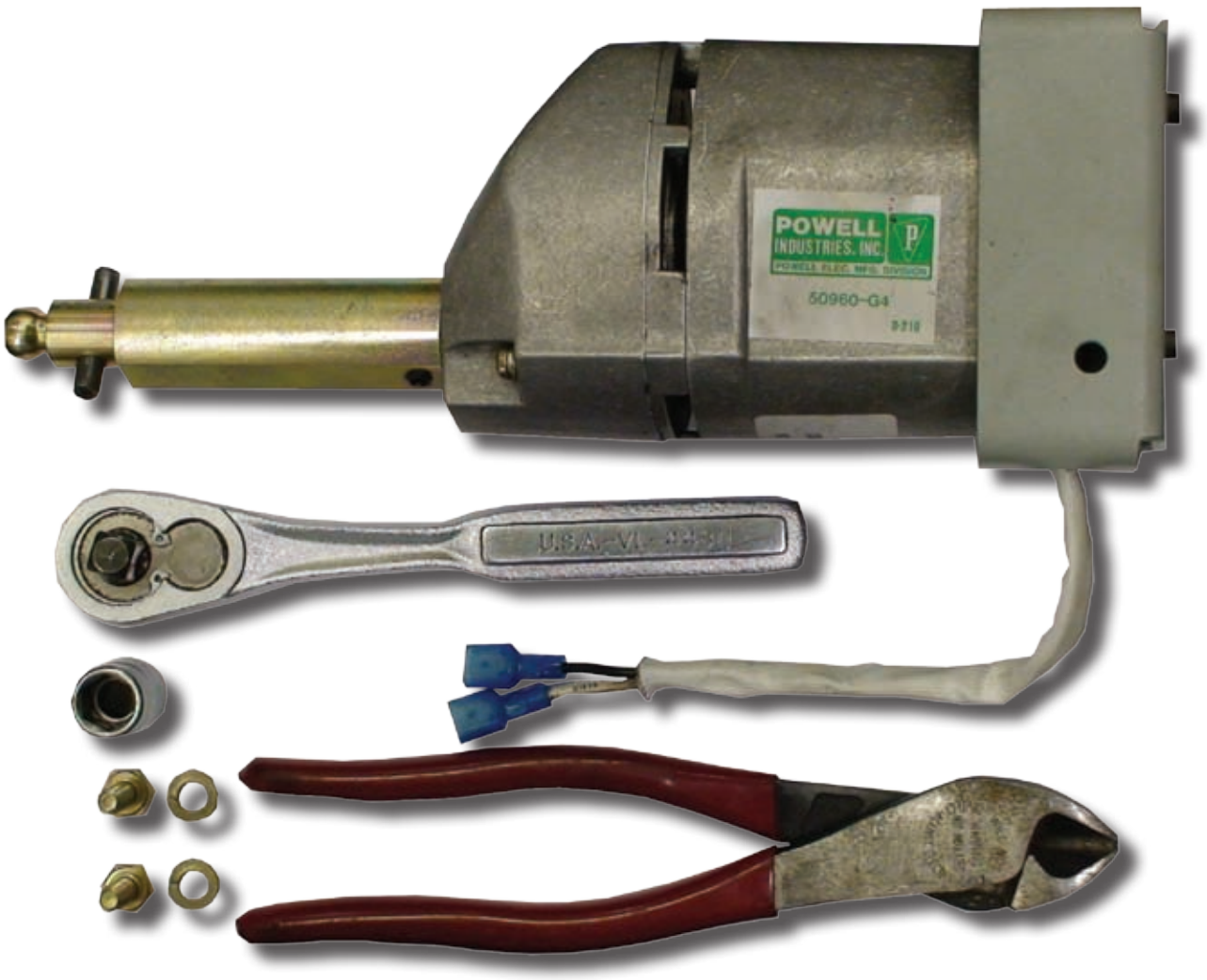
POWELL

Powered by Safety®

SM-1200
Charging Motor Assembly





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Signal Words

As stated in ANSI Z535.4-2002, § 4.13-4.13.3 the signal word is a word that calls attention to the safety sign and designates a degree or level of hazard seriousness. The signal words for product safety signs are **"Danger"**, **"Warning"**, and **"Caution"**. These words are defined as:

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Not stated in ANSI Z535.4-2002, § 4.13-4.13.3 as a signal word but used in this manual is **"IMPORTANT"**. This is defined as:

⚠ IMPORTANT

IMPORTANT indicates a section of the manual covering a non hazardous situation, but one where Powell feels proper attention is warranted.

Qualified Person

For the purposes of this manual, a qualified person, as stated in NFPA 70®, is one familiar with the construction and operation of the equipment and the hazards involved.

In addition to the above qualifications, one must also be:

1. trained and authorized to energize, deenergize, clear, ground, and tag circuits and equipment in accordance with established safety practices.
2. trained in the proper care and use of personal protective equipment (PPE) such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.
3. trained in rendering first aid if necessary.

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Ch 1 General Information

⚠ WARNING

The equipment described in this document may contain high voltages and currents which can cause serious injury or death.

The equipment is designed for use, installation, and maintenance by knowledgeable users of such equipment having experience and training in the field of high voltage electricity. This document and all other documentation shall be fully read, understood, and all warnings and cautions shall be abided by. If there are any discrepancies or questions, the user shall contact Powell immediately at 1.800.480.7273.

⚠ WARNING

Before any adjustment, servicing, part replacement, or any other act is performed requiring physical contact with the electrical working components or wiring of this equipment, the power supply must be disconnected. Failure to follow this warning may result in injury or death.

⚠ IMPORTANT

Powell reserves the right to discontinue and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

A. Scope

The information in this service manual describes the following Charging Motor:

- 50960G04P 120VAC/125VDC
- 50960G05P 240VAC/250VDC
- 50960G06P 48VDC
- 77318G02P 120VAC/125VDC (PowlVac-ND®)
- 77318G03P 240VAC/250VDC (PowlVac-ND)
- 77318G01P 48VDC (PowlVac-ND)

This device can be used in the following circuit breakers:

- PowlVac® STD
- PowlVac® CDR
- PowlVac® ASD
- PowlVac® 38kV CDR
- PowlVac-ND®

Note: *This charging motor can also be used in certain PowlVac® replacement circuit breakers, however, the placement and procedures may vary for installation.*

B. Purpose

The information in this maintenance procedure is intended to provide information required to properly install the charging motor described in ***Ch 1 General Information,*** **A. Scope.**

This instruction bulletin provides:

1. Safety guidelines
2. Instructions for installation and placing the charging motor into service
3. Illustrations, photographs, and description of the charging motor

The illustrations contained in this document may not represent the exact construction details of each particular type of charging motor. The illustrations in this document are provided as general information to aid in showing component locations only.

All illustrations are shown using deenergized equipment.

> ⚠ ***WARNING***
>
> ***Be sure to follow the appropriate safety precaution while handling any of the equipment. Failure to do so may result in serious injury or death.***

To the extent required, the products described herein meet the applicable ANSI, IEEE, and NEMA Standards; however, no such assurance is given with respect to local codes and ordinances which may vary greatly.

Ch 2 Safety

A. Safe Work Condition

The information in Section A is quoted from *NFPA 70E 2004 - Article 120, 120.1 Establishing an Electrically Safe Work Condition.*

120.1 Process of Achieving an Electrically Safe Work Condition

1. Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.

2. After properly interrupting the load current, OPEN the disconnecting device(s) for each source.

3. Wherever possible, visually verify that all blades of the disconnecting devices are fully OPEN or that drawout type circuit breakers are withdrawn to the fully disconnected position.

4. Apply lockout/tagout devices in accordance with a documented and established policy.

5. Use an adequately rated voltage detector to test each phase conductor or circuit part to verify they are deenergized. Test each phase conductor or circuit part both phase-to-phase, and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily.

6. Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being deenergized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

B. Safety Guidelines

Study this maintenance procedure and all other associated documentation before installing the undervoltage device.

Each user has the responsibility to instruct and supervise all personnel associated with usage, installation, operation, and maintenance of this equipment on all safety procedures. Furthermore, each user has the responsibility of establishing a safety program for each type of equipment encountered.

It is mandatory that the following rules be observed to ensure the safety of personnel associated with usage, installation, operation, and maintenance of these circuit breakers.

The safety rules in this instruction bulletin are not intended to be a complete safety program. The rules are intended to cover only some of the important aspects of personnel safety related to charging motor.

C. General

1. Only supervised and qualified personnel trained in the usage, installation, operation, and maintenance of the circuit breaker shall be allowed to work on this equipment. It is mandatory that this instruction bulletin, any supplements, and service advisories be studied, understood, and followed.

2. Maintenance programs must be consistent with both customer experience and manufacturer's recommendations, including service advisories and instruction bulletin(s). A well planned and executed routine maintenance program is essential for circuit breaker's reliability and safety.

3. Service conditions and circuit breaker applications shall also be considered in the development of safety programs. Variables include ambient temperature; humidity; actual continuous current; thermal cycling; number of operations; interrupting duty; and any adverse local conditions including excessive dust, ash, corrosive atmosphere, vermin and insect infestations.

D. Specific

1. **DO NOT WORK ON AN ENERGIZED CIRCUIT BREAKER.** If work must be performed on a circuit breaker, remove it from service and remove it from the metal-clad switchgear.

2. **DO NOT WORK ON A CIRCUIT BREAKER WITH THE CONTROL CIRCUIT ENERGIZED.**

3. **EXTREME CARE MUST BE EXERCISED TO KEEP ALL PERSONNEL, TOOLS, AND OTHER OBJECTS CLEAR OF MECHANISMS WHICH ARE TO BE OPERATED, DISCHARGED, OR RELEASED.** These circuit breakers utilize stored energy mechanisms. These mechanisms must be serviced only by skilled and knowledgeable personnel capable of releasing each spring load in a controlled manner. Detailed information regarding these mechanisms is found in this instruction bulletin.

4. **DO NOT ATTEMPT TO CLOSE THE CIRCUIT BREAKER MANUALLY ON AN ENERGIZED CIRCUIT.**

5. **DO NOT USE AN OPEN CIRCUIT BREAKER AS THE SOLE MEANS OF ISOLATING A HIGH VOLTAGE CIRCUIT.** For complete isolation, the circuit breaker shall be in the disconnected position or shall be withdrawn completely.

6. **ALL COMPONENTS SHALL BE DISCONNECTED BY MEANS OF A VISIBLE BREAK AND SECURELY GROUNDED FOR SAFETY OF PERSONNEL PERFORMING MAINTENANCE OPERATIONS ON THE CIRCUIT BREAKERS.**

7. Interlocks are provided to ensure the proper operating sequences of the circuit breakers and for the safety of the user. If for any reason an interlock does not function as described, do not make any adjustments, modification, or deform the parts. **DO NOT FORCE THE PARTS INTO POSITION. CONTACT POWELL FOR INSTRUCTIONS.**

E. X-Rays

When high voltage is applied across the contacts of a vacuum interrupter, there is the possibility of generation of X-rays. The intensity of the X-radiation is dependent on the peak voltage and the contact gap. At the normal operating voltage for this type of equipment, the radiation levels are negligible. At the voltages specified for testing, test personnel shall be in front of the circuit breaker such that the two layers of steel used in the frame and front cover construction are between the test personnel and the vacuum interrupters, and that the test personnel be no closer than one meter (3') from the front of the circuit breaker. **THE CIRCUIT BREAKER SHALL BE EITHER FULLY OPEN, OR FULLY CLOSED WHEN MAKING HIGH POTENTIAL TESTS. DO NOT TEST WITH CONTACTS PARTIALLY OPEN.**

F. Safety Labels

The equipment described in this document has **DANGER**, **WARNING, CAUTION,** and instruction labels attached to various locations. All equipment **DANGER**, **WARNING, CAUTION,** and instruction labels shall be observed when the circuit breaker is handled, operated, or maintained.

> ⚠ ***IMPORTANT***
>
> ***Warning and Caution labels are located in various places in and on the switchgear and on the circuit breaker removable element. Always observe these warnings and caution labels. Do NOT remove or deface any of these warning/caution labels.***

Ch 3 Equipment Description

A. General

The charging motor is normally located in the lower right hand corner of the circuit breaker.

> ⚠ ***CAUTION***
>
> ***Ensure that the control circuits are deenergized and the circuit breaker is deenergized, disconnected by means of a visible break, and securely grounded. Do NOT start to work on a closed circuit breaker or a circuit breaker with the main closing spring charged.***

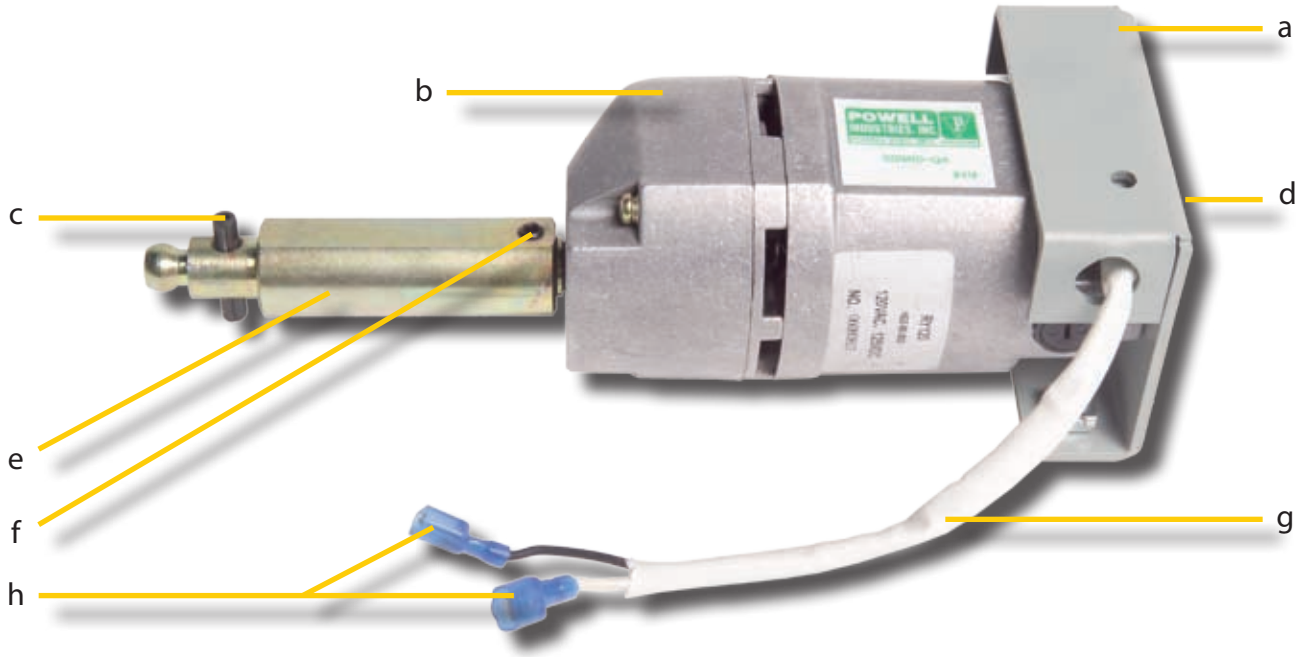
The charging motor assembly consists of the following:

- Charging Motor
- Motor Coupler
- ¼″-20 x ¼″ Hex Head Socket Screw
- ¼″ x 1-¼″ Spiral Pin
- 8-32 x 3/8″ Socket Head Cap Screw
- Motor Mounting Bracket
- Wire Connections (Faston®)

Tools required for installation:

- Socket Wrench
- 7/16″ Socket
- Wire Cutters

Figure 1 Charging Motor Assembly



a. Motor Mounting Bracket
b. Charging Motor
c. Spiral Pin
d. 8-32 Socket Head Cap Screw (showing location only)
e. Motor Coupler
f. ¼"-20 x ¼" Hex Head Socket Screw
g. Acrylic Sleeving
h. Wire Connections (Fastons®)

Ch 4 Installation

Note: *The instructions in* ***Ch 4 Installation****,* **A. Removing the Old Charging Motor Assembly from the Circuit Breaker, B.** *Installing the New Charging Motor Assembly into the Circuit Breaker, and* **C. Testing the Charging Motor Using a Test Cabinet** *cover the following circuit breakers only:*

- *PowlVac® STD*
- *PowlVac® CDR*
- *PowlVac® ASD*
- *PowlVac® 38kV CDR*

A. Removing the Old Charging Motor Assembly from the Circuit Breaker

Perform the following steps to remove the old charging motor assembly from the circuit breaker:

⚠ CAUTION

Ensure that the control circuits are deenergized and the circuit breaker is deenergized, disconnected by means of a visible break, and securely grounded. Do NOT start to work on a closed circuit breaker or a circuit breaker with the main closing spring charged.

1. Remove the front cover of the circuit breaker.
2. Cut the tie wrap holding the two wires from the charging motor to the wiring harness, if present (Figure 2).

⚠ IMPORTANT

Locate the Wiring Diagram section on the circuit breaker nameplate. If the wiring diagram number begins with "507" replace Step 3 with Steps 2a, 2b, and 2c. If the wiring diagram number begins with "504" go directly to Step 3.

2a. Remove the existing motor plug by cutting the wires on the harness side of the motor plug assembly

Note: *If wire tags aren't visible contact Powell Service Division before proceeding to the next step.*

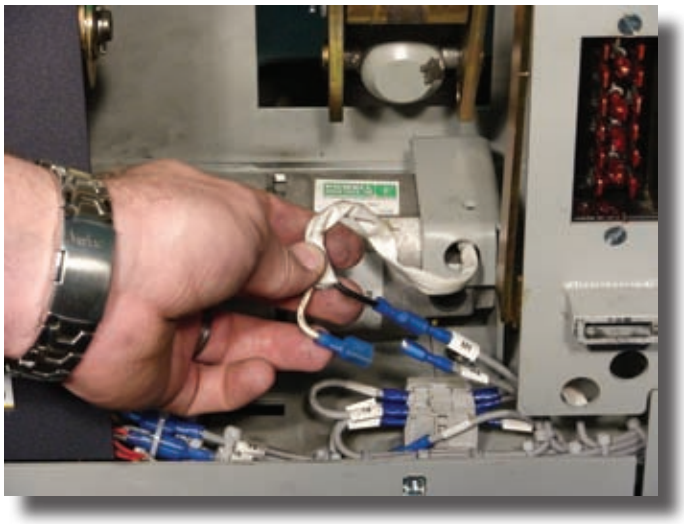
2b. Strip the wires appropriately to allow for crimping

2c. Crimp the Faston® connector to the wiring harness and proceed to Step 4

Figure 2 Cutting the Tie Wrap

3. Disconnect the white and black wires from the wiring harness (Figure 3).

Figure 3 Disconnecting Charging Motor Wires form the Wiring Harness

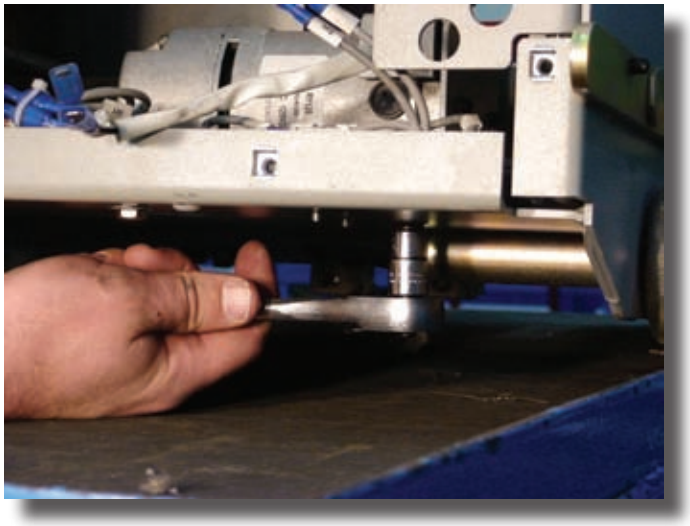


4. Elevate and secure the circuit breaker so there is at least 6 inches of clear space under the circuit breaker base pan.

> ⚠ ***CAUTION***
>
> ***Ensure that the circuit breaker is stable and secure before performing Step 5. Failure to do so may result in personal injury.***

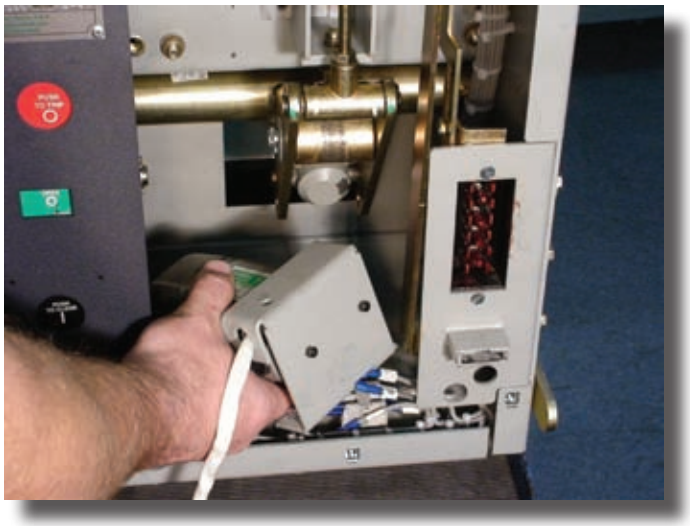
5. Once the circuit breaker is stable and secure, remove the two ¼″-20 x ¾″ Hex Head Bolts from the circuit breaker (Figure 4). Retain the bolts for reassembly.

Figure 4 Removing Hex Head Bolts



6. Remove the charging motor from the circuit breaker by pulling to the right and tilting towards the front of the circuit breaker (Figure 5).

Figure 5 Removing the Charging Motor



B. Installing the New Charging Motor Assembly into the Circuit Breaker

⚠ CAUTION

Ensure that the control circuits are deenergized and the circuit breaker is deenergized, disconnected by means of a visible break, and securely grounded. Do NOT start to work on a closed circuit breaker or a circuit breaker with the main closing spring charged.

Perform the following steps to install the new charging motor assembly into the circuit breaker:

1. Remove the front cover of the circuit breaker.
2. Elevate and secure the circuit breaker so there is at least 6 inches of clear space under the circuit breaker base pan.
3. Using Rheolube 368A Grease, lubricate the end of the motor coupler.

⚠ CAUTION

Ensure that the circuit breaker is stable and secure before performing Step 4. Failure to do so may result in personal injury.

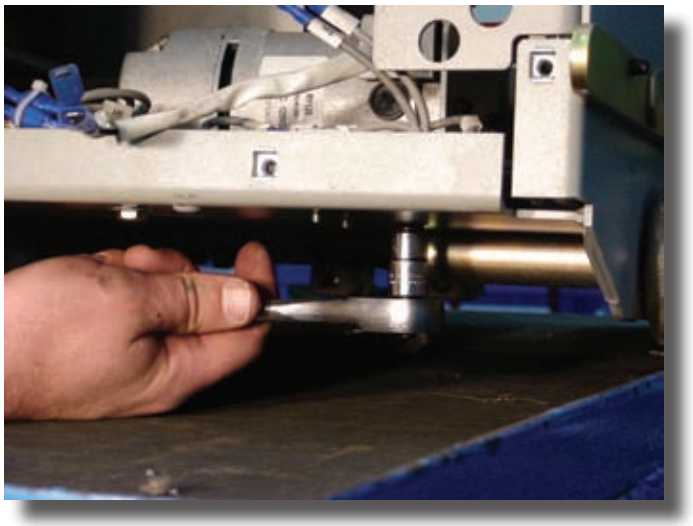
4. Insert the motor coupler end of the charging motor assembly into the motor shaft slot (Figure 6).

Figure 6 Motor Shaft Slot

5. Secure the charging motor to the circuit breaker by tightening the two ¼"-20 x ¾" Hex Head Bolts to the charging motor mounting bracket 5-7 ft-lbs (Figure 7).

   Note: *Use Loctite 242 or equivalent on the two ¼"-20 x ¾" Hex Head Bolts before installing.*

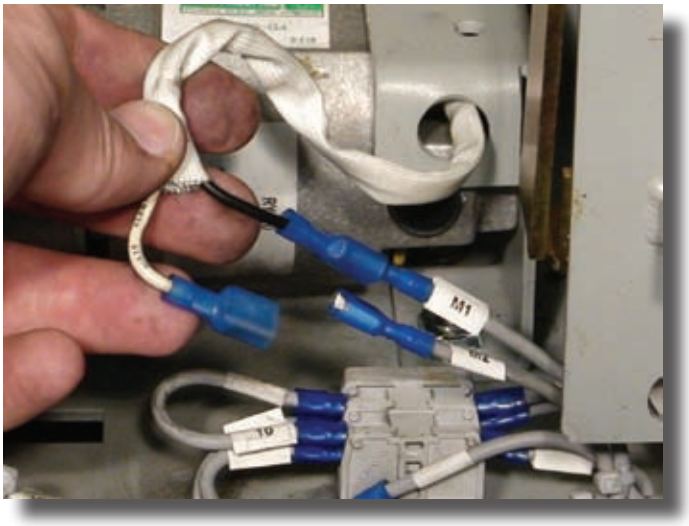
Figure 7 Securing the Charging Motor to the Circuit Breaker



6. Connect wire M1 from the wiring harness to the black wire from the charging motor and connect wire M2 from the wiring harness to the white wire from the charging motor (Figure 8).

   Note: *If wire tags aren't visible contact Powell Service Division before proceeding to the next step.*

Figure 8 Connecting the Charging Motor Wires to the Wiring Harness



7. Secure the wires to the wiring harness located in front of the two-point terminal block using a tie wrap.
8. Lower the circuit breaker from its elevated position
9. Reinstall the front cover of the circuit breaker.

C. Testing the Charging Motor Using a Test Cabinet

1. Roll the circuit breaker to the test cabinet area.

> ⚠ **CAUTION**
>
> ***Ensure that the Test Cabinet Power Switch is in the OFF position.***

2. Connect the test cabinet umbilical cord (Figure 8, d) into the circuit breaker secondary disconnect receptacle.

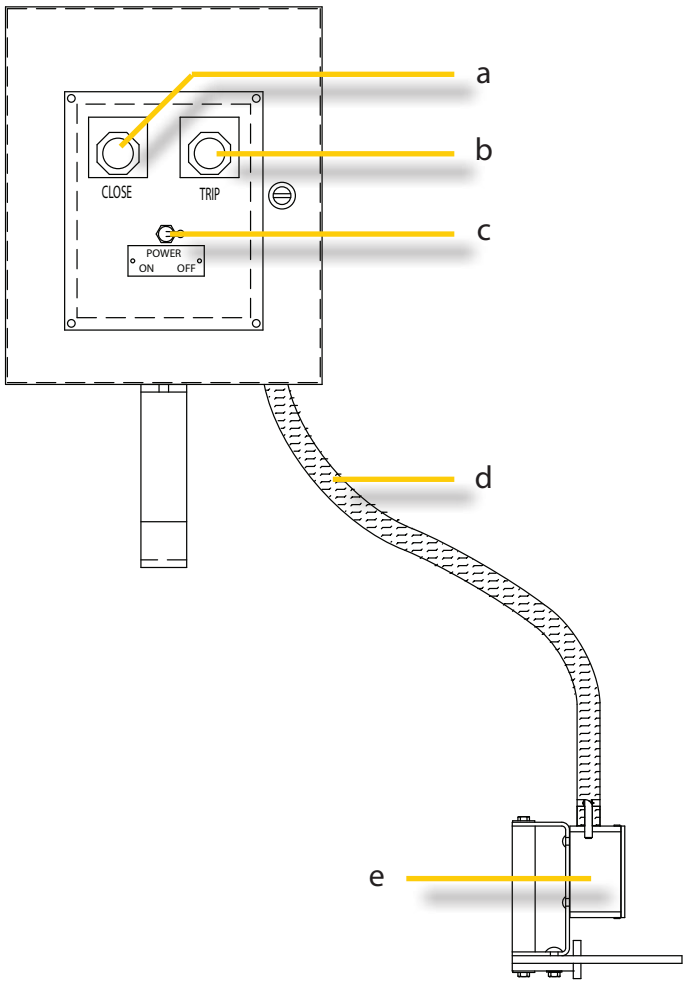
   Note: *If there is an Undervoltage Device in the circuit breaker refer to SM-1800 Undervoltage Assembly Service Manual.*

3. Turn the test cabinet power switch (Figure 8, c) to the ON position. This will charge the circuit breaker. If the circuit breaker charges fully then the motor is installed correctly. If the motor does not charge the main spring, double check that the wire connections are correct. If problems persist contact Powell Service Division at 1.800.480.7273.

   Note: *The motor should charge in less than 10 seconds at nominal control voltage.*

> ⚠ **IMPORTANT**
>
> ***If a knocking noise is observed during charging, refer to the Ratchet Wheel Holding Pawl Adjustment section of the appropriate circuit breaker instruction bulletin.***

Figure 9 Typical Test Cabinet with Umbilical Cord



a. Close Push Button
b. Trip Push Button
c. Test Cabinet Power Switch
d. Test Cabinet Umbilical Cord
e. Test Cabinet Umbilical Plug

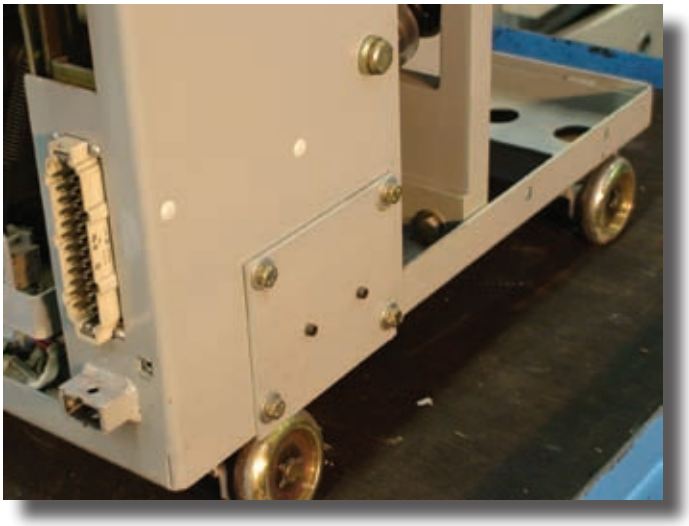
D. Removing the Old Charging Motor from the PowlVac-ND® Circuit Breaker

Perform the following steps to remove the old charging motor assembly from the circuit breaker:

> ⚠ **CAUTION**
>
> ***Ensure that the control circuits are deenergized and the circuit breaker is deenergized, disconnected by means of a visible break, and securely grounded. Do NOT start to work on a closed circuit breaker or a circuit breaker with the main closing spring charged.***

1. Remove the front cover of the circuit breaker.
2. Remove the four ¼"-20 x ¾" Hex Head Bolts from the charging motor assembly bracket located at bottom right side of the circuit breaker (Figure 10).

Figure 10 Charging Motor Assembly Bracket



3. Pull the charging motor out of the circuit breaker frame (Figure 11).

Figure 11 Removing the Charging Motor from the PowlVac-ND Circuit Breaker

4. Disconnect the black and white wires from the wiring harness (Figure 12).

Figure 12 Disconnecting/Connecting Wires

E. Installing the New Charging Motor Assembly into the PowlVac-ND® Circuit Breaker

1. Connect the black wire from the charging motor to wire M1 from the wiring harness to and connect the white wire from the charging motor to wire M2 from the wiring harness to (Figure 12).

   Note: *If wire tags aren't visible contact Powell Service Division before proceeding to the next step.*

2. Insert the motor coupler end of the charging motor assembly into the motor shaft slot (Figure 6).
3. Secure the charging motor to the circuit breaker by tightening the four ¼"-20 x ¾" Hex Head Bolts to the charging motor assembly bracket (Figure 10).

   Note: *Use Loctite 242 or equivalent on the four ¼"-20 x ¾" Hex Head Bolts before installing.*

4. Reinstall the front cover of the circuit breaker.

F. Testing the Charging Motor Using a PowlVac-ND® Test Cabinet

1. Roll the circuit breaker to the test cabinet area.

⚠ CAUTION

Ensure that the Test Cabinet Power Switch is in the OFF position.

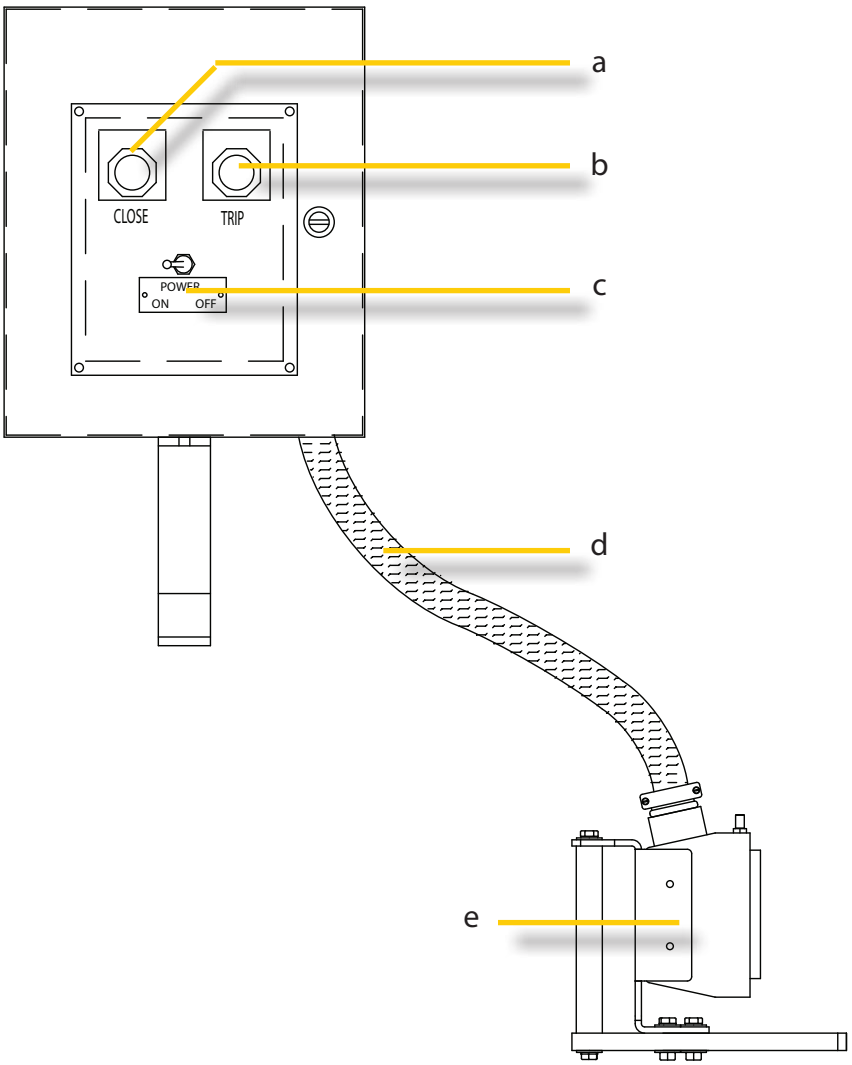
2. Connect the test cabinet umbilical cord (Figure 13, d) into the circuit breaker secondary disconnect receptacle.
3. Turn the test cabinet power switch (Figure 13, c) to the ON position. This will charge the circuit breaker. If the circuit breaker charges fully then the motor is installed correctly. If the motor does not charge the main spring, double check that the wire connections are correct. If problems persist contact Powell Service Division at 1.800.480.7273.

   Note: *The motor should charge in less than 10 seconds at nominal control voltage.*

⚠ IMPORTANT

If a knocking noise is observed during charging, refer to the Ratchet Wheel Holding Pawl Adjustment section of the appropriate circuit breaker instruction bulletin.

Figure 13 Typical PowlVac-ND® Test Cabinet with Umbilical



a. Close Push Button
b. Trip Push Button
c. Test Cabinet Power Switch
d. Test Cabinet Umbilical Cord
e. Test Cabinet Umbilical Plug

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SM-1200
Charging Motor Assembly

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