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## GETTING STARTED

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### System Options

CD60M/80M Series drives must be installed by competent personnel familiar with the installation, commissioning and operation of motion control equipment. In the final application the equipment must be enclosed to prevent the operator coming into contact with any high voltages. This includes the transformer, drive and motor terminations, but excludes the drive front panel. Take care, unexpected motion may occur at any time, especially during the commissioning of motion control equipment.

The CD60M and CD80M drives have the same physical size and can be supplied with either 10HP or 14HP front panels. This allows you to replace existing CD drives using the 14HP panel size version or to take advantage of the greater packing density offered by the 10HP panel size. Motherboards can also be supplied in 10HP and 14HP versions. Refer to Table 5 to determine the relevant part numbers.

### Rack Options

Using a CN Series EuroRack, you can mount up to 6 drives together with a PM1200CN or PM2000CN power unit. Alternatively, up to 8 drives may be fitted if an external supply is used. The translator card plus power card construction of the drives enables the use of 100mm EuroCard guides or 111.7mm module guides.

14HP size drives can be used in conjunction with, or as a replacement for existing CD drives mounted in CC racks.

### Power Supply Options

Depending upon the high speed torque requirements demanded by your application, you may select either the PM1200CN supplying 85VDC at 15A or the PM2000CN supplying 120VDC at 15A.

### Transformer Options

Drives may be powered directly from the rectified and smoothed secondary output of a suitable isolating transformer. Digiplan transformers are recommended because of their superior regulation performance under varying load conditions, minimising supply overvoltage at low drive currents.

The CD60M/CD80M drives have a conservatively rated operating voltage and will allow overvoltage conditions to exist provided the +10% maximum (154V DC peak) is not exceeded.

Description	Part Number
10HP front panel	FP52 (CD60M) FP53 (CD80M)
14HP front panel	FP50 (CD60M) FP51 (CD80M)
10HP motherboard	CD60/80MBKIT
14HP motherboard	CDMBKIT or CDCMBKIT or CD25/35MBKIT
Power Supplies	
85V DC 15A	PM1200CN
120V DC 15A	PM2000CN
Transformers	
600VA, for 85V DC	TO92
1200VA, for 85V DC	TO73
1000VA, for 120V DC	TO182

Table 5. CD60M/CD80M Related Parts

**Basic System Configuration (Stand-alone Drive)**

The CD60M/CD80M drives may be used without a motherboard, connections being made directly to the translator card edge connector.

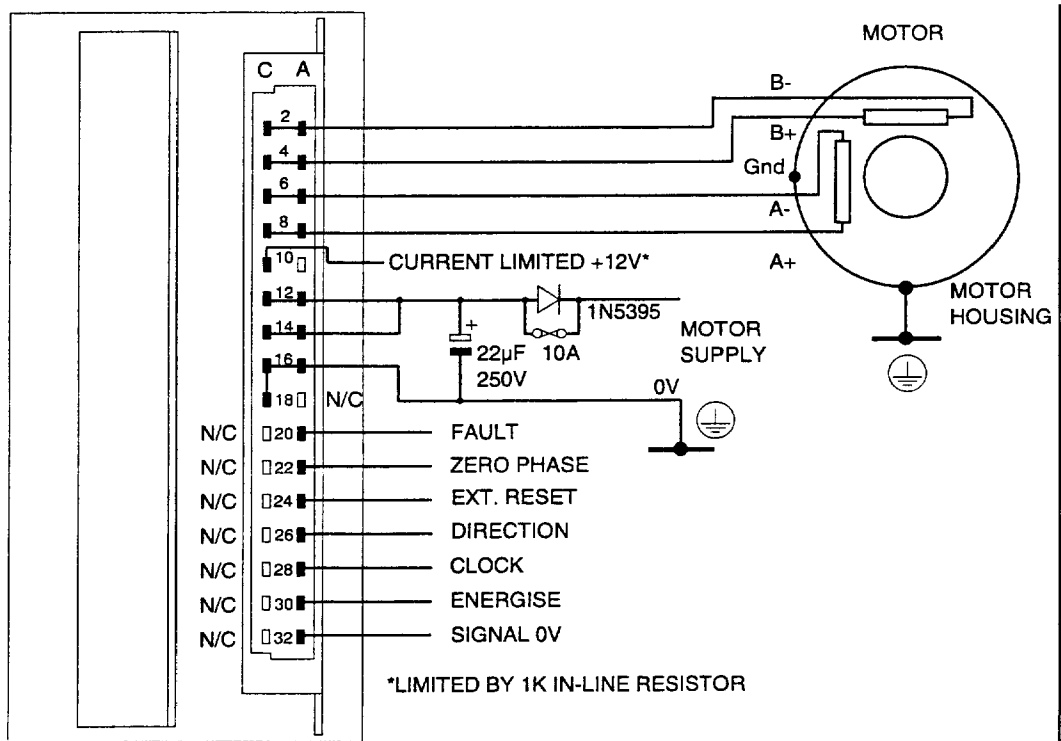


Figure 2. Edge Connections (Stand-alone Drive)

<b>Edge Connections</b>	Figure 2 shows the pinouts on the edge connector, viewed from the back of the drive. When you purchase a <i>drive only</i> module, a mating solder-type connector is provided to make user connections. When making your connections, ensure the motor supply to the drive is protected by a <i>fast-blow</i> fuse with a reverse bypass diode. This allows a return path for regenerated current back to the supply capacitor in the event of fuse failure. Both drives use a fast-blow 10A fuse.
<b>Fault</b>	Fault is a composite, open collector output signal which goes high in the event of an overcurrent, supply failure or over-temperature fault.
<b>Zero Phase</b>	The zero phase open collector output signal goes low each time the Translator is in its primary state i.e., current flowing from positive to negative in motor phase A, and from negative to positive in motor phase B. This signal can be used when establishing a mechanical reference or <i>home</i> position.
<b>External Reset</b>	You may reset the drive by applying a logic low to the reset input for 1 second. This input was formally boost on the existing CD range. Ensure any boost connection is removed when replacing a CD drive with a CD60M/CD80M drive.
<b>Direction</b>	Taking this input terminal low (connecting it to the 0V terminal) will reverse the direction of motor rotation. The direction must only be changed when the motor is stationary or running within the start/stop speed range.
<b>Clock</b>	Clock or step causes the motor to advance one step for every low going transition received at this input.
<b>Energise</b>	When link LK3 on the drive Translator card is in the 'I' position this input can be used to remotely energise/de-energise the drive. When you take this input high the drive is de-energised and if it is safe to do so, the motor may be rotated slowly without switching the system off.
<b>0V Connection on 16 a, c</b>	Use this terminal as the common return point for the controller signals.

### Motor Connections

Connect the motor to edge connector pins 2, 4, 6 & 8 as shown in Figure 2. The A and C sides of the connector are linked to increase current handling. If you are unsure which motor wires correspond to Phase A and Phase B, refer to Tables 6 and 7.

### Factory Settings

CD60M/CD80M drive functions are factory-set to provide optimum system performance. You do not need to alter these settings to accommodate the preliminary system operation and testing discussed in this section. Normally, these factory settings, with the exception of motor current, will satisfy the complete system operating requirements. The Installation section discusses optional drive settings you can use for your particular application. The basic drive operating conditions are factory set as follows:

- Drive current is set at maximum:
  - CD60M      6A
  - CD80M      7.8A
  
- Drive resolution is set at maximum:
  - CD60M      4,000 steps/rev
  - CD80M      4,000 steps/rev
  
- Drive standby current reduction is set to:
  - CD60M      50% of full load
  - CD80M      50% of full load
  
- Drive energise is set to:
  - CD60M      Permanent
  - CD80M      Permanent

## Basic System Configuration (Rack-mount Drive)

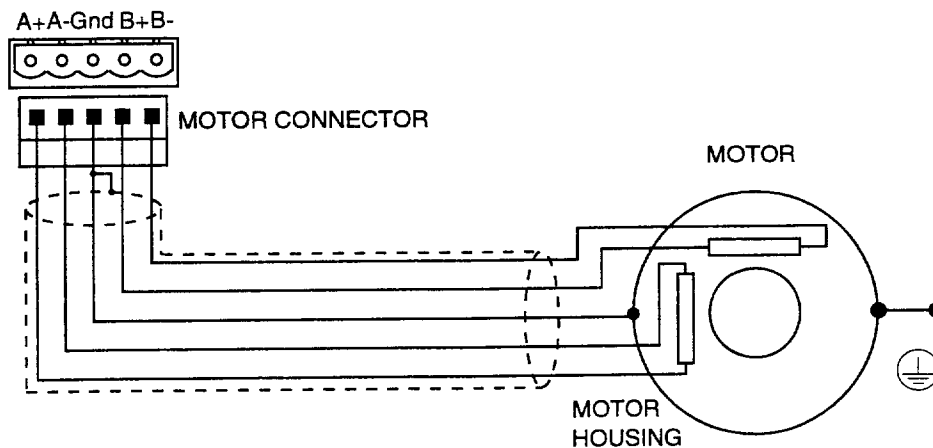
Owing to their dual card size construction the CD60M/CD80M drives can be mounted in a variety of "standard" racks. Generally a number of drives are mounted in one rack together with a power supply module. Transformers supplying the power module need to be mounted close to the rack to minimise lead lengths.

If you purchased a Digiplan stepper motor with the CD60M/CD80M drive system, it will be pre-wired and ready to connect to the motherboard. Refer to Figure 3 for motor connections.

If you are using a motor from another supplier, refer to Tables 6 and 7 to determine which motor wires correspond to Phase A and Phase B.

Once you have determined the motor's wiring configuration, connect the motor leads to the connector (TB1) marked "MOTOR" on the motherboard. The motor cable earth conductor and screen should be connected to the terminal marked "GND". Note the motor cable screen is only connected to ground at one end.

The motor body must be reliably earthed (do not rely on the 'Gnd' connection through the motherboard motor connection).



To reverse motor rotation relative to the direction input, interchange connections to A+ and A-.

**Figure 3 Drive Motor Connections**

# 10 CD60M/CD80M STEPPER DRIVE USER GUIDE

N.C. - no connection.

MAKE	TYPE	A+	A-	B-	B+	NOTES
Pacific Scientific	6-lead	Black	Orange	Red	Yellow	White/Blk/Org, White/Red/Yel N.C.
	8-lead	Black	Orange	Red	Yellow	Link Wh/Blk & Wh/Org Link Wh/Red & Wh/Yel
	T.box	1	3	2	4	Link 5 & 6, link 7 & 8
Astrosyn, Rapidsyn, Slo-syn	6-lead	Red	Red/Wh	Grn	Grn/Wh	White & Black N.C.
	T.box (x6)	1	3	4	5	2 & 6 N.C.
Slo-syn	8-lead	Red	Red/Wh	Grn	Grn/Wh	Link Black & White, link Org & Blk/Wh
	T.box (x8)	1	3	5	4	Link 2 & 6, link 7 & 8
Stebon, Digiplan SM	8-lead	Red	Yel	Pink	Blk	Link Blue & violet, link White & Grey
	T.box	1	2	3	4	Link 5 & 6, link 7 & 8
M.A.E.	6-lead	Grn/Wh	Grn	Red	Red/Wh	White & Black N.C.
	8-lead	Black	Orange	Red	Yellow	Link Wh/Blk & Wh/Org, Link Wh/Red & Wh/Yel
	T.box	6	5	8	7	Link 1 & 3, link 2 & 4
Zebotronics	T.box	1	4	5	8	Link 2 & 3, link 6 & 7
Oriental	6-lead	Black	Green	Red	Blue	Yellow & White N.C.
Sonceboz	8-lead	Green	Grn/Wh	Red	Red/Wh	Link Org & Blk/Wh, link Black & White
Japan Servo	6-lead	Red	Blue	Green	Yellow	2 x White N.C.
Escap	8-lead	Brown	Org/Wh	Red	Yel/Wh	Link Brn/Wh & Org, Link Red/Wh & Yellow.
Bodine	8-lead	Brown	Orange	Yellow	Red	Link Wh/Brn & Wh/Org, link Wh/Yel & Wh/Red.
	T.box	1	3	4	2	Link 5 & 7, link 6 & 8
Digiplan/Compumotor OEM Series	4-lead	-	-	-	-	Internally wired in parallel
	8-lead	Red	Black	Green	White	Link blue & yellow Link orange & brown
Digiplan/Compumotor QM & S Motors	8-lead	Red	Black	White	Green	Link Yel & Blue Link Org & Brown
Digiplan/Compumotor QM & S Motors (except 106-205)	T.box	1	3	4	5	Link 2 & 6 Link 7 & 8
Digiplan/Compumotor QM & S106-205	T.box	1	3	7	8	Link 5 & 6 Link 2 & 4

**Table 6. Motor Connection Data - Windings in Series**

N.C. - no connection.

For 6-lead motors, connections shown are for one half-winding.

MAKE	TYPE	A+	A-	B-	B+	NOTES
Pacific Scientific	6-lead	Black	Wh/Blk/ Orange	Red	Wh/Red/ Yellow	Or & Yellow N.C.
	8-lead	Black & Wh/Or	Or & Wh/Blk	Red/ Wh/Yel	Yel & Wh/Red	
	T.box	1 & 5	3 & 6	2 & 7	4 & 8	
Astrosyn, Rapidsyn, Slo-syn	6-lead	Red	Black	Green	White	Red/Wh & Grn/Wh N.C.
	T.box(x6)	1	6	4	2	3 & 5 N.C.
Slo-syn	8-lead	Red & White	Blk & Red/Wh	Grn & Blk/Wh	Org & Grn/Wh	
	T.box(x8)	1 & 2	3 & 6	4 & 7	5 & 8	
Stebon, Digiplan SM	8-lead	Rd & Blue	Yel & Violet	Wh & Pink	Black & Grey	
	T.box	1 & 6	2 & 5	3 & 8	4 & 7	
M.A.E.	6-lead	Grn/Wh	White	Red	Black	Grn & Red N.C
	8-lead	Black & Wh/Or	Or & Wh/Blk	Red & Wh/Yel	Yel & Wh/Red	
	T.box	3 & 6	1 & 5	4 & 8	2 & 7	
Zebotronics	T.box	1 & 2	3 & 4	5 & 6	7 & 8	
Oriental	6-lead	Black	Yellow	Red	White	Grn & Blue N.C.
Sonceboz	8-lead	Grn & Blk/Wh	Or & Grn/Wh	Red & White	Blk & Red/Wh	
Japan Servo	6-lead	Red	White*	Green	White*	
Escap	8-lead	Brn & Orange	Brn/Wh & Org/Wh	Red & Yellow	Red/Wh & Yel/Wh	
Bodine	8-lead	Brn & Wh/Or	Wh/Brn & Orange	Yel & Wh/Red	Wh/Yel & Red	
	T.box	1 & 7	3 & 5	4 & 6	2 & 8	
Digiplan/Compumotor OEM Series†	4-lead	Red	Black	Green	White	
	8-lead	Red & Blue	Yellow & Black	Green & Orange	Brown & White	
Digiplan/Compumotor QM & S Motors	8-lead	Red & Blue	Blk & Yellow	Wh & Brn	Green & Org.	
Digiplan/Compumotor QM & S Motors (except 106-205)	T.box	1 & 2	3 & 6	4 & 7	5 & 8	
Digiplan/Compumotor QM & S 106-205	T.box	1 & 5	3 & 6	2 & 7	4 & 8	

\* Use correct White for each phase.† Size 34 only. Size 23 can only be operated in series.

**Table 7. Motor Connection Data - Windings in Parallel**

**S/QM & SM Series Motors**

In the table below, 'S' denotes series connection and 'P' parallel connection. The OEM 83-size motors are 4-lead only.

	CD60 LK1=B	CD60 LK1=C	CD80 LK1=B	CD80 LK1=C	Peak Motor Current (A)	Rota Inertia Kg-cm <sup>2</sup> (oz-in <sup>2</sup> )
	LK4	LK4	LK4	LK4		
OEM 57-40S		M			2.7	0.070 (0.380)
OEM 57-51S		L		M	3.3	0.12 (0.650)
OEM 57-83S		K		L	3.8	0.25 (1.360)
OEM 83-62		J		L	4.4	0.64 (3.50)
OEM 83-93	M			J	5.6	1.23 (6.70)
OEM 83-135	L		M		6.9	1.87 (10.24)
S/QM 57-83P		L			3.1	0.234 (1.28)
S/QM 57-102P		L		M	3.5	0.32 (1.75)
S/QM 83-62P		J		L	4.4	0.64 (3.5)
S/QM 83-93S		L			2.9	1.23 (6.70)
S/QM 83-93P	M			J	5.6	1.23 (6.70)
S/QM 83-135S		L		M	3.5	1.87 (10.24)
S/QM 83-135P	L		M		6.9	1.87 (10.24)
S/QM 106-178S	L			J	6.0	8.05 (44.0)
S/QM 106-178P	J*		J		12.0	8.05 (44.0)
S/QM 106-205S		K		M	3.6	9.51 (52.0)
S/QM 106-205P	L		M		7.2	9.51 (52.0)
S/QM 106-250S	L			J	6.2	12.14 (63.0)
S/QM 106-250P	J*		J		12.4	12.14 (63.0)
SM 57-83P		J		K	4.7	0.23 (1.26)
SM 57-102P		J		L	4.6	0.30 (1.64)
SM 83-62S		L		M	3.2	0.60 (3.30)
SM 83-62P	L			J	6.4	0.60 (3.30)
SM 83-93S		J		L	4.0	1.25 (6.38)
SM 83-93P	K		L		7.9	1.25 (6.83)
SM 83-135S		K		L	3.8	2.00 (10.93)
SM 83-135P	K		L		7.6	2.00 (10.93)
SM 106-140S	M			K	5.0	3.65 (19.96)
SM 106-140P	J		K		9.9	3.65 (19.96)

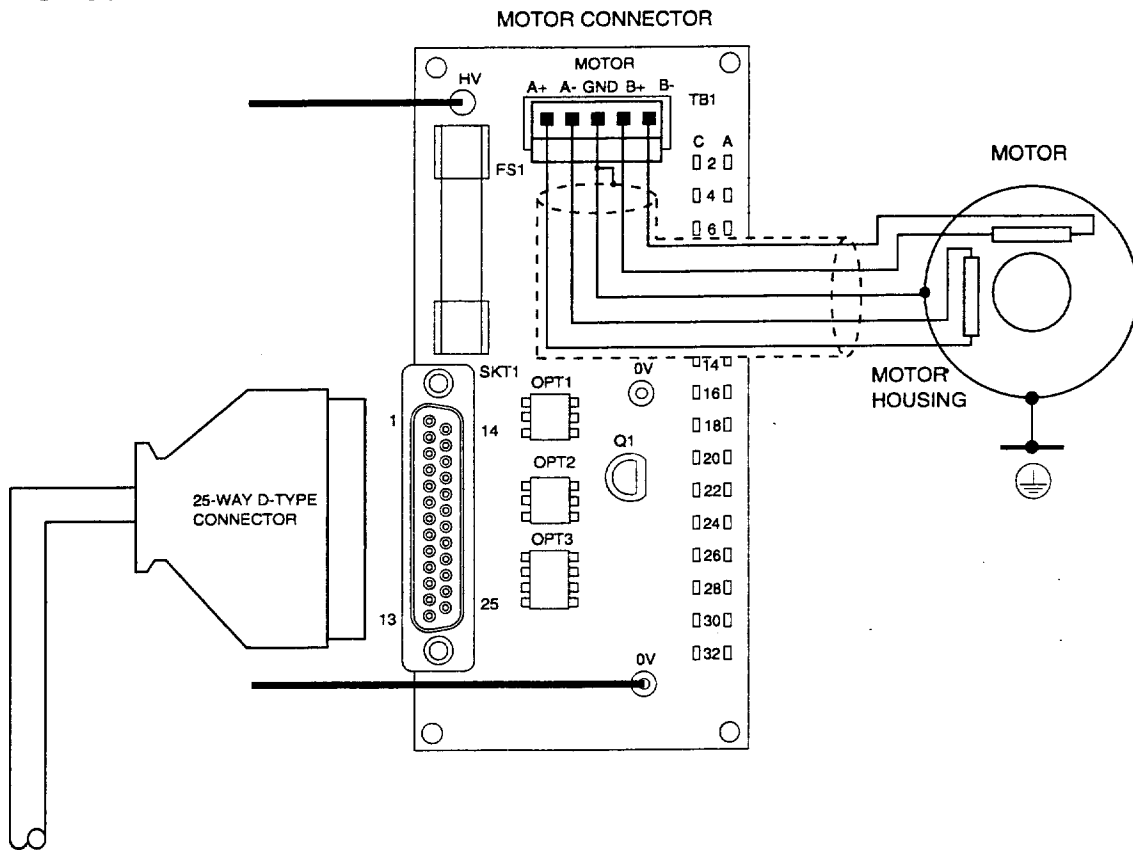
\*Motor will operate well below its maximum torque capacity.

**Table 8. Current Link Settings for OEM, S/QM and SM Series Motors**

*Note: there will be no automatic current reduction at standstill with LK1 in position C. This position is specified when the drive current must be set below 60% of its maximum value in order to match the motor.*

**Test Configuration Circuit**

A CD60M/CD80M drive test configuration is shown in Figure 4, viewed from the back of a 10HP motherboard connected to the drive.



**Figure 4 10HP Motherboard Connections**

**Indexer Connections**

Indexer connections are made via the 25-way D-type connector (SKT1), shown in Figure 4. Pin connections are detailed in Table 9.

Pin	Function
1	STEP +
14	STEP -
2	DIRECTION +
15	DIRECTION -
16	SHUTDOWN +
17	SHUTDOWN -
9	FAULT +
21	FAULT -

NOTE: All other pins are not used

**Table 9. Indexer Connector Pinouts**

### DC Power Connections

By using a standard rack for the test configuration, a drive can be mounted and connected to system components using a 10HP motherboard. Standard DC power supplies can also be mounted within the same rack to provide an HV DC bus. DC power supply connections and transformer connections required by the DC supplies are detailed in the Installation section.

### Powering Up the CD Drive

Before you power-up the CD drive, you should verify that the power and motor cables are properly connected, the motor case earthed and the motor held securely. If everything is OK, the drive will be enabled (evident by *holding torque* on the motor) when you apply power.

If the drive is functioning properly, the green **ZERO PHASE** LED will be on and the red LEDs will be off. If the power supply is functioning properly, both power supply LEDs will be on.

If there is a short-circuit, over-temperature, or undervoltage condition, the corresponding red LED will be illuminated. If one of the red drive LEDs illuminate, or if the motor does not have holding torque, remove power to the system and refer to the Maintenance and Troubleshooting section.

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### Functional Test

Use the following procedures to test the functionality of the CD60M/CD80M drive system and to verify proper system connections.

#### STEP 1

Set up the indexer to run in accordance with the installation procedures outlined in the indexer manual. *Make sure the indexer resolution (steps/rev) matches the drive resolution setting.* Note that a Compumotor indexer will default to a setting of 25,000 steps/rev and a 0.3 $\mu$ s pulse width, which may not pass through the input filter.

#### STEP 2

Apply power to the drive and set the indexer to perform a move with the following parameters:

- Step Pulse Width = Minimum of 1 $\mu$ s
- Velocity = 4 revolutions per second (rps)
- Acceleration = 5 rps<sup>2</sup>
- Distance = 4,000 steps

Executing this move should cause the motor to make a 4,000-step move. Using factory settings the motor should turn 1 revolution.

If the motor does not move, refer to the Maintenance and Troubleshooting section.

CD60M/CD80M drives are protected against short-circuit and over-temperature. Nevertheless, it is not recommend that you test these features or operate your system in a way that will induce short-circuit or over-temperature situations.