 0
Drive Status: EN/DIS
Units: N/A
EEPROM: No

SINPARAM

Queries the sine calibration values. There are four calibration parameters with a Sine Encoder and six calibration parameters with a Resolver. All calibration parameters have hexadecimal values.

Sin and Cosine Offset
Multiply by (10000/32768) to get the value in Millivolts. This offset is at the ADC terminal (after the sin and cosine signals are amplified).

Sin to Cosine Match Gain and Scale
The algorithm requires that the sin and cosine signals have the same amplitude. This value equals gain/2^scale and represents the amplitude difference of the sin and cosine signals. It should be close to 1. The firmware multiplies the sin signal samples by this value to get the same amplitude for the sin and cosine signals.

Full-scale Gain and Scale (RELEVANT ONLY FOR RESOLVERS)
The algorithm requires that the sin and cosine signals are scaled to 32768. The final value equals gain/2^scale and represents the factor to multiply the sin and cosine signals. This value should be between 1.2 and 1.3. The firmware multiplies the sin and cosine signal samples by this value.

Firmware Versions: 6.3.3 and higher
Range: Sin offset: -32768 to 32767
Cosine offset: -32768 to 32767
Sin to Cosine match gain: 1 to 32767
Sin to Cosine match scale: 1 to 15
Full-scale gain: 1 to 32767
Full-scale scale: 1 to 15

Type: Standard variable (Read-Only)
Default: 0h 0h 4000h Eh 4000h Eh
(last two are for resolver ONLY)
Drive Status: DIS

Units: Internal
EEPROM: Yes
Opmodes: All

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. A number of 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*	Internal fault
5*	Run away – algorithm failed due to excessive motion. This may be due to the values of either IENCSTART or INITGAIN being too high. Make sure IENCSTART is set correctly and reduce the value of INITGAIN.
6*	Motion profile mismatch. Adjust the value of INITGAIN.
7*	Insufficient motion. Increase IENCSTART or INITGAIN.
8 – 15	Not used.

* - firmware version 6.3.0 and later

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 runs for the time specified by *duration1* at the speed specified by *velocity1*, then runs 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
Range: *[durationN]:* 0 to 32767
[velocityN]: -VLIM to +VLIM
Opmodes: 0
Command Syntax: STEP *[duration1] [velocity1] {<duration2> <velocity2>}*
Units: *[durationN]* milliseconds
[velocityN]: rotary: RPM, linear: mm/sec
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 the LED segments 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
Range: 0, 1
Opmodes: All

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

Units: seconds
EEPROM: Yes

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
Range:0000:00 to 9999:45
Opmodes: All

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

Units: hours: minutes
EEPROM: Yes

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. When this variable is changed, the drive enters a no-comp state, requiring a CONFIG command.

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

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 the analog input ANIN for OPMODE 1 (analog torque mode). 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 channel relative to the motor shaft position. (***The range accepts all data, but must be limited to MENCRES * SININTOUT.***)

Firmware Versions: 3.6.0 and later
Range: 0 to 2^{31}
Opmodes: All
Type: variable (R/W)
Default: 0
Drive Status: EN/DIS
Units: SININTOUT
EEPROM: Yes (Encoder,must use HSAVE)

Troubleshooting

Technical papers and publications about the SERVO**STAR** and its associated applications complete the information package necessary for the user to become well versed with the product. Danaher Motion Kollmorgen's engineering and technical resource staff has prepared these notes. Also included are the *SERVO**STAR**® S and SERVO**STAR**® CD Installation Manual* as well as the *SERVO**STAR**® S and SERVO**STAR**® CD SERCOS IDN Manual*. The PSP CD-ROM contains the technical content in electronic .PDF format. You must have Adobe's Acrobat Reader (also available on the CD-ROM) installed on your computer to view and print these documents. The most recent versions of all the material contained in this PSP CD-ROM can be downloaded from Danaher Motion Kollmorgen's website (www.Danaher Motion Kollmorgen.com).

TROUBLESHOOTING TOOLS

The **MOTIONLINK** package comes with a comprehensive monitoring and troubleshooting help set. For troubleshooting the SERVO**STAR**, it provides a Status screen (click on "Status" button in the upper right-hand corner of Main screen). This screen allows you to check the SERVO**STAR** enable switches, the Status Display LED, fault status with complete error history, and mode settings for several of the SERVO**STAR**'s protection features. If using the terminal mode, you can simply check the contents stored in the STATUS, FLTHIST, and ERR variables.

An additional help provided by **MOTIONLINK** is the I/O screen (click on "I/O" button on the side of the Main screen), which gives you the ability to check the status of the hardware position limit switches, the motor thermostat, and the encoder equivalent output. It also allows you to set up the I/O on the C3 connector for a variety of troubleshooting and monitoring approaches.

For monitoring system performance, **MOTIONLINK** comes with a variety of monitoring tools. You can monitor a variety of variables from the Monitor screen (click "Monitor" button at the top of the Main screen) and compare up to three variables at one time. The Tune and Record screen allows you to evaluate the system's actual performance against a predefined command profile. Also from this screen, you can vary the performance by adjusting the gains until optimum following is achieved.

ERROR CODES

In most cases, the SERVO**STAR** SC communicates error codes with a text message via the serial port to the host. Some error codes are also transmitted to the Status Display. The same message is saved in the EEPROM under an error history log (FLTHIST, ERR) so nothing is lost when power is removed. Not all errors reflect a message back to the host. In these cases, the no-message errors communicate only to the Status Display.

The response of the SERVO**STAR** to an error depends on the error's severity. There are two levels of severity:

Warnings (simply called errors and not considered faults and do not disable operation)
Fatal errors (fatal faults that disable almost all SERVO**STAR** functions, including communications).

The SERVO**STAR** automatically disables at the occurrence of a fault. Executing a SERVO**STAR** disable command (DIS or K) followed by the EN command or toggling the Remote Enable line (REMOTE) resets the fault latch and, if the fault condition is no longer present, re-enables the system.

Fault Monitoring System

The SERVO**STAR**'s microprocessor is constantly monitoring the status of many different components. In general, the SERVO**STAR** latches all fault conditions so you can readily determine the source of the problem. When a fault is detected, it is logged in the internal error log, indicated in the Status Display, enunciated over the serial port, and causes a SERVO**STAR** disable. Many faults can be reset by toggling the hardware remote enable (REMOTE input).

The following provides a list of some of the more frequent faults the SERVO**STAR** may detect in the unit hardware and operating system:

Motor OverTemperature: The Motor's External Thermostat input is monitored for an open circuit condition. You define (using THERMODE) what happens under this fault condition. The worst case scenario is a power stage disable when an 'H' appears in the status display, and the fault relay contacts (RELAY) are open.

Hardware Position Limit Inputs: The IN1, IN2, IN3 Inputs are constantly monitored. If the variables INxMODE set these inputs for CW/CCW hardware position limits, they are monitored for an open-circuit condition. Although not necessarily an error condition, motor operation can be effected by these inputs. The SERVO**STAR** ignores the hardware position limits if you sets LIMDIS = 1. The worst case scenario is that further motion in the given direction is not allowed with an 'L' in the status display. If both CW and CCW position limit inputs have detected an open-circuit condition, the SERVO**STAR** enters into Hold position state (HOLD = 1).

Drive OverTemperature: The internal heatsink temperature is monitored for an unsafe condition. This condition causes a 't' to be displayed and disables the SERVO**STAR**. The SERVO**STAR** eventually cools enough to allow reset.

RMS OverCurrent (Foldback): the Foldback detection system can 'clamp' the available output current. This is not a true fault condition, but may cause undesired performance as the command current is limited below what is required to achieve the desired performance. This condition is indicated with a flashing 'F' in the status display and is detected by monitoring the FOLD switch variable.

Bus OverVoltage: an over-voltage condition shuts down the SERVO**STAR** and displays a lower-case 'o' in the status display. This fault occurs normally during REGEN operation where the BUS is raised to higher values than that produced by the power supply.

Bus UnderVoltage: an under-voltage condition shuts down the SERVO**STAR** and displays an 'u' in the status display. This fault normally occurs when the incoming line voltage drops out or a fault occurs in the power supply.

PowerStage Fault (OverCurrent): Hardware circuitry monitors load short-circuit, transistor failure, and instantaneous OverCurrent. In general, a power stage fault cannot be reset by toggling the Remote Enable, only by power cycling. This condition is indicated by a flashing 'P' in the status display.

Feedback Loss: Hardware is used to detect a wire-break condition in encoder based systems or the presence of the Sine and Cosine resolver feedback signals in resolver based systems. The lack or loss of either of these signals causes the SERVO**STAR** to disable and display an 'r' in the status display.

Low-voltage power supply faults: Out of tolerance values on the ± 12 VDC analog supplies displays an 'A' and the disables the SERVO**STAR**.

OverSpeed fault: Software continuously monitors the actual feedback speed. If the motor speed exceeds the VOSPD limit, a 'J' is displayed and the SERVO**STAR** is disabled. This normally occurs when there is an improperly tuned system and the load overshoots its commanded speed.

No compensator: In case the SERVO**STAR** cannot design a compensator, such as after a RSTVAR command, CLREEPROM, or any change in the motor or SERVO**STAR** parameters, a flashing minus sign (-) is displayed and the SERVO**STAR** is disabled. This display normally indicates that the SERVO**STAR** does not have a compensation file loaded.

Memory reliability: During the initialization process upon power up, the run time, variables memory (RAM - Random Access Memory), and the program memory (EPROM - Electrically Programmable Read Only Memory) are tested.

If a RAM fault is detected, an 'I' is displayed and the SERVO**STAR** halts. If an EPROM fault is detected, a 'c' is displayed and the SERVO**STAR** halts.

The user configuration non-volatile memory (EEPROM - Electrically Erasable Programmable Read Only Memory) is also checked for integrity upon power-up. Any discrepancy in this data is noted with an 'e' in the status display. After power-up is successfully completed, any subsequent fault in the operation of the EEPROM is noted with an 'E' in the status display.

WatchDogs: In addition, the SERVO**STAR** incorporates a watchdog system to maintain software operation integrity. Failure of the watchdog mechanism displays three bars on the status display and halts the SERVO**STAR**. This normally indicates serious problems. Please contact the factory for support.

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
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

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
Burnin is active	47	The requested function cannot be executed during Burnin (a factory function)

Error Message	Err #	Possible Cause
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
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

CUSTOMER SUPPORT

Danaher Motion Kollmorgen technical documentation is updated periodically and may be changed without notice. The latest documentation can be found on our website.

For information on this product or where to purchase near you, contact: your local distributor. To locate a distributor near you, visit the website.

Danaher Motion Customer Support
Continental US Customers: 1-800-777-3786
International Customers: (815) 226-2222
Email: customer.service@danahermotion.com
Website: www.danahermotion.com