X150/X150E Software Reference User Guide

Software revision

X150 version 5.9

X150E version 6.2

For engineering
assistance in Europe:
Parker Hannifin plc
Electromechanical Division - Digiplan
21 Balena Close
Poole, Dorset
England, BH17 7DX
Direct Lines for Technical Support
Tel: 01202-699000 Fax: 01202-695750
E-mail: tech.help@digiplan.com

Part No: 1600.221.01   September, 1996

For engineering
assistance in the U.S.:
Parker Hannifin Corporation
Compumotor Division
5500 Business Park Drive, Suite D
Rohnert Park, CA 94928
USA
Telephone: (800) 358-9070
Fax: (707) 584-3793
FaxBack System: (800) 936-6939
BBS: (707) 584-4059
E-mail: tech_help@cmotor.com

IMPORTANT INFORMATION FOR USERS

Installation and Operation of Digiplan Equipment

It is important that Digiplan motion control equipment is installed and operated in such a way that all applicable safety requirements are met. It is your responsibility as an installer to ensure that you identify the relevant safety standards and comply with them; failure to do so may result in damage to equipment and personal injury. In particular, you should study the contents of this user guide carefully before installing or operating the equipment.

The installation, set-up, test and maintenance procedures given in this User Guide should only be carried out by competent personnel trained in the installation of electronic equipment. Such personnel should be aware of the potential electrical and mechanical hazards associated with mains-powered motion control equipment - please see the safety warning below. The individual or group having overall responsibility for this equipment must ensure that operators are adequately trained.

Under no circumstances will the suppliers of the equipment be liable for any incidental, consequential or special damages of any kind whatsoever, including but not limited to lost profits arising from or in any way connected with the use of the equipment or this user guide.

⚠ SAFETY WARNING

High-performance motion control equipment is capable of producing rapid movement and very high forces. Unexpected motion may occur especially during the development of controller programs. ***KEEP WELL CLEAR*** of any machinery driven by stepper or servo motors. Never touch it while it is in operation.

This product is sold as a motion control component to be installed in a complete system using good engineering practice. Care must be taken to ensure that the product is installed and used in a safe manner according to local safety laws and regulations. In particular, the product must be enclosed such that no part is accessible while power may be applied.

EMC INFORMATION

EMC Information is presented in boxed paragraphs (such as this one). Digiplan cannot guarantee compliance unless guidelines are strictly followed.

The information in this user guide, including any apparatus, methods, techniques, and concepts described herein, are the proprietary property of Parker Digiplan or its licensors, and may not be copied, disclosed, or used for any purpose not expressly authorised by the owner thereof.

Since Digiplan constantly strives to improve all of its products, we reserve the right to modify equipment and user guides without prior notice. No part of this user guide may be reproduced in any form without the prior consent of Digiplan.

© Digiplan Division of Parker Hannifin plc, 1996
– All Rights Reserved –

Table of Contents

Products Covered by this User Guide

This User Guide is applicable to all products which use the X150 or X150E controllers.

The X150 is used in the BLHX servo drive, the PDHX stepper drive and the X150DS servo controller. The X150E is used in the BDHX-E servo drive and the PDHX-E stepper drive.

Not all the commands listed here apply to every product. Each command description heading contains a list of X150/X150E products. If a command can be used with a particular product, the product name is followed by a software version number, from which the command description applies. For example, the ICON command description applies to the BDHXE from version 6.2 of the software onwards. If a command cannot be used with a particular product **n/a** (not applicable) appears following the product type. For example, PDHXE **n/a** appears in the OSB command header, meaning OSB does not apply to the PDHXE.

Note: In many cases commands may have been available in earlier revisions of the software, but command descriptions have been extensively revised to be valid from version 5.9 for X150 products and version 6.2 for X150E products.

Please note: The ⚠ symbol warning label means Caution - refer to the accompanying documentation.

User Guide Change Summary

When a user guide is updated, the new or changed text is differentiated with a change bar in the outside margin (this paragraph is an example). If an entire section is changed, the change bar is located on the outside margin of the section title.

This is the first issue of the X150/X150E Software Reference User Guide.

X150/X150E Series Software Reference Guide

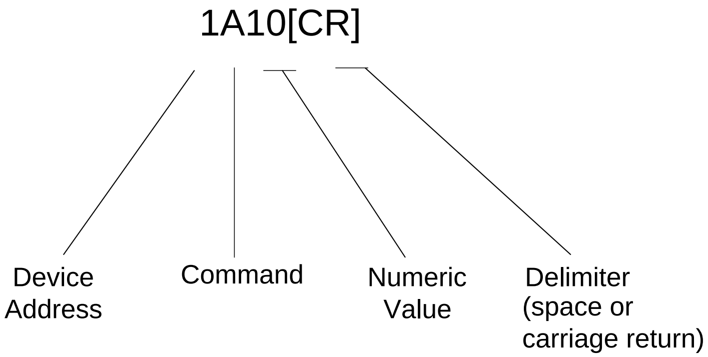
Command Structure

This section defines the basic format for positioner commands.

Basic Format

All positioner commands are sequences of upper case characters of the form:

[device address] [command] [numeric value] [delimiter]



where:

device address - is a numerical value from 1 to 16 for the X150 and from 1 to 32 for the X150E. It determines which device will receive the command. Its value will be between 1 and 16 (or 1 and 32) since up to 16 positioners (or 32) may be present in a system. If the device address is omitted, the command applies to all positioners.

command - up to six characters beginning with an uppercase ASCII letter

numeric value - a number defining the value to be programmed, such as the number of steps to move. If the numeric value is omitted the current value will be reported.

delimiter - is a SPACE or CARRIAGE RETURN

All individual commands end in a delimiter that signifies that the command is complete. A delimiter serves the same function as the space between words in a sentence. The delimiter, which is part of the command, is a space character (entered with the keyboard space bar) or a carriage return [CR].

The format for each individual command is given by the **syntax**,
for example:
<a>GH<s>n

<a>	is the device address
GH	is the command

<s>	is the sign, indicating direction of travel
n	is the numeric value, in this case the speed in revs/sec

Characters inside <> are optional. The direction is taken to be positive if no sign is included.

Sign <s>

s = sign (+ or -)

The sign placed before the numeric value indicates the required direction of travel for a move. If the sign is omitted, a positive value is assumed.

Numeric Value n

The value of n may be expressed as:

an Integer (a whole number such as 40)

a decimal number such as 10.25

a scientific E notation number such as
+12.3840E-04 etc.

Value Reporting

All commands which take a value, such as a velocity command like 1V5, will return the current programmed value if none is sent. So sending 1V[CR] will result in the positioner responding with a message such as *V = 5 revs/sec. Certain commands will return a value which differs slightly from the value originally programmed. This is caused by rounding errors following controller calculations and can be ignored.

Defaults

Command parameters have default or factory setting values which are listed for each command. The value given is the general product default (corresponding to the commands RFS0 followed by RIFS). See commands RFS and RIFS for further information.

Command Attributes

All commands are either Immediate or Buffered and Universal or Device Specific, as explained below.

Immediate (I): Executed immediately upon receipt.

Buffered (B): Stored in the command buffer and executed in sequential order.

Universal (U): Commands that are intended for all positioners in the system. They do not require a device address. Any universal command can be made device specific by including a device address.

Device Specific (D): Commands that are intended for one positioner only and therefore 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. All 'Universal' commands can be made 'device specific' by including a device address, except the 'Z' (reset) command.

Buffered/Immediate Commands

All commands annotated with * can be prefixed by the character B, in which case they become buffered rather than immediate commands.

WARNING: Although every effort is made to ensure that the default values of parameters are harmless and conservative, there can be problems when the unit is connected to non-standard servo drives or loads. Under these circumstances follow the tuning procedures starting with low servo gains as described.

DETAILED COMMAND LIST

A	**Acceleration Rate**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>An	Revs/sec^2	0 or n = 0.060 - 999,999	10	Buffered, Universal, Saveable in sequence

SEE ALSO V, D

Description
Set the acceleration rate. The acceleration remains set until it is changed or the system is reset.

If n = 0 there is no acceleration period. The maximum possible acceleration is used (start/stop move).

If using low values of acceleration a check should be made to ensure that it has not been rounded down to zero.

Example

Command	Description
1A10	Sets acceleration of device 1 at 10 revs/sec^2
A5	Sets acceleration of all devices to 5 revs/sec^2

The data value can be substituted with one of the Controller’s variables.

Example

Command	Description
VAR1=10	Load the value 10 into VARIABLE 1
A(VAR1)	Set the accelerate value to 10 revs/sec

B	Buffer Status Request	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aB	N/A	N/A	N/A	Immediate, Device Specific, Never Saved

RESPONSE TO aB **IS** *B or *R **SEE ALSO** BS

Description
The command requests the status of the command buffer. The response, *R[CR] or *B[CR], indicates if more or less than 10% of the command buffer is free.

*R = more than 10% of the buffer is free
*B = less than 10% of the buffer is free

The command is normally sent after a long series of commands to ensure that room exists for more commands. The command buffer is 2000 bytes long. Each character (including delimiters) uses one byte.

Example

Command	Response
1B	*B (less than 10% of command buffer is free)

BDL Busy Delay

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aBDLn	milliseconds	0 - 300ms	200ms	Buffered, Device Specific,

Description
This command allows the output on busy to remain active for a defined time period. It is useful when the drive is being controlled from a PLC requiring an acknowledge signal to be present for a certain minimum time. Note the delay is programmed in milliseconds, but only has an input resolution of 2ms.

Example

Command	Response
1OUT3G	Define output 3 as busy output
1BDL50	Make busy active for 50ms

BS Buffer Size Request

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aBS	Bytes	0 - 2000	N/A	Immediate, Device Specific, Never Saved

RESPONSE TO aBS **IS** *n bytes free **SEE ALSO** B

Description
Requests the remaining bytes available in the command buffer. The response, 4 decimal digits (0-2000) followed by a [CR], indicates the number of bytes remaining in the command buffer. When entering long strings of commands, check the buffer status to ensure that there is enough room in the buffer, otherwise commands will be lost. Each character (including delimiters) uses one byte.

Example

Command	Response
1BS	Response *122[CR] (122 bytes remaining in the buffer)

C Continue

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>C	N/A	N/A	N/A	Immediate, Universal, Never Saved

SEE ALSO PS, U

Description

The continue command ends a pause state. It enables the interface to continue executing buffered commands after a pause has been initiated with the PS command or the U command. This command is useful when you want to transmit a string of commands before you actually execute them.

Example

<u>Command</u>	<u>Description</u>
MC	Set continuous mode
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
PS	Pause
G	G will not be recognised until PS is cleared with C
T10	Delay for 10 secs
SB	Stop
C	Continue

***CAG**	**Configure Acceleration Gain**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CAGn	Milliseconds	1.0 to 32768	1.00	Immediate, Universal, *

SEE ALSO SIM, CCS

Description
During following in scaling mode (SIM3, 4) the acceleration profile to the input stream velocity can be adjusted using the CAG command. CAG sets the time constant of a digital filter which profiles or smoothes the input pulse stream. In response to a step change in input frequency, the output will accelerate or decelerate to the new rate following an exponential profile. The CAG value represents the time in milliseconds to reach 67% of the final speed; 95% of the final speed is reached after 3 times the CAG value.

Example

Command	Description
ST0	Motor energised
SIM3	Normal unreversed scaled following
CCS3	Step and direction decode
CUR200	The input pulse stream resolution
CMR4000	The motor resolution
CAG100	100ms input filter controls acceleration
1SV	Save, and power up in the following mode

***CCP**	**Configure Command Peak**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CCPn	N/A	n = 0 - 1023	1023	Immediate, Universal, *

Description
This command can be used to limit or clamp the maximum value of the output demand to a value less than the full range of -1023 to +1023. Since the drive is configured as a torque amplifier, CCP serves as a torque-limiting function.

Example 1

Command	Description
1CCP(VARn)	Load maximum value of the output demand from value in VARn

Example 2

Command	Description
1CCP102	Limit the interface output to -102 to +102 i.e. 10% of full scale

This clamping action is the last to take place before the control signal is output, therefore a command such as CCP0 would block any output signal to the drive.

CCS	**Configure Command Source**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aCCSn	N/A	n = 0 - 3	0	Buffered, Device Specific
				SEE ALSO SIM

Description
This command is used to configure the decode of the external axis encoder input when using following mode of operation as follows:

n = 0	Normal x4 decode
n = 1	x2 decode
n = 2	x1 decode
n = 3	Step and direction decode

Example

Command	Description
1CCS1	Set axis 1 to x2 decode
1SIM1	Select encoder following mode, axis 1

If an encoder to be tracked by axis 1 has 1000 lines per rev, it is decoded as 2000 steps per rev (x2 decode). The motor on axis 1 with 4000 steps per rev would move 1/2 revolution in response to a 2000 step move (1 revolution) of the tracked axis.

***CDG**	**Configure Derivative Gain**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES

<a>CDGn	N/A	n = 0 - 32,767	RFS dependent	Immediate, Universal, *

Description
Configure the derivative gain when using PID tuning. This term represents the derivative of position error, in other words the rate at which position error is changing. It produces a damping action in a similar way to velocity feedback and sets the velocity feedback and feedforward gains to equal values.

CDR

Configure Drive Resolution

BDHXE v6.2 PDHXE **n/a**
BLHX **n/a** PDHX **n/a**
X150DS **n/a**

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
<a>CDRb	N/A	0 or 1	0	Immediate, Device specific

Description
Configure Drive Resolution allows you to configure the drive to work with a 512 line encoder or a 1024 line encoder for commutation signals.

b	Resolution
0	1024
1	512

This command is only valid for a BDHX-E. The default value is 1024 lines.

CER	Configure Encoder Resolution	BDHXE **n/a** BLHX **n/a** X150DS **n/a**	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aCER<n>	n=pulses/rev	0 - 32767	4000	Immediate, Buffered,
				SEE ALSO MR

Description

If an encoder is being used for position purposes, this command configures the number of pulses the encoder produces per revolution. The number of pulses entered is post-quadrature (i.e. the number of encoder lines multiplied by 4). A 1000 line encoder producing 4000 pulses, will require you to enter CER4000.

Example

Command	Description
CER8000	Configure encoder resolution as 8000, i.e. 8000 pulses are produced by 1 revolution of the encoder.

*CEW	Configure In-Position Window	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CEWn	Steps	n = 0 - 31,999	49	Immediate, Universal, *

Description

This command, together with the CIT command, can be used to configure an in-position window, which in its turn can be used to indicate that the preceding index has terminated. An output can be configured as an in position output with the OUTnT command.

The in-position condition is met when:

a) The indexer algorithm has finished (no input position command)
b) The CEW condition is met i.e. the position error is less than that specified by CEW
c) The above condition has been true for the length of time specified by the CIT command

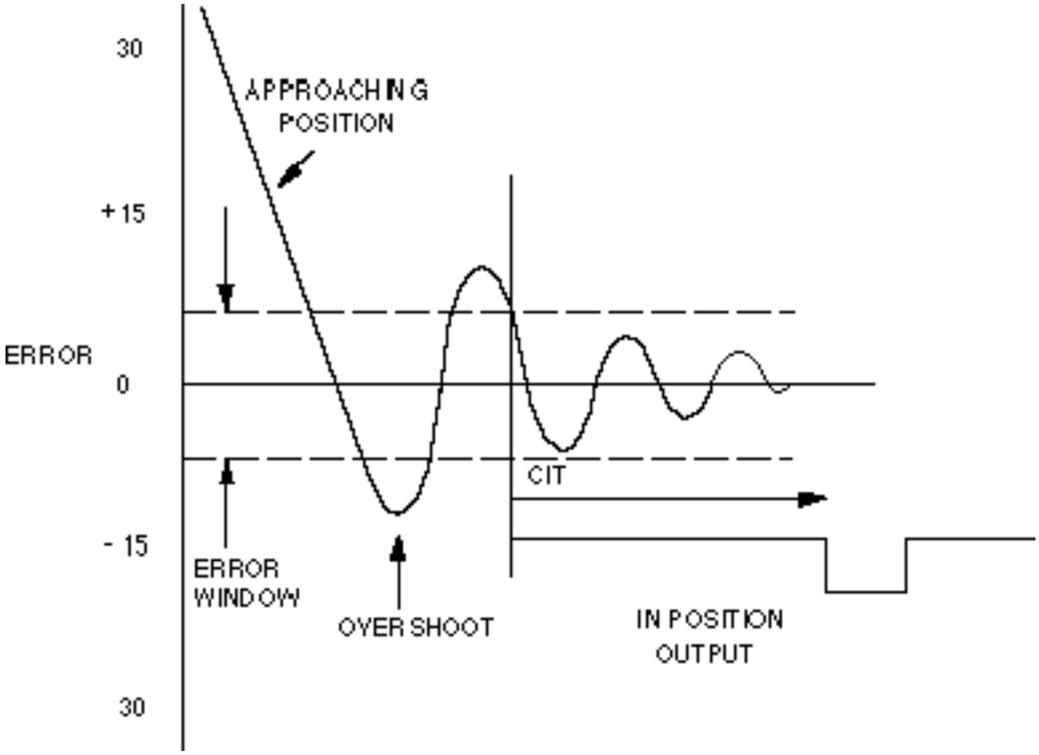


Figure 1-1. Final Positioning

*CFG Configure Feedforward Gain

BDHXE v6.2 PDHXE **n/a**
BLHX v5.9 PDHX **n/a**
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CFGn	N/A	n = 0 - 32,767	RFS dependent	Immediate, Universal, *

Description
Used to set the velocity feedforward gain. The opposing action of proportional and velocity feedback results in a position error which depends on speed. This is called 'following error'. Velocity feedforward can be used to offset the following error and improve tracking accuracy. This is important in contouring applications. For true PID, this can be set to the same value as the velocity feedback, or the CDG command may be used instead.

CFS Configure Fail Safe

BDHXE v6.2 PDHXE **n/a**
BLHX **n/a** PDHX **n/a**
X150DS **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CFSb	N/A	0 or 1	0	Immediate

Description
Configure Fail Safe loop active (b=0) is used to configure the Reset input on the User I/O Connector as a pull-down input. This will require a user to connect the Reset input to +Vs via a normally closed emergency off switch before the drive can be energised. This is the preferred safety off switch arrangement, where breaking a circuit causes the drive to de-energise.

When configured not active (b=1) the Reset input is configured as a pull-up input, requiring the user to connect the input to 0V to reset the drive.

b	Fail safe loop active?
0	YES
1	NO

If no safety loop is available or if the drive is being tested the safety loop can be overridden by use of the aCFS1 command.

This command is only valid for a BDHX-E. The default value is fail safe loop active.

*CIG Configure Integral Gain

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CIGn	N/A	n = 0 - 32,767	0	Immediate, Universal, *
			SEE ALSO	OSB, CIW, OSM

Description
Used to set the integral gain. If proportional feedback is insufficient to overcome static position errors due to friction or gravity, integral action accumulates a steady-state position error until sufficient torque is applied to move the load to reduce the error. It improves overall positioning accuracy, but low frequency oscillation may occur around the commanded position.

*CIT Configure In-Position Time

BDHXE v6.2	PDHXE 6.2
BLHX v5.9	PDHX 5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CITn	Milliseconds	n = 0 - 32,766	20	Immediate, Universal
				SEE ALSO CEW

Description
This command is used to specify the time period that the servo is to be within the in position window before the 'in position' signal is generated. The range of n is 0 to 32,767 and it represents the number of milliseconds to be used as the testing time frame. The shortest time for which the motor must be stopped and within the window before it is considered 'in position' is 2 milliseconds. If at any point during that 2 milliseconds the motor is outside the window, then the 'in-position' output will remain inactive.

Example

Command	Description
1OUT2T	Set output 2 as 'in position'
1CIT30	Set 'in position' time to 30ms
1CEW20	Set error window to 20 steps

***CIW**	**Configure Integral Action Window**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CIWn	User steps	n = 0 - 31,999	39	Immediate, Universal
				SEE ALSO OSB

Description
Sets the width of the position window within which integral action is active when the indexer demanded motion is complete.

Example

Command	Description
1CIW5	Figure 1-2 shows the integral action window set to 5 user steps by this command and it initiates final positioning under integral gain.

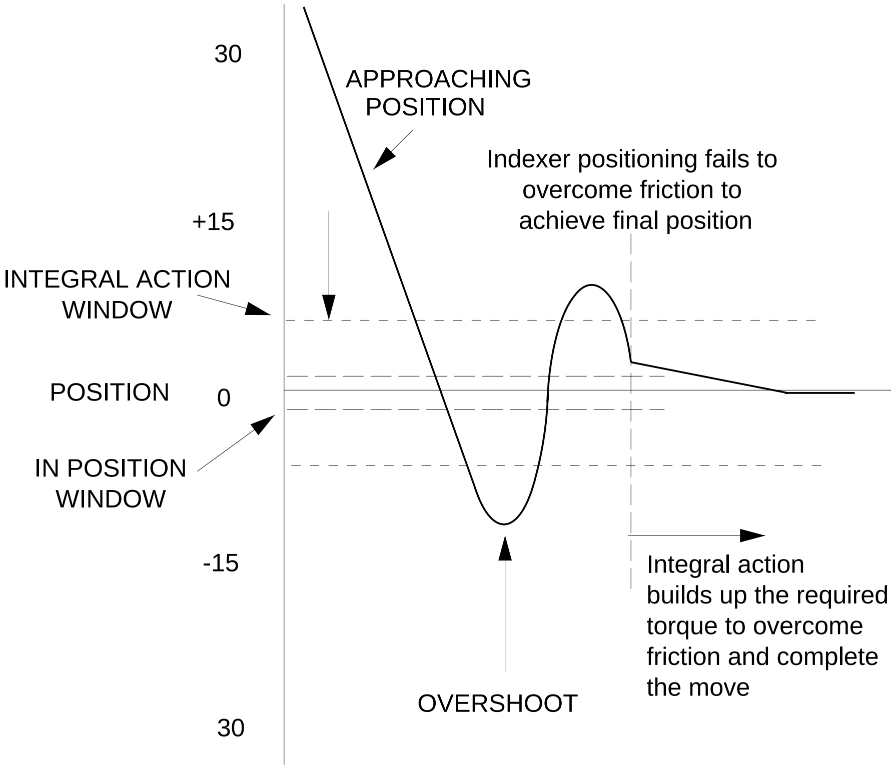

30
APPROACHING POSITION
Indexer positioning fails to overcome friction to achieve final position
+15
INTEGRAL ACTION WINDOW
POSITION
0
IN POSITION WINDOW
-15
Integral action builds up the required torque to overcome friction and complete the move
OVERSHOOT
30

Figure 1-2. Integral Action

***CIX**	**Configure Index Mark Resolution**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
<a>CIX	Steps/mark	1 - 32,767	RFS dependent	Immediate, Universal, *

SEE ALSO CUR, CMR, OSK

Description
For systems fitted with an incremental encoder with an index mark, this command programs the Controller with the encoder resolution in terms of the number of steps between index marks. This number is used for encoder error checking (see option OSK). It is usually the number of steps per rev of the motor and it will normally be 2000 or 4000 for a brushless system (4096 for DS). This parameter does not need to be changed unless the motor is changed to one having a different encoder resolution or number of steps per revolution.

Example 1

Command	Description
1CIX(VARn)	Set the index mark resolution for an encoder resolution contained within VARn

Example 2

Command	Description
1CIX2000	Set the index mark resolution for device 1 for a 500 line encoder

Note that the control module uses a x4 decoding circuit giving an effective resolution of 4 times the number of encoder lines.

*CJL Enter Combined Motor & Load Inertia

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CJLn	Kg-cm^2	N/A	RFS dependent	Immediate, Universal

SEE ALSO CTQ,

Description

This command has no effect on the behaviour of the Controller. It allows entry of the combined motor and load inertia in calculations.

Example

Command	Description
1CJL1.8	Defines a motor and load inertia of 1.8 Kg-cm^2

*CMR Configure Motor Resolution

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CMRn	Steps/rev	n = 1 - 32,767	4096	Immediate, Universal, *

SEE ALSO CUR, CIX

Description

Programs the Controller to match the motor resolution for the servo motor. The number n is determined by the encoder fitted to the motor relative to your required speed and velocity distance units (motor revs, metres, table revs etc.). It will normally be 2000 or 4000 for a brushless system to be programmed in rps units at the motor.

In systems using load mounted encoders to provide position feedback (SIM6), the CMR value needs to be set to match the load encoder resolution.

Note: The ratio between CMR and CUR will effect the value of D. If CMR : CUR is altered the distance travelled will remain the same.

Example 1

Command	Description
1CMR2000	Set the resolution for device 1 to be programmed in motor revs per second for a 500 line encoder

Note that the Controller uses a x4 decoding circuit giving an effective resolution of four times the number of encoder lines.

Example 2

Command	Description
1VAR30=2000	Set VAR30 to 2000
1CMR(VAR30)	Set the motor resolution for device 1 to be programmed in motor revs per second for a 500 line encoder

Note: Software scaling is the scaling of the encoder input when using the SIM3 or SIM4 commands to achieve following at a ratio greater or less than 1. Unlike hardware scaling, exact following ratios can be achieved by controlling both the numerator and denominator parts of the fraction used to set the scaling ratio, thus ratios such as 3:1 can be obtained.

The scaling ratio is set using the CMR command value divided by the CUR command value to give :

$$\text{Motor Output Rate} = \text{input rate} \times \frac{\text{CMR}}{\text{CUR}}$$

*COFF Configure Amplifier Offset

BDHXE v6.2 PDHXE **n/a**
BLHX v5.9 PDHX **n/a**
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>COFFn	N/A	n = -1024 - +1023	0	Immediate, Universal, *

Description
This command can be used to cancel the effect of an offset in the torque amplifier. An excessive offset error can sometimes be the cause of movement at power up, but it is unlikely to affect the closed loop operation unless it is very large. The value should be chosen such that at standstill, position demand equals actual position. It can be set by opening the loop (make CPG, CVG, CIG all zero) and adjusting COFF for zero drift, or reading back the position using the DPE command and setting COFF for the smallest error.

Example

Command	Description
1VAR2=10	Set variable 2 to the value 10
1COFF(VAR2)	Torque amplifier offset set to 10

Note 1023 represents the maximum torque in a given direction.

CPC Configure Motor Pole Count

BDHXE v6.2 PDHXE **n/a**
BLHX **n/a** PDHX **n/a**
X150DS **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CPCn	Motor pole pairs	4,6,8	6	Immediate, Device specific

Description
Configure motor pole count for the BDHX servo drive. The BDHX can work with 4,6 or 8 pole pair motors. This command allows you to configure the drive to work with non-Digiplan motors. The default setting is for Digiplan Motors which have 6 pole pairs.

NOTE: This command is only valid when the drive type is 7, that is for a BDHX-E servo drive.

Example

Command	Description
1CPC4	Configure the drive for use with a 4 pole pair motor

*CPE	Configure Position Error Limit	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CPEn	Motor steps	n = 0 - 32,767	4000	Immediate, Universal, *

SEE ALSO FSD

Description
Defines maximum allowed position error. If the absolute position error is greater than this number, the Controller will de-energise the drive. If a valid number in steps is entered, it will become the new maximum position error, otherwise the current setting is reported. Exceeding the maximum position error is a fault condition that will cause the amplifier to be shutdown. If the maximum position error is defined as 32,768 the shutdown function is disabled and no amount of position error will generate an error condition or shutdown the motor.

A stepper motor fitted with an encoder can also use CPE to provide Stall Detect. A stall is detected when the error between the commanded position and the actual position, determined by the encoder, exceeds the value set by the CPE command.

NOTE: In the event that the gain used during setting up is too great, a small position error setting will prevent oscillation and potential mechanical damage to the connected system.

Example

Command	Description
1CPE1000	Set the position error limit of device 1 to 1000 motor steps

***CPG**	**Configure Proportional Gain**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CPGn	N/A	n = 0 - 32,767	RFS dependent	Immediate, Universal, *

Description

This command is used to set the proportional gain. The proportional gain determines the amount of torque produced in response to a given position error. It sets the stiffness of the system and also affects the following error. A high proportional gain gives a stiff, responsive system but results in overshoot and oscillation which require damping.

If no value is supplied with the command, the previous setting is reported.

***CTG**	**Configure Filter Time Constant**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CTGn	Milliseconds	n = 0 - 32,767	0	Immediate, Device Specific, *

Description

Sets the time constant of the filter used to reduce the effect of transients at the input of the drive amplifier and to smooth the response of the incremental velocity feedback loop.

*CTQ Enter Motor Torque

BDHXE v6.2 PDHXE **n/a**
BLHX v5.9 PDHX **n/a**
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CTQn	Nm	N/A	3.6	Immediate, Universal, *

SEE ALSO CJL,

Description
This command has no effect on the behaviour of the Controller. It allows entry of the available motor torque in calculations.

Example

Command	Description
2CTQ2.4	Defines the maximum motor torque as 2.4Nm

*CUR Configure User Resolution

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CURn	User steps	n = 1 - 32,767	4000	Immediate, Universal, *

SEE ALSO CMR

Description
This command is used to define the number of steps per revolution required by the user. Previous D commands are reconfigured by the CUR command so that the move distance remains the same.

Example

Command	Description
1CUR2000	Set user resolution as 2000 steps/rev
D4000	Set distance to 4000 user steps (2 revs)
G	Go - move 2 revolutions

Example

Command	Description
1CUR4000	Set user resolution to 4000 steps/rev
1D4000	Set the move distance to 4000 steps (1 rev)
1CUR2000	Change the resolution to 2000 step/rev, but the distance programmed by the D command changes to 2000 so the move distance remains 1 revolution.

Example

Command	Description
1VAR30=1000	Set variable 30 to a value of 1000
1CUR(VAR30)	Set user resolution to 1000 steps/rev

Note: Software scaling is the scaling of the encoder input when using the SIM3 or SIM4 commands to achieve following at a ratio greater or less than 1. Unlike hardware scaling, exact following ratios can be achieved by controlling both the numerator and denominator parts of the fraction used to set the scaling ratio, thus ratios such as 3:1 can be obtained.

The scaling ratio is set using the CMR command value divided by the CUR command value to give :

$$\text{Motor Output Rate} = \text{input rate x } \frac{\text{CMR}}{\text{CUR}}$$

Note: The ratio between CMR and CUR will effect the value of D. If CMR : CUR is altered, the D value is automatically corrected so that the distance travelled will remain the same.

*CVG Configure Velocity Gain

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
<a>CVGn	N/A	n = 0 - 32,767	RFS dependent	Immediate, Universal, *

Description
Used to set the gain of the velocity feedback loop. The velocity feedback is a signal which increases with shaft speed. It acts in opposition to proportional feedback to stabilise the motion. This setting is generally used to damp vibrations in the servo response, allowing a higher proportional gain to be used.

*CVT	Configure Velocity Trip	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>CVTn	Revs/sec	n = 0.5 - 200.0	149.9	Immediate, Universal, *
				SEE ALSO CPE, CIX

Description

Defines maximum allowed motor speed for a servo system. If the absolute motor speed exceeds this value, the Controller will de-energise the drive. If a valid number is entered, it will become the new maximum speed. Exceeding the maximum speed is a fault condition that will cause the amplifier to be shut down. If the maximum speed is defined as zero the shutdown is disabled and no speed however great will generate an error condition or shutdown the motor. This command uses the CIX value to convert the rps figure to an encoder count rate trip. The resolution of this figure is coarse, 0.5 rps at 4000 steps/rev for example, and it should be set somewhat larger than the maximum indexing speed to allow for ripple.

Note: This command can be used if the module is operated as a velocity amplifier without position control (that is with CPG zero). It is also used with the SIM6 load feedback mode to provide a safety trip if the load encoder or the load coupling breaks.

Example

Command	Description
CVT50	Set the motor speed trip to 50 rps

After a CVT trip the message:

“#94 Shutdown by excessive motor speed”

will appear in response to the RSE command and RE will indicate ‘*B’ (de-energised). Bit 10, in the RSE bit list has been assigned to this fault and will be set. The status code for this error is 4, the same as the position error trip code.

CVT0 will disable the velocity trip limit.

D Distance

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>D<s>n	Steps	-268,435,454 to +268,435,454	4000	Buffered, Universal, Saveable in Sequence

SEE ALSO MN, MPA, MPI, A, V, G, MQ

Description
This command is used in MN and MQ to move the motor a number of steps (n) in the direction specified by <s>. The direction is assumed to be positive if no sign is given. The D command overrides a previous H command in terms of motor direction.

Example

Command	Description
MN	Normal mode
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
D-100000	A 4000 steps/rev motor will turn 25 revolutions in the negative direction
G	Go

The data value can be substituted with one of the Controller’s variable values.

Example

Command	Description
VAR5=40000	Load variable 5 with the value 40000
D(VAR5)	Set the move distance to 40000 steps
G	Go, a 4000 steps/rev motor will turn 10 revs

DCLR Clear Display on RP240

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>DCLRn	Line number	0, 1, 2	None	Buffered, Universal, Saveable in Sequence

SEE ALSO DPC, DTXT, DVO, DCNT

Description
The Clear Display (DCLR) command clears a specified line of the RP240 display, and repositions the cursor to the beginning of the line.

n= 0 Clear all lines of the RP240 display and positions the cursor at the beginning of the first line
n= 1 Clear line 1 of the RP240 display
n= 2 Clear line 2 of the RP240 display

Example

Command	Description
DCLR1	Clear line one (1) of the RP240 display

DCNT Enable/Disable Pause and Continue

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>DCNTb	None	0, 1	0	Buffered, Universal, Saveable in Sequence

RESPONSE TO aDCNT **IS** *b **SEE ALSO** DSTP, DTXT

Description
This command enables or disables the PAUSE and CONTINUE keys on the RP240.

DCNT0	Disable PAUSE and CONTINUE keys
DCNT1	Enable PAUSE and CONTINUE keys

When the PAUSE and CONTINUE keys are enabled (DCNT1), pressing the pause key will pause command execution. Pressing the CONTINUE key re-enables command execution.

Pressing the PAUSE key will not pause motion. It will pause execution of commands after the motor has come naturally to rest.

Once you have activated the PAUSE and CONTINUE keys, they will remain active at all times, although execution will be delayed while numeric or function key information is being requested (VARn=NUM or VARn=FUN).

When enabled, the CONTINUE key will also clear a pause condition set by either the PS or U command.

The PAUSE key can also be cleared by the C command or the active going transition of an input defined as function F e.g. 1IN3F

Example

Command	Description
1XE10	Erase sequence #10
1XD10	Begin definition of sequence #10
1DCNT1	Enable PAUSE and CONTINUE keys
1DSTP1	Enable STOP key
1XT	End definition of sequence #10

DFX Display Flags Indexer

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDFX	N/A	N/A	N/A	Immediate, Device Specific, Never Saved

RESPONSE TO aDFX **IS** *bbbb_.....

Description

Reports all indexer status flags as 36 bits where the response is:

bbbb_.............bbb[CR]

The order of the bits is *35,34,33,32_....._3,2,1,0

Response Bits:

35-32	are all reserved for future use
31	1= Paused waiting for TRMN command condition to be cleared
30	1= Paused waiting for TRMP command condition to be cleared
29	Reserved
28	1= Paused waiting for data entry on RP240
27	1= Instant pause, waiting for user defined pause input to clear
26	1= Checking for valid WHEN condition
25	Reserved
24	1= Paused waiting for registration trigger
23	1= Run sequence on power up
22	1= Executing a sequence
21	1= Paused, waiting on in-position
20	1= Paused, waiting on distance trigger bits
19	1= Paused, waiting on trigger bits
18	1= Tuning
17	1= Paused by PS command, waiting on C (continue)
16	1= Performing a wait
15	1= Homing 2nd leg, low speed move back to home limit
14	1= Homing 1st leg of home move, high speed to home limit
13	1= Go home move to encoder position
12	1= Home limit switch has been hit
11	1= -limit switch has been hit

Response Bits (continued):

10	1= +limit switch has been hit
9	1= Jogging is enabled, we are jogging
8	1= Skip next buffered command
7	1= Set if continuous move direction is negative
6	1= Set if current move direction is negative
5	1= Set if we want to change velocity
4	1= Set if in continuous mode,clear if in preset mode
3	1= Set if in absolute mode, clear if in incremental mode
2	1= Performing a variable speed move
1	1= Performing a preset move
0	1= Performing a continuous move

DIC — Display Indexer Counter

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDIC	User steps	-268435454 to +268435454	N/A	Immediate, Device Specific, Never Saved

RESPONSE TO aDICa **IS** *n **SEE ALSO** D, ID

Description
Requests a single display of the contents of the ndexer counter as a single value in steps at the user resolution. This is the programmed D value.

Example

Command	Response
1DIC	*1000 (CR). The counter is programmed for a D value of 1000 user steps.

DLED	Turn RP240 LEDs On/Off	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>DLEDn	None	0, 1, X	none	Buffered, Universal, Saveable in Sequence

SEE ALSO O

Description
The DLED command controls the state of the 8 LEDs on the RP240. A one will turn an LED on, a zero will turn an LED off, and an X will leave the LED unchanged from its last state.

The command example below reads from left to right and corresponds to the LEDs from top to bottom.

Example

Command	Response
DLED1100XX11	Turn LEDs 1, 2, 7 and 8 on, LEDs 3 and 4 off, and leave LEDs 5 and 6 unchanged
DLEDXX1	Turn LED 3 on, leave LEDs 1, 2 and 4 - 8 unchanged

DPA	Display Position Actual	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDPA	User steps	+268435454 to -268435454	N/A	Immediate, Device Specific, Never Saved

RESPONSE TO aDPA **IS** *n

SEE ALSO OSC, PZ, SP

Description
Continuous display of actual position. The response is the position in user steps which should have resulted from the number of clock pulses sent to the drive from the Controller since the drive was enabled or a PZ or SP command was issued, provided that the motor did not de-synchronise.

DPC Position Cursor on RP240

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>DPCnxx	Line number	1, 2	None	Buffered, Universal, Saveable in Sequence

SEE ALSO DCLR, DTXT, DVO

Description
The Position Cursor (DPC) command places the cursor at line n, column xx. The lines are numbered from top to bottom, 1 to 2. The columns are numbered from left to right, 00 to 39.

You must use 00, 01,02,.....09 instead of 0, 1, 2,.....9 for the column number (i.e. DPC208, not DPC28).

```
Line 1   00 01 02........... ......................................................37 38 39
Line 2   00 01 02...................................................................37 38 39
```

Once the cursor has been placed, all succeeding text (DTXT) or variable data (DVO) will be displayed beginning at the current cursor location. All numeric data entered using the VARn=NUM command will also be displayed at the current cursor location.

Example

Command	Response
DPC205	Position the cursor on line 2, column 5
“DTXT DIGIPLAN DEMO PROGRAM”	Place message DIGIPLAN DEMO PROGRAM at current cursor position

DPE Display Position Error

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v6.2
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDPE	User steps	-32,767 to +32,768	N/A	Immediate, Device Specific, Never Saved

SEE ALSO OSC

Description
Continuous display of position error. The response is the difference between the setpoint and the actual position in user steps. It is used by the position control algorithm to control motor current. The difference between command setpoint and actual position is also used to determine if the motor is within the deadband specified by the CEW command. The response is a single instantaneous value reported at 150ms intervals until the return key is pressed. See also OSC command.

DPE is valid for stepper drives if position maintenance or encoder mode is set.

DPS	**Display Position Setpoint**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
**aDPS	User steps	+268,435,454 to -268,435,454	N/A	Immediate, Device Specific, Never Saved

SEE ALSO OSC

Description
Continuous display of the commanded position. The response is repeatedly updated until the return key is pressed. It is the absolute number of pulses sent to the drive from the interface since the drive was enabled (or reset). See also OSC command.

DR Display Report

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDR<n>	N/A	1 - 3	N/A	Immediate, Device Specific, Never Saved

Description

This command reports the setup of the various parameters of the control module:

If n = 1, screen 1, the general status of the control module parameters is displayed.
If n = 2, screen 2, the status of the drive and indexer are displayed.
If n = 3, screen 3, the status of system switches are displayed.

If n is omitted, the selectable facilities are shown on consecutive displays.

The following examples show typical screen displays for DR1, DR2 and DR3 commands:

```
1DR1
;Product 5, BL 34/42 size brushless servo.  Indexer mode is MN, MPI
;Axis setup is indexer mode.
;No daughter boards fitted.  RP240 interface connected
;Indexer position..........=11565          Programmed Distance......D=40000
;Programmed Velocity......V=35             Programmed Acceleration..A=1000
;Go Home Final vel'y....GHF=0.09997558     Go Home Acceleration....GA=10.00976
;Jog Velocity............JV=1              Jog Acceleration........JA=99
;Limit Acceleration......LA=900.0244       Limit Disable...........LD=0
;User Resolution.........UR=4000           Motor (fb) resolution...MR=4000
;Proportional Gain.......PG=91             Velocity Feedback.......VG=25
;Filter Time Constant....TG=0.70           Velocity Feed Forward...FG=2
;Integral Action Gain....IG=0              Amplifier offset.......OFF=0
;Dynamic Error Limit.....PE=4000           Int. cation window......IW=40
;In position wait time...IT=20             In pos window(deadband) EW=50
;Dither Amplitude.......DTA=300            Dither Frequency.......DTF=50
;Position Error............=2              Command peak(clamp).....CP=1023
;Velocity Trip...........VT=150.00         Following Acc'n Gain....AG=1.00
;Following percent......FOL=100
```

```
1DR2
;Drive status is:
;No errors
*0000_0000_0000_0000_0000
;Index status flags are:
;N/A               N/A               N/A               N/A
;TRMNPAUSE         TRMPPAUSE         N/A               KEYPAUSE
;INSTPAUSE         WHENCHK           SINGLESTEP        TRRPAUSE
;PUSEQ             EXSEQ             TRIPPAUSE         TRDPAUSE
;TRIGPAUSE         TUNING            PAUSE             WAIT
;HOMESLOW          HOMEFAST          HOMEINDEX         HOMELIMIT
;HITLIMIT-         HITLIMIT+         JOGGING           SKIPPING
;DIR               NEG               MQ                MC
;ABSOLUTE          QPERFORM          PPERFORM          CPERFORM
*0000_0000_0000_0000_0000_0001_0000_0000_0000

>1DR3
;Software Switches are:
;A=~RS232_ECHO     N/A               N/A               D=01 (WDOG)
;N/A               N/A               G=LIM_SV          H=STOP_SV
;N/A               N/A               K=STOP_EN         N/A
;N/A               N/A               N/A               N/A
*0000_0000_0000_0000
;Other Switches are:
;A=IDX_HOME        B=SWITCH_IACT     C=SINGLE_DS       N/A
;E=JOG_ENABLE      N/A               N/A               N/A
;N/A               J=24BIT_GBOX      K=IDX_CHECK       L=N/A
;M=FAST_IACT       N/A               O=NOUNIT          N/A
*0000_0000_0000_0000
;Encoder Specific Switches are:
;N/A               B=MOT/ENC         C=POS. MAINT.     D=STOP STALL
;N/A               N/A               N/A               N/A
;N/A               N/A               N/A               N/A
;N/A               N/A               N/A               N/A
*0000_0000_0000_0000
>
```

Note: The bit field is read from left to right in blocks of 4.

DRD

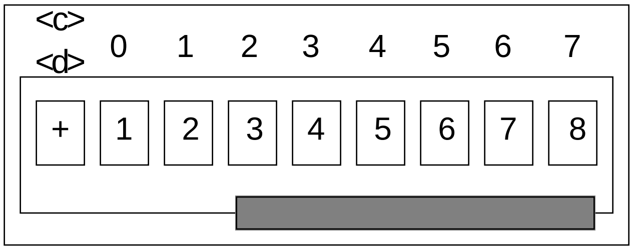
Read Distance Via Parallel Input/Output

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>DRD<c>, <d>,<e>	c, d =digit selector e = scaling factor	c, d = 0-7 e = 0-7	None	Buffered, Universal Saveable in Sequence

SEE ALSO STR

Description
This command instructs the Controller to read distance values from Compumotor's TM8 Module.



The command syntax allows for digit range selection through the optional <c><d> fields. The <c> field is used to signify the start of the digit range to be read from the TM8 Module. The raw data format is xxxxxxxxxx, the maximum value is 268,435,454. Any larger number will result in the Controller giving an error response. The <d> field represents the end of the digit range to be read. The values of these fields can range from 0 to 7 with the <c> field always being less than or equal to the <d> field value.

The <e> field is used to scale the distance value by 10^e. If the <c> and <d> fields are used, the <e> field must be used. If the <c>, <d> and <e> fields are not used, the DRD command will read all the digits of the TM8 Module. If you are using the TM8 Module, the Output Strobe Delay Time must be set at a value of 10 or greater.

You may use a PLC with the DRD command. The DRD command uses a multiplexed I/O scheme. The outputs strobe through a BCD sequence at the Set Strobe Output Delay Time (STR) command rate and reads one BCD digit at a time. The outputs and inputs must be configured as in the TM8 Module read case.

WARNING

The displayed distance is dependent upon the resolution used.

Example

Turn the TM8 Module's thumbwheels to display:
+ 1 2 3 4 5 6 7 8

Type the following commands:

Command	Response
DRD	Request all thumbwheel values
1D	Will give the response: **D+12345678*

DS Display Signal

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDSn	N/A	1-17	N/A	Immediate, Device Specific, Never Saved

SEE ALSO OSC

Description
Requests the continuous display of variable parameters. The PIC screen shown below is a representation of the control algorithm and any parameter in this diagram can be displayed. If n is omitted, a list of the signal displays is produced. See also OSC command.

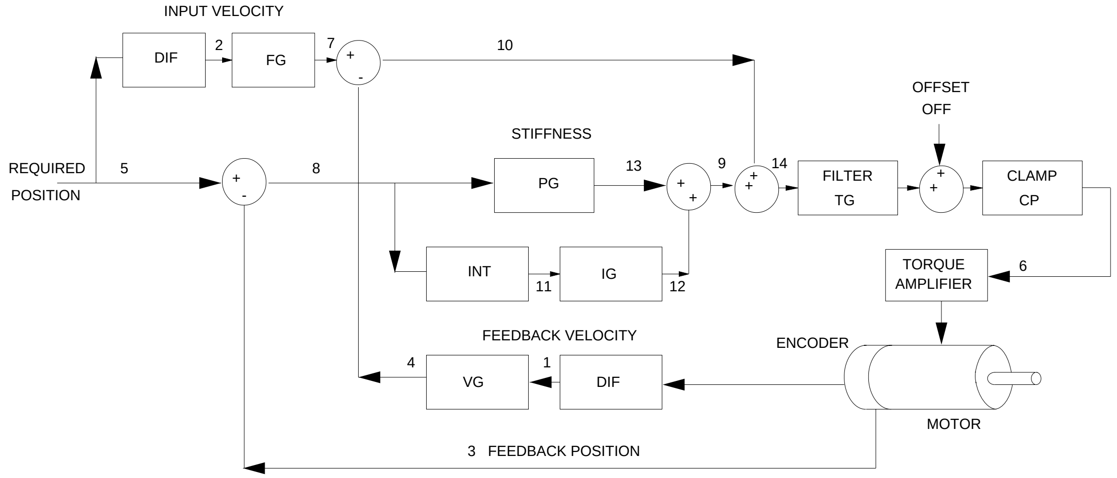


Figure 1-3. Servo Control Loop

The individual parameters are:

DS1	Motor velocity	DS4	Feedback velocity
DS2	Input velocity	DS5	Input position
DS3	Motor position	DS6	Filtered torque demand

DS7	Input velocity action
DS8	Position error
DS9	Demand less filtered velocity
DS10	Velocity action difference
DS11	Integral of position error
DS12	Integral action
DS13	Error times gain (= torque)
DS14	Torque demand
DS15	Unfiltered unscaled following count
DS16	Filtered unscaled following count
DS17	Filtered scaled following count

Example

Command	Description
1DS8	Shows the position error for RS232C Control Module 1

The significance of the numbers displayed will vary with the signal point chosen. Input and motor velocities are expressed in encoder edges per 500µS period, with a maximum value of +/-255. Other parameters have values between +32767 and -32768, except the torque demand which covers the range +1023 to -1023 for full torque. A continuous display of the maximum value indicates saturation.

DSTP Enable/Disable Stop

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>DSTPb	None	0, 1	0	Buffered, Saved in Sequences

RESPONSE TO aDSTP **IS** *b

SEE ALSO SSH, DCNT

Description

The DSTP command enables or disables the STOP key on the RP240.

DSTP0	Disable stop key
DSTP1	Enable stop key

When the STOP key is enabled (DSTP1), pressing the STOP key will cause the Controller to stop motion and to exit all loops and sequences.

DSTP can be used with SSH1 mode to save the command buffer when the STOP key is pressed.

Once you have enabled the STOP key, it will be enabled at all times.

Example

Command	Description
XE10	Erase sequence 10
XD10	Begin definition of sequence 10
SSH1	Enable save command buffer on stop
DCNT1	Enable PAUSE and CONTINUE keys
DSTP1	Enable STOP key
XT	End definition of sequence 10

DTXT	Display Text Data on RP240 LCD	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>DTXT"`text data`"		42 characters Max.	None	0 Buffered, Universal, Saveable in Sequence

SEE ALSO DCLR, DPC, DVO

Description

This command places the text string, `text data`, beginning at the current cursor location. The text string can be any alpha character from A to Z, or a to z, any numeric character from 0 to 9, or the following characters:

` ! @ # $ % ^ & ( ) - + = { } [ ] | : ' < > ? , . / *

A space or underscore "_" is used to separate words. The underscore will be displayed as a space on the RP240 display. The semicolon ";", backslash "\", and tilde "~" are illegal characters to use with the DTXT command. If the text string is too long, the text string will wrap around to the next line.

Example

Command	Description
DPC205	Position the cursor on line 2, column 5
DTXT "DIGIPLAN DEMO PROGRAM"	Place message DIGIPLAN DEMO PROGRAM at current cursor position

The text string must be enclosed by "quote marks. Within the " quote marks, the space character acts as an ordinary text character and not as a command delimiter.

DVA	**Display Velocity Actual**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
aDVA	Steps/500µs	±255	N/A	Immediate, Device Specific, Never Saved

SEE ALSO OSC

Description
This command returns a continuous display of the actual velocity. The number is reported in motor steps per 500µs, and is repeatedly updated until the return key is pressed. This value is the shaft velocity being read from the encoder, measured over a 500µs period. The DVA command has the same effect as the DS1 command. See also OSC command.

DVO	**Display Variable Data on RP240 LCD**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
<a>DVOn,n,n,b	None	see below	None	Buffered, Universal, Saveable in Sequence

SEE ALSO DTXT, DPC, DCLI

Description
The DVO command is used to display a variable at the current cursor location. Any of the fifty variables available in the Controller can be displayed.

1st n =	Variable Number (Range = 1 to 50)
2nd n =	Number of whole digits displayed, digits to left of decimal point (Range = 0 to 15)
3rd n =	Number of fractional digits displayed, digits to the right of the decimal point (Range = 0 to 5)
b =	Sign bit, 0 = no sign displayed, 1 = display plus or minus sign

Example

Command	Description
DPC205	Position the cursor on line 2, column 5
DVO2,2,1,1	Place variable 2 at current cursor position. If variable 2 contained the number 53.23, then +53.2 is displayed on the RP240 LCD starting at column 5, line 2

DVS Display Velocity Setpoint

BDHXE v6.2 PDHXE **n/a**
BLHX v5.9 PDHX **n/a**
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDVS	Steps/500µs	±255	N/A	Immediate, Device Specific, Never Saved

Description
Requests a continuous display of the velocity setpoint. The displayed value is the velocity being sent to the velocity part of the servo loop by the servo algorithm. It is repeatedly updated until the return key is pressed. The DVS command has the same effect as the DS2 command. See also OSC command.

DW Dead Band Window

BDHXE **n/a** PDHXE v6.2
BLHX **n/a** PDHX v5.9
X150DS **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aDW<n>	n=motor steps	0-32767	10	Buffered, Saved in sequences

Description
The Dead Band Window (DW) command sets the number of encoder pulses the encoder may be in error, before position maintenance corrects for that position error. If the number is set too small, the motor may oscillate about its correct position.

Example

Command	Description
DW20	The motor may have an error of 20 pulses before position maintenance will attempt to correct that error.

E Enable Communications

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>E	N/A	N/A	N/A	Immediate, Universal

SEE ALSO F, SSA, EX

Description
This command allows the Controller to accept commands over the serial communications interface. You can re-enable the the communications interface with this command if you had previously disabled the RS232C interface with the F command. If several units are using the same communications interface, use of the E and F commands can help to streamline programming.

Example

Command	Description
F	Disable communications all axes
1E	Enable communications axis 1
4E	Enable communications axis 4
A10	Set acceleration to 10 revs/sec^2
V5	Set velocity to 5 revs/sec
D5000	Set distance to 5000 steps
G	Only axes 1 and 4 move

ELSE ELSE

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>ELSE	N/A	N/A	None	Buffered, Universal, Saveable in Sequence

SEE ALSO IF, NIF

Description

This command is used in conjunction with the IF and NIF commands to provide conditional program flow. If the IF condition is true, the commands between the IF and ELSE commands are executed, with the commands after the ELSE command ignored until the NIF command is encountered. If the IF condition is false, the commands between the ELSE and NIF commands are executed. The ELSE command is optional and does not have to be included in the IF statements.

<IF> (condition) commands <ELSE> commands <NIF>

Example

Command	Description
IF (INXXX1 OR VAR1>20)	If input status is XXX1 or variable 1 greater than 20 then execute the next command. If not, execute the command preceeding the ELSE command
XR1	Execute sequence 1
ELSE	Else
XR2	Execute sequence 2
NIF	End of IF statement

EX	Set Communication Style	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aEXn	N/A	n = 0 or 1	User messages sent (EX1)	Immediate, Device Specific,

SEE ALSO SSA

Description
Sets the style of communication between the Controller and the terminal/computer.

n = 1 sets terminal mode i.e. user-friendly messages.
n = 0 sets computer mode i.e. no user-friendly messages are sent.

The ">" prompt is not returned when n = 0

F	Disable Communications	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>F	N/A	N/A	N/A	Immediate, Universal

SEE ALSO E, EX, SSA

Description
The F command disables command execution by devices connected to the RS232C Control Module. The disabled device will still echo back commands sent to it however. It is useful when you are programming multiple devices on a single interface. Devices that are not intended to respond to universal commands should be disabled using device specific F commands. This enables you to program other devices without specifying a device indentifier on every command. This command is auto-saved.

Example

Command	Description
1F	Disable axis 1
3F	Disable axis 3
G	All axes except 1 & 3 will move

FOL Following Percent

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>FOLn	Percent	0.0 - 5000.0	100	Buffered, Universal

SEE ALSO SIM, CCS

Description

During preset following indexing mode (SIM5) the move velocity in rps is set as a percentage of the following input velocity in rps by the FOL command value.

Example

Command	Description
CUR800	Pulse source resolution in pulses / rev
1CCS3	With clock and direction decode
CMR4000	The interface motor resolution
MN	Set mode to normal
MPI	D values are incremental
1SIM5	Set indexer mode to preset following
FOL50.0	Follow at 50% of the input encoder/clock rate
A100	Acceleration fixed at 100 rps/s
D16000	Will move 4 revs
G	The motor will accelerate at 100 rps absolute to 1/2 the input encoder/clock speed in rps

The CMR / CUR ratio matches the input/output pulse rate, allowing FOL to control the output velocity in rps.

FP Following Encoder Trigger Point

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
FPnnn	nnn=encoder count	±268,435,454	N/A	Buffered

SEE ALSO SIM, PFZ

Description
This command suspends normal command execution until a pre-defined encoder count is registered.

Example

Command	Description
FP500	Normal command execution continues once an encoder count of 500 is registered

The value programmed into FP cannot be read back. This command cannot be used in SIM0 mode of operation.

Warning - If an encoder is not fitted and the FP command is used, all buffered commands will remain suspended while waiting for the correct condition to be met. The commands ‘S’ and ‘K’ will terminate the ‘FP’ command.

FRD Read Following Value Via Parallel Input/Output

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>FRD<c><d><e>	c, d =digit selector e = scaling factor	c, d = 0-7 e = 0-7	None	Buffered, Universal, Saveable in Sequence

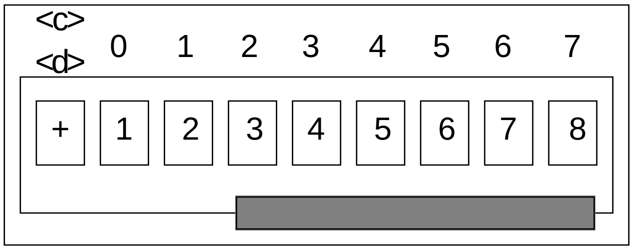
SEE ALSO STR, FOL

Description
FRD instructs the Controller to read Following Ratio values from the TM8 Module - refer to the TM8 Module section within the drive User Guide.

The command syntax allows for digit range selection through the optional <c><d> fields. The <c> field is the start of the digit range and the <d> field is the end of the digit range that the TM8 Module reads. The raw data format is XXXX.X, the maximum value = 5000.0. Any larger number will result in a ? response. The <c> field is always less than or equal to the <d> field value.

The <e> field scales the following value by 10^e. If the <c> and <d> fields are used, the <e> field must be used. If the <c>, <d>, and <e> fields are not used, FRD will read all the TM8 Module’s digits. If you use the TM8 Module, the Output Strobe Delay Time (STR) must be set to 10 or greater.

You may use a PLC with FRD to enter data into the Controller upon execution of a FRD command, the outputs strobe through a BCD sequence at the Set Strobe Output Delay Time (STR) command rate and read one BCD digit at a time. The I/O must be configured as in the TM8 Module.



Example

Turn the TM8 Module's thumbwheels to display:
+ 1 2 3 4 5 6 7 8

Type the following commands:

Command	Response
FRD0,4,0	Request ratio from digits 0-4
1FOL	
FOLLOWING PERCENT = 1234.5%	
FRD3,3,0	Request digit 3
1FOL	
FOLLOWING PERCENT = 000.4%	
FRD3,5,1	Requests digit range 3 through 5 multiplied by 10^1
1FOL	
FOLLOWING PERCENT = 456%	

FS Encoder Function Report

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aFS	none	none	none	Immediate, Never Saved

Description
The status of the FS_FLAGS will be reported back to show the mode in which the stepper will function with an encoder connected. The command FS will report the stepper encoder switches with a response *bbbb_bbbb_bbbb_bbbb where the order of the bits is:

```
(X)BCD_(X)(X)(X)(X)_(X)(X)(X)(X)_(X)(X)(X)(X)
```

(X) = not used. Therefore bit 2 indicates the status of FSB, bit 3 the status of FSC etc.

```
;Stepper Encoder Switches are:
;N/A          B=MOT/ENC       C=POS. MAINT.      D=STOP STALL_
;N/A          N/A             N/A                N/A
;N/A          N/A             N/A                N/A
;N/A          N/A             N/A                N/A
*0000_0000_0000_0000
```

FSB Set Indexer to Motor/Encoder Step Mode

BDHXE **n/a** PDHXE v6.2
BLHX **n/a** PDHX v5.9
X150DS **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES

<a>FSBn	n=mode	0=motor steps 1=encoder steps	0	Buffered, Saveable in Sequence

SEE ALSO CER, D, CMR

Description
The Set Indexer to Motor/Encoder step mode (FSB) command sets the indexer to perform moves in either motor steps or encoder steps.

FSB0: Motor steps
FSB1: Encoder steps

In Motor Steps mode, the distance command (D) defines moves in motor steps. In Encoder Step mode, the distance command defines moves in encoder steps.

You must set up the indexer for the correct encoder resolution. The CER command defines encoder resolution.

Enabling Encoder Step Moves does not guarantee that your moves will position to the exact encoder step commanded. Position maintenance (FSC) must be enabled to activate closed-loop servoing.

Example

Command	Description
CER4000	Set up encoder. 4,000 encoder pulses (1,000 lines) are produced per unit of the motor
FSB1	Set moves to encoder step mode
A10	Set acceleration to 10 rps^2
AD15	Set deceleration to 15rps^2
V5	Set velocity to 5rps
D4000	Set distance to 4,000 encoder steps
G	Executes the move (Go)

FSC Enable/Disable Position Maintenance

BDHXE **n/a**	PDHXE v6.2
BLHX **n/a**	PDHX v5.9
X150DS **n/a**	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>FSCn	n=mode	0=disable 1=enable	0	Buffered, Saveable in Sequence

SEE ALSO CPG, DW, CER, FSB

Description

FSC1: Enable Position Maintenance
FSC0: Disable Position Maintenance

Enabling position maintenance causes the indexer to servo the motor until the correct encoder position is achieved. This occurs at the end of a move (if the final position is incorrect) or any time the indexer senses a change in position while the motor is at zero velocity. You must have an encoder connected to enable position maintenance. Position maintenance can only be enabled if Encoder Step mode is selected (FSB1).

Example

Command	Description
CER1000	Set up encoder resolution to 1,000 counts/revolution
FSB1	Set moves to encoder step mode
FSC1	Enable position maintenance
V5	Set velocity to 5rps
D4000	Set distance to 4,000 encoder steps
G	Executes the move (Go)

FSD	**Stop on Stall**	BDHXE **n/a**PDHXE v6.1 BLHX **n/a** PDHX v5.9 X150DS **n/a**

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
aFSDn	n=mode	0=off 1=on	0	Buffered, Saveable in Sequence

SEE ALSO CPE, CER, XFK, FS

Description

FSD1: Stall Detetion Active
FSD0: Stall Detection Inactive

If you enter FSD0, the indexer will attempt to finish the move when a stall is detected, even if the load is jammed. A stall occurs when the position error exceeds the maximum position error (CPE). If you enter FSD1, the indexer will stop the move in progress when it detects a stall. The move is stopped with a controlled deceleration defined by A.

Example

Command	Description
DW100	Set window value to 100 steps
CER2000	Set encoder resolution to 2,000 steps/rev
FSD1	Enable stop on stall

G Go

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>G	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO S, MN, MC, MQ, A, V, D

Description
Go - make a move using the previously entered parameters. It is not necessary to re-enter A, V and D.

Example

Command	Description
MN	Select normal mode
A10	Set acceleration to 10 revs/sec/sec
V10	Set velocity to 10 revs/sec
D100000	Set distance to 100,000 steps
G	Go

GA Go Home Acceleration

BDHXE v6.2 PDHXE v6.2
BLHX v5.9PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>GAn	Revs/sec^2	n = 0.06 - 999,999	10	Buffered, Universal, Saveable in Sequence

SEE ALSO GH, GHF, RG

Description
This command is used to set the acceleration rate to be used in performing the GH command. The value can be saved in non-volatile RAM. The default is changed by the user if the GA command is issued and then a save is performed (SV command).

If n=0, there is no acceleration period. The maximum possible acceleration is used.

If using low values of acceleration, a check should be made to ensure that it has not been rounded down to zero.

GH Go Home

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>GH<s>n	Revs/sec	n =100-0.01 and -0.01 to -100	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO RG, GH, GHF

Description
Go Home + or -. This command causes the Controller to rotate the motor in the direction and at the speed specified until its home limit input is activated.

The GH+2 command causes the Controller to seek the home position at 2 revs/sec. The sign is optional (a "+" or positive is assumed if omitted). The controller will reverse direction if a limit is activated and it will cease the attempt to go home if the second limit is also activated.

Note that the GH command will reset the absolute position counter to zero. If you want to set the counter to another value, use the SP command after the GH is complete.

Example

Command	Description
GH-2	Motor will turn negatively at 2 revolutions per second and look for Home limit input to go active. It will then stop, reverse and finally stop completely when the home switch is hit for the second time.

GHF Go Home Final

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>GHFn	Revs/sec	n = 0.01 - 100	0.1	Buffered, Universal, Saveable in Sequence

SEE ALSO GH, GA, RG

Description
This command is used to set the velocity for the final move in the go home sequence.

The value can be saved in battery backed up RAM.

GOSUB GOSUB Sequence

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>GOSUBn	n=sequence number	1 - 64	None	Buffered, Universal, Saveable in Sequence

SEE ALSO XR, XG, GOTO, XRT, XT

Description

GOSUB jumps to the designated sequence to continue program execution. If an XT or XRT command is reached in the called sequence, program execution returns to the originating sequence. The maximum number of nested sequences is 16. Nesting is a sequence calling a sequence that also contains a GOSUB command. When the GOSUB routine is completed, program control returns to the statement following the GOSUB command.

The data value can be substituted with one of the Controller's variable values. The integer value of the variable is always used.

Example

Command	Description
VAR1=4	
GOSUB(VAR1)	Call sequence #4 as a subroutine

Example

Command	Description
XE5	Erase sequence #5
XD5	Define sequence #5
A2	Set acceleration to 2 rps^2
V5	Set velocity to 5 rps
D25000	Set distance to 25,000 steps
GOSUB2	Call sequence #2 as subroutine
D50000	Set distance to 50,000 steps
GOSUB2	Call sequence #2 as subroutine
XT	End defining sequence #5
XE2	Erase sequence #2
XD2	Define sequence #2
G	Execute move
1PR	Report position request
XT	End defining sequence #2
XR5	Execute sequence #5

GOTO GOTO Sequence

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>GOTOn	n=sequence number	1 - 64	None	Buffered, Universal, Saveable in Sequence

SEE ALSO XR, XG, GOSUB

Description

This command transfers program control to a designated sequence to continue program execution. Once you jump to a sequence using the GOTO command, the program will not automatically return to the originating sequence as a GOSUB operation would execute*. There are no limitations on the number of GOTO commands as there is no nesting involved.

The data value can be substituted with one of the Controller's variable values. The integer value of the variable is always used.

*Note if a GOTO command is used following an IF command the code jumped to must be preceded by a NIF command to clear the original IF command.

Example

Command	Description
VAR1=4	
GOTO(VAR1)	GOTO sequence #4

Example

Command	Description
XE5	Erase sequence #5
XD5	Define sequence #5
A2	Set acceleration to 2 rps^2
V5	Set velocity to 5 rps
D25000	Set distance to 25,000 steps
GOTO2	Goto sequence #2
XT	End defining sequence #5
XE2	Erase sequence #2
XD2	Define sequence #2
G	Execute move
1PR	Report position request
XT	End defining sequence #2
XR5	Execute sequence #5

H Change Direction

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>H	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO H+, H-, D

Description
This command reverses direction of the next move.
The D command could subsequently be used to reset the direction.

Example

Command	Description
D8000	Set distance to 8000 steps
G	Go - move 8000 steps in the + direction
H	Reverse direction
G	Go - move 8000 steps in the - direction

^H Backspace

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
^H	N/A	N/A	N/A	Immediate, Never Saved

Description
This produces a backspace during command input, deleting the last character. It will not prevent the execution of an immediate command.

The ^H command (^H indicates that the CONTROL or CTRL key is held down when the H key is pressed) backspaces one character provided a delimiter has not been sent. A new character may be entered at that position to replace the existing character. The effect of this command character is to cause the Controller 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.

Because the Controller processes each command upon receipt of the delimiter, it is not possible to backspace once the delimiter is encountered. If you type a device address wrongly, you must re-type the whole command.

H+ & H- Set Direction

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>Hs	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO H, D

Description

Sets the direction of all moves according to s = "+" (positive) or "-" (negative). A subsequent D command will reset the direction for following moves.

Example

Command	Description
H-	All moves are made negative until otherwise specified in the command string

HALT Halt

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>HALT	None	None	None	Buffered, Saveable in Sequence

SEE ALSO K

Description

The HALT command stops program execution and clears the command buffer.

Example

Command	Description
XE1	Erase sequence #1
XD1	Define sequence #1
A2	Set acceleration to 2 rps^2
V2	Set velocity to 2 rps
D100000	Set distance to 100,000 steps
L25	Loop 25 times
G	Execute move (go)
IF(IN_10)	If input 1 on and input 2 off execute all commands until NIF encountered
HALT	Terminate program execution
NIF	End of IF statement
N	End of loop
XT	End defining sequence #1

ICON

Input Configuration

BDHXE v6.2	PDHXE v6.2
BLHX **n/a**	PDHX **n/a**
X150DS **n/a**	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aICONn	N/A	N/A	00011100	Immediate, Universal Saveable in Sequence

SEE ALSO OCON

Description

The ICON command configures the user inputs as +5V or +24V pull-up inputs or 0V pull-down inputs. The command can also be used to determine the Vs voltage supplied (+5V or +24V) and the destination of the primary feedback from the encoder.

The format for n, the input pattern, is specified by:

bbbbbbbb

This pattern represents from left to right:

PL1 PL2 PL3 SL1 SL2 SL3 VOL ENC

Where:

PL1 to PL3 set the voltage to which a bank of inputs is pulled up to.

PLx Value	Pull-up Level
0	5V
1	24V

SL1 to SL3 set the sense level of each bank of inputs.

SLx Value	Function
0	Pull down (sink)
1	Pull up Source

VOL sets the level of voltage available at the Vs output connector.

VOL Value	EXT V
0	5V
1	24V

ENC defines the connection of the encoder feedback. The BDHXE has only one user encoder connection (Ext. Enc.) which can be used for a load mounted encoder when ENC=1. For following applications, the same input is used (Ext. Enc.) with ENC=0.

Note: the BDHXE cannot follow and use a load mounted encoder at the same time.

ENC Value	Encoder Input (Ext. Enc.)
0	Following applications
1	Load mounted encoder

The PDHXE has two user encoder connections ‘Prim. Enc.’ and ‘Ext. Enc.’ controlled by ENC as explained below.

ENC Value	Primary Encoder Input	External Encoder Input
0	Position maintenance or following	Not currently used
1	Not connected	Position maintenance or following

Note: the PDHXE cannot provide position maintenance and following at the same time.

Example

Command	Description
1ICON10101010	Configure inputs

Bank 1: 24V rail voltage and pull down
Bank 2: 5V rail voltage and pull up
Bank 3: 24V rail voltage and pull down
External voltage set to 24V
See above tables for ENC setting

ID	**Immediate Distance**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>ID<s>n	Steps	-268,435,454 to +268,435,454	4000	Immediate, Universal

SEE ALSO D

Description

During motion, the distance the motor is travelling can be altered to a new value set by the ID command. An attempt to change the motion direction or to set the target within the current stopping distance causes the unit to stop immediately at the currently programmed acceleration rate - if you are in terminal mode a warning message is returned. In incremental mode the sign is ignored and the distance is relative to the original start point of the current move, and in the same direction of motion. When stopped the ID command is simply an immediate version of the D command.

Example

Command	Description
MN	Normal preset movement
MPA	Absolute programming
PZ	Force current position 0
D-140000	Target is -140000
G	Start moving
ID-40000	Change target
IPR	Reports -40000 at end of move

IF	**If**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>IF<e>	e = evaluation commands	refer to evaluation commands	None	Buffered, Saveable in Sequence

SEE ALSO ELSE, NIF

Description

This command is used in conjunction with the ELSE and NIF commands to provide conditional program flow. If the IF condition is true, the commands between IF and ELSE are executed. Commands after ELSE are ignored until NIF is encountered. If the IF condition is false, commands between the IF and ELSE are ignored, and commands between the ELSE and NIF are executed. The ELSE command is optional and does not have to be included in IF statements.

Only two conditions may be tested in each IF condition statement using logic operators AND or OR only.

IF statements can be nested, up to a maximum of 16 levels.

IF(condition)...commands...ELSE...commands...NIF

Example

Command	Description
IF(VAR1>5 AND IN_XXXX11)	If variable 1 is greater than 5, and inputs 5 and 6 are active, execute sequence 1, else sequence 2
XR1	Execute sequence 1
ELSE	Else
XR2	Execute sequence 2
NIF	End of IF

Note if a GOTO command is used to jump out of an IF - ELSE - NIF loop the code jumped to must be preceded by a NIF command to clear the original IF command.

IFOL Percent

Immediate Following

BLHX v5.9

BDHXE v6.2 PDHXE v6.2
PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>IFOLn	Percent	0.1 - 5000.0	100	Universal, Device specific, Immediate

SEE ALSO SIM, CCS, FOL

Description

This is an immediate version of the FOL command. During sequence execution the following ratio in SIM5 mode can be altered to a new value using the IFOL command. In response to the IFOL command the motor will accelerate or decelerate to the new following ratio at the acceleration rate defined by A.

The IFOL command uses the RS232C communication link to alter the motor following ratio.

Example

Command	Description
1XE1	Erase sequence
1XD1	Define sequence
1CUR800	Pulse source resolution in pulses/rev
1CCS3	With clock and direction decode
1CMR4000	Motor resolution
1MC	Mode continuous
1SIM5	Preset following mode
1FOL50.0	Set default following ratio at 50% of the input encoder rate
1A100	Set acceleration rate as 100 rps/rps
1G	The motor will accelerate at 100 rps/rps and run until commanded to stop
1XT	Terminate sequence
1SV	Save sequence to memory
1XR1	Run sequence one
1IFOL80	Set following ratio at 80% of the input encoder rate from the terminal

IN

Set Input Function

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>INn<func>	N/A	N/A	N/A	Buffered, Functions are Saveable

SEE ALSO INL, IS

Description

For the X150 the active state of the user definable inputs is determined by links 15 and 17 as shown below. The sense level of the user definable inputs can be changed from 24V to 5V operation by transferring links 14 and 16 to position B.

LINKS 15 & 17	LOGIC "1" (ACTIVE)	LOGIC "0" (INACTIVE)
A	0V	+24V or open circuit
B	+24V	0V or open circuit

For the X150E the active state and sense levels of user definable inputs is determined by the ICON command.

The IN command determines the function assigned to each of the 10 user definable inputs.

FUNCTION A TRIGGER INPUT - Used with the TRE,TRN and IN command. Trigger active at logic 1 level.

FUNCTION B SEQUENCE STROBE INPUT - Set input as sequence strobe. Sequence select active on logic 0 to 1 transition.

FUNCTION C KILL INPUT - Immediately halts execution of a move and dumps the sequence or command buffer. Same as Kill (K) command. Kill active on logic 0 to 1 transition.

FUNCTION E DRIVE SHUTDOWN INPUT - Enables and disables the drive. Same as ON and OFF commands. Shutdown is active at logic 0 level, therefore the input must remain active (e.g. normally closed switch) for normal operation.

FUNCTION F PAUSE/CONTINUE INPUT - Pause and continue command execution. Same as pause (PS) and continue (C) commands.

Logic 1 = Pause execution
Logic 0 = Continue

FUNCTION G GO INPUT - Initiates a move. This is entered as a GO (G) command. Go is active on the logic 0 to 1 transition.

FUNCTION H DIRECTION INPUT - Used to toggle the direction of the motor. Same as entering the H command. You must toggle the input from logic 0 to logic 1 to change direction.

FUNCTION J JOG CW INPUT - This input initiates jogging in the CW (positive) direction. To use this command jogging must be enabled using the OSE1 command.

FUNCTION K JOG CCW INPUT - This input initiates jogging in the CCW (negative) direction. To use this command jogging must be enabled using the OSE1 command.

FUNCTION M TERMINATE LOOP INPUT - Terminates loop after finishing the current pass. Same as Y command.

FUNCTION N DATA INPUT - Loads parallel bytes of data. This input is used to input data ie distance, velocity, loop count and variables etc. Four inputs are required. See DRD, FRD, LRD, TRD, VARD, VRD, XRD.

FUNCTION O SEQUENCE DATA INPUT - Executes sequence from input. Sequence defined as binary pattern and used with INnB as strobe.

FUNCTION P MEMORY LOCK INPUT - Prevents sequence editing and prevents the use of some commands. This input is useful if you do not want others to access your program or to modify parameter values.

INPUT ON	Lock out sequence editing and commands
INPUT OFF	Do not lock out commands

Commands locked out are CPE, CPG, CPM, RIFS, XE and XD. The indexer will report its setting, but you cannot change or use those commands while you are in a locked-out mode.

FUNCTION Q	Continue, following a pause due to PS command received.
FUNCTION R	RESET INPUT - Invokes a software reset. Same as Z command. Active at the logic 1 level.
FUNCTION T	POSITION ZERO INPUT - Sets the present position as the absolute zero position. Same as PZ command. Active on the logic 0 to 1 transition.
FUNCTION W	DATA SIGN INPUT - Input used with DRD, VRD command to indicate the sign of the distance value being loaded. If a data sign input is not defined, the sign defaults to a + sign. INPUT at logic 1 - sign is negative INPUT at logic 0 - sign is positive

Example

Command	Description
1IN4C	Configure input 4 as kill input
1IN9N	Configure input 9 as a data input
1OUT5J	Configure output 5 as a strobe output

INL Set Active Input Level

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>INLn	n=active level	1=high 0=low X=no change	0	Buffered, Saveable in Sequence

Description
This command configures the logic level the drive considers to be an active input signal.

INL0 Sets a low level (closed) as an active signal
INL1 Sets a high level (open) as an active signal

This command allows you to use either normally-closed (INL1) or normally-open (INL0) switches.

Example

Command	Description
1INL	Sample present active levels *0000000_0000000000
1INLXXXX10X_1XX1X0XX	Set active levels
1INL	Re-sample active levels

Input active levels are:
LMT+ LMT- HOME AUX-IN STOP ENG INDEX_I1 I2 I3 I4 I5 I6 I7 I8 I9 I10
*0000100_1001000000

IO Immediate Output

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>IObbbbbb	N/A	b = 0, 1, X	N/A	Immediate, Universal, Never Saved

Description
This command sets the output bits as specified in the pattern on an immediate basis. b = 0, 1 or X (X leaves the output unchanged).

Example

Command	Description
2IO10X	This command sets the outputs of device 2 : O1 to 1 and O2 to 0. It leaves O3 unchanged. 04 to 06 are also left unchanged.

IS	**Input Status**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
aIS	N/A	N/A	N/A	Immediate, Device Specific, Never Saved

SEE ALSO IN

Description
Report Input status. The response is:

```
*bbbbbbb_bbbbbbbbbb[CR]
```

The pattern of the response is, from left to right:

```
LIMIT+  LIMIT-  HOME  AUX-IN  STOP  ENG  INDEX  -
IN1  IN2  IN3  IN4  IN5  IN6  IN7  IN8  IN9  IN10
```

This is an immediate command that will report the status of all the inputs no matter what the configuration.

Active inputs are indicated by 1's.

Example

Command	Response
1IS	*0000000_1000000000[CR]. This indicates that only Input 1 is active

IV	Immediate Velocity	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>IVn	Revs/sec	n = 0.0001 to 200.00	1	Immediate, Universal
				SEE ALSO V

Description
This is an immediate version of the V command. During motion, the speed the motor is travelling can be altered to a new value set by the IV command. In response to the IV command the motor will accelerate or decelerate to the new velocity, but will still travel the programmed distance.

The IV command uses the RS232C communication link to alter the motor velocity. If the motor is already stopping at the end of a move a warning message is returned (terminal mode only).

Example

Command	Response
MN	Normal preset movement
MPA	Absolute programming
V5	
D-140000	Target is -140000
G	Start moving
IV20	Speed up during move
1PR	* - 140000 (shows end point is unchanged)

IVAR Immediate Variables

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>IVARn	n=variable	1 - 50	N/A	Immediate, Device specific

SEE ALSO VAR

Description
This is an immediate version of the VAR command. During sequence execution the value of a variable can be altered to a new value using the IVAR command. In respones to the IVAR command the variable specified will be loaded with the new value. The new value is automatically saved to memory.

The IVAR command uses the RS232C communication link to alter the value stored within a specified variable.

Example

Command	Response
1XE1	Erase sequence
1XD1	Define sequence
1MN	Mode normal
1VAR1=4000	Load variable 1 with the value 4000
1A100	Acceleration rate 100 rps/rps
1V10	Velocity 10 rps
1L	Infinite loop between L and N
1D(VAR1)	Distance to travel is defined by the contents of VAR1
1G	The motor will move the distance specified by D
1N	
1XT	Terminate sequence
1SV	Save sequence to memory
1XR1	Run sequence 1
1IVAR8000	Change distance to 8000 on the next execution of the infinite loop from the terminal

JA Jog Acceleration

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>JAn	Revs/sec^2	n = 0.06 - 999,999	99	Buffered, Universal, Saveable in Sequence

SEE ALSO JV, OSE

Description
Sets the jog acceleration. The acceleration rate used in jog operations is set by this command.

If n=0, there is no acceleration period. The maximum possible acceleration is used.

If using low values of acceleration, a check should be made to ensure that it has not been rounded down to zero.

Example

Command	Description
JV1.5	Set jog speed to 1.5 revs/sec
JA20	Set jog acceleration to 20 revs/sec/sec

JV Jog Velocity

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>JVn	Revs/sec	n = 0.0001 - 200	1	Buffered, Universal, Saveable in Sequence

SEE ALSO JA, OSE

Description
Sets the jog velocity. The velocity used in jog operations is set using this command. The factory default can be changed by saving a new JV value to non-volatile RAM using the SV command.

Example

Command	Description
JV1.5	Set jog speed to 1.5 revs/sec
JA20	Set jog acceleration to 20 revs/sec/sec

K Kill

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>K	N/A	N/A	N/A	Immediate, Universal, Never Saved

SEE ALSO S, LS, HALT, XFK

Description
Kill - This command stops Controller commands to the motor. In addition it terminates a loop, ends a time delay, and clears a pause. The command buffer is also cleared.

Program control will pass to a fault sequence, if defined.

KILL Kill

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>KILL	N/A	N/A	N/A	Immediate, Universal, Never Saved

SEE ALSO S, LS, HALT

Description
This is an alternative expression for the K command. It stops controller commands to the motor. In addition it terminates a loop, ends a time delay, and clears a pause. The command buffer is also cleared.

L	Loop	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>L<n>	Times	n = 0 - 200,000	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO Y, N, LRD

Description
When combined with the N command, the L command will cause all of the commands between L and N to be repeated the number of times indicated by n. If L is entered with no number following it or if n = 0, the commands will be repeated continuously.

The END-OF-LOOP command (N) can be used to indicate that the Controller should proceed with further commands after the designated numbers of loops have been executed, or in combination with the "Y" command, to indicate where execution is to stop. The "U" command may be used to temporarily halt loop execution, the C command will then cause the loop to resume execution.

There should be a balanced number of loops and loop terminators inside a sequence. Starting a loop in one sequence and terminating it in another sequence is not allowed. Nested loops require complete closure before execution will begin. There is a maximum of 16 nested loops.

The data value can be substituted with one of the Controller's variable values. The integer value of the variable is always used.

Example

Command	Description
VAR1=20	Set variable #1 to 20
L(VAR1)	Loop 20 times
G	Go
T1	Wait for 1 second
N	End of loop

Example

Command	Description
PS	Pause
A10	Set acceleration to 10 rps^2
V10	Set velocity to 10 revs/sec
D1000	Set distance to 1,000 steps
L5	Loop 5 times
G	Go
N	End of loop
C	Continue

Example (nested loop)

Command	Description
L10	Loop 10 times
D4000	Set distance to 4,000 steps
G	Go
L5	Loop 5 times
D10	Set distance to 10 steps
G	Go
N	End of the 5 x 10 step
N	End of the overall loop

The commands L5 D10 G N form a nested loop.

LA Limit Deceleration

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>LAn	Revs/sec^2	n = 0.06 - 999,999	900	Buffered, Universal, Saveable in Sequence

SEE ALSO L

Description

Define or report the deceleration rate after limit switch operation. This allows a rapid deceleration in response to a limit switch regardless of the rate programmed by the "A" command.

If n=0 there is no acceleration period. The maximum possible acceleration is used.

If using low values of acceleration, a check should be made to ensure that it has not been rounded down to zero.

LD Limit Disable

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>LDn	N/A	n = 0 - 3	0	Buffered, Universal, Saveable in Sequence

SEE ALSO LA, RA, SSG

Description

This command is used to disable the end of travellimit switch functions.

n = 0: Enable all limits (default)
n = 1: Disable limit +
n = 2: Disable imit -
n = 3: Disable + & - limit

Example

Command	Description
1LD3	The detection of both + and - limit switch operation is disabled for axis 1

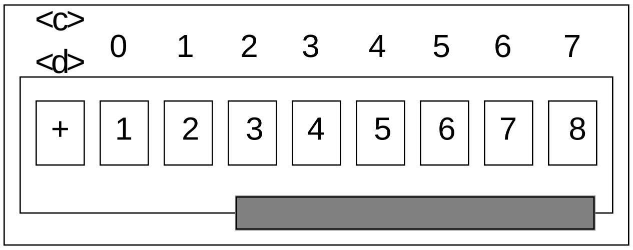
LRD	**Read Loop Count Via Parallel Input/Output**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>LRD<c>, <d>,<e>	c, d =digit selector e = scaling factor	c, d = 0-7 e = 0-7	None	Buffered, Universal, Saveable in Sequence

SEE ALSO STR

Description

The LRD command instructs the Controller to read loop count values from Compumotor's TM8 Module.



The command syntax allows for digit range selection through the optional <c><d> fields. The <c> field is used to signify the start of the digit range to be read from the TM8 Module. The <d> field represents the end of the digit range to be read. The values of these fields can range from 0 to 7 with the <c> field always being less than or equal to the <d> field value.

The <e> field is used to scale the distance value by 10^e. If the <c> and <d> fields are used, the <e> field must be used.

If the <c>, <d> and <e> fields are not used, the LRD command will read all the digits of the TM8 Module. If you are using the TM8 Module, the Output Strobe Delay Time must be set at a value of 10 or greater.

You may use a PLC with the LRD command. The LRD command uses a multiplexed I/O scheme. The outputs strobe through a BCD sequence at the Set Strobe Output Delay Time (STR) command rate and reads one BCD digit at a time. The outputs and inputs must be configured as in the TM8 Module read case.

Example

Turn the TM8 Module's thumbwheels to display:
+ 1 2 3 4 5 6 7 8

Type the following commands:

Command	Response
LRD	Loop count is 12,345,678

LS Fast Stop At Limit Decelerate

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>LS	N/A	N/A	N/A	Immediate, Universal, Never Saved

SEE ALSO SSH, LA, S

Description
Decelerate and stop at the limit switch deceleration rate set by LA (usually set fast compared to normal acceleration rate).

If SSH1 (save command buffer on stop) is set, the command buffer is not cleared and the move in progress is terminated.

MC Mode Continuous

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>MC	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO MN, A, V

Description
MC sets the move mode to continuous. It causes subsequent moves to ignore any distance parameter and move continuously at the programmed velocity until stopped by an S, LS or K command.

Example

Command	Description
MC	Set continuous mode
H-	Set direction to negative
A10	Set acceleration to 10 rev/sec/sec
V10	Set velocity to 10 rev/sec
G	Go - run continuously at 10 rev/sec in the negative direction

MN Mode Normal

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>MN	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO MQ, MC, MPA, MPI, A, V, D

Description
MN sets the move mode to normal preset distance. It causes last issued distance parameter to be used as the distance for the current move. The MN command will change the mode of operation from continuous back to preset.

Example

Command	Description
MN	Set mode to normal
A10	Set acceleration to 10 rev/sec/sec
V10	Set velocity to 10 rev/sec
D8000	Set distance to 8000 steps
G	Go - run for 8000 steps

MPA Mode Position Absolute

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>MPA	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO MN, MQ, MC, MPI, D, PZ

Description
Sets the position mode to absolute. In this mode all move distances are referenced to absolute zero. Units are scaled by the CUR command. You must be in the preset mode (MN or MQ command) before the MPA command will take effect.

Example

Command	Description
MN	Set normal mode
MPA	Set absolute mode
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
D10000	Set new absolute position to 10,000 steps
G	Go - move to position 10,000
D2000	Set new absolute position to 2,000 steps
G	Go - move 8,000 steps negative to position 2,000

Note that in the absolute mode, giving two G (go) commands in succession, without changing the value of D (distance) will cause the motor to move only once as the motor will have achieved the desired absolute position at the end of the first move.

MPI Mode Position Incremental

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>MPI	N/A	N/A	N/A	Buffered, Universal,

Saveable in Sequence

SEE ALSO MPA, D, MN

Description

Sets the position mode to incremental. In this mode all move distances are referenced to the starting position of each move. You must be in the Preset mode (MN or MQ command) before the MPI command will take effect. MPI is the factory default on the MN command.

Example

Command	Description
MN	Set normal mode
MPI	Set incremental mode
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
D8000	Set distance to 8000 steps
G	Go - move 8000 steps positive
D-4000	Set distance to 4000 steps negative
G	Go - move to position +4000 steps from the starting position

MQ Speed Change Mode

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>MQ	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO TRIP, MN

Description
This command allows buffered commands to be executed during a preset move.

MQ sets the move mode to normal preset distance. It causes last issued distance parameter to be used as the distance for the current move. The MQ command will change the mode of operation from continuous back to preset.

Given that buffered commands can be executed during a preset move, a TRIP command can be used to hold off further command execution until the move finishes.

Example

Command	Description
MQ	Set speed change mode
PZ	Set position to zero
A50	Set acceleration to 50 revs/sec^2
V20	Set speed to 20 revs/sec
D8000	Set total distance to 8000 steps
G	Go - start move
TRD3000	Change speed at distance of 3000 steps
V10	New speed set to 10 revs/sec
TRE_X1	Change speed when input goes to 1
V4	New speed set to 4 revs/sec
TRIP	Wait for end of move before executing next command

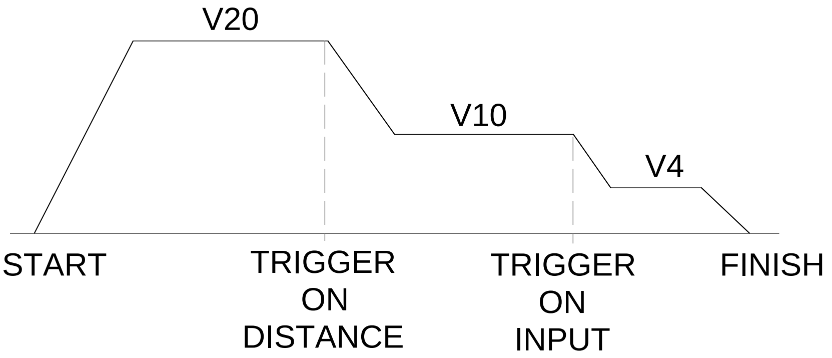


Figure 1-4. Complex Velocity Profile Using MQ Mode

The motor accelerates at 50 revs/sec^2 to a velocity of 20 revs/sec. At a distance of 3000 steps the velocity changes to 10 revs/sec. When Input 2 is energised the velocity changes to 4 revs/sec until the programmed distance is reached at 8000 steps.

MV	**Maximum Correction Velocity**	BDHXE **n/a** PDHXE v6.2 BLHX **n/a** PDHX v5.9 X150DS **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES	
<a>MVn	Revs/sec	n = 0.00001 - 50.00	1	Buffered, Universal, Saveable in Sequence	
				SEE ALSO	FS, DW, CER

Description
This command sets the correction velocity, which is the maximum velocity the motor can possibly travel during a position maintenance correction move.

N End Loop

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>N	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO L, Y

Description
Marks the end of a loop. When used in conjunction with the L command, it causes the buffered commands between the L and the N to be executed as many times as the number following L.

Example

Command	Description
A10	Set acceleration to 10 revs/sec^2
V10	Set speed to 10 revs/sec
D8000	Set distance to 8000 steps
L5	Set to loop 5 times
G	Go - move 8000 steps (repeated 5 times)
N	End of loop

NIF End of IF

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>NIF	None	None	None	Buffered, Universal, Saveable in Sequence

SEE ALSO ELSE, IF

Description
This command marks the end of an IF statement. When using the IF command, NIF must be used to identify the end of the IF statement.

```
IF(condition)...commands...ELSE...commands...NIF
```

Example

Command	Description
IF(VAR5>VAR7)	If variable #5 > variable #7, execute sequence 1
XR1	Execute sequence 1
NIF	End of IF statement
XR2	Execute sequence 2

NWHILE End of WHILE

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>NWHILE	None	None	None	Buffered, Universal, Saveable in Sequence

SEE ALSO WHILE, REPEAT, UNTIL

Description

NWHILE marks the end of the WHILE statement. WHILE is evaluated, and if it is true all commands between the WHILE and NWHILE commands are executed. NWHILE then redirects program flow back to the WHILE for another evaluation check. Commands between WHILE and NWHILE will continue to execute as long as the WHILE condition is true: when the WHILE condition is false, program flow jumps to the command after NWHILE.

WHILE(condition)...commands...NWHILE

Example

Command	Description
WHILE(IN_XXX1)	While input #4 is active, execute commands between WHILE & NWHILE
XR1	Execute sequence 1
T2.0	Time delay of two seconds
NWHILE	End of WHILE

O Programmable Output

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>Obbbbbb	N/A	b = 0, 1, X	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO SSD, IO, OUT, OCON

Description
This command sets the output bits as specified in the pattern.

b = 0, 1 or X (X leaves the output unchanged)

OCON Output Configuration

BDHXE v6.2	PDHXE v6.2
BLHX **n/a**	PDHX **n/a**
X150DS **n/a**	

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
<a>OCONn	N/A	N/A	111111	Buffered, Universal Saveable in Sequence

SEE ALSO ICON, OUT, O

Description
The OCON command configures the user outputs as NPN or PNP transistor outputs using the circuit shown in Figure 1-5.

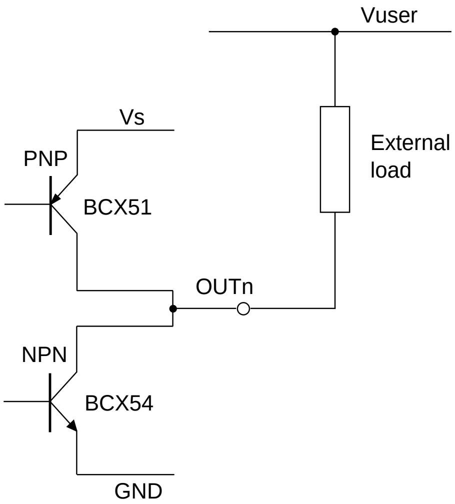


Figure 1-5. NPN or PNP Output Configuration

The format for n, the input pattern, is specified by:

bbbbbb

This pattern represents from left to right:

out1 out2 out3 out4 out5 out6

Where: An output is set to 0 to configure it as NPN
An output is set to 1 to configure it as PNP

Example

<u>Command</u>	<u>Description</u>
1OCON000111	Configure outputs 1 to 3 to be NPN and outputs 4 to 6 to be PNP

OFF De-Energise Drive

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>OFF	N/A	N/A	N/A	Immediate, Universal

SEE ALSO ST, ON

Description
De-energises the drive immediately. This command may be used to shut down the drive quickly in an emergency. Issuing an SV command after the OFF command will cause the drive to power up in the de-energised state.

The OFF command effectively performs a 'KILL' before de-energising the drive, dumping the command buffer and terminating sequence execution.

ON Energise Drive

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>ON	N/A	N/A	N/A	Immediate, Universal

SEE ALSO ST, OFF

Description
This command is used to re-energise the drive after a shutdown. Issuing an SV command after the ON command will cause the drive to power up in the energised state.

OS

Other Switches

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aOS	N/A	N/A	N/A	Buffered, Device Specific

Description
The command OS will report the state of the OS switches with a response *bbbb_bbbb_bbbb_bbbb where the order of the bits is:

ABCD_EFGH_IJKL_MNOP

Therefore bit 1 indicates the status of OSA, bit 2 the status of OSB etc.

Note: Certain letter options may not be available.

1OS	A=IDX_HOME	B=SWITCH_IACT	C=SINGLE_DS	N/A
	E=JOG_ENABLE	N/A	N/A	N/A
	N/A	J=24BIT_GBOX	K=IDX_CHECK	N/A
	M=FAST_IACT	N/A	O=NOUNIT	N/A

OSA

Home at Index Pulse

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aOSAn	N/A	n = 0 or 1	0	Buffered, Device Specific

SEE ALSO GH

Description
This command enables homing to an index pulse for servo systems fitted with an incremental encoder with an index track. On completion of the homing routine, the motor will stop on the first index pulse after the edge of the home switch is detected. This results in a highly-repeatable home position which is not affected by small variations in the operation of the home switch.

Only one index pulse should be seen whilst in the 'proximity' of the home sensor.

n = 1: Home to index pulse within home switch range
n = 0: Home at home switch edge

OSB

Integral Action Selection

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aOSBn	N/A	n = 0 or 1	0	Buffered, Device Specific

SEE ALSO CIW, CIG

Description

This command selects whether integral action will occur all the time or only while within the integral action window, defined by CIW.

n = 1: Integral action will only occur whilst 'in-position'
n = 0: Integral action occurs all the time

OSC

Monitor Command Reporting

BDHXE v6.2	PDHXE v6.1
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aOSCn	N/A	n = 0 or 1	0	Buffered, Device Specific

SEE ALSO DS, DPA, DPE

Description

The OSC command selects continuous reporting of monitor commands (DS, DPA etc.) or reporting of one value only.

n = 1: Signal monitor commands report only one value

n = 0: Monitor commands report continuously

OSE Jog Enable

BDHXE v6.2	PDHXE v6.1
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aOSEn	N/A	n = 0 or 1	0	Buffered, Device Specific

SEE ALSO IN, JA, JV

Description

The OSE command is used to enable or disable the jog function.

n = 1: Jog enabled
n = 0: Jog disabled

When the JOG function is enabled, input 10 is used to JOG in a CW rotation and input 9 is used to JOG in a CCW rotation.

OSJ Select 24/16 Bit Gearbox

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aOSJn	N/A	n = 0 or 1	0	Buffered, Device Specific

SEE ALSO: RAT

Description

The OSJ command selects 24 or 16 bit gearbox used with the RAT command for external pulse stream following.

n = 1: 24 bit gearbox operation - RAT command range = +/-16777216

n = 0: 16 bit gearbox operation - RAT command range = +/-65535

The 24 bit range has been included in this software version for higher resolution, but the 16 bit range has been retained for compatibility with earlier software verions.

OSK	**Integrity Check of Optical Encoder**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
aOSKn	N/A	n = 0 or 1	0	Buffered, Device Specific
				SEE ALSO CIX

Description
This command enables an encoder integrity check for servo systems fitted with an incremental encoder.

n = 1	The encoder count will be checked at the index track
n = 0	The encoder count will not be checked

If a count error occurs at the index track with the OSK option enabled, the interface will de-energise the drive, and an RSE command will produce the message:

#90 Shutdown by <X> counts encoder error at index track

Bit 9 in the de-energise data will be set and the status LED will display 1.

The RE command will show the drive to be de-energised.
This option requires the encoder to have an index pulse that is one pulse wide (when gated with the A and B encoder channels). The option also requires only one index pulse every time the motor moves the number of pulses defined in the CMR command, i.e. generally, only one pulse per rev.

OSM

Integral Action Sensitivity

BDHXE v6.2 PDHXE **n/a**
BLHX v5.9 PDHX **n/a**
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES	
aOSMn	N/A	n = 0 or 1	0	Buffered, Device Specific	
				SEE ALSO	CIG

Description
This command enables a fast, wide range version of the integral action capability.

n = 0 Accumulate at 20ms sampling to standard range
n = 1 Accumulate at 2ms sampling to a 256 times larger range

The default setting OSM0 is suitable for the majority of situations in which integral action would be needed, i.e. systems with a significant frictional load. Lightly-loaded systems using smaller motors may benefit from the OSM1 setting.

OSO

Suppress Units

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES	
aOSOn	N/A	n = 0 or 1	0	Buffered, Device Specific	
				SEE ALSO	CMR, CUR, CIX

Description
This command suppresses any reference to units such as RPS in the message prompts. This avoids confusion on linear and rotary systems where the velocity is not expressed in revolutions at a motor shaft.

n = 0 rps and rps/s units appear in messages
n = 1 rps and rps/s units do not appear in messages

OUT Out Function

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>OUTn<func>	N/A	N/A	Function A	Buffered, Functions are Saveable

SEE ALSO O, IO, SSD

Description

This command sets the function for each of the six outputs. All the outputs can be configured for the same or different functions. The default setting for all six outputs is function A. Programmable output, "Output 1" can also be configured as a hardware watchdog fault output; if the SSD1 command is used then output 1 is a watch dog fault output and cannot be used for any other purpose. If SSD0 command is used then output 1 functions as a normal user definable output. The following, is a list of functions available for each output.

FUNCTION A	PROGRAMMABLE OUTPUT - Used with O command.
FUNCTION B	MOVING/NOT MOVING OUTPUT - On when motion is occurring.
FUNCTION C	On when sequence in progress.
FUNCTION F	FAULT OUTPUT - On when no fault present (Fail safe operation).
FUNCTION G	On when controller is busy.
FUNCTION H	User-defined energise state. On when drive energised by ON command. Turns off following an OFF command, but not if drive de-energised by a fault.
FUNCTION J	STROBE OUTPUT - Used in conjunction with INnN to load bytes of parallel data from thumbwheel.
FUNCTION L	Changeover output sense i.e. On to Off or Off to On.
FUNCTION T	IN-POSITION OUTPUT - The output will turn on when the motor iswithin the error window for the specified time defined by CEW & CIT commands.
FUNCTION Z	A 100ms pulse is generated following a correctly executed registration move. The level of the pulse can be set high or low using the OUTL command described above.

Example

Command	Response
1OUT3B	Set output 3 to turn on (when motor is moving)

Example

Command	Response
OUT	Will display the setting for all outputs

OUTL Set Active Output Level

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>OUTLn	n=active level	0=low 1=high X=no change	0	Buffered, Saveable in Sequence

SEE ALSO INL, OUT
OCON

Description
This command configures the voltage level of active output signals.

OUTL0	Sets a low level (0V) as an active signal.
OUTL1	Sets a high level (5V or 24V) as an active signal

You must configure the outputs using the OUT command if you wish to use the outputs for anything other than programmable outputs.

Example

Command	Description
1OUTL	Sample present active output levels *000100
1OUTL XX10X1	Set active output levels
1OUTL	Re-sample status of active output levels ;Output active levels are: ;01 02 03 04 05 06 *001001

P Position

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aP	User steps	±268435455	N/A	Immediate, Device Specific

SEE ALSO PR

Description
Displays the position relative to the start of the last index. The position counter is cleared and restarted by the next G command. This is a single response in user steps, and can be used during a move.

PASS Password Protection

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aPASSnnnn	N/A	0000 to 9999	0000	Buffered, Device Specific

Description
Sequences can be password protected to prevent them from being uploaded once they have been saved. A four figure number is used as the password.

A password value of zero indicates that there is no protection. A new password can only be entered when the old password protection has been removed.

The system and password can be reset on memory loss and the next power up will be in the default state of sequence upload enabled. Using the command aPASSnnnn will assign the password ‘nnnn’ during that power-up cycle. It can be made permanent by using the SV command. To disable the password or create a new password, the original password must be entered to clear the protection. You can now enter a new password and permanently save it, or enter ‘0000’ to remove password protection.

Note:
1. Care must be taken when saving data because the last number assigned will be saved as the new password.
2. Once a password has been assigned there is no way of changing it or overriding it apart from re-entry of the correct password.

PF	Report Following Encoder Position	BDHXE **n/a** BLHX **n/a** X150DS **n/a**	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aPF	Encoder steps	±268435455	N/A	Buffered, Device Specific Saveable in sequence

SEE ALSO PR, PFZ, VAR

Description
Reports the current following encoder count regardless of the SIM mode selected. If an encoder is not fitted the displayed value will be indeterminate.

PFZ	Set Following Encoder Position to Zero	BDHXE **n/a** BLHX **n/a** X150DS **n/a**	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>PFZ	Encoder steps		N/A	Buffered Saveable in sequence

SEE ALSO FP

Description
The counter for the following encoder position is set to zero.

PIC	Picture	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>PIC	N/A	N/A	N/A	Immediate, Universal

SEE ALSO DS

Description
Displays a picture of the servo loop with the signal monitor numbers. A device address is not necessary since any Controller will return the same display.

PR Position Report

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aPR	User steps	-268,435,455 to +268,435,455	N/A	Buffered, Device Specific

SEE ALSO MPA, MPI, D, PZ, SP, P

Description

Requests the current absolute position. The report is a number preceded by a sign and followed by a carriage return *(s)n[CR]. The number represents the cumulative position in user steps (n) with respect to the position at power up or the last point at which an SP or PZ command was issued resetting absolute zero. The sign indicates which side of the absolute zero position the motor is on.

Example

Command	Response
1PR	*-25600[CR] (Motor is at absolute position -25600)

PS	**Pause**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
<a>PS	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO C, IN, DCNT

Description

This command pauses the execution of the current command string or sequence. Execution will then be resumed after a C command (continue) is received. The command is used to allow the entering of a complete command string before the commands are executed.

Example

Command	Description
PS	Pause until C command is received
D5000	Set distance to 5000 steps
G	Go - start move
H-	Set direction to negative
G	Go - start negative direction move
C	Release pause - both moves now carried out

PZ	Position Zero	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>PZ	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO MN, MQ, MPA, MPI, PR, D, SP

Description
Sets the current position to be absolute zero.

Example

Command	Description
MPA	Set absolute mode
D2500	Set new position to 2500 steps
G	Go - move to absolute position +2500
1DPA	Report the new position (+2500 returned)
1PZ	Set the new position as absolute zero
1DPA	Report the position (zero is returned)

Where a servo is used, due to offsets in the loop the demanded position and the feedback position may not be exactly equal. This command sets the physical or feedback position zero, so the demand position indicated by DPS may show a non-zero value.

QS	Transmit An Identifier	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>QS	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

Description
Responds with the identity of the echoing device. The command can be used to confirm which device is echoing after a series of universal commands.

The response consists of an asterisk, a two digit device address, an exclamation mark and a carriage return.

Example

Command	Description
MN	Select normal mode
D4000	Set distance to 4000 steps
A100	Set acceleration to 100 revs/sec^2
V50	Set velocity to 50 revs/sec
G	Go
QS	Transmit identifier

If this is executed as a sequence by axis 1, the response ;*01! will be received over the RS232C line when the sequence is complete.

R Report Serial Interface Status

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aR	N/A	N/A	N/A	Immediate, Device Specific
			SEE ALSO	RA,RB,RG, RS,OS,SS,XC,XSP,XSD, XSR,XSS,DFS,DFX

Description

Requests the status of the Controller. The response is *<char>[CR] :

*R [CR] - ready for a command with no errors.
*S [CR] - ready for a command with function errors.
*T [CR] - ready for a command with previous comms error.
*U [CR] - ready for a command with function error and previous comms error.
*B [CR] - busy performing a move with no errors.
*C [CR] - busy performing a move with function error.
*D [CR] - busy performing a move with previous comms error.
*E [CR] - busy performing a move with function error and previous comms error.

In terminal mode a message apperars as well. The ready response means a buffered command will be executed immediately on receipt.

The RS232 communications is considered to have an error if:

A framing error occured (start / stop bits incorrect)
An overrun error occured (new character received whilst previous one unread)

Reading the status clears an outstanding communications error and the ‘U’ message on the status indicator.

The indexer is considered to be busy if any of the following conditions are met (generally DFX indexer flags):

Waiting for data entry from the RP240 (KEYPAUSE)
In the process of making a preset move (PPERFORM)
In the process of making a continuous move (CPERFORM)
In the process of making a jog move (JOGGING)
Waiting on a trigger (TRIGPAUSE)
Waiting on a distance trigger (TRDPAUSE)
Waiting on a position trigger (TRIPPAUSE)
Paused and waiting on a continue (PSPAUSE, UPAUSE or INSTPAUSE
In the process of gohome (HOME_FAST or HOME_SLOW)
In the process of executing a power up sequence (PUSEQ)
In the process of executing a sequence (EXSEQ)
In the process of waiting on a time delay (TPERFORM)
Processing commands inside a loop
Processing commands inside a sequence
Waiting on a motor distance trigger (TRMPPAUSE, TRMNPAUSE)
Waiting on a registration move (TRRPAUSE)

The indexer is considered to have a function error if:

1. The servo is off for any reason (RSE reports non-zero)
2. The last move was an attempt to gohome and it failed
3. The power up sequence number was invalid
4. A limit was hit on the last move (except a gohome move)

Example

Command	Response
1R	*R[CR] Controller ready to accept a command. If it's a buffered command, it will be executed immediately.

RA	**Report A - Limit Status Request**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRA	N/A	N/A	N/A	Immediate, Device Specific

Description
Requests the status of the limits. The response, in accordance with the following table, is the current and last move limit status represented by a single character from @[CR] to O[CR].

Example

Command	Response
1RA	*I [CR] The current move is limited by the negative limit and the last move was terminated by the positive limit.

Response Character	Last Move Terminated By		Current Move Limited By	
	Positive Limit	Negative Limit	Positive Limit	Negative Limit
*@	NO	NO	NO	NO
*A	YES	NO	NO	NO
*B	NO	YES	NO	NO
*C	YES	YES	NO	NO
*D	NO	NO	YES	NO
*E	YES	NO	YES	NO
*F	NO	YES	YES	NO
*G	YES	YES	YES	NO
*H	NO	NO	NO	YES
*I	YES	NO	NO	YES
*J	NO	YES	NO	YES
*K	YES	YES	NO	YES
*L	NO	NO	YES	YES
*M	YES	NO	YES	YES
*N	NO	YES	YES	YES
*O	YES	YES	YES	YES

The RA command is useful when the motor will not move in either or both directions. The report back will indicate whether or not the last move was terminated by a limit switch activation and if the current move is disabled by an active limit.

RAT	**Set Rate Multiplier Value**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
aRATn	Rate multiplier value	See description	65535	Buffered, Device Specific

SEE ALSO CCS, SIM, OSJ

Description
This command is used in servo mode to configure a rate multiplier on the external encoder input when using the following mode of operation. The range of the command is determined by the setting of the OSJ command as follows:

OSJ = 0:	RAT range -65536 to +65535
OSJ = 1:	RAT range -16777216 to +16777216

The effect is that of a gearbox on the second encoder input that obeys the following formula:

Output rate to the motor (OSJ = 0) = $\frac{n}{65536}$ x input rate from the external encoder.

Output rate to the motor (OSJ = 1) = $\frac{n}{16777216}$ x input rate from the external encoder.

For a limited number of pulses:

Pulses to motor (OSJ = 0) = INT $\frac{n \text{ x pulses in}}{65536}$

Pulses to motor (OSJ = 1) = INT $\frac{n \text{ x pulses in}}{16777216}$

where INT means 'the integer part of'. The value is rounded down towards zero whether the value is positive or negative.

Negative values of RAT allow the direction of following to be reversed.

NOTE: The number of external encoder input pulses is also affected by the CCS command.

Example

A 4000 step/rev motor is required to follow a 1000 line/rev encoder at half the encoder speed in the opposite direction. 1 revolution of the encoder produces 1000 x 4 (CCS0 set) = 4000 pulses; -2000 pulses are required to produce a half revolution of the motor shaft in the opposite direction.

$$\text{So } n = \frac{65536 \times (-2000)}{4000} = -32768$$

Command	Description
1CCS0	Select x 4 decode
1OSJ0	Set OSJ for 65536 RAT range
1SIM1	Select encoder following mode
1RAT-32768	If the tracked encoder turns 1 revolution CW, the number of pulses sent to the motor is:

$$\frac{-32768 \times 4000}{65536} = -2000$$

The motor of axis 1 therefore turns a half revolution CCW.

RB

Report B - Misc. Status Request

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRB	N/A	N/A	N/A	Immediate, Device Specific

SEE ALSO IS, TR, PS, L, ST, R, RA

Description
Requests the status of a loop, a pause, a shutdown or an input . The response is @ [CR] to O [CR] according to the following table.

Response Character	Loop Active	Pause Active	Shutdown Active	Input Active
*@	NO	NO	NO	NO
*A	YES	NO	NO	NO
*B	NO	YES	NO	NO
*C	YES	YES	NO	NO
*D	NO	NO	YES	NO
*E	YES	NO	YES	NO
*F	NO	YES	YES	NO
*G	YES	YES	YES	NO
*H	NO	NO	NO	YES
*I	YES	NO	NO	YES
*J	NO	YES	NO	YES
*K	YES	YES	NO	YES
*L	NO	NO	YES	YES
*M	YES	NO	YES	YES
*N	NO	YES	YES	YES
*O	YES	YES	YES	YES

Loop active means that a loop is in progress.

Pause active means that buffered commands are not being executed and the Controller is waiting for a C command.

Shutdown active means that the motor is shutdown.

Input active means that at least one input trigger is active.

Example

Command	Response
1RB	*J[CR] There is no loop active, pause is active, the motor is not shutdown and there is an input trigger active.

RE	Drive Status Request	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRE	N/A	N/A	N/A	Immediate, Device Specific

Description
Requests the energised/de-energised status of the drive. The response is *@ if the drive is energised or *B if the drive is de-energised.

REPEAT Repeat

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>REPEAT	None	None	None	Buffered, Universal, Saveable in Sequence

SEE ALSO UNTIL, WHILE, NWHILE

Description

The REPEAT command in conjunction with the UNTIL command provides a means of conditional program flow. The REPEAT command marks the beginning of the conditional statement. The commands after the REPEAT are executed until the UNTIL statement is encountered. The UNTIL command is then evaluated, if it is false, the program flow is redirected to the REPEAT command, otherwise a true evaluation causes the command after the UNTIL command to execute as the REPEAT...UNTIL loop is exited. The commands between the REPEAT and UNTIL are always executed at least once. Up to 16 levels of REPEAT commands may be nested.

REPEAT...commands...UNTIL (condition)

Note: The input conditions will not be evaluated until the UNTIL command is evaluated. Hence, the statements/moves between REPEAT and UNTIL will not be interrupted.

Example

Command	Description
REPEAT	Repeat command
XR1	Execute sequence 1
T2	Delay 2 seconds
UNTIL(IN_1)	If input #1 active, do next command, else execute from the command following REPEAT

RFS	Return to Factory Settings	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>RFSn	N/A	0-7	N/A	Immediate, Universal

SEE ALSO Z, RIFS, SV

Description

Return to standard default settings appropriate to the product in use. This command will configure the motor type, set normal resolution values and define appropriate servo gains for the product you specify. The Z command will restore the settings to their values prior to entry of the RFS command if they have not been saved using SV.

Available product numbers are as follows:

1. Reserved
2. Open loop stepper
3. Reserved
4. BL Series 16 or 23-size brushless servo
5. BL Series 34-size brushless servo
6. DS Servo series
7. APEX Servo and BDHX-E

Sending the command RFS with no address or value will result in a list of the product numbers being returned. Preceding RFS by the axis address will return the existing product number for that axis.

Example

Command	Description
1RFS4	Set axis 1 as a BL 23-size brushless servo
2RFS	Return the current product number for axis 2

The command RFS0 will give a generalised setup. You can also set appropriate indexer default values by sending RIFS after the correct RFS command.

RG	**Report Go Home Status**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRG	N/A	N/A	N/A	Immediate, Device Specific

SEE ALSO GH, GA, GHF, R

Description
Requests the status of the last Go Home attempt. The response is @ [CR] or A [CR] , indicating the success or failure of last go home attempt as follows:

Response	Go Home Successful
*@	NO
*A	YES

RIFS	**Return Indexer to Factory Settings**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>RIFS	N/A	N/A	N/A	Immediate, Universal

SEE ALSO Z, RFS, SV

Description
This command sets indexer default values appropriate to the product number entered using the RFS command.

The RIFS command also generates twelve sample sequences. These will overwrite any existing sequences numbered 1 to 12 entered since the last SV command.

Example

Command	Description
1RFS5	Set axis 1 as a BL 34 size brushless servo
1RIFS	Set indexer default values suitable for BL brushless servo

RPO Report Power-On Time

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRPO	N/A	N/A	N/A	Immediate, Device Specific

Description

Requests the Controller power on time (hours) in decimal, for example 33.7 hours. A continuous record of usage is maintained by the Controller.

RS Report Sequence Status

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRS	N/A	N/A	N/A	Immediate, Device Specific
				SEE ALSO XR, XP

Description

Request the status of the last sequence execution. The response will be @ [CR] to D [CR]) according to the following table:-

Response Character	Sequence Started	Sequence Ended
*@	NO	NO
*A	YES	NO
*C	YES	YES
*D	NO	YES

Whenever a sequence is started, the sequence start bit is set and the sequence end bit is cleared (this only occurs if the sequence is valid and is actually run). Whenever a sequence is ended, the start bit is cleared and the end bit is set. Any abrupt move termination (e.g. limit activation), or a K or S command clears both bits.

*D is reported when there is an unbalanced number of loops and loop terminators inside a sequence. Starting a loop in one sequence and terminating it in another sequence is not allowed. Nested loops require complete closure before execution will begin.

Example

Command	Response
1RS	*A Sequence in progress

RSE Report Servo Errors

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRSE	N/A	N/A	N/A	Immediate, Device Specific

SEE ALSO R

Description
Returns all servo error flags as a set of messages to the terminal and as a bit pattern. The messages correspond with the status LED indications. The bit pattern sent is:- *xxxx_xxxx_0xxx_xxxx_xxxx where the rightmost "x" bit is bit 0. Possible messages include:

Message	Bit No.	Status Code	Fault
#20	0	1	De-energised by ST1 or OFF command
#22	2	3	EPROM changed with different memory map
#23	3	4	Excessive position error
#24	4	5	Memory failure - failed checksum
#25	5	1	Undefined drive
#26	6	7	Prolonged max torque demand
#27	7	8	Output to drive is zero torque
#28	8	8	Possible watchdog time out
#80	12	2	Drive disabled by composite drive fault
#81	13	2	Impending power loss
#82	14	2	Drive disabled by motor over temperature
#83	15	2	Drive disabled by drive over temperature
#90	9	1	Shutdown by <n> counts encoder error at index track
#94	10	4	Excessive motor speed (servo only)

RSIN Set Variable Interactively

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>VARn =RSIN	n=variable number	1 - 50	none	Buffered, Saveable in Sequence

SEE ALSO VAR, TX, “

Description

The RSIN command allows variables to be loaded with data during sequence execution. The variable is chosen using VARn=RSIN, where n is the variable number.

When the command is executed, the data is transmitted to the drive by issuing a ‘!’ character followed by the data to be loaded (!nnnnnnnnnn.nnnnn). Command processing pauses with the RSIN command and resumes when the data is transmitted to the drive.

VARn=RSIN data is to be loaded into VARn
!nnnnnnnnnn.nnnnn = load data into VARn

Example

Command	Description
XE1	Erase sequence #1
XD1	Define sequence #1
1”ENTER_DATA”	Transmit message
VAR2=RSIN	Data is to be entered for variable #2
XT	End defining sequence
XR1	Execute sequence #1
ENTER_DATA	Message transmitted
!12.34	Variable 2 gets loaded with 12.34

RST Freeze Torque Demand

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>RSTn	N/A	n = 0 - 1	0	Buffered, Universal, Saveable in Sequence

SEE ALSO ST, CPG

Description
This command should be used when servo tuning parameters need to be changed such as when switching between position and torque control modes. RST allows the changeover to be accomplished without introducing a large discontinuity in position or torque. RST1 effectively opens the servo feedback loop by holding the torque at its current level. Whilst the feedback loop is open the new parameters may be entered as buffered commands. RST0 then releases the torque demand which closes the loop again. To maintain continuity of torque demand RST0 also introduces a position error or a torque offset dependent upon the new value of CPG. For a full explanation of switching between position and velocity modes refer to ***Torque control applications*** in the ***Basic Motion Control Concepts*** section of the relevant drive user guide.

RV Revision Level

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aRV	N/A	N/A	N/A	Immediate, Device Specific

Description
Request software version number. An example response is:

```
* ISSUE: 6.1     DATE: 11-Jun-96 10:45 [CR]
```

This is the software revision and the date and time of the revision.

S Stop

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>S	N/A	N/A	N/A	Immediate, Universal

SEE ALSO K, SB, SSH

Description
Stop. If SSH 0 (Don't save command buffer on stop) 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.

The motor is decelerated to stop using the current acceleration value ('A') but the drive stays energised.

If SSH1 (Save command buffer on stop) is set, the command buffer is not cleared and only the move that is in progress is terminated.

Example

Command	Description
MC	Set continuous mode
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
G	Go - run continuously
S	The motor will decelerate to a stop at a rate of 10 revs/sec/sec as soon as S is entered

SAVE Save

BDHXE v6.2 PDHXE v6.2
BLHX v5.9PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSAVE	N/A	N/A	N/A	Immediate, Device Specific

Description

This is an alternative expression for the SV command. It causes the current servo set up and indexer parameters to be saved in non-volatile RAM.

Note that in order to successfully save data using an X150 controller, link 8 must be in position B. Remove the link, or place in park position A, to write protect the RAM.

An error message is generated if an attempt is made to save data with the link in position A.

If you are using an X150E controller (BDHXE or PDHXE), bit switch 8 (of address switch) must be set to ON to allow writing of data to the RAM and set to OFF to write protect the RAM.

An error message is generated if an attempt is made to save data with switch 8 in the OFF position.

SB Stop Buffered

BDHXE v6.2 PDHXE v6.2
BLHX v5.9PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>SB	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

Description

Stop. The motor is decelerated to a stop using the current acceleration value (A). The command can be used in the MC or MQ modes. The command buffer is unaffected.

Example

Command	Description
2A10	Set acceleration for axis 2 to 10 revs/sec^2
2SB	Axis 2 is decelerated to a stop at the rate of 10 revs/sec^2

SIM	**Set Indexer/Following Mode**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSIMn	n = Mode number	0 - 6	0	Buffered, Device Specific

SEE ALSO CCS, RAT, FOL

Description
This command is used to configure the Controller for following a second encoder. The mode of operation is selected by n as follows:

n = 0 Normal control module operation. In this mode any pulses arriving at the external encoder input are ignored.

n = 1 Encoder following operation. In this mode the position of the motor follows the pulse stream on the external encoder input and the Controller motion commands are inactive.

n = 2 Super position operation. In this mode both the incoming pulses from the external encoder and control module motion commands are active. The position of the motor is the sum of both motions.

n = 3 Positive software scaled encoder following operation.

n = 4 Negative software scaled encoder following operation.

n = 5 Preset following index mode

n = 6 Load mounted encoder feedback.

Note:

1. Using a standard wired encoder, the direction of the motor shaft is opposite to that of the encoder. When operating in encoder following mode the STOP and KILL commands will have no effect, the motor can only be stopped by a signal at the stop input. Energise/de-energise commands are effective.

2. SIM1 and SIM2 can only be used in stepper mode with a 1:1 following ratio. The RAT command is not valid for stepper mode.

SIM3 and SIM4 provide a software scaled following capability which allows the input pulse stream to be multiplied or divided with a sign reversal if required. The scaling ratio is set by the CMR and CUR commands which define the motor and user resolutions.

SIM5 selects indexing at a speed determined by the external input. The percentage following factor is set by the FOL command.

SIM6 enables an encoder mounted on the load, to provide the position feedback for the servo loop. The velocity information is still derived from the motor mounted encoder.

Example

Command	Description
1SIM0	Set normal control mode
GH2	Go home
1SIM1	Set control by external encoder

SKE Skip On 'Equals'

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>SKEn	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO SKN, TRE

Description
Skip the following command on an input pattern equal to n. This command is used in sequences to control execution flow. The format for n, the input pattern, is specified by:

bbbbbbb_bbbbbbbbbb

The pattern is from left to right :

LMT+ LMT- HOME AUX_IN STOP ENERGISE INDEX -
IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10

Each input can be 0 (off), 1 (on) or X (don't care). You can omit trailing X specifiers within each group.

For example the following two pattern are equivalent:

001XXXX_XXXXX11XXX and

001_XXXXX11

The next two are also equivalent:

XXXXXXX_X1 and

_X1

Example

Command	Description
1SKEX1	The next command will be skipped if the negative limit input is active

SKN Skip On 'Not Equal'

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES

<a>SKNn	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO SKE, TRE

Description
Skip the next command on input pattern not equal to n. The command is used in sequences to control execution flow. The format for n, the input pattern, is specified by:

bbbbbbb_bbbbbbbbbb

This pattern represents from left to right :

LMT+ LMT- HOME AUX_IN STOP ENERGISE INDEX -
IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10

Each input can be 0 (off), 1 (on) or X (don't care). You can omit trailing X specifiers within each group.

For example the following two specifiers are equivalent:

001XXXX_XXXXX11XXX and

001_XXXXX11

The next two are also equivalent:

XXXXXXX_X1 and

_X1

Example

Command	Description
SKNXX1	The next command will be skipped if the HOME input is not active

SMP Sample Rate for the Following Encoder Count

BDHXE v6.2 PDHXE v6.2
BLHX **n/a** PDHX v5.9
X150DS **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES

<a>SMPn	a=axis address
	n=rate
		1 - 30	10	Buffered, Universal Saveable in Sequence

SEE ALSO VAR=SMC, SIM

Description

The sample rate is set in multiples of 2 milliseconds and is only valid in SIM5 mode of operation.

SP	**Set Position**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSP<s>n	Motor steps	-268,435,454 to +268,435,454	0	Buffered, Device Specific, Saveable in Sequence

SEE ALSO MPA, MPI, PR, D, PZ

Description
Adds the value of n to the absolute position counter. The counter will be set to n if a PZ command is given prior to the SP command. This command is useful for setting the absolute zero point to some location other than that of the physical hardware home. If you have a cut-off saw for example, you may not be able to mount the home switch at the cut point. However, by mounting the home a known distance away and resetting the reference point with the SP command, the system may be made to function as if the home switch were at the cut point.

Note that the units of the SP command are scaled by the CMR command. You can get a position report in the same units by using the DPA command.

Example

Command	Description
GH2	Go home
PZ	Set position to zero
SP4000	The absolute position will be set to 4000 so that the absolute zero will be one motor revolution away from the switch location.

SS Set Switches

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSS	N/A	N/A	N/A	Buffered, Device Specific, Saveable in Sequence

Description
The command SS will report the state of the SS switches with a response *bbbb_bbbb_bbbb_bbbb where the order of the bits is:

ABCD_EFGH_IJKL_MNOP

Therefore bit 1 indicates the status of SSA, bit 2 the status of SSB etc.

Note: Certain letter options may not be available.

1SS	A=RS232_ECHO	N/A	N/A	D=01(WDOG)
	N/A	N/A	G=LIM_SV	H=STOP_SV
	N/A	N/A	K=STOP_EN	N/A
	N/A	N/A	N/A	N/A

SSA	**RS232C Echo Control**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSSAn	N/A	n = 0 or 1	0	Buffered, Device specific Saveable in Sequence

SEE ALSO EX

Description

This command turns the RS232C echo on and off

SSA0 = Echo on
SSA1 = Echo off

In the Echo On mode characters that are received by the Controller are echoed automatically. In the Echo Off mode, characters are not echoed. This command is useful if your computer cannot handle echoes.

In a daisy chain, you must have the echo turned on (SSA0) to allow controllers further down the chain to receive commands.

Example

Command	Description
SSA1	Turns the echo off (Characters sent to the Controller are not echoed back to the host).

SSD	**Set Output 1 as Composite Fault Signal**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSSDb	N/A	b = 0 or 1	0	Buffered, Saveable in Sequence

SEE ALSO OUT

Description

b = 0: Normal
b = 1: Output 1 is configured as a hardware watchdog fault output

When SSD=1, output 1 is a hardware watchdog fault output and cannot be used for any other purpose.

The output will be on when no fault is present (fail safe operation). Under firmware or hardware fault conditions the output will switch off.

The operation of output 1 when SSD=1 should not be confused with the OUTnF command. OUTnF (FAULT OUTPUT) only reports software fault conditions rather than hardware or firmware faults. Once output 1 is programmed as a watchdog fault output, other commands will be prevented from altering the state of output 1 until ‘Normal’ operation is resumed by issuing a SSD=0, followed by OUT1A and O0 commands.

SSG Save Command Buffer On Limit

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSSGb	N/A	n = 0 or 1	0	Buffered, Device Specific, Saveable in Sequence

SEE ALSO LD, LA, RA

Description

b = 0: Normal
b = 1: Command buffer saved on limit

Normally, when a limit is hit, the current command buffer or sequence is cleared thus preventing further execution. Setting this bit to 1 prevents this activity.

SSH Save Command Buffer On Stop

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSSHb	N/A	b = 0 or 1	0	Buffered, Device Specific, Saveable in Sequence

SEE ALSO S, IN

Description

b = 0: Normal
b = 1: Save command buffer on stop ('S' command).

This command operates in a similar way to SSG, but relates to the stop command or STOP input.

SSK

Enable/Disable De-energise On Stop

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSSKb	N/A	b = 0 or 1	0	Buffered, Device Specific, Saveable in Sequence

SEE ALSO S

Description
Motor stop type.

b = 0: On stop the motor will not de-energise
b = 1: On stop the motor will de-energise

When the STOP input becomes active the motor will stop in an energised state or a de-energised state, depending upon the previous state of SSK. The default condition is for the motor to stop in an energised state, following a STOP input.

SSP

Hide Variable Entry

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSSPn	N/A	n = 1 or 0	N/A	Buffered, Device Specific, Saveable in Sequence

SEE ALSO ON, OFF

Description
The hide variable entry switch SSP can ‘mask’ data entry when using the RP240. When SSP is enabled asterisks are echoed to the RP240 display instead of the value of keys being pressed. The value of n controls the echo of characters:

n=0: Normal operation, character keys are echoed back to display.
n=1: Asterisks are echoed back to the display.

You can use the command to hide the value of numbers when a password is being entered. The password number will be entered, but the display will only show ‘****’. When used for this purpose, SSP will need to be ‘set’ (n=1) just before password entry and ‘reset’ (n=0) just after password entry.

ST Shutdown

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>STn	N/A	n = 1 or 0	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO ON, OFF

Description
Motor shutdown.

0:	The drive is enabled
1:	The drive is disabled.

Any move commands given during motor shutdown will not be executed. ST0 re-enables all move commands. This function is normally used to allow manual positioning of the load.

It can also be used within sequences to energise/de-energise the drive under program control.

Example

Command	Description
ST1	The drive is disabled

STOP Stop

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>STOP	N/A	N/A	N/A	Immediate, Universal

SEE ALSO K, S

Description
This is an alternative expression for the S command. If SSH 0 (Don't save command buffer on stop) is set, the command buffer is cleared (at the end of a move if one is in progress).

Both a sequence (XD command) and a time delay are terminated by the Stop command.

The motor is decelerated to stop using the current acceleration value ('A') but the drive stays energised.

If SSH1 (Save command buffer on stop) is set, the command buffer is not cleared and only the move that is in progress is terminated.

Example

Command	Description
MC	Set continuous mode
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
G	Go - run continuously
STOP	The motor will decelerate to a stop at a rate of 10 revs/sec/sec as soon as STOP is entered

STR Set Strobe Output Delay Time

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>STR<n>	n = ms	10 - 5,000	10	Buffered, Universal, Saveable in sequence

RESPONSE TO aSTR IS Strobe time = n milliseconds

SEE ALSO VRD, LRD, DRD,XRD, TMRD, FRD, VARD

Description
This command defines the amount of time each strobe output is active. These delay and strobe outputs are used when loading parallel BCD data via remote inputs. The data transferred from the remote inputs are:

Velocity	VRD
Distance	DRD
Loop Counts	LRD
Sequence Numbers	XRD
Time	TMRD
Following	FRD
Variables	VARD

If used with a PLC, the Output Delay Time should be greater than the PLC Scan Time (to ensure that the data is present during a read) or set to a minimal debounce time if thumbwheel switches are used. The strobe output indicates that the Controller is ready for parallel input.

SV Save

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aSV	N/A	N/A	N/A	Immediate, Device Specific

Description
This command causes the current servo set up and indexer parameters to be saved in non-volatile RAM.

Note that in order to successfully save data using an X150 controller, link 8 must be in position B. Remove the link, or place in park position A, to write protect the RAM.

An error message is generated if an attempt is made to save data with the link in position A.

If you are using an X150E controller (BDHXE or PDHXE), bit switch 8 (of address switch) must be set to ON to allow writing of data to the RAM and set to OFF to write protect the RAM.

An error message is generated if an attempt is made to save data with switch 8 in the OFF position.

T Time Delay

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>Tn	Seconds	n = 0.001 - 4,294,967	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO VAR, TMRD

Description

This command causes the Controller to wait the number of seconds specified before it executes the next command in the buffer.

Example

Command	Description
MN	Set normal mode
A5	Set acceleration to 5 revs/sec^2
V5	Set velocity to 5 revs/sec
D25000	Set distance to 25000 steps
T2	Pause for 2 seconds
G	Go
T5	5 second time delay
G	After a further pause of 5 seconds, the move is again executed

The data value can be substituted with one of the Controller’s variables.

Example

Command	Description
VAR1=2	Load the value 2 into variable 1
G	Perform predefined move
T(VAR1)	Pause for 2 seconds
G	Perform predefined move

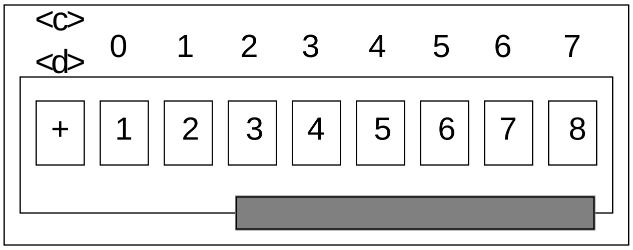
TMRD Read Timer Via Parallel Input/Output

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TMRD<c><d><e>	c, d =digit selector e = scaling factor	c, d = 0-7 e = 0-7	None	Buffered, Universal, Saveable in Sequence

SEE ALSO STR, T

Description
This command instructs the Controller to read timer values from the TM8 Module.



The command syntax allows for digit range selection through the optional <c><d> fields. The <c> field is used to signify the start of the digit range to be read from the TM8 Module. The raw data format is xxx.xxx, the maximum value is 999.999. Any larger number will result in the Controller giving an error response. The <d> field represents the end of the digit range to be read. The values of these fields can range from 0 to 7 with the <c> field always being less than or equal to the <d> field value.

The <e> field is used to scale the timer value by 10^e. If the <c> and <d> fields are used, the <e> field must be used.

If the <c>, <d> and <e> fields are not used, the TMRD command will read all the digits of the TM8 Module. If you are using the TM8 Module, the Output Strobe Delay Time must be set at a value of 10 or greater.

You may use a PLC with the TMRD command. The TMRD command uses a multiplexed I/O scheme. The outputs strobe through a BCD sequence at the Set Strobe Output Delay Time (STR) command rate and reads one BCD digit at a time. The outputs and inputs must be configured as in the TM8 Module read case. A TMRD command will issue the following strobe sequence:

Example

Turn the TM8 Module's thumbwheels to display:
+ 0 0 1 2 3 4 5 6

Type the following commands:

Command	Response
1TMRD	Sets a time delay of 123.456 seconds

TRD Trigger on Index Distance

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TRDn	User steps	±2,097,151	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO TRMN, TRMP, MQ

Description
Pauses command execution until a specified indexer distance has been reached. It is used in the speed-change mode MQ to cause velocity to change at a specific point, but can also be used for example to turn on an output. The distance specified can be incremental, or absolute in MPA mode.

Example

Command	Description
TRD3000	Set speed change distance to 3000 steps
V10	Change speed to 10 revs/sec

The data value can be substiituted with one of the Controller’s variable values.

Example

Command	Description
VAR5=3000	Set variable 5 to 3000
TRD(VAR5)	Set speed change distance to 3000 steps
V10	Change speed to 10 revs/sec

TRE	**Trigger on Input Equal**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TREn	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO SKE, TRN

Description
Pause until input status matches the pattern n.

The format for n is bbbbbbb_bbbbbbbbbb and is equivalent to:

```
LMT+  LMT-  HOME  AUX_IN  STOP  ENERGISE  INDEX  -
IN1  IN2  IN3  IN4  IN5  IN6  IN7  IN8  IN9  IN10
```

Each input can be 0 (off), 1 (on) or X (don't care). You can omit trailing X specifiers within each group.

For example the following specifiers are equivalent:

001XXXX_XXXXX11XXX and

001_XXXXX11

The next two are also equivalent:

XXXXXXX_X1 and

_X1

Example

Command	Description
1TRE_X1	The next command will be executed when input 2 is enabled

TRIP Trigger on In Position

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TRIP	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO CEW, CIT

Description

After use of this command, further buffered commands are not executed until the motor has stopped within the positive error deadband region for the specified in position wait time. The TRIP command can be used in the MC or MQ modes.

Example

Command	Description
MQ	Set speed change mode
1OUT2T	Set output 2 as 'in position'
CEW50	Set position error window to 50 steps
CIT50	Set in-position wait time to 50ms
V35	Set velocity to 35 revs/sec
A200	Set acceleration to 200 revs/sec^2
D80000	Set distance to 80000 steps
L	Set to loop once
G	Go - start the move
TRIP	Wait until in position before repeating move
N	End of loop

TRMN Negative Trigger on Motor Position

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TRMNn	User steps	±268,435,455	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO TRD, TRMP

Description

TRMN pauses command execution until a specified motor or feedback position has been reached or exceeded in the negative sense. It is used in the speed change mode MQ to cause velocity change at a particular physical position, but can also be used for example to turn on an output. The distance specified is always absolute.

Example

Command	Description
TRMN-40000	Specify negative motor position
O1	Output 1 turns on when 40000 is reached or exceeded

TRMP Positive Trigger on Motor Position

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TRMPn	User steps	±262,143,998	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO TRD, TRMN

Description

TRMP pauses command execution until a specified motor or feedback position has been reached or exceeded in the positive sense. It is used in the speed change mode MQ to cause velocity change at a particular physical position, but can also be used for example to turn on an output. The distance specified is always absolute.

Example

Command	Description
TRMP40000	Specify positive motor position
O1	Output 1 turns on when 40000 is reached or exceeded

TRN

Trigger on Input Not Equal

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TRNn	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

Description
Pause until the input status is not equal to n.

The format for n is bbbbbbb_bbbbbbbbbb and is equivalent to:

LMT+ LMT- HOME AUX_IN STOP ENERGISE INDEX -
IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10

Each input can be 0 (off), 1 (on) or X (don't care). You can omit trailing X specifiers within each group.

For example the following specifiers are equivalent:

001XXXX_XXXXX11XXX and 001_XXXXX11

The next two are also equivalent:

XXXXXXX_X1 and _X1

Example

Command	Description
1TRN_X1	The next command will be executed when input 2 is disabled

TRR Registration Move Distance

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TRRn	User steps	-2,097,152 to +2,097,151	0	Buffered, Universal, Saveable in sequence

Description
Selects Registration move, a move ending a specified distance in user steps after a mark signal appears at AUX_IN. The move is used in modes MC or MQ.

TRS Trigger status

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TRS	N/A	N/A	N/A	Immediate, Universal,

SEE ALSO TRE, TRN

Description
TRS is used to check the status of trigger lines.

Example

Command	Description
1TRS	Check trigger levels

```
Active trigger levels are:
LMT+ LMT- HOME AUX-IN STOP ENG INDEX_I1 I2 I3 I4 I5 I6 I7 I8 I9 I10
*XXXXXXX_XX11X0X1XX
```

TUNE

Display Tuning Settings

BDHXE v6.2	PDHXE **n/a**
BLHX v5.9	PDHX **n/a**
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aTUNE<n>	N/A	1-11	N/A	Buffered, Device Specific, Saveable in Sequence

SEE ALSO TUNET, TUNEV, DR

Description

The TUNE command with no parameter causes the control module to report tuning information calculated or measured during the previous move. The response format is:

1. Measured largest position error - steps.
2. Measured largest torque demand.
3. Measured settling time within window (ms).
4. Measured total indexing + settling time (ms).
5. Calculated stiffness (mNm/step).
6. Calculated error at maximum torque (steps).
7. Estimated load inertia (Kg/cm$^{2)}$.
8. Estimated maximum available acceleration (revs/sec^2).
9. Estimated double time constant (ms).
10. Estimated 1/2 settling time (ms).
11. Estimated closed loop bandwidth (Hz).

If a numeric parameter <n> is entered, any one of the above values as defined by the number will be reported.

If CPG is set to zero, the range of values returned will be restricted to the first 4 (i.e. TUNE5 and above are not available). If CVG is set to zero, the range of values returned will be restricted to the first 6 (i.e. TUNE7 and above are not available).

Example

Command	Description
1TUNET	Self-tune servo
CEW2	Set narrow 'in position' window
D400	Set distance to 400 steps
A100	Set acceleration to 100 revs/sec^2
V50	Set velocity to 50 revs/sec
G	Go - start the move
1TUNE3	Report data item 3 (settling time) only

# TUNET	**Servo Self-Tuning** **(Torque amplifier settings)**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TUNET	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO TUNE, TUNEV

Description

This command self-tunes the servo as a torque amplifier for a point to point move. The following parameters are set:

CPG Maximised to the point where the standing digital vibration is reasonable.

CVG Set for stability - little overshoot beyond the end point of a move and no oscillations.

CTG Set to cut off the velocity feedback action at high frequency.

Example

Command	Description
1TUNET	Self-tune servo
1SV	Save parameters for future use

SAFETY

The tuning process moves the load a distance of 178 steps backwards and forwards using step changes of position demand that result in about 50% of the maximum available motor torque being suddenly applied to the load. This process continues for up to 30 seconds depending on the load conditions. During this time buffered commands typed at the keyboard or pending in a sequence will not be executed. However, the unit will respond to immediate commands such as K, S or OFF, to enabled end of travel inputs and stop input. If the tuning is interrupted in this way, the servo parameters will then be in an intermediate state and it may be necessary to cycle the power or use the Z command to restore them to a viable state.

OFF or power cut is the only safe way to stop uncontrolled unstable oscillation.

# TUNEV	**Servo Self-Tuning** **(Velocity amplifier settings)**	BDHXE **n/a** BLHX v5.9 X150DS v5.9	PDHXE **n/a** PDHX **n/a**

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>TUNEV	N/A	N/A	N/A	Buffered, Universal, Saveable in sequence

SEE ALSO TUNE, TUNET

Description

This command self-tunes the servo as a velocity amplifier for a point to point move. The process may also be used for pneumatic and hydraulic actuators. It is a limited process, maximising CPG starting from the value you enter so that there is little overshoot and no oscillations occur. The final value of CPG is dependent on the velocity loop gain which you have set. The following parameters are set:

CPG Maximised, starting from the entered value and taken to the point where there is little overshoot beyond the end of move position and no oscillations occur.

CVG Not altered - normally zero since damping is provided by the velocity amplifier.

CTG Not altered.

Example

Command	Description
1CPG50	CPG set for a low gain
1TUNEV	Self-tune servo
1SV	Save parameters for future use

SAFETY

The tuning process moves the load a distance of 178 steps backwards and forwards using step changes of position demand that result in about 50% of the maximum available motor torque being suddenly applied to the load. This process continues for up to 30 seconds depending on the load conditions. During this time buffered commands typed at the keyboard or pending in a sequence will not be executed. However, the unit will respond to immediate commands such as K, S or OFF, to enabled end of travel inputs and stop input. If the tuning is interrupted in this way, the servo parameters will then be in an intermediate state and it may be necessary to cycle the power or use the Z command to restore them to a viable state.

OFF or power cut is the only safe way to stop uncontrolled unstable oscillation.

TX Transmit Variable Plus String

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES

aTXn,m,p,x	see below	n=1 - 50
		m=0 or 1
		p=0 - 5
		x=ASCII
			none	Buffered,
				Saveable in Sequence

SEE ALSO VAR, RSIN

Description
This command transmits via the serial port (RS-232C) the value of a user variable and a string to compose a command for another indexer. The command format is TXn,m,p,x, where:

n = The variable number
m = 1 if the sign is to be sent, 0 if the sign is not to be transmitted
p = The number of digits to be sent after the decimal point
x = The ASCII string that is transmitted prior to the variable contents

Example

Command	Description
VAR1=987.12345	Set variable #1
1TX1,0,3,3V	3V987.123 is transmitted via the serial port
1TX1,1,0,2D	2D+987 is transmitted via the serial port
1TX1,0,5,2VAR3=	2VAR3=987.12345 is transmitted via the serial port

U Pause

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>U	N/A	N/A	N/A	Immediate, Universal

SEE ALSO PS, C

Description
Pause immediately and wait for continue.

Execution of a command string will be paused at the point where a U command is entered. Command C will cause execution to be resumed at the point where it was paused.

Example

Command	Description

MN	Set normal mode
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
L	Loop continuously
D8000	Set distance to 8000 steps
G	Go - start move
H-	Set direction to negative
G	Go - start negative move
N	End of loop

In this example the motor will turn 2 revolutions in the positive direction, then two revolutions in the negative direction in a continuous loop. If a U command is entered during the execution of the loop, the motor will stop at the end of its current move. On receipt of a C command, execution of the loop will be resumed from the point where it was paused.

UNTIL Until

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>UNTIL(e) conditions	e=evaluation	-	None	Buffered, Saveable in Sequence

SEE ALSO REPEAT, WHILE, NWHILE

Description
The UNTIL command marks the end of the REPEAT command. The UNTIL command is evaluated and if it is false, program flow is redirected to the REPEAT command, where the commands between the REPEAT and UNTIL commands are executed again. Those commands will continue to execute until the UNTIL command is true, then the commands after the UNTIL command are executed.

REPEAT...commands...UNTIL(condition)

Example

Command	Description
REPEAT	Repeat
XR1	Execute sequence 1
T1	Time delay of 1 second
UNTIL(IN_10 OR IN_01)	If input #1 on and input #2 off, or input #1 off and input #2 on, do next command, else execute from command following REPEAT

V Velocity

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>Vn	Revs/sec	n = 0.0001 - 200.00	1	Buffered, Universal, Saveable in Sequence

SEE ALSO A, D, G

Description
Sets the velocity. Note that the actual top speed of the motor is limited by the motor type and drive. If the velocity is set too high, the position error will exceed the maximum position error limit (set by CPE) and the drive will be shut down. If the command V0 is given when moving in MQ or MC the motor will stop as with the S command. If the motor is not moving, the fastest possible velocity is used for the move.

Example

Command	Description
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
D8000	Set distance to 8000 steps
G	Go - Motor will turn 2 revolutions in the positive direction at 10 revolutions per second

The data values can be substituted with one of the Controller's variables.

Example

Command	Description
VAR1=10	Load the value 10 into variable 1
V(VAR1)	Set velocity to 10 revs/sec

VAR Variables

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>VARn	n=variables	1 - 50	0	Buffered, Saveable in Sequence

Description
Fifty variables (VAR1 - VAR50) can be used to perform mathematical operations and these can then be used for selected data fields or in evaluation statements. You can substitute variables for data fields for the following commands:

XG(VARn)	Goto sequence number contained in VARn
XR(VARn)	Run sequence number contained in VARn
GOTO(VARn)	Goto sequence number contained in VARn
GOSUB(VARn)	Gosub to sequence number contained in VARn
L(VARn)	Load loop count with value in VARn
V(VARn)	Load velocity with value in VARn
D(VARn)	Load distance with value in VARn
A(VARn)	Load acceleration with value in VARn
T(VARn)	Load and execute a timer with value in VARn
CMR(VARn)	Load motor resolution with value in VARn
COFF(VARn)	Load amplifier offset with value in VARn
CUR(VARn)	Load user resolution with value in VARn
FOL(VARn)	Load following with value in VARn
VAR(VARn)	Load variable with value in VARn
TRR(VARn)	Load registration distance with value in VARn
TRD(VARn)	Load trigger distance with value in VARn
VARn=POS	Load variable with the present value of the position counter
VARn=ABS	Load variable with the absolute encoder position
VARn=FEP	Load variable with the following encoder position
VARn=RSIN	Load variable with data during sequence execution
VARn=TQ	Load variable with torque level, 1023 equals maximum peak torque

OPERATORS

>	Greater than
<	Less than
=	Equal to
AND	Logic AND
OR	Logic OR
*	Multiply
+	Addition
-	Subtraction
/	Division

Example

Command	Description
VAR1=50	Load variable #1 with 50
XR(VAR1)	Execute sequence #50

You can use variables in mathematical operations to obtain new values:

Addition:	VARn=VARn+VARn
Subtraction:	VARn=VARn-VARn
Division:	VARn=VARn/VARn
Multiplication:	VARn=VARn*VARn

A constant, POS (the present value of the position counter), or ABS (Encoder Position) can be substituted for the operands:

```
VAR1=VAR2+20
VAR5=VAR7
VAR8=POS+50000
VAR9=20.62
```

Example

Command	Description
VAR1=20	Load variable #1 with 20
VAR2=5	Load variable #2 with 5
VAR3=VAR1-VAR2	Variable #3 now contains 15

The mathematical operations are evaluated in order from left to right along the command line.

```
e.g.    VAR4 = VAR1 - VAR2 * VAR3
is equivalent to:     (VAR1 - VAR2) * VAR3
and not:              VAR1 - (VAR2 * VAR3)
```

To read back the value of a variable type:

1VAR3 <CR>

The response is:

```
* 15.0000
```

VARDn Read Variable Via Parallel Input/Output

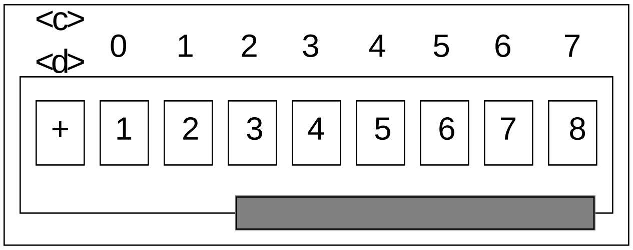
BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES

<a>VARDn,
<c>,<d>,<e>
	c, d =digit selector
	e = scaling factor
		c, d = 0-7
		e = 0-7
		n=1-50
			None	Buffered, Universal, Saveable in Sequence

SEE ALSO STR

Description
This command instructs the Controller to read Variable values from Compumotor's TM8 Module. Inputs 6-10 are used as data inputs and outputs 3-6 are used to strobe the TM8 Module.



The command syntax allows for digit range selection through the optional <c><d> fields. The <c> field is used to signify the start of the digit range to be read from the TM8 Module. The raw data format is xxxxx.xxx. The <d> field represents the end of the digit range to be read. The values of these fields can range from 0 to 7 with the <c> field always being less than or equal to the <d> field value.

The <e> field is used to scale the variable value by 10^e. If the <c> and <d> fields are used, the <e> field must be used.

If the <c>, <d> and <e> fields are not used, the VARD command will read all the digits of the TM8 Module. If you are using the TM8 Module, the Output Strobe Delay Time must be set at a value of 10 or greater.

You may use a PLC with the VARD command. The VARD command uses a multiplexed I/O scheme. The outputs strobe through a BCD sequence at the Set Strobe Output Delay Time (STR) command rate and reads one BCD digit at a time. The outputs and inputs must be configured as in the TM8 Module read case.

Example

Turn the TM8 Module's thumbwheels to display:
+ 1 2 3 4 5 6 7 8

Type the following commands:

Command	Response
1VARD1	Load variable 1 from digits
1VAR1	12345678

VARn=FUN Enable and Read Function Keys

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>VARn=FUN	variable number	1 - 50	None	Buffered, Universal, Saveable in Sequences

SEE ALSO VAR

Description

The VARn=FUN command is used to enable the function keys on the RP240 and retrieve the function key pressed. Once this command is encountered, command processing stops until the RP240 returns a number corresponding to the function key pressed. Function key 1 (F1) returns a 1, function key 2 (F2) returns a 2, etc. MENU RECALL returns a zero. The number that is returned is placed in the variable n.

Example

Command	Description
XE1	Erase sequence 1
XD1	Begin definition of sequence 1
DPC205	Position the cursor on line 2, column 5
DTXT"PRESS F1"	Place message PRESS F1 at current cursor location
VAR1=FUN	Retrieve function key pressed value and place in variable 1
L	Begin endless loop
IF(VAR1=1)	If variable 1 equals 1, do the commands between IF and NIF
XG2	Branch to sequence 2
NIF	End IF statement
N	End endless loop
XT	End definition of sequence 1

VARn=NUM Enable and Read Numeric Keypad

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>VARn=NUM	None	1 - 50	None	Buffered, Universal, Saveable in Sequences

SEE ALSO VAR

Description

The VARn=NUM command is used to enable the numeric keypad on the RP240 and retrieve the numeric information entered. Once this command is encountered, command processing stops until the RP240 returns a value entered on the numeric keypad. The sign of a number to be entered is selected using the +/- key, which must be pressed before the number is entered if its sign is to be changed. Normally, numbers are entered directly, without any change of sign. The C/E key will delete the last key entered and allow you to re-type.

The number that is returned by the RP240 is placed in the variable n of the Controller. If either the +/- key, the ENTER key, or the . key is entered by itself, the variable will be set to zero.

Example

Command	Description
XE1	Erase sequence 1
XD1	Begin definition of sequence 1
DCLR0	Clear display
DPC105	Position the cursor on line 1, column 5
DTXT"ENTER BAG COUNT"	Place message ENTER BAG COUNT at current cursor location
VAR1=0	Initialize variable 1
WHILE(VAR1<1 OR VAR1>10)	Do statements between WHILE and NWHILE until 1<VAR1<11
VAR1=NUM	Retrieve numeric value and place in variable 1
IF(VAR1<1)	If variable 1 < 1 do the command between IF and NIF
DPC205	Position the cursor on line 2, column 5
DTXT”BAG COUNT TOO LOW”	Place message BAG COUNT TOO LOW at current cursor location

T2	Time delay 2 seconds
DCLR2	Clear line 2 of RP240 display
NIF	End IF statement
NWHILE	End WHILE statement
MN	Set to normal mode
LD3	Disable limits (if not connected)
A10	Set acceleration to 10 rps^2
V2	Set velocity to 10 rps
D25000	Set distance to 25,000 steps
L(VAR1)	Loop as many times as specified by variable 1
G	Initiate motion
T1	Time delay 1 second
N	End loop
XT	End definition of sequence 1

VARn=SMC Set User Variable to Sampled Count

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>VARn=SMC	variable number		None	Buffered, Universal, Saveable in Sequence

SEE ALSO VAR

Description

This allows the velocity of the following encoder to be monitored and used to modify the operation of the program.

A nominated user variable is loaded with the number of encoder pulses occurring during each sample period.

a	is the axis address
n	is the user variable number

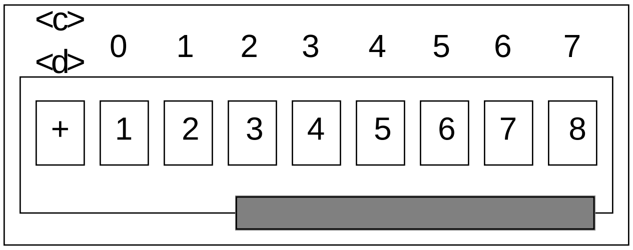
VRD	**Read Velocity Value from Parallel Input/Output**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>VRD<c> <d>,<e>	c, d =digit selector e = scaling factor	c, d = 0-7 e = 0-7	None	Buffered, Universal, Saveable in Sequence

SEE ALSO STR

Description

This command instructs the Controller to read Variable values from Compumotor’s TM8 Module.



The command syntax allows for digit range selection through the optional <c><d> fields. The <c> field is used to signify the start of the digit range to be read from the TM8 Module. The raw data format is xxx.xxxx, the maximum value is 200.0000. Any larger number will result in the Controller giving an error response. The <d> field represents the end of the digit range to be read. The values of these fields can range from 0 to 7 with the <c> field always being less than or equal to the <d> field value.

The <e> field is used to scale the velocity value by 10^e. If the <c> and <d> fields are used, the <e> field must be used.

If the <c>, <d> and <e> fields are not used, the VRD command will read all the digits of the TM8 Module. If you are using the TM8 Module, the Output Strobe Delay Time must be set at a value of 10 or greater.

You may use a PLC with the VRD command. The VRD command uses a multiplexed I/O scheme. The outputs strobe through a BCD sequence at the Set Strobe Output Delay Time (STR) command rate and reads one BCD digit at a time. The outputs and inputs must be configured as in the TM8 Module read case.

Example

Turn the TM8 Module's thumbwheels to display:
+ 0 0 1 2 3 4 5 6

Type the following commands:

Command	Response
1VRD	Read velocity value
1V	Response *V12.3456

WHEN Set WHEN Condition

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>WHEN(e)	e=evaluation commands	See evaluation commands	None	Buffered, Universal, Saveable in Sequence

SEE ALSO XWHEN

Description
The WHEN command allows you to continuously examine a set of conditions and if the condition is true, the Controller will execute the sequence defined by the XWHEN command. The command currently in progress will finish, and the XWHEN sequence will execute.

The XWHEN sequence will not execute every time that the WHEN condition is met, only the first time. For multiple execution of the XWHEN sequence, the last command of the XWHEN sequence should be the WHEN command again.

After the XWHEN sequence has been executed, control passes back to the original sequence, returning to the command after the original interruption.

Example

Command	Description
XWHEN2	Set WHEN sequence to 2
WHEN(IN_1)	When input #1 becomes active, execute the WHEN sequence (#2)

WHILE WHILE

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>WHILE(e)	e=evaluation commands	See evaluation commands	None	Buffered, Universal, Saveable in Sequence

SEE ALSO NWHILE, REPEAT UNTIL

Description
The WHILE command, in conjunction with the NWHILE command, provides a means of conditional program flow. The WHILE command marks the beginning of the conditional statement. If the WHILE is true, the commands between the WHILE and NWHILE commands are executed. However, if the WHILE is false, program execution jumps to the command after the NWHILE command. Up to 16 levels of WHILE commands may be nested.

WHILE(condition) commands NWHILE

Example

Command	Description
WHILE(IN_1)	While input #1 is active, run commands between WHILE and NWHILE
XR1	Execute sequence 1
NWHILE	End of WHILE

XBS Sequence Memory Available Report

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXBS	None	None	None	Immediate, Device Specific, Never Saved

RESPONSE TO aXBS **IS** *n bytes free

Description
This command reports the remaining amount of memory that can be used for sequence storage. The total space available for sequence storage is 8,000 bytes (characters). XBS is useful for determining how much more programming can be done on the Controller, after defining several programs.

Example

Command	Description
1XBS	*4000 bytes free

There are 4,000 bytes available in the sequence buffer.

XC Checksum

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXC	N/A	N/A	N/A	Buffered, Device Specific, Saveable in Sequence

Description

This command causes the checksums for the volatile and non-volatile RAM to be computed and reported .

XD	**Sequence Download**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XDn	N/A	1 - 64	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO XT, XE, XR, XRP, XU

Description

This is the 'Start sequence' indicator for downloading a sequence. It clears the command buffer and all subsequent commands will be stored in the buffer until receipt of an XT command. A sequence will not be stored if a sequence with the same number identifier already exists, or if there is an error whilst downloading the sequence. THE SEQUENCE IS NOT STORED IN NON-VOLATILE BACKUP RAM UNTIL THE SV COMMAND IS GIVEN.

Example

Command	Description
XD1	Start sequence 1 download
A10	Set acceleration to 10 steps/sec^2
V10	Set velocity to 10 revs/sec
D8000	Set distance to 8000 steps
G	Go - start move
D4000	Set distance to 4000 steps
H	Reverse direction
G	Go - start move
XT	End of download

The sequence is defined as sequence No.1. Each time XR1 is entered the motor will turn 2 revolutions positive and then 1 revolution negative.

XE Sequence Delete

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XEn	n = sequence number	n = 1 - 64	N/A	Buffered, Universal

SEE ALSO XD, XT, XR, XRP, XU, XEALL

Description
Delete sequence n from RAM.
XEALL will delete all existing sequences.

Example

Command	Description
XE1 1SV	Sequence No.1 is deleted from RAM
XEALL	Erase all sequences

XEALL Erase All Sequences

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XEALL	None	None	N/A	Buffered, Saveable in Sequence

SEE ALSO XD, XE,XR, XT

Description
This command erases all defined sequences. ***It should be used with extreme caution.***

Example

Command	Description
XEALL	Erase all defined sequences

XFK Set Fault or Kill Sequence

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XFKn	n = sequence	n = 0 - 64	0	Buffered, Universal

number

Saveable in Sequence

SEE ALSO K, XR

Description

This command selects the sequence that will be executed if a fault or kill condition occurs. A selection of 0 causes no sequences to be executed. This command enables a pre-defined sequence to be executed when a fault or kill condition exists.

The fault conditions are listed below:

*NO_ERRORS/WARNINGS
*USER_INPUT_FAULT
*MOTOR_FAULT
*BATTERY_ BACKUP_RAM_CORRUPTED
*DRIVE_OVERHEATING
*EXCESSIVE_POSITION_ERROR

The kill condition exists if issued via the hardware or RS232C interface.

Example

Command	Description
XFK5	Execute sequence #5 when fault or kill condition exists
XE5	Erase sequence #5
XD5	Define sequence #5
SB	Stop buffered
XT	End sequence definition

Note: STOP is not a fault condition.

XG GOTO Sequence

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XGn	n = sequence number	n = 1 - 64	None	Buffered, Saveable in Sequence

SEE ALSO XR, GOTO, GOSUB

Description

This command will jump to a designated sequence for execution. Once you jump to a sequence using XG, you cannot return to the sequence from which XG originated (unless another XG command is executed)*. To jump to a sequence and return (GOSUB operation), you must use the XR or GOSUB commands. There are no limitations on the number of XG commands - no nesting involved.

*Note if an XG command is used following an IF command the code jumped to must be preceded by a NIF command to clear the original IF command.

Example

Command	Description
XE1	Erase sequence 1
XD1	Define sequence 1
A2	Sets acceleration to 2 rps^2
V5	Sets velocity to 5 rps
D10000	Sets distance to 10,000 steps
G	Executes the move (Go)
XG5	Go to sequence #5
XT	End defined sequence #1
XE5	Erase sequence #5
XD5	Define sequence #5
1PR	Absolute position report
XT	End sequence #5 definition
XR1	Execute sequence #1

The data value can be substituted with one of the Controller’s variable values. The integer value of the variable is always used.

Example

Command	Description
VAR1=4	Set variable 1 to 4
XG(VAR1)	Go to sequence #4

XP	**Power-On Sequence Number**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XPn	n = sequence number	n = 0 - 64	N/A	Buffered, Universal

SEE ALSO XSP, XSR, XZ

Description

Set the power-on sequence mode and sequence number to be executed on power up. The command must be saved before power off to enable the sequence to be executed on power up. If the command XP0 is sent, no power-on sequence will be executed. This facility is normally used for stand alone operation.

Example

Command	Description
XP1	Sequence No.1 will be executed on power-up
1SV	Save current setup

XR	**Run Sequence**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XRn	n = sequence number	n = 1 - 64	N/A	Buffered, Universal, Saveable in Sequence
				SEE ALSO XT, XD, XE, XRP, GOSUB, XRT, XU

Description
Run a sequence.

An XR command can be used within one sequence to start execution of another sequence

If an XT or XRT command is reached in the called sequence, program execution returns to the originating sequence. When the XRn routine is completed, program control returns to the statements following the XRn command. In this respect an XR acts like a subroutine call.

The maximum number of nested sequences is 16.

You must be certain that the number of loops and loop terminators are balanced within a single sequence.

You cannot start a loop in one sequence and end it in another called by the XR command.

Example

Command	Description
XR1	Sequence No.1 will be executed

The data value can be substituted with one of the Controller’s variable values. The integer value of the variable is always used.

Example

Command	Description
VAR1=4	Set variable 1 to 4
XR(VAR1)	Call sequence #4 as a subroutine

XRD

Read Sequence via Parallel Input/Output

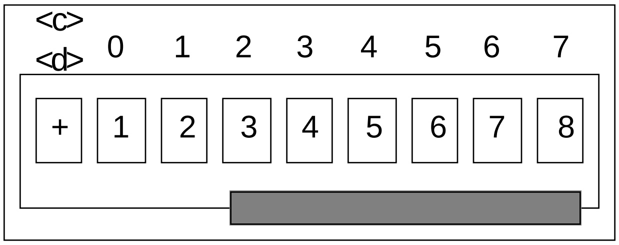
BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XRD<c>, <d>,<e>	c, d =digit selector e = scaling factor	c, d = 0-7 e = 0-7	None	Buffered, Universal, Saveable in Sequence

SEE ALSO STR

Description

This command instructs the Controller to read Variable values from Compumotor’s TM8 Module.



The command syntax allows for digit range selection through the optional <c><d> fields. The <c> field is used to signify the start of the digit range to be read from the TM8 Module. The raw data format is xx, the maximum value is 64. Any larger number will result in the Controller giving an error response. The <d> field represents the end of the digit range to be read. The values of these fields can range from 0 to 7 with the <c> field always being less than or equal to the <d> field value.

The <e> field is used to scale the sequence value by 10^e. If the <c> and <d> fields are used, the <e> field must be used.

If the <c>, <d> and <e> fields are not used, the XRD command will read all the digits of the TM8 Module. If you are using the TM8 Module, the Output Strobe Delay Time must be set at a value of 10 or greater.

You may use a PLC with the XRD command. The XRD command uses a multiplexed I/O scheme, as in the TM8 Module read case.

Example

Turn the TM8 Module's thumbwheels to display:
+ 0 0 0 0 0 0 1 2

Type the following commands:

<u>Command</u>	<u>Response</u>
1XRD	Run sequence 12

XRP Run/Pause Sequence

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XRPn	n = sequence number	n = 1 - 64	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO XR, XD, XT, XE, C, DCNT

Description
Run a sequence with a pause. The XRP command operates in the same way as XR except that a pause condition, which must be cleared before the command buffer is executed, is automatically generated . The pause condition is executed only if the sequence is valid.

The pause condition is cleared by either a C command (continue) or the CONTINUE key on the RP240 (DCNT1).

Example

Command	Description
XRP1	Sequence No.1 is loaded into the command buffer and is paused until a continue (command C) is entered

XRT Return From Sequence

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XRT	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO XT, XR GOSUB,

Description
This command is used in a sequence to terminate execution of that sequence. It is typically used in branched sequences where the RS232C Control Module must exit the sequence before the XT command. It can be used in conjunction with 'SKIP' commands.

# XSD	## Sequence Download Status Report	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXSD	N/A	N/A	N/A	Buffered, Device Specific
				SEE ALSO XD, XE

Description
Requests report back of the status of a previous sequence sent from the Controller to the RS232C Control Module as a single ASCII character followed by [CR] as follows:

0[CR]: Received OK

1[CR]: Cannot overwrite existing sequence (sequence with this number already exists - erase previous one first)

2[CR]: Sequence buffer full

Note that in order to retain the sequence it is necessary to save it using the SV command.

Example

Command	Response
1XSD	0[CR] (Sequence received OK) ;download OK

XSR	**Sequence Run Status Report**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXSR	N/A	N/A	N/A	Immediate, Device Specific

SEE ALSO XR, XRP

Description

Return sequence run status as a single ASCII character followed by [CR].

0[CR] = Running (or ran successfully)
2[CR] = Invalid sequence - requested sequence doesn't exist

Example

Command	Response
1XSR	0 (sequence OK)

XSS	**X Sequence Status**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXSSn	Sequence number	n = 1 - 64	N/A	Buffered, Device Specific

SEE ALSO XD, XT, XE

Description

Return status of sequence n as a single ASCII character followed by [CR].

0[CR]: Empty - sequence doesn't exist
2[CR]: OK - sequence does exist

The XSS command will inform the user if the sequence indicated by the number immediately following (no space) the XSS command does in fact exist in volatile memory.

For the sequence to exist in non-volatile memory, the SV command must be used to save the sequence.

Example

Command	Response
1XSS1	0 [CR] (Sequence not defined)

XST	**Sequence Step Mode**	BDHXE v6.2 PDHXE v6.2 BLHX v5.9 PDHX v5.9 X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXST<n>	n = mode	0 = off 1 = on	0	Buffered, Device Specific Saveable in Sequence

SEE ALSO #, XR, XTR

RESPONSE TO aXST **IS** *n single step mode active or *n single step mode inactive

Description

This command sets the Controller into a Sequence Step mode. This command can only be used with the # (n) command. When you are running a sequence with Sequence Step mode active, every time you issue a # (n) command, the Controller will execute n commands in the sequence buffer.

XST1: Sequence Step Mode active
XST0: Sequence Step Mode inactive

Since you need to send a # command over the RS-232C interface, this command cannot be run in Stand Alone mode. You must be executing the sequence in RS-232C mode. You must enter a delimiter after the step (#) command to execute the command. If you are in the trace mode (XTR), the Controller will display n commands every time you enter the #n command. This command is useful for troubleshooting your program to see where you are in the program and what takes place with each command. You can use the Kill (K) command to abort sequence execution.

Example

Command	Description
XE1	Erase sequence #1
XD1	Define sequence #1
A5	Sets acceleration to 5 rps^2
V2	Sets velocity to 2 rps
D10000	Sets distance to 10,000 steps
G	Executes the move (Go)
XT	End defining sequence #1
1XST1	Enable Single-Step mode
1XTR1	Enable trace mode
XR1	Execute sequence #1
#	Execute the 1st command
;SEQUENCE: 1 COMMAND: A5	Display the 1st command executed
#	Execute the 2nd command
;SEQUENCE: 1 COMMAND: V2	Display the 2nd command executed
#	Execute the 3rd command
;SEQUENCE: 1 COMMAND: D10000	Display the 3rd command executed
#	Execute the 4th command
;SEQUENCE: 1 COMMAND: G	Display the 4th command executed - motor should have moved 10,000 steps
#	Execute the 5th command

XT Sequence Terminator

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XT	N/A	N/A	N/A	Buffered, Universal, Saveable in Sequence

SEE ALSO XE, XD, XU

Description
The XT command is used to terminate a sequence download, thus returning the system to command mode. The executable end of sequence is also marked at this point.

XTR Sequence Trace Mode

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXTR<n>	n = mode	0 = off 1 = on	0	Buffered, Device Specific Saveable in Sequence

SEE ALSO XR, XST

RESPONSE TO aXTR **IS** *n trace mode active or *n trace mode inactive

Description

XTR1: Enables Trace Mode
XTR0: Disables Trace Mode

When the trace mode is enabled, commands will be echoed to the host via the RS232 interface, if the Controller is runing a sequence.

Enabling Trace Mode transmits the commands and the sequence number being executed. If you have a loop (L), REPEAT or WHILE command in a sequence, it will display the iteration count. XTR is useful if you wish to see where you are in the program as it is being executed.

Although the XTR mode can be selected while a sequence is not being executed, XTR can be used within a sequence allowing selective operation of the trace mode. This is particularly useful when debugging long and complex sequences.

Example

Command	Description
XE1	Erase sequence #1
XD1	Define sequence #1
A10	Sets acceleration to 10 rps^2
V5	Sets velocity to 5 rps
D25000	Sets distance to 25,000 steps
L2	Loop 2 times
G	Executes the move (Go)
N	End loop
XT	End defining sequence #1
1XTR1	Enable trace mode
XR1	Execute sequence #1

Trace mode output is shown below:

```
;SEQUENCE: 1 COMMAND: A10
;SEQUENCE: 1 COMMAND: V5
;SEQUENCE: 1 COMMAND: D25000
;SEQUENCE: 1 COMMAND: L2
;SEQUENCE: 1 COMMAND: G        LOOP COUNT: 1
;SEQUENCE: 1 COMMAND: N        LOOP COUNT: 1
;SEQUENCE: 1 COMMAND: G        LOOP COUNT: 2
;SEQUENCE: 1 COMMAND: N        LOOP COUNT: 2
;SEQUENCE: 1 COMMAND: XT
```

XU Sequence Upload

BDHXE v6.2	PDHXE v6.2
BLHX v5.9	PDHX v5.9
X150DS v5.9	

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
aXU<n>	n = sequence number	n = 1 - 64	N/A	Immediate, Device Specific

SEE ALSO XE, XD, XR

Description
The sequence upload command displays the sequences stored in RAM. The value n is the sequence number and if it is omitted a display of all stored sequences will occur. Note the Controller is supplied with default sequences to get you started (see RIFS command).

XWHEN Set WHEN Sequence

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XWHEN<n>	n = sequence number	0 - 64	0	Buffered, Universal, Saveable in Sequence

RESPONSE TO aXWHEN **IS** *n

SEE ALSO WHEN

Description
XWHEN selects the sequence that will be executed if a WHEN condition is true. XWHEN0 causes no sequences to be executed. The WHEN condition continually examines a set of conditions. If the condition is true, the XWHEN sequence is executed.

Note: Use of this command will increase program execution time.

Example

Command	Description
XWHEN5	Execute sequence #5 when the WHEN condition is true

XZ Reset Power-Up Sequence Mode

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>XZ	N/A	N/A	N/A	Immediate, Universal

SEE ALSO Z, XP

Description
Sets the power-on sequence mode to zero (thereby disabling sequence activation on power-on).

This is the same function as XP0 but it also calls the SV command to save this mode.

*Y Terminate Loop

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>Y	N/A	N/A	N/A	Immediate, Universal, *

SEE ALSO L, N

Description
Terminates a loop at end of the current pass.

Example

Command	Description
L	Loop continuously
A10	Set acceleration to 10 revs/sec^2
V10	Set velocity to 10 revs/sec
D8000	Set distance to 8000 steps
T2	Wait for 2 seconds
G	Go - start move
N	End of loop
Y	Terminate loop at end of pass

Loop will continuously cause the motor (4000 steps/rev) to move 2 revolutions positive and then wait for 2 seconds. The loop will be terminated at the end of the pass during which the Y command is entered.

Z Reset

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
Z	N/A	N/A	N/A	Immediate, Universal

Description
Software reset. This command applies a reset as if the power had been switched off and then on again. The command is universal and it returns all axes to their last saved settings - it cannot be made device specific.

; Comment Field

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES

;	None	None	None	-

Description
The ; designates a comment within a program. The characters between the ; and the next <CR> are not executed and allow the addition of descriptions to source programs.

Comments cannot be stored in a sequence.

Example

Command	Description
XD1	;Defines sequence #1
A20	;Sets acceleration to 20 rps2
V5	;Sets velocity to 5 rps
D50000	;Sets distance to 50,000
G	;Executes the move (Go)
XT	;Ends defining sequence #1

Within a comment field, the space character acts as an ordinary text character and not as a command delimiter.

# Step Sequence

BDHXE v6.2 PDHXE v6.2
BLHX v5.9 PDHX v5.9
X150DS v5.9

SYNTAX	UNITS	RANGE	DEFAULT	ATTRIBUTES
<a>#<n> commands	n = program	1 - 255	None Never saved	Immediate,

SEE ALSO XST

Description

This command controls the execution of a sequence when the Single-Step mode (XST) is enabled. Each time you enter the #n command followed by a delimiter (carriage return or space), n commands in the sequence buffer will be executed. Only a # followed by the delimiter causes one command to be executed. You can run in Single-Step mode only if you have an RS-232C interface connected to a host. If you issue a Kill (K) command, while you are in Single-Step mode, the sequence execution will be aborted, but Single-Step mode is retained. When you cycle power, the indexer will no longer be in Single-Step mode.

Example

Command	Description
XE1	Erase sequence #1
XD1	Define sequence #1
A5	Sets acceleration to 5 rps^2
V2	Sets velocity to 2 rps
D10000	Sets distance to 10,000 steps
G	Executes the move (Go)
XT	End defining sequence #1
1XTR1	Enable trace mode
XST1	Enable Single-Step mode
XR1	Execute sequence #1
#	Execute the 1st command
;SEQUENCE COMMAND A5	Display the 1st command executed
#	Execute the 2nd command
;SEQUENCE COMMAND V2	Display the 2nd command executed
#	Execute the 3rd command
;SEQUENCE COMMAND D10000	Display the 3rd command executed
#	Execute the 4th command
;SEQUENCE COMMAND G	Display the 4th command executed - motor should have moved 10,000 steps
#	Execute the 5th command
;SEQUENCE COMMAND XT	Display the last command executed

“	**Quote**	BDHXE v6.2 BLHX v5.9 X150DS v5.9	PDHXE v6.2 PDHX v5.9

SYNTAX	**UNITS**	**RANGE**	**DEFAULT**	**ATTRIBUTES**
a”x”	x=ASCII or number	50 characters max	None	Buffered, Saveable in Sequence

Description
Any characters entered between quotation marks (“) will be transmitted, exactly as they were entered, over the RS-232C link. This command is used during buffered moves or sequences, or to command other devices to move. The ASCII range of characters accepted by the command is 33 - 126 (decimal). Each quote command may be followed by a maximum of 50 characters. Underscore characters ‘_’ will be printed as spaces.

Example

Command	Description
MN	Select normal mode
A10	Set acceleration to 10 rps^2
V5	Set velocity to 5 rps
D12500	Set distance to 12,500 steps
G	Execute the move
1”MOVE_DONE”	Once the drive has completed the move it will send the message MOVE_DONE from its RS-232C port

Example

Command	Description
MN	Select normal mode
A10	Set acceleration to 10 rps^2
V5	Set velocity to 5 rps
D12500	Set distance to 12,500 steps
G	Execute the move
1”2XR1”	Once the move is done, Go Sequence 1 is commanded on a unit with device address 2

Command Summary

Motion Commands

A(n)	Set acceleration
C	Continue
D(n)	Set move distance
FOL	Set Following (SIM5 mode)
G	Go, make a move
H	Reverse motor direction
H+	Set positive direction
H-	Set negative direction
ID	Immediate distance
IV	Immediate velocity
L(n)	Loop instructions
MC	Move continuous
MN	Normal preset moves
MPA	Absolute position mode
MPI	Incremental position mode
MQ	Velocity change preset moves
N	End of loop indicator
PS	Wait for continue
SIM	Set indexer/following mode
T(n)	Delay for n secs
TRD	Pause until distance reached
TRE	Pause until inputs equal
TRIP	Pause until in position
TRMN	Pause until Feedback -ve of Position
TRMP	Pause until Feedback +ve of Position
TRN	Pause until inputs not equal
TRR	Pause for I6 registration
U	Pause, wait for continue
V(n)	Set velocity

Start/Stop Commands

HALT	Kill indexer, buffered
K	Kill indexer immediately
LS	Stop now at LA deceleration
S	Stop motion, decelerate now
SB	Stop motion, buffered
ST1	Buffered stop - de-energise drive
ST0	Buffered start - re-energise drive
OFF	Immediate stop - de-energise
ON	Immediate start - re-energise
Y	Terminate loop or sequence
Z	Power up reset

Sequence Commands

GOSUB	Execute sequence and return
GOTO	Execute sequence, no return
XBS	Sequence buffer size report
XC	Report checksum
XD(n)	Begin download sequence
XE(n)	Delete sequence
XEALL	Erase all sequences
XFK	Set fault or kill sequence
XG	Execute sequence, no return
XP(n)	Select power up sequence
XR(n)	Execute sequence
XRP(n)	Execute sequence with pause
XRT	Return from sequence
XSD	Report status of download
XSR	Report run sequence status
XSS(n)	Report sequence status
XST	Enable single step execution
XT	Sequence terminator
XTR	Enable sequence trace facility
XU(n)	Sequence upload
XZ	Disable power up sequence mode

Homing, Jog, Limit Commands

GA(n)	Set go home acceleration
GH+/-(n)	Go home with direction + velocity
GHF(n)	Final home velocity
JA(n)	Set jog acceleration
JV(n)	Set jog velocity
LA(n)	Set limit deceleration
LD(n)	Set limit function
OSA	1 = home to index pulse
PZ	Set current position as absolute zero
SP(n)	Set current position to value n

Option Set Commands

E	Enable communications
EX	1=terminal 0=computer mode
F	Disable communications
OS	Display 'OS' switches
OSA	1=Home to index pulse
OSB	1=switched integral action on
OSC	1=single value returned by DS
OSE	1=enable jog
OSJ	1=24 bit gearbox 0=16 bit
OSK	1=encoder count checked
OSO	1=suppress units
SS	Display SS switches
SSA	0=echo on 1=echo off
SSG	1=save comm buffer on limit
SSH	1=save command buffer on stop
SSK	Enable/Disable de-energise on stop

Information Commands

B	Command buffer status request
BS	Command buffer size request
DS	Signal display by number
DFX	Returns index status (36 bits)
DIC	Report Control Module position
DPA	Display position-actual
DPE	Continuous error display
DPS	Display position setpoint
DR	Display report
DVA	Display velocity-actual
DVS	Display velocity setpoint
OSC	1=Single value returned by DS
P	Request position this move
PIC	Display servo loop diagram
PR	Request absolute position
QS	Send a response at move end
R	Status request
RA	Limit switch status request
RB	Pause status request
RE	Report drive status
RG	Go home status request
RPO	Report power on time
RS	Sequence status request
RSE	Report servo error conditions
RV	Report software revision

Inputs and Outputs

DRD	Read distance via data inputs
FRD	Read following value via inputs
IO	#Sets outputs immediately
IS	#Reports input status
LRD	Read loop count via data inputs
O	Turns outputs on and off
SKE	Skip on inputs equal
SKN	Skip on inputs not equal
SSD	1=output 1 is composite fault
SSG	1=save command buffer on limit
SSH	1=save command buffer on stop
STR	Set strobe output delay time
TMRD	Read timer via data inputs
TRE	Pause until inputs equal
TRN	Pause until inputs not equal
VARD	Read variable via data inputs
VRD	Read velocity via data inputs
XRD	Read sequence via data inputs

Control and Memory Commands

CCP	Set command peak (clamp)
CEW	Set in pos’n window
CDG	Set D gain in PID
CFG	Set feed forward gain
CIG	Set integral action gain
CIT	In position wait time (2ms ints)
CIW	Set integral action window
CIX	Set index mark resolution
CJL	Set motor + load inertia (Kg-cms^2)
CMR	Set feedback (motor) resolution
COFF	Set amplifier offset
CPE	Set position error limit
CPG	Set forward path gain
CTG	Set filter time constant
CTQ	Set available motor torque (Nm)
CVG	Set velocity feedback gain
CVT	Set velocity trip
CUR	Set user resolution
CCS	Configure command source
DS	Signal display by number
IVAR	Immediate variables
OFF	Immediate de-energise
ON	Immediate energise
RAT	Set gearbox scaling factor
RFS	Servo to factory settings
RIFS	Indexer to factory settings
RSE	Reports servo error conditions
RST	Freeze/Unfreeze torque demand
SIM	Select indexer operation
ST0	Buffered energise
ST1	Buffered de-energise
SV	Save current settings in backup RAM
TUNE	Report tuning information
TUNET	Automatic torque amp tuning
TUNEV	Automatic velocity amp tuning
VAR	Assign expression to variable

Following Commands

CAG	Set following acceleration gain
CCS0	x4 following decode
CCS1	x2 following decode
CCS2	x1 following decode
CCS3	Clock and Direction Decode
CUR	Set user resolution
CMR	Set feedback (motor) resolution
FOL	Set following (SIM5 mode)
IFOL	Immediate following percent
RAT	Set gearbox scaling factor
SIM0	Indexer, not following, mode
SIM1	Encoder following mode
SIM2	Superposition following mode
SIM3	Positive scaled following
SIM4	Negative scaled following
SIM5	Preset following indexer mode
SIM6	Load mounted encoder feedback

RP240 Commands

DCLR	Clear display
DCNT	Enable/disable PAUSE/CONTINUE
DLED	Turn RP240 LED’s on or off
DPC	Position cursor on display
DSTP	Enable/disable STOP key
DTXT	Write text data to display
DVO	Write variable data to display
VARn=FUN	Enable and read function key
VARn=NUM	Enable and read numeric key

Conditional Commands Execution

IF..ELSE..NIF	Conditional command execution structure
REPEAT.. UNTIL()	Conditional command loop execution
WHILE().. NWHILE	Conditional command loop execution
WHEN()	Setup a condition check
XWHEN	Execute sequence upon WHEN condition TRUE

ALPHABETICAL COMMAND LISTING

“	Quote
#	Step Sequence
;	Comment Field
A	Acceleration Rate
B	Buffer Status Request
BDL	Busy Delay
BS	Buffer Size Request
C	Continue
CAG	Configure Acceleration Gain
CCP	Configure Command Peak
CCS	Configure Command Source
CDG	Configure Derivative Gain
CDR	Configure Drive Resolution
CER	Configure Encoder Resolution
CEW	Configure In-Position Window
CFG	Configure Feedforward Gain
CFS	Configure Fail Safe
CIG	Configure Integral Gain
CIT	Configure In-Position Time
CIW	Configure Integral Action Window
CIX	Configure Index Mark Resolution
CJL	Enter Motor + Load Inertia
CMR	Configure Motor Resolution
COFF	Configure Amplifier Offset
CPC	Configure Motor Pole Pairs
CPE	Configure Position Error
CPG	Configure Proportional Gain
CTG	Configure Filter Time Constant
CTQ	Enter Motor Torque
CUR	Configure User Resolution
CVG	Configure Velocity Gain
CVT	Configure Velocity Trip
D	Distance
DCLR	Clear Display
DCNT	Enable/Disable Pause and Continue
DFX	Display Flags Indexer
DIC	Display Indexer Counter
DLED	Turn RP240 LEDs On/Off
DPA	Display Position Actual
DPC	Position Cursor
DPE	Display Position Error
DPS	Display Position Setpoint
DR	Display Report

DRD	Read Distance via Parallel Input/Output
DS	Display Signal
DSTP	Enable/Disable Stop
DTXT	Display Text Data on RP240 LCD
DVA	Display Velocity Actual
DVO	Display Variable Data on RP240 LCD
DVS	Display Velocity Setpoint
DW	Dead Band Window
E	Enable Communications
ELSE	Else
EX	Set Communication Style
F	Disable Communications
FOL	Following Percent
FP	Following Encoder Trigger Point
FRD	Read Following Value via Parallel Input/Output
FS	Encoder Function Report
FSB	Set Indexer to Motor/Encoder Step Mode
FSC	Enable/Disable Position Maintenance
FSD	Stop on Stall
FSE	
G	Go
GA	Go Home Acceleration
GH	Go Home
GHF	Go Home Final
GOSUB	GOSUB Sequence
GOTO	GOTO Sequence
^H	Backspace
H	Change Direction
H+	Set Direction
H-	Set Direction
HALT	Halt
ICON	Input Configuration
ID	Immediate Distance
IF	If
IFOL	Immediate Following Percent
IN	Define Inputs
INL	Set Active Input Level
IO	Immediate Output
IS	Input Status
IV	Immediate Velocity

IVAR	Immediate Variables
JA	Jog Acceleration
JV	Jog Velocity
K	Kill
KILL	Kill
L	Loop
LA	Limit Deceleration
LD	Limit Disable
LRD	Read Loop Counter via Parallel Input/Output
LS	Limit Switch Fast Stop
MC	Mode Continuous
MN	Mode Normal
MPA	Mode Position Absolute
MPI	Mode Position Incremental
MQ	Speed Change Mode
N	End Loop
NIF	End of IF
NWHILE	End of WHILE
O	Programmable Output
OCON	Output Configuration
OFF	De-Energise Drive
ON	Energise Drive
OS	Other Switches
OSA	Home to an Index Pulse
OSB	Integral Action Selection
OSC	Monitor Command Reporting
OSE	Jog Enable
OSJ	RAT 16/24 Bit select
OSK	Integrity Check of Encoder
OSM	Integral Action Sensitivity
OSO	Suppress Units
OUT	Define Outputs
OUTL	Set Active Output Level
P	Position
PASS	Password Protection
PF	Report Following Encoder Position
PFZ	Set Following Encoder Position to Zero
PIC	Picture
PR	Position Report
PS	Pause
PZ	Position Zero
QS	Transmit An Identifier
R	Report Control Module Status
RA	Report A - Limit Status Request
RAT	Set Rate Multiplier Value
RB	Report B - Miscellaneous Status Request
RE	Drive Status Request
REPEAT	Repeat
RFS	Return Servo to Factory Settings
RG	Report Go Home Status
RIFS	Return Indexer to Factory Settings
RPO	Report Power-On Time
RS	Report Sequence Status
RSE	Report Servo Errors
RSIN	Set Variable Interactively
RST	Freeze Torque Demand
RV	Revision
S	Stop
SAVE	Save
SB	Stop Buffered
SIM	Set Indexer/Following Mode
SKE	Skip On 'Equals'
SKN	Skip On 'Not Equal'
SMP	Sample Rate for the Following Encoder Count
SP	Set current position to value
SS	Set Switches
SSA	RS232C Echo Control
SSD	Set Output 1 as Composite Fault Signal
SSG	Save Command Buffer On Limit
SSH	Save Command Buffer On Stop
SSK	Enable/Disable De-energise on Stop
SSP	Hide Variable Entry
ST	Energise/De-Energise Drive
STOP	Stop
STR	Set Strobe Output Delay Time
SV	Save
T	Time Delay
TMRD	Read Timer via Parallel Input/Output
TRD	Trigger On Input Distance
TRE	Trigger On Input Equal
TRIP	Trigger On In Position
TRMN	Negative Trigger on Motor Distance
TRMP	Positive Trigger on Motor Distance

TRN	Trigger On Input Not Equal
TRR	Registration Mode
TRS	Trigger Status
TUNE	Show Tuning Settings
TUNET	Self-Tune Servo (Torque Amplifier)
TUNEV	Self-Tune Servo (Velocity Amplifier)
TX	Transmit Variable Plus String
U	Pause
UNTIL	Until
V	Velocity
VAR	Variables
VARD	Read Variable via Parallel Input/Output
VARn=FUN	Enable and Read Function Keys
VARn=NUM	Enable and Read Numeric Keys
VARn=SMC	Set User Variable to Sampled Count
VRD	Read Velocity Value from Parallel Input/Output
WHEN	Set When Condition
WHILE	While
XBS	Sequence Memory Available Report
XC	Checksum
XD	Sequence Download
XE	Sequence Delete
XEALL	Erase All Sequences
XFK	Set Fault or Kill Sequence
XG	GOTO Sequence
XP	Power-On Sequence Number
XR	Run Sequence
XRD	Read Sequence via Parallel Input/Output
XRP	Run/Pause Sequence
XRT	Return From Sequence
XSD	Sequence Download Status Report
XSR	Sequence Run Status Report
XSS	X Sequence Status
XST	Sequence Step Mode
XT	Sequence Terminator
XTR	Set Trace Mode
XU	Sequence Upload
XWHEN	Set WHEN Sequence
XZ	Reset Power-Up Sequence Mode
Y	Terminate Loop
Z	Reset

INDEX