IB 6.2.13.7-1
Rev. 2, Feb-98

INSTALLATION/MAINTENANCE INSTRUCTIONS

Medium Voltage
Vacuum Power Circuit Breakers

ADVAC™

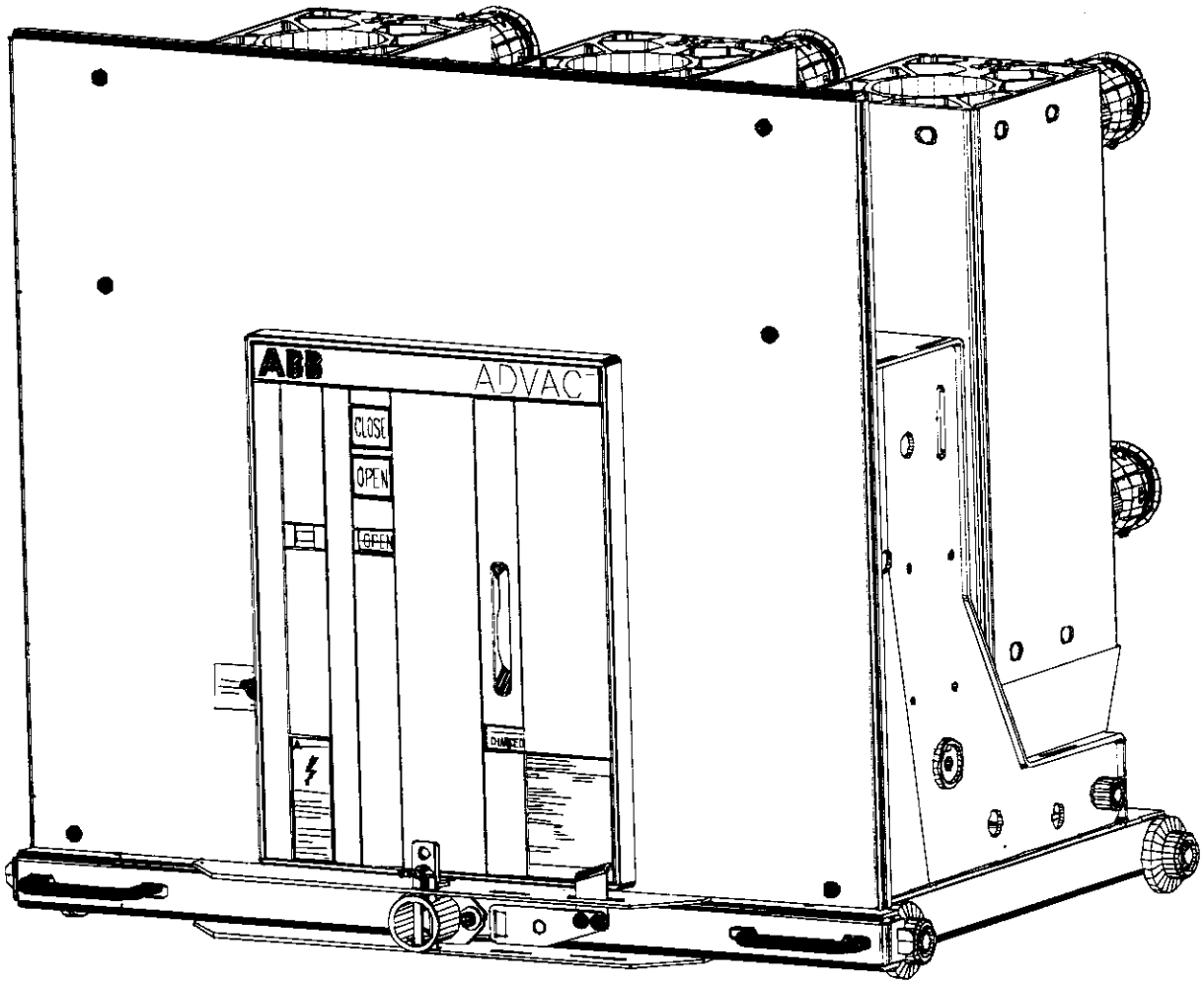


ABB Power T&D Company Inc.
Distribution Systems Division

TABLE OF CONTENTS

These instructions do not purport to cover all details or variations nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose the matter should be referred to the nearest District Office.

INTRODUCTION

The purpose of this manual is to provide instructions for unpacking, storage, installation, operation and maintenance for the ADVAC™ vacuum circuit breakers. This manual should be carefully read and used as a guide during installation, initial operation, and maintenance.

The specific ratings of each model circuit breaker are listed on the individual nameplates. The ADVAC™ breakers are protective devices. As such, they are maximum rated devices. Therefore, they should not under any circumstances be applied outside of their nameplate ratings.

WARNING WARNING WARNING WARNING

THE CIRCUIT BREAKERS DESCRIBED IN THIS BOOK ARE DESIGNED AND TESTED TO OPERATE WITHIN THEIR NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS MAY CAUSE EQUIPMENT TO FAIL, RESULTING IN PROPERTY DAMAGE, BODILY INJURY AND DEATH.

ALL SAFETY CODES, SAFETY STANDARDS AND/OR REGULATIONS AS THEY MAY BE APPLIED TO THIS TYPE OF EQUIPMENT MUST BE STRICTLY ADHERED TO.

FIELD NOTES

SAFE PRACTICES

ADVAC™ circuit breakers are equipped with high energy and high speed mechanisms. The design includes several interlocks and safety features to provide safe and proper operating sequences. To ensure safety of personnel associated with installation, operation and maintenance of these breakers, the following recommendations must be followed:

Only qualified persons, as defined in the National Electric Safety Code, who are familiar with the installation and maintenance of medium voltage circuits and equipment should be permitted to work on these breakers.

Read these instructions carefully before attempting any installation, operation or maintenance of these breakers.

DO NOT work on an energized breaker.

DO NOT work on a breaker unless all components are disconnected by means of a visible break and securely grounded.

DO NOT work on a breaker with power supplied to the secondary control circuit.

DO NOT defeat safety interlocks. This may result in bodily injury, death and/or equipment damage.

DO NOT work on a closed breaker.

DO NOT work on a breaker with a charged closing spring.

DO NOT use a circuit breaker by itself as the sole means of isolating a high voltage circuit.

DO NOT leave a breaker in an intermediate position in a cell. Always have the breaker in the disconnect, test or connected position.

IMPORTANT NOTICE:

FAILURE TO OBSERVE THE REQUIREMENTS OF OSHA STANDARD 1910.269 CAN CAUSE DEATH OR SEVERE BURNS AND DISFIGUREMENT. THAT STANDARD SPECIFICALLY PROHIBITS THE WEARING OF POLYESTER, ACETATE, NYLON, OR RAYON CLOTHING BY EMPLOYEES WORKING WITH EXPOSURE TO ELECTRIC ARCS OR FLAMES

FIELD NOTES

RECEIVING, HANDLING, AND STORAGE

ADVAC™ circuit breakers are subject to complete factory production tests and inspection prior to packaging. The shipping package is designed to provide protection during shipment and to provide convenient handling. Accessories such as charging handles and racking handles are shipped separately from the circuit breaker.

Receiving

Immediately upon receipt of the circuit breakers, examine the cartons to determine if any damage or loss was sustained during transit. If injury or rough handling is evident, file a damage claim at once with the carrier and promptly notify the nearest District Office. ABB is not responsible for damage of goods after delivery to the carrier. However, we will lend assistance if notified of claims. Use care in unpacking to avoid damaging any circuit breaker parts.

Unpack circuit breakers as soon as possible after receipt. If unpacking is delayed, difficulty may be experienced in making a claim for damages not evident upon receipt. Check the contents of each carton against the packing list before discarding any packing material. If any discrepancy is discovered, promptly notify the nearest District Office. Information specifying the purchase order number, carton number and part numbers of damaged or missing parts should accompany the claim.

Handling

ADVAC™ circuit breaker shipping containers are designed to be handled by fork lift. If the container must be skidded for any distance it is preferable to use roller conveyors of individual pipe rollers.

Once removed from the shipping container, the circuit breaker wheels are designed to move the breaker across a smooth, prepared surface.

Care must be taken not to damage the secondary locking tab (item 9, page 8) when transporting, rolling, or handling the ADVAC™ breakers.

DO NOT pull the circuit breaker by the front handles with the breaker in any position other than full disconnect.

Storage

Circuit breakers should be installed in their permanent location as soon as possible. If the breakers are not placed in service for some time, it is advisable to provide adequate means of protection. This may be done by keeping the breaker in its original shipping container and storing in a warm, dry and uncontaminated atmosphere. The breakers should be stored to minimize condensation. Moisture can cause deterioration of metal parts and high voltage insulation.

Prior to storage of the breaker, verification should be made that the breaker is free from shipping damage and is in satisfactory operating condition. See *DESCRIPTION AND OPERATION* to verify satisfactory operating condition.

CAUTION CAUTION CAUTION CAUTION

The shipping containers provided are not designed for stacking.

INSERTION AND REMOVAL

WARNING WARNING WARNING WARNING

DO NOT ATTEMPT TO INSERT THE CIRCUIT BREAKER INTO ANY CIRCUIT BREAKER COMPARTMENT PRIOR TO INSPECTION OF THE BREAKER. COMPARE BREAKER NAMEPLATE RATING WITH SWITCHGEAR RATING. VERIFY SECONDARY VOLTAGES ON THE BREAKER AND IN THE CIRCUIT BREAKER COMPARTMENT.

DO NOT ATTEMPT TO INSERT A CLOSED CIRCUIT BREAKER.

ALWAYS INSPECT BREAKER COMPARTMENT TO ENSURE THAT IT IS FREE OF OBSTRUCTIONS, TOOLS, OR OTHER EQUIPMENT.

Insertion (Refer to Fig. 1 & 2)

(from Withdrawn Position)

1. Align breaker and ramp, dolly or lift truck with circuit breaker compartment
2. Pull handles (10) to center (this withdraws Cell Interlock Tabs (11) allowing breaker to be inserted)
3. Push breaker into breaker compartment with handles. Interlocks may restrict insertion. (Ref. *Interlocks*)
4. Align Cell Interlock Tabs with Circuit Breaker Compartment Slots (A)
5. Push Handles out to fully engage Cell Interlock Tabs into Circuit Breaker Compartment Slots
   A. Visually check that Cell Interlock Tabs are engaged in Circuit Beaker Compartment Slots (if Cell Interlock Tabs are not fully extended, racking is prevented)
   B. Breaker is now in the Disconnect Position

Removal (Refer to Fig. 1 & 2)

(to Withdrawn Position)

CAUTION CAUTION CAUTION CAUTION

Do not attempt to remove the breaker from the circuit breaker compartment without the required ramp, dolly or lift truck. Refer to the specific switchgear Installation and Maintenance manual for details.

1. Visually check to see the Truck (12) is against the Locator Channel
2. Pull Handles to center (this withdraws Cell Interlock Tabs allowing breaker to be removed and discharges mechanism)
3. Pull the breaker from Circuit Breaker Compartment with the Handles onto the required transportation device
4. Breaker is now in the Withdrawn Position.

FIELD NOTES

Racking

ADVAC™ circuit breakers are designed with three positive positions. The Disconnect position allows only manual operation of the breaker without control power and shutters closed. The Test Position allows manual and electrical operation of the breaker with control power supplied through the secondary contacts with shutters closed. As the breaker approaches the Connected position, an increase in racking force is required to lift the shutters and to engage the primary contacts. In the Connected position the primaries are fully engaged with shutters open, and electrical operation of the breaker through the secondaries is still enabled.

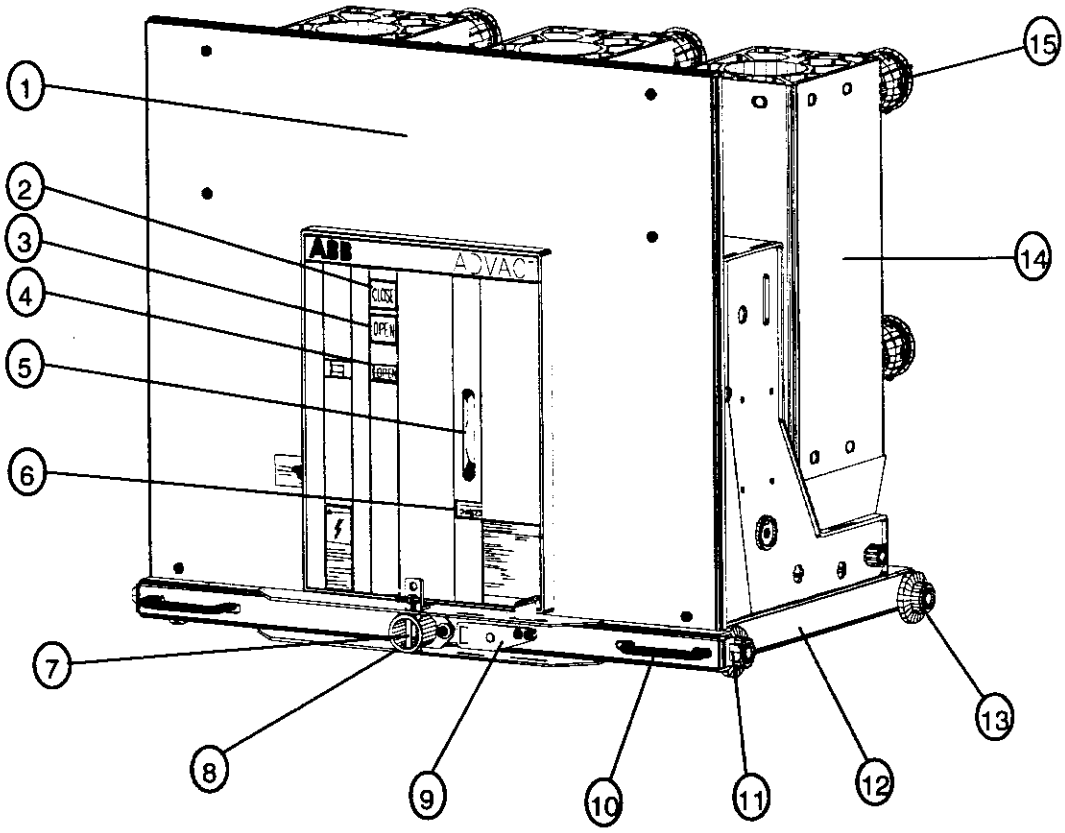
1. Engage Racking Handle onto Racking Screw (7)
2. Actuate Position Release Lever (9) to begin racking breaker
   A. Clockwise (cw) rotation inserts the breaker towards the primaries
   B. Counterclockwise (ccw) rotation withdraws the breaker away from the primaries

Disconnect Through Test

1. Breaker MUST BE OPEN and discharged prior to racking (Ref. *Manual Operation of Breaker*)
   A. Verify Close/Open Indicator shows OPEN
   B. Verify Charged/Discharged Indicator shows DISCHARGED
   C. Verify Motor Disconnect Switch OFF
      (The motor will charge when the secondaries engage if the switch is ON)
2. Four (4) revolutions (40mm) will move the breaker between the Disconnect and Test positions
   A. The Disconnect Position is indicated by a positive lock
      - Actuate Position Release Lever (9) to begin racking from disconnect position
   B. The Test Position is indicated by a positive lock
      - Closing is prevented between Disconnect and Test positions
      - Control power is available in the Test Position, Shutters are closed.

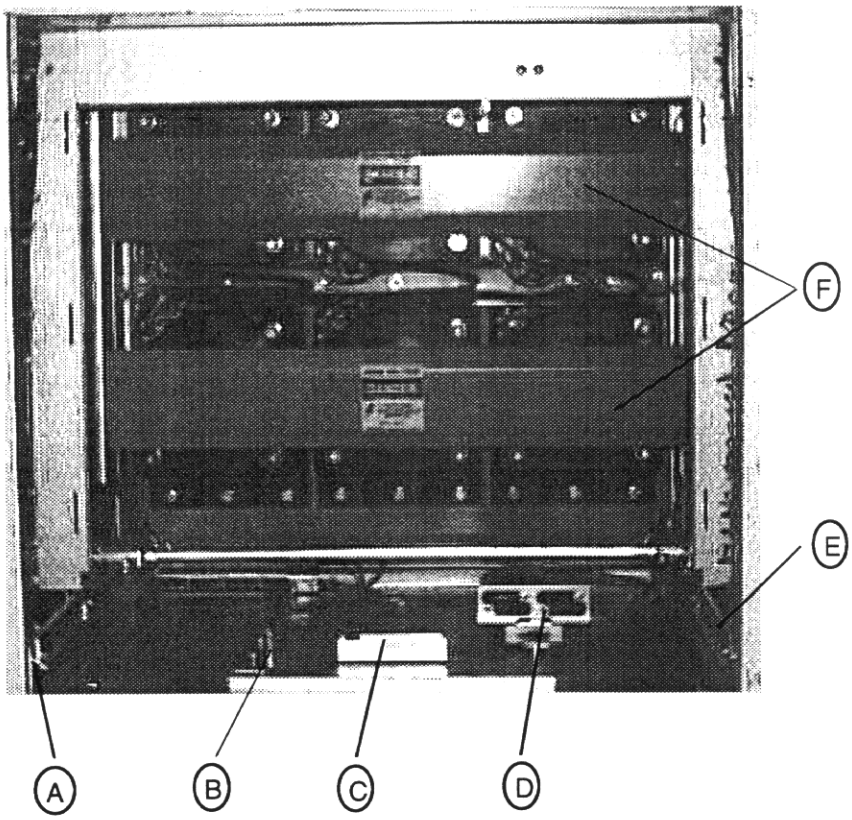
Test Through Connect

1. Breaker MUST BE OPEN before racking (see Electrical Operation)
   A. Verify Close/Open Indicator shows OPEN
   B. Verify Motor Disconnect Switch is ON
   C. Breaker Compartment Door is CLOSED
2. 21 revolutions (210mm) will move the breaker between the Test and Connect positions
   A. The Test Position is indicated by a positive lock
      - Racking is prevented for a CLOSED breaker
      - Actuate and hold the Position Release (9) to begin racking from the Test Position
      - Closing is prevented between Test and Connect positions
   B. The Connect Position is indicated by a position lock
      - Racking is prevented for a CLOSED breaker
      - Actuated and hold the Position Release to begin withdrawal from the Connect Position



#	DESCRIPTION	#	DESCRIPTION
1	FRONT PLATE ASSY	9	POSITION RELEASE
2	CLOSE PUSH BUTTON	10	HANDLE
3	OPEN PUSH BUTTON	11	CELL INTERLOCK TAB
4	CLOSE/OPEN INDICATOR	12	TRUCK
5	CHARGING PAWL	13	WHEEL
6	CHARGED/DISCHARGED INDICATOR	14	POLE ASSEMBLY
7	RACKING SCREW	15	PRIMARY CONTACT
8	COLLAR		

Figure 1: Breaker with Front Plate



#	DESCRIPTION		#	DESCRIPTION
A	COMPARTMENT SLOTS		D	SECONDARY DISCONNECTS
B	GROUND BAR		E	WHEEL RAILS
C	CODE PLATE		F	SHUTTERS

Figure 2: Breaker Compartment

	DISCONNECT	TEST	CONNECT
Distance from Disconnect	0 MM 0 REVOLUTIONS 0 INCHES	40 MM 4 REVOLUTIONS 1.57 INCHES	250 MM 25 REVOLUTIONS 9.84 INCHES
Manual Operation	YES	YES	NOT RECOMMENDED
Electrical Operation	NO	YES	YES
Control Power	NO	YES	YES
Shutter	CLOSED	CLOSED	OPEN
Primary Engaged	NO	NO	YES
Position Indication	POSITIVE LOCK & CELL DECAL	POSITIVE LOCK & CELL DECAL	POSITIVE LOCK & CELL DECAL
Interlocks	INTERFERENCE BLOCKING PREVENTS INSERTION RELEASE LEVER	RELEASE LEVER	CLOSING PREVENTED UNTIL IN FULL CONNECT RELEASE LEVER
Requirements To Rack breaker from Position	BREAKER OPEN POSITION RELEASE LEVER ACTUATED	BREAKER OPEN POSITION RELEASE LEVER ACTUATED	BREAKER OPEN POSITION RELEASE LEVER ACTUATED
Notes	A, B	A	A

Table 1 : Racking

Notes:

A. Closed door racking is recommended between ALL positions. Racking with the breaker compartment door open between any position defeats the safety provided by SafeGear design and construction.

B. Motor Disconnect Switch should be OFF until secondaries are engaged in the Test Position.

THIS PAGE INTENTIONALLY BLANK

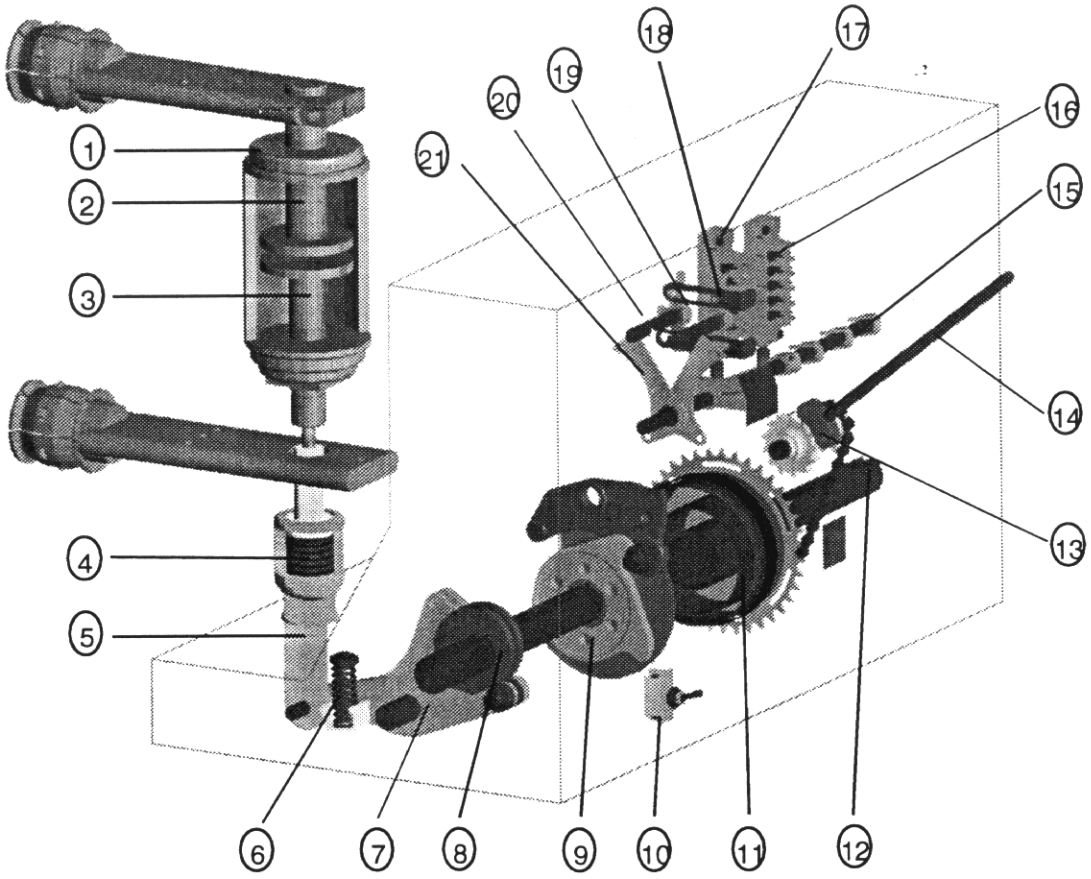
DESCRIPTION AND OPERATION

The ADVAC™ medium voltage circuit breaker uses a spring for stored energy. The Closing Spring (11) is a toroidal spring. This spring supplies the force necessary to close the breaker but also assists with the opening. During the closing operation, Opening Springs (6) (compression type) are charged along with Contact Springs (4) (also compression type) in the pole assembly. During the opening operation, the Contact Springs and Opening Springs supply the driving force to open the interrupter contacts.

Mechanism Operation (Refer to Fig. 3)

1. Manual or electrical charging rotates the Closing Spring (11) 360° to charge
   A. Motor limit switch (17) changes state and removes control power from the motor
   B. Closing Spring Charged/Discharged Indicator changes to show CHARGED
   C. Close Trigger (20) is set against Half Shaft (19)
2. Manual or electric close rotates half shaft (19) to release Close Trigger
   A. Close Trigger releases Stop Disk (9) through a series of linkages
   B. The Closing Spring rotates Main Shaft (12) 270°
   C. The Cams (8) fixed on Main Shaft actuate Rocker Arms for each pole
      - Rocker Arms compress Opening Springs
      - Rocker Arms drive interrupter Push Rods (5)
      - Push Rods close interrupter Moving Contact (3)
      - Push Rods charge Contact Springs (4)
   D. Main Shaft actuates Auxiliary Shaft (15) changing Auxiliary Contacts (16)
      - 52a contacts close
      - 52b contacts open
3. Manual or electric opening rotates half shaft to release Open Trigger
   A. Open Trigger releases Stop Disk through a series of linkages
   B. Opening Springs, Contact Springs and Closing Spring discharge, rotating the Main Shaft 90° (discharging the 360° charge on the Closing Spring)
   C. Contact Springs discharge driving Push Rod to begin opening the Interrupter contacts
   D. Opening Springs discharge driving the Rocker Arms to fully open the Interrupter Contacts
   E. Closing Spring discharges rotating the

      Cam 90°
   F. Main Shaft actuates Auxiliary Shaft changing Auxiliary Contacts (16)
      - 52a contacts open ; 52b contacts close



#	DESCRIPTION	#	DESCRIPTION
1	VACUUM INTERRUPTER	12	MAIN SHAFT
2	STATIONARY CONTACT	13	CHARGING PAWL
3	MOVING CONTACT	14	CHARGING HANDLE
4	CONTACT SPRINGS	15	AUXILIARY SHAFT
5	PUSH ROD	16	AUXILIARY CONTACT
6	OPENING SPRING	17	MOTOR LIMIT SWITCH
7	ROCKER ARM	18	CLOSE PUSHBUTTON
8	CAM	19	HALF SHAFT
9	STOP DISK	20	CLOSING TRIGGER
10	MOTOR DISCONNECT SWITCH	21	OPENING TRIGGER
11	CLOSING SPRING		

Figure 3: Breaker

Interlocks

The ADVAC™ breaker contains a number of interlocks. A description of each interlock follows as encountered during racking of the breaker into the breaker compartment.

DANGER DANGER DANGER DANGER
MODIFICATION TO INTERLOCKS CAN RESULT IN HAZARDOUS CONDITIONS TO PERSONNEL AND EQUIPMENT. DO NOT OVERRIDE, BY-PASS OR ADJUST INTERLOCKS.

INTERFERENCE BLOCKING: A code plate in the breaker compartment prevents under rated breakers from being inserted into higher rated compartments. The code plate rating includes continuous current, interrupting current, close and latch capability and maximum voltage. Breakers with the same or higher code plate rating can be inserted into a compartment of equal or lower value.

POSITIVE POSITION FOR RACKING: The racking mechanism is blocked unless the interlock tabs are fully extended into the compartment slots.

POSITIVE POSITION FOR REMOVAL: The handle release pin prevents withdrawing the breaker from the compartment by blocking withdrawal of the locking tabs. The handle release pin blocks the handles unless the breaker is in the Disconnect position.

CAUTION CAUTION CAUTION CAUTION
The closing spring may be manually recharged in the disconnect and withdrawn positions. Verify that the breaker is OPEN and the Closing Spring is DISCHARGED before removing the front cover.

AUTOMATIC SPRING DISCHARGE (ASD): This maintenance interlock discharges the closing spring and opens the breaker. Activation of the ASD occurs when withdrawing the locking tabs in the Disconnect position.

POSITION INTERLOCKS: The Position Release Lever must be depressed in order to begin racking the breaker in any direction from any positive position (Disconnect, Test, or Connect). The release lever is blocked from actuation when the breaker is CLOSED. The ability to close the breaker is blocked unless the breaker is in one of the three positive positions.

Manual Operation of Breaker

(Refer to Table 1 & Fig. 1)

The breaker can be operated manually or electrically. The manual Charging Handle is required for manual operation.

1. Inspect initial state of the breaker to determine the operations available (Refer to Table 1 and Fig.1)
   - A. Close/Open indicator (4)
   - B. Closing Spring Charged/Discharged Indicator (6)

Closing Spring Indicator (6)	Mechanism (4)	Operations Available	Proceed to Step
Discharged	Open	None Available	2
Discharged	Closed	Open	6
Charged	Open	Close-Open	5
Charged	Closed	Open-Close-Open	7

Table 2: Operations

2. Insert manual Charge Handle into Charging Pawl (5)
3. Charge breaker by up and down motions (approximately 25 times)
   - A. Closing Spring completely charged
     - • Charge handle has free movement
     - • Closing Spring Charged/Discharged Indicator changes to CHARGE
4. Remove Charging Handle
   - A. Breaker ready to perform Close-Open (C-O) operation
5. Manual Close breaker via Close Push Button (2)
   - A. Breaker Closes
     - • Close/Open Indicator changes to CLOSED
     - • Closing Spring Charged/Discharged Indicator changes to DISCHARGED
   - B. Breaker ready to perform Open (O) operation (if O-C-O is desired, see Step 7)
6. Manual open breaker via Open Push Button (3)
   - A. Breaker opens
     - • Close/Open Indicator changes to OPEN
     - • Closing Spring Charged/Discharged Indicator remains DISCHARGED
   - B. No additional operations available, return to Step 3 if additional operation is desired

7. If an Open-Close-Open (O-C-O) operation is desired:

   A. Recharge the breaker after step 5 (Steps 3,4)

   B. Breaker now ready to perform (O-C-O) (Steps 6,5,6)

      Closing Spring Charged/Discharged Indicator will remain CHARGED after first Open

Electrical Operation

To operate the breaker electrically, control power must be available. The section, *Racking,* describes the application of control power through the secondary disconnect when the breaker is in the Test and Connect positions. Optional test jumpers and test cabinets to connect control power to a withdrawn circuit breaker are available (contact the local ABB sales office for details).

1. Inspect initial state of the breaker to determine the operations available
   - A. Close/Open Indicator
   - B. Closing Spring Charged/Discharged Indicator
   - C. Circuit breaker position Test or Connect (or control power applied externally, if withdrawn)
   - D. Spring Charging Motor Switch
2. Turn Spring Charging Motor Switch to ON with available control power
   - A. Charging motor energized
     - Charge time approximately 8-10 seconds (nominal voltage)
     - Closing Spring Charged/Discharged Indicator shows CHARGED
   - B. Breaker ready to perform C-O operation
3. Close breaker using manual close push-button or by electrical signal to the rotary close coil (after close operation the motor charges unless control power is removed)
   - A. Close coil rotates half shaft and closes breaker
     - Close/Open Indicator changes to CLOSED
     - Closing Spring Charged/Discharged Indicator changes to DISCHARGED
     - Charging motor energized
     - Charge time approximately 8-10 seconds (nominal voltage)
     - Closing Spring Charged/Discharged Indicator shows CHARGED
   - B. Breaker ready to perform O-C-O operation
4. Open breaker using manual open push-button or by electrical signal to the rotary open coil
   - A. Open coil rotates half shaft and opens breaker
     - Close/Open Indicator changes to OPEN
     - Closing Spring Charged/Discharged Indicator remains CHARGED
   - B. Breaker ready to perform C-O operation
5. Breaker ready to continue operations returning to step 3 above until the Spring Charging Motor Switch is turned OFF or control power is removed. Once control power is removed from the charging motor the Closing Spring will not recharge after a close operation

Control Scheme

ADVAC™ circuit breakers are available with two control packages. The standard package (Fig 7) includes charge, close, and open functions, and 4a and 4b auxiliary contacts for customer use. The optional package (Fig 8) adds to the standard package 5a and 4b auxiliary contacts for customer use as well as an optional second open coil and/or under voltage (UV) open/trip device if required. Refer to Figure 5: Sequence of Operation for a summary of the timing sequence.

1. Initial State
   - A. Closing Spring Discharged (33Lsa Open/33Lsb Closed)
   - B. Breaker Open (52a Open/52b Closed)
2. Upon available control power
   - A. Motor Disconnect Switch ON
   - B. Secondary engaged
   - C. Motor charges through 33Lsb
3. Closing spring charged
   - A. 33Lsa closes
   - B. 33Lsb opens
     (removing control power to motor)
   - C. Breaker ready to close
4. Electrical control pulse sent to close circuit
   - A. Current energizes 52x (Close Coil is not rated for continuous duty)
     - Coil rotates half shaft and closes breaker
       - 52a closes
       - 52b opens
     - Coil de-energizes with release of signal and as 52b opens and 52Yb opens
   - B. Current energizes 52Y
     (Y Coil is not rated for continuous duty)
     - 52Ya closes
     - 52Yb opens
   - C. Closing Spring Discharges
     - 33Lsa closes
     - 33Lsb opens
   - D. Closing Spring charged
     - 33Lsa closes
     - 33Lsb opens (removing control power to motor)
     - Breaker ready to perform O-C-O operation

5. Electrical control pulse sent to open circuit

A. Current energizes 52TC (Open Coil is not rated for continuous duty)

- Coil rotates half shaft
  - 52a opens
  - 52b closes
- Breaker Open

B. Breaker ready to perform C-O operation

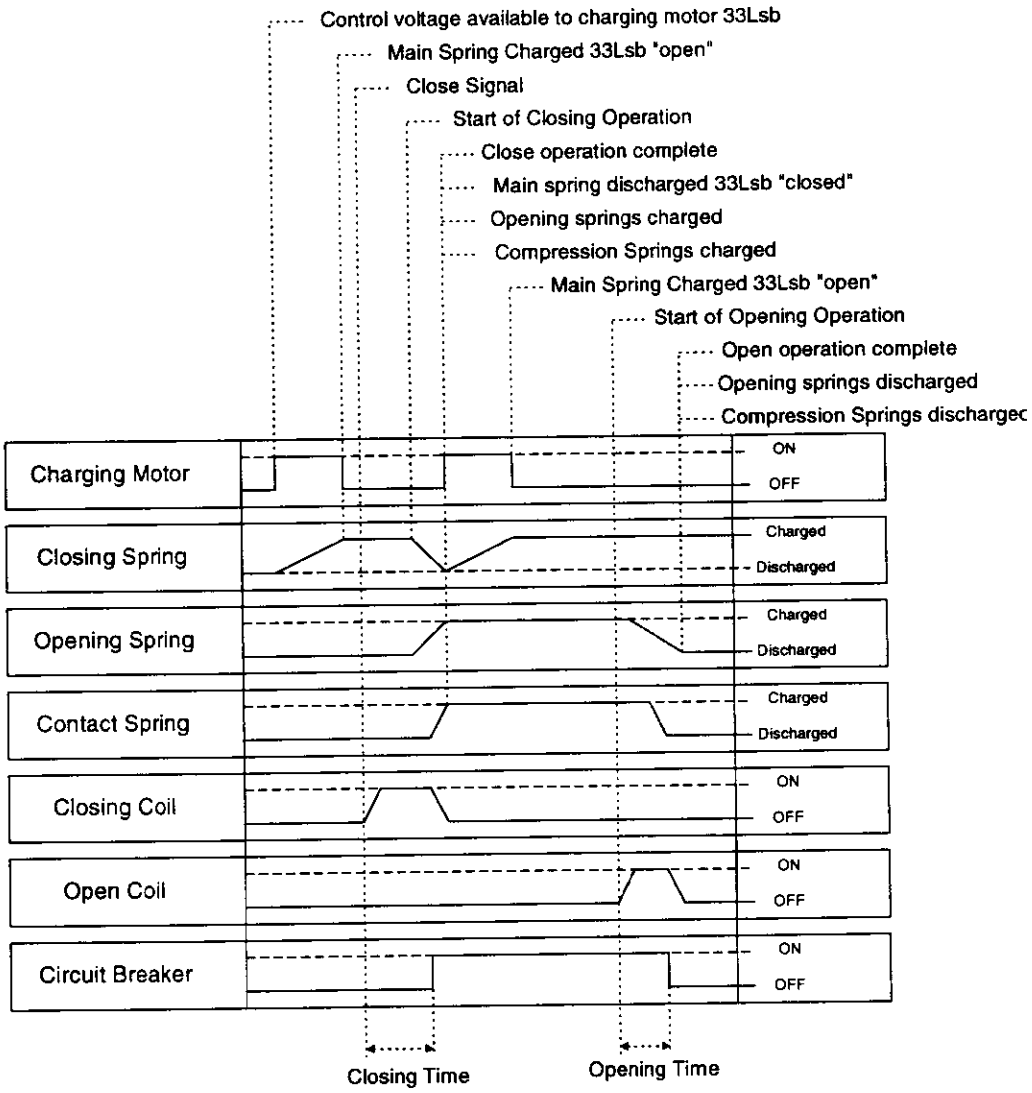


Figure 4: Sequence of Operation

MAINTENANCE

ADVAC™ circuit breakers are designed for a minimum amount of maintenance. Circuit breakers in a clean, non-corrosive environment require annual inspection. Dusty or corrosive environments require inspection more often. Inspection is required following each interrupted fault.

DO NOT work on an energized breaker.

DO NOT work on a breaker unless all components are disconnected by means of a visible break and securely grounded.

DO NOT work on a breaker with power supplied to the secondary control circuit.

DO NOT defeat safety interlocks. This may result in bodily injury, death and/or equipment damage.

DO NOT work on a closed breaker.

DO NOT work an a breaker with a charged closing spring.

DO NOT use a circuit breaker by itself as the sole means of isolating a high voltage circuit.

DO NOT leave a breaker in an intermediate position in a cell. Always have the breaker in the disconnect, test or connected position.

Mechanism (Refer to Fig. 5a & 5b)

The mechanism requires visual inspection of hardware, lubrication and operation during routine inspection.

Discharge the closing springs by pressing the Manual Close Button and then Open the breaker. Verify springs are discharged. Remove the front cover with a Phillips screwdriver. Correct loose or missing hardware.

Always lubricate the working surface of the Cams (B) and the Motor Linkage (P). Verify lubrication on latching surfaces located above the Charging Motor (D) in the mechanism (See Fig 5b). Remove any grease on the breaker frame. Use Anderol 757 grease for lubrication (ABB No. 712994A, 4 oz. tube). If the grease becomes caked and dirty, remove with a clean cloth and reapply lubrication.

Verify that the operation of the manual close and trip actuators is free and smooth

Replace the front cover before operation. Manually operate the mechanism a minimum of 2-5 operations to exercise the mechanism.

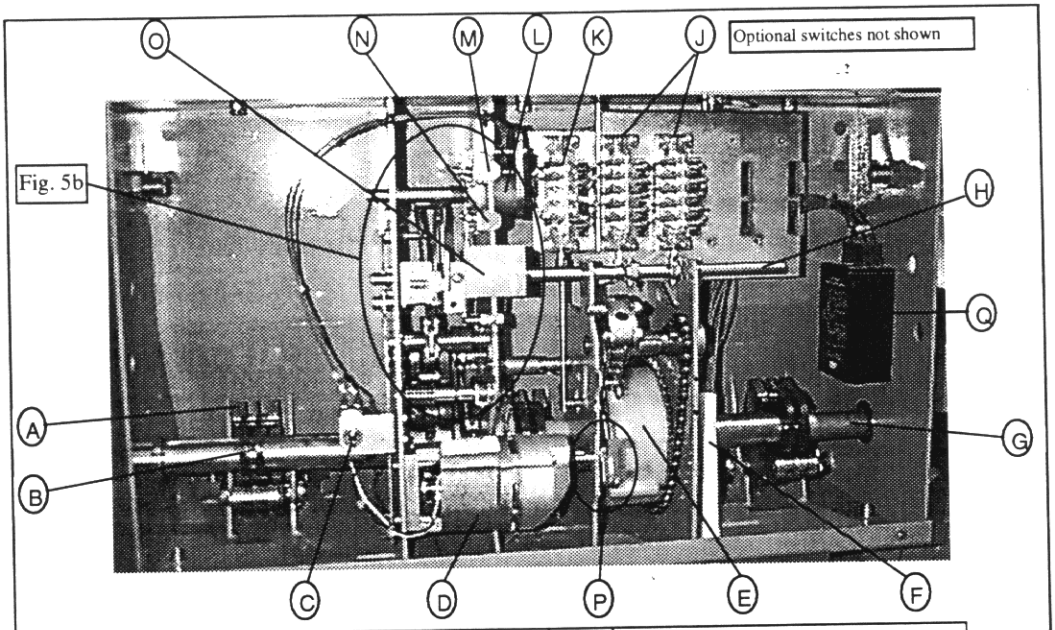


Fig. 5b

#	DESCRIPTION	#	DESCRIPTION
A	ROCKER ARM	J	AUXILIARY SWITCHES
B	CAM	K	MOTOR LIMIT SWITCH
C	MOTOR DISCONNECT SWITCH	L	CLOSE COIL
D	CHARGING MOTOR	M	CLOSE PUSHBUTTON
E	CLOSING SPRING	N	OPEN PUSHBUTTON
F	SECONDARY WIRING	O	OPEN/CLOSE INDICATOR
G	MAIN SHAFT	P	MOTOR LINKAGE
H	AUXILIARY SHAFT	Q	CONTROL DEVICE

Figure 5a: Breaker without Front Plate

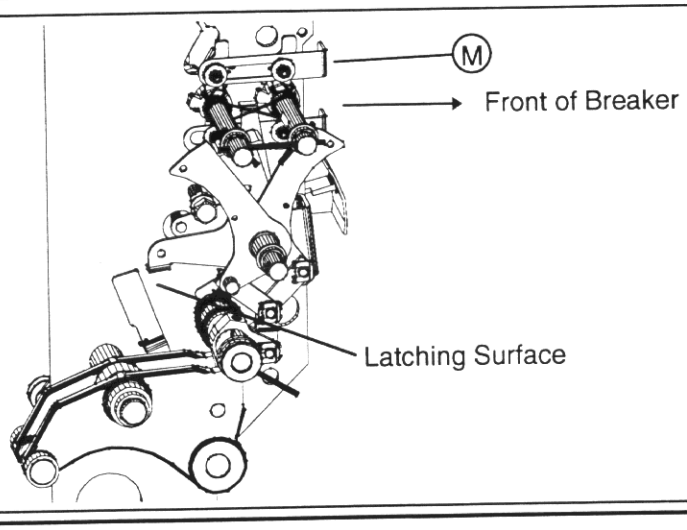


Fig. 5b:
Mechanism
Cross-Section

Truck (Refer to Fig. 6)

The truck requires visual inspection of hardware, lubrication and operations during routine maintenance.

With the breaker outside the cell, verify all visible hardware including handles (1) and wheels (2) for tightness. Wheels should rotate freely by hand movement. Replace or tighten any missing or loose hardware.

With the breaker outside the cell, rotate the racking screw as though racking the breaker to the connect position. This process will expose surfaces inside the truck that need to be inspected and lubricated. Lubricate the exposed parts, specifically the Racking Screw (4) and Position Release Shaft (5) during the operation. Inspect breaker locking tabs (3) and Secondary Locking Tab (6) for any damage. Return truck to disconnect position.

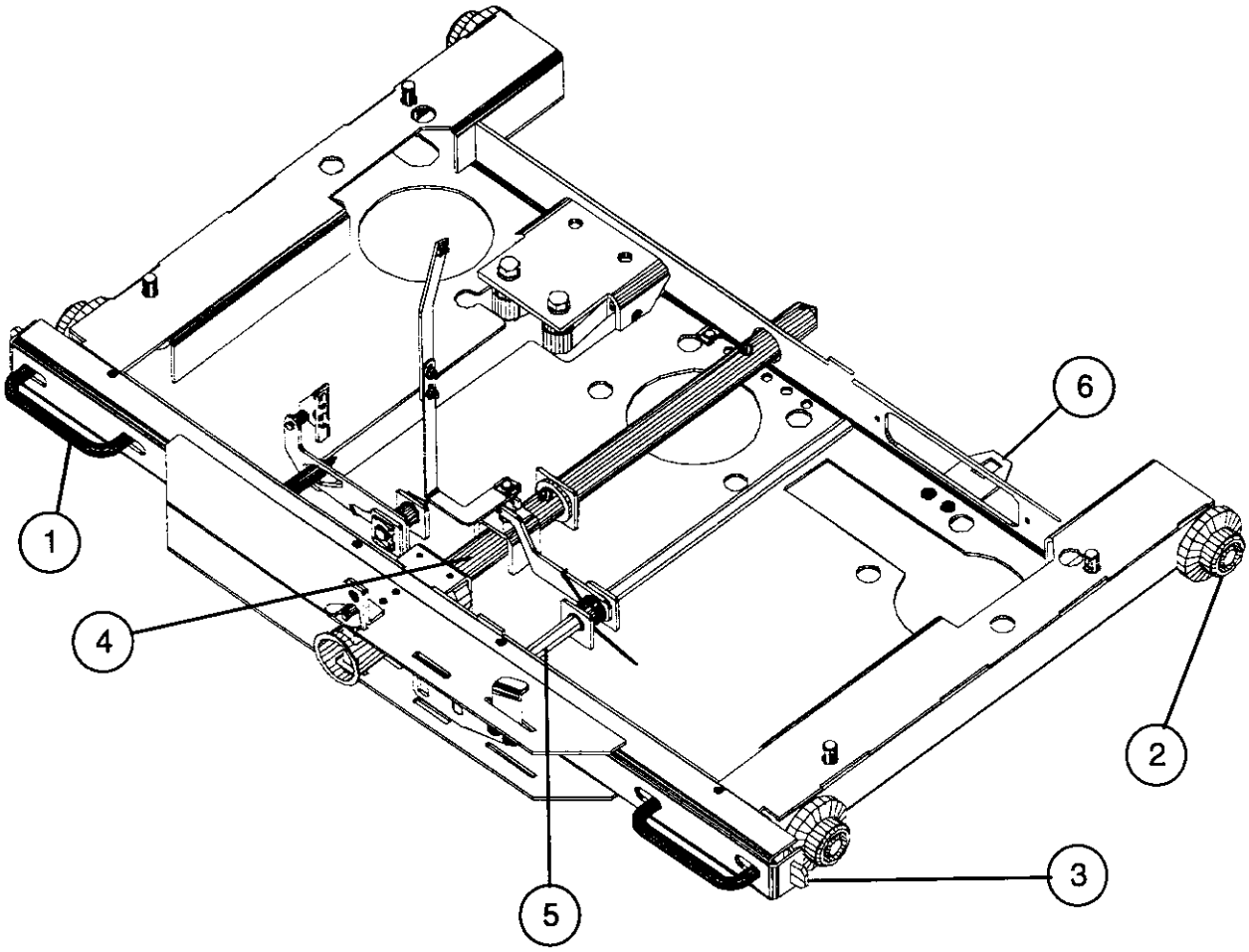


Figure 6: Truck

Control (Secondary Wiring)

The secondary wiring requires visual inspection of hardware, low-frequency withstand voltage test and 2-5 operations during routine maintenance. Disconnect control power before verifying secondary hardware and low-frequency withstand voltage testing.

Remove the front cover with a Philips screwdriver. Correct any loose or missing mounting hardware. Verify the ground wire connection to the frame and the connectors' alignment on the electrical components. Visually inspect the secondary plug and correct any pins that may have become displaced.

CAUTION CAUTION CAUTION CAUTION

The motor circuit must be isolated, motor disconnect switch OFF during low frequency withstand voltage testing of the secondary circuit. Damage to the motor may result from full secondary low-frequency withstand voltage.

To verify the integrity of the secondary insulation, perform the following low-frequency withstand voltage test:

1. Motor Disconnect Switch OFF
2. Connect all pins from the secondary to a test wire
3. Connect test wire to the high potential lead of the test machine
4. Ground the breaker frame
5. Start machine with output potential at zero
6. Increase the potential to the required insulation test voltage (1125VAC RMS)
7. Hold for one minute
8. Reduce potential to zero and turn off machine

A successful withstand indicates satisfactory insulation strength of the secondary circuit. Failing insulation will not sustain the voltage across the secondary. Replace the breaker control wiring if the insulation fails during low-frequency withstand voltage testing.

Replace the front cover before operation. Verify the electrical operation with 2-5 operations in the Test position or with a remote power supply.

Primary Circuit *(Pole)*

The primary circuit requires visual inspection of hardware, low-frequency withstand voltage test and lubrication during routine maintenance.

The insulation material should be clean and free of structural cracks. Some minor cracks are inherent in the insulation material. Inspect for structural cracks and replace damaged parts.

Dirt or dust may create a dielectric path on the insulation. Remove dust and dirt with a clean lint free cloth. Apply distilled water to the cloth to remove any difficult dirt. DO NOT return the breaker into service until the insulation surfaces are dry.

Lubrication on the primary contacts should be inspected during routine maintenance. Use NO-OX-ID special grade-A grease for the lubrication of primary contacts (ABB No. 713222A, 1 Pt. can).

CAUTION CAUTION CAUTION CAUTION

Applying abnormally high voltage across a pair of contacts in vacuum may produce X-radiation. The radiation may increase with the increase in voltage and/or decrease in contact spacing. It is recommended that all operating personnel stand at least one meter away and in front of the circuit breaker.

To verify the integrity of the primary insulation perform the following low-frequency withstand voltage test:

1. Close the breaker (no control power supplied to breaker)
   A. Connect the high potential lead to one pole
   B. Ground the remaining poles and breaker frame
2. Start machine with output potential at zero
3. Increase the potential to the rated voltage (see Table 3)
4. Hold for one minute
5. Decrease potential and turn off machine
6. Repeat for the remaining poles

A successful withstand indicates satisfactory insulation strength of the primary circuit.

WARNING WARNING WARNING WARNING

THE INTERNAL SHIELD OF A VACUUM INTERRUPTER CAN ACQUIRE AN ELECTRIC CHARGE WHICH CAN BE RETAINED EVEN AFTER THE VOLTAGE IS REMOVED. DISCHARGE THE MID-BAND RING WITH A GROUNDING STICK BEFORE WORKING ON THE DEVICE.

To verify the integrity of the vacuum interrupters perform the following low-frequency withstand voltage test:

1. Open the breaker (no control power supplied to breaker)
   A. Connect the high potential lead to one terminal
   B. Ground the remaining 5 terminals and breaker frame
2. Start machine with output potential at zero
3. Increase the potential to the rated voltage (see Table 3)
4. Hold for one minute
5. Decrease potential and turn off machine
6. Repeat for the remaining 5 terminals

A successful withstand indicates satisfactory vacuum integrity.

FIELD NOTES

Replace interrupters that fail to sustain the voltage across the open contacts.

Do not let the peak DC voltage exceed the peak of the corresponding AC RMS test voltage while using a DC high potential machine.

Rated Maximum Voltage kV, rms	Dielectric Test Value 1 Minute Dry rms kV
4.76	15
8.25	27
15	27

Table 3: Primary Low-Frequency Withstand Voltages

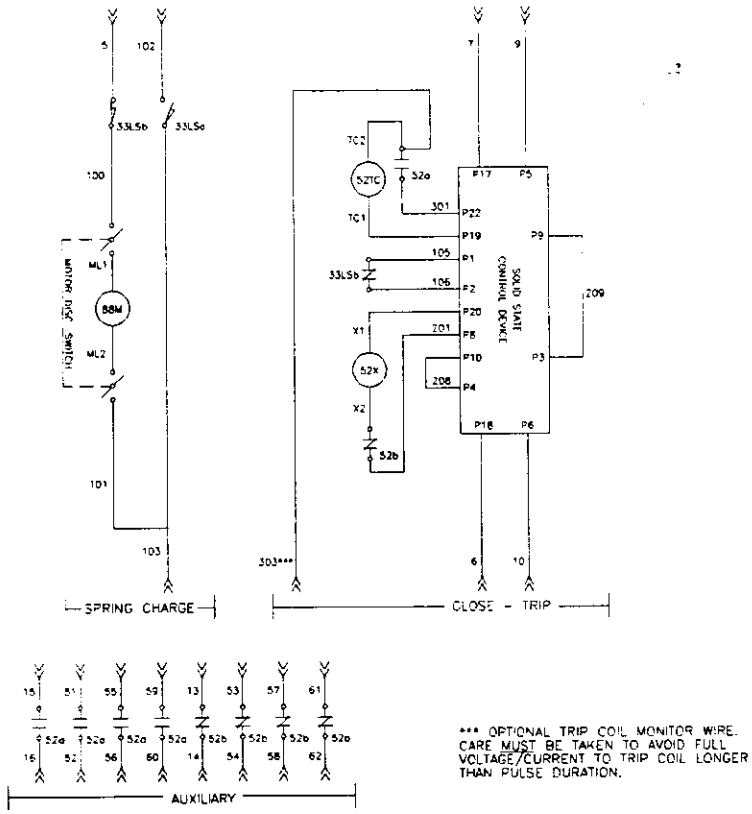


FIGURE 7: SCHEMATIC - STANDARD WIRING

DEVICE	FUNCTION
27	Undervoltage
33	Spring Charge Position Switch
52	AC Circuit Breaker
88	Spring Charging Motor
LS	Limit Switch
M	Motor
TC	Open/Trip Coil
UV	Undervoltage Coil
X	Close Coil

"a" Contact open when circuit breaker is open and closes when circuit breaker is closed
"b" Contact closed when circuit breaker is open and opens when circuit breaker is closed

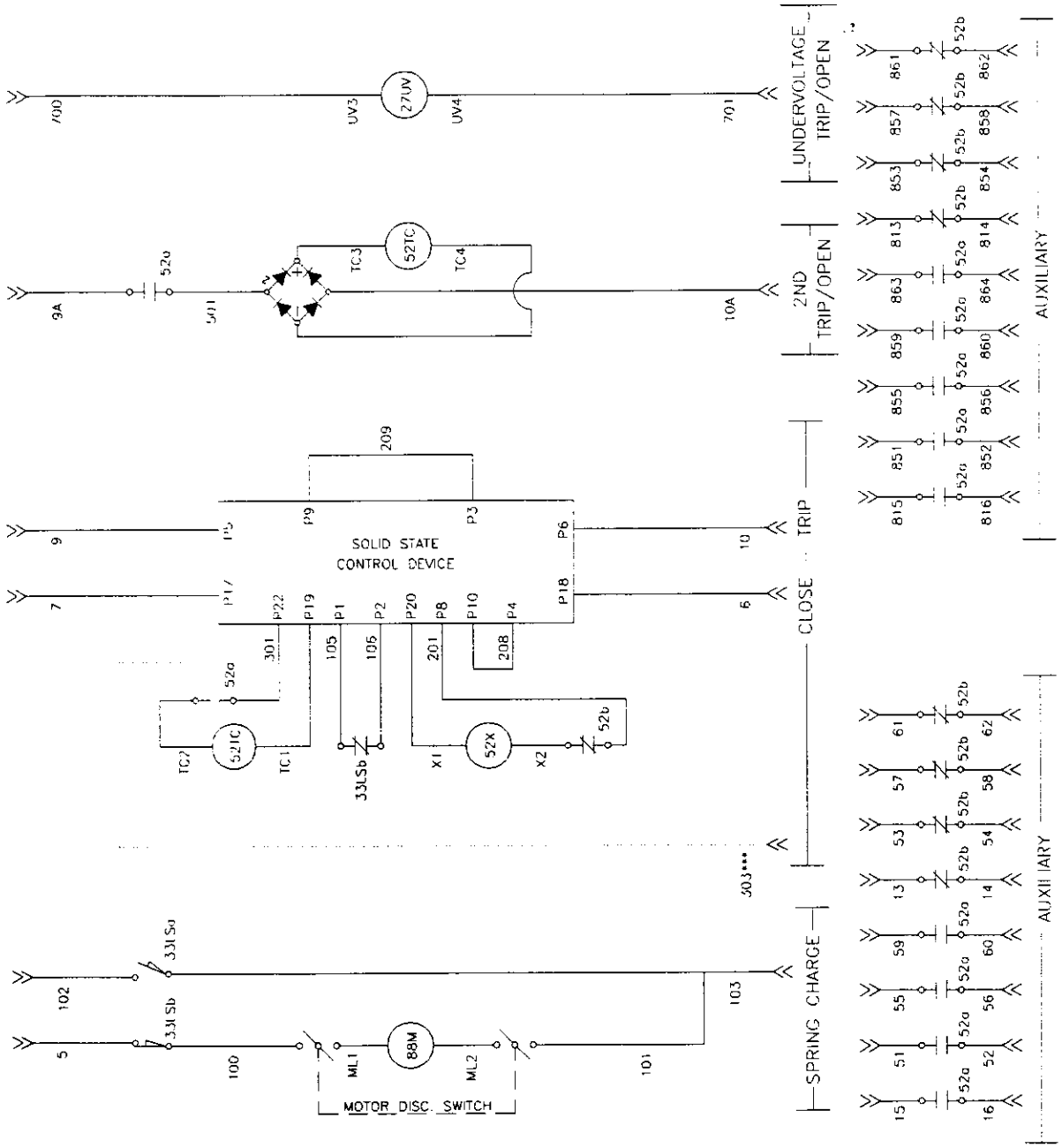
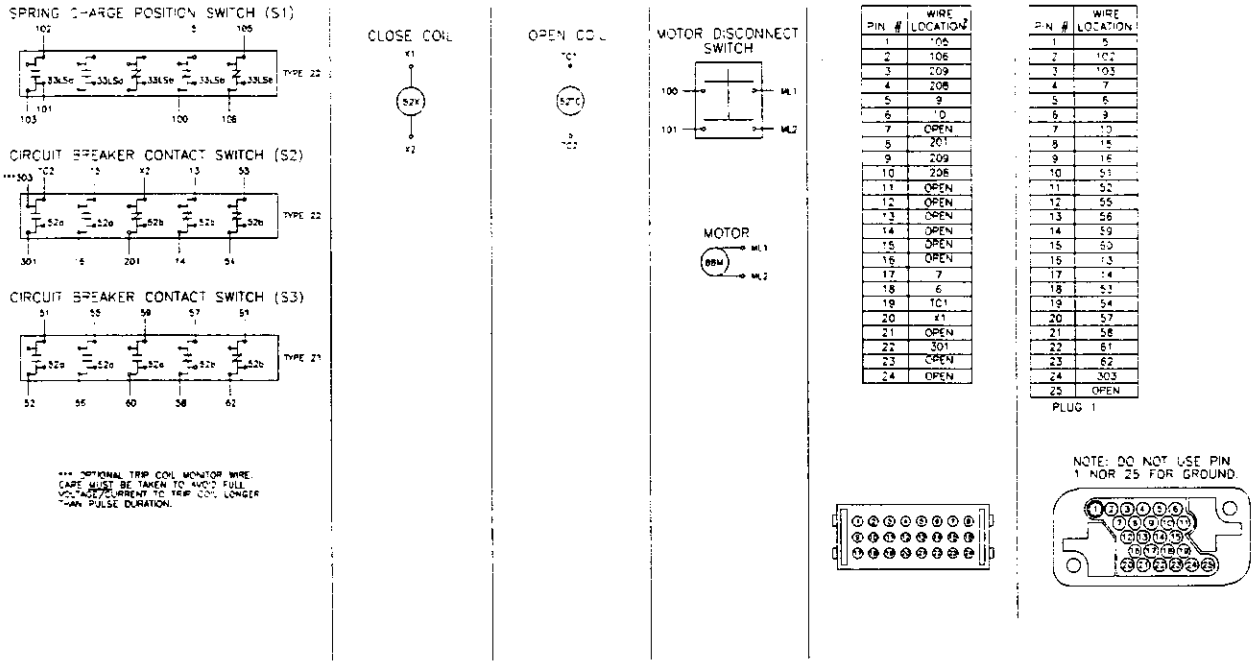


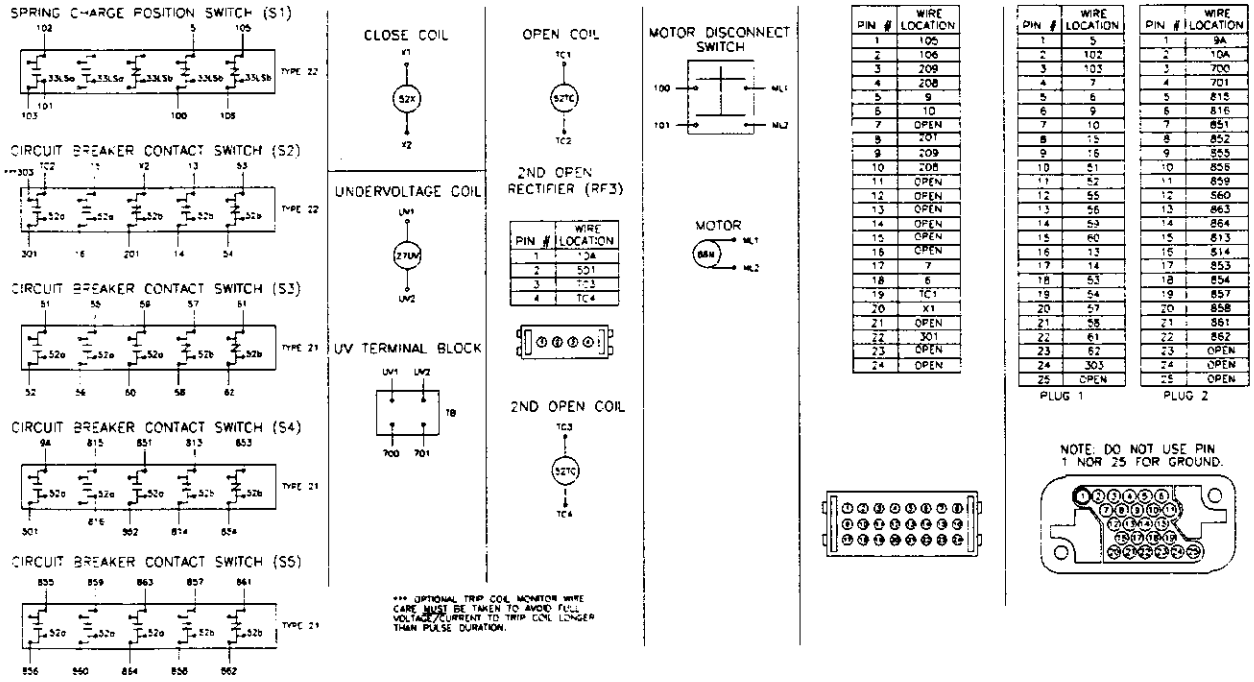
FIGURE 8: OPTIONAL WIRING SCHEMATIC



PIN #	WIRE LOCATION
1	105
2	106
3	209
4	208
5	9
6	10
7	OPEN
8	201
9	209
10	208
11	OPEN
12	OPEN
13	OPEN
14	OPEN
15	OPEN
16	OPEN
17	7
18	6
19	TC1
20	X1
21	OPEN
22	301
23	OPEN
24	OPEN

PIN #	WIRE LOCATION
1	5
2	102
3	103
4	7
5	6
6	9
7	10
8	15
9	16
10	51
11	52
12	55
13	56
14	59
15	60
16	13
17	14
18	53
19	54
20	57
21	58
22	61
23	62
24	303
25	OPEN

FIGURE 9: STANDARD WIRING, POINT TO POINT DIAGRAM



PIN #	WIRE LOCATION
1	105
2	106
3	209
4	208
5	9
6	10
7	OPEN
8	201
9	209
10	208
11	OPEN
12	OPEN
13	OPEN
14	OPEN
15	OPEN
16	OPEN
17	7
18	6
19	TC1
20	X1
21	OPEN
22	301
23	OPEN
24	OPEN

PIN #	WIRE LOCATION
1	10A
2	501
3	TC3
4	TC4

PIN #	WIRE LOCATION
1	5
2	102
3	103
4	7
5	6
6	9
7	10
8	15
9	16
10	51
11	52
12	55
13	56
14	59
15	60
16	13
17	14
18	53
19	54
20	57
21	58
22	61
23	62
24	303
25	OPEN

PIN #	WIRE LOCATION
1	9A
2	10A
3	700
4	701
5	815
6	816
7	851
8	852
9	855
10	856
11	859
12	560
13	863
14	864
15	813
16	814
17	853
18	854
19	857
20	858
21	861
22	862
23	OPEN
24	OPEN
25	OPEN

FIGURE 10: OPTIONAL WIRING, POINT TO POINT DIAGRAM

TROUBLE SHOOTING GUIDE

Symptom	Potential	Remedy
Breaker will not RACK	Tabs are not engaged in cubicle	Align breaker with cubicle
	Locked in Position	Hold Position Release to start racking
	Breaker Closed	Breaker must be open to rack
Breaker will not CHARGE	Motor switch off	Turn Motor Disconnect Switch ON
	No control power	Breaker in Disconnect Position
	Motor will not run	Replace Motor
	Spring charged	View Spring Charge Indicator
Breaker will not CLOSE	Closing spring not charged	Charge Closing spring
	Breaker already closed	View OPEN/CLOSE Indicator
	Breaker is not in positive position	Rack into Disconnect, Test or Connect Position
	No electrical close signal	Verify control power available
		Check close solenoid
		Check for loose wiring
Breaker will not OPEN	Breaker already open	View OPEN/CLOSE Indicator
	No electrical open signal	Verify control power available
		Check open solenoid
Breaker will not DISENGAGE (from Cubicle)	Handles can not disengage tabs	Rack breaker into Disconnect Position
	Breaker not in Disconnect Position	Rack breaker until handles disengage tabs from cubicle

POST ORDER SERVICE

When requesting service or renewal parts information, please have the breaker identification available. The breaker rating label contains the serial number, catalog number and wiring diagram number.

Breaker Catalog Number: _____

Breaker Serial Number: _____

Wiring Diagram Number: _____

POST ORDER SERVICE — RENEWAL PARTS *(8am to 4:30pm M-F EST)*	ABB SERVICE HELP DESK *(8am to 6pm M-F EST)*
Call: 1-800-929-SWGR 1-407-323-8220 Ext. 131 Fax: 1-407-321-2759	1-800-626-4999

ABB Power T&D Company Inc.
Distribution Systems Division

Division Headquarters
Switchgear Systems
IEC Products & Systems
After-market Components

201 Hickman Drive
Sanford, FL 32771
(407) 323-8220
(407) 322-8934 (Fax)

Circuit Breaker Operations
OEM Components
KIRK™ Interlock Systems

2300 Mechanicsville Highway
Florence, SC 29501
(803) 665-4144
(803) 667-5109 (Fax)

Power Distribution Centers

12257A F.M. 529
Houston, TX 77041
(713) 466-1550
(713) 466-0018 (Fax)