

Energizing switchboard

WARNING

HAZARDOUS VOLTAGE WILL CAUSE SEVERE INJURY OR DEATH.

WARNING

ONLY THOSE PROFESSIONALS TRAINED AND QUALIFIED ON ELECTRICAL DISTRIBUTION SWITCHBOARDS SHOULD INSTALL AND/OR SERVICE THIS EQUIPMENT.

Extreme hazards can exist when energizing electrical distribution equipment and switchboards. Take all precautions necessary to protect people and property when energizing the equipment. Short circuits and ground faults may exist as a result from inadequate installation. Short circuits and ground faults within the switchboard can cause catastrophic damage, injury, and death.

1. Prior to energizing the switchboard, turn OFF all overcurrent devices and loads internal to the switchboard plus mains in downstream equipment.
2. Verify and follow the sequence of energizing circuits and loads. Verify phase sequencing on loads, such as motors, that can be damaged or destroyed by incorrect phase connections.
3. If provided, use remote operators to close and energize switchboard, overcurrent devices, and loads.
4. Beginning with the main(s), turn ON each overcurrent device.

Maintenance

It is essential to maintain the equipment in satisfactory condition.

To ensure continued quality service, a systematic maintenance schedule is vital. Facility operation and local conditions vary to such an extent that the schedule must be prepared to suit the conditions. The maintenance schedule for individual devices, such as circuit breakers, meters, fusible switches, and so on, should be based upon recommendations contained in the individual instruction leaflet for each device. Inspection and test operations should be coordinated with an overall testing program to result in the least operating inconvenience and system shutdowns.

DANGER

HAZARDOUS VOLTAGE WILL CAUSE SEVERE INJURY OR DEATH. DE-ENERGIZE SWITCHBOARD PRIOR TO SERVICING.

WARNING

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Prior to performing any maintenance on the switchboard, first de-energize the switchboard at the source. Use lockout/tagout precautions as prescribed in OSHA, NFPA 70E, and other safety manuals.

The switchboard should be given a thorough maintenance check annually.

Exercise extreme care to prevent the equipment from being connected to the power source while tests are being conducted.

Switchboard insulation resistance testing

Maintenance before cleaning

Prior to cleaning, perform an initial Megger or DC test of the switchboard insulation, between phases and ground. Inspect for symptoms that may indicate overheating or weakened insulation. Record test readings. Refer to NEMA publication AB-4, *Guidelines for Inspection and Preventative Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Application*.

Prior to testing, remove all control power fusing and connections to products, which will be damaged in this test. This includes all components with control wire fusing, TVSS, SPDs, metering equipment, and so on.

⚠ WARNING

TO PREVENT DAMAGE TO GROUND FAULT CONTROL CIRCUITS, METERING CIRCUITS, SPD, OR OTHER CONTROL CIRCUITS, WHEN MEGGERING SWITCHBOARD, ISOLATE CIRCUITS FROM SWITCHBOARD SYSTEM BEFORE BEGINNING THE MEGGER OPERATION. BE SURE TO RECONNECT THOSE CIRCUITS AFTER MEGGER TESTS ARE COMPLETED.

NOTE: SOME GROUND FAULT CIRCUITS MAY NOT BE FUSED; THEREFORE, ISOLATION OF THOSE CIRCUITS REQUIRES DISCONNECTING WIRING FROM BUS BARS.

DO NOT USE AC dielectric testing.

⚠ WARNING

DO NOT USE ALTERNATING CURRENT (AC) DIELECTRIC/MEGGER TESTING. DAMAGE TO COMPONENTS WILL OCCUR.

Cleaning

While the switchboard is de-energized, remove dust and debris from bus bars, connections, supports, and enclosure surfaces. A vacuum cleaner with a long nozzle will be of assistance. Wipe clean with a lint-free cloth. Do not use solvents to clean equipment, as damage to surfaces can occur.

Should the switchboard be exposed to adverse conditions, such as airborne contaminants, more frequent inspections and cleaning may be required.

⚠ WARNING

DO NOT USE COMPRESSED AIR TO CLEAN OR BLOW OUT DEBRIS OR DUST IN SWITCHBOARDS.

Use of compressed air to clean or blow out debris in switchboards may imbed the contaminants within overcurrent devices, metering equipment, and other components. Damage to insulation and other surface materials can occur. Do not use compressed air in cleaning.

Switchboard insulation resistance testing

Maintenance after cleaning

After cleaning, perform a second Megger or DC test of the switchboard insulation between phases and ground.

Prior to testing, remove all control power fusing and connections to products, which will be damaged in this test. This includes all components with control wire fusing, TVSS, SPDs, metering equipment, and so on.

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NOTE: SOME GROUND FAULT CIRCUITS MAY NOT BE FUSED; THEREFORE, ISOLATION OF THOSE CIRCUITS REQUIRES DISCONNECTING WIRING FROM BUS BARS.

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A test resulting in readings at or above 1 megaohm is satisfactory. Compare these test readings with prior readings and retain with previous testing for future comparisons. Trends of lowered insulation resistance are signs of potential problems. A Switchboard Inspection Log form is provided in **Appendix B** to record readings.

Bus and cable connections

1. Inspect bus bar and cables for visible damage.
2. Visually inspect connections for overheating and damage.
3. All bus bar and cable connections should be checked and torqued in accordance with labeling on the switchboard. Refer to **Appendix A, Table 2** for torque values.
4. Inspect for broken wire strands and pinched or damaged insulation on cable connections.

Insulation

All bus bar and structure insulation in the switchboard, including bus supports, bus shields, bus bracing, insulating barriers, and so on, should be visually checked for damage. Replace damaged parts. The life of insulation material is dependent on keeping the material dry and clean.

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Overcurrent devices

Maintenance instructions and field-testing for overcurrent devices are included with the instruction leaflet for each device within a family. One instruction leaflet per frame or family type was included with this installation booklet inside the switchboard. Refer to the leaflet on each device. If leaflets are missing, contact Eaton for replacement.

Circuit breakers

Visually inspect circuit breakers for signs of discoloration, cracking, scorching, overheating, or broken parts. Exercise the breaker operating mechanism, making sure it is opening and closing. A breaker showing signs of any one of these issues should be replaced. Refer to NEMA publication AB-4, *Guidelines for Inspection and Preventative Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications*.

Fusible overcurrent devices

Visually inspect the switching mechanism and fuse connections. Visually inspect the fusible devices for signs of discoloration, cracking, scorching, overheating, or broken parts. Replace any worn parts or the entire switch.

Fuse replacement

DANGER

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Be sure the switch mechanism is turned to the OFF position before attempting to remove fuses. Visually inspect the switch contacts, blades, and mechanism to ensure that the mechanism is in the OPEN/OFF position.

Check fuses to ensure that they are of the proper class, ampere, voltage, and interrupting rating. Ensure that non-current-limiting fuses are not used as replacements for current-limiting fuses. Never attempt to defeat rejection mechanisms that are provided to prevent the installation of the incorrect class of fuse.

Meters, controllers, surge equipment, and other devices

Individual devices should be maintained according to the specific instructions supplied for each device. Remove dust and dirt from exterior with a dry lint-free cloth. Unless specifically instructed in the individual device instruction leaflet, do not attempt to open sealed cases or containers.

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Secondary wiring

Check all wiring connections for tightness, including those at the current and potential transformers, if present, and at all terminal blocks. Check all secondary wiring connections to ensure that they are properly connected to the switchboard ground bus, where indicated. Look for broken wire strands and pinched or damaged insulation.

Ventilation

Check all grills and ventilation ports for obstructions and accumulations of dirt. Clean ventilation ports, if necessary. For switchboards installed outdoors, inspect the air space under the switchboard to be sure that it is clean and clear of debris, leaves, and obstructions.

Records

It is essential to maintain the equipment in satisfactory condition.

Maintain a permanent record of all maintenance activities and testing for future reference (see **Appendix B**).

The condition of each switchboard should be recorded as a guide for anticipating the need for any replacement parts or components or special attention at the next regular maintenance period. It is recommended that a series of inspections be made at quarterly intervals until the progressive effects of local conditions can be analyzed to determine a regular schedule.

Switchboard events and service interruptions

Short-circuits, ground faults, and overloads

WARNING

DO NOT ATTEMPT TO RE-ENERGIZE SWITCHBOARD OVERCURRENT DEVICES AFTER ELECTRICAL EVENTS, SUCH AS SHORT CIRCUITS, GROUND FAULTS, AND OVERLOADS, UNTIL THE CAUSE OF THE EVENT HAS BEEN IDENTIFIED AND CORRECTED.

A thorough assessment, identification, and correction of the event origin must be completed. An additional assessment of the conductor insulation and other insulating materials should be made. Replace all damaged insulation materials, conductors, and overcurrent devices. Original switchboard parts, insulators, insulation material, and overcurrent devices must be replaced with renewal parts from Eaton (see "Renewal parts," **page 19**).

Do not attempt to re-energize switchboard overcurrent components after electrical events, such as short circuits, ground faults, and overloads, until the cause of the event has been identified and corrected.

After the event has been rectified, test equipment per the maintenance process described in this publication.

Physical damage

Any physical damage to the switchboard that occurs after the switchboard is installed must be corrected. A thorough inspection, which includes the exterior enclosure and deadfront, plus interior components in the damaged portion of the switchboard, should be conducted. Replace all damaged parts and components. Ensure that there are no gaps in the switchboard enclosure that could cause exposure to live parts. Contact Eaton for renewal parts and assistance.

After the physical damage has been corrected, test equipment per the maintenance process described in this publication.

Water damage

⚠ DANGER

WET SWITCHBOARDS PRESENT A HAZARDOUS CONDITION AND MAY CAUSE INJURY OR DEATH. DE-ENERGIZE POWER TO ALL EQUIPMENT BEFORE SERVICING.

DO NOT WORK ON SURFACES OR FLOORS WHERE THERE IS STANDING WATER.

⚠ DANGER

DO NOT WORK ON SWITCHBOARDS OR ENTER AREAS THAT HAVE STANDING WATER. DE-ENERGIZE ALL EQUIPMENT IN AREAS WITH STANDING WATER.

DO NOT WORK ON WET ENERGIZED ELECTRICAL EQUIPMENT.

Major accumulation of water or moisture on any part of the switchboard can cause catastrophic damage to the switchboard. If a switchboard has been submerged by more than 2 inches or where running or standing water has had contact with current-carrying parts, it has sustained significant damage.

⚠ WARNING

SWITCHBOARD COMPONENTS, INCLUDING CIRCUIT BREAKERS, FUSIBLE SWITCHES, METERING, AND SO ON, SUBJECTED TO WATER OR MOISTURE MAY BE RENDERED UNSAFE. REPLACEMENT IS REQUIRED.

The switchboard and its components may be damaged beyond repair and may need replacement.

1. **Do not attempt to clean or repair water-damaged equipment or components.**
2. **De-energize the switchboard at its source.**
3. **Do not energize.**
4. **Contact Eaton for replacement.**

Minor accumulations of moisture, such as condensation, over a short period of time, may be corrected using heat.

De-energize switchboard.

Apply approximately 250 watts per vertical section for a sufficient period of time until the moisture disappears, and then remove all heat sources and materials used for drying.

Inspect for damage to components and any corrosion. If any damage or corrosion is present, contact Eaton. **DO NOT RE-ENERGIZE SWITCHBOARD.**

After the switchboard has dried completely, remove all materials and tools from the equipment. Inspect all connections for damage and torque. Reinstall all covers, fillers, deadfront assemblies, and side sheets. Conduct switchboard insulation resistance testing described in this publication.

Renewal parts

Switchboards can be complex assemblies with unique parts to fit the specific application and need. The manufacturer offers expertise with renewal part identification. To ensure safety and to maintain UL listing, it is essential that only new parts and components from Eaton be used.

When ordering renewal parts or when requesting information on the switchboard, it is essential to include as much information as possible.

Each switchboard will have a nameplate and other identification marks with details that will help expedite information requests and orders. The following may be required to help identify parts and information requests:

- GO or General Order Number
- Item number
- Description of the equipment
- Supply voltage
- Equipment ratings
- Catalog number or style number of part, if available
- Description of the part
- Drawing numbers
- Rating of part(s)

Electrical distribution equipment has a limited life span. As such, the manufacturer cannot guarantee the availability of obsolete equipment or parts. Equipment replacement may be recommended.