



MORRISON HERSHFIELD

Switchboard Circuit Breaker Remote Operation and Racking

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Switchboard Circuit Breaker Remote Operation and Racking

Operation and maintenance of power circuit breaker equipment involves exposure to potential hazards associated with high-energy electrical supply systems which are typically encountered within data centers. Switchboard accessory mechanisms are available to provide safety when interacting with this equipment.

An *Arc Flash* is a form of electrical explosion, usually occurring within electrical switchboards or other equipment, resulting from a low impedance fault between the phase conductors or between a phase conductor and the grounded equipment enclosures for a solidly-grounded neutral electrical distribution system.

According to various reports on workplace safety related incidents, about five arc flash incidents occur daily in the United States alone. Injuries vary from minor to extremely serious or critical burns, hearing and vision loss, or possible fatalities.



Morrison Hershfield's electrical engineering studies are performed to calculate the incident energy and determine flash protection boundaries for the facility's electrical equipment to establish the required class of Personal Protective Equipment (PPE) to be worn by equipment operators in accordance with industry standards. However, for some equipment installations the arc flash potential may be so extreme that access to the equipment may be classified as a Prohibited Approach Boundary. For these locations, there is no class of PPE that can adequately protect the operator thereby precluding safe breaker operation or racking while energized. Even for less extreme approach boundaries, it is desirable to provide for remote operation accessories and procedures which place the operator outside of the potential hazard zone by providing a means to remotely operate and rack-out power circuit breakers while the switchboard is energized.

There are three scenarios of equipment operation to consider:

- The first is during normal operation, i.e. opening and closing of a circuit breaker using the circuit breaker's integral push-buttons or operating switchboard-installed electrical operation switches or pushbuttons.
- The second scenario involves partial racking of a circuit breaker for a Lockout/Tagout operation or placing the circuit breaker in the Test position to disconnect its power terminals from the switchboard buses.
- The third scenario is the physical extraction of a power circuit breaker from an energized switchboard cradle for bench testing and maintenance.

Switchboards and circuit breakers require periodic inspection, testing, and maintenance for continued reliability and safe operation. Frequently, redundant design configurations may permit de-energized equipment maintenance, which is preferred for safe electrical equipment maintenance. However, there are many instances where circuit breakers may need to be partially racked or removed for maintenance while the switchboard remains energized.



For such critical activities, the use of a remote racking device permits the removal and re-insertion of switchboard circuit breakers while the operator is outside the flash protection boundary. There are many types of remote racking systems available. Remote racking mechanisms are electrically operated via a hand-held controller. Most are typically wired controls having cables 30 feet or more. Many incorporate wireless control systems which permit operation outside of the electrical room when the facility incorporates video monitoring of the electrical rooms. Both designs remove the operator outside the arc flash boundary. (Photo: Schneider Electric NW Remote Racking Device)

There are many varieties of remote operation devices for switchboard, switchgear, and motor control centers. Some are available from original equipment manufacturers. Others are manufactured by third party organizations. Remote operation tools may be generally categorized as follows:

Handheld Tools: Tools available from original equipment vendors are generally manufactured for a specific model of their circuit breaker and are designed to be temporarily bolted to the front of a breaker carriage, engage the racking screw, and withdraw the breaker to the Test or Disconnected Position. Similar equipment is also available from third-party suppliers may be adapted to a variety of different manufacturer's circuit breaker cradle hardware. (Photo: GE Remote Racking Operator).



Roll-up Racking Tools: Free-standing devices resembling a mover's hand truck which may be rolled-up to the switchboard are available in a variety of configurations. Many are manufactured to suit a given vendor's circuit breaker type, occasionally available with interchangeable hardware. The operating mechanism is then raised to a specific cell position where it engages the breaker cradle's jack-screw and safely operates to extract the circuit breaker. These tools are usually ideally suited for insulated case breakers. (Photo: CBS ArcSafe)



Roll-up Racking with Full Breaker Removal Tools: Variations on roll-up style may be equipped with an extraction type mechanism for breaker insertion and removal in conjunction with jack accessories to lift and transport a large circuit breaker. For large medium voltage and heavy air frame circuit breakers, varieties can also incorporate a crane for hoisting and support for these heavier circuit breakers.

Various manufacturers can incorporate integrated remote racking drive assemblies which are permanently installed within the cubicles of larger circuit breakers, usually for medium voltage switchgear, which only require the operator to plug-in the handheld remote control to operate and rack the circuit breaker at a safe distance while still observing the operation using appropriate protective equipment. Ideally suited for larger switchgear utilizing air magnetic, SF6, or vacuum circuit breakers, integral racking motors provide an additional margin of safety since external mounting and alignment of heavy or bulky equipment is eliminated, reducing operator exposure time in front of switchgear thereby increasing operator safety. Operator controls may be integrated into switchgear secondary control circuits or SCADA systems using standard interface protocols such as a Modbus interface or discrete component wiring to an operator console location. Electrical interlocking can be incorporated to assure open device extraction.

Many hardware and configuration options are available from which to select. Equipment for safe operation is available to protect operating personnel from unnecessary risk.

