TYPE PM MOTOR OPERATORS FOR AUTOMATIC SOURCE-TRANSFER AND SCADA CONTROLLED APPLICATIONS 15kV • 25kV

Run-and-Trip Style and Fast-Trip Style

Federal Pacific Type PM Switch Operators are available in two styles (Run-and-Trip Style and optional Fast-Trip Style) depending on the speed of operation required for the specific application. Regardless of the speed of operation, these motor operators are side mounted to units of 15kV and 25kV live-front or (as illustrated above) dead-front pad-mounted switchgear and provide motor-operated switching for automatic-transfer and remote supervisory-controlled applications on underground power distribution systems. Automatic-transfer unit pictured above illustrates motor-operator mounting in low-voltage compartments at left and foreground enclosure on side at right. Low-voltage enclosure at far right contains micro-processor control and associated wiring.

Federal Pacific Motor Operators to Automate Underground Distribution Systems

Federal Pacific 15kV and 25kV Manual Models of Pad-Mounted Switchgear can be equipped with motor operators either for automatic source-transfer applications, designated as ATPSI/II Models for Live-Front units and ATPSE Models for Dead-Front units, or for SCADA controlled applications, designated as SCPSI/II Models for Live-Front units and SCPSE Models for Dead-Front units. When equipped with motor operators, Federal Pacific Models of Pad-Mounted Switchgear will effect switching operations in a run (charge-spring) and trip sequence in approximately 6-8 seconds or alternately, with an optional Fast-Trip design in approximately 25-29 cycles. These operating times do not include time delays required for coordination or verification that the event is not permanent.

Run-and-Trip Motor Operator
The Federal Pacific Type PM Motor Operator, dubbed the run-and-trip motor operator includes all the features that have been provided in the past for motor operators used in remote-supervisory control applications.

The operating speed for the Run-and-Trip Style Type PM Motor Operator is approximately 4-5 seconds from the instant the motor is actuated through to completion of switch opening or closing. Operation can be effected either automatically when combined with an SEL-451 Relay or remotely when combined with appropriate communications components. Operating time for the automatic source-transfer scheme using the Run-and-Trip Style Type PM Motor Operator is approximately eight (8) seconds. Operating time does not include time required for sensing or time delays required to establish system conditions. These motor operators can also be used in selected configurations of Federal Pacific Metal-Enclosed switchgear.

Fast-Trip Style Type PM Motor Operators
The operating speed for the Fast-Trip Style Type PM Motor Operator is approximately 18-19 cycles from the instant the motor is actuated through to the completion of switch opening or closing. Operation can be effected either automatically when combined with an SEL-451 Relay or remotely when combined with appropriate communications components. Operating time for the automatic source-transfer scheme using the Fast-Trip Type PM Motor Operator is approximately 25-29 cycles. Operating time does not include time required for sensing or time delays required to establish system conditions. These motor operators can also be used in selected configurations of Federal Pacific Metal-Enclosed switchgear.

Type PM Motor Operators
Whether Run-and-Trip Style or Fast-Trip Style, the Federal Pacific Type PM Switch Operator is designed primarily for use on Federal Pacific units of pad-mounted switchgear, replacing the manual operating handle and placed over the manual-operating shaft. However, it may also be applied for specific unique applications when side mounted to bays of metal-enclosed switchgear. The run-and-trip motor operator is direct, side-connected to the enclosure of pad-mounted switchgear, and can be similarly connected on bays of metal-enclosed switchgear where space and configuration arrangements permit. A direct, front-connected arrangement is also available for metal-enclosed switchgear (refer to the Federal Pacific Switchgear Product Catalog section on "Automatic Metal-Enclosed Switchgear" and Figure 2 on page 135).

The Type PM motor-operator enclosure is an aluminum NEMA 3R, which is rated for outdoor service. The door opening is fully gasketed and seals tight against the door to prevent entry of rain and contamination. The door includes a stainless-steel handle, a continuous, stainless-steel hinge, a storage pocket for the instruction manual, a mounting clip for storage of spare secondary control-circuit fuses, a manual operating handle with storage provisions, and a wind brace to hold the door open.

Remote-Supervisory Control Applications
The Type PM motor operator includes LOCAL/REMOTE selector switch, local controls, control and battery charger/manager electronic components, AC power and control cable connections, provision for other optional controls, and provision for an RTU and radio/phone. The electronically controlled motor unit is suitable for operation of both 15kV and 25kV 600-ampere and 1200-ampere Federal Pacific Auto-jet® Load-Interrupter Switches.

The motor unit also includes a decoupler that when decoupled from the switch allows exercising the motor without operating the disconnect switch. The decoupler thus allows functional operation of the motor to be performed as a part of normal maintenance and checkout procedure. The Type PM Motor Operator uses a solid-state controller, which provides consistent and accurate control at each end of the interrupter switch operating stroke. It has a user programmed electronic control that responds to an electronic sensor enclosed within the motor housing. Limit positions are set from the control panel. The controller also provides open and closed position status outputs for an RTU.

Figure 1. Federal Pacific Type PM motor operator enclosures include many features providing convenience and security.

The operating controls, mounted on a panel inside the enclosure, consist of the Local-Remote Selector Switch, the Close-Open Switch and two Indicator Lights to show switch position. Three push buttons, mounted below the control switches behind a secured protective cover; set and adjust the motor-limit controls. Programming controls have safety covers to prevent accidental contact with the limit control during normal local operations.

When a CLOSE or OPEN command is given from either the "Remote" or "Local" position, the command is "sealed in"; and the motor will run to its established limits of travel and cannot be stopped at an intermediate position. The Type PM unit, in most situations, uses 120 volts AC in tandem with DC power supplied by the battery backup system to operate the load-interrupter switch. An electronic battery charger and battery manager system maintains battery voltage and provides battery condition status output signals for an RTU.

Modular construction and plug-in connections make maintenance and service easy.

The unit weighs approximately 100 Lb. (45 Kg) without the packing.

For the motor operator in remote-supervisory control applications, a 12-volt, 33-amp-hour battery supplies power to the motor-operator assembly and has adequate capacity to power associated components, including an optional radio and RTU. A 24-volt DC battery and charging system is also available. A system combining a battery and 120-volt AC input to a battery charger permits motor operation even when there is a weak battery voltage.

The battery charger is temperature compensated. With loss of input power from the charger, the battery can typically maintain the RTU and radio loads for 24 hours. The system includes an electronics package that provides (1) battery overcharge protection and (2) battery testing. Status outputs wired for input to an RTU include: Switch Position, Battery Condition, and Monitoring of Controller Status.

Sufficient open space provided on the internal mounting plate for installation of communications components, both a remote-terminal unit (RTU) and radio or other communications portal, for remote-supervisory control operations. When ordering, if specified, an antenna can be installed or provisions provided on the enclosure.

Figure 2. Standard-Style Type PM Motor Operator provides space for an RTU, radio and antenna, power supply, control power source and associated components.

Figure 3. Fast-Trip Style Type PM Motor Operator has a larger, high-speed motor and space to accommodate an array of communications and control components similar to the Standard-Style Motor Operator. Cover (with yellow label) over motor is interlocked so that when the cover is open, motor operation is blocked to prevent exposure to fast moving parts.

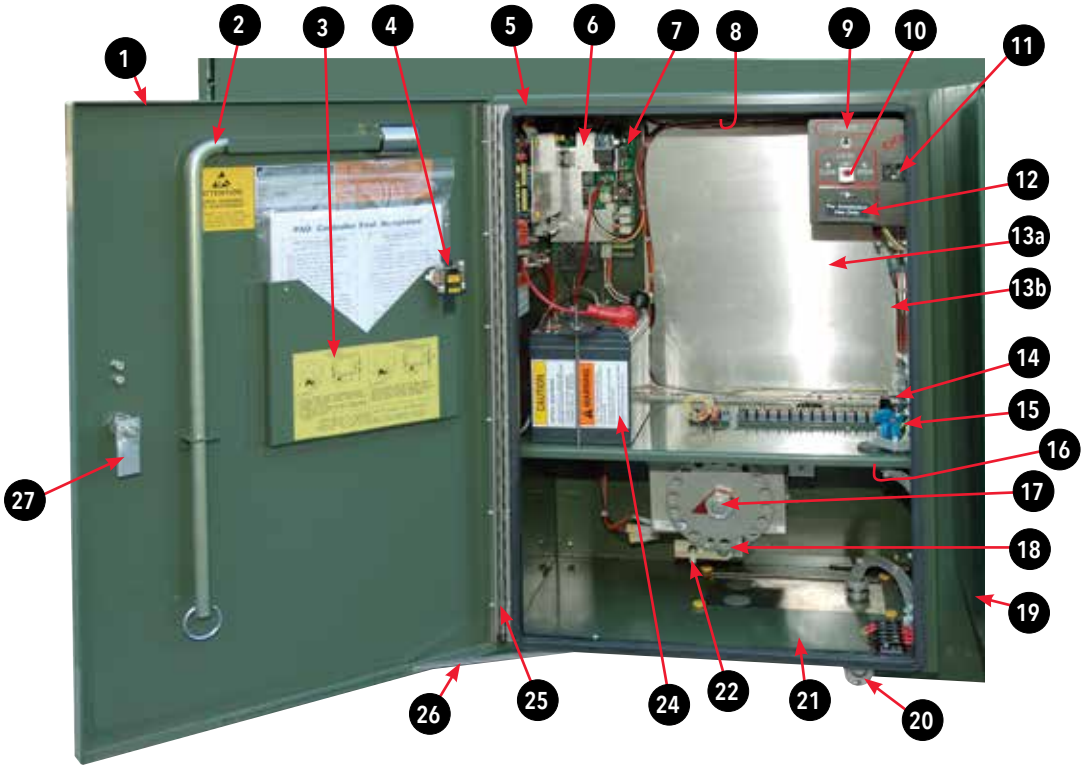

Figure 4. Features of Federal Pacific Standard-Style and Fast-Trip Style (Standard-Style is Pictured) Type PM Motor Operator.

1 **Aluminum Enclosure** – Heavy-gauge and corrosion resistant construction with door overlapping opening.

2 **Manual Switch-Operating Handle** – For use in the event that control power is lost - with storage provisions.

3 **Instruction Manual Storage Pocket** – Provides convenient holder for easy reference.

4 **Storage Clip for Spare Secondary Fuses** – Backup protection for vulnerable control circuits.

5 **Fully Gasketed Door Opening** – Combined with rigid construction and deep overlap of door provides protection from the environment.

6 **Control Module with LED Status** – Provides intelligence for controlling operations and status outputs.

7 **Power Module with Battery Charger** – Ensures availability of adequate control power for switching operations.

8 **Ribbon Cable Wiring System** – Simplifies interconnecting control wiring for easy identification and maintenance (on underside of roof).

9 **Local/Remote Selector Switch** – When in Local, allows operation at the unit while blocking remote operation; remote operation is enabled when in remote.

10 **Open/Close Operating Switch with Indicating Lamps** – Permits local electrical switching and annunciates switch position.

11 **Fused AC Receptacle** – Provides power outlet for connection of secondary load.

12 **Motor-Travel Set Controls** – Secured behind cover, allows adjustment of the travel limits for the motor operator.

13a **Mounting Plate** – Provides space for installation of RTU.

13b **Radio Provisions (radio by customer)** – Space permits installation of a radio for communication with a master station.

14 **Disconnecting Fuses** – Protect AC circuits and facilitate easy replacement.

15 **Smurff™ Surge Protector** – Provide surge protection for control circuits.

16 **Heater with Thermostat** – Keeps interior dry, eliminating potentially damaging moisture.

17 **Open/Close Motor-Position Indicator** – Semaphore target provides indication of actual motor position and switch position when coupled. See Figures 3 and 8 for picture of fast-trip style and additional features that may apply.

18 **Padlockable Motor Assembly** – Insures personnel security against inadvertent operation.See Figures 3 and 8 for picture of fast-trip style and additional features that may apply.

19 **Gasketing Shroud** – Seals motor-operator enclosure to pad-mounted switchgear enclosure (Not visible).

20 **Ground Connector** – On exterior of enclosure allows connecting enclosure to system ground.

21 **Removable Access Plate** – Allows installation of a knockout for entry of control wiring.

22 **Padlockable Decoupler Lever** – Facilitates testing of motor and controls while providing easy secure method of isolation for operating personnel. See Figures 3 and 8 for picture of fast-trip style and additional features that may apply.

23 Padlock Tab

24 **Battery with Venting Hose** – Maintains power availability for motor operation and control equipment.

25 **Stainless-Steel Door Hinge** – Continuous hinge ensures smooth door opening throughout unit life.

26 **Door Holder** – Secures door open.

27 **Stainless-Steel Door Handle & Latch** – Durable components that ensure easy operation.

28 **Key Interlock** - Coordinate access to fuse compartments by requiring switches to be open.

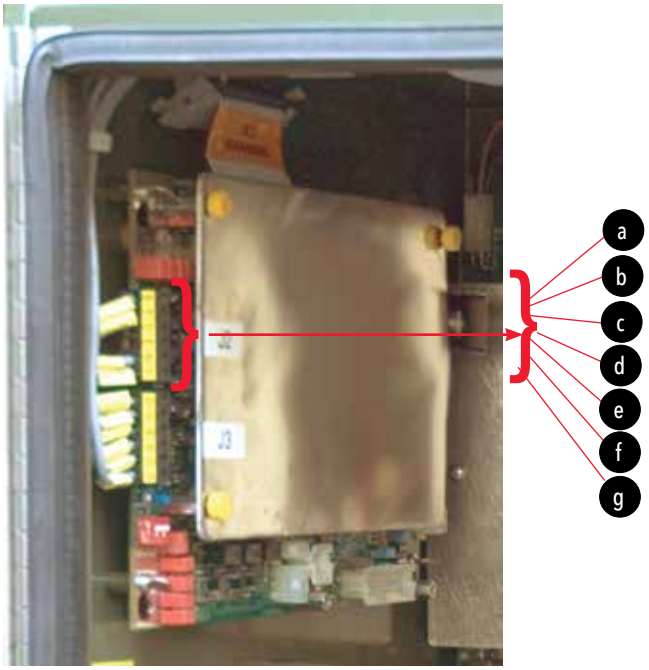

Figure 5. Control module with LED status lamps.

Status Outputs

a. Loss of AC Power/Loss of Charger Alarm
b. No-Go Alarm
c. Motor Open Statusv
d. Motor Closed Status
e. Low-Battery Alarm
f. Remote Status
g. Pushbutton

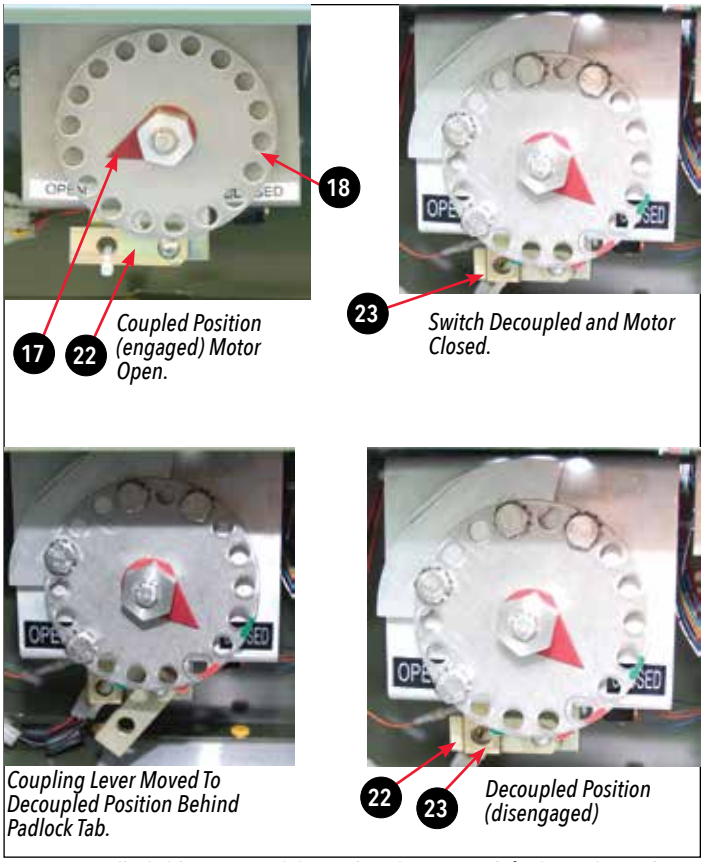

Figure 7. Padlockable motor and decoupler. Photo at top left shows decoupler in coupled (engaged) position. Photo at bottom right shows decoupler in decoupled (disengaged) position.

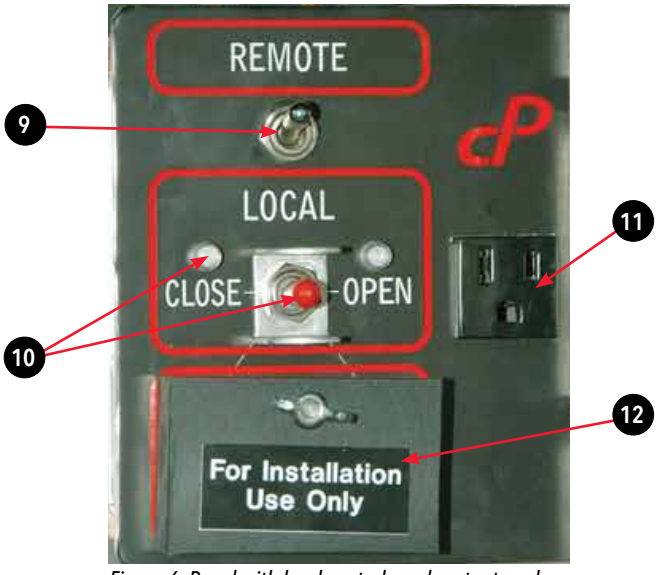

Figure 6. Panel with local controls and motor travel set controls.

Figure 8. Open door view of Fast-Trip Style Type PM Motor Operator showing motor and decoupler lever.

Notes