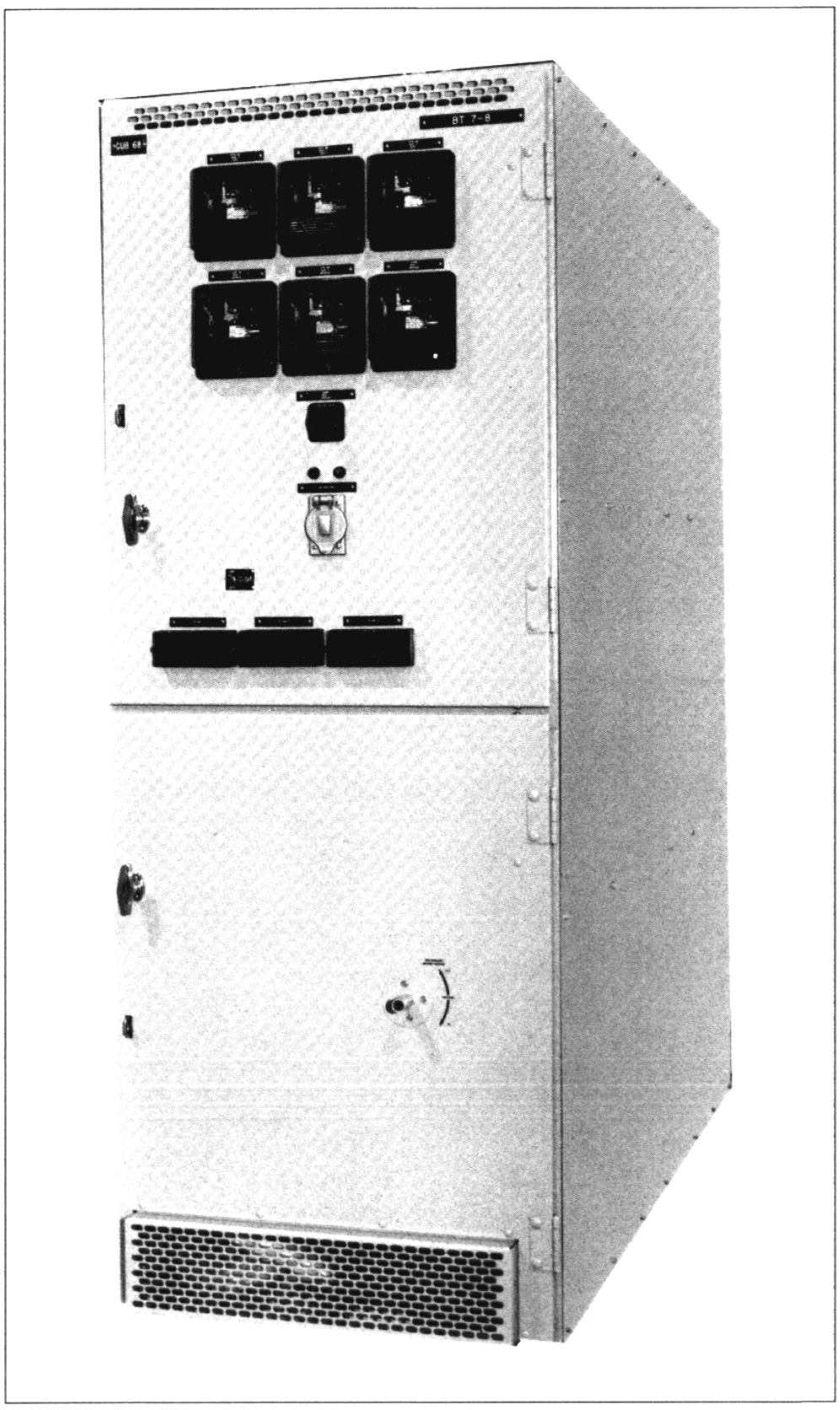
SQUARE D
Instruction Bulletin

Bulletin 6055-17
June, 1993
Smyrna, TN, U.S.A.

3000A Circuit Breaker Unit

For 4.76–15.0 kV
Series 3 Metal-Clad Switchgear



NOTICE

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this manual to warn of potential hazards and to call attention to additional information which clarifies or simplifies a procedure.

⚠ DANGER

Used where there is a hazard of severe bodily injury or death. Failure to follow a "DANGER" instruction ***will*** result in ***severe*** bodily injury or death.

⚠ WARNING

Used where there is a hazard of bodily injury or death. Failure to follow a "WARNING" instruction may result in bodily injury or death.

⚠ CAUTION

Used where there is a hazard of equipment damage. Failure to follow a "CAUTION" instruction may result in damage to equipment.

NOTE

Provides additional information to clarify or simplify a procedure.

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SECTION 1—INTRODUCTION

Square D's basic Series 3 metal-clad switchgear is designed for Type VAD-3 vacuum circuit breakers, which are available for 1200A and 2000A continuous current.

The 3000A unit detailed in this bulletin is used in the same lineup and has the same basic design concept as 1200A and 2000A units; however, it uses a Type VAD-2 circuit breaker (figure 1).

NOTE

Use this bulletin in conjunction with Instruction Bulletin 6055-10 *Metal-Clad Indoor Switchgear 4.76–15.0 kV.* All topics covered in instruction bulletin 6055-10 apply to this unit except for the circuit breaker cell description and operating instructions. Refer to instruction bulletin 6055-10 for information on the following topics:

- Voltage Transformer, Control Power Transformer, and Fuse Drawout Units
- Main Bus Compartment
- Cable Compartments
- Surge Protectors and Lightning Arrestors
- Start-up
- Inspection and Maintenance
- Accessories

Refer to instruction bulletin 6055-10 *before* performing work or maintenance on this unit. Contact your local Square D field office for additional copies.

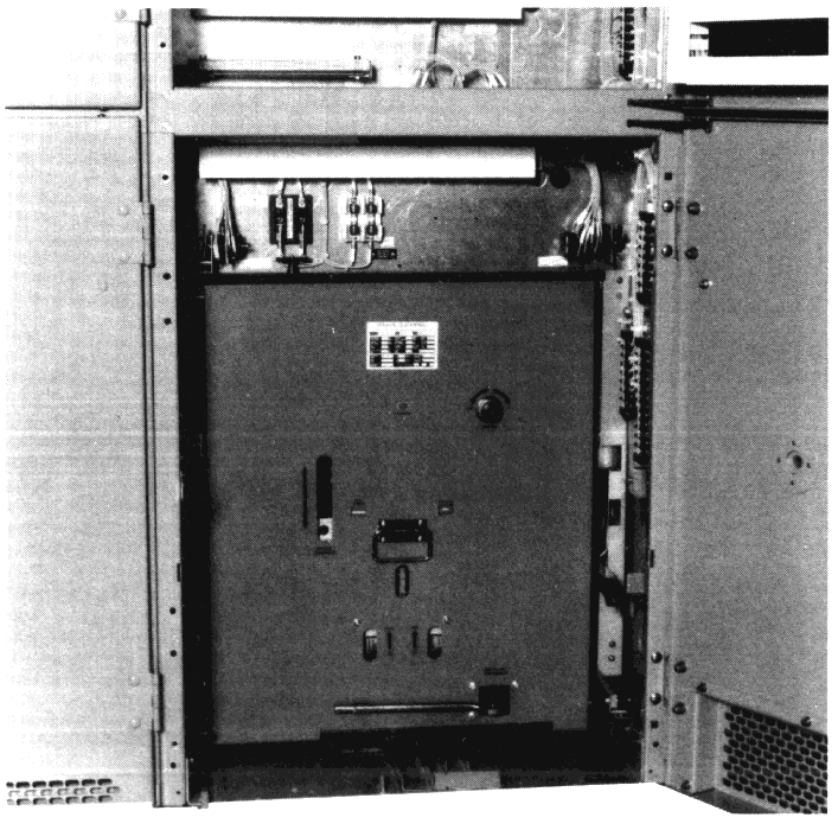


Figure 1: 3000A unit with VAD-2 circuit breaker

SECTION 2—SAFETY PRECAUTIONS

⚠ DANGER

HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE.

- All personnel involved in handling, site preparation, installation, testing, operation, and maintenance should be thoroughly familiar with the information in this instruction bulletin, instruction bulletin 6055-10, and customer drawings provided ***before*** working on this equipment.
- The metal-clad switchgear's protective features include automatic shutters, circuit breaker interlocks, and compartment barriers. All are designed to provide personnel protection when operated as instructed. Never make these interlocks inoperative; never operate the equipment with any safety barriers removed.
- Always assume that all high-voltage parts are energized until you are certain they are de-energized.
- Check interconnection diagrams and make sure there are no backfeed potential sources.
- Never disconnect the main trip source of energized equipment.
- Do not open a circuit breaker door unless the circuit breaker is tripped.
- Move circuit breakers to the *disconnected* position before removing rear access panels.
- Use out-of-service tags and padlocks when working on equipment. Leave the tags in place if you leave the area or until the work is completed and the equipment is ready to be put back into service.
- ***When in doubt, stop!*** Re-read the instruction bulletin(s) or refer to the customer drawings before proceeding. Eliminate dangerous and costly human errors!
- The complete assembly arrangement determines if the top or bottom contacts are the line side; both can be energized when the circuit breaker is removed from the compartment.
- Disconnect all high voltage to the switchgear before accessing the horizontal bus compartment.
- Do not use liquid fire extinguishers or water on electrical fires! Before extinguishing fires within the assembly, be absolutely certain the main power source is disconnected and the main and all feeder circuit breakers are tripped.
- This instruction bulletin does not cover all possible equipment combinations or details thereof. Nor does it cover field conditions that may exist or arise during handling, site preparation, installation, testing, operation, or maintenance. For additional information, or if unforeseen site conditions or problems exist, contact your local Square D field office.

Failure to observe these precautions will result in severe personal injury, death, or equipment damage!

SECTION 3—RECEIVING, HANDLING, STORAGE

Receiving

Two-high 4.76–15.0 kV metal-clad indoor switchgear is shipped on skids in protective crates or wrapping to prevent damage during normal transit. Circuit breakers are individually skid-mounted.

Inspect each crate for external damage or indications of rough handling before accepting the shipment. If there is any indication of external damage or mistreatment, or if the correct number of crates has not been received, make note of the problem on the shipping papers before signing them. Immediately file a formal damage claim with the carrier. Notify the local Square D field office about the extent of damage or shortages, and attach a copy of the formal damage claim.

Open the shipping crates as soon as possible after receipt and inspect the contents for damage. Check the packing list in detail against the equipment received to ensure the order and shipment are complete.

If the equipment is stored prior to installation, leave it on the shipping skids to facilitate moving it later.

Handling

The switchgear sections are normally shipped in one or two bays. Each section has four lifting lugs bolted on top. If more than two bays are shipped as one section, lifting channels or frames may be bolted on top. Put a crane hook through each of the four holes to lift and move the sections. After the group is placed in position, remove and discard the lifting lugs, then screw the bolts back into place to cover the mounting holes.

If no crane is available, the sections may be unloaded and moved with a forklift. Rollers under the skids may be used on a relatively flat surface if other moving equipment is not available or if space prohibits the use of other moving methods.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

Do not remove the skids until the shipping sections are in the final location. Do not maneuver the switchgear directly on rollers; always use the skids to prevent switchgear distortion or damage.

Failure to observe these precautions can result in equipment damage.

Storage

If the assembly is stored prior to installation, place it in a clean, dry, well-ventilated area with a mean temperature of approximately 70°F. Prohibit unauthorized personnel from entering the storage area to eliminate tampering. Place dust covers over circuit breakers. If space heaters are furnished in the assembly, energize them from an external source. Consult the schematic diagrams and wiring diagrams for a logical connection point, and for voltage and power requirements.

Storage (cont.)

If no space heaters are installed in the assembly, and the area is cold and damp, use a temporary heating source within the assembly. A minimum of 200 watts of heat per cell is recommended. Avoid greasy, smoky heaters; high carbon content smoke can deposit carbon on insulation, causing tracking and eventual insulation failure.

⚠ CAUTION

HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE.

If the space heaters are normally energized from the assembly control power transformer, open the control power transformer secondary circuit breaker, remove the primary current limiting fuses, and install an out-of-service tag before energizing the space heaters. This prevents backfeed to the main bus through the control power transformer.

Failure to observe these precautions can result in personal injury or equipment damage.

SECTION 4—DESCRIPTION

3000A Base Unit

The 3000A base unit has the same basic structure, main bus, load bus, and door features as the standard Series 3 switchgear. However, the 3000A circuit breaker cell is larger than the standard Series 3 circuit breaker cell detailed in Instruction Bulletin 6055-10 *Metal-Clad Indoor Switchgear 4.76–15.0 kV*. The 3000A base unit's ventilation system, which vents through the roof, is also larger (figure 2).

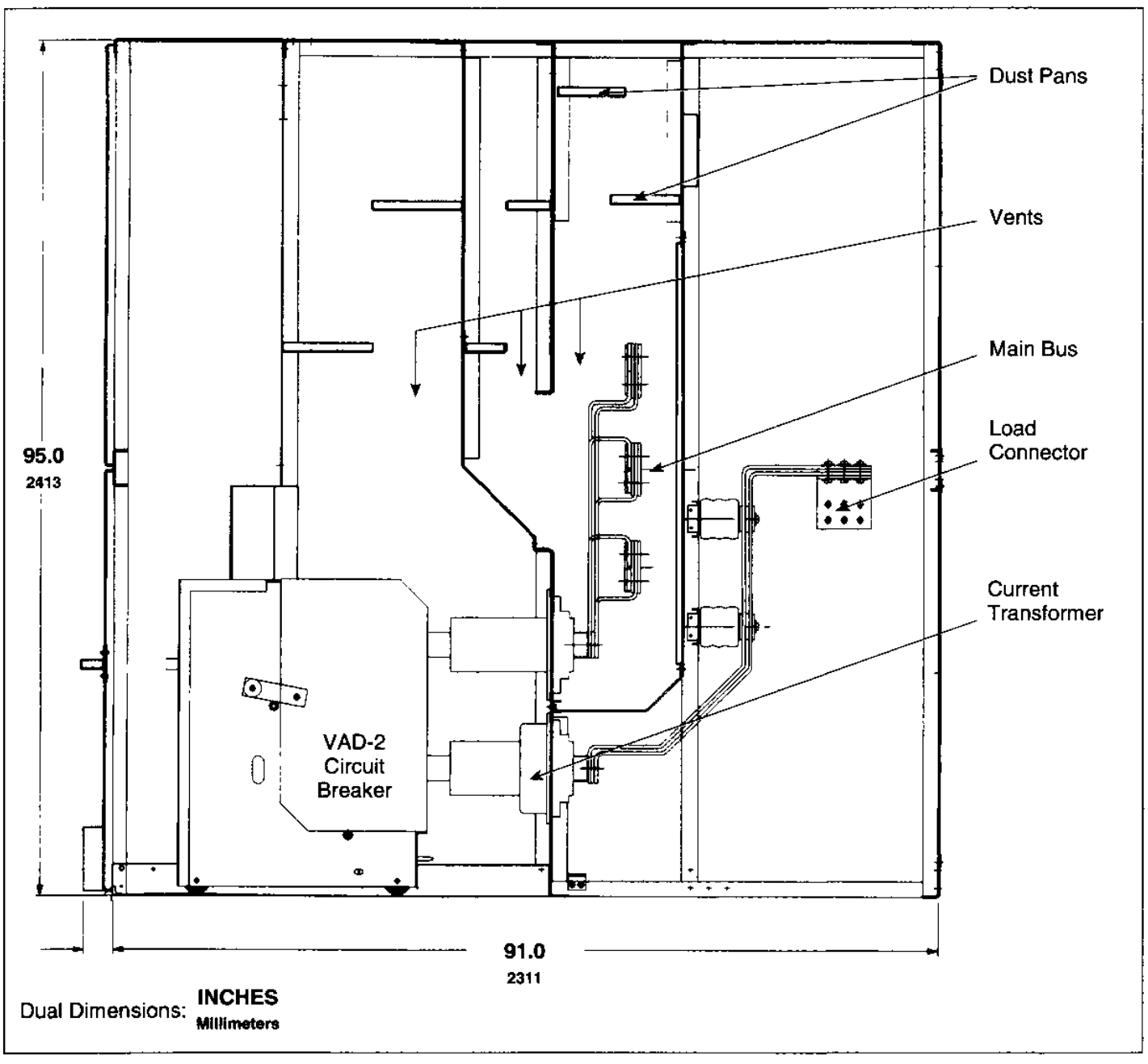


Figure 2: 3000A base unit outline

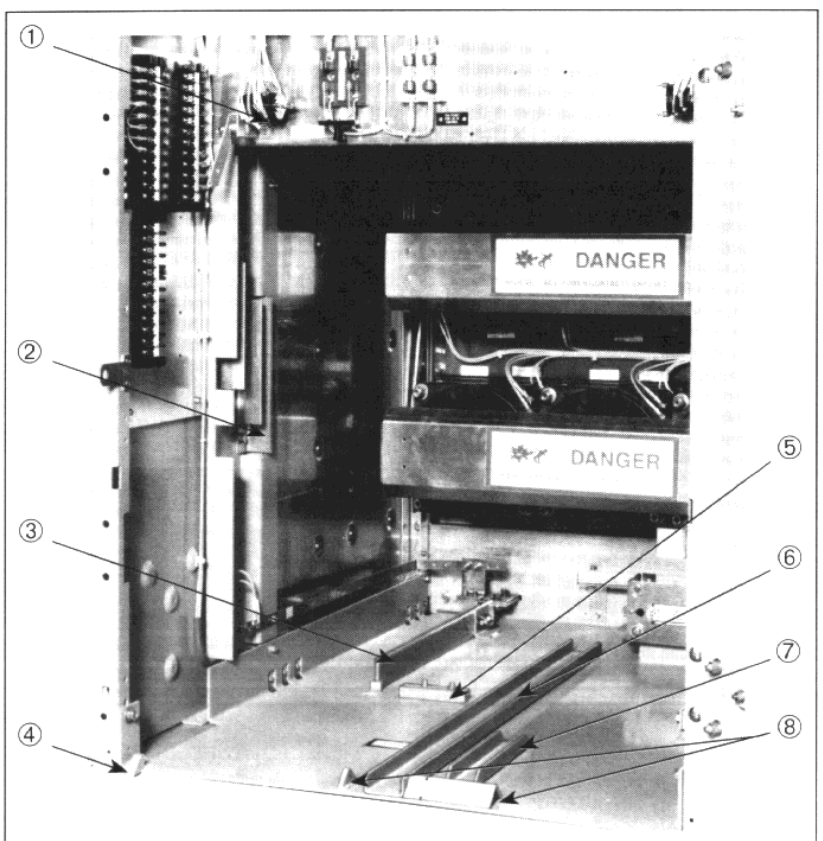
Circuit Breaker Cell

The circuit breaker cell (figures 3 and 4) contains 12 separate but coordinated features, each necessary for the safe operation of the circuit breaker:

- Circuit breaker guide channel
- Racking mechanism
- Disconnect position latch
- Circuit breaker interlocks
- Rating interlocks
- Ground and test unit interlock
- Secondary control power receptacle
- Shutters
- Cell interlock
- Ground contact bus
- Mechanism operated contacts (MOC)—optional
- Truck operated contacts (TOC)—optional

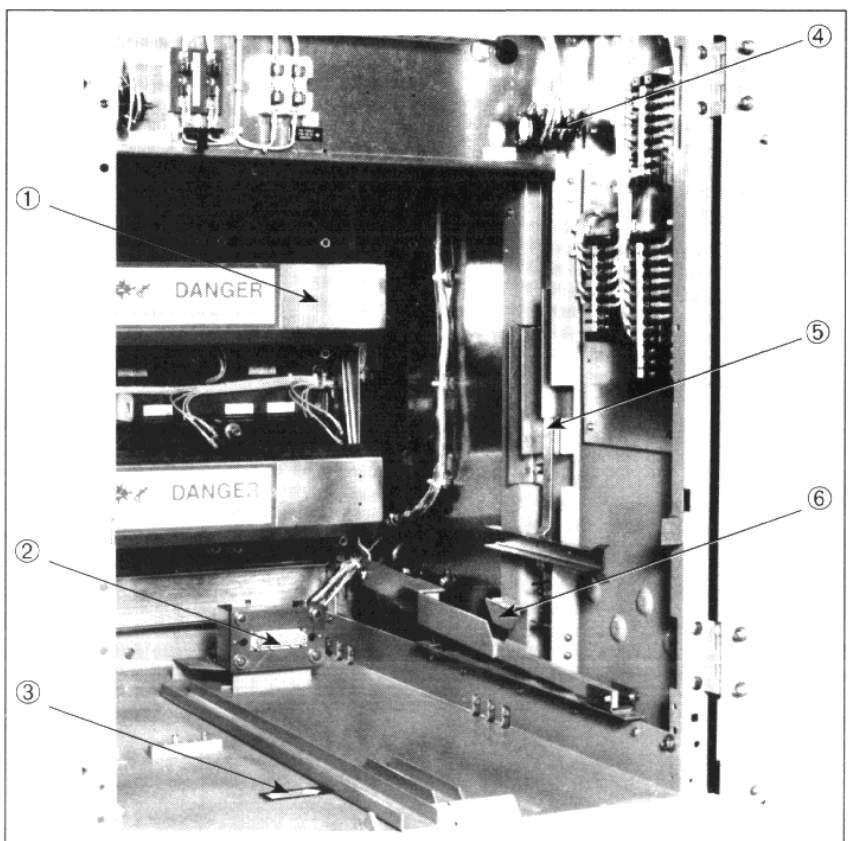
Each feature is described on the following pages.

Circuit Breaker Guide Channel—The circuit breaker guide channel (figure 3) is a floor-mounted channel running from front to back in the center of the compartment. It is used to align the circuit breaker in the compartment. Mating guides are located on the bottom of the circuit breaker. The circuit breaker guides slide inside the compartment guide channel when the circuit breaker is properly inserted into the compartment.



① Truck Operated Contacts (TOC)
② Racking Bracket
③ Ground Contact Bus
④ Circuit Breaker Latch Bracket
⑤ Compartment Rating Interlock
⑥ Circuit Breaker Guide Channel
⑦ Position Interlock
⑧ Spring Discharge Interlock

Figure 3: Circuit breaker interlocks



① Shutter
② Secondary Control Power Receptacle
③ Circuit Breaker Position Indicator
④ Mechanism Operated Contacts (MOC)
⑤ Racking Bracket
⑥ Shutter Pivoting Lever

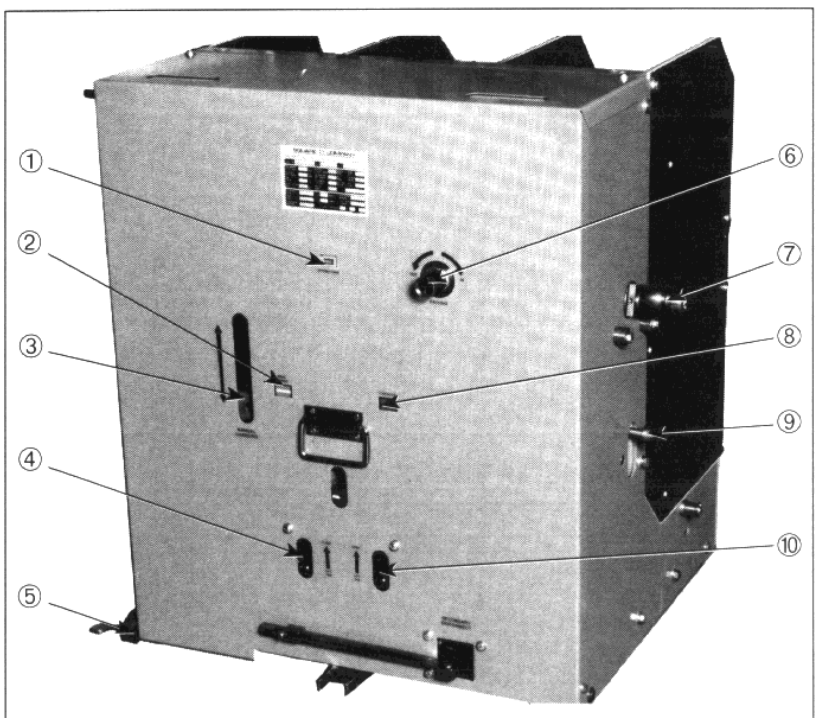
Figure 4: Shutter assembly and interlocks

Circuit Breaker Cell (cont.)

Racking Mechanism—Each circuit breaker has its own internal gear-driven mechanism which operates a racking arm with roller on the left and right sides of the circuit breaker (figures 5 and 6). The racking mechanism is operated by a removable racking crank inserted into the front of the circuit breaker, with the front door open or closed. Racking brackets are mounted on the left and right sides of the circuit breaker compartment. The racking arm rollers engage and hold the circuit breaker firmly in the *connected* position inside the compartment.

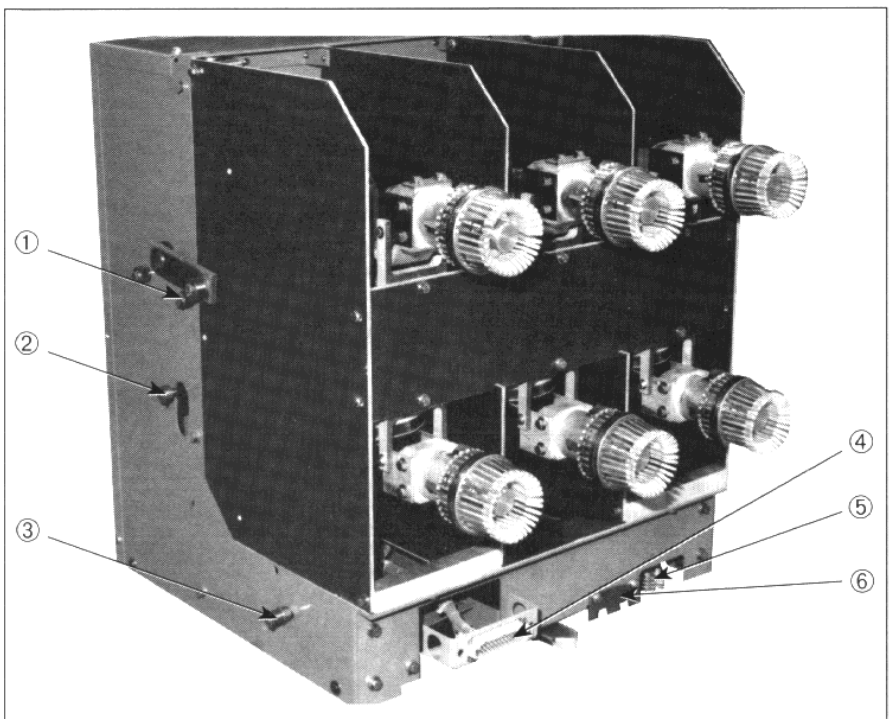
A circuit breaker position indicator (figure 4) is located on the cell floor. The racking crank has grooves which visually indicate the position of the circuit breaker when the door is closed. While cranking the circuit breaker in the *test/disconnected* or *connected* position, a position stop is felt.

Disconnect Position Latch—A latch at the bottom front of the circuit breaker (figure 5) prevents the removal of the circuit breaker from the cell. Push down and hold the disconnect position latch, releasing the VAD-2 circuit breaker from the *test/disconnected* position, to remove it from the cell.



① Operating Counter
② Spring Charge Indicator
③ Manual Spring Charging Port
④ Manual Close Lever
⑤ Disconnect Position Latch
⑥ Racking Shaft
⑦ Racking Arm
⑧ Open/Close Indicator
⑨ Mechanism Operated Contact (MOC) Shaft
⑩ Manual Trip Lever

Figure 5: Type VAD-2 vacuum circuit breaker, front



① Racking Arm
② Mechanism Operated Contact (MOC) Shaft
③ Shutter Roller
④ Secondary Control Power Plug
⑤ Ground Shoe
⑥ Circuit Breaker Rating Interlock

Figure 6: Type VAD-2 vacuum circuit breaker, back

Circuit Breaker Cell (cont.)

Circuit Breaker Interlocks—Two compartment floor-mounted interlock cam systems are provided as safety features.

A position interlock (figure 3, page 6) prevents the circuit breaker from being accidentally closed between the *test/disconnected* and *connected* positions. The interlock cam mechanically operates the circuit breaker trip mechanism between these two positions so the circuit breaker cannot be closed.

The spring discharge interlocks (figure 3) are used to discharge the springs. If the closing springs are charged, and the circuit breaker is inserted into or withdrawn from the compartment, the springs are automatically discharged approximately one inch from the *test/disconnected* position.

⚠ CAUTION

HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE.

Do not test interlocks by hand. Test interlocks only by moving the circuit breaker over the cell-mounted operating cams. Operating interlocks in an incorrect sequence may result in mechanism damage.

Failure to observe these precautions can result in personal injury or equipment damage.

Rating Interlocks—Each compartment (figure 3) and circuit breaker (figure 6, page 7) is provided with a set of fixed mechanical interference rating interlocks. These interlocks prevent accidental insertion into the compartment of circuit breakers with incorrect current, voltage, or interrupting ratings.

Ground And Test Unit Interlock—Each circuit breaker cell is equipped with a ground and test unit permissive interlock. It prevents the insertion into the circuit breaker cell of any G & T not equipped with the required ground and test unit interlocks.

Secondary Control Power Receptacle—The circuit breaker secondary control power receptacle (figure 4, page 6) is located in the lower right floor of the compartment. A moving mating secondary control power plug mounted on the circuit breaker can be connected in both the *test/disconnected* and *connected* positions. Engagement is automatic in the *connected* position.

Shutters—Two steel shutters (figure 4) are mounted directly in front of the primary high voltage contacts. Shutters prevent incidental contact with the primary high voltage contacts. The shutters move with a rotary motion. They are stored above the top and below the bottom primary high voltage contact tubes when the circuit breaker is in the *connected* position.

Shutter position is controlled by a shutter pivoting lever (figure 4) on the lower right side of the compartment. A shutter roller on the right side of the circuit breaker rides over the lever mechanism, forcing it to pivot and the shutters to open while the circuit breaker is being racked into the *connected* position.

The shutters can be held closed when the circuit breaker is withdrawn from the cell or when it is in the *test/disconnected* position (see **Cell Interlock**, page 9).

Circuit Breaker Cell (cont.)

Cell Interlock—A cell interlock is provided in each circuit breaker compartment for locking the circuit breaker out of the connected position.

The cell interlock is located inside the right-hand circuit breaker rail and has padlock provisions as standard. It can be equipped with a key interlock when specified by the user.

The cell interlock prevents racking the circuit breaker into the *connected* position. A circuit breaker can be stored in the *test/disconnected* position with the cell interlock closed.

Ground Contact Bus—A ground contact bus (figure 3, page 6) is located on the bottom of the circuit breaker cell. It connects directly to the main ground. A mating set of sliding contacts is located on the underside of the circuit breaker. The contacts engage before the circuit breaker reaches the *test/disconnected* position and stay continuously grounded up to the *connected* position.

Mechanism Operated Contacts (MOC)—Optional—Mechanism operated contacts (figure 4, page 6) are compartment-mounted auxiliary contacts operated by the circuit breaker mechanism. Like circuit breaker-mounted auxiliary contacts, they indicate the position—open or closed— of the circuit breaker. They operate in both the *connected* and *test/disconnected* positions. The MOC unit is used if more than five auxiliary contacts are needed on one circuit breaker.

The MOC unit is mounted on the right side of the circuit breaker cell. It is operated by a mechanism that is driven vertically by a roller on the right side of the circuit breaker. Gravity holds the mechanism in the open position when the circuit breaker is withdrawn from the compartment.

Truck Operated Contacts (TOC)—Optional—Truck operated contacts (figure 3, page 6) indicate the physical position of the circuit breaker in the compartment. They indicate whether the circuit breaker is in the *connected* or *test/disconnected* position.

The TOC unit does not distinguish between the circuit breaker being in the *test/disconnected* position or withdrawn completely from the compartment.

The TOC unit is mounted on the left side of the horizontal steel barrier in the top of the circuit breaker cell. It is operated by a spring-loaded lever. This lever is activated, just before the circuit breaker reaches the operating position, by a bracket on the front cover of the circuit breaker.

SECTION 5—OPERATING INSTRUCTIONS

Circuit Breaker-Circuit Breaker Cell Interlock System

The circuit breaker and the circuit breaker cell are equipped with an interlock system (figure 3, page 6). The system is activated by cams mounted on the floor of the circuit breaker cell which push operating rods on the circuit breaker. The interlocks provide the following safety features:

- Prevent the circuit breaker from being pushed into the cell when the circuit breaker is closed. Spring discharge cams (spring discharge interlock, figure 3) trip the circuit breaker automatically when the circuit breaker enters the cell.
- Prevent the circuit breaker from being closed while it is moved between the *test/disconnected* and *connected* position. A long cam holds the trip signal on the circuit breaker (position interlock, figure 3).
- Prevent the circuit breaker from being moved from the operating position when the circuit breaker is closed. The racking mechanism on the circuit breaker is blocked when the circuit breaker is closed, preventing the circuit breaker from being moved. Even if the circuit breaker was movable when closed, a cam would trip the circuit breaker open.
- Discharge both the closing and trip springs when the circuit breaker is being moved from the circuit breaker cell. Spring discharge cams actuate both the *trip* and *close* signals for personnel safety.

Circuit Breaker Operation

The vacuum circuit breaker has five operating functions built into the circuit breaker and circuit breaker cell. They are listed below:

- Racking mechanism
- Secondary control power plug
- Disconnect position latch
- Manual spring charging mechanism
- Manual close and open

Each of the functions is described in detail below.

Racking Mechanism—The racking mechanism moves the circuit breaker from the *test/disconnected* position to the *connected* position and back to the *test/disconnected* position. For a description of how the mechanism works, see **Racking Mechanism**, page 7.

Push the circuit breaker into the compartment to engage the disconnect position latch. The racking mechanism arm rollers aim toward the back of the circuit breaker, approximately 15° below horizontal.

Insert the racking handle (figure 7, page 11), and rotate it clockwise to rack the circuit breaker into the *connected* position. When in the *connected* position, the circuit breaker's forward motion stops. The compartment and circuit breaker position indicators align. This alignment is visible when the circuit breaker is racked with the door open. When the circuit breaker is racked with the door closed (which must be done when the switchgear is energized), the red groove on the operating handle will line up with the front door.

Circuit Breaker Operation (cont.)

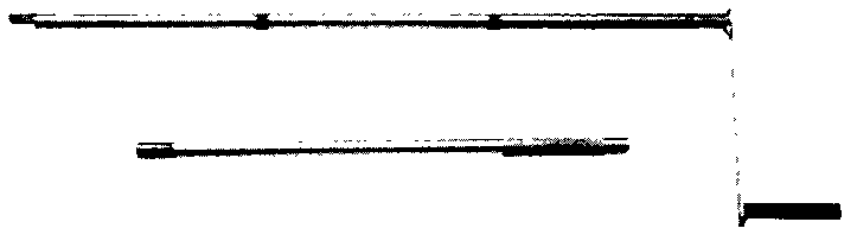


Figure 7: Circuit breaker racking and charging handles

To remove a circuit breaker from the *connected* position to the *test/disconnected* position, open the circuit breaker electrically with the compartment door closed. Insert the racking handle; rotate it counterclockwise until the compartment and circuit breaker position indicators line up and/or the green groove of the racking handle lines up with the closed front door.

⚠ WARNING

HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE.

When the switchgear is energized, always open and close the circuit breaker, and rack the circuit breaker from one position to another with the door closed.

Never force the circuit breaker inside the circuit breaker cell. If a mechanism is not operating smoothly, always look for and correct the cause.

Failure to observe these precautions can result in severe personal injury, death, or equipment damage!

Secondary Control Power Plug—The secondary control power plug (SCPP) provides control power to the circuit breaker and provides necessary electrical control to the circuit breaker. In normal operation, the SCPP automatically connects and disconnects as the circuit breaker is moved into and out of the connected position. The SCPP can be engaged while the circuit breaker is in the *test/disconnected* position.

To test the control system while the circuit breaker is in the *test* position, unlatch and lift the manual control plug operator, pushing it into the circuit breaker. When a stop is felt, the plug engages. The circuit breaker can now be electrically operated the same as in the *connected* position. After checking all electrical functions, unplug the control and fold the operating handle back to its normal position. Crank the circuit breaker into the *connected* position as necessary.

The circuit breaker secondary control power plug (figure 6, page 7) automatically engages the compartment secondary control power receptacle when in the *connected* position, and disengages as the circuit breaker is racked out to the *test/disconnected* position.

Disconnect Position Latch—The disconnect position latch (figure 5, page 7) prevents the circuit breaker from rolling out of the compartment in the *test/disconnected* position. To remove the circuit breaker, push down and hold the latch handle while pulling the circuit breaker out of the compartment.

Circuit Breaker Operation (cont.)

Manual Spring Charging Mechanism—In normal operation, when the control plug is engaged, the motor automatically charges the circuit breaker closing springs. The springs can also be charged manually, using the manual spring charging mechanism. This feature is provided for testing and maintenance purposes, and for extreme emergency operating conditions.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

Never manually close a circuit breaker in the *connected* position, unless the opening source of power and protective relays are connected and operable.

Failure to observe this precaution can result in equipment damage.

Insert the manual charging handle (figure 7, page 11) into the manual spring charging mechanism; pump the handle up and down until a loud click is heard, and the pumping force becomes prohibitive. **Remove the handle**. The closing springs are now charged, and the circuit breaker can be closed and opened electrically or manually. Refer to the circuit breaker instruction manual for further information.

Manual Close And Open Levers—Manual close and open levers are located at the bottom of the circuit breaker. These levers operate the circuit breaker whether the circuit breaker is charged manually or electrically; use them only when testing the circuit breaker during start-up or maintenance.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

When the switchgear is energized, never use the manual open and close levers stored on the front of the circuit breaker. Use the control switch with the front door closed.

Failure to observe this precaution can result in equipment damage.

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