

Section 6. PROGRAMMER'S REFERENCE

6.1. INTRODUCTION

This section discusses the Compumotor Plus commands in detail. It is divided into three subsections. The first subsection explains command syntax and system parameters that affect command usage. The second part groups the commands according to usage and provides examples of how to use them in conjunction with other commands. The third portion contains an alphabetical listing of all Compumotor Plus commands with syntax and usage information.

6.2. COMMAND LANGUAGE FUNDAMENTALS

6.2.1. Issuing a Compumotor Plus Command

Compumotor Plus commands must be entered in the following form:

[device address][COMMAND][parameters][delimiter]

All Compumotor Plus commands are upper-case ASCII characters. You may use either upper- or lower-case characters when issuing a command. The characters returned from the drive will always be upper-case. To avoid confusion, the use of upper-case characters is recommended.

When you issue a command, you will often be required to provide a value for a parameter or provide other specific information. The following symbols are used in the Syntax section of the command descriptions to represent parameters and other required information:

<u>Symbol</u>	<u>Represents</u>
a	Device address. This can be a number from 1 to 16. For more information on assigning multiple devices to a drive, see the "Identification of Units" section below.
n	ASCII digit, usually 0-9.
b	A binary value--0 or 1 (ASCII 0 or 1).
h	A hexadecimal digit.
l	ASCII character, usually from A-Z.
d	Delimiter, either a space character, entered with the keyboard space bar, or a carriage return. All individual commands end in a delimiter, which signifies the command is complete. A delimiter serves the same function as the space between words in a sentence.

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The Range portion of the command description provides the possible values for n, b, h, and l.

If a symbol appears surrounded by angle brackets $\langle \rangle$, providing a value for that symbol is optional.

NOTE

The Compumotor Plus ignores invalid commands, except in the interactive mode.

The example below shows a set of individual command entries with space delimiters on the same line:

Command: MN A10 V2 D25000 L10 G N

If spaces are used as the delimiters, and a large number of multiple command entries are made, you may exceed your terminal's characters-per-line limit 180 character is a typical value. When the carriage return is used as a delimiter, the cursor returns to the beginning of the line.

NOTE

Pressing the carriage return on some terminals will return the cursor to the start of the line. The line-feed key (or CTRL-J) may also have to be pressed to move the cursor to the next line feed. This will not affect the delimiter entered using carriage return. The line feed is ignored.

The example that follows shows the effect of using the carriage return/line feed as the delimiter when the terminal provides an automatic line feed.

```
> CMR5000  
> CVG50  
> LD3
```

6.2.2. Command Types

There are five types of commands:

Parameter: Commands that set up a parameter for operation, but do not make an operation happen.

Execute: Commands that make a certain operation happen.

Status: Commands that make Compumotor Plus report back information to the terminal.

Sequence: Commands that define and execute a sequence.

Definition/Report: Commands that either define a new parameter or report information about that parameter.

Each of the five types of commands is either Immediate or Buffered:

Immediate: Immediate commands are executed as soon as you issue the command. They take priority over any operation currently in progress. Some immediate commands, such as the Stop (S) commands, clear the command buffer, while others, such as the Status Request commands, do not affect the buffer.

Buffered: Buffered commands are stored in the command buffer if the indexer is not free to process them. They are executed in the order in which they were received.

Each of the five types of commands is either Universal or Device Specific:

Universal: Universal commands do not require a device address.

Device-Specific: Device-specific commands require a device address for execution. All commands that request data to be transmitted back to the host are device specific. This includes position report backs and status requests.

6.3. COMMAND DESCRIPTION BY FUNCTION

6.3.1. Set-Up Commands

These are commands you will use frequently in setting-up and maintaining your system.

<u>Set-Up Commands</u>	<u>Description</u>
E	Enable the RS-232C
SV or SAVE	Save new values
F	Disable RS-232C
CPB1	Enables the push buttons
CPB0	Disables the push buttons
OFF or STO	Turns power amplifier of
ON or ST1	Turns the power amplifier on
RFS	Returns the drive to factory settings
1DFS	Displays all of the servo status flags
1RSE	Reports Servo Errors
Z	Resets the drive
1RV	Software revision level reported
K	Kills current motion

6.3.2. Configuration Commands

The following commands are designed to let you configure the system to meet your requirements:

<u>Configuration Commands</u>	<u>Description</u>
CMTR	Configure drive to motor size
CMR	Define/Report motor resolution
CDB	Define/Report value of the dead band
CPE	Define/Report maximum following error

Normally, the factory settings for the motor driver combination are all that you will need.

6.3.3. Configure Term Maximum Commands

The following tuning commands are accessed only via the RS-232C communication link. They allow you to set system maximums.

<u>Configure Term</u>	<u>Description</u>
<u>Maximum Commands</u>	
CVM	Define/Report the maximum gain the velocity term can achieve
CDM	Define/Report the derivative gain maximum
CIM	Define/Report the integral gain maximum
CPM	Define/Report the proportional gain maximum

NOTE

Any changes made to parameters using these commands are NOT permanent UNTIL THEY ARE SAVED. To make a change permanent, the SAVE or SV command must be issued. The SAVE command will save all changes that have been made into EEPROM. Thus, if changes are made with these commands and the machine is reset, the changes are lost unless the SAVE command was issued before resetting the machine.

6.3.4. Tuning Commands

The following commands are accessed via push-button tuning or the RS-232C communication link.

<u>Tuning Commands</u>	<u>Description</u>
CVG	Define/Report velocity gain
CDG	Define/Report derivative gain
CIG	Define/Report integral gain
CPG	Define/Report proportional gain
DTP	Report all gains, maximums, default resolution, and motor type

The values represent a percentage of the maximum value that the term is allowed to achieve. The range is 1 to 99. To change the maximum value of the term, you must use the Configuration Maximum Commands (see section 6.3.3). The form of the equation for the tuning set up is:

$$\text{Gain Value} = \text{Term Maximum} \times \text{Term Percentage}$$

6.3.5. Display/Report Commands

The following commands cause the drive to report the requested parameter to the terminal at regular intervals.

<u>Display/Report Commands</u>	<u>Description</u>
DCA	Display/Report the average current
DCI	Display/Report the current at the time the command is issued
DCP	Display/Report the peak current
DPR	Display/Report the resolver position
DPS	Display/Report the position set point
DPA	Display/Report the position actual
DPE	Display/Report the position error
DVA	Display/Report the velocity actual
DVS	Display/Report the velocity set point

Responses and reports from the drive have an asterisk as a leading character to prevent the response from being interpreted as a command by other drives on the communication link. All display/report commands must be prefixed with a device address. This is to prevent several units from trying to report at once. These commands do NOT display values to the two-number display on the push-button tuning panel.

Each of the display/report commands prompts the drive to periodically report the appropriate parameter to the terminal where it is displayed. When any of these commands is issued, no other command may be issued until the reporting is terminated. To terminate a report, press any key.

6.4. COMMAND STRUCTURE

The following is an example of how Compumotor Plus commands are documented in the Command List section of this manual.

COMMAND IDENTIFIER

Name: *Command Name*
Syntax: *The command's required and/or optional parameters*
Default: *The result if you do not specify a parameter*
Range: *The range of values for the required parameter*
Valid: *The versions of Compumotor Plus that support the command*

Type:

Parameter			
Execute			
Status			
Sequence		Immediate	Universal
Definition/Report	, Buffered	, Specific	

Description: *Description of the command*

See also: *Related commands*

Example: *Example of command use*

6.5. COMMAND LIST

CDB

Name: Configure Dead Band
 Syntax: <a>CDB, aCDBnnnnnd
 Default: 0
 Range: 0-32,767
 Valid: Drive
 Type: Definition/Report, Immediate, Universal/Device-Specific
 Description: If no parameter is supplied, this command will report the current value of the dead band in motor steps. If a number is supplied, it will become the new dead band value. The slip fault line to the indexer is used to indicate when the absolute value of the following error is within the deadband region. The slip fault line to the indexer connector will be on to indicate that the following error exceeds the dead band. When the slip fault line is off it indicates that the absolute value of the following error is within the dead band region. This is useful when you need to know if the motor rotor is within a certain tolerance range with respect to the indexer command.

See also: None
 Example: lCDB (Response: *SLIP_FAULT_DEADBAND=0STEPS)

CDG

Name: Configure Differential Gain
Syntax: <a>CDGnnd, aCDGd
Default: 30
Range: 0-99
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: The differential gain is related to position error changes with respect to time. If a valid number is entered, a new differential gain will be calculated using the percentage of the maximum. Otherwise, the current setting is reported.

See also: None
Example: 1CDG (Response: *DIFFERENTIAL_GAIN_MAXIMUM=30PERCENT)

CDM

Name: Configure Differential Maximum
Syntax: <a>CDMnnnnnd, aCDMd
Default: 400
Range: 0-32,767
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: The response to this commands reports the gain of the portion of the controller that amplifies the derivative of the position error with respect to time. If a valid number is entered, it will become the new differential gain maximum. Otherwise, the current setting is reported.

See also: None
Example: 1CDM (Response: *DIFFERENTIAL_GAIN_MAXIMUM=400)

CGS

Name: Configure Gain Switching
Syntax: aCGSd
Default: 2 and 4
Range: 0-4
Valid: Drive
Type: Definition/Report
Description: This command defines and reports the current gain switching mode. Derivative gain switching linearly scales the derivative gain value (defined by the CDM and CDG commands) down to zero as the motor speed drops from 2.0 rps to 0.0 rps. The effect of this mode is to reduce amplifier noise at low velocity. Torque gain switching provides a high-resolution torque command to the amplifier when the torque command computed by the PIDV software falls below a certain threshold. The purpose of this mode is to provide high in-position stability.

CGS1: Derivative switching off
CGS2: Derivative switching on
CGS3: Torque switching off
CGS4: Torque switching on

The default setting is derivative and torque switching is on.

See also: None
Example: None

CIG

Name: Configure Integral Gain
Syntax: <a>CIGnnnnnd, aCIGd
Default: 50
Range: 0-32,767
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: The integral gain is related to position error with respect to time. If a valid number is entered, a new integral gain will be calculated using the percentage. Otherwise, the current setting is reported.

See also: None
Example: 1CIG (Response: INTEGRAL_GAIN=3PERCENT)

CIL

Name: Configure Integrator Limit
Syntax: aCILd, <a>CILnnnnnd
Default: None
Range: 0 to 2,147,483,647
Valid: Drive
Type: Definition/Report
Description: Defines/reports the maximum size of the integrator which accumulates past positional errors in the PIDV compensation code.

See also: None
Example: None

CIM

Name: Configure Integral Maximum

Syntax: <a>CIMnnnnnd, aCIMd

Default: 9000

Range: 0-32,767

Valid: Drive

Type: Definition/Report, Immediate, Universal/Device-Specific

Description: The response to this command defines the maximum of the integral of the position error with respect to time. If a valid number is entered, it will become the new integral gain maximum. Otherwise, the current setting is reported.

See also: None

Example: None

CMR

Name: Configure Motor Resolution
Syntax: <a>CMRnnnnnd, aCMRd
Default: 5,000
Range: 200-12,800
Valid: Drive
Type: Definition/Report

Description: Use the CMR command to define or report motor resolution. The drive must be shut down before the CMR command can be executed. Enter a number between 200 and 25,600. If you choose a multiple or submultiple of 12,800, the positioning will be slightly more accurate than a non-multiple. The math is done as an integer value, so a truncation error within a single revolution can occur. This error is not cumulative. Refer to the truncation errors Section for more information. Configure Motor Resolution definition/report numeric parameter expected. The drive must be shut down before the CMR command can be executed.

If a valid integer number is sent, the new resolution will be that number of steps per motor revolution. If no value is sent, then the current resolution is reported. The factory default is 5,000 steps of resolution per revolution.

The motor actually functions at 12,800 steps per revolution. Changing the motor resolution does not affect dynamic performance. The microprocessor simply converts the command position to the appropriate absolute resolver position mathematically. Thus a multiple or submultiple of 12,800 converts to an exact resolver position, whereas a non multiple or submultiple of 12,800 may be rounded off for a given position. Since the Compumotor Plus converts the absolute indexer count into the position, there is no accumulation of error.

Before the CMR command is active, you must issue either the OFF or STO command to shut down the drive. This prevents the motor from making large, unexpected moves when the resolution is changed. After the CMR command, you must issue either the ON or ST1 command to re-enable the drive. The new resolution you have just issued will not take effect until you issue a distance command after the CMR command.

See also: None
Example: If the resolution is set to 5,000 steps per revolution, we

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compute the scale factor as $(32,768 * 65,536) / 5,000 = 429,496.7296$. Since we have 16-bit precision, the 0.7296 is truncated.

If you command a move with D500000, the conversion from user friendly units back to resolver units is done as follows:

$(500,000 * 429,496) / 65,536 = 3,276,794.434$. Since you can't move to a fractional position, the motor actually moves to 3,276,794 counts of the resolver. So where you would expect the motor to go exactly 100 revolutions $(500,000 / 5,000)$? For this move, the motor will actually go $3,276,794/32768 = 99.99981689$ revolutions. This error does not accumulate, because if you gave a second move of the same distance the calculation will use the absolute distance to calculate the next move.

If all of this turns out to be a bother, and the truncation error is a problem to you, you can simply choose a resolution that does Divide evenly into $(12,800 * 65,536)$ or 2,147,483,648. e.g., 4,096; 8,192; 16,384; etc.

Since a change in resolution can cause major dynamic discontinuities, the motor resolution cannot be changed while the system is active. You must issue the ST0 or OFF command to disable the drive before you can change the motor resolution.

Be certain to save any changes you wish to retain before cycling power to the drive.

CMTR

Name: Configure Motor
Syntax: <a>CMTRnd
Default: None
Range: 1-3
Valid: Drive
Type: Executable, Buffered, Universal
Description: Use this command to configure the drive to the motor size that is being used with the drive. This is normally done for you at Compumotor's factory. This command selects the proper current values and factory defaults for the various motor sizes used with the drive. The possible configurations are shown below:

	1CMTR	This will report the present set up as *MOTOR_TYPE=CP1 (or 2, or 3)
57-120	1CMTR1	Sets the drive up for the Compumotor Plus
83-150	1CMTR2	Sets the drive up for the Compumotor Plus
106-210	1CMTR3	Sets the drive up for the Compumotor Plus

You must issue a SAVE command after issuing a CMTR command to save the motor type entered.

See Also: None
Example: 1CMTR (Response for 83-150 motor: *MOTOR_TYPE=CP2)

CPB

Name: Configure Push Buttons
Syntax: <a>CPBnd, aCPBd
Default: 0
Range: 0, 1
Valid: Drive
Type: Executable, Buffered, Universal
Description: The CPB1 command enables the front-panel push buttons. Any changes made to the controller's gains are retained in volatile memory. The CPB0 command disables the front-panel push buttons. You must issue a SAVE command to retain the values must be retained after a power loss or reset.

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See Also: None
Example: CPB0 (This command will disable the push buttons.)

CPE

Name: Configure Position Error
Syntax: <a>CPEnnnnd, aCPEd
Default: 5000
Range: 0-65,365 Steps
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: The response to this command defines or reports the maximum following error. If the absolute position error is greater than this number, the amplifier will shut itself off. If a valid number in steps is entered, it will become the new maximum following error. Otherwise, the current setting is reported. Exceeding the maximum following error is an error condition that will cause the amplifier to be shutdown. If the maximum following error is defined as zero, the *shutdown motor on following error exceeded* function is disabled and no amount of following error will generate an error condition or shutdown the motor. The factory default setting is one revolution of the motor.

The value of the following error is only calculated when the CPE command is given. The stored number is in terms of motor revolution. Changes of the CMR resolution will leave the following error actual distance unchanged unless a new CPE command is issued.

This command differs from the CDB command, since being outside dead band region only affects the slip fault output. The CPE settings will shut off the drive.

You should be certain to save your settings to the EEPROM if you wish them to be permanent.

See also: None
Example: 1CMR5000 1CPE1000 (This command will set the following error to one fifth of a revolution of the motor. Issuing 1CMR25000 1CPE will get a position error of 5,000 steps, since it is still one fifth of a revolution. If you issue 1CPE1000 after the 1CMR25000 command, the position error will be set to 1/25th of a revolution.)

CPG

Name: Configure Proportional Gain
Syntax: <a>CPGnnd, aCPGd
Default: 15
Range: 0-99
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: The proportional gain is related to the position error. If a valid number is entered, a new proportional gain will be calculated based on the percentage. Otherwise, the current setting is reported.

See also: None

Example: 1CPG4 (This command sets the proportional gain to 4%.)

CPM

Name: Configure Proportional Maximum
Syntax: <a>CPMnnnnnd, aCPMd
Default: 100
Range: 0-32,767
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: This command defines the maximum of the term that amplifies the position error. If a valid number is entered, it will become the new proportional gain maximum. Otherwise, the current setting is reported.

See also: None

Example: 1CPM (Response: *PROPORTIONAL_GAIN_MAXIMUM=100)

CVG

Name: Configure Velocity Gain
Syntax: <a>CVGnndd, aCVGd
Default: 25
Range: 0-99
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: The velocity gain is related to the error in the motor speed with respect to the commanded velocity from the indexer. If a valid numerical parameter is entered, then the velocity gain will be recalculated using the new percentage of the maximum. Otherwise, the current setting will be reported.

See also: None
Example: 1CVG60 (This command sets the velocity gain to 60%.)

CVM

Name: Configure Velocity Maximum
Syntax: <a>CVMnnnnnd, aCVMd
Default: 2000
Range: 0-32,767
Valid: Drive
Type: Definition/Report, Immediate, Universal/Device-Specific
Description: This command allows you to change the factory value for the maximum gain that the velocity term can achieve. This would normally be changed only if the values provided for your motor were not satisfactory for your application. The default values are motor dependent. If a valid parameter is sent, that value will become the new maximum. Otherwise, the current setting is reported.

See also: None
Example: 1CVM2000 (This command sets the velocity maximum to 2,000)

DCA

Name: Display Current Average
Syntax: <a>DCAd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: DCA displays/reports the average current flowing through the motor in amperes. This information is reported and continuously updated until a key is pressed. To get this number, 60,000 data points of the instantaneous current are read at 10-millisecond intervals. These values are averaged to provide a slow varying 10 minute average current value.
See also: None
Example: None

DCI

Name: Display Current Immediately
Syntax: <a>DCId
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: DCI periodically displays/reports current on an instantaneous basis. This number is reported in amperes and is repeatedly updated until a key is pressed. This number is a single sampling of the current.
See also: None
Example: None

DCP

Name: Display Current Peak

Syntax: <a>DCPd

Default: None

Range: None

Valid: Drive

Type: Parameter, Buffered, Universal

Description: DCP periodically displays/reports the peak current. This number is reported in amperes and is repeatedly updated until a key is pressed. This command samples the instantaneous current at 500 microsecond intervals. Each reading is compared to the largest previous reading. If the new value is larger, it will become the new value. This reading accumulates from the time the command is sent, so that the highest instantaneous current ever seen by the motor over long periods of time may be captured.

See also: None

Example: None

DFS

Name: Display Flags of Servo

Syntax: aDFSd

Default: None

Range: None

Valid: Drive

Type: Status, Immediate, Device-Specific

Description: This command returns all servo status flags as 32 bits, where the response is *bbbb_bbbb_bbbb_bbbb_bbbb_bbbb_bbbb_bbbb*[cr], and where the order of the bits is *31,30,29,28_ _3,2,1,0*. The bit descriptions and values are shown below.

<u>Bit</u>	<u>Description</u>	<u>Value</u>
31-12	Reserved	
11	Enable circuit	0-enabled 1-disabled
10	High-voltage problem	no=0 yes=1
9	Reserved	
8	Failed arc check	no=0 yes=1
7	Overtemp (short circuit)	no=0 yes=1
6	Average current exceeded	no=0 yes=1
5	Max position error exceeded	no=0 yes=1
4	Reserved	
3	Driver error undefined	no error=0 PWM Hardware shutdown=1
2	Drive overtemp	no=0 yes/shutdown=1
1	Overcurrent	no=0 yes/shutdown error=1
0	RS-232C CMD	0=ON/ST1 1=OFF/ST0

DPA

Name: Display/Report Position Actual
Syntax: aDPAd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This number is reported in steps and is repeatedly updated until a key is pressed. It is the absolute resolver position scaled in motor steps since the drive was enabled. The resolver of the Compumotor Plus actually counts at 32,768 counts per revolution of the motor shaft. The value that is displayed is calculated by creating a scale factor when the CMR command is issued $(32,768 * 65,536)/CMR = \text{scale factor}$. The scale factor is carried out to 16 bits. The rest is truncated. This can cause a small non-cumulative error in position if the CMR resolution does not evenly divide into 2,147,483,648.

See also: None
Example: None

DPE

Name: Display/Report Position Error
Syntax: aDPEd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This command reports the difference between set point and actual position in steps. The position control algorithm uses this number to determine what sort of current should be sent to the motor. The difference between the command set point and the actual position is also used to determine if the motor is within the dead band specified in the CDB command. This number is reported in motor steps and is repeatedly updated until a key is pressed.

See also: None
Example: None

DPR

Name: Display/Report Position Resolver
Syntax: aDPRd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This number is reported in steps and is repeatedly updated until a key is pressed. This value is the resolver position in motor steps within a single revolution of the motor shaft. This is an absolute value with the zero referenced to how the resolver is mounted on the shaft. This data would be useful to diagnose a resolver problem.

See also: None
Example: None

DPS

Name: Display/Report Position Set Point
Syntax: aDPSd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This number is reported in steps and is repeatedly updated until a key is pressed. This number is the absolute number of pulses sent to the drive from the indexer since the drive was enabled (or reset).

See also: None
Example: None

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DTP

Name: Display Tuning Parameters
Syntax: aDTPd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This command displays all pertinent tuning parameters at one time. Useful when tuning several parameters at once.

See also: None

Example: 1DTP Gives the response as follows:

	P	I	D	V
PERCENT	20	50	50	60
MAXIMUM	100	9000	400	2000

*INTEGRATOR_LIMIT-100000
*MIXIMUM_POSITION_ERROR-0_STEPS

*MOTOR_TYPE-CP1
*MOTOR_RESOLUTION-5000_STEPS/REV

*LIMITS_DISABLED

DVA

Name: Display/Report Velocity Actual
Syntax: aDVAd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This is the actual shaft velocity reported in revolutions per minute (RPM).

See also: None

Example: None

DVS

Name: Display/Report Velocity Set Point
Syntax: aDVSd
Default: None
Range: None
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This number is reported in steps per second and is repeatedly updated until a key is pressed. This number is calculated at 500 microsecond intervals and reported at 28 millisecond intervals. This value is the velocity being sent to the velocity part of the servo loop by the PID loop.
See also: None
Example: None

E

Name: Enable RS-232C Interface
Syntax: <a>Ed
Default: RS-232C Enabled
Range: None
Valid: Drive
Type: Execute, Immediate, Universal
Description: Try issuing the E command if you do not get any response on the RS-232C link. The E command may be preceded by a device address of 1 to 16. For example, 1E will enable only device number one. Sending an E command without a device address will enable RS-232C on all of the drives on the daisy chain.

The E command is also used in conjunction with the F command to return to front-panel control.

See also: F
Example: E or 1E (These commands enable RS-232C commands.)

F

Name: Disable RS-232C Interface
Syntax: <a>Fd
Default: RS-232C
Range: None
Valid: Drive
Type: Execute, Immediate, Universal
Description: Disable all RS-232C commands except E. Used in conjunction with the E command.

See also: E.
Example: F or lF (This command locks the device. All RS-232C commands are disabled, except the E command).

^H

Name: Backspace
Syntax: ^H (Control H, one character, ASCII 8)
Default: None
Range: None
Valid: Drive
Type: Execute, Buffered, Universal
Description: It will not prevent execution of an immediate command. The ^H command backspaces one character. A new character may be entered at that position to replace the existing character. (^H indicates that the CONTROL or CTRL key is held down when the H key is pressed.) The effect of this command character is to cause the indexer to back up one character in the command buffer regardless of what appears on the terminal. On some terminals pressing the Backspace key will produce the same character.

See also: None
Example: None

H

Name: Set or Reverse Motor Direction
Syntax: <a>H<s>d
Default: None
Range: Space, +, or -
Valid: Drive
Type: Parameter, Buffered, Universal
Description: This command sets or reverses the direction of the next move. It explicitly sets the direction for the next move if a sign (+ or -) is provided, or reverses the direction of the next move if just the H is commanded.

See also: H(s), D.

Example: MN A10 V10 D10000 G H G (The motor will turn two revolutions CW and then two revolutions CCW. This assumes 5,000 steps per revolution.)

HELP

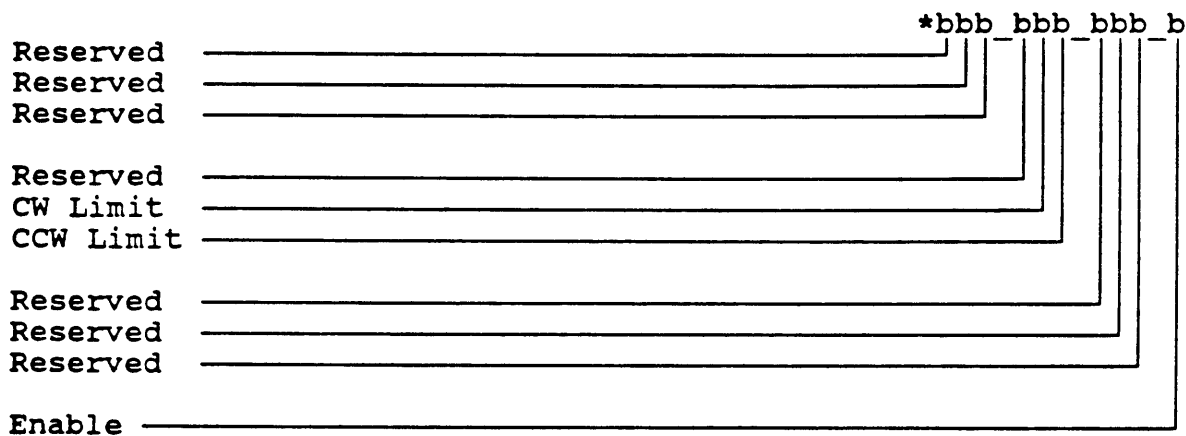
Name: Help Command
Syntax: <a>HELPd
Default: None
Range: None
Valid: Drive
Type:
Description: This command provides a list of commands and a brief description of each command. The help command is active only when the device address is set to 1.

See also:

Example:

IS

Name: Input Status
Syntax: aISd
Default: *000_000_000_1 (Assuming only the enable input is installed.)
Range: None
Valid: Drive
Type: Status, Immediate, Device-Specific
Description: Report Input status Where the response is *bbb_bbb_bbb_b<CR>. (One indicates on or grounded, zero = off or floating.



This is an immediate command that will check and report the status of all of the inputs no matter the configuration, or input mode.

See Also: IM
Example: lIS (Response: *100_000_000_0<cr>. This indicates that TRIG1 is active).

K or KILL

Name: Kill
Syntax: <a>Kd
Default: None
Range: None
Valid: Drive
Type: Execute, Immediate, Universal
Description: This command stops the indexer commands to the motor. In addition, it terminates an immediate loop, ends time delays in any mode, exits RM mode, and aborts a command sequence download in progress (XD command). The command buffer and all indexer flags are also cleared (DFX will report all zeros). The power amplifier is not shut down. Kill basically stops all indexer functions.

This command attempts to stop the motor at an extremely high deceleration rate. Inertial loads may over drive the motor and cause the drive to fault due to excess following error. If this happens, the motor will free wheel. Use this command only in controlled situations where it can do no harm, or in emergencies. Use the S command for a controlled stop.

See also: S, STOP
Example: A10 V10 MC GK (The motor will ramp up to 10 rps and run continuously until the K command is entered. At that time, the drive will attempt to instantaneously stop the motor.)

LD

Name: Limit Disable
 Syntax: <a>LDnd
 Default: 0
 Range: 0, 1, 2, 3
 Valid: Drive
 Type: Execute, Buffered, Universal
 Description: Disable/Enable limit switches

Enable all limits	n=0
Disable CW limit	n=1
Disable CCW limit	n=2
Disable CW & CCW limits	n=3

The factory default is LDO. This will not allow the motor to turn during initial testing without issuing the LD3 command, allows motor motion without using limit switches.

See also: IM
 Example: LDO (All limits are enabled and must be disabled through hardware.)

OFF

Name: Off
 Syntax: <a>OFFd
 Default: On
 Range: None
 Valid: Drive
 Type: Immediate
 Description: The OFF command clears the command buffer. Using the OFF command disables the amplifier.

See Also: ON
 Example: OFF (This command clears the command buffer.)

ON

Name: On
Syntax: <a>ONd
Default: On
Range: None
Valid: Drive
Type: Executable, Immediate, Universal
Description: The ON command enables the amplifier.

See Also: OFF
Example: ON (This command provides current to the amplifier.)

RFS

Name: Return Factory Settings
 Syntax: <a>RFSd
 Default: None
 Range: None
 Valid: Drive
 Type: Immediate, Parameter
 Description: Returns the drive to factory settings. All settings are as they were when the drive was shipped from the factory. This is the same as pushing the P and I buttons at the same time.

See also: None
 Example: None

RSE

Name: Report Servo Errors
 Syntax: aRSEd
 Default: None
 Range: None
 Valid: Drive
 Type:
 Description: If an error condition in the servo drive exists, such as excessive following error or an EEPROM failure, it will be reported in the form *nn<CR>, where n = the code. Errors that are indicated with display codes are soft errors. To clear an error, you must reset the drive. The possible error messages are:

<u>CODE</u>	<u>CONDITION</u>
20	Excessive position error
22	Maximum average current exceeded
23	Drive enable not active
30	EEPROM check sum error
60	RS-232C commanded shutdown

Refer to the Troubleshooting section for diagnostic codes.

See also: Troubleshooting section
 Example: 1RSE (Response = *NO_ERRORS)

RV

Name: Revision
Syntax: aRVd
Default: None
Range: None
Valid: Drive
Type: Status, Buffered, Device-Specific
Description: This command requests EPROM version number. The response is in the form *92-nnnnnn-nnl<CR>. The RV command reports the software revision level of the controller software. It reports the part number that is written on the label of the controller's EPROMs.

See also: None
Example: RV (Response = *92-7730-01Y1. This response indicates that version Y1 of the software is in the Compumotor Plus.)

S

Name: Stop
Syntax: <a>Sd
Default: None
Range: None
Valid: Drive
Type: Execute, Immediate, Universal
Description: An S command will always cause a deceleration to velocity at the last defined acceleration rate. The S command clears any remaining commands in the command buffer, unless it is prevented from doing so via the SS command.

PROGRAMMER'S REFERENCE

NOTE

Normally, the motor is decelerated to a stop at the same rate it was accelerated. A different deceleration rate may be programmed in continuous mode only, by calling for a velocity of 0.0 rev/sec with a new acceleration and executing a G rather than S command.

Command: " MC A1 V10 G ... A100 V0 G "

The feasibility of a steeper deceleration curve should be checked. Compute the rotational momentum of the load in question and the amount of energy that may be taken from the load without the motor losing synchronism.

If SSH0 is set, the command buffer is cleared (at the end of a move if one is in progress). A command sequence download is aborted (XD command) and a time delay is terminated. Any move in progress will decelerate to a stop at the last defined acceleration rate. RM mode velocity is not affected. If SSH1 is set, the command buffer is not cleared and only the move that is in progress is terminated.

See also: K, SSH

Example: MC A10 V10 G S (The motor will decelerate to a stop at a rate of 10 revs/sec/sec as soon as S is

SS

Name: Set Switches
Syntax: aSSlbd
Default: None
Range: 0-A-H, b=0,1
Valid: Drive
Type: Parameter, Buffered, Device-Specific
Description: This command sets up the functions outlined in the table that follows. The form of the command is "SSl1 or SS10 " where the following binary values Enter b = 0 or 1 as shown in the table below to obtain the desired result.

<u>Command</u>	<u>Description</u>	<u>0/1</u>
SSA b	Reserved	
SSB b	Reserved	
SSC b	Reserved	
SSD b	Reserved	
SSE b	Reserved	
SSF b	Reserved	
SSG b	Reserved	
SSH b	Reserved	
SSI b	Interactive mode	on/off
SSJ b	Reserved	

Switch I: Switch I enables/disables the interactive mode. When enabled the indexer/drive responds to RS-232C commands with a prompt. Commands it recognizes return a line feed, carriage return and >. Commands it does not recognize return a line feed, carriage return and ?.

Report: If you send only the SS command preceded by the device address, you will get a response showing the switch settings. For example, SS will respond with *unnnnnnh<CR> where the order of the response is A-J.

See also: IM
Example: None

PROGRAMMER'S REFERENCE

ST

Name: Shutdown
Syntax: <a>STnd
Default: None
Range: None
Valid: Drive
Type: Execute, Buffered, Universal
Description: STl rapidly ramps the current motor to zero. Any move commands given during motor shutdown will not be acted upon. ST0 ramps the currents up to normal level (at the position read upon execution of the STl command) and re-enables all move commands. This command is normally used to reduce motor heating or allow manual positioning of load.

See also: None
Example: STl (Current to the motor is ramped to zero.)

SV

Name: Save
Syntax: aSVd
Default: None
Range: None
Valid: Drive
Type: Execute, Immediate, Device-Specific
Description: The SAVE or SV command will save any new values you have given the drive. For values not changed, the last value to have been saved will be re-saved. This is the same as pushing all three mode buttons down and releasing them. The SV and SAVE commands will cause the controller to save the gains as currently set and exit the tuning mode. This command must be used to save sequences as well. When the SAVE command is finished executing, "*<CR>" will be sent to the communications terminal.

The following parameters are saved in response to a Save command. Commands not listed are not saved.

The CMTR and SS commands are not affected by the RFS command.

The following parameters are restored to their default values by the RFS command: CBP, CCA, CCP, CDB, CDM, CDG, CIM, CIG, CIL, CPE, CPG, CMR, CPM, CVG, CVM.

See also: None
Example: SV (Unit responds with "*<CR>")

PROGRAMMER'S REFERENCE

Z

Name: Hardware and Software Reset
Syntax: <a>Zd
Default: None
Range: None
Valid: Drive
Type: Execute, Immediate, Universal
Description: The Z command is equivalent to cycling the AC power to the indexer, which returns all internal settings to their power-up values. The command buffer is cleared. Like the K command, Z causes an immediate cessation of output pulses to the motor.

NOTE

When the "Z" command is used, the indexer is busy for 500 milliseconds and will ignore any commands.

See also: None
Example: Z (This command sets all move parameters to zero. The command buffer is cleared. The position counter is set to zero. Any changes that have not been saved before issuing this command will be lost.)