Bulletin DB-38B18

PTAD™ Poletop Motor and Controller for Unitized Overhead Switches

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Poletop Switch Motor Assembly and Controller (PTAD™)

Application

The Cleaveland/Price PTAD™ is a switch automation system that enables hotstick-operated and vertical-pipe-driven unitized distribution switches to be integrated into a customer's SCADA system. The PTAD™ is a solution to the problem of switches going out of adjustment due to twisting of wooden distribution poles. By installing the motor on the switch crossarm, twisting of the pole does not become an issue in switch adjustment.

General Description

A single 12-volt, 33 amp-hour battery contained within the controller supplies power to the PTAD™ motor assembly on the switch and also supplies power to the remote terminal unit (RTU) and communication device. A power supply is also provided to accommodate RTUs that require a 24-VDC power supply. The battery and 120-VAC charging voltage combine to provide concurrent power sources for the motor. An electronic system provides a complete temperature-compensating charging system as well as battery-testing function. Status indications are provided for switch position, motor position, battery condition, AC-charging voltage presence and remote-ready state.

With loss of charger power, the battery, with 1-amp RTU and communication loads, can typically support communications and operation for up to 24 hours. The battery can support devices with very low power requirements for up to 150 hours.

The controller enclosure offers sufficient room to house both the RTU and communication device. All components are accessible through the front door. The aluminum enclosure of the PTAD™ controller is powder-coated white to provide a surface that reflects the heating rays of the sun, thereby minimizing heat buildup within the enclosure and extending battery life.

The easy-to-install PTAD™ motor assembly mounts to the switch crossarm with a manufacturer model-specific mounting kit. The motor assembly has provision for manual operation via hotstick.

Double PTAD™ installation at a tap location

PTAD™ Operation

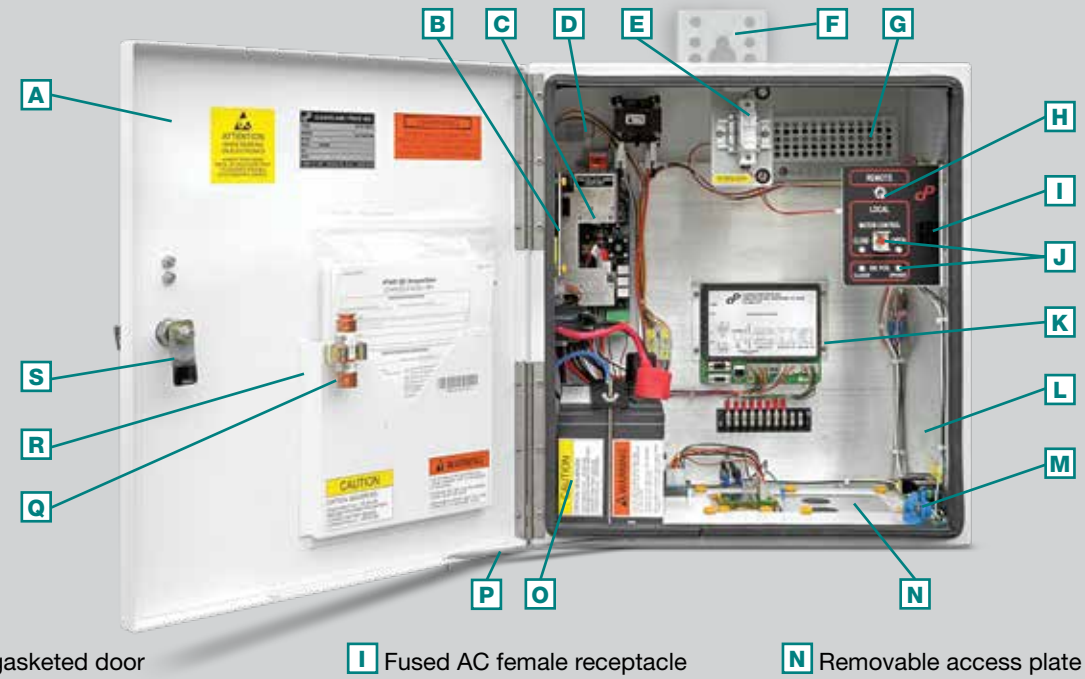
Local electrical and remote operation of the PTAD™ can be selected via a toggle switch located on the front control panel. The position of the selector switch is reported through a status indicator. The open/close switch for local electrical operation is also located on the front control panel.

The PTAD™ motor assembly features a hotstick operating lever for manual operation. Pulling the red flag hook closes the switch; pulling the green flag hook opens the switch. SCADA status and local indicating lights are provided for both motor and controller position.

After a manual switch operation, the switch position and the motor control position indications will be different. The statuses can be easily resynchronized electrically, either locally or remotely, without changing switch position. The statuses also can be resynchronized by another manual switch operation.

The PTAD™ is provided with a lockout-tagout feature that prevents mechanical and electrical operation of the switch.

PTAD™ Controller Features



- **A** Fully gasketed door
- **B** Control module with LED status
- **C** Power module with battery charger
- **D** Ribbon-cable wiring system
- **E** Electrical lock-out disconnect switch
- **F** Mounting channel
- **G** Heater with thermostat
- **H** Local/Remote switch
- **I** Fused AC female receptacle
- **J** Open—Close switch with indicating lights for both motor control and switch position
- **K** Customer-specified RTU
- **L** Location for customer-specified radio
- **M** Smurff™ surge protector and disconnecting fuses for incoming AC
- **N** Removable access plate
- **O** Battery with venting hose
- **P** Open door stay
- **Q** Spare fuses
- **R** Instruction book pocket
- **S** Stainless steel handle and latch

PTAD™ Battery

The battery used in the PTAD™ is a maintenance-free, lead-acid type that is completely sealed. It has a pressure relief valve that only opens during excessive gas buildup should overcharging occur. Gasses are vented via a hose to the outside of the enclosure, preventing the buildup of corrosive and explosive gasses within the enclosure. The battery typically has a five-year life depending upon duty and environment. Battery life can be extended by adding the optional battery cooler/warmer.

Charging the Battery

The PTAD™ has a “battery manager” charging circuit with a temperature-compensation feature to prevent overcharging or undercharging the battery. The battery is charged through a transformer and rectifier that delivers an electronically controlled charge from the customer’s AC source. A low battery voltage alarm with charging voltage present acts as an early warning to indicate that the battery is approaching the end of its useful life.

Circuit Board and Connectors

The control circuits and the power circuits are located on separate boards to segregate high-voltage and low-voltage components for the best reliability. The printed circuit boards are conformal-coated to withstand condensing humidity, open door rain, frost, and environmental pollutants. The circuit boards are connected by ribbon cables with gold-plated contacts for maximum reliability.

Heater and Thermostat Protection

A thermostatically controlled 100-watt heater is provided in the PTAD™ controller. A 63-watt heater is provided in the motor assembly.

Surge and Electrostatic Protection

All controllers come with the proven Smurff™ surge protector. Circuits have been tested to withstand surges and electrostatic voltages beyond the values set by ANSI C37.90.1 and C62.41, and Mil. Std. DOC-HDBK263. Field experience has proven that Cleaveland/Price‘s surge protection system will protect electronic components from direct lightning strikes.

PTAD™ Motor Assembly Features

The PTAD™ motor assembly mounts to the unitized switch crossarm using a switch-specific mounting assembly. It is available for almost all mounting configurations and distribution voltages. The high-torque motor will operate a switch in 0.4 seconds.

The motor assembly features:

- Decouple-free manual operation
- Easy access and safe operating hotstick hooks
- Constant ready state for immediate operation without spring windup
- Auxiliary switch-free motor travel limits
- Over-toggle mechanism in the closed position to keep switch firmly closed
- Low manual operating force
- Hotstick-operated mechanical lockout with reflective hook

PTAD™ motor on Hubbell horizontal mount AR switch

PTAD™ motor on S&C triangular mount Alduti-Rupter switch

Convenient hotstick operation

Motor Lockout

Mechanical Lockout

Mechanical lockout of the PTAD™ motor operator is easily performed by closing the lockout blade with a hotstick.

Lockout device on the PTAD™ motor shown in the locked and latched position.

Lockout disconnect switch shown in the open position.

Electrical Lockout

Electrical lockout at the PTAD™ controller enclosure is accomplished by interrupting the control circuit at the disconnect switch. The switch is padlockable in the open position.

PTAD™ Advantages

One-step Manual Operating Mechanism

The PTAD™ does not require decoupling of the motor from the switch linkage for manual operation. By pulling down the raised flag hook with a hotstick, the patented mechanism automatically disengages itself from the motor.

Automatic Battery Testing

The controller's smart circuit continuously monitors the battery to provide real-time reporting of battery condition.

A 12-ampere load is applied to the battery every five minutes and the battery voltage is measured with the battery charger off. The test duration is very short so the energy drain on the battery is minimal. Since the testing is done automatically, there is no need for the customer to implement a command system to perform a battery test periodically.

Automatic Load Disconnect

Under the battery loads of a radio and RTU, battery voltage will decline when AC is lost. The battery manager of the PTAD™ features an automatic load disconnect that drops all loads when a very low-voltage threshold is reached. This feature is especially important when storms cause extended loss of AC, as many batteries can be ruined within 36 hours. The automatic load disconnect prevents deep discharge of the battery that causes damage and necessitates battery replacement.

No-Go Function

Upon loss of AC, the PTAD™ will report a Charger Alarm through the RTU. If AC is not restored for an extended period of time, the PTAD™ will report Battery Alarm and eventually a No-Go Alarm as the battery voltage drops and those battery voltage threshold values are met. No-Go prevents an underpowered and incomplete operation of the switch; however, the unit will stay in communication with the control center until the automatic load disconnect condition is met. When the charging source is restored, the unit becomes instantly operational due to the dual power source, but the No-Go Alarm status remains until the battery is sufficiently charged.

Dual Power Source for the Motor

The PTAD™ motor operates from 120-volt AC as a primary power source and uses the battery as a backup. Since the motor uses AC as its primary power source, the motor can be operated as long as AC is present even if the battery is weak. This feature maximizes the reliability of the automation system.

Operator Status Indications

PTAD™ status indications include switch position, motor position, local/remote control switch position, loss of AC, low battery voltage, and No-Go. All statuses are reported back through the RTU and are indicated locally via LEDs on the PTAD™ control board and front panel. The PTAD™ also has the capability to invert the status indications by changing the position of a DIP switch.

PTAD™ Enclosure

The PTAD™ NEMA 3R controller enclosure is designed for maximum reliability, featuring:

- Corrosion-resistant marine-grade aluminum alloy construction
- Powder-coated surfaces for long-life durability
- Fully gasketed door
- Stainless steel hinges
- Padlockable stainless steel door handle assembly
- Cable entrances protected by anti-tamper collars
- Galvanized steel back channel with mounting keyhole

Smart Grid Integration

The PTAD™ is an ideal component for switching functions on a smart grid system. It can be mounted to any manufacturer's overhead switch and easily integrated into the system using an RTU and communication device. With components of choice, a customer may not be tied into a closed proprietary controller system. Also, with Cleaveland/Price, there are no expensive controller software upgrades to deal with.

Communication can be by any means; radio, fiber optics, cell phone, broadband over power line, or a hybrid system of communications. For radio communication installations, a controller may be supplied with a bulkhead antenna mounted on top of the controller enclosure or supplied with a coaxial surge protector for a separately mounted antenna.

Data collection capability can be added with the installation of Cleaveland/Price's LineScope® power monitor system. Three LineProbe sensors mount to the conductors and wirelessly stream data to a consolidating RTU that is attached easily to the PTAD™ control board. Power monitoring values including THD are collected and transmitted. For customers who use post-type sensors, a multiconductor, single-conduit field sensor cable can be supplied for connection between the sensors and the RTU. The field sensor cable eliminates the need for a junction box at switch level for the sensor cables and conveniently carries the AC supply cable from the PT.

The LineScope® RTU may be programmed for autotransfer or fault locating, isolation, and restoration. An Auto-Tag SCADA lockout board is an available option to suspend the RTU control programming and disable SCADA and local electrical control.

A PTAD™ installation can be as minimal or all-encompassing as a customer desires. If a customer wishes to upgrade the installation to collect additional data or perform added functions at a later time, the necessary components can be added simply to the PTAD.™

PTAD™ Options

- Stainless steel controller enclosure (instead of aluminum)
- RTU and communication device
- Battery cooler/warmer—keeps the battery at a constant moderate temperature to extend battery life and maintain functionality in freezing temperatures
- Auto-Tag SCADA board
- Time delay for local electrical operation
- 230 VAC charging voltage
- Current, voltage, and fault sensors
- Field sensor cable for post sensors
- Additional features and capabilities are available upon request

Auto-Tag board

Other Cleaveland/Price Automation Products

In distribution applications for overhead switches, we also offer the BR model operator for loadbreak switches using a reciprocating operating pipe and the BT-D for switches using a torsional operating pipe. Cleaveland/Price also offers unitized phase-over-phase switches with controllers for overhead transmission applications.

For underground conductor switching operations we offer the PAD, RSD, UAD, and UAD-V controllers. These controllers are designed to be retrofitted to almost any one-way or multi-way padmounted or vault-installed switch from manufacturers such as S&C, Thomas and Betts/Elastimold, Hubbell, Federal Pacific, G&W, Canada Power Products, Joslyn, and others.

PAD and RSD controllers install on pad-mounted switches. The PAD controller can be attached to the switch enclosure without modifying the enclosure.

UAD and UAD-V controllers can operate a Cleaveland/Price motor that attaches to the vault-installed switch or, if applicable, can control a magnetic actuator on the switch. The UAD mounts at ground level. The submersible UAD-V mounts within the vault.

PAD controllers mounted on an S&C PME switch

UAD-V controlling a G&W switch

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