Dual axis stepper/HSC module

MC	M3-40B

2 axis stepper controller and high-speed counter
24V step/dir interface

▶ *Step rates up to 4 MHz*
▶ *Advanced floating point position loop*
▶ *Encoder rate 17.5 MHz*
▶ *< 1 μsec registration response*
▶ *High-speed, on-board motion processor*

▶ *Closed-loop stepper control*
▶ *Optically and electrically isolated*
▶ *16 inputs configurable as 10 MHz counters*
▶ *6 position-based outputs*

General specifications

Number of axes	2
Axis type	Stepper
Command type	Step/direction
Digital inputs	10
Digital outputs	10
Encoder inputs	2(A, B, Z)
Counter inputs	16 @ 10 MHz
Connection	Removable terminal block
Connection type	Tension clamp
Terminal block part number	069-622210
Terminal wire size (UL 1059)	18 - 22 AWG
Test point	All connections
Status indicator	One LED per channel
Module size	1 rack slot (0.75"/19 mm)
Bus power required (5 VDC)	0.26 mA
Isolation rating	500 VDC
Operating temperature	
Horizontal installation	0 - 50°C
Vertical installation	0 - 35°C
Storage temperature	–25 – 85°C
Humidity	5 – 95% non-condensing

Actual size

Minimum hardware revision	A
Minimum firmware revision	1.02
Minimum operating system revision	5.00.90
Documentation number: 950-534002-004	

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Performance specifications

Parameter	Value
Position range	64-bit
Position resolution	$\pm$1 step
Velocity range	$\pm$4M steps/sec
Velocity resolution	$\pm$1 step/sec
Position loop update	500 μsec/2 axes
Command resolution	1 step
Closed loop feature	Encoder
Encoder feedback type	5 V - differential quadrature
Max encoder rate	17.5 MHz

Electrical specifications

Parameter	Value
Max encoder input voltage	6 VDC
Encoder Turn ON/OFF threshold	$\pm$200mV
Encoder termination resistor	100Ω (10%)
Registration input type	VDC sourcing
Registration response	<1 μsec
Registration Turn ON threshold	0.53 * VS
Registration Turn OFF threshold	0.32 * VS
Max registration voltage	VS
Max ON registration current	2.6 mA DC
Registration input resistance to VDC RTN	10 KΩ (10%)
Output current:	
per channel	$\pm$0.5 A
per module	$\pm$3 A
per controller	$\pm$8 A
Output voltage:	
V_{OL} (sinking) @100 mA	0.4 VDC
V_{OL} (sinking) @ 0.5 A	2 VDC
V_{OH} (sourcing) @ 100 mA	VS – 0.4 VDC
V_{OH} (sourcing) @ 0.5 A	VS – 2 VDC

Additional features

Parameter	Value
Per module motion I/O	
Inputs:	
Assignable[1]	10
Registration[2]	4
Capture speed	< .25 μsec
Outputs:	
Assignable[3]	10
Move types:	Linear, Cam, Spline, Gear, Segmented moves

Application notes

1. General purpose inputs and outputs can be assigned special functions such as limits, enable, running, etc. or used programmatically. They can also be configured as high-speed (10 MHz) counters. See Doc. No. 951-530017: QuickMotion Reference Guide for details.
2. Any two inputs can be configured as high-speed registration inputs (response time < 0.25 μsec).
3. Three pairs of digital outputs can be used for stepper drive control or used as standard outputs.
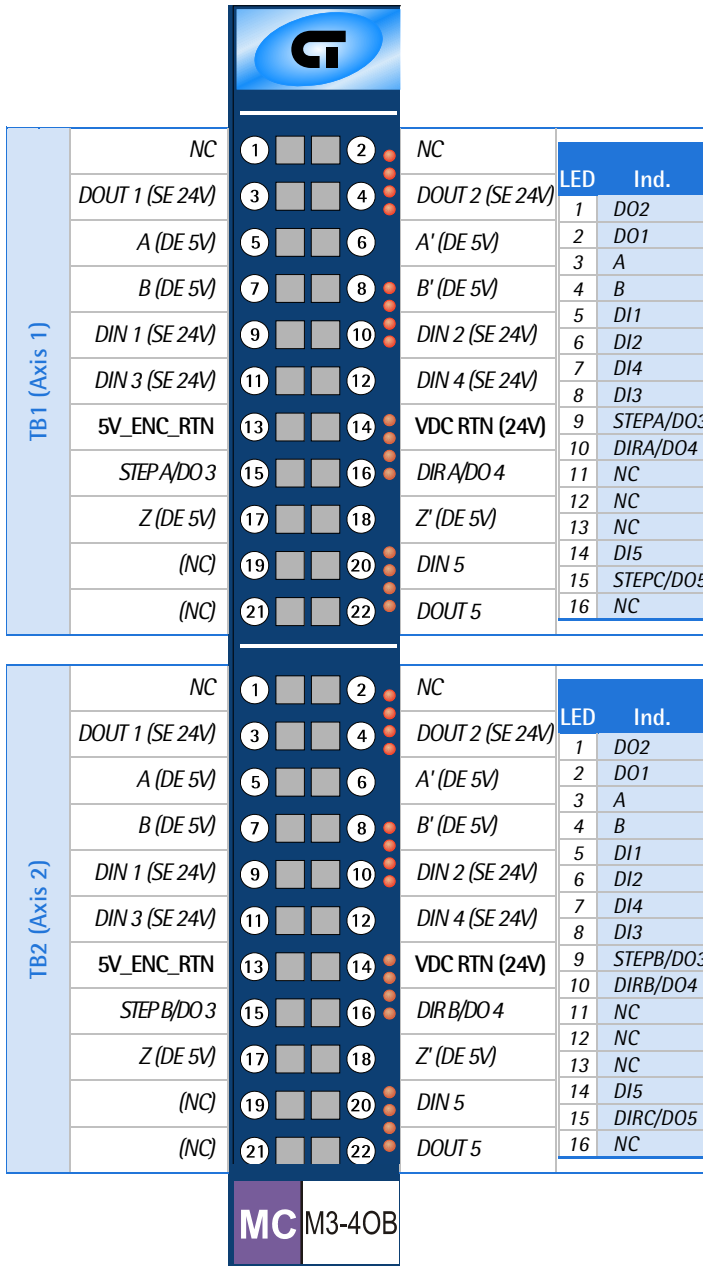
2 axis stepper controller and high-speed counter
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Terminal block connections

TB1 (Axis 1)

	Pin		Pin	
NC	1	2		NC
DOUT 1 (SE 24V)	3	4		DOUT 2 (SE 24V)
A (DE 5V)	5	6		A' (DE 5V)
B (DE 5V)	7	8		B' (DE 5V)
DIN 1 (SE 24V)	9	10		DIN 2 (SE 24V)
DIN 3 (SE 24V)	11	12		DIN 4 (SE 24V)
5V_ENC_RTN	13	14		VDC RTN (24V)
STEP A/DO 3	15	16		DIR A/DO 4
Z (DE 5V)	17	18		Z' (DE 5V)
(NC)	19	20		DIN 5
(NC)	21	22		DOUT 5

LED	Ind.
1	DO2
2	DO1
3	A
4	B
5	DI1
6	DI2
7	DI4
8	DI3
9	STEPA/DO3
10	DIRA/DO4
11	NC
12	NC
13	NC
14	DI5
15	STEPC/DO5
16	NC

TB2 (Axis 2)

	Pin		Pin	
NC	1	2		NC
DOUT 1 (SE 24V)	3	4		DOUT 2 (SE 24V)
A (DE 5V)	5	6		A' (DE 5V)
B (DE 5V)	7	8		B' (DE 5V)
DIN 1 (SE 24V)	9	10		DIN 2 (SE 24V)
DIN 3 (SE 24V)	11	12		DIN 4 (SE 24V)
5V_ENC_RTN	13	14		VDC RTN (24V)
STEP B/DO 3	15	16		DIR B/DO 4
Z (DE 5V)	17	18		Z' (DE 5V)
(NC)	19	20		DIN 5
(NC)	21	22		DOUT 5

LED	Ind.
1	DO2
2	DO1
3	A
4	B
5	DI1
6	DI2
7	DI4
8	DI3
9	STEPB/DO3
10	DIRB/DO4
11	NC
12	NC
13	NC
14	DI5
15	DIRC/DO5
16	NC

MC M3-4OB

1. *All step and dir connections are single-ended 24V.*

Special I/O Functions

- **16 HS Counters (10 MHz):** *All five inputs as well as the A, B, and Z signal pins on each axis connector can be configured as high-speed counters.*

- **Period Measurement (0.1 µsec accuracy):** *Two pairs of inputs on each axis can be set up to measure the time between activation of the first and second input in the pair. Ideal for high-speed measurement and frequency measurement.*

- **Frequency Outputs:** *Three outputs on each axis can generate a programmable frequency up to 500 KHz.*

- **Pulse Outputs:** *All ten outputs can be pulsed for a programmable time value with an accuracy of 0.5 msec.*

- **Programmable Limit Switch Outputs:** *Three outputs on each axis can be configured to automatically turn on and off as a function of the encoder position. Up to sixteen on/off positions can be configured per axis. The on/off positions can be changed programmatically on-the-fly. This is especially useful to compensate for lead or lag time based on operating speed.*
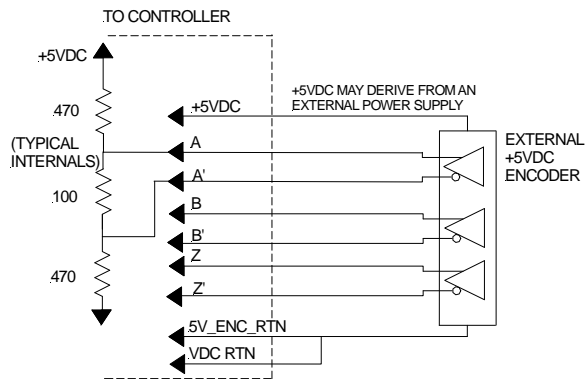
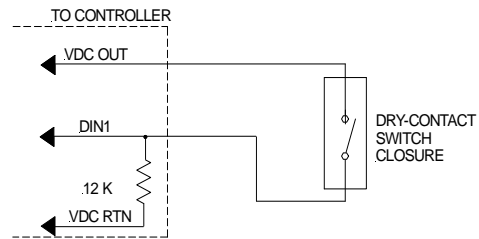## Dual axis stepper/HSC module

MC **M3-40B**

Application Information

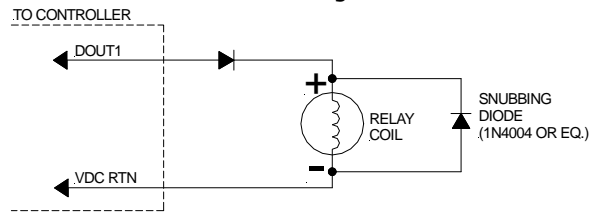### Differential Encoder/Counter Application

All Single-ended Inputs Application

Digital Outputs & Stepper Command
Sourcing

Notes

1. If an output is used to drive transistor loads, proper current limiting must be observed.
2. When a digital device is powered via an external power source, it may be necessary to tie the ground of this power source to the controller's voltage supply return (VDC RTN)
3. For register and programming information, refer to the appropriate controller Applications Guide.
4. The information and illustrations contained herein are the property of Control Technology Corporation and are subject to change without notice. Data based on VS = 24 VDC @ 25°C unless otherwise noted. For additional information and/or updates, visit www.ctc-control.com. Copyright © 2007 – 2012 Control Technology Corporation. All Rights Reserved.
5. VS refers to the voltage supply of the controller.
6. For single–ended counter or encoder input signals, tie A', B', and Z' to 5V_ENC_RTN.