IM-4056
September 2025

Three-Phase Electronically Commutated Motors

Installation, Operation & Maintenance Manual

Electronic commutation (EC) is the latest motor technology to be used in direct drive fans. Also known in the industry as Brushless DC, the EC motors utilize an electronic circuit board to control the functionality of the motor. The motor operates off three-phase power, which is converted to DC power within the motor's circuitry. The result is a highly efficient motor with an expanded speed control range and a variety of speed control options from which to choose.

Infinitum AirCore EC	Wolong EMR	WEG W30
		
Refer to pages 3-4	Refer to pages 4-5	Refer to pages 6-7

Model ECPFN with EC motor

TCF
Twin City Fan

Review AMCA Bulletin 410 and Product I&M Prior to Installation

This manual has been prepared to guide the users of electronically commutated motors in the proper installation, operation and maintenance procedures to ensure maximum equipment life with trouble-free operation. For safe installation, startup and operational life of this equipment, it is important that all involved with the equipment be well-versed in proper fan safety practices and read this manual. It is the user's responsibility to make sure that all requirements of good safety practices and any applicable safety codes are strictly adhered to. Because of the wide variety of equipment covered in this manual, the instructions given here are general in nature. Additional product and engineering information is available at *www.tcf.com*.

SAFETY NOTICE

Refer to the safety section(s) in the product installation and maintenance manuals prior to installing or servicing the EC motor. The most current version of this installation and maintenance manual can be found on our website at *www.tcf.com/resources/im-manuals*.

Table of Contents

Electrical Connection

1. Connect supply wiring to the disconnect switch (non-fused standard).
2. The motor is factory set at the voltage marked on the fan nameplate. Check the line voltage with the nameplate voltage.
3. The main power wiring should be sized for the ampacity shown on the nameplate. Size wires in accordance with the ampacity tables in Article 310 of the National Electrical Code. If long wires are required, it may be necessary to increase wire size to prevent excessive voltage drop. Wires should be sized for a maximum of 3% voltage drop.
4. Disconnect switches are not fused. The power leads must be protected at the point of distribution in accordance with the fan nameplate.
5. All units must be electrically grounded in accordance with local codes or, in the absence of local codes, with the latest edition of the National Electrical Code (ANSI/NFPA 70). A ground lug is provided as standard in the unit terminal box. Size grounding conductor in accordance with Table 250-95 of the National Electrical Code. DO NOT use the ground lug for connecting a neutral conductor.
6. Supply voltage to the power ventilator should not vary by more than 10% of the value indicated on the unit nameplate. Phase unbalance must not exceed 2%.

CAUTION

1. **Use copper conductors only.**
2. **Protect wiring from sharp edges. Leave some slack in the line to prevent damage. Do not allow the power or speed control cables to kink or come in contact with oil, grease, hot surfaces or chemicals. If damaged, discontinue use immediately and have cord replaced. Use proper strain relief.**

NOTE: For discontinued or deactivated motors, see page 8 of this manual.

Motor Identification

This manual covers three-phase EC motor identification, power and speed control methods for the motors shown below. For single-phase motors, please refer to IM-4055. For motors with multiple nameplates, refer to the drive nameplate rather than the nameplate on the motor itself.

The three-phase EC motors covered in this manual are organized by manufacturer in the quick guide on page 1 and by parameter in a more detailed breakdown in the *Three-Phase EC Motors by Horsepower* table below.

Threee-Phase EC Motors by Horsepower

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
5	415	TEFC	15	1800	500046788	Infinitum	AE15-0500-1800-BAAS-AA40
	460	TEFC	15	1800	500040009	Infinitum	AE15-0500-1800-AAAS-AA40
	575	TEFC	15	1800	500065100	Infinitum	AE15-0500-1800-CAAS-AA40
	380-480	TEAO	213T	1800	500044396	WEG	18034650
	480	TEFC	184	1800	500043326	Wolong	EMR184HP05S185T4FA
7-1/2	460	TEFC	18	1800	500043381	Infinitum	AE18-0750-1800-AAAS-AA40
	460	TEFC	15	2400	500040987	Infinitum	AE15-0750-2400-AAAS-AA40
	575	TEFC	15	2400	500063075	Infinitum	AE15-0750-2400-CAAS-AA40
	380-480	TEAO	213T	1800	500044397	WEG	18034652
	480	TEFC	215	1800	500043327	Wolong	EMR215HP07S184T4FA
10	460	TEFC	20	1800	500043383	Infinitum	AE20-1000-1800-AAAS-AA40
	460	TEFC	18	2400	500040988	Infinitum	AE18-1000-2400-AAAS-AA40
	575	TEFC	20	1800	500063152	Infinitum	AE20-1000-1800-CAAS-AA40
	575	TEFC	18	2400	500065253	Infinitum	AE18-1000-2400-CAAS-AA40
	380-480	TEAO	213T	1800	500044398	WEG	18034863
	480	TEFC	215	1800	500043328	Wolong	EMR215HP10S184T4FA
15	460	TEFC	20	1800	500043384	Infinitum	AE20-1500-1800-AAAS-AA40
	460	TEFC	20	2700	500043385	Infinitum	AE20-1500-2700-AAAS-AA40

If your motor is not listed below, please contact the Aftermarket team for an equivalent motor.

Email: parts@tcf.com
Phone: 888-444-4823

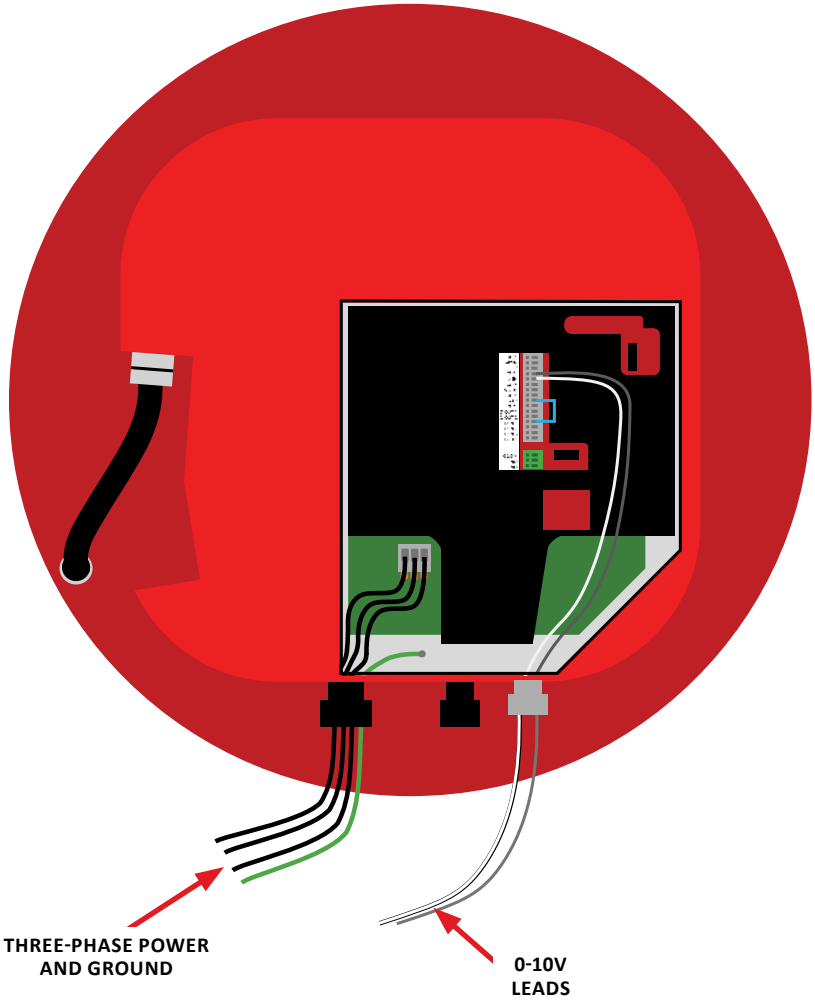
Power Connection and Speed Control

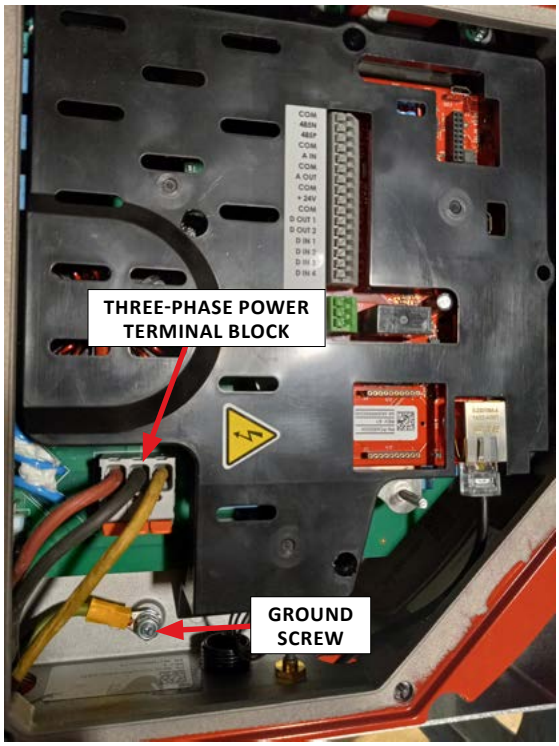
For Infinitum AirCore EC Motors:

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
5	415	TEFC	15	1800	500046788	Infinitum	AE15-0500-1800-BAAS-AA40
	460	TEFC	15	1800	500040009	Infinitum	AE15-0500-1800-AAAS-AA40
	575	TEFC	15	1800	500065100	Infinitum	AE15-0500-1800-CAAS-AA40
7-1/2	460	TEFC	18	1800	500043381	Infinitum	AE18-0750-1800-AAAS-AA40
	460	TEFC	15	2400	500040987	Infinitum	AE15-0750-2400-AAAS-AA40
	575	TEFC	15	2400	500063075	Infinitum	AE15-0750-2400-CAAS-AA40
10	460	TEFC	20	1800	500043383	Infinitum	AE20-1000-1800-AAAS-AA40
	460	TEFC	18	2400	500040988	Infinitum	AE18-1000-2400-AAAS-AA40
	575	TEFC	20	1800	500063152	Infinitum	AE20-1000-1800-CAAS-AA40
	575	TEFC	18	2400	500065253	Infinitum	AE18-1000-2400-CAAS-AA40
15	460	TEFC	20	1800	500043384	Infinitum	AE20-1500-1800-AAAS-AA40
	460	TEFC	20	2700	500043385	Infinitum	AE20-1500-2700-AAAS-AA40

Power Connection – Infinitum AirCore

Remove the rear motor drive plate. Connect the three-phase power wires to the tri-port terminal block with the ground wire connected to the grounding screw as shown.





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TWIN CITY FAN

Power Connection and Speed Control (cont.)

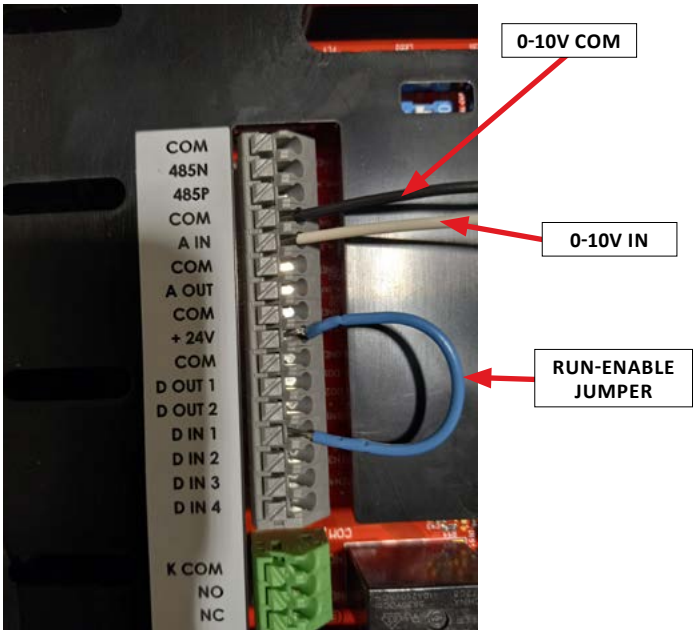
Speed Control – Infinitum AirCore EC

Connect the +24V and D IN 1 terminals to enable the drive, as shown by the blue wire.

0-10V

Connect the ground wire of the 0-10V DC power supply to one of the COM terminals on the primary terminal block.

Connect the supply wire of the 0-10V DC power supply to the A IN terminal. Motor speed can be adjusted by varying the input voltage of the DC power supply.

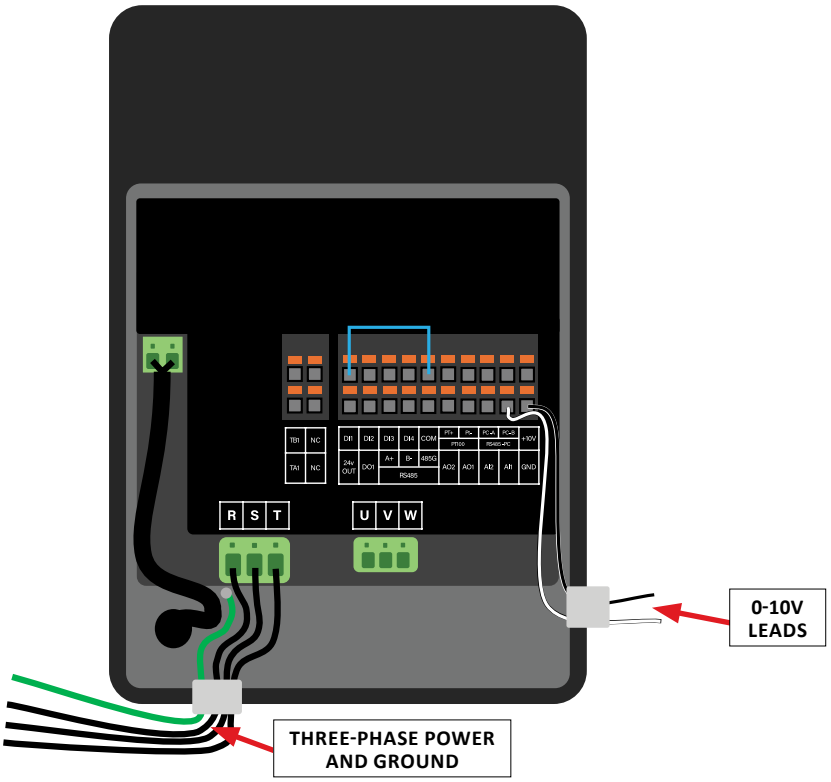


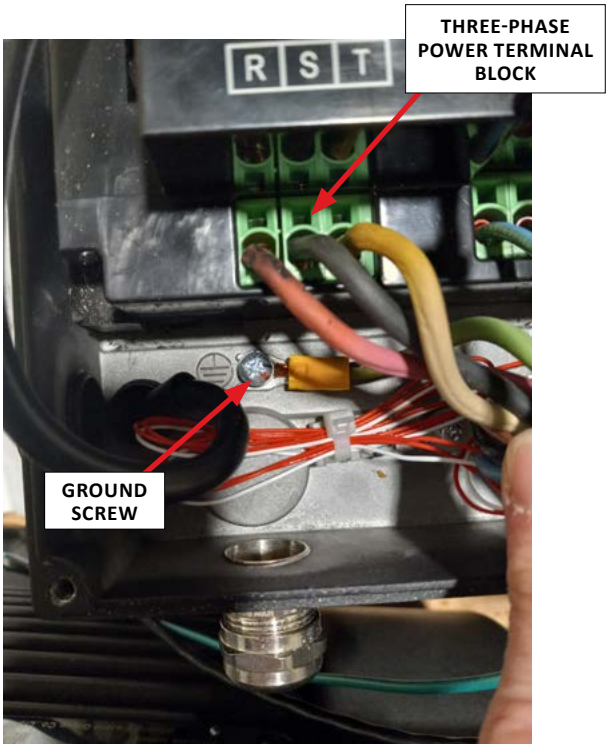
For Wolong EMR Motors:

HP	Voltage	Encl.	RPM	TCF PN	Manufacturer	Manufacturer PN
5	460	TEFC	1800	500043326	Wolong	EMR184HP05S185T4FA
7-1/2	480	TEFC	1800	500043327	Wolong	EMR215HP07S184T4FA
10	480	TEFC	1800	500043328	Wolong	EMR215HP10S184T4FA

Power Connection – Wolong EMR

Connect the three power leads to the three-phase power terminal block labeled RST and the ground lead to the grounding screw location shown.

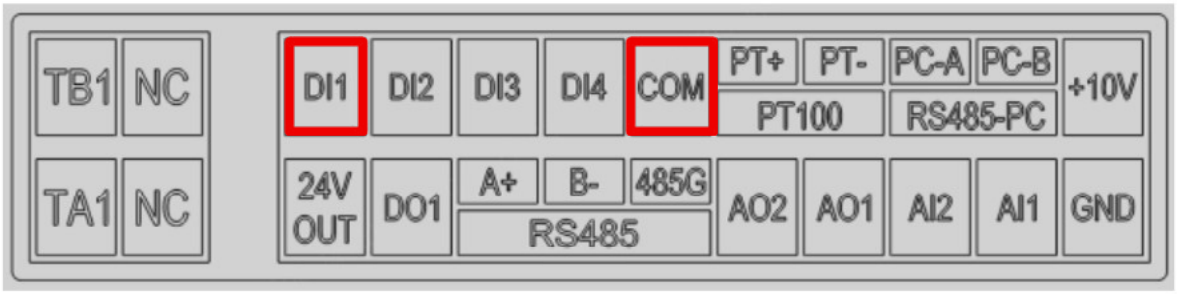




Power Connection and Speed Control (cont.)

Speed Control – Wolong EMR

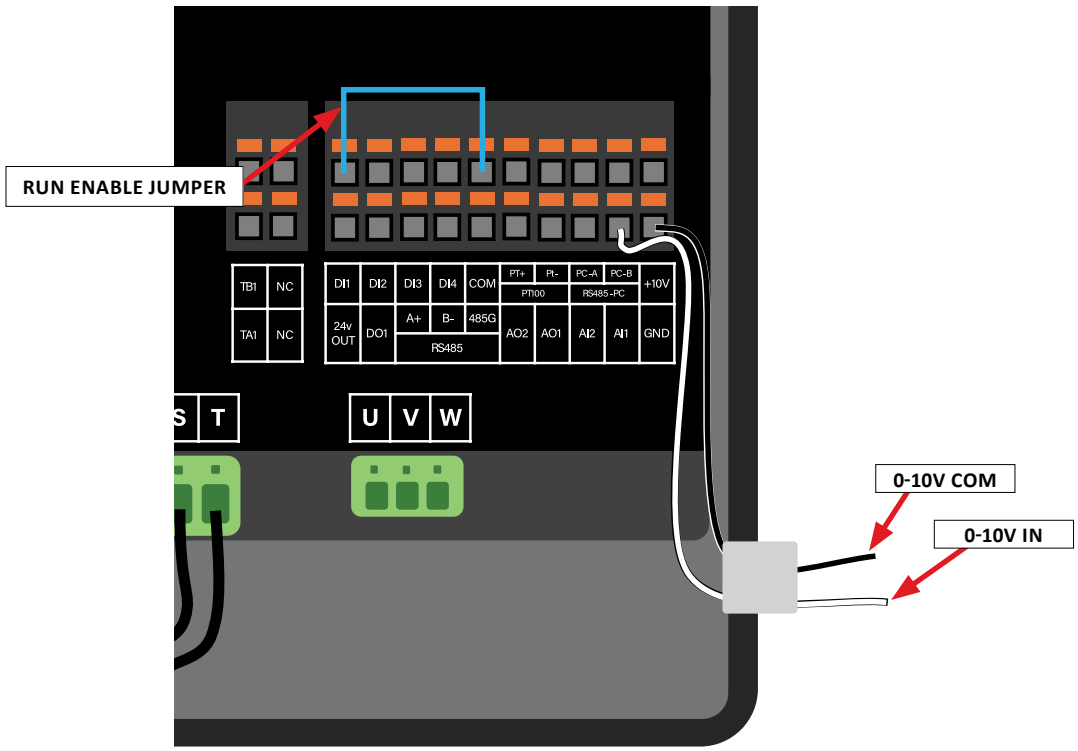
Connect the DI1 and COM terminals to enable the drive, as shown by the blue jumper wire.



0-10V

Connect the ground wire of the 0-10V DC power supply to the GND terminal on the primary terminal block, as shown by the black wire.

Connect the supply wire of the 0-10V DC power supply to the AI1 terminal, as shown by the white wire. Motor speed can be adjusted by varying the DC power supply input voltage.



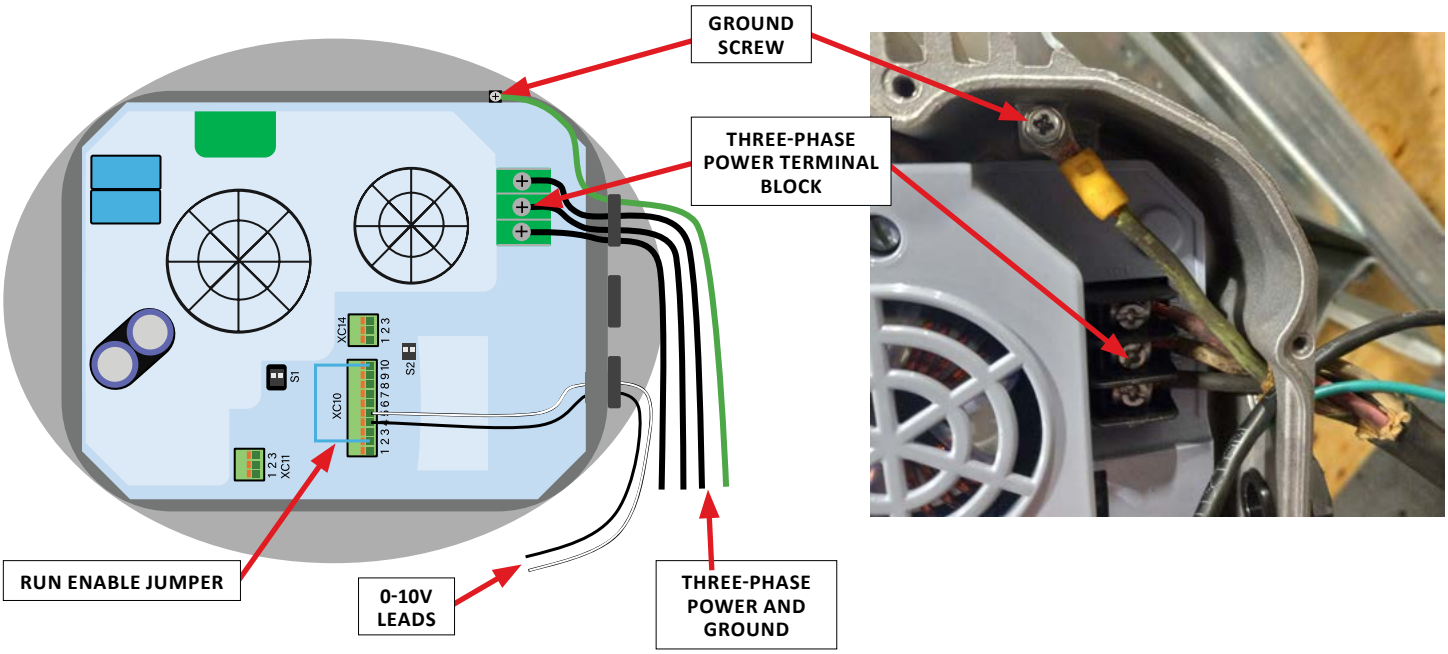
Power Connection and Speed Control (cont.)

For WEG W30 Motors:

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
5	380-480	TEAO	213T	1800	500044396	WEG	18034650
7-1/2	380-480	TEAO	213T	1800	500044397	WEG	18034652
10	380-480	TEAO	213T	1800	500044398	WEG	18034863

Power Connection – WEG W30

Connect the three power leads to the three-phase power terminal block and the ground to the grounding screw location shown.



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Power Connection and Speed Control (cont.)

Speed Control – WEG W30

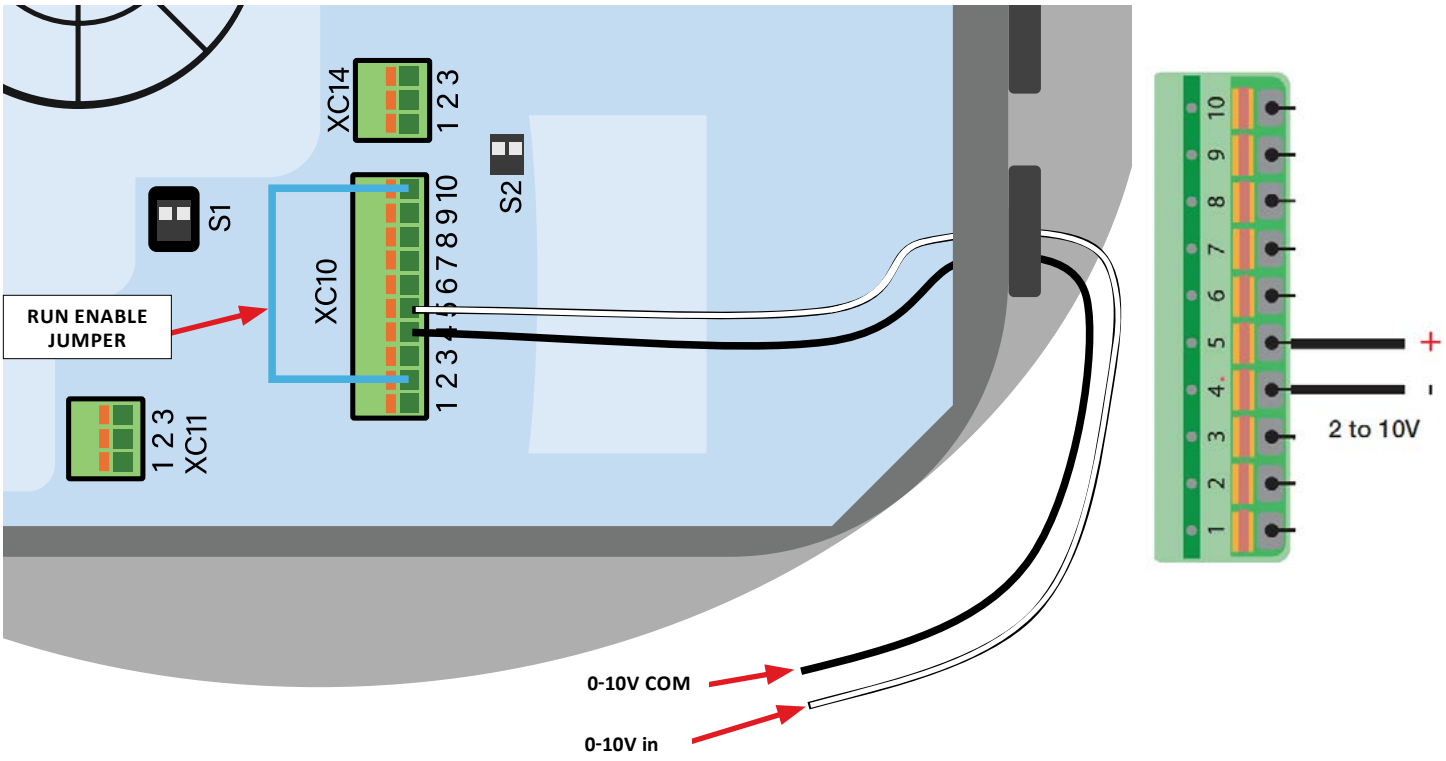
Connect the DI1 (terminal port 10) to +10V (terminal port 2) to activate the drive, as shown by the blue run enable jumper below.

Note that the drive will default to clockwise rotation (from the shaft side of the motor). To switch to counter-clockwise rotation, the +10V (terminal port 2) and DI2 (terminal port 9) must be connected, in addition to the DI1 to +10V connector.

0-10V

Connect the ground wire of the 0-10V DC power supply to one of the GND terminals (ports 1, 4 or 6) on the primary terminal block, as shown by the black wire.

Connect the positive wire of the 0-10V DC power supply to the AI_V terminal (port 5), as shown by the white wire. Motor speed can be adjusted by varying the DC power supply input voltage.



Speed Control Options: Discontinued SyMAX Motors

Connections

This motor is designed to be connected to the three-phase supply mains at all times. Motor operation is controlled by an analog DC voltage signal. The motor is shipped with all necessary internal connections made for signal, power and ground connections. The three-phase AC lines are labeled “L1”, “L2” and “L3” and the earth ground line is a green and yellow wire. The customer is required to connect the three-phase AC lines and earth ground to their supply.

SyMAX motors covered in this section

Motor PN	HP	Voltage/ Phase
67003305	1	208 - 230/3
67003306	1 1/2	208 - 230/3
67003307	2	208 - 230/3
67003309	3	208 - 230/3
67003405	1	460/3
67003406	1 1/2	460/3
67003407	2	460/3
67003409	3	460/3

Figure 1. Connections for signal and power leads

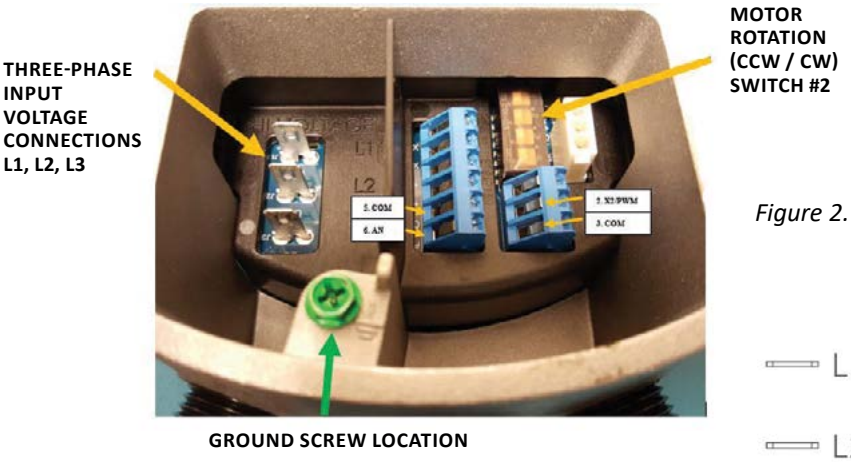
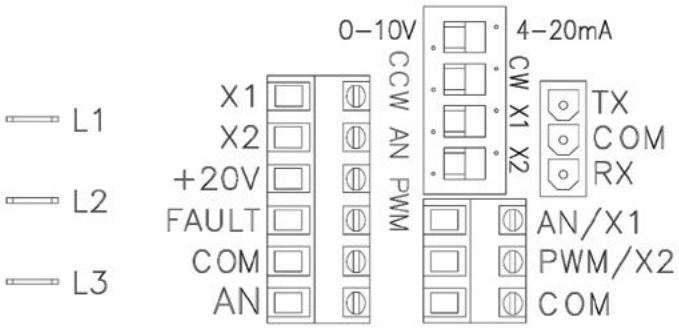


Figure 2. Connection label supplied on cover plate



Operation Method

This engineering sample is setup for constant speed operation. The analog DC control voltage controls the target speed to maintain. Speed maximum setting (10V) has been set for 1750 RPM. Speed minimum setting has been set for 200 RPM with a turn on speed of 250 RPM at ~1.6V. The torque to speed relationship is dependent on the load on the motor.

Control Method

The default motor control method is 0-10V DC where 0V is off and 10V is full speed. DC signal should be applied per Figure 1. +V DC line attached where shown (AN). DC common line should be attached per Figure 2 where shown (COM).

Maintenance

EC motors use brushless technology with sealed bearings so no maintenance is required while in operation, other than keeping the motors dry and free of dirt, dust and debris. If the motors are not placed into service right away, they should be stored in a clean, dry space. Avoid areas with significant temperature variation to reduce condensation. If the storage area location is prone to vibration, place vibration dampers under the motor base to prevent premature wear and damage to the bearings. It is recommended that the output shaft be rotated 5 to 10 times every quarter (three months) to distribute grease in the bearings and reduce the chance of corrosion formation on bearing rolling elements and raceways.

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