

boltswitch[®]
bolted pressure contact switches

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

NEC 240.67 COMPLIANCE &
NFPA 70E ELECTRICAL SAFETY



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BEFORE INSTALLING OR OPERATING THIS BOLTED PRESSURE SWITCH (BPS),
READ THESE INSTRUCTIONS CAREFULLY.

RECEIVING, HANDLING AND STORAGE

Upon receipt, examine the package for any damage sustained in shipment. Damage must be reported immediately.

Unpack carefully. Be sure that no loose parts are left in the packaging material. Remove any debris or loose packing material on or in the device. If a sling is used to lift the BPS out of the carton, do not wrap the sling around any parts that can be damaged or bent, such as the connecting rod, arc quenchers or switch terminals.

Manual switches are shipped in the closed position. Switches equipped with shunt tip operators are shipped in the open position.

Most switches can be operated while standing on a bench to verify operation before installation. If the switch does not stand reasonably vertical, a block of wood or similar item can be placed under the terminals or operator housing.

The switch should be stored in a clean, dry location. It is best to keep the device covered during storage, because light can accelerate tarnish of silver plated components, and airborne dust will adhere to lubricated parts. To avoid corrosion, do not cover the switch with materials that absorb moisture.

INSTALLATION

The switch should be installed in accordance with all applicable codes and standards. Final inspection of the installation may be required by the local authority having jurisdiction.

Location

Better performance and longer life may be expected if the area is clean, dry, dust-free, and well ventilated. The switch should be easily accessible, and there should be sufficient space to allow for maintenance.

Mounting

This BPS is designed for mounting in a vertical position. Gravity can affect the operating characteristics. Top feed switches have the line terminals at the top and the load terminals at the bottom. Bottom feed switches have the line terminals at the bottom and the load terminals at the top. In both cases, the switch blades pivot at the bottom. Accordingly, bottom feed switches have energized switch blades when the switch is in the off position (if the circuit feeding the switch is energized). This is by design and intent.

Open Type Switches

Open switches are designed for mounting in a switchboard or enclosure of the customer's design and construction. In most cases, the fuse access door of the switchboard or enclosure should be hinged on the right side. Adequate space must be provided to maintain electrical clearances and wiring space. An opening is required for the switch operating means. Additional openings may be required for ventilation. Outline drawings provide dimensions for mounting the switch and for all required openings.

Mounting the switch consists of bolting the switch base to the supporting structure within the switchboard or enclosure and connecting the power buses or cables. The surface to which the switch mounts must be true, flat, and capable of supporting the weight of the switch. After mounting the device in a switchboard or enclosure, verify that the handle means aligns properly with the handle opening, and that the switch is level. If adjustments are needed, it may be necessary to loosen the mounting bolts, shift the switch as required, and then retighten the mounting bolts.

With the switch securely bolted to the supporting structure, mount the line and load conductors to the switch terminals. Be sure that all points of termination are of good conductivity and that the bus or cables are properly aligned and supported. Mating surfaces must be clean, parallel, have a smooth surface, and be firmly bolted together. The bus or cable must have adequate current-carrying capacity to prevent excessive heating. Obey all torque requirements that are provided.

Verify that the enclosure does not interfere with any of the moving parts of the switch. Particular attention should be directed to the switch operator assembly (housing with springs connected to the switch handle). As the switch is operated, some parts may rotate out of the operator housing, and spring guides may protrude beyond the sides of the operator housing. Be certain that these moving parts remain unobstructed.

Transparent materials are utilized on switches that require a barrier over the switch blades, providing what is known as "visible contacts". As an option, a viewing window can be installed over the transparent barrier. Many feel this is one of the best (and simplest) safety features available. "Visible contacts" are a requirement of some specifications.

The insulating surfaces of the switch should be kept free of pencil lines, paint, oil or other foreign materials as they may cause low resistance between points of different potential and result in electrical breakdown.

ENERGIZING THE SWITCH

BEFORE ENERGIZING THE SWITCH, INSULATION RESISTANCE TESTING OF THE CIRCUIT SHOULD BE PERFORMED TO INSURE THERE ARE NO SHORT CIRCUITS OR GROUND FAULTS. If this testing is conducted with an over-voltage source, be sure to disconnect any control transformers or other voltage sensitive equipment in the system to avoid damage. Follow industry accepted practices for performing the tests and energizing the system.

Closing

Manually operated switches and switches equipped with shunt trip operators are closed by rotating the handle counter-clockwise. The upper most position is the ON position.

Break-before-make double-throw switches ("Geneva" switches) require handle rotation in the direction of the side that is being closed. The opposite side of the "Geneva" switch remains blocked in the open position.

Motor operated switches can be closed without electrical power by rotating the hexagonal operating shaft counter-clockwise with an 18 inch breaker-bar and socket.

Opening

Manually operated switches are opened by rotating the handle clockwise.

Switches equipped with shunt trip operators are opened by use of the "trip lever" or by energizing the electrical tripping means. **DO NOT USE THE HANDLE TO INITIATE OPENING. THIS WILL DAMAGE THE LATCH THAT HOLDS THE OPENING SPRINGS IN A CHARGED STATE.** If adverse conditions have prevented a switch from opening by means of the opening springs, the handle can be used to assist opening the switch blades. This should be attempted only after efforts to open the switch with the manual trip lever have been exhausted.

Position Indicator Feature

If the switch is equipped with a position indicator feature, the actual position of the switch blades can be determined by the color showing in the indicator window. The position indicator window is located above and to the right of the operator shaft.

The color code is as follows:

Green - The switch is open

Red - The switch is closed

Yellow - WARNING, THE SWITCH IS PARTIALLY CLOSED

IF ANY YELLOW APPEARS IN THE WINDOW, IMMEDIATE ACTION IS REQUIRED. Yellow indicates that the switch blades are not fully closed (or fully open), and the bolted pressure mechanism is not fully engaged. If the switch is left in this position, the circuit being fed may seem normal, but over time, overheating or other severe damage may occur. A thorough examination of the entire switch and installation should be made as soon as possible.

MAINTENANCE

MAKE SURE POWER IS DISCONNECTED TO ALL SWITCH TERMINALS BEFORE ANY MAINTENANCE WORK IS PERFORMED.

Switches equipped with optional Class I ground fault components provide protection to equipment only, not personnel. **DO NOT WORK ON EQUIPMENT HOT.**

Inspection

Inspection of the BPS is recommended at least once a year. More frequent inspections are recommended if operated under severe conditions, such as frequent operation, harmonic loads, high ambient temperature, dusty environment, moisture or other unfavorable conditions. A complete inspection of the device should always be made after the BPS has interrupted a ground fault, or has been involved in an incident that caused one or more of the fuses to blow.

At regular inspection periods the BPS should be operated. Check to see that the blades close and open fully. The blades should be vertical when the switch is closed, and rotate approximately 45 degrees upon opening. Clear separation between the blades and jaw contacts should be observed when the switch is open. Also observe the rotation of the crossbar, to verify that it travels completely. On most switches, the crossbar rotates approximately 90 degrees. When the switch is closed, the crossbar should be in a vertical position, near or touching the blades. When the switch is open, the crossbar should be in a horizontal position.

If overheating is observed, a complete inspection of the BPS and the installation should be made. Verify that the switch blades and crossbar close fully, as previously discussed. Verify that the switch and the connecting bus (or cable) are properly sized for the load current. For switches requiring ventilation, verify that the vents are open and adequate in size. In some cases, overheating can be a result of severe conditions not easily observed, such as harmonics. A knowledgeable electrical professional may be needed to identify the cause of the problem and offer solutions.

Bolted Pressure Mechanism (Clamp Nuts)

READJUSTING THE CLAMP NUTS ON BOLTED PRESSURE CONTACT MECHANISMS COULD CAUSE SWITCH FAILURE. The bolted pressure contact mechanisms are factory set and should not need to be disassembled or readjusted under most circumstances. If adjustment is needed, consult the factory.

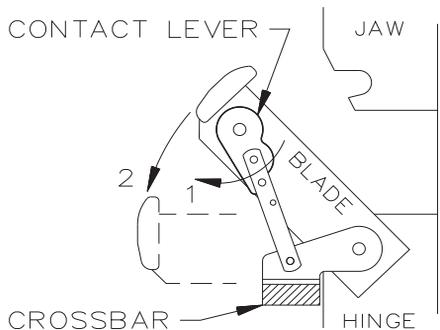
MAINTENANCE TIPS

For better access to the jaw contacts, the blades may be "dropped down" to a horizontal position, commonly referred to as the maintenance position.

To drop the blades to the maintenance position:

1. Rotate the contact lever as shown (arrow 1).
2. As it rotates, the blades will rotate down to allow improved access (arrow 2).

BE SURE TO RETURN THE BLADES TO THEIR ORIGINAL POSITION BEFORE OPERATING SWITCH. To do this, push the blades up until they click into position.



By disconnecting one end of the connecting rod (remove cotter pin and clevis pin), the crossbar and switch blades can be operated slowly either by hand or by using a crescent wrench as a lever on the crossbar. This provides an easy means of checking blade alignment, arcing contact adjustment and ease of blade closing. If the switch is equipped with arcing contacts, they should make brushing contact, should all touch simultaneously, and should make contact prior to the blades making contact. Be sure to reinstall the cotter pin when reassembling the connecting rod. Operate the switch several times without power connected.

Lubrication

In general, the BPS is adequately lubricated before shipment for initial use. If re-lubrication is required, the following procedure is recommended:

- A - Remove hardened grease and dirt from bearing surfaces by using kerosene.
- B - Use a fine file to smooth any pit marks on the switch blades.
- C - Apply a thin film of non-conductive lubricant to contact sliding surfaces. Petroleum jelly (Vaseline) works well in many applications, and is readily available.
- D - Lubricate linkages and operator joints with light machine oil.

DO NOT USE ELECTRICALLY CONDUCTIVE GREASE. THE USE OF CONDUCTIVE GREASE SUCH AS GRAPHITE GREASE OR CONDUCTOR TERMINATION COMPOUND COULD CAUSE SEVERE DAMAGE.

High temperature greases are not recommended for general use because they tend to solidify at lower temperatures.

Arc Quencher Replacement

The arc quenchers should be inspected for cracks in the molded sides and excessive erosion of the steel plates. Damaged arc quenchers should be replaced.

Arcing Contact Replacement

Some switch designs have replaceable arcing contacts. The arcing contacts should be inspected for erosion. Excessively eroded parts should be replaced.

Transparent Face Barrier

If the transparent face barrier requires cleaning, wash gently with mild soap or detergent and lukewarm water, using a soft clean cloth or sponge. Do not scrub or use brushes or squeegees. Rinse again. Dry with a soft cloth or moist cellulose sponge to prevent water spotting.

Maintenance After Interrupting a Ground Fault

The ground fault system associated with a BPS is known as "ground fault protection of equipment". In most applications, ground fault protection of equipment is provided on the service disconnect, thus, when it functions, it will disconnect the electrical power to the entire building. In the event that this BPS trips due to a ground fault, it should be regarded as an ultimate form of electrical protection to the facility, and should not be taken lightly. Any electrical fault can escalate to other conductors very rapidly. The magnitude of the fault current interrupted by the switch may be many times the actual current rating of the switch, and may have caused damage.

IF A GROUND FAULT RELAY CAUSES THE SWITCH TO OPEN, THE FOLLOWING SHOULD BE PERFORMED BEFORE RE-ENERGIZING THE SWITCH:

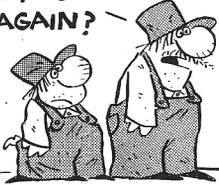
1. Locate the electrical fault and remove it from the system.
2. Repair any damage caused by the fault.
3. Test the system to be certain no faults exist.
4. Check and repair any damage to the BPS. This usually requires disconnecting the power feeding the switch.
5. Re-test the ground fault system and record the results.
6. Re-energize the system in the proper manner.

Repairs to the BPS must be made before placing the switch back in service. Opening under fault conditions is among the most severe duty required by a switch in laboratory testing. Switch standards do not require an un-serviced switch to be suitable for reuse, or be capable of being closed back into a fault. Particular attention should be given to the arcing contact (both stationary and moving), blades, jaw terminals, and arc quenchers. Removal of the barriers may be necessary for inspection or repairs.

Soiled lubrication should be removed. Any weld marks, pitting or splatter on the blades or jaw terminals should be filed smooth and re-lubricated. Excessive over-flash on the barriers may warrant their replacement. Arcing contacts and arc quenchers should be examined as previously explained.

BEFORE ATTEMPTING TO PLACE THE BPS BACK IN SERVICE, BE CERTAIN THE GROUND FAULT SENSING EQUIPMENT HAS BEEN RESET. The ground fault system (including the BPS) should then be tested to assure it is functioning properly. Record the test results, and be prepared to present the records to the authority having jurisdiction upon request.

WOULD YOU
RUN THROUGH
THAT AGAIN?



ON
OFF

