IM-4055
September 2025

Single-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 Brush Free or Brushless DC, the EC motors utilize an electronic circuit board to control the functionality of the motor. The motor operates off AC single-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.

The single-phase EC motors covered in this manual are organized by manufacturer in the quick guide below and by parameter in a more detailed breakdown in the *Single-Phase EC Motors by Horsepower* table on page 2.

ABB EC Titanium	McMillan	WEG eZA	Wolong GridSmart
			
Refer to pages 3-6	Refer to pages 7-9	Refer to pages 10-13	Refer to pages 14-17

Model VCU 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 pages 18-20 of this manual.

Motor Identification

This manual covers single-phase EC motor identification, power and speed control methods for the motors shown below. For three-phase motors, please refer to IM-4056. For motors with multiple nameplates, refer to the drive nameplate rather than the nameplate on the motor itself.

The single-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 *Single-Phase EC Motors by Horsepower* table below.

Single-Phase EC Motors by Horsepower

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
1/8	115/230	ODP	48CZ	200-1800	500027447-Wolong	Wolong	EM4810D142A6
1/6	115	ODP	48C	300-1800	67001008-McMillan	McMillan	F2212B4494
	115/230	ODP	48CZ	200-1800	500027446-Wolong	Wolong	EM4810D142A5
1/4	208-230	TENV	48C	300-1800	67002101-McMillan	McMillan	2216A4273
	115	ODP	48C	300-1800	67001001-McMillan	McMillan	F2216B4286
	115/230	ODP	48C	200-1800	67001701-Wolong	Wolong	EM4810B142A4
1/2	115	ODP	48C	300-1800	67001003-McMillan	McMillan	F2232B4287
	115/230	ODP	48C	200-1800	67001703-Wolong	Wolong	EM4810D122A0
	208-230	ODP	48C	350-1800	67001103-McMillan	McMillan	F2232B4495
3/4	115	ODP	48C	300-1800	67001004-McMillan	McMillan	F2240B4288
	115/230	ODP	48C	200-1800	67001704-Wolong	Wolong	EM4810C341A0
	208-230	ODP	48C	350-1800	67001104-McMillan	McMillan	F2240B4496
1	208-230	ODP	48C	350-1800	67001015-McMillan	McMillan	F2256B4497
	115	ODP	48C	300-1800	67001005-McMillan	McMillan	F2256B4289
	115	ODP	48C	350-1150	67001105-McMillan	McMillan	F2280B4385
	208-230	ODP	48C	350-1150	67001115-McMillan	McMillan	F2280B4493
	115/230	ODP	48C	200-1800	67001705-Wolong	Wolong	EM4810C111A2
	115	TEFC	56Z	180-1800	500035500-ABB	ABB	35-0000-1606
	220-277	TEAO	48Z	200-1800	500034745-WEG	WEG	WECM-ST80-65A2
2	208-240	TEFC	143TZ	180-1800	500035501-ABB	ABB	35-0000-1587
	208-277	TEAO	48Z	200-1800	500034744-WEG	WEG	WECM-ST80-120A2

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

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

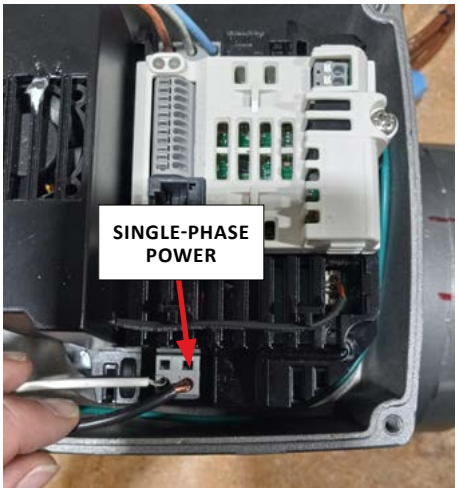
Power Connection and Speed Control

For ABB EC Titanium Motors:

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
1	115	TEFC	56Z	180-1800	500035500-ABB	ABB	35-0000-1606
2	208-240	TEFC	143TZ	180-1800	500035501-ABB	ABB	35-0000-1587

Power Connection – ABB EC Titanium

To power an ABB EC Titanium motor, connect single-phase power leads to the power block as shown below. Run the ground wire around the front of the drive to the ground screw on the far corner, as shown by the green wire in the image below.



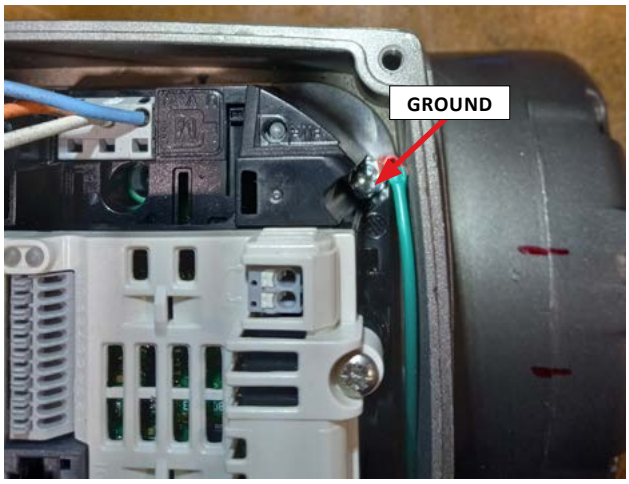
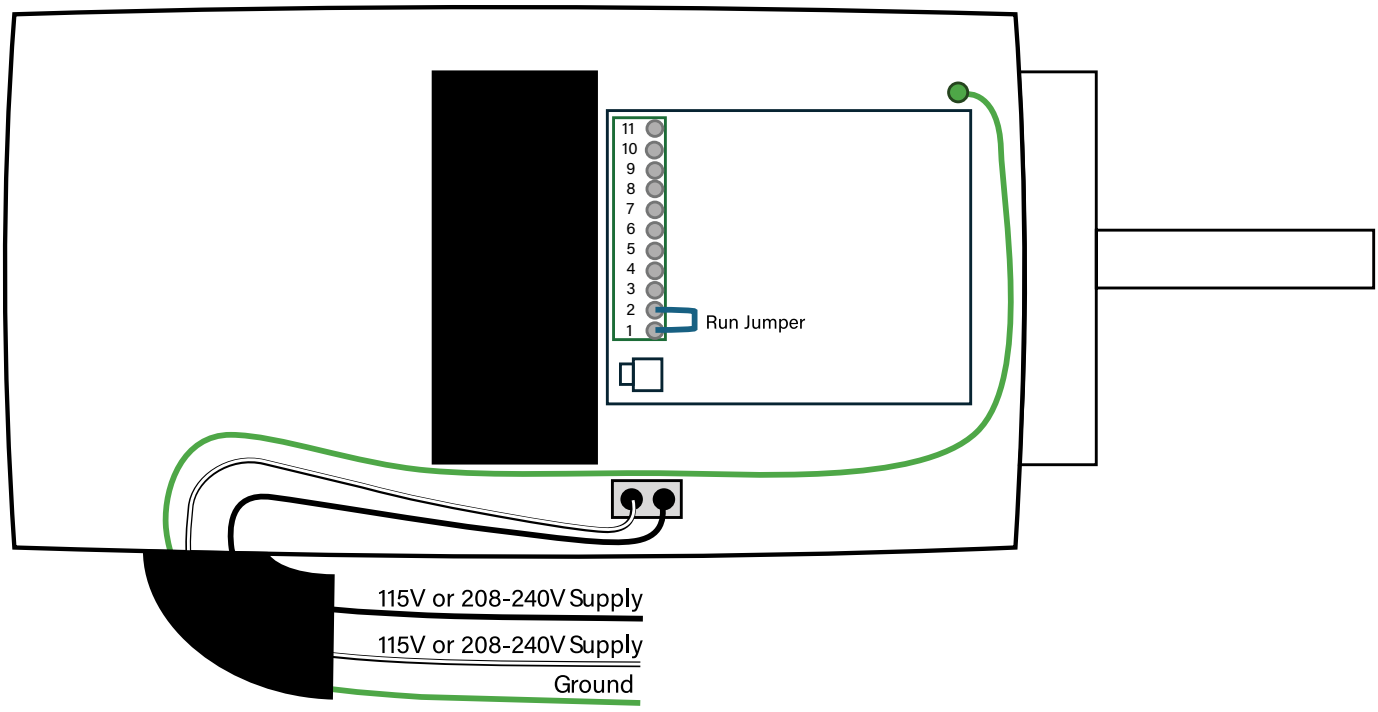


ABB EC Titanium Power and Run Jumper



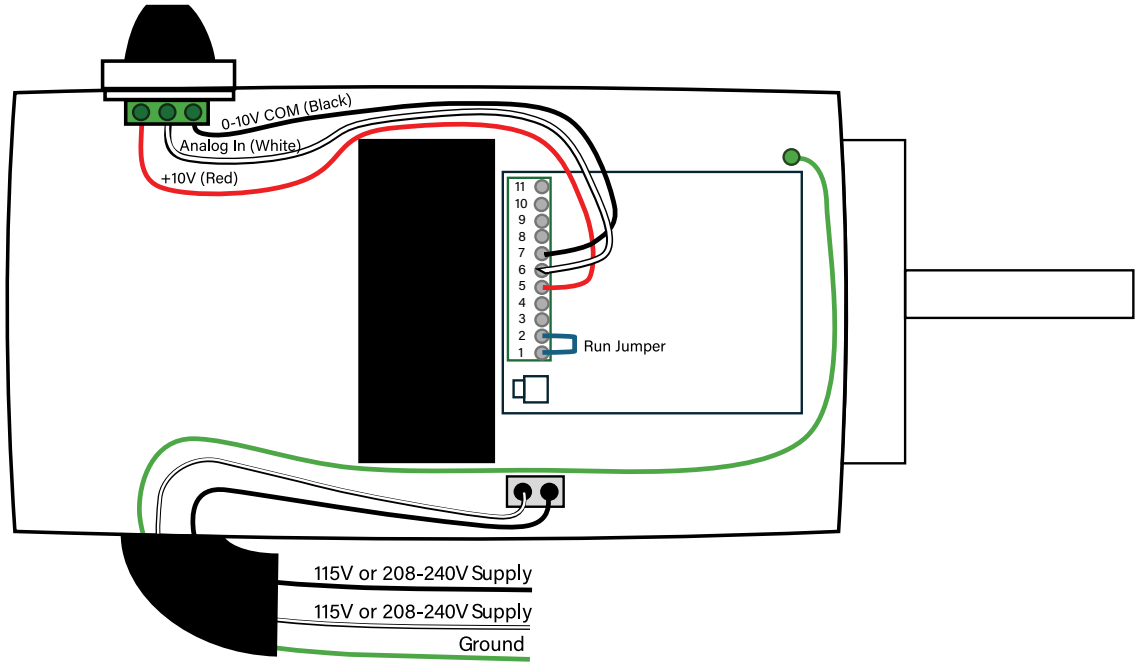
Power Connection and Speed Control (cont.)

Speed Control – ABB EC Titanium

To enable the drive on an ABB EC Titanium motor, connect terminal 1 (+24V) to terminal 2 (Digital Input 1) with a jumper wire, as shown in the images below. This was installed at the factory. To change the direction of rotation, wire an additional jumper from terminal 1 (+24V) to terminal 3 (Digital Input 2).

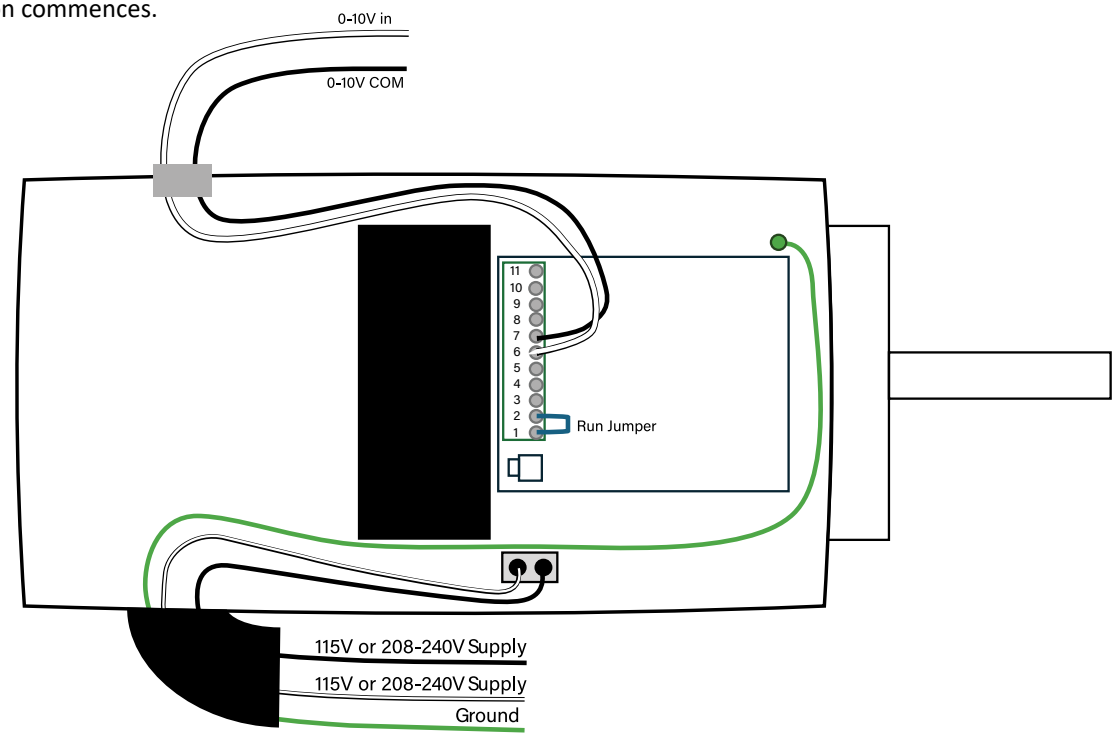
Potentiometer

To control the speed of the ABB EC Titanium motor with a potentiometer, connect the potentiometer leads to terminal 5 (+10V), terminal 6 (Analog Input 1) and terminal 7 (0-10V COM) on the main terminal block, with the center wiper leg on port 6 (Analog Input 1), as shown in the schematic below.



0-10V

To control the speed of the ABB EC Titanium motors utilizing a 0-10V source, connect the positive (0-10V) wire to terminal 6 (Analog Input 1) and the negative lead to terminal 7 (0-10V COM), as shown below. EC motors have varying minimum thresholds for applied DC voltage before rotation commences.



Power Connection and Speed Control (cont.)

Remote Mounted Dial (RMD)

24V AC Transformer (115V shown)

Remote Mounted Dial

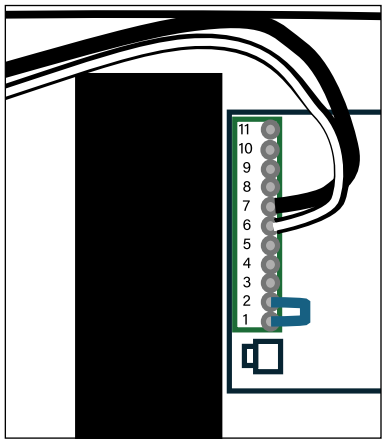
(front)

(back)

Utilizing the remote mounted dial and 24V AC transformer, the ABB EC Titanium motor can be controlled similarly to the 0-10V shown on the previous page. Connect the ground and supply lines as shown in the schematic below.

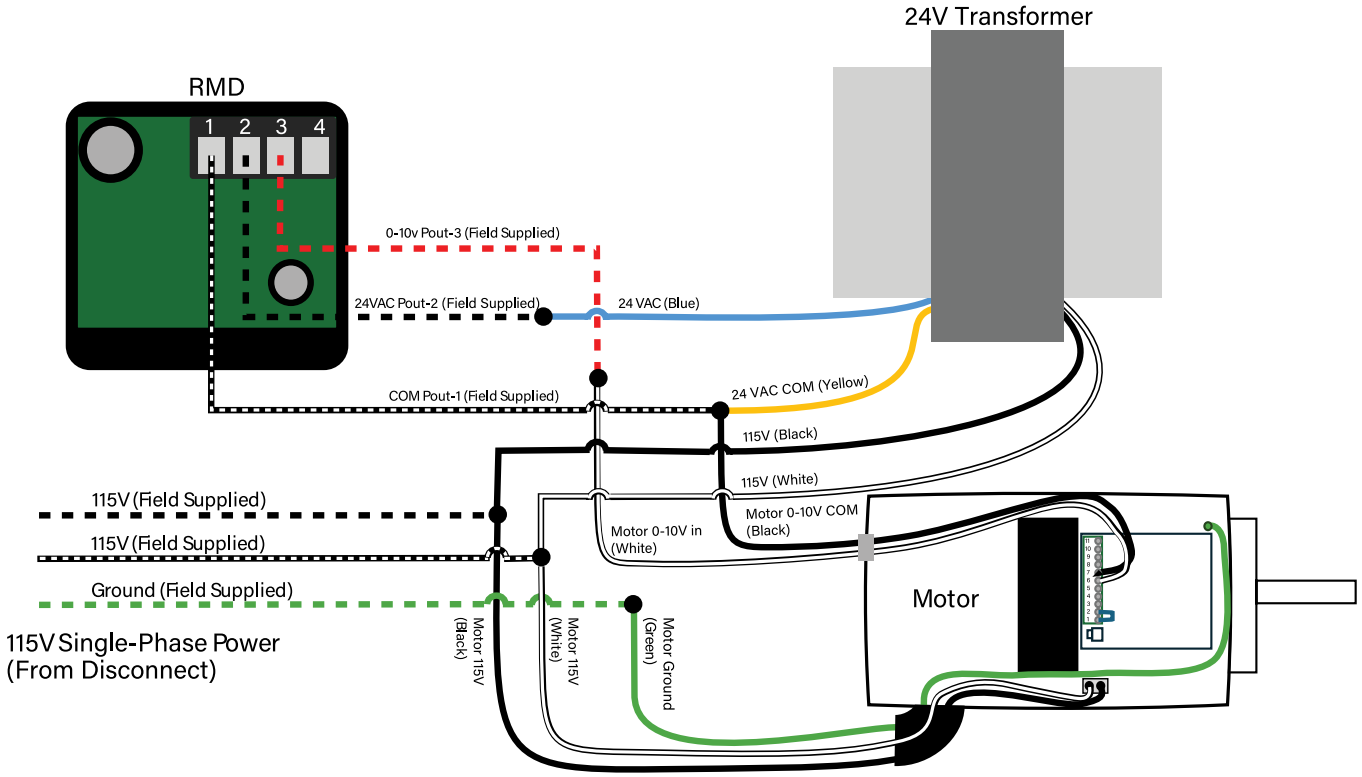
On the low voltage side, connect the terminal 1 lead from the RMD to both the yellow COM lead of the 24V transformer and the 0-10V COM lead of the motor (Motor Port 7). Next, connect the terminal 2 lead from the RMD to the blue 24V AC lead of the 24V transformer. Finally, connect the terminal 3 lead of the RMD to the 0-10V input lead of the motor (Motor Port 6).

See the wiring schematics below for a visual representation of these connections.



Motor Ports Close-Up

ABB EC Titanium 115V RMD Wiring Schematic



Power Connection and Speed Control (cont.)

ABB EC Titanium 208V RMD Wiring Schematic

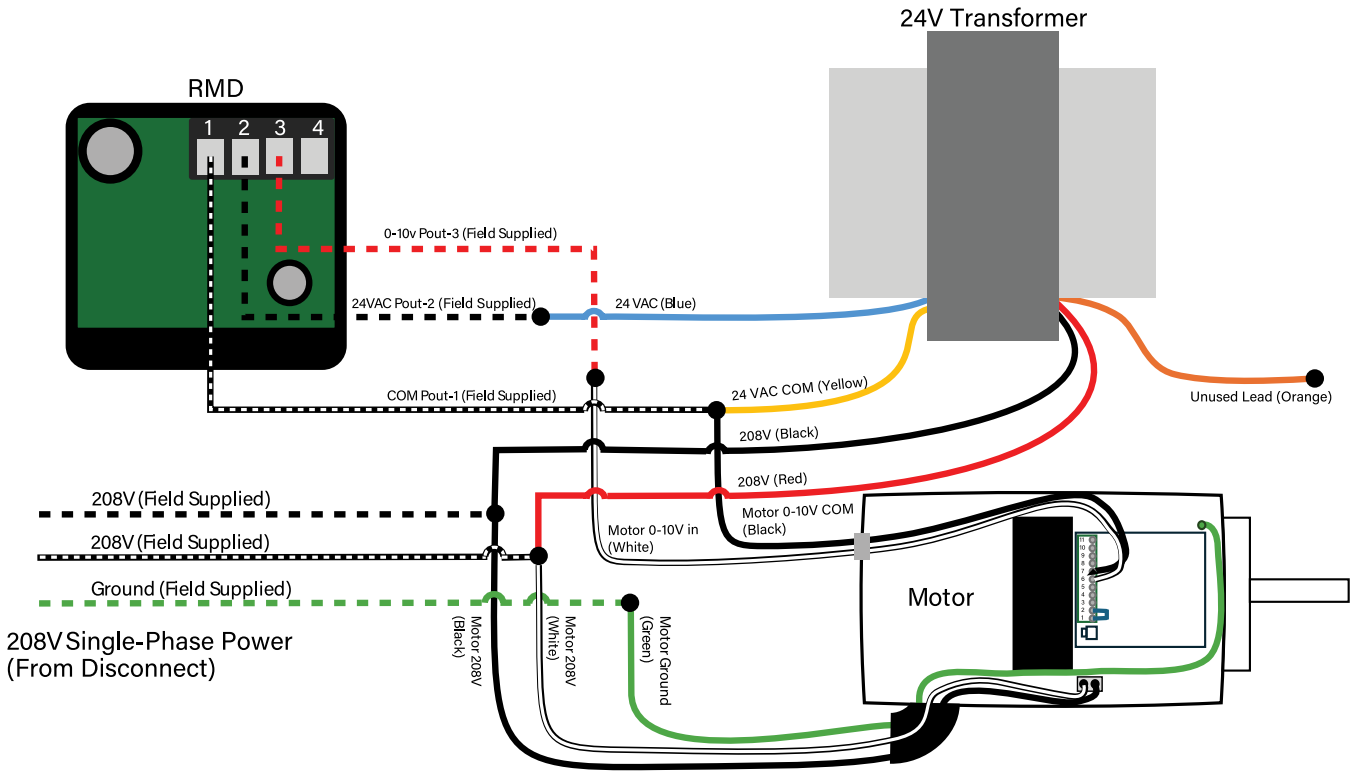
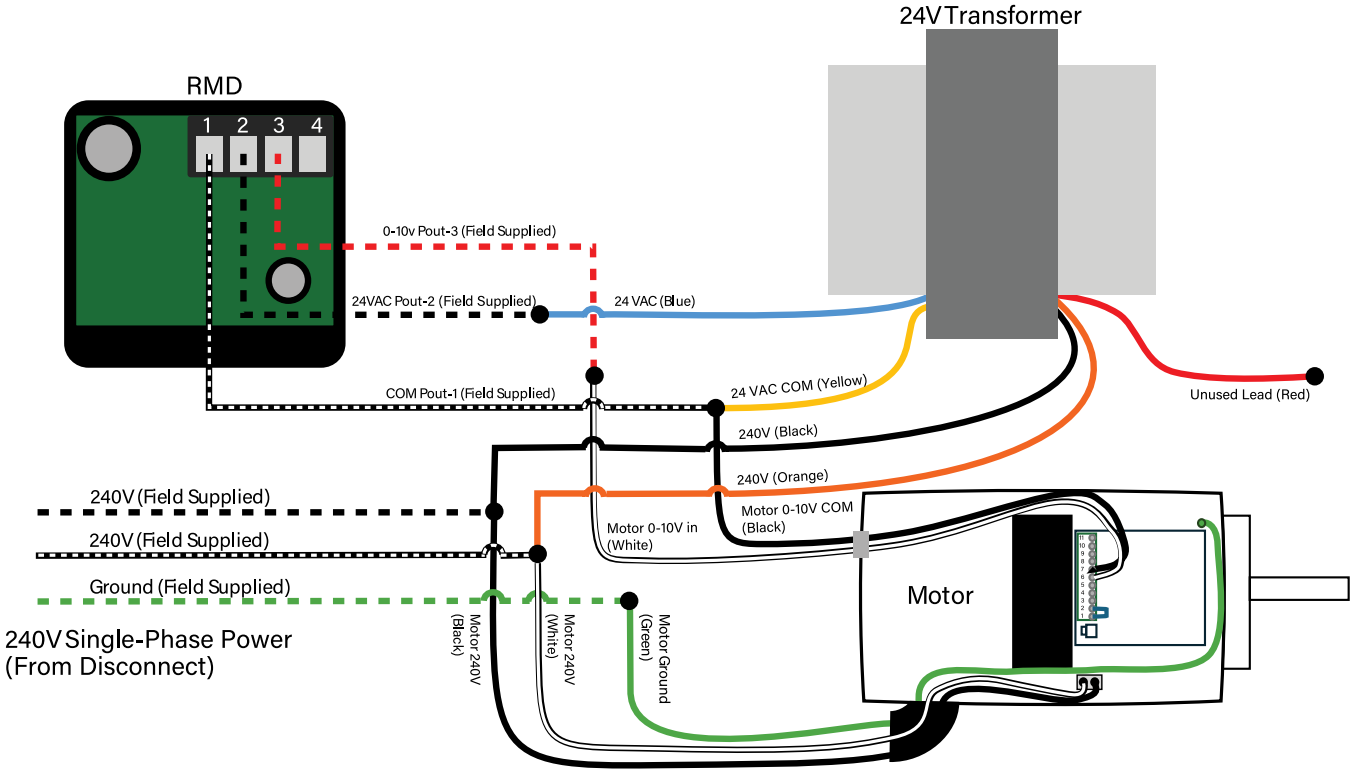


ABB EC Titanium 240V RMD Wiring Schematic



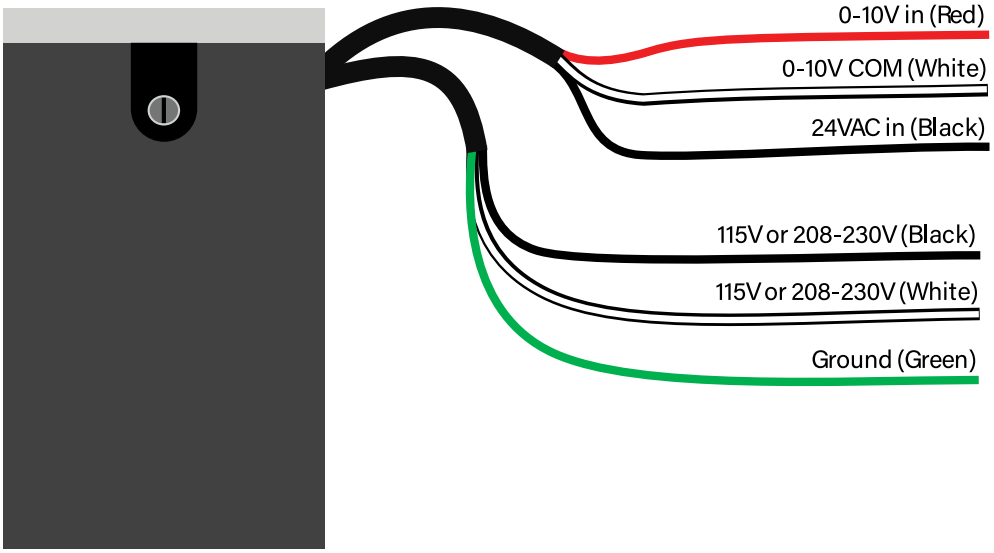
Power Connection and Speed Control (cont.)

For McMillan Motors:

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
1/6	115	ODP	48C	300-1800	67001008-McMillan	McMillan	F2212B4494
1/4	115	ODP	48C	300-1800	67001001-McMillan	McMillan	F2216B4286
	208-230	TENV	48C	300-1800	67002101-McMillan	McMillan	2216A4273
1/2	115	ODP	48C	300-1800	67001003-McMillan	McMillan	F2232B4287
	208-230	ODP	48C	350-1800	67001103-McMillan	McMillan	F2232B4495
3/4	115	ODP	48C	300-1800	67001004-McMillan	McMillan	F2240B4288
	208-230	ODP	48C	350-1800	67001104-McMillan	McMillan	F2240B4496
1	208-230	ODP	48C	350-1800	67001015-McMillan	McMillan	F2256B4497
	115	ODP	48C	300-1800	67001005-McMillan	McMillan	F2256B4289
	115	ODP	48C	350-1150	67001105-McMillan	McMillan	F2280B4385
	208-230	ODP	48C	350-1150	67001115-McMillan	McMillan	F2280B4493

Power Connection – McMillan

Connect the heavier gauge, copper core, green, white and black leads of the motor to the ground, neutral and hot leads of the single-phase power supply, respectively. The two sets of leads (power supply and 0-10V controls) have been sleeved as sets to help distinguish between them.



Speed Control – McMillan

Motor Mounted Dial

A potentiometer is mounted to the motor housing offering full speed control range. Speed adjustment is made with a small flat head screwdriver on the screw head shown in the image to the right. With this option, the motor's 0-10V DC control leads are terminated in a standard 2x4 junction box from the factory and can remain there if not required by the end user.

TCF Twin City Fan

Power Connection and Speed Control (cont.)

Remote Mounted Dial (RMD)

24V AC Transformer (115V shown)

Remote Mounted Dial

(front)

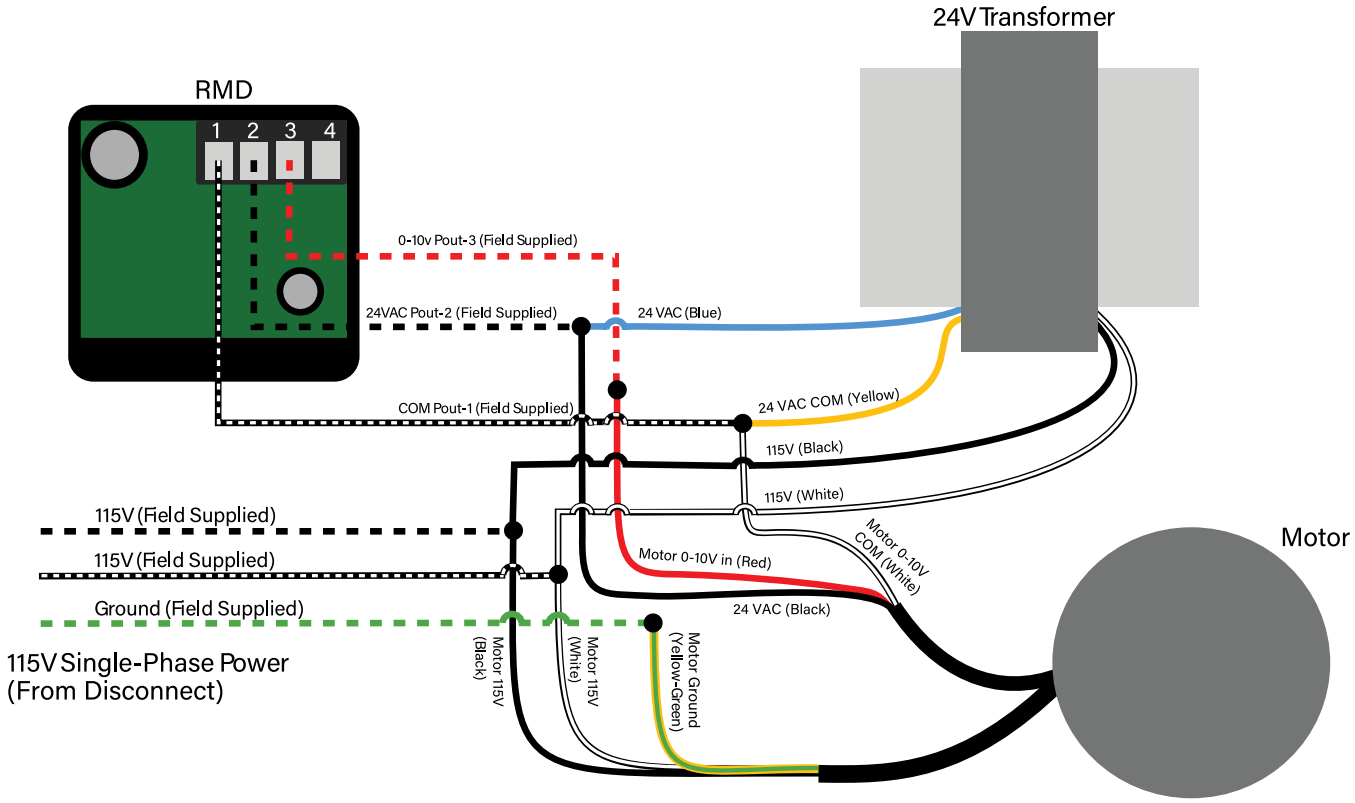
(back)

Utilizing the remote mounted dial and 24V AC transformer, the McMillan EC motor can be controlled with a remote 0-10V signal provided by the RMD. Connect the ground and supply lines as shown in the schematic below.

On the low voltage side, connect the terminal 1 lead from the RMD to both the yellow COM lead of the 24V transformer, and the white 0-10V COM lead of the motor. Next, connect the terminal 2 lead from the RMD to both the blue 24V AC lead of the 24V transformer, and the black 24V AC lead of the motor. Finally, connect the terminal 3 lead of the RMD to the red 0-10V input lead of the motor. Note that the previous instructions can be utilized for both 115V and 208-230V motors, but the 24V AC transformer MUST be properly selected for the input voltage. All other instructions are standardized between the two supply and motor voltages.

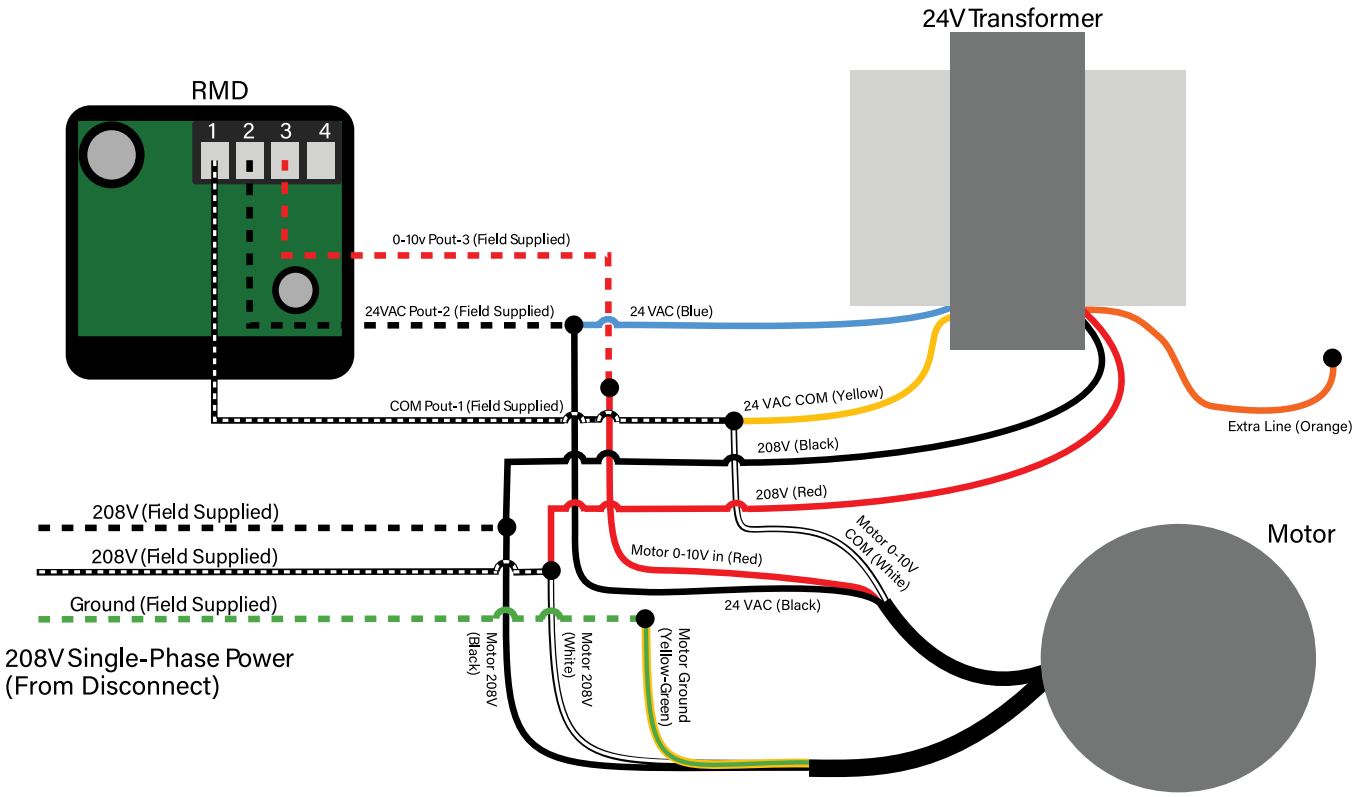
See the wiring schematics below for a visual representation of these connections.

McMillan Motor with RMD and 115V Supply Wiring Schematic

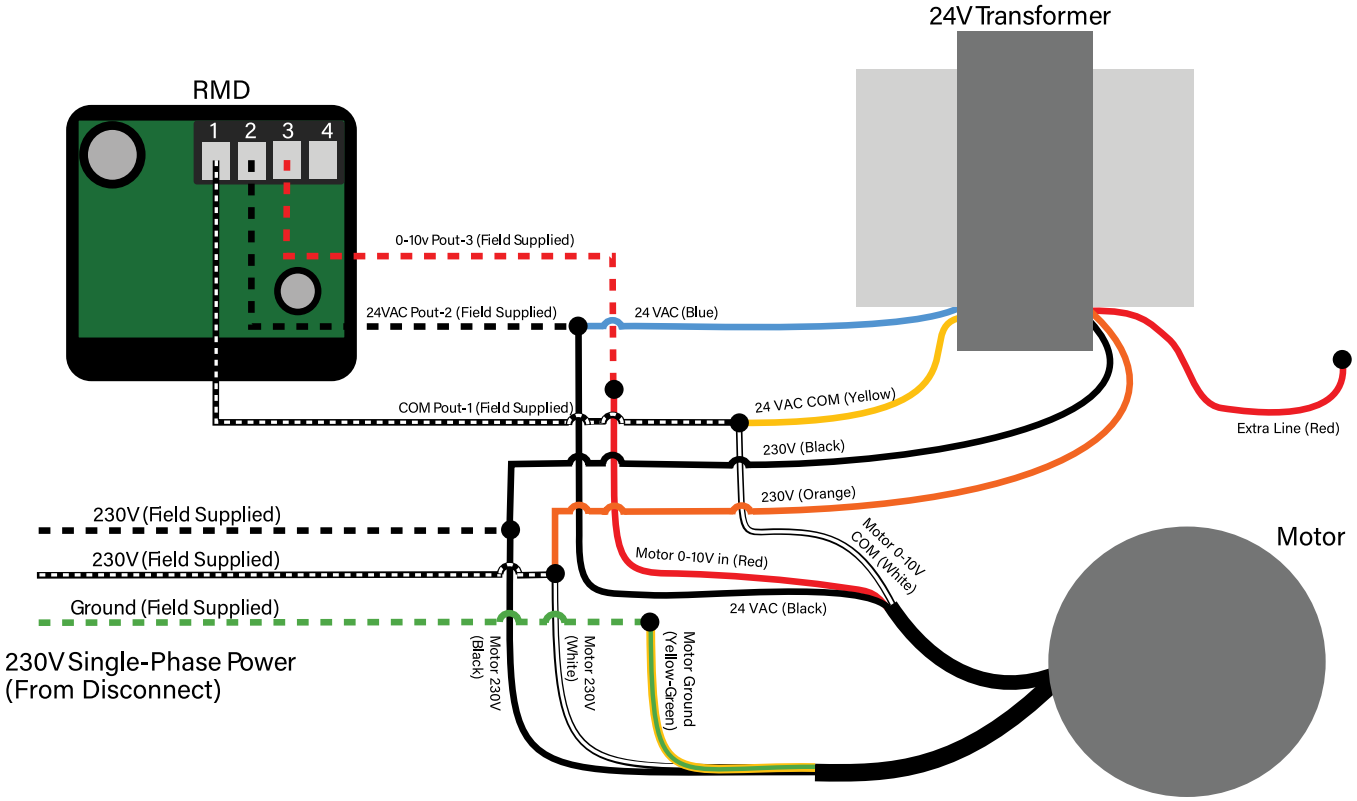


Power Connection and Speed Control (cont.)

McMillan Motor with RMD and 208V Supply Wiring Schematic



McMillan Motor with RMD and 230V Supply Wiring Schematic



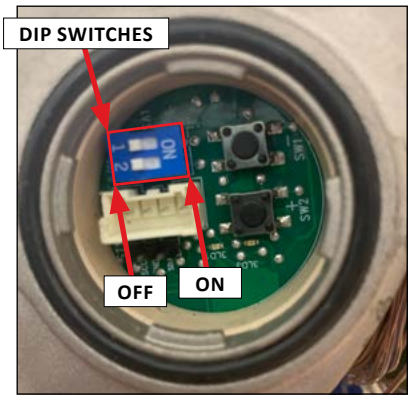
Power Connection and Speed Control (cont.)

For WEG eZA Motors:

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
1	220-277	TEAO	48Z	200-1800	500034745-WEG	WEG	WECM-ST80-65A2
2	208-277	TEAO	48Z	200-1800	500034744-WEG	WEG	WECM-ST80-120A2

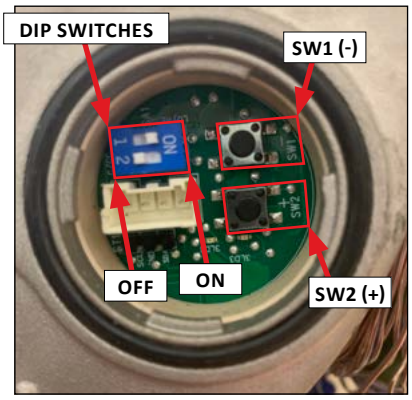
Dip Switch Orientation

Potentiometer, 0-10V DC, RMD



Dip Switch 1 Position: OFF - Remote Operation
Dip Switch 2 Position: ON - CCW Fan Rotation
Dip Switch 2 Position: OFF - CW Fan Rotation
** Fan rotations are as viewed from non-shafted end*

Local Control with Tact Buttons

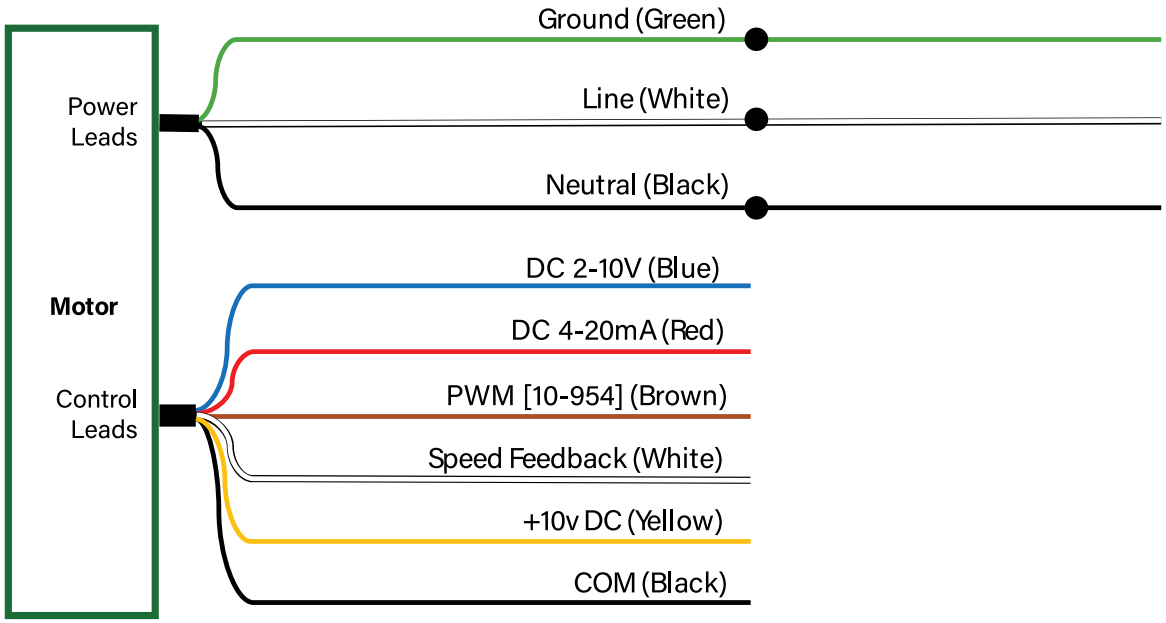


Dip Switch 1 Position: ON - Local Operation
Dip Switch 2 Position: ON - CCW Fan Rotation
Dip Switch 2 Position: OFF - CW Fan Rotation
** Fan rotations are as viewed from non-shafted end*

Power Connection – WEG eZA

To power a WEG eZA motor, connect the supply ground and single-phase power leads to the ground and power leads running out of the motor as shown in the schematic below.

WEG eZA Power

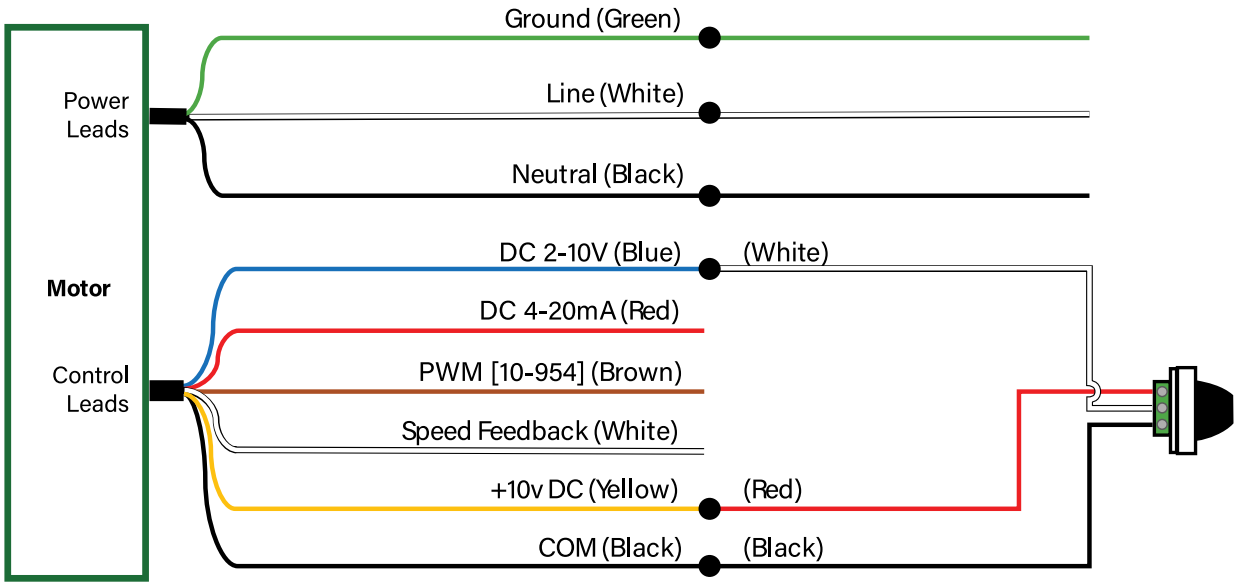


Power Connection and Speed Control (cont.)

Speed Control – WEG eZA

Potentiometer

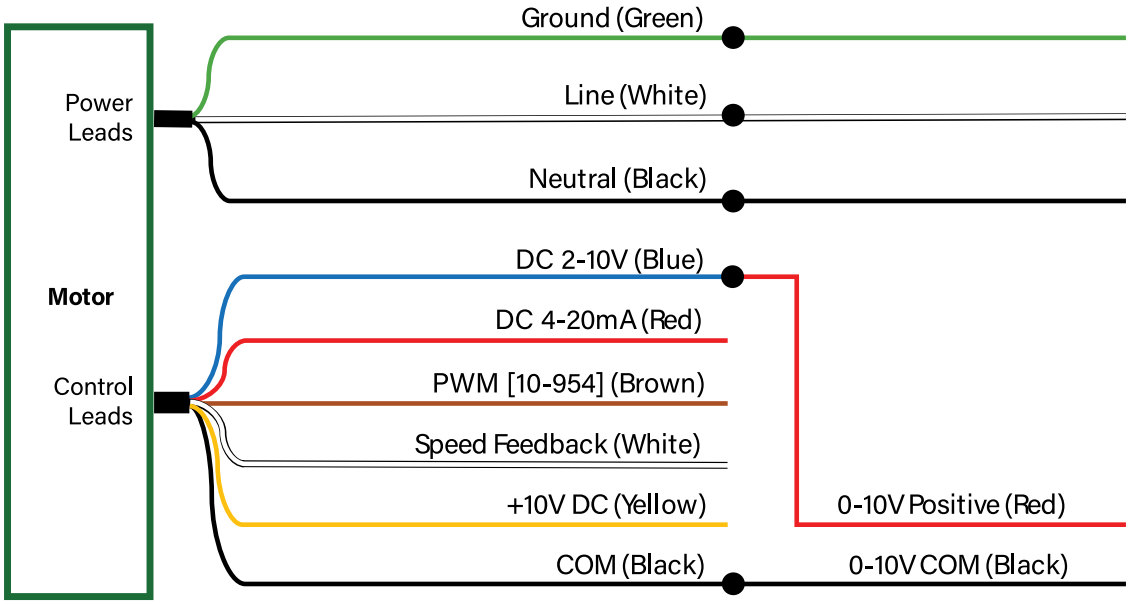
Wire potentiometer to DC voltage (2-10V), 10V DC source and common leads as shown in the wiring diagram below. Cap all unused control leads and note that all leads used will have to be run through a single conduit. Reference dip switch orientations on page 10.



Power Connection and Speed Control (cont.)

0-10V

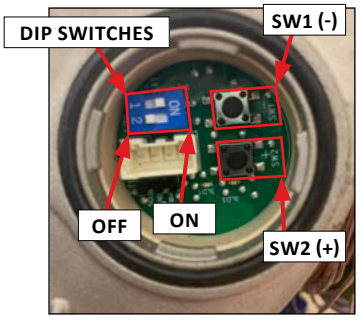
Connect the hot lead of the 0-10V power supply to the DC voltage (2-10V) lead of the motor, similar to the potentiometer shown on the previous page. Connect the neutral/common lead of the power supply to the common lead of the motor control wires, similar to the potentiometer shown on the previous page. Cap all unused motor leads and note that all leads will have to be run through a single conduit. Reference dip switch orientations on page 10. EC motors have varying minimum thresholds for applied DC voltage before rotation commences.



Local Control with Tact Buttons

First, access the non-shaft side of the motor and remove the cap covering the dip switches and the tact buttons. Ensure dip switches are in the correct location. Finally, adjust the motor RPM to the desired speed.

- SW2(+) raises RPM by 15-20 RPM each click
- SW1(-) lowers RPM by 15-20 RPM each click



Remote Mounted Dial (RMD)

24V AC Transformer (115V shown)

Remote Mounted Dial

(front)

(back)

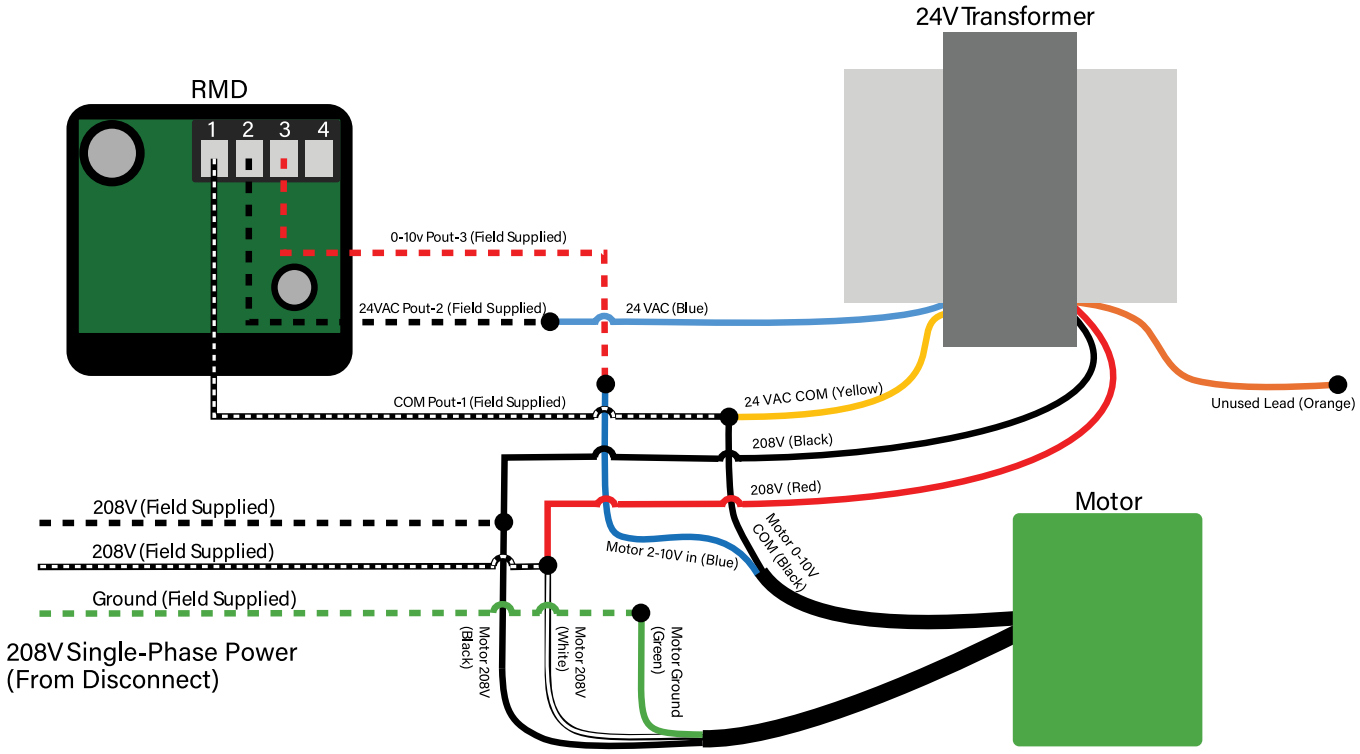
Utilizing the remote mounted dial and 24V AC transformer, the WEG eZA motor can be controlled similarly to the 0-10V shown above. Connect the ground and supply lines as shown in the schematic on the following page.

On the low voltage side, connect the terminal 1 lead from the RMD to both the yellow COM lead of the 24V transformer and the black 0-10V COM lead of the motor. Next, connect the terminal 2 lead from the RMD to the blue 24V AC lead of the 24V transformer. Finally, connect the terminal 3 lead of the RMD to the blue 2-10V input lead of the motor.

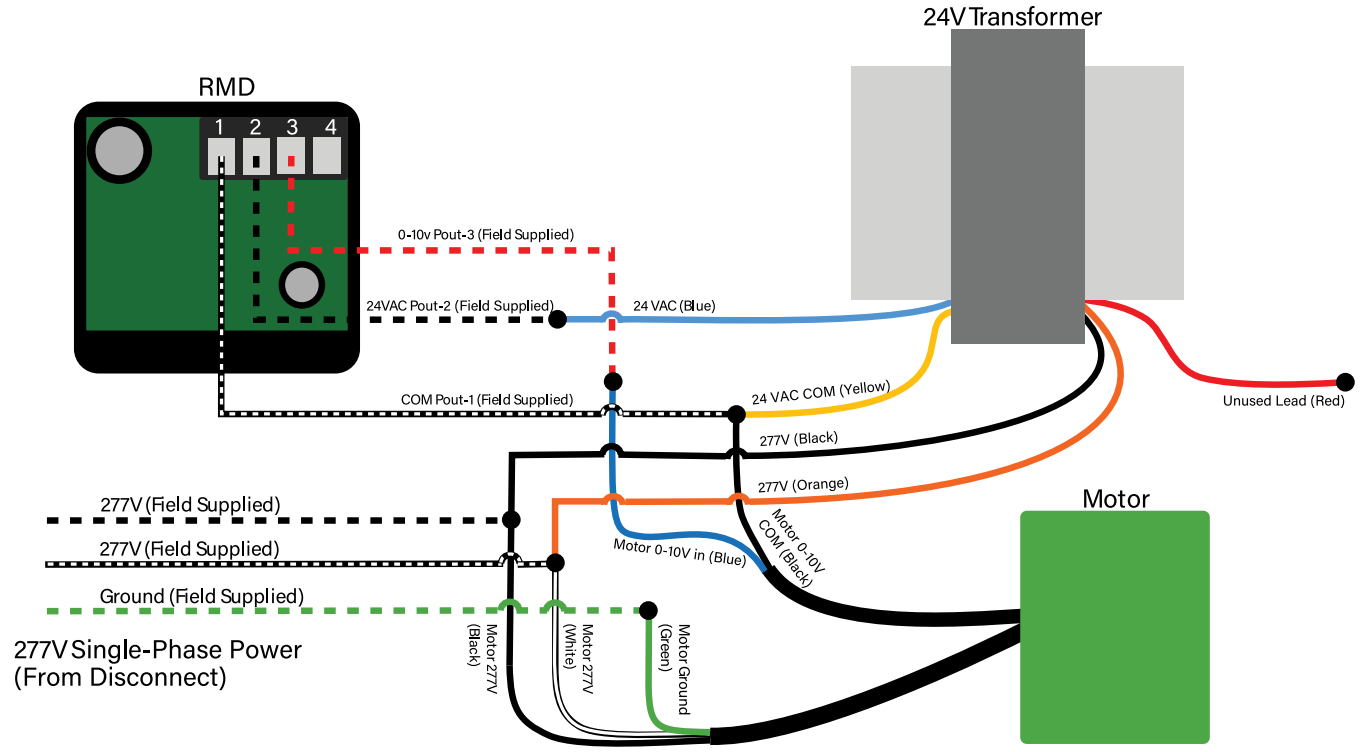
See the wiring schematics on the following pages for a visual representation of these connections. Reference dip switch orientations on page 10.

Power Connection and Speed Control (cont.)

WEG eZA with RMD and 208V Supply Wiring Schematic



WEG eZA with RMD and 277V Supply Wiring Schematic



Power Connection and Speed Control (cont.)

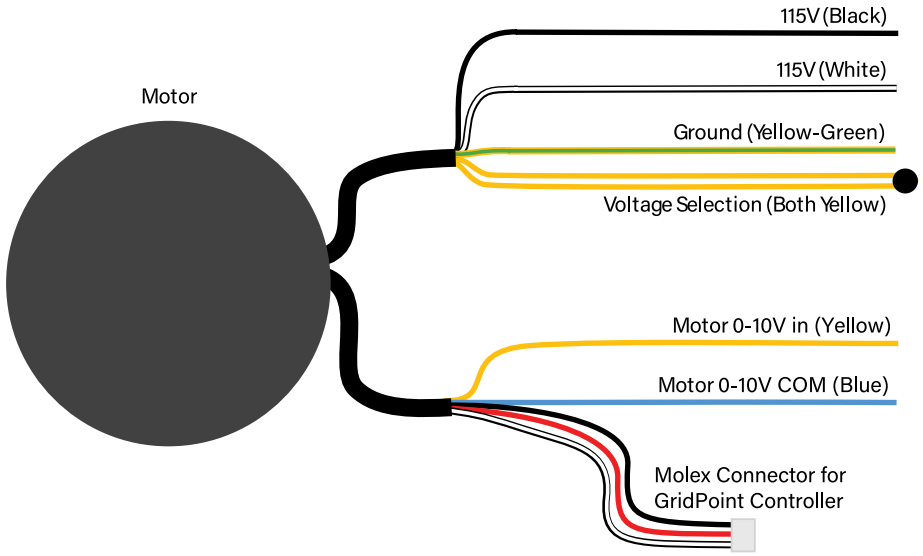
For Wolong GridSmart Motors:

HP	Voltage	Encl.	Frame	RPM	TCF PN	Manufacturer	Manufacturer PN
1/8	115/230	ODP	48CZ	200-1800	500027447-Wolong	Wolong	EM4810D142A6
1/6	115/230	ODP	48CZ	200-1800	500027446-Wolong	Wolong	EM4810D142A5
1/4	115/230	ODP	48C	200-1800	67001701-Wolong	Wolong	EM4810B142A4
1/2	115/230	ODP	48C	200-1800	67001703-Wolong	Wolong	EM4810D122A0
3/4	115/230	ODP	48C	200-1800	67001704-Wolong	Wolong	EM4810C341A0
1	115/230	ODP	48C	200-1800	67001705-Wolong	Wolong	EM4810C111A2

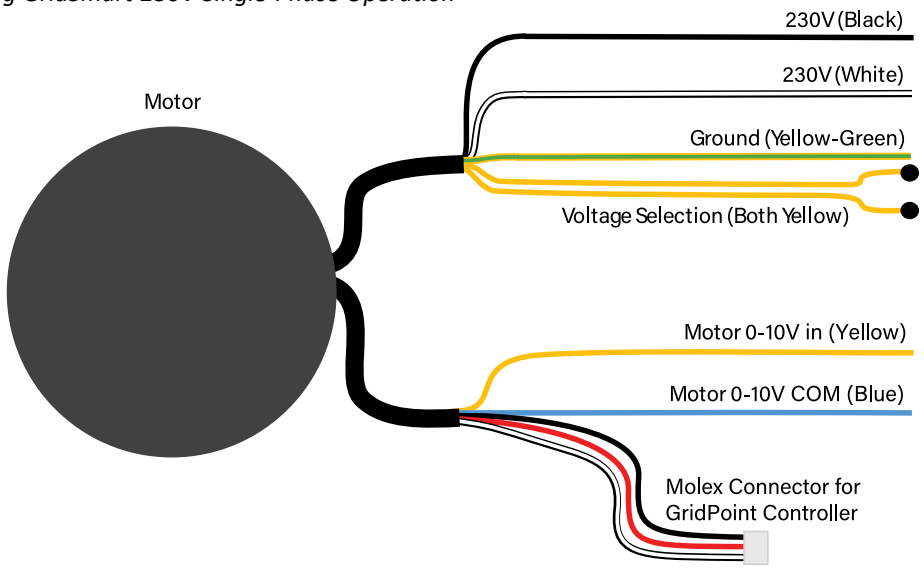
Power Connection – Wolong GridSmart

To power a Wolong GridSmart motor, connect the supply ground and single-phase power leads to the ground and power leads running out of the motor as shown in the schematic below. Note that for 115V operation, the two yellow wires in the power lead bundle must be connected, while the two yellow wires must be disconnected for 230V operation.

Wolong GridSmart 115V Single-Phase Operation



Wolong GridSmart 230V Single-Phase Operation



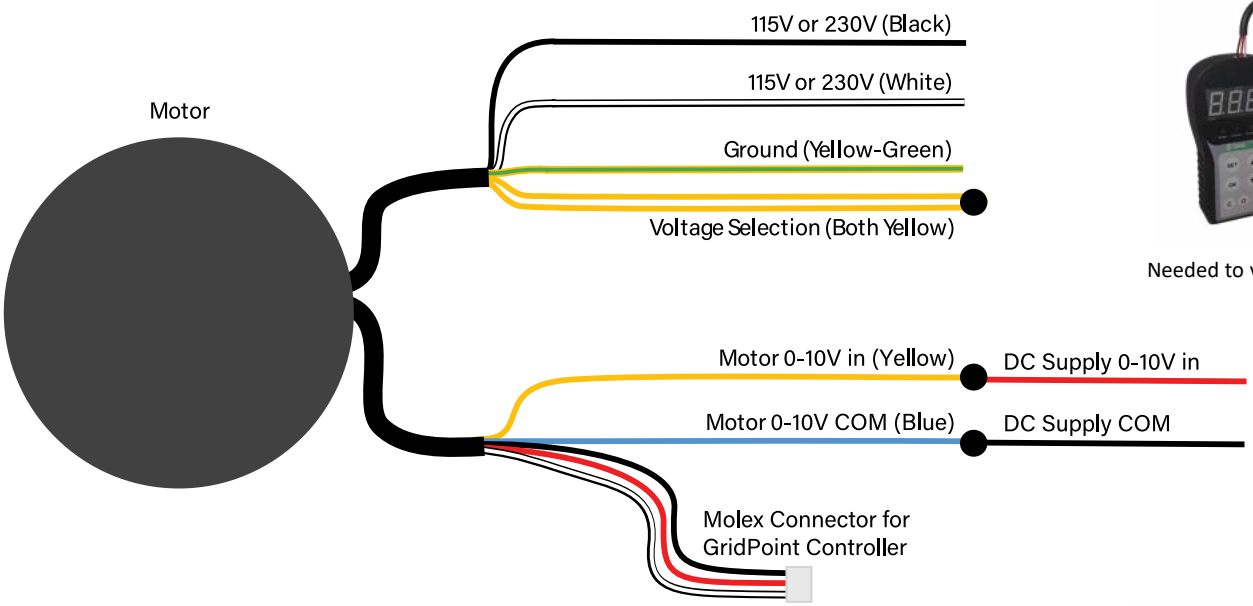
Power Connection and Speed Control (cont.)

Speed Control – Wolong GridSmart

0-10V

To control the speed of a Wolong GridSmart motor with a 0-10V input, first connect the power leads as shown. Next, plug in GridPoint Controller, turn on and ensure parameter P008 is set to 1. Next, connect the yellow 0-10V input lead from the motor's low voltage wire bundle to the positive 0-10V lead of the power supply. Finally, connect the blue 0-10V COM wire to the negative wire of the 0-10V power supply. The motor's speed can now be adjusted by varying the 0-10V input voltage. EC motors have varying minimum thresholds for applied DC voltage before rotation commences.

The wiring schematics below provide a visual representation of the instructions above.



Needed to verify P008.

GridPoint Controller

The motor will be factory set and labeled at the RPM specified by the customer. A 36" long control lead with a three-pin connector is prewired from the motor. The three-pin connector attaches to the GridPoint Controller, a handheld device that can set the motor to a specific RPM.

Note: More than one fan can be controlled (not simultaneously) by a single GridPoint Controller.

Instructions

1. Fan must be running when the controller is used.
2. Turn the controller on and plug it into the motor. It will automatically connect.
3. The display will show the current speed. Power, Connect and Direction LEDs will be on.
4. If the Up arrow is pressed, the display will show E000 (no error), max speed, constant speed, d000 (direction) and C000 (motor operation mode 0).
5. To set the maximum speed:
   a. Press 'SET' for 2s.
   b. Press the Up or Down arrow to display P000.
   c. Press 'OK'. This will display the current maximum speed.
   d. Press the Up or Down arrow to change the digit. To move to the next digit, press and hold the Up arrow until the next digit flashes. Keep changing values until the desired speed is reached.
   e. Press 'OK' to save the value. Press 'OK' again to go back to the first display.
   f. Press 'O' for 2s to send the command to the motor.
6. To set the speed for Constant speed operation:
   a. Press 'SET' for 2s.
   b. Press Up or Down arrow to select P001.
   c. Press 'OK'. The default value is '0'. Change to desired speed by following steps 5d and 5e.
   d. Press 'M' for 2s to send the command to the motor.
7. To set motor operation mode (0-10V or constant speed):
   a. Press 'SET' for 2s.
   b. Press the Up or Down arrow to display P008.
   c. Press 'OK'.
   d. Arrow Up or Down to select desired mode. (0 for constant speed mode or 1 for 0-10v mode)
   e. Press 'OK' to save the value.
   f. Press 'M' for 2s to send the command to the motor.
8. Once programming is complete, move to the next fan or store the GridPoint Controller in a safe location for future adjustments.

Power Connection and Speed Control (cont.)

Remote Mounted Dial (RMD)

24V AC Transformer (115V shown)

Remote Mounted Dial

(front)

(back)

GridPoint Controller

Utilizing a remote mounted dial (RMD), 24V AC transformer and GridPoint Controller, the Wolong GridSmart motor can be controlled similarly to the 0-10V shown on the previous page. Connect the ground and supply lines as shown in the schematic below.

On the low voltage side, connect the terminal 1 lead from the RMD to both the yellow COM lead of the 24V transformer and the black 0-10V COM lead of the motor. Next, connect the terminal 2 lead from the RMD to the blue 24V AC lead of the 24V transformer. Finally, connect the terminal 3 lead of the RMD to the blue 0-10V input lead of the motor.

If 115V input power is being supplied to the motor, ensure that the two yellow wires are connected, as shown in the first schematic below. If 230V input power is being supplied to the motor, ensure that the two yellow wires stemming from the motor are disconnected and capped off, as shown in the second schematic below.

Turn on the GridPoint Controller and plug it into the white Molex Connector at the end of the red, black and white wires stemming from the motor's 0-10V DC lead.

Supply power to the motor. The "PWR", "CON" and "DIR" lights on the GridPoint Controller should illuminate. If any of the three fail to illuminate, check wire connections. Utilizing the GridPoint Controller, set the motor max operating speed as shown in the section on the previous page. Note that the RMD will only adjust the motor's speed up to the operating speed set using the GridPoint Controller.

Disconnect the GridPoint Controller and adjust the RMD to adjust the motor speed. Note that there is a small switch on the back of the RMD. This switch allows for selection between 0-10V and 2-10V operation. If the ability to turn off the motor with the RMD is required, set this switch to 0-10V. If the RMD will only be used to adjust speed with a separate power disconnect, set this switch to 2-10V.

See the wiring schematics on the following page for a visual representation of these connections.

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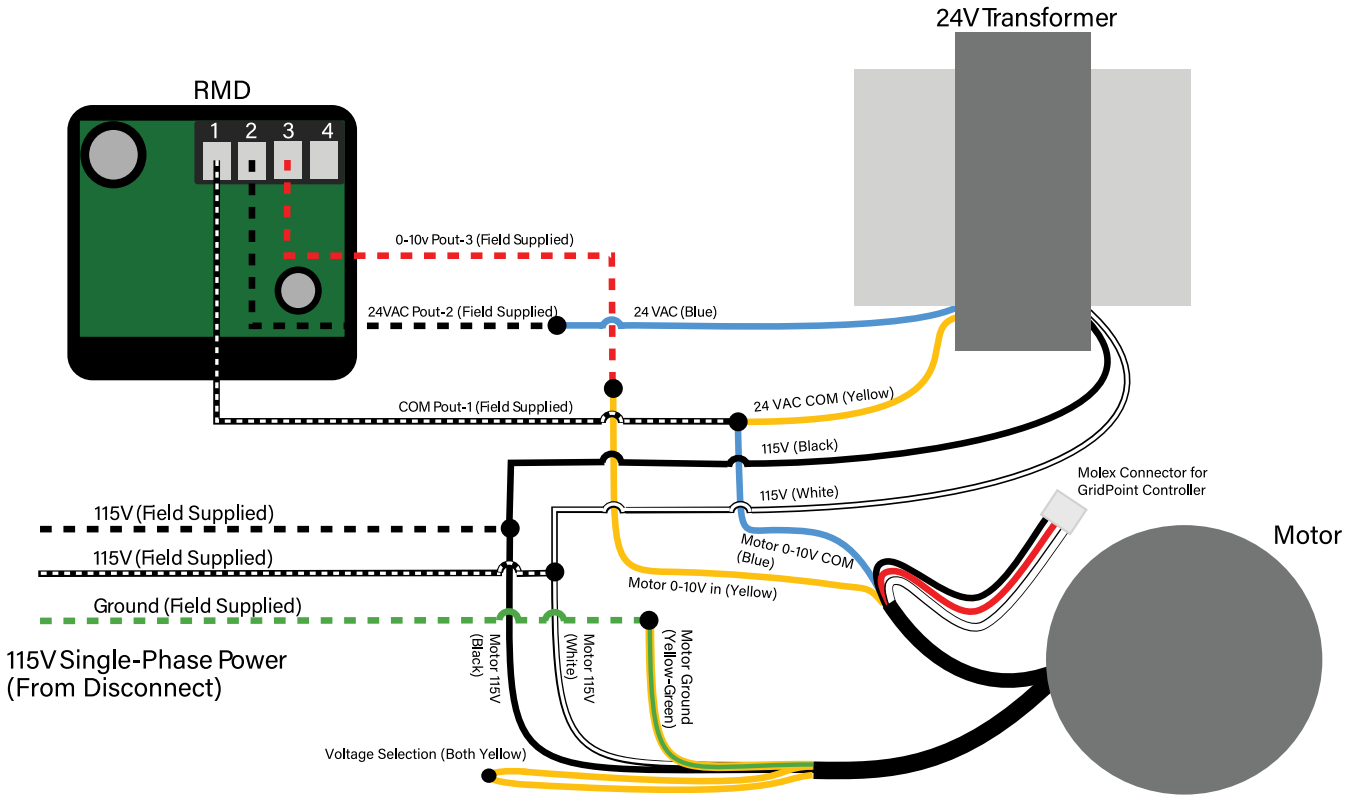
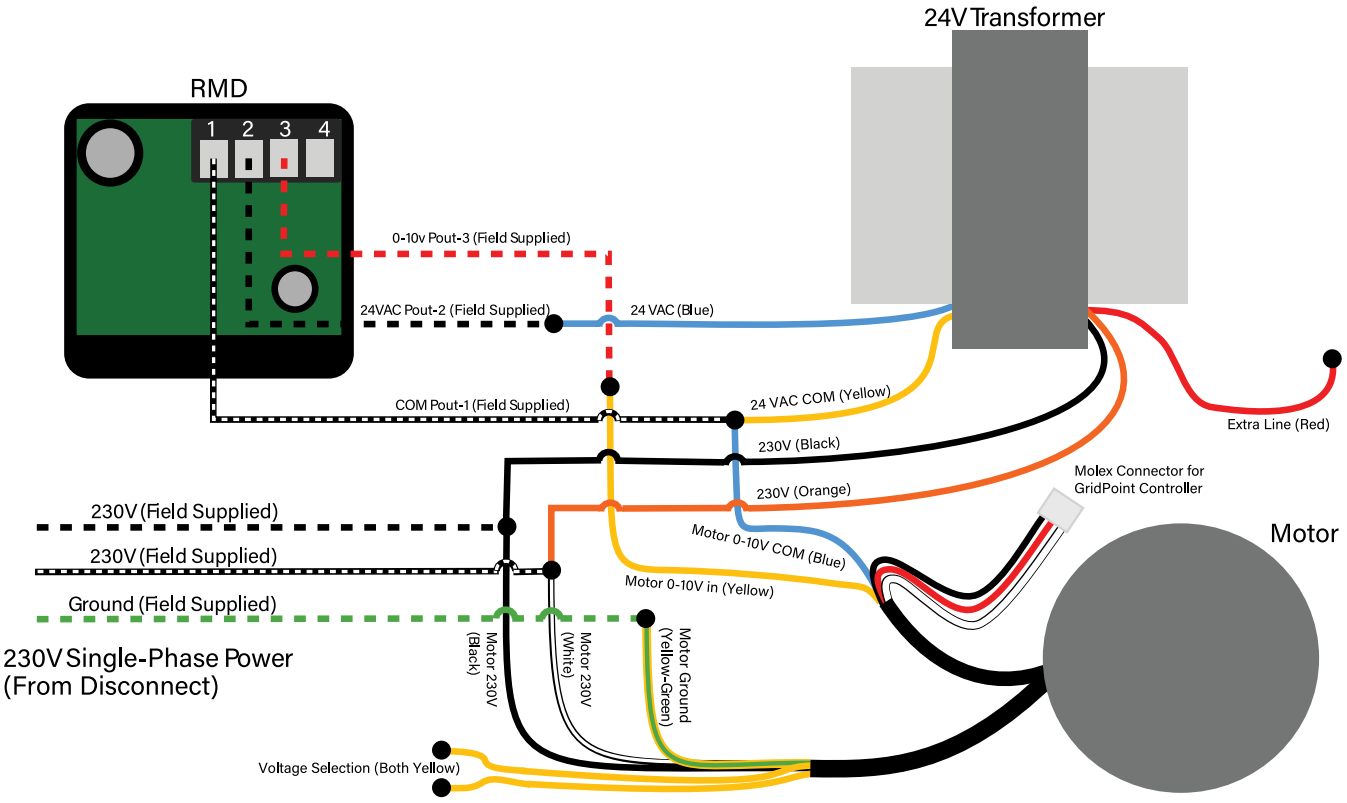
Power Connection and Speed Control (cont.)

Wolong GridSmart Motor with RMD and 115V Supply Wiring Schematic



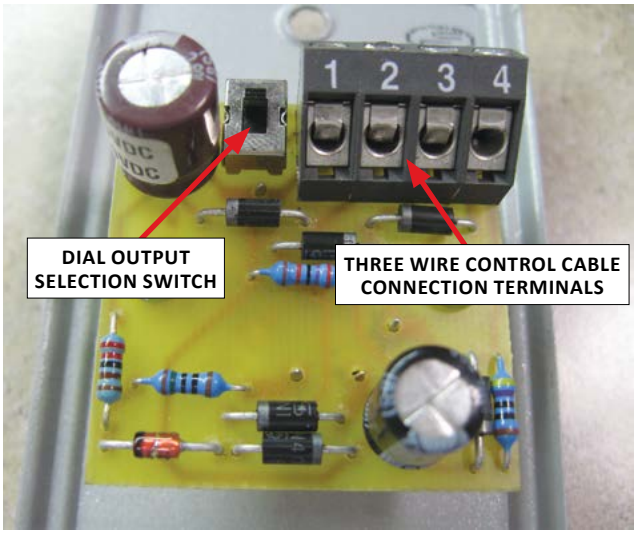
Wolong GridSmart Motor with RMD and 230V Supply Wiring Schematic



Speed Control Options: ODP & TENV Discontinued Motors

Remote Mounted Dial, RMD (Optional Feature) – A wall mounted dial allows the fan to be controlled from within the building by sending the motor a 0-10V DC option. This option includes a 115V or 230V (depending upon the motor voltage selected) to 24V AC transformer mounted in the NEMA electrical enclosure. On models VC, VCU, DCRD, DCLH/P and DCV the junction box for the transformer will be located within the fan motor enclosure/weather cover. On models DSI and TCPE, the junction box for the transformer will be located on the exterior of the fan.

With this option a three-wire control cable must be field supplied and wired from the 24V AC transformer box to the remote location of the controller. In addition, a standard 2x4 single gang electrical junction box (by others) is required to mount the controller. The maximum distance from the remote mounted controller to the motor is 100 feet. Distances greater than this could cause a loss of the signal to the motor and result in unstable motor performance.



CAUTION

Always disconnect power before inspection or maintenance. Although motor may be off and not running when a 0-1.9V DC signal is present, high voltage will still be present at the motor.

Note: This section refers to motors 67001001, 67001003, 67001004, 67001005, 67001008, 67001015, 67001103, 67001104, 67001105, 6700115, 67001701, 67001703, 67001704, 67001705, 67001715, 67002101, 67002107, 67002205, 500027446, 500027447.

TCF Twin City Fan

On the back of the remote mounted dial there is a small switch that will allow the user to change the output of the remote mounted dial. The settings of the switch are 0-10V or 2-10V. A label on the rear of the controller's printed circuit board describes the settings. The motor will run regardless of which setting the dial is at, but because the motor operates off of a 2-10V DC signal, it will be off when a 0-1.9V DC signal is present. If the user requires the remote mounted dial to turn off the motor, the dial should be set at 0-10V DC.

The field supplied three-wire control cable connections from the transformer box to the remote mounted dial must be made as shown in table to the right.

Connection in Transformer Box	Description	Terminal on Back of Dial
Yellow/White	Common	1
Blue/Black	24V AC	2
Red	0-10V DC	3

The user should verify that the dial is properly working by adjusting the dial and checking that the motor speed changes accordingly. The voltage at the dial should also be verified. 24V AC should be present across terminal 1 and 2. Terminals 1 and 3 should have a DC voltage in the range of 0-10V DC, which should vary as the dial is adjusted.

Note that the motor mounted dial acts as a speed reference for this option. In order to have the full speed control range available for a given fan/motor combination, the motor mounted dial must be turned all the way in the CW direction or to the maximum RPM available.

TCF Twin City Fan

Speed Control Options: TEFC Discontinued Motors

This section covers the motors listed in the chart below.

HP	Voltage/Phase	Encl.	RPM Range	Control Method	Motor PN
1	115/208-230/1	TEFC	200-1800	MMD/0-10V	67002205
2	208-230/1	TEFC	200-1800	MMD/0-10V	67002107

Installation

1. Connect the motor to AC power and ground the external speed control. Follow Figures 1 and 2 below for appropriate voltage. Use appropriate strain relief (not provided) and branch protection.

⚠ CAUTION

Do not remove conduit box cover for at least five (5) minutes after AC power is disconnected to allow capacitors to discharge. Dangerous voltages are present inside the equipment even when the motor is not rotating. Electrical shock can cause serious or fatal injury.

AC power

Connect it to the motor control as follows:

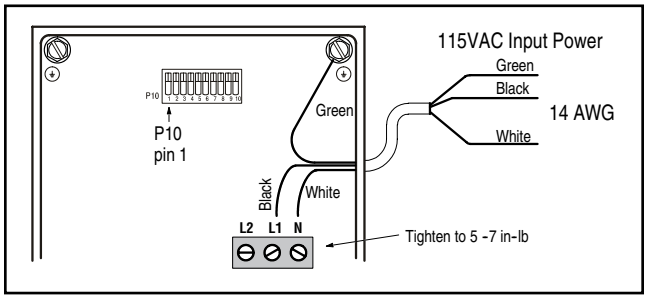
a. Connect 115V AC (Black) to L1.
b. Connect Neutral (White) to N.
c. Connect Ground to ⏚

Use only Copper Wire for all wiring, minimum 75°C.

⚠ CAUTION

Connection of 115V AC power to "N" will damage the unit.

Figure 1. 115V AC Power Connection to Motor Speed Controller



AC power

Connect it to the motor control as follows:

a. Connect 230V (White) to L1.
b. Connect 230V (Black) to L2.
c. Connect Ground to ⏚

Use only Copper Wire for all wiring, minimum 75°C.

⚠ CAUTION

Connection of 230V AC power to "N" will damage the unit.

Figure 2. 230V AC Power Connection to Motor Speed Controller

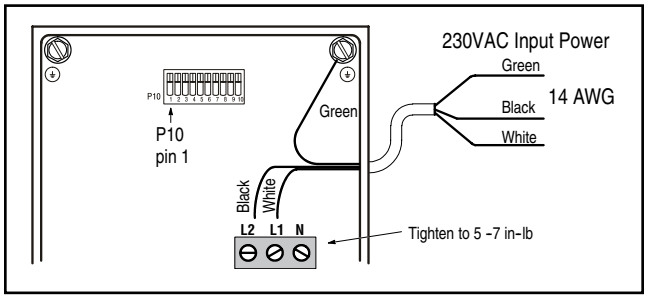


Table 1. Single-Phase Power Requirements

Nominal AC Voltage	Minimum AC Volts	Maximum AC Volts	HP	Input Arms	Output Arms
115	103	126	1.0	12.0	2.83
			1.0	6.0	2.83
230	200	264	2.0	12.0	5.29

Note: Internally, the speed controller provides 240V AC three-phase at 8 kHz switching frequency to the motor.

Table 2. Branch Protection

Motor Assembly	Fuses				Maximum UL Listed Circuit Breaker
	Fast-Acting		Time-Delay		
	Class	Max Rating	Class	Max Rating	
All (1 HP-2 HP)	RK1	20A	RK5	20A	20A

Note: A different fuse Class may be used as an alternative to the Class shown, provided it is of the same or lesser rating and has equivalent (or better) clearing time and peak let-through characteristics (i.e. Class H, K1, J, T, etc.)

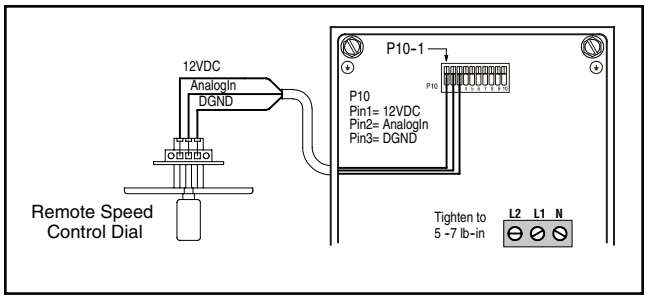
Speed Control Options: TEFC Discontinued Motors (cont.)

2. Connect the motor to the appropriate speed control option. The motor can accommodate 1 of 2 methods for speed control. The first method is a potentiometer (also known as a remote speed control or motor mounted dial). This is an analog dial that controls the speed of the motor by sending a variable 0-10V DC signal to the motor. CW rotation of the potentiometer increases the speed and CCW rotation decreases the speed (all the way CCW turns the motor off). Note that the motor will run between 2-10V and will shut off from 0-1.9V. See Figure 3 below for details on wiring a potentiometer if required.

   Connect the speed control potentiometer to the motor control as follows:
   a. Connect one end of potentiometer to P10-1 (12V DC).
   b. Connect center (wiper) of potentiometer to P10-2 (Analog Input)
   c. Connect other end of potentiometer to P10-3 (DGND)

   Use only copper wire for all wiring.

Figure 3. Motor Speed Controlled by a Remote Speed Control Dial (Potentiometer)

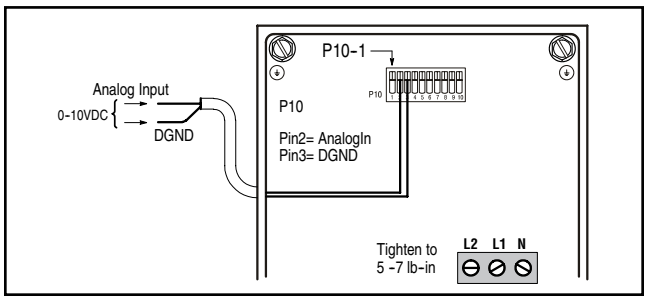


   The second speed control method is to send the motor a 0-10V DC control signal. From the factory, a two-wire harness is provided for field connections. Note that the motor does not require a 24V power source to operate in this mode. See Figure 4.

   Connect the control signal harness to the motor control as follows:
   a. Connect a positive voltage source to pin P10-2 (Analog Input)
   b. Connect source common to P10-3 (DGND)

   Use only copper wire for all wiring.

Figure 4. Motor Speed Controlled by 0-10V DC Control Signal



Description	Wire Color
0-10V DC (Analog Input)	Red
Ground (DGND)	White

It is the responsibility of the installer/controls engineer to ensure that any field supplied controls are compatible and functional with this motor technology. TCF is not responsible for field supplied or customer designed fan or motor controls.

3. Verify rotation of motor is correct by energizing the motor and checking that the rotation matches the fan rotation label. This can also be done before any speed controls are wired in by placing a jumper wire between terminals Pin 1 and Pin 2. This will send 10 volts into the motor and cause it to run at full speed. To change the rotation of the motor, swap the T1 (Black) and T2 (Blue) leads (as shown on the right). Note that the motor and fan warranty are void if the motor is rotating in the incorrect direction. Also verify that the motor speed control is functioning properly.

Maintenance

These motors use brushless technology with sealed bearings so no maintenance is required other than keeping the motors dry and free of dirt, dust and debris. Always keep records of the maintenance that is performed.

Troubleshooting

Remote dial does not vary the motor speed (all motor types, except OP)

- Verify that correct connections are made.
- Make sure that the connections are solid.
- Check control input voltage at connection (inside transformer box).
- Make sure that the dial on the motor is opened CW.

Speed control does not vary the motor speed

- Check voltage to ensure the motor is receiving the correct input voltage.
- Check voltage at the remote dial. 12V AC should be present across the 12V and COM terminals and 0-10V DC should be present between the 0-10V and COM terminals.
- Verify that the potentiometer or 0-10V DC lead is properly wired to the control board according to the diagram.
- Verify that all of the connections inside of the fan and motor are secure. If using a Wolong GridSmart motor, verify parameter P008 is set to 1.

GridPoint Controller does not connect to motor

- Check that cable connections are secure between the motor and the GridPoint Controller.

Motor does not operate (TEFC motors: 67002107, 67002205)

- Check that the motor is wired for the correct supply voltage.
- Verify the status LED is solid red.
- Verify that the jumper wire is present between terminals 9 and 10 on the low voltage terminal board because this is required for the motor to operate.
- Verify that the yellow wires are present on terminals 5 and 6 on the low voltage terminal board.

Fault indication (TEFC motors: 67002107, 67002205)

A red LED is located either on the control board or on the side of the conduit box to provide diagnostic assistance of motor faults. When a fault occurs, the LED will blink a specific number of times to identify the fault that has occurred. See the table to the right for fault indications.

When a fault occurs, the LED will blink the number of times corresponding to the fault, pause and then repeat blinking. Count the number of blinks multiple times to ensure that the proper fault has been identified. With most of the faults, the motor will restart automatically. If the motor experiences an overload fault over 10 times within an hour, the motor will shut down to protect itself and the power will need to be reset.

TEFC Motors (67002107 and 67002205)	
No. of Blinks	**Indicated Fault**
2	Overcurrent
3	Overvoltage
4	Undervoltage
5	Communication Error
6	Sync Loss
7	Spin Fault
8	3 Sec/60 Sec Motor Overload
9	Motor Over-Temperature

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