

Chapter 4

OPERATION.

4.1 OVERVIEW

Operation of the CX-DH Series Indexer/Drive involves sending commands to the unit and monitoring/interpreting the responses returned by the unit. All communication with the DH Series is accomplished over the RS-232C interface. Each Indexer/Drive is configured with a device address (letters "H" through "N"), as described later in this chapter. Units are shipped from Compumotor with the device address set to H.

4.2 POWER-UP

Both the +12-90 VDC and the +9-12 VDC logic supplies should be turned ON at about the same time. Power may be turned OFF in any order.

CAUTION

The logic power supply must remain at 9 VDC or higher while motor power is connected. Failure to do so will cause the drive to enter a fault condition.

4.4 DEVICE ADDRESSING

There are seven possible device addresses for the Indexer/Drive. A valid device address must be assigned to each Indexer/Drive before it can respond to commands. The first character of each command contains the device address of the desired unit. The default device address set at the factory is "H". This is a good character to use for testing purposes, particularly if a terminal is being used to send commands. Device addresses are set with jumpers at the front of the unit.

The possible addresses are:

ASCII Char	JU1	JU2	JU3
N	Out	Out	In
M	Out	In	Out
L	Out	In	In
K	In	Out	Out
J	In	Out	In
I	In	In	Out
H*	In	In	In

* = factory default settings

NOTE: Do not install JU4

Note

At least one jumper must be installed. When no jumpers are installed, the Indexer/Drive will not respond to commands (the green LED, mounted on the rear panel, will flash at a once-per-second rate after power-on initialization).

4.45 CURRENT JUMPER SETTINGS

The Compumotor CX Series Indexer/Drive is equipped with five jumpers (JU5 - JU9) used to set the motor phase current. Jumper settings for JU5 through JU9 are outlined in Appendix E and F.

Commands sent to the Indexer/Drive are echoed, except for the STATUS commands. When a single Indexer/Drive is being operated, no intercharacter transmission delays are required. When multiple units are daisy-chained, a five millisecond intercharacter delay is recommended.

The easiest way to ensure that the proper amount of intercharacter delay is being used is to wait for a character to be returned to the computer before sending the next character. This will work for all commands except the STATUS commands, which respond with a status character instead of echoing the command character.

Following is a brief summary of RS-232C command transmission constraints:

- a. All multibyte commands must be sent with a 5 millisecond inter-character delay in a daisy-chain configuration. All commands must be separated by a least two character periods (about 2 milliseconds).
- b. The "[" and "/" commands (Status Request) should not be sent more often than necessary while the motor is moving (<20 times/second.)
- c. The "Z" and "]" commands (STOP and KILL) should not be sent repeatedly to terminate a single move.
- d. The "P", "Q", "S", and "T" commands (UTILITY, SET HOME, GO HOME, and MOVE) should be sent only when the motor is not moving. In the case of commands sent to the Indexer/Drive generating motor movement, the MOVE STATUS command can be used to determine when the command has finished executing. Commands that send back a byte to the host indicate by the transmission that they are done.

Most other commands will take less time than the required two-character intercommand delay. The exceptions are the **DRIVE ENABLE** command ("PB"), which may take up to 0.5 seconds, and the **SOFTWARE RESET** command ("PN"), which may take up to 3 seconds.

- e. The character "pass-along" nature of daisy-chained RS-232C communications requires that the host not send out another command following a command that generates a response from one of the controllers until that response has been received.

4.5 FUNCTIONAL TEST

Note

This test assumes that the Indexer/Drive has been set at device address "H", the factory setting.

A functional test can be performed on the DH series by the following procedure:

- a. Attach the motor, the power supplies (switched OFF), and the RS-232C port. Make sure all connections are secure. Connect normally closed limit switches or jumper pins 9 and 10 together. Also jumper pins 12, 13, and 14 together.
- b. If using a Compumotor supply, turn on the power.
- c. If you are using separate supplies, turn on the motor (+12 - 90 VDC) supply. Next turn on the logic (+9 - 12VDC) supply.
- d. After a few seconds, the board-mounted red LED, visible at the rear of the enclosure should make one faint blink and then apply current to the motor and the shaft should lock

- e. If you are using a terminal, press the H key, then the / key. The Indexer/Drive should echo an - character, indicating that the motor is not moving. If you are using a computer to send messages or cannot easily view returning characters, skip this step.
- f. Transmit the character string HT1008+001388. This should result in the motor moving exactly one revolution clockwise (viewed from the face of the motor) at a velocity of one rev/sec. Then transmit the character string HT1008+000000. The motor should rotate counterclockwise one revolution to the starting point (position = zero).
- g. If the motor does not move when step f is performed, make sure that your RS-232C port is configured properly: 9600 baud, 8 data bits, 1 start bit, 1 stop bit, no parity, and full duplex.

4.6 COMMAND FORMAT

The CX-DH Indexer/Drive responds to 12 distinct commands. Some commands (such as the STOP command) are two characters: a device address followed by the command number. Some commands (such as MOVE or GO HOME) require additional characters that specify acceleration, velocity, distance, etc. There are two double-character STATUS commands that cause the Indexer/Drive to return a single-character containing status information (moving, not moving, at HOME, hit a limit, etc.).

Note

All commands, when shown in the manual, will be in quotation marks for clarity. These are not part of the command. Do not transmit the quotation marks to the Indexer/ Drive.

All commands contain the device address of the desired unit as the first character of the command, and the command identifier as the second character of the command. The command format is, in general:

- Character 1: Device Address (characters "H" through "N")
- Character 2: Command (characters "P" through "]")
- Character 3-N: Additional command data as needed for individual commands

All command characters are printable ASCII characters. Data is specified in split-ASCII format, where two characters (each is 0-9 or A-F) combine to describe an 8-bit quantity. For example, the quantity 255 decimal is specified with the ASCII characters "FF". This is hexadecimal arithmetic, where the quantities 0-255 decimal are described by 00-FF hexadecimal.

4.7 TRANSMISSION OF COMMANDS

The CX-DH Indexer/Drive analyzes the first character of a command string and looks at the device address. If the device address in the command and the device address on the board match, the unit processes the command (in the case of two-character commands) or waits for additional command characters. If there is only one Indexer/Drive on the host's RS-232C port, subsequent command characters can be transmitted at any time. This presumes that the host would not be addressing a nonexistent device.

Note

The character "pass-along" nature of the daisy-chained RS-232C communications requires that the host not send out another command following a command that generates a response from one of the controllers until that response has been received (this applies only to a multidrop configuration).

Double-character commands (Status Requests, KILL, and STOP) are always processed and responded to instantly. Transmitting Status Requests at a high rate (>10/sec) to each unit can degrade motor performance and should be avoided.

4.8 ECHOING OF COMMANDS

The Indexer/Drive normally echoes characters as it receives them, with some exceptions. The device identifiers and commands "P" - "W" are always echoed. Commands "[" and "\" are not echoed, they are responded to with the appropriate response (see command summary). The device address characters ("H" - "N") are always echoed.

4.9 MOVE PARAMETERS

4.9.1 VELOCITY RANGES

Velocity ranges are specified in an ASCII representation of hexadecimal (hex) numbers, as shown below. The hex numbers shown are those actually sent to the Indexer/Drive. They are sent as ASCII characters representing the hex values. For example, to specify a velocity of 20 revs/second, a "6" followed by an "F" would be sent to the Indexer/Drive. The characters "6" and "F" are ASCII numbers 54 and 70 (decimal). A decimal-to-ASCII conversion chart is provided in Appendix C.

Velocity Range: 0.0625 (Velocity 01) to 20.0 (Velocity 111 decimal or 6F hexadecimal) revs/sec as shown in Table 4-1.

4.9.2 ACCELERATIONS

Accelerations are always specified as two characters in an ASCII representation of hex numbers, as shown below. The hex numbers shown are those actually sent to the Indexer/Drive. They are sent as ASCII characters representing the hex values. For example, to specify an acceleration of 125 revs/sec/sec, a "0C" would be sent to the Indexer/Drive. The "0C" is an ASCII number 67 (decimal).

Acceleration Range: 0.06 (Acceleration 01) to 125 (Acceleration 12 decimal or 0C hex) revs/sec/sec.

Acceleration Number	Hex Equivalent	Value (revs/sec/sec)
1	01	0.060
2	02	0.120
3	03	0.240
4	04	0.490
5	05	0.980
6	06	1.950
7	07	3.900
8	08	7.800
9	09	15.625
10	0A	31.250
11	0B	62.500
12	0C	125.000

Table 4-1. Velocity Range Definitions

Velocity Number	Revs/sec	Velocity Number	Revs/sec	Velocity Number	Revs/sec
01	0.0625 --	26	2.3750 --	4B	6.0000 --
02	0.1250 --	27	2.4375 --	4C	6.2500 --
03	0.1875 --	28	2.5000 --	4D	6.5000 --
04	0.2500 --	29	2.5625 --	4E	6.7500 --
05	0.3125 --	2A	2.6250 --	4F	7.0000 --
06	0.3750 --	2B	2.6875 --	50	7.2500 --
07	0.4375 --	2C	2.7500 --	51	7.5000 --
08	0.5000 --	2D	2.8125 --	52	7.7500 --
09	0.5625 --	2E	2.8750 --	53	8.0000 --
0A	0.6250 --	2F	2.9375 --	54	8.2500 --
0B	0.6875 --	30	3.0000 --	55	8.5000 --
0C	0.7500 --	31	3.0625 --	56	8.7500 --
0D	0.8125 --	32	3.1250 --	57	9.0000 --
0E	0.8750 --	33	3.1875 --	58	9.2500 --
0F	0.9375 --	34	3.2500 --	59	9.5000 --
10	1.0000 --	35	3.3125 --	5A	9.7500 --
11	1.0625 --	36	3.3750 --	5B	10.0000 --
12	1.1250 --	37	3.4375 --	5C	10.5000 --
13	1.1875 --	38	3.5000 --	5D	11.0000 --
14	1.2500 --	39	3.5625 --	5E	11.5000 --
15	1.3125 --	3A	3.6250 --	5F	12.0000 --
16	1.3750 --	3B	3.6875 --	60	12.5000 --
17	1.4375 --	3C	3.7500 --	61	13.0000 --
18	1.5000 --	3D	3.8125 --	62	13.5000 --
19	1.5625 --	3E	3.8750 --	63	14.0000 --
1A	1.6250 --	3F	4.0000 --	64	14.5000 --
1B	1.6875 --	40	4.1250 --	65	15.0000 --
1C	1.7500 --	41	4.2500 --	66	15.5000 --
1D	1.8125 --	42	4.3750 --	67	16.0000 --
1E	1.8750 --	43	4.5000 --	68	16.5000 --
1F	1.9375 --	44	4.6250 --	69	17.0000 --
20	2.0000 --	45	4.7500 --	6A	17.5000 --
21	2.0650 --	46	4.8750 --	6B	18.0000 --
22	2.1250 --	47	5.0000 --	6C	18.5000 --
23	2.1875 --	48	5.2500 --	6D	19.0000 --
24	2.2500 --	49	5.5000 --	6E	19.5000 --
25	2.3125 --	4A	5.7500 --	6F	20.0000 --

4.9.3 POSITION RANGE

Position ranges are specified in an ASCII representation of hex numbers. The hex numbers shown are those actually sent to the Indexer/Drive. They are sent as ASCII characters representing the hex values. For example, to specify a position of +5000 decimal steps, a +001388 would be sent to the Indexer/Drive (1388 base 16 = 5000 decimal. The +001388 is represented by the ASCII codes 43, 48, 48, 49, 51, 56, 56 (decimal).

Position Range: $\pm 8,388,607$ steps at 5,000 steps/rev.
All positions absolute with respect to HOME position.

4.10 COMMANDS

Commands are sent to the Indexer/Drive exactly as shown. There are no delimiters such as carriage returns or line feeds required to signify the end of each command. The Indexer/Drive considers a command as being valid only after it has received the proper number of characters associated with a given command. For example, the "P" command requires the command identifier (for example "H"), followed by the command character ("P"), followed by four parameter character characters (only the first of which is valid). This is a total of six characters.

The Indexer/Drive checks to see if the first character is its device address. If so, the following characters are evaluated for the command character and any required parameter information.

Device identifiers fall in the range of "H" through "N", or ASCII codes 72-78. Command numbers fall in the range of "P" through "-", or ASCII codes 80-95. Parameter information falls in the range of "0" through "9", "A" through "F" and "W", or ASCII codes 48-57, 65-70, and 87.

The available device address characters are "H", "I", "J", "K", "L", "M", and "N", all of which are valid and are used.

The allowable command characters are "P", "Q", "R", "S", "T", "U", "V", "W", "X", "Y", "Z", "[", "\", "]", "^", and "-". Not all allowable commands are defined, however. Commands not specified in the command summary that follows will be ignored.

Table 4-2 is a summary of the allowable commands.

Table 4-2. Command Summary

Command Character	Command Description
PB	Enable/disable motor power (shutdown)
PC	Set holding current
PW	Reset
Q	Define current position as home position
S	Go home
T	Move to absolute position X
U	Move continuously
Z	Stop the motor (controlled, uses the current move acceleration)
[	Input status request
\	Move status request
]	Kill motor motion (immediate, attempts to stop the motor instantly)

The following is a description of the eight commands you can use to control operation of the CX-DH Series Indexer/Drive.

Note

Commands "P", "Q", "S", and T and "U" should be sent only when the motor is not moving. In the case of command-generated motor movement, the MOVE STATUS command can be used to determine when the command has finished executing. Commands which send back a byte to the host indicate by the transmission that they are done. Most other commands will take less time than the required two-character intercommand delay. The exceptions are the DRIVE ENABLE command, which may take up to 0.5 second, and the SOFTWARE RESET command, which may take up

4.10.2 THE "PB" COMMAND

Enables/disables (shuts down) motor. This command requires a 1/2-second delay before sending any new command. The command format is:

dPBn00, where d = the device address
n = 0 or 1 (motor disabled/enabled)

Note

The last 2 parameter characters are not currently defined, but are required and must be ASCII "0".

HPB100

Character 1: Device address character

Character 2: "P"--the command character

Character 3: "B"--enable/disable (shutdown) motor

Character 4: "1" or "0"--"1" = enable motor. "0" = disable motor

Character 5: "0"--this is a filler character that must always be present.

Character 6: "0"--this is a filler character that must always be present.

Example : (assume device "H")

MOTOR ENABLED: HPB100

MOTOR DISABLED: HPB000

Note

Position may be lost after disabling motor.

4.10.3 THE "PC" COMMAND

Sets the motor's holding current. The amount of current used to hold the motor motionless is set to one of eight values with this command. It may be used to reduce motor heating and reduce overall system current usage. The command format is:

dPCn00, where d = the device address
n = 1 through 8, as described below

Note

The last two parameter characters are not currently defined, but they are required and must be ASCII "0".

H P C 1 0 0

Character 1: Device address character

Character 2: "P"--the command character

Character 3: "C"--set motor holding current

Character 4: "1" or "8"--"1" = lowest motor torque.
"8" = maximum motor torque. Characters "2" through "7" select intermediate values of motor current. Note that the characters specified for this command are ASCII characters 49-56 (decimal).

Character 5: "0"--this is a filler character that must always be present.

Character 6: "0"--this is a filler character that must always be present.

Example : (assume device "H")

SET MOTOR to lowest allowable value: "HPC100"

SET MOTOR to rated holding torque: "HPC800"

SET MOTOR to 50% of rated holding torque: "HPC400"

4.10.4 THE "PW" COMMAND

Resets the Indexer/Drive. The command format is:

dPW000, where d = the device address

Note

The last three parameter characters are not currently defined, but they are required and must be ASCII "0".

H P W 0 0 0

Character 1: Device address character

Character 2: "P"--the command character

Character 3: "W"--reset the Indexer/Drive

Character 4: "0"--this is a filler character that must always be present

Character 5: "0"--this is a filler character that must always be present.

Character 6: "0"--this is a filler character that must always be present.

Example : (assume device "H")

RESET: HPW000

4.10.5 THE "Q" COMMAND

Defines the current position as the HOME position. This command sets the Indexer/Drive's absolute position counter to zero, making the next move relative to the current position. If this command is used in front of every MOVE command (Command #4), each move will be incremental with respect to the previous position. The command format is:

dQ, where d = the device address

H Q

Character 1: Device address character

Character 2: "Q"--the command character

Example : (assume device "H")

SET HOME: HQ

4.10.6 THE "S" COMMAND

The GO HOME function works as follows: The motor will move in the indicated direction until it detects either a limit for that direction or the HOME bit. If the HOME bit is detected, the motor is decelerated to a stop; it then moves in the opposite direction at a fixed velocity of 0.5 rev/sec until the HOME-bit is detected, at which point the motor is stopped immediately; this position is then set as absolute position 0.

If a limit is activated before the HOME bit is detected during this slow scan, the HOME procedure is aborted and the HOME position is not changed.

If the initial scan detects a limit before the HOME bit, then the direction is reversed and the scan for the HOME bit repeated. If the HOME bit is found, the direction is again reversed and a slow scan for the HOME bit is made as described above.

If both limits are detected without the HOME bit being found, the HOME operation is aborted without updating the HOME location.

The STOP command can be used to abort the GO HOME operation at any time; the GO HOME operation will be deemed unsuccessful if terminated with a STOP command. The HOME status bit is set if the GO HOME procedure is successful; otherwise it is cleared.

Note

If the HOME region is so long that when the motor stops the HOME input is still active, there will be no back-up to the HOME bit.

The command format is:

dSaabbc, where d = the device address
aa = velocity (01-6F)
bb = acceleration/deceleration (01-0C)
d = + or - (search direction)

H S 2 0 0 8 -

Character 1: Device address character

Character 2: "S"--the command character

Characters 3-4: "01" through "6F"--Velocity number. Refer to section 4.9.1 for definition.

Characters 5-6: "01" through "0C"--Acceleration number. Refer to section 4.9.2 for definition.

Character 7: "+" or "--Initial motor direction. Clockwise or counterclockwise, respectively.

Example : (assume device "E") velocity = 2 revs/sec,
acceleration = 7.8 revs/sec/sec, starting in the
counterclockwise direction.

GO HOME: HS2008-

4.10.7 THE "T" COMMAND

Moves the motor to absolute position. The command format is:

dTaabbxxxxxx, where d = the device address

aa = velocity (01-6F)

bb = acceleration/deceleration
(01-0C)

c = + or - (direction)

xxxxxx = absolute position
(000000-7FFFFFF)

Character 1: Device address character

Character 2: "T"--the command character

Characters 3-4: "01" through "6F"--Velocity number. Refer to section 4.9.1 for definition.

Characters 5-6: "01" through "0C"--Acceleration number. Refer to section 4.9.2 for definition.

Character 7: "+" or "--" direction. + = clockwise; - = counterclockwise.

Characters 8-13: "000000" through "7FFFFFF"--Position number. Refer to section 4.9.3 for definition.

Example : (assume device "H") velocity = 3 revs/sec,
acceleration = 15.625 revs/sec/sec,
clockwise direction, distance = 10 revs.

MOVE: HT3009+00C350

The following command would move the motor back to position zero:

MOVE: HT3009+000000

4.10.8 THE "U" COMMAND

Moves the motor continuously at a constant velocity. The command format is:

dUppppppp, where d = the device address

p = parameter characters

Character 1: Device address character

Character 2: "U"--the command character

Characters 3-4: "01" through "6F"--Velocity number. Refer to the section on motor velocities for definition.

Characters 5-6: "01" through "0C"--Acceleration number. Refer to the section on acceleration for definition.

Character 7: "+" or "--Motor direction. + = clockwise; - = counterclockwise.

Example : (assume device "H") velocity = 3 revs/sec,
acceleration = 15.625 revs/sec/sec,
clockwise direction.

MOVE: HU0039+

4.10.9 THE "Z" COMMAND

Stops the motor. If the motor is moving, it will decelerate to a stop at the selected acceleration rate for the move in progress. The final absolute position will be indeterminate. The command format is:

dZ, where d = the device address

H Z

Character 1: Device address character

Character 2: "Z"--the command character

Example: (assume device "H")

STOP: HZ

4.10.10 THE "[" COMMAND

Input status request. The Indexer/Drive will echo the device address and then send out one character reflecting the state of the following inputs:

- Bit 0: CW limit status
- Bit 1: CCW limit status
- Bit 2: HOME input status

The character sent will be ASCII value 96 (the "[" character) plus the combination of bits 0, 1, and 2 or ASCII codes 96-103 (decimal). The command character is not echoed for the command; instead the response is sent. The command format is:

d[, where d = the device address

H [

Character 1: Device address character

Character 2: "["--the command character

Example: (assume device "H")

Input status request: "H["

The Indexer/Drive will respond by echoing the device address, followed by a single ASCII character with a base value of 96 (decimal). It will not echo the command character. A value of up to 7 may be added to the base value in the following fashion:

	ASCII Character Returned							
	"["	"a"	"b"	"c"	"d"	"e"	"f"	"g"
Clockwise limit	low	hi	low	hi	low	hi	low	hi
Counterclockwise limit	low	low	hi	hi	low	low	hi	hi
HOME input	low	low	low	low	hi	hi	hi	hi

For example, if the limit inputs are low and the home input is high, the response would be "Hd" (assuming device "H").

4.10.11 THE "\ " COMMAND

Move status request. The Indexer/Drive will echo the device address and then send out one character reflecting the state of the following inputs:

- Bit 0: MOVE status (set if motor is moving)
- Bit 1: GO HOME status (set if last GO HOME attempt successful)
- Bit 2: LIMIT TERMINATION status (set if last move terminated by a limit)

The character sent will be ASCII value 96 (the "" character) plus the combination of bits 0, 1, 2, and 3 or ASCII codes 96-103 (decimal). Therefore, a "\ " is sent if all bits are low. The command character is not echoed for the command; instead the response is sent. The command format is:

d, where d = the device address

H \

Character 1: Device address character

Character 2: "\ "--the command character

Example: (assume device "H")

MOVE status request: "H\"

The Indexer/Drive will respond by echoing the device address followed by a single ASCII character with a base value of 96 decimal (60 hex). It will not echo the command character. A value of up to 7 may be added to the base value in the following fashion:

	ASCII Character Returned							
	"`"	"a"	"b"	"c"	"d"	"e"	"f"	"g"
Moving	no	yes	no	yes	no	yes	no	yes
GO-HOME status	bad	bad	ok	ok	bad	bad	ok	ok
Limit termination status	ok	ok	ok	ok	bad	bad	bad	bad

4.10.12 THE] COMMAND

Kill motor motion. If the motor is moving, it will immediately decelerate at 125 revs/sec/sec to a stop. The final absolute position will be indeterminate the load can drive the motor when the KILL command is used, possibly making the motor stall. This command should not be used as an emergency stop unless the defined acceleration is so low that the motor would run beyond its normal end of travel in attempting to stop the motor. The command format is:

d], where d = the device address

H]

Character 1: Device address character

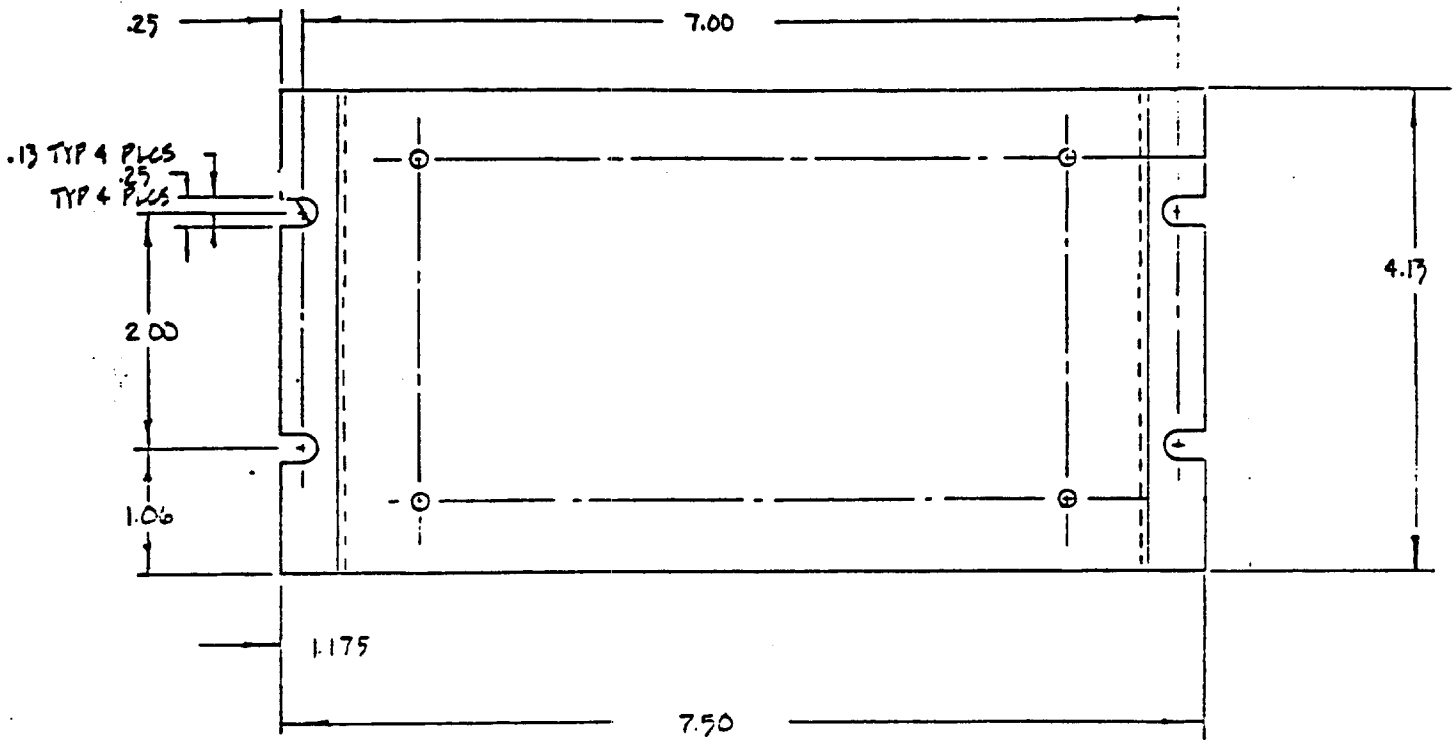
Character 2: "]"--the command character

Example: (assume device "H")

KILL: "H]"

Appendix B

DE SERIES MOUNTING PLATE DIMENSIONS



Appendix C

ASCII CHARACTER SET

CHR	OCT	DEC	HEX	CHR	OCT	DEC	HEX	CHR	OCT	DEC	HEX	CHR	OCT	DEC	HEX	
^@	NUL	000	000	00	SP	040	032	20	@	100	064	40	^	140	096	60
^A	SOH	001	001	01	!	041	033	21	A	101	065	41	a	141	097	61
^B	STX	002	002	02	"	042	034	22	B	102	066	42	b	142	098	62
^C	ETX	003	003	03	#	043	035	23	C	103	067	43	c	143	099	63
^D	EOT	004	004	04	\$	044	036	24	D	104	068	44	d	144	100	64
^E	ENG	005	005	05	%	045	037	25	E	105	069	45	e	145	101	65
^F	ACK	006	006	06	&	046	038	26	F	106	070	46	f	146	102	66
^G	BEL	007	007	07	^	047	039	27	G	107	071	47	g	147	103	67
^H	BS	010	008	08	(	050	040	28	H	110	072	48	h	150	104	68
^I	HT	011	009	09	)	052	043	29	I	111	073	49	i	151	105	69
^J	LF	012	010	0A	*	052	042	2A	J	112	074	4A	j	152	106	6A
^K	VT	013	011	0B	+	053	043	2B	K	113	075	4B	k	153	107	6B
^L	FF	014	012	0C	,	054	044	2C	L	114	076	4C	l	154	108	6C
^M	CR	015	013	0D	-	055	045	2D	M	115	077	4D	m	155	109	6D
^N	SO	016	014	0E	.	056	046	2E	N	116	078	4E	n	156	110	6E
^O	SI	017	015	0F	/	057	047	2F	O	117	079	4F	o	157	111	6F
^P	DLE	020	016	10	0	060	048	30	P	120	080	50	p	160	112	70
^Q	DC1	021	017	11	1	061	049	31	Q	121	081	51	q	161	113	71
^R	DC2	022	018	12	2	062	050	32	R	122	082	52	r	162	114	72
^S	DC3	023	019	13	3	063	051	33	S	123	083	53	s	163	115	73
^T	DC4	024	020	14	4	064	052	34	T	124	084	54	t	164	116	74
^U	NAK	025	021	15	5	065	053	35	U	125	085	55	u	165	117	75
^V	SYN	026	022	16	6	066	054	36	V	126	086	56	v	166	118	76
^W	ETB	017	012	17	7	067	055	37	W	127	087	57	w	167	119	77
^X	CAN	030	024	18	8	070	056	38	X	130	088	58	x	170	120	78
^Y	EM	031	025	19	9	071	057	39	Y	131	089	59	y	171	121	79
^Z	SUB	032	026	1A	:	072	058	3A	Z	132	090	5A	z	172	122	7A
^[	ESC	033	027	1B	;	073	059	3B	[	133	091	5B	{	173	123	7B
^\	FS	034	028	1C	<	074	060	3C	\	134	092	5C	|	174	124	7C
^]	GS	035	029	1D	=	075	061	3D	]	135	093	5D	}	175	125	7D
^^	RS	036	030	1E	>	076	062	3E	^	136	094	5E	~	176	126	7E
^-	US	037	031	1F	?	077	063	3F	^-	137	095	5F	DEL	177	127	7F

Appendix D

CONNECTOR PINOUT ASSIGNMENTS

SCREW TERMINAL CONNECTOR: Three "Phoenix" screw terminal connectors.

Pin	Description
16	RS-232C receive
15	RS-232C transmit
14	Signal ground
13	Clockwise limit switch input (normally closed, active high)
12	Counterclockwise limit switch input (same as clockwise)
11	Home sensor input (normally open, active low)
10	Opto +
9	+9 - 12 volt DC
8	Signal ground
7	Signal ground
6	+12 - 90 volts DC
5	Motor phase center taps
4	Motor phase 2
3	Motor phase 2
2	Motor phase 1
1	Motor phase 1

Note

Eight lead motors require that the two windings that make up a complete phase be connected in series and that the connection point be used as the center tap for each phase.

Appendix

CX SERIES CURRENT SETTING TABLES

Phase Current in amps per phase: JU5 - JU9

<u>Current</u>	<u>JU5</u>	<u>JU6</u>	<u>JU7</u>	<u>JU8</u>	<u>JU9</u>
0.14	off	off	off	off	off
0.31	off	off	off	off	on
0.47	off	off	off	on	off
0.62	off	off	off	on	on
0.78	off	off	on	off	off
0.94	off	off	on	off	on
1.09	off	off	on	on	off
1.25	off	off	on	on	on
1.41	off	on	off	off	off
1.56	off	on	off	off	on
1.72	off	on	off	on	off
1.87	off	on	off	on	on
2.03	off	on	on	off	off
2.19	off	on	on	off	on
2.34	off	on	on	on	off
2.50	off	on	on	on	on
2.66	on	off	off	off	off
2.81	on	off	off	off	on
2.97	on	off	off	on	off
3.12	on	off	off	on	on
3.28	on	off	on	off	off
3.44	on	off	on	off	on
3.59	on	off	on	on	off
3.75	on	off	on	on	on
3.91	on	on	off	off	off
4.06	on	on	off	off	on
4.22	on	on	off	on	off
4.37	on	on	off	on	on
4.53	on	on	on	off	off
4.68	on	on	on	off	on
4.84	on	on	on	on	off
5.00	on	on	on	on	on

Appendix F

MOTOR CURRENTS

Current setting for Compumotor motors

<u>MODEL</u>	<u>CURRENT</u>	<u>JU5</u>	<u>JU6</u>	<u>JU7</u>	<u>JU8</u>	<u>JU9</u>
CX57-51	0.94 amps/phase	off	off	on	off	on
CX57-83	1.56 amps/phase	off	on	off	off	on
CX57-102	1.72 amps/phase	off	on	off	on	off
CX83-62	2.03 amps/phase	off	on	on	off	off
CX83-93	2.50 amps/phase	off	on	on	on	on
CX83-135	3.44 amps/phase	on	off	on	off	on
CX106-120	4.53 amps/phase	on	on	on	off	on
CX106-178	5.00 amps/phase	on	on	on	on	on

ADDRESS SELECT

<u>DEVICE ADDRESS</u>	<u>JU1</u>	<u>JU2</u>	<u>JU3</u>
ADDRESS H	on	on	on
ADDRESS I	on	on	off
ADDRESS J	on	off	on
ADDRESS K	on	off	off
ADDRESS L	off	on	on
ADDRESS M	off	on	off
ADDRESS N	off	off	on
ERROR (INVALID)	off	off	off

ERRATA TO CX-DH INSTRUCTION MANUAL

P/N 88-007101-01
Date: May 19, 1987

The following information was inadvertently left out of the CX-DH instruction Manual. The information will be inserted into the next revision of the manual.

Device Address Select

Device	AS1	AS2	AS3
H	ON	ON	ON
I	OFF	ON	ON
J	ON	OFF	ON
K	OFF	OFF	ON
L	ON	ON	OFF
M	OFF	ON	OFF
N	ON	OFF	OFF
Undefined	OFF	OFF	OFF

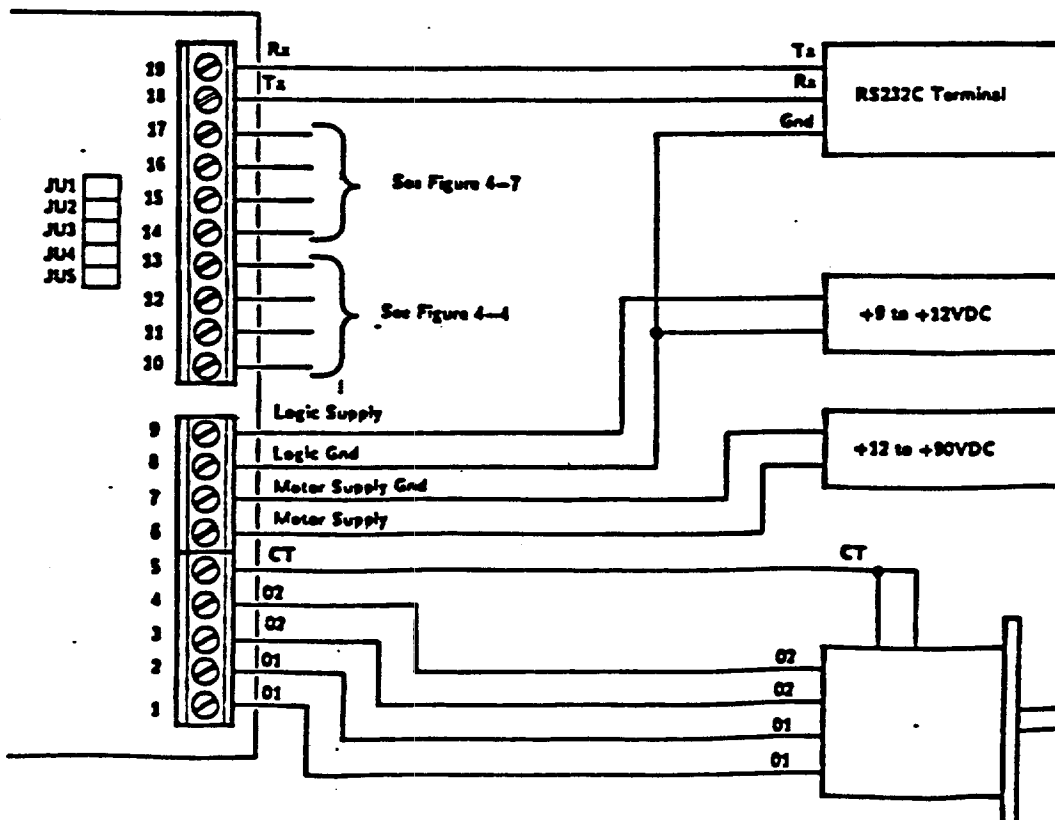
Device address select inputs are normally high (OFF), this causes the power-up address to be undefined, unless the user configures the inputs differently. To turn on, or "energize" these inputs, they must be pulled low (0V).

NOTE: Power up with an undefined address causes the CX-DH to enter an error state (flashes the LED slowly). The address must be changed and power cycled to correct the error state.

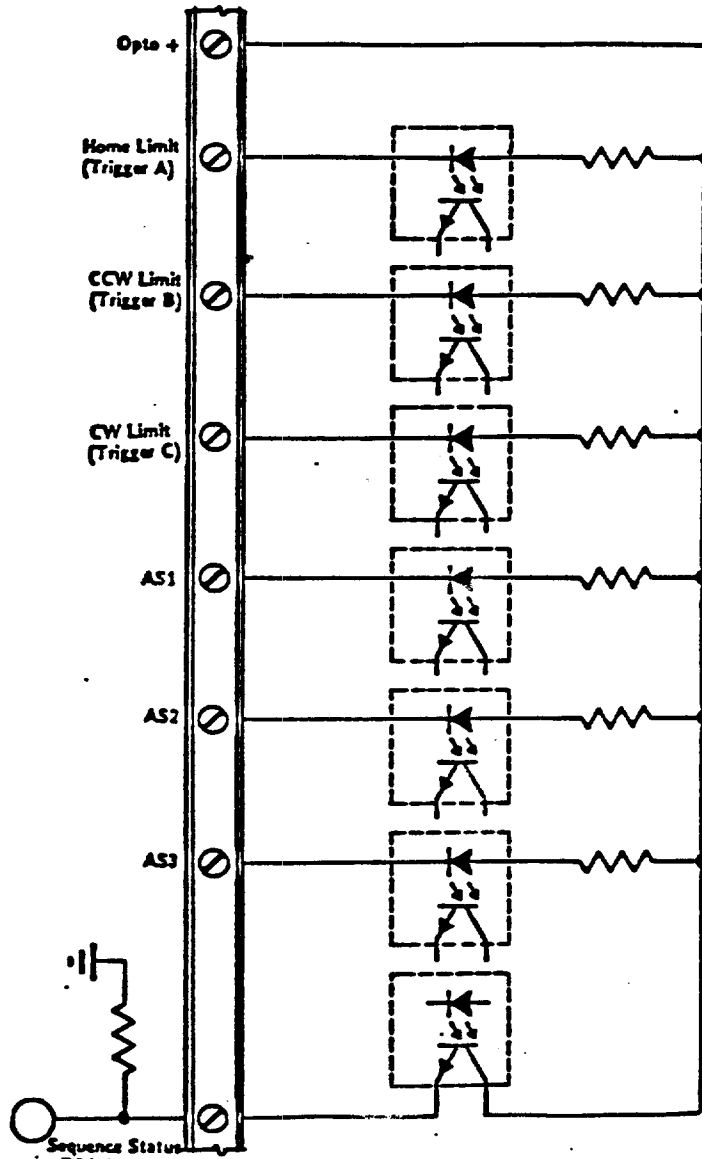
Status Output:

The status output (J1 pin 17) indicates end of sequence (low) or sequence in process (hi) when the CX-DH is in XP9 mode.

Figure : CX Connection Diagram



Optical Isolation Circuit



Current for Compumotor Motors

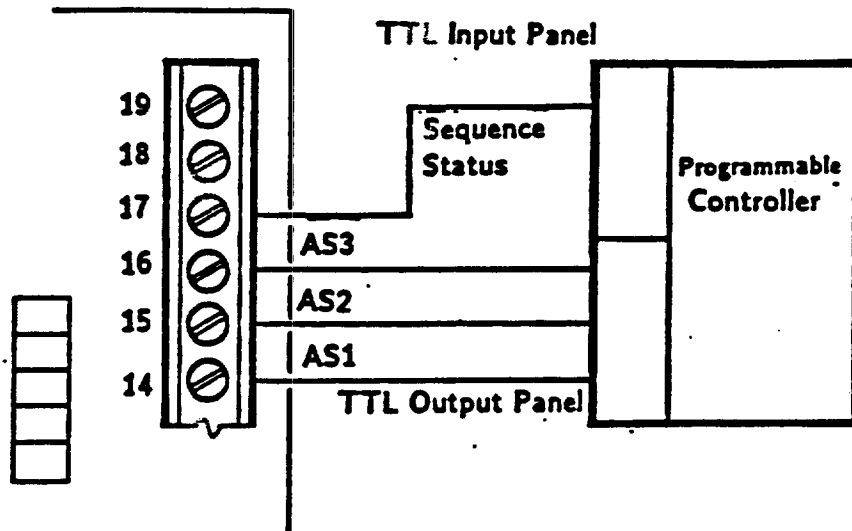
Recommended Settings for Compumotor Supplied Motors

MODEL	CURRENT	JU1	JU2	JU3	JU4	JU5
CX57-51	0.94 amp/phase	0	0	1	0	1
CX57-83	1.56 amps/phase	0	1	0	0	1
CX57-102	1.72 amps/phase	0	1	0	1	0
CX83-62	2.03 amps/phase	0	1	1	0	0
CX83-93	* 2.50 amps/phase	0	1	1	1	1
CX83-135	3.44 amps/phase	1	0	1	0	1
CX106-120	4.53 amps/phase	1	1	1	0	1
CX106-178	5.00 amps/phase	1	1	1	1	1

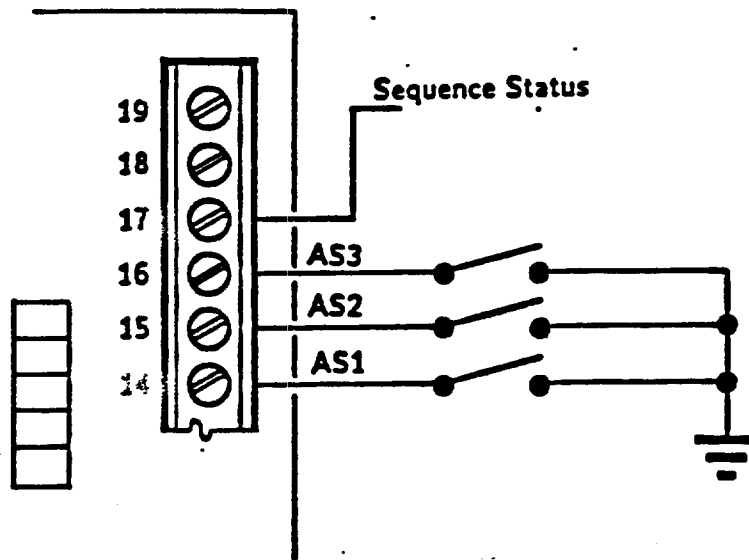
Note: 0 = Jumper is OFF
1 = Jumper is ON

Remote Address and Sequence Select

PLC Controlled Operation



Manually Controlled Operation



Connector and Jumper Listing

CONNECTIONS

Motor Connections

Pin #	Description
1	Phase 1 (green)
2	Phase 1 (green/white)
3	Phase 2 (red)
4	Phase 2 (red/white)
5	Center taps (black,white)

Power Supply Connections

Pin #	Description
6	High voltage DC (+12V to +90V)
7	Power Ground
8	Logic Ground
9	Low voltage (+9V to +12V)

Limit Inputs

Pin #	Description
10	Opto + (optical interface power)
11	Home sensor (home limit)
12	CCW limit
13	CW limit

RS-232C connections

Pin #	Description
8	Ground (logic Ground)
18	Transmit
19	Receive

Address/Sequence Select

PIN #	Description
14	Add/Seq Slct 1
15	Add/Seq Slct 2
16	Add/Seq Slct 3
17	Sequence Status

JUMPERS

Address Select:

Pin #	Description
14	Device Address
15	Device Address
16	Device Address

Status Output:

Pin #17 indicates end of sequence (low) or sequence in process (hi)