Power Circuit Breakers

Types CG-38 and CG-48
Installation and Maintenance Instructions

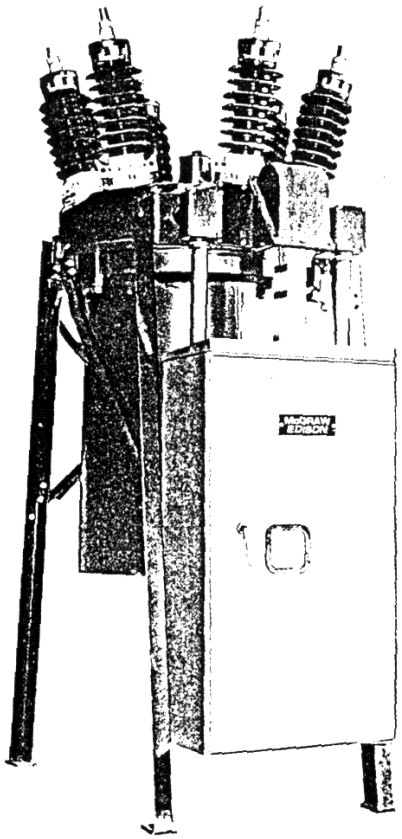


Figure 1
A typical CG oil circuit breaker with an OA-3 operating mechanism.

CONTENTS

GENERAL

Service Information S290-15-5 pertains specifically to McGraw-Edison Type CG-38 and CG-48 oil circuit breakers, (Figure 1). Detailed outline and control drawings and connection diagrams are issued for – and accompany – each breaker.

When installing, performing maintenance work, making adjustments or replacing parts on a CG-38 or CG-48 oil circuit breaker the latest revision of the following instructions – copies of which accompany each breaker – must be followed.

Operating Mechanism: Service Information S290-50-1, Type OA-3 Operating Mechanism

Oil: PTI-S-266-1, Oil Circuit Breaker Insulating Oil and Oil Handling

Tank Hoists: Manual-PTI-S-712, Windlass-S290-15-4, and Hydraulic-S290-15-1.

Bushing Current Transformers: Service Information S290-80-2, Type OE Bushing Current Transformers

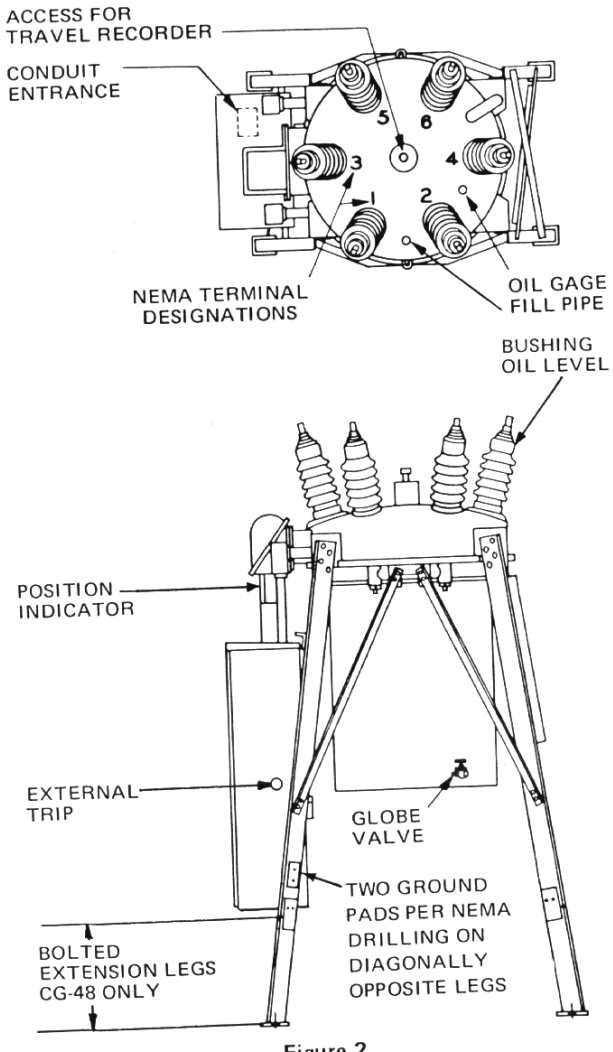


Figure 2
...CG oil circuit breaker.

CG-38 and CG-48 oil circuit breakers conform to all applicable national standards for electrical characteristics, mechanical features, and accessories. Auxiliary provisions include an external trip device and a mechanical position indicator, breaker tank and bushing oil-level gauges, oil filling openings, drain valves, and facilities for mounting time-travel recorder and electrical grounding. Type CG-48-72.5 kv breakers require the addition of leg extensions in the field.

Standard NEMA terminal designations are shown in Figure 2. Facing the mechanism cabinet and from front to rear terminals are numbered 1 and 2 on the right, 3 and 4 in the center and 5 and 6 on the left.

SHIPPING

Except in special cases, each Type CG-38 and Type CG-48 breaker is shipped substantially assembled with the operating mechanism and the bushings in place. The contact assemblies of the three poles are in a single cylindrical tank supported by a structural steel frame. Small accessory parts are shipped in suitably marked packages. Oil is shipped separately.

Each breaker is shipped with the contacts blocked closed by a red rod inserted in the mechanism (Figure 3). The mechanism is unlatched so that opening-spring pressure is on the rod. Refer to the Operating Mechanism Instructions for removing this rod.

Detailed outline drawings, control drawings, connection diagrams, all pertinent instructions, and packing lists are shipped protected in each mechanism cabinet. A shipping list in a weatherproof envelope is attached to each shipment.

NOTE: Breakers shipped overseas require special disassembled packaging.

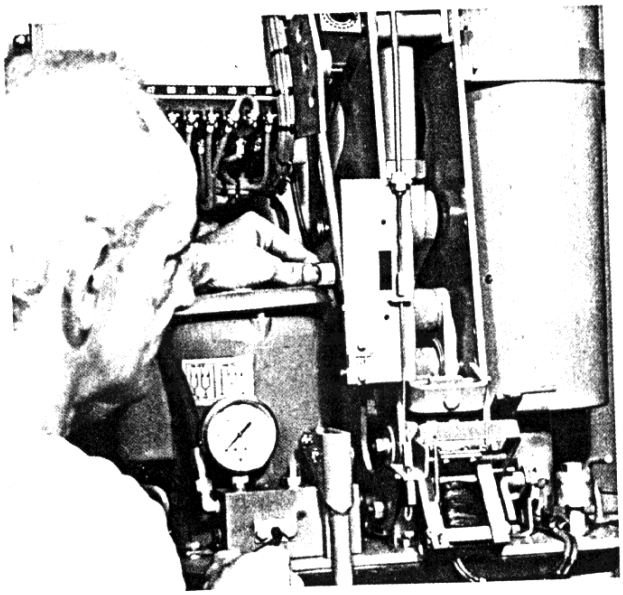


Figure 3
Rod being inserted into OA-3 operating mechanism linkage to block CG breaker contacts closed during shipment.

INITIAL INSPECTION

Refer to Service Information S290-50-1, Type OA-3 Operating Mechanism Instructions, for initial inspection of the operating mechanism.

NOTE: Do not remove bracing or blocking from the operating mechanism at this time.

Immediately upon receipt of the breaker:

1. Check breaker exterior for evidence of damage in transit.
2. Attach a McGraw-Edison hydraulic, windlass or manual tank hoist to the tank.
3. Unbolt the tank.
4. Using the tank hoist, lower the tank carefully to avoid damaging the sealing gasket.
5. Inspect the tank interior for evidence of rough handling or damage in transit and storage.
6. Reseal all openings promptly to prevent entrance of dirt and moisture.
7. Remove all masking tape. (Later removal may be very difficult)
8. Using the tank hoist, carefully raise the tank.
9. Tighten the nuts to secure the tank clamps to the underside of the tank flange by pulling up progressively in small increments (Figure 4).

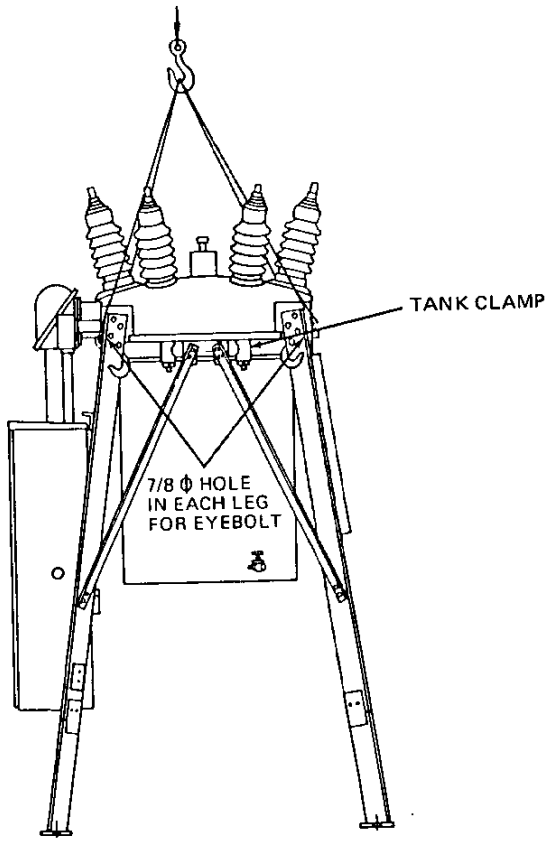


Figure 4
Typical sling arrangement for hoisting CG-38 or CG-48 breaker.

Should this initial inspection reveal evidence of rough handling or damage in transit or shortage, notify – and file a claim with – the carrier at once. Also notify McGraw-Edison Power Systems Division, Canonsburg, Pa. 15317.

IDENTIFICATION RECORDS

Retain permanently complete identification records for each breaker:

Detailed outline drawings.
Control drawings.
Connection diagrams.
All pertinent instructions.

Accurate and complete identification – including serial number and rating – must accompany any reference to, or inquiry about, the breaker to McGraw-Edison Power Systems Division.

UNLOADING OR MOVING

Type CG-38 and CG-48 breakers must be unloaded and moved by hoisting only. Slings used for hoisting must have adequate lifting capacity. The weight of each breaker is shown on its nameplate.

1. Type CG-38 and CG-48 breakers are usually hoisted without oil in the tank by one of the following two lifting methods:
   - A. With the breaker in the upright position, attach slings from front to back at the points shown in Figure 4.
     - (1) Because of the weight of the operating mechanism cabinet, slings must be of unequal length; therefore, clamps – or similar fixtures – must be provided on the ends of the slings to prevent the hoisting cables from sliding in the lift hook.
     - (2) Lift the breaker straight up, being careful not to damage the bushings with the lifting rigging.
   - B. With the breaker in the upright position, place eyebolts suitable for lifting in each of the four 7/8 inch holes near tops of the frame legs (Figure 4).
     - (1) Attach slings to the eyebolts.
     - (2) Lift the breaker straight up, being careful not to damage the bushings with the lifting rigging.

NOTE: To upright a Type CG-38 or CG-48 breaker shipped in the horizontal position, braced and anchored to a skid:

- Leaving the shipping frame intact, place eyebolts in the 7/8 inch holes in the two top legs.
- Attach slings to the eyebolts.
- Lift the breaker and, as it is lifted, it will assume an angle so that it can be tilted upright while being pivoted at the ground line.

PREPARING A BREAKER FOR STORAGE

If a breaker is not to be placed in the service-ready condition immediately upon receipt, it is considered to be in storage.

Short-term storage: A breaker on its foundation for an appreciable period of time before it is made ready for service.

Long-Term storage: A breaker on its foundation for more than a few months before it is made ready for service.

Refer to – and observe – applicable portions of instructions covering the operating mechanism, S290-50-1, the oil, PTI-S-266-1, and the bushing current transformers, S290-80-2.

Short-Term Storage

1. Open the mechanism cabinet.
2. Using a McGraw-Edison hydraulic, windlass or manual tank hoist lower the tank carefully to avoid damaging the sealing gasket.
3. Remove all packing material that might possibly collect moisture from the mechanism cabinet and the tank.
   A. Do not remove desiccants (if supplied) at this time. Desiccants should be maintained in effective condition until the breaker is made ready for service.
   B. Do not remove the rod blocking mechanism closed at this time.
   C. Open all boxes, inspect the contents, and reseal the boxes.
   D. Store all boxes indoors in a dry place.
   E. Inspect the interiors of the mechanism cabinet and the tank thoroughly to be sure they are clean and free from foreign materials.
4. Remove the protective coverings from all bushings.
   A. Inspect the bushings thoroughly.
   B. Replace the protective coverings on all bushings.
5. Close the mechanism cabinet.
6. Raise the tank.
7. Reseal all openings to exclude moisture.
8. Energize the cabinet heaters with a temporary electrical supply until permanent connections are made.

Long-Term Storage

In addition to the above instructions, remove desiccants if supplied, and fill the tank with tested insulating oil to keep the interior dry during storage.

1. At least once every six months during the storage period:
   A. Drain off any water that may have collected in the drain pipe from condensation.
   B. Test the oil in the tank in accordance with the test procedures outlined in S290-05-2, Oil Circuit Breaker Insulating Oil and Oil Handling, to make sure the dielectric strength of the oil is above 25 kv.
      (1) If the dielectric strength of the oil is 25 kv or lower, process the oil in accordance with the procedures outlined in S290-05-2, Oil Circuit Breaker Insulating Oil and Oil Handling.

INSTALLATION

SAFETY PRECAUTIONS

It is extremely important that all safety precautions described in Service Information S-290-50-1, Type OA-3 Operating Mechanism Instructions, be clearly understood and carefully followed.

When pressure is not required in the OA-3 operating mechanism accumulator for operational checks, drain the hydraulic oil from the accumulator to discharge the pressure to assure safe working conditions. To balance pressure on the accumulator piston seals, a pressure of precharge plus ten strokes of the hand pump (that is, 5 cu in.) must be maintained at all times when the breaker is not in service or under test.

Personnel performing work on a CG-38 or CG-48 oil circuit breaker or an OA-3 operating mechanism must clearly understand – and follow – both the breaker instructions and the operating mechanism instructions.

The breaker should not be operated at full speed unless the tank is filled with oil and the interrupter chambers are in place.

When it is necessary to use the operating mechanism for operational checks, stay clear of all moving parts.

Although the CG-38 and CG-48 breakers were designed with the safety of operating personnel foremost in mind, the inherent mechanical characteristics of the breaker – along with the necessary activities of operating personnel – make cautious work habits essential.

Prior to installing a CG-48 breaker in its permanent position, attach the extension legs (Figure 2).

1. Prepare concrete piers or a flat slab to meet foundation requirements of the drawings submitted for the breaker.
2. Level and anchor the breaker solidly in place at the points shown on the outline drawing.
   A. Use shims with a generous area where – and as – needed to level the base and distribute the load evenly.
   B. Using a spirit level, make sure the breaker is level from front to rear and from side to side.
3. Ground the breaker.
   A. Clean the surface of the ground pad on the breaker leg (Figure 2).

   NOTE: Capacity of the connection should be sufficient to carry – without damage – the full ground short circuit of the system.

   B. Install the grounding connector.

4. Prepare the operating mechanism for service in accordance with Service Information S-290-50-1, Type OA-3 Operating Mechanism Instructions.

NOTE: If permanent heater connections cannot be made promptly, a temporary supply should be provided to prevent moisture condensation in the mechanism cabinet.

CAUTION

Mechanism operating circuits should not be closed until called for in both the mechanism and these breaker instructions.

5. Attach a McGraw-Edison hydraulic or manual tank hoist to the tank.
6. Carefully lower the tank to avoid damaging the sealing gasket.
7. Remove moisture barriers or desiccants (if supplied) at this time.
8. Make sure all internal and external fasteners are tight.
9. Make sure all entrance bushings are clean.
10. Check the bushing current transformers visually to make sure the leads are intact.

SAFETY PRECAUTIONS

Current-transformer secondaries not connected to relays, instruments, or meters must be short-circuited and grounded at the terminal blocks in the operating mechanism cabinet.

11. Check liftrods to make sure they are vertical and, therefore, parallel with movable contact members (Figure 5).
    A. If a liftrod is not vertical, refer to liftrod verticality in the Adjustments section.
    Correct this condition before proceeding to the next installation step.
12. Using the operating mechanism maintenance-positioning valve, slow-close the breaker until the movable contact members are about to enter the interrupter chambers.
13. Refer to – and follow – the slow-speed positioning Instructions for the OA-3 Operating Mechanism, S-290-50-1.
    A. Make sure that the movable contact members of all three poles are aligned with interrupter chambers so that, on closing the movable contact members will enter the interrupter chambers freely and on center, (Figure 5).

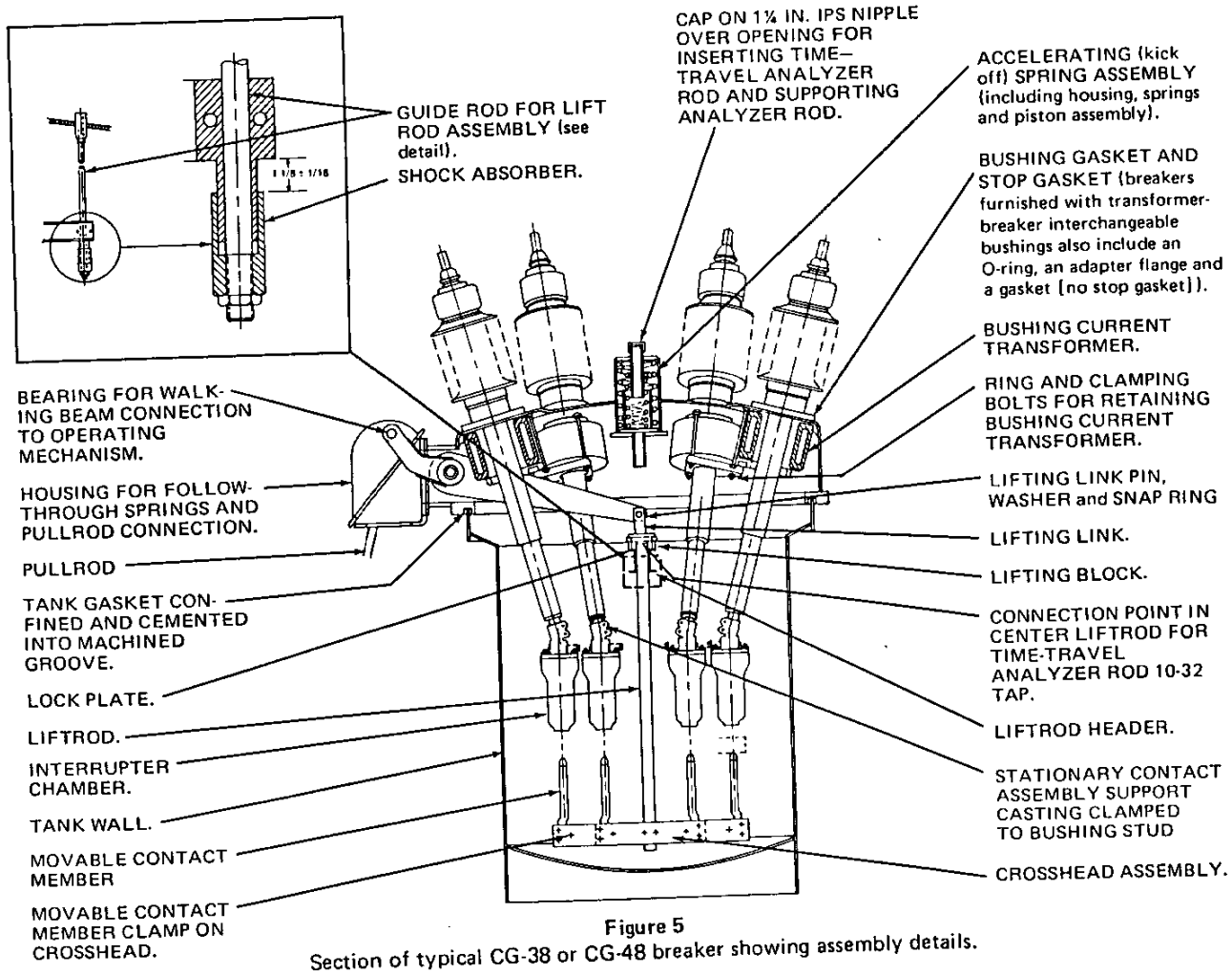


Figure 5
Section of typical CG-38 or CG-48 breaker showing assembly details.

(1) If a movable contact member is not properly aligned, refer to movable contact member alignment in the Adjustments section.

Correct this condition before proceeding to the next installation step.

14. When movable contact members are aligned with the interrupter chambers, continue to slow-close the breaker and, as the breaker is closing, check each pole to make sure that:

A. Upon entry into the interrupter chamber, the movable contact member does not rub on the throat of the chamber.

(1) If a movable contact member rubs on the throat of its interrupter chamber, refer to movable contact member alignment in the Adjustments section.

Correct this condition before proceeding to the next installation step.

15. Using the operating mechanism maintenance-positioning valve, slow-open the breaker.

16. Make a scribe mark on each movable contact member 1-1/4 inches from the tip end (Figure 6).

17. Detach interrupter assemblies by removing four nuts at the contact support casting (Figure 6).

Do not invert the interrupter since the baffle assembly may fall out.

A. With a non-carbon, grease-base pencil mark the location and position of each interrupter assembly, in accordance with terminal designations per Figure 2, so that it can be reinstalled properly.

18. Using the operating mechanism maintenance-positioning valve, slow-close the breaker completely, allowing it to settle on the latch with no overtravel.

19. Check penetration of each movable contact member into its stationary contact.

A. The scribe mark made 1-1/4 inches from the tip end of each movable contact member must be even with the end of its stationary contact ± 1/16 inch.

(1) If the penetration of a movable contact member is not 1-1/4 inches ± 1/16 inch, refer to movable contact member penetration in the Adjustments section.

Correct this condition before proceeding to the next installation step.

20. Using the operating mechanism maintenance-positioning valve, slow-open the breaker.

21. Reinstall the interrupter chambers (Figure 6).

A. The interrupter port axis must form a 90-degree angle with respect to the line formed by the clamping surfaces of the contact support casting (Figure 6).

B. Make sure each interrupter chamber is vertical and aligned with its movable contact member (Figure 6).

C. Make sure nuts on the mounting studs are secured.

22. Check electrical resistance of the three liftrods (Figure 5).

NOTE: Liftrods are made of organic insulating material and, when not immersed in dry oil, can absorb moisture.

A. Conduct a megger test over the full length of each liftrod (Figure 5).

(1) Electrical resistance of all liftrods must be at least 10,000 megohms.

a. If the electrical resistance of a liftrod is less than 10,000 megohms, refer to Electrical resistance of liftrods in the Adjustments section.

Correct this condition before proceeding to the next installation step.

23. Check to make sure all interrupter parts are dry.

A. If all interrupter parts are not dry, refer to Interrupter parts in the Adjustments Section.

Correct this condition before proceeding to the next installation step.

NOTE: To avoid absorption of excess moisture and to keep insulating values high, do not overexpose any insulating part to air with a relative humidity exceeding 50 percent.

24. Check to make sure all insulation – organic and inorganic – is clean.

NOTE: Contaminants on insulating parts facilitate electrical breakdown.

A. Clean insulation with insulating oil and clean, lint-free rags.

25. Install the drain valve (Figure 2).

A. Make sure the oil pressure will be under the seat (not on the top – or stem – side).

B. Apply thread compound to threads before installing drain valves.

NOTE: If plugs are used in the valves, do not cement the plugs.

26. Using clean, lint-free rags and insulating oil, wipe down the interior of the tank.

Do not rub in residue – it might be conductive.

27. Raise the breaker tank.

A. Check to make sure the gasket is in place and in good condition.

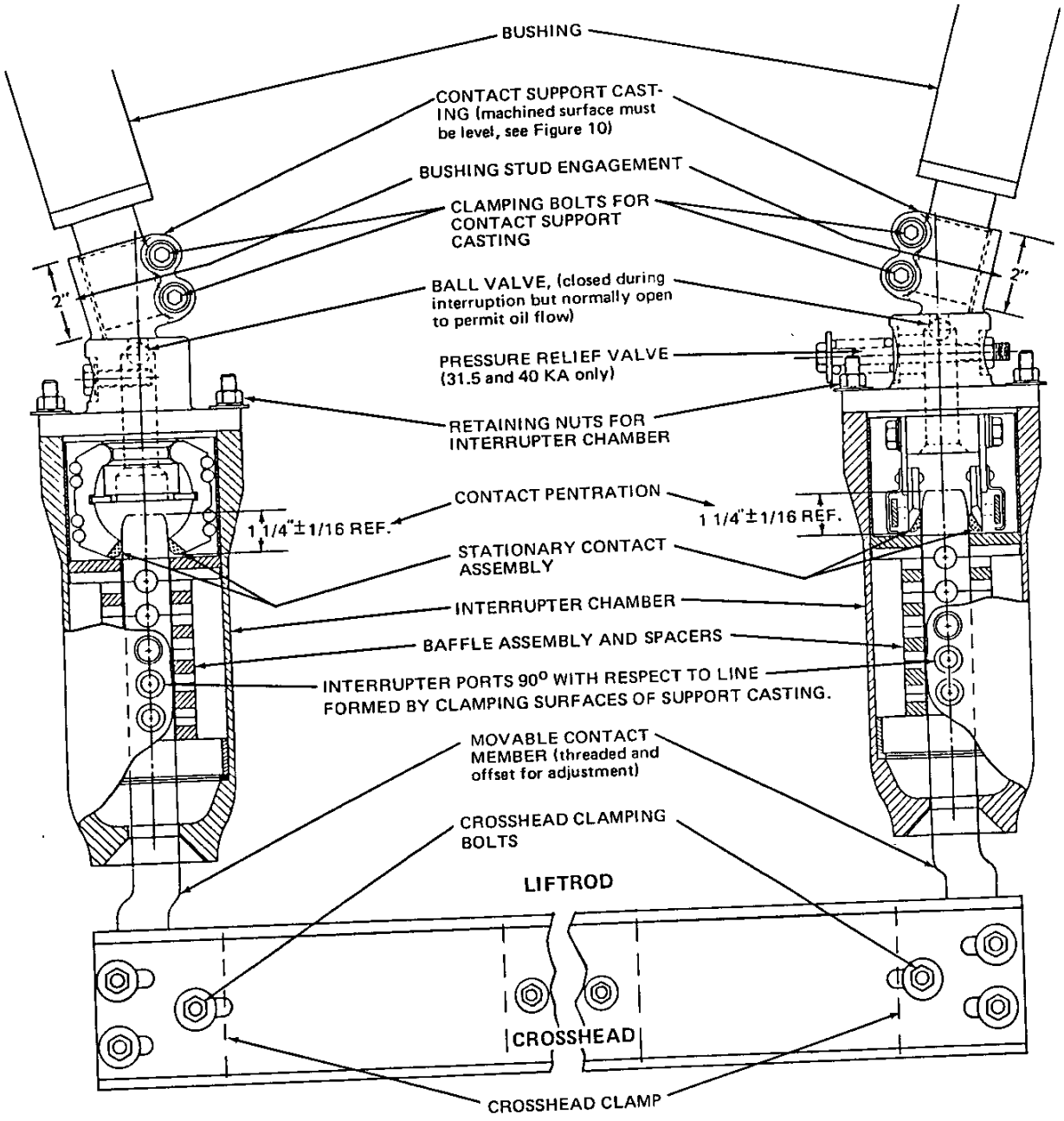
NOTE: The gasket is factory-cemented into a grooved tank-retaining flange which is welded to the bottom of the breaker head.

B. Grease-coat the gasket surface so that it will not stick to the tank.

C. Tighten the nuts to secure the tank clamps to the underside of the tank flange by pulling up progressively in small increments.

28. Fill the breaker tank with tested oil through the drain valve (Figure 2) or through the oil filling opening in the tank cover to the point indicated on the oil-level gage.

Refer to – and follow – S290-05-2, Oil Circuit Breaker Insulating Oil and Oil Handling, for testing the oil.



20 KA
GARTER SPRING-TYPE INTERRUPTER

31.50 & 40 KA
TULIP-CLUSTER-TYPE INTERRUPTER

Figure 6
Movable contact member penetration and alignment.

A. It is recommended that four hours be allowed for the oil to deaerate before energizing the breaker, especially if the tanks are filled from the top.

B. Operate the breaker eight to ten times during this four-hour period to free entrapped air.

C. After the oil has been deaerated, check the oil-level gage.

D. If deaeration has reduced the oil volume, add more oil to the appropriate point on the oil level gage (Figure 7).

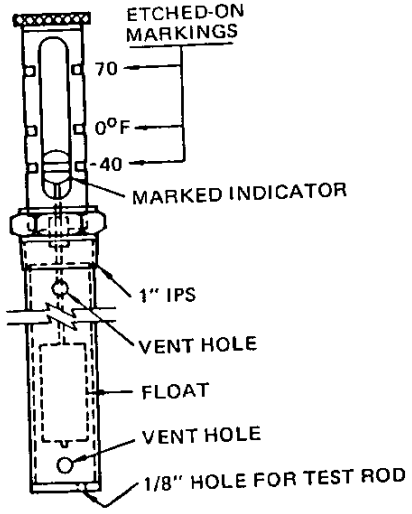


Figure 7
Float-type oil-level gage for Type CG-38 and CG-48 breakers.

29. Make sure that the operating mechanism is ready for normal (fast) operation and that all safety blocking has been removed.

Refer to – and follow – Service Information S290-50-1, Type OA-3 Operating Mechanism Instructions.

30. Using mechanical control in accordance with S290-50-1, Type OA-3 Operating Mechanism Instructions, fast-operate the breaker:

A. Close the breaker manually by depressing the closing lever.

(1) The breaker should close at normal operating speed.

B. Open the breaker manually by using the trip lever.

(1) The breaker should open at normal speed.

31. Connect a temporary two-pushbutton station with open and close buttons close enough together to coordinate the electrical control of the breaker.

Refer to – and follow – the connection diagrams that accompany the breaker.

32. Using the temporary electrical controls, momentarily energize the closing circuit.

A. The breaker should close instantly.

33. Using the temporary electrical controls momentarily energize the opening circuit.

A. The breaker should open instantly.

34. Using the temporary electrical controls, repeat the closing and opening operations.

35. With the breaker open, check the operation of the Y (anti-pump) relay.

A. Close the opening switch and hold it.

B. Close the closing switch and hold it.

The breaker should close and open and remain open.

C. Release both the opening and closing switches.

36. Perform time-travel tests (optional).

A. Using the operating mechanism maintenance-positioning valve, slow-close the breaker.

B. Remove pipe cap (Figure 5) from the pipe nipple.

C. Install the analyzer adapter plate on the pipe nipple.

D. Insert the analyzer rod in hole (Figure 5) on the center liftrod.

NOTE: The fitting on the center liftrod has a 10-32 tapped hole for the analyzer rod (Figure 5).

E. Record direct readings of contact speed/motion characteristics.

NOTE: Figure 8 is a typical time-travel chart for CG-38 and CG-48 breakers.

F. Remove the analyzer rod.

G. Remove the analyzer adapter plate from the pipe nipple.

H. Reinstall pipe cap (Figure 5) on the pipe nipple, re-sealing the cap on the nipple with thread compound.

37. Check all painted surfaces, making sure they are clean.

A. Retouch the paint where necessary for appearance and complete protection.

38. Place the breaker and the operating mechanism in the following service-ready condition:

A. Pump motor switch closed and accumulator charged;

B. Maintenance-positioning valve closed;

C. Breaker in the open position;

D. Heaters in the operating mechanism cabinet energized.

SAFETY PRECAUTION

Main (load) connections should not impose more than a 100-pound maximum cantilever pull on the bushings. Forces may be caused by expansion, contraction, wind loading, or foundation movement.

CAUTION

When making line connections, do not torque the bushing top terminal assembly over 60 ft-lb; over torquing the bushing top terminal assembly will turn the core in the bushing, thus breaking the internal ground lead.

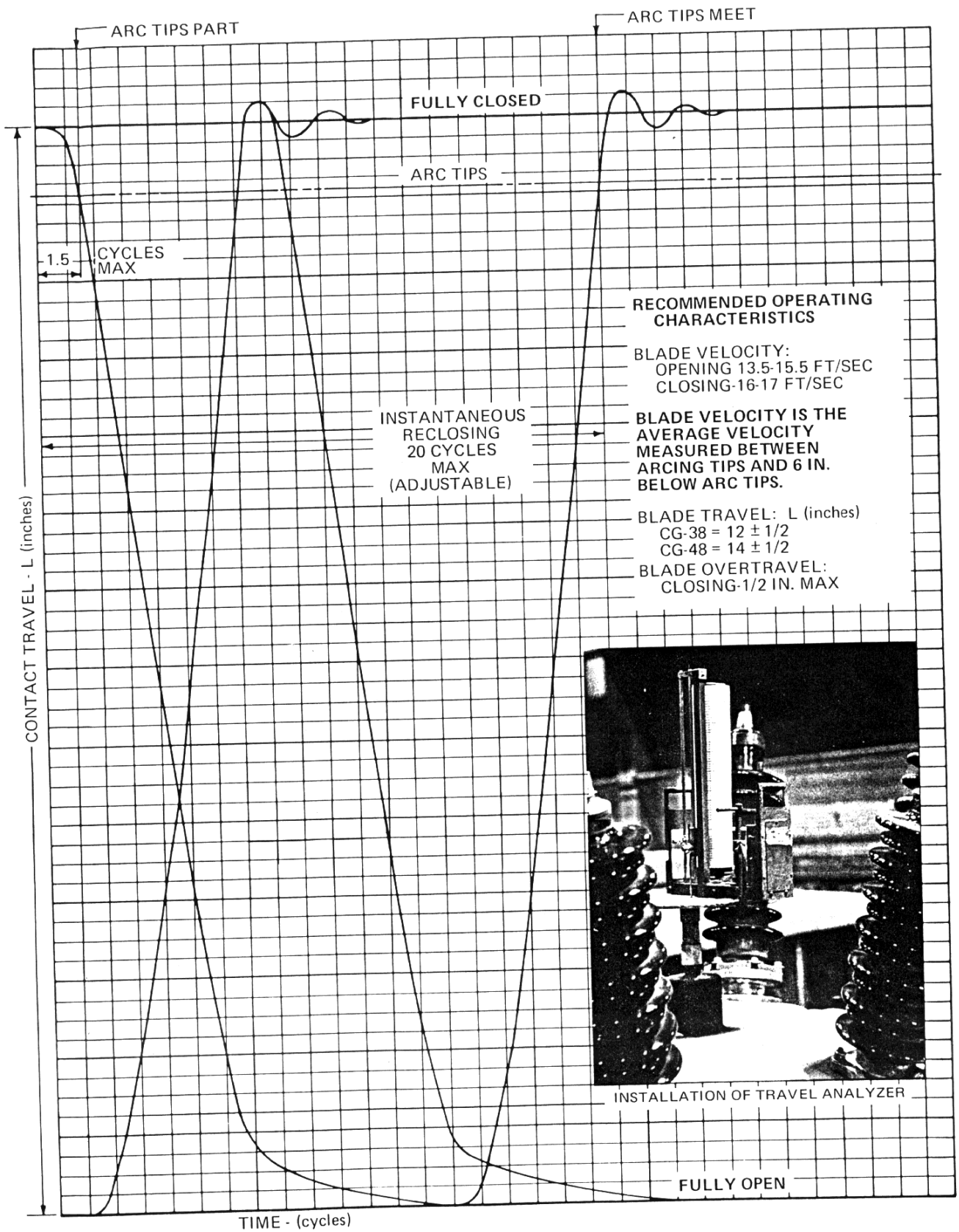


Figure 8
Typical time-travel chart, CG-38 and CG-48 oil circuit breakers.

39. Establish permanent service records.
    A. Record the operation-counter registration.
    B. Record pertinent facts regarding the condition of the breaker.
    C. Record complete nameplate information.

MAINTENANCE

Every CG-38 or CG-48 oil circuit breaker should be removed from service and checked at least once a year. More frequent maintenance checks may be indicated by the number and severity of interruptions performed. The breaker should be thoroughly inspected after interrupting five full-rated faults or when the total of the fault currents interrupted equals five times the rated short circuit current, starting with new contacts. Operating mechanism maintenance, covered by Service Information S290-50-1, OA-3 Operating Mechanism Instructions, must be coordinated with the CG-38 or CG-48 breaker maintenance.

Keep complete records of all out-of-service inspections and all maintenance work performed.

SAFETY PRECAUTIONS

Before performing any maintenance on a CG-38 or CG-48 oil circuit breaker, the breaker must be out of service.

Refer to – and follow – instructions in Service Information S290-50-1, Type OA-3 Operating Mechanism prior to making any maintenance checks.

The operating mechanism maintenance-positioning valve must be used during the performance of some of the maintenance steps. Observe all safety precautions in S290-50-1 as well as those throughout these instructions when using this valve.

When pressure is not required in the OA-3 operating-mechanism accumulator for operational checks, drain the hydraulic oil from the accumulator to discharge the pressure to ensure safe working conditions. To balance pressure on the accumulator piston seals, a pressure of precharge plus ten strokes on the hand pump (that is, five cu in.) must be maintained at all times when the breaker is not in service or under test.

If there is no oil in the tank and the interrupter chambers are not in place, a CG-38 or CG-48 breaker must be slow-operated only – never operated at full speed.

Before operating a CG-38 or CG-48 breaker at full speed, it should always be slow-closed several times.

Personnel performing work on a CG-38 or CG-48 oil circuit breaker or an OA-3 operating mechanism must clearly understand – and follow – both the breaker instructions and the operating mechanism instructions. The power and speed of CG-38 or CG-48 breakers in operation make observation of all safety precautions extremely important.

MATERIALS

- Clean, lint-free rags
- Insulating oil
- Lubricants
- Sliding surfaces (such as pins and rods): -40° + 130°F temperature-range oil such as Keystone No. 4062, Standard (California) RPM Handy Oil, or Texaco Capella AA.
- Gasket cement – Armstrong N-111.
- Ball bearings and roller bearings: Shell Oil Company Aeroshell No. 14 grease.

PROCEDURE

1. Open the breaker and remove the breaker from service.
2. Perform maintenance checks on the operating mechanism before making any maintenance checks on the oil circuit breaker.

   Refer to – and follow – Service Information S290-50-1, OA-3 Operating Mechanism Instructions.
3. Fast-operate the breaker several times to clean the contacts.
4. With the breaker closed, conduct a top-of-bushing, terminal-to-terminal resistance test on each of the three breaker poles (Figure 2).

   NOTE: Resistance test results indicate the current-carrying condition of the breaker, not its ability to interrupt faults.

Electrical Resistance Level	Electrical Resistance* (microohms)
Normal	170 ± 40
Caution	230
Service Limit	260

*Measured externally – terminal-to-terminal – with the breaker closed. Resistance values must be maintained below the caution level.

   NOTE: Because the contacts clean themselves when the breaker is operated, resistance values may run high if the breaker has not been operated for several months.

   A. If resistance test values are at – or above – the caution level shown in the table, operate the breaker several times.
   B. With the breaker closed, recheck the top-of-bushing, terminal-to-terminal resistance test values.
   C. If resistance test values are still at – or above – the caution level, refer to top-of-bushing terminal-to-terminal resistance test in the Adjustments section.

      Make this adjustment immediately after performing maintenance steps 5 and 6.
5. Attach a McGraw-Edison hydraulic, windlass or manual tank hoist to the breaker tank.
6. Carefully lower the tank.
7. Recondition the oil in accordance with PTI-S-266-1 if required.
8. Perform maintenance checks on the entrance bushings.

   A. Clean the bushing.

B. Make sure there are no cracks or chips in the porcelain.

C. Make sure the oil in the bushing is at the proper level (Figure 2).

D. If a bushing must be replaced, refer to Bushings in the Parts Replacement section.

Make this replacement before proceeding to the next maintenance step.

NOTE: If any change in – or addition to – bushing current transformers is desired, make the change or addition at the same time the bushing is replaced.

9. Check the bushing current transformers visually to make sure the leads are intact.

NOTE: If a change in – or addition to – bushing current transformers is desired, refer to Bushing Current Transformers in the Parts Replacement Section and Service Information S290-80-2, Type OE Bushing Current-Transformer Instructions.

Make this change or addition before proceeding to the next maintenance step.

SAFETY PRECAUTION

Current-transformer secondaries not connected to relays, instruments, or meters must be short-circuited and grounded at the terminal blocks in the operating mechanism cabinet.

10. Using clean, lint-free rags and insulating oil, clean the interiors of the breaker tank, if required.

11. Make sure water has not leaked into the tanks.

A. If there is evidence of water leakage, determine the cause.

Correct this condition before proceeding to the next maintenance step.

12. Using clean, lint-free rags and insulating oil, clean the liftrods (Figure 5).

Do not rub in residue – it may be conductive.

13. Make sure all fasteners are tight.

14. Check liftrods to make sure they are vertical and parallel to movable contact members (Figure 5).

A. If a liftrod is not vertical, refer to liftrod verticality in the Adjustments section.

Correct this condition before proceeding to the next maintenance step.

15. With the interrupter chambers removed, check the contact surface on the end of each movable contact member and the mating surface of each contact shoe of the stationary contact assembly (Figure 6).

A. If the contact surfaces are slightly eroded, refer to Movable and Stationary contacts in the Adjustments section.

Correct this condition before proceeding to the next maintenance step.

B. If the contact surfaces are severely eroded refer to Movable and Stationary contacts in the Parts Replacement section.

NOTE: If Movable or Stationary Contacts require replacement, the change should be made prior to checking alignment and penetration.

16. Using the maintenance-positioning valve, slow-close the breaker until the movable contact members are about to enter the interrupter chambers (Figure 5).

Refer to – and follow – the slow-speed positioning Instructions for the OA-3 Operating Mechanism, S290-50-1.

A. Make sure movable contact members in all three poles are aligned with interrupter chambers so that, on closing, the movable contact members will enter interrupter chambers freely and on center (Figure 5).

(1) If a movable contact member is not properly aligned, refer to Movable contact member alignment in the Adjustments section.

Correct this condition before proceeding to the next maintenance step.

17. With the movable contact members aligned with the interrupter chambers, continue to slow-close the breaker and, as the breaker is closing, check each pole to make sure that:

A. Movable contact members enter interrupter chambers properly and do not rub on the throats of the chambers during the closing operation (Figure 5).

(1) If a movable contact member rubs on the throat of its interrupter chamber during the closing operation, refer to Movable contact member alignment in the Adjustments section.

Correct this condition before proceeding to the next maintenance step.

18. Using the operating mechanism maintenance-positioning valve, slow-open the breaker.

19. Make a scribe mark on each movable contact member 1-1/4 inches from the tip end (Figure 6).

20. Detach interrupter chambers by removing four nuts at the contact support casting (Figure 6).

Do not invert the interrupter since the baffle assembly may fall out.

CAUTION

Handle all insulating parts carefully. Protect them from abrasion or other damage.

Do not overexpose insulating parts to air with a relative humidity of over 50 percent.

A. With a non-carbon, grease-base pencil, mark the location and position of each interrupter assembly in accordance with terminal designations per Figure 2, so that it can be reinstalled properly.

21. Using the operating mechanism maintenance-positioning valve, slow-close the breaker completely, allowing it to settle to the latch with no overtravel.

22. Check the penetration of each movable contact member into its stationary contact.

    A. The scribe mark made 1-1/4 inches from the tip end of each movable contact member must be even with the end of its stationary contact assembly ± 1/16 inch (Figure 6).

        (1) If penetration of a movable contact member is not 1-1/4 inches ± 1/16 inch, refer to Movable contact member penetration in the Adjustments section.

        Correct this condition before proceeding to the next installation step.

23. Using the operating mechanism maintenance-positioning valve, slow-open the breaker.

24. Remove baffle assemblies and spacers from interrupter chambers (Figure 9).

25. Clean interrupter chambers and baffle assemblies by flushing them with clean insulating oil (Figure 9).

26. To determine if a baffle assembly should be replaced:

    A. A caliper check can be made through the top of the baffle assembly (Figure 9).

        (1) If elongation of the round hole through the center of the baffle assembly exceeds 1/8 inch, refer to the interrupter chamber baffle assembly in the Parts Replacement section.

        Make this replacement before proceeding to the next maintenance step.

27. Check the electrical resistance of the three liftrods.

    NOTE: The liftrods are made of organic insulating material and, when not immersed in dry oil, they can absorb moisture.

    A. Conduct a megger test over the full length of each liftrod (Figure 5).

        (1) Electrical resistance of the liftrods must be at least 10,000 megohms.

            a. If the electrical resistance of a liftrod is less than 10,000 megohms, refer to Electrical resistance of liftrods in the Adjustments section.

        Correct this condition before proceeding to the next maintenance step.

28. Check to make sure all interrupter parts are dry.

    A. If all the interrupter parts are not dry, refer to Interrupter Parts in the Adjustments section.

    Correct this condition before proceeding to the next maintenance step.

    NOTE: To avoid absorption of excess moisture and to keep insulating values high, do not overexpose any insulating part to air.

29. Reinstall the interrupter assemblies.

    NOTE: The interrupter port axis must form a 90-degree angle with respect to the line formed by the clamping surfaces of the contact support casting (Figure 6).

30. Check to make sure all insulation – organic and inorganic – is clean.

    NOTE: Contaminants on insulating parts facilitate electrical breakdown.

    A. Clean insulating parts with insulating oil with clean, lint-free rags.

31. Using clean, lint-free rags and insulating oil, wipe down the interior of the tank.

32. Lubricate all moving parts, using the proper lubricant.

    NOTE: The main bearing of the walking beam (Figure 5) is life-time lubricated and requires no lubrication unless dismantled.

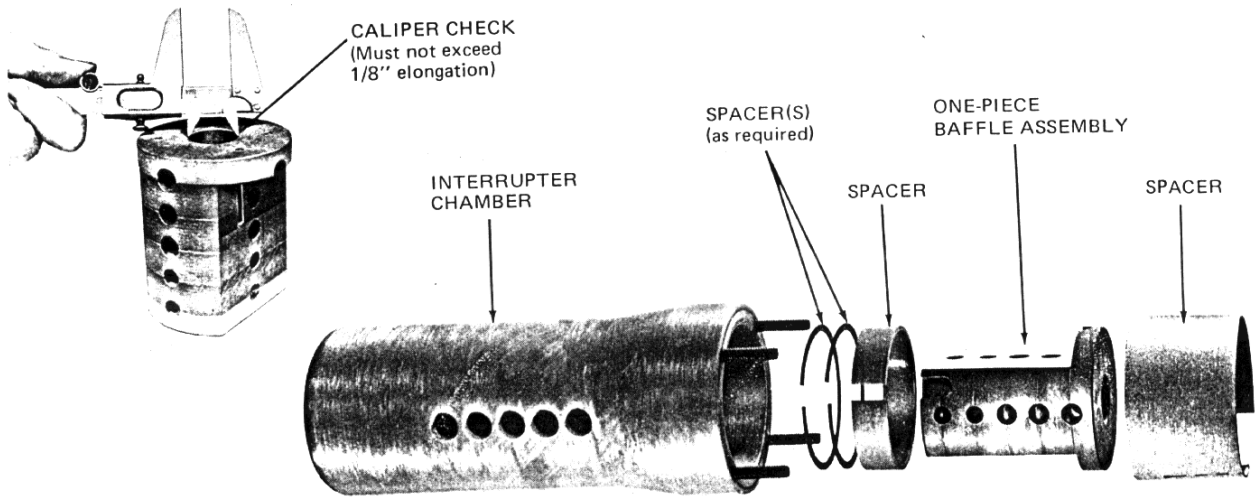


Figure 9

33. Check to make sure the distance between the top of the dashpot, detail (Figure 5), of the opening shock absorbers and the bottom of the crosshead is 1-1/8 inches.

    A. If the distance between the top of the dashpot and the bottom of the crosshead is not 1-1/8 inches, refer to Opening Shock Absorbers in the Adjustments section of these instructions.

    Correct this condition before proceeding to the next maintenance check.

34. Using the operating mechanism maintenance-positioning valve slow-close the breaker.

35. Attach a McGraw-Edison hydraulic, windlass or manual tank hoist to the tank.

36. Carefully raise the tank.

    A. Check to make sure the tank-sealing gasket mounted in the head of the breaker is securely in place.

37. Tighten the nuts to secure the tank clamps to the underside of the tank flange by pulling up progressively in small increments.

38. Fill the breaker with tested oil – through the drain valve (Figure 2) or through the oil filling opening in the tank cover to the point indicated on the oil-level gage.

    Refer to – and follow – S290-05-2, Oil Circuit Breaker Insulating Oil and Oil Handling, for testing the oil.

    A. It is recommended that four hours be allowed for the oil to deaerate before energizing the breaker, especially if the tank is filled from the top.

    B. Operate the breaker eight to ten times during this four-hour period to free entrapped air.

    C. After the oil has been deaerated, check the oil-level gage (Figure 7).

    D. If deaeration has reduced the oil volume, add more oil to the appropriate point on the oil-level gage (Figure 7).

39. Make sure that the operating mechanism is ready for normal (fast) operation and that all safety blocking has been removed.

    Refer to – and follow – Service Information S290-50-1, Type OA-3 Operating Mechanism Instructions.

40. Using mechanical control in accordance with S290-50-1, Type OA-3 Operating Mechanism Instructions, fast-operate the breaker:

    A. Close the breaker manually by depressing the closing lever.

    (1) The breaker should close at normal speed.

    B. Open the breaker manually by using the trip lever.

    (1) The breaker should open at normal speed.

41. Connect a temporary two-pushbutton station with open and close buttons close enough together to coordinate the electrical control of the breaker.

    Refer to – and follow – the connection diagram that accompanies the breaker.

42. Using the temporary electrical controls, momentarily energize the closing circuit.

    A. The breaker should close instantly.

43. Using the temporary electrical controls, momentarily energize the opening circuit.

    A. The breaker should open instantly.

44. Using the temporary electrical controls, repeat the closing and opening operations.

45. With the breaker open, check the operation of the Y (anti-pump) relay.

    A. Close the opening switch and hold it.

    B. Close the closing switch and hold it.

    The breaker should close and open and remain open.

    C. Release both the opening and the closing switches.

46. Perform time travel tests (optional).

    A. Using the operating mechanism maintenance-positioning valve, slow-close the breaker.

    B. Remove pipe cap (Figure 5) from the pipe nipple.

    C. Install the analyzer adapter plate on the pipe nipple.

    D. Insert the analyzer rod in hole (Figure 5) on the center liftrod.

    NOTE: The fitting on the center liftrod has a 10-32 tapped hole for the analyzer rod.

    E. Record direct readings of contact speed/motion characteristics.

    NOTE: Figure 8 is a typical time-travel chart for CG-38 and CG-48 breakers.

    F. Remove the analyzer rod.

    G. Remove the analyzer adapter plate from the pipe nipple.

    H. Reinstall pipe cap (Figure 5) on the pipe nipple, resealing the cap on the nipple with thread compound.

47. Check all painted surfaces, making sure they are clean.

    A. Retouch the paint where necessary for appearance and complete protection.

48. Place the breaker and the operating mechanism in the following service-ready condition:

    A. Pump motor switch closed and accumulator charged;

    B. Maintenance-positioning valve closed;

    C. Breaker in the open position;

    D. Heaters in the operating mechanism cabinet energized.

SAFETY PRECAUTION

Main (load) connections should not impose more than a 100-lb maximum cantilever pull on the bushings. Forces may be caused by expansion, contraction, wind loading, or foundation movement.

49. In the permanent service file, record all maintenance work performed.

    A. Record operation-counter registration.

    B. Record pertinent facts regarding condition of breaker.

ADJUSTMENTS

SAFETY PRECAUTIONS

Before making any adjustments on a CG-38 or CG-48 oil circuit breaker, the breaker must be out of service.

Prior to making any adjustments refer to – and follow – instructions in Service Information S290-50-1, Type OA-3 Operating Mechanism.

The OA-3 operating mechanism maintenance-positioning valve must be used when making some adjustments. Observe all safety precautions in S290-50-1 as well as those throughout these instructions when using this valve.

Refer to Service Information S290-50-1, OA-3 Operating-Mechanism instructions, for the proper use of these valves.

When pressure is not required in the OA-3 operating-mechanism accumulator for operational checks, drain the hydraulic oil from the accumulator to discharge the pressure on the accumulator working conditions. To balance pressure on the accumulator piston seals, a pressure of precharge plus ten strokes of the hand pump (that is, five cu in.) must be maintained at all times when the breaker is not in service or under test.

If there is no oil in the tank and the interrupter chambers are not in place a CG-38 or CG-48 breaker must be slow-operated only – never operated at full speed.

Before operating a CG-38 or CG-48 breaker at full speed, it should always be slow-closed several times.

When it is necessary to use the operating mechanism for operational checks, stay clear of all moving parts.

Personnel performing work on a CG-38 or CG-48 oil circuit breaker or an OA-3 operating mechanism must clearly understand – and follow – both the breaker instructions and the operating mechanism instructions. The power and speed of CG-38 or CG-48 breakers in operation make observation of all safety precautions extremely important.

Keep complete records of all adjustments made.

1. Liftrod verticality.

   If a liftrod is not vertical:

   A. Make sure the breaker is level.

   B. If the breaker is level, but the liftrod (Figure 5) is not vertical:

      (1) With the breaker open, loosen the clamps on the guide rod (Figure 5).

      (2) Place the liftrod in the vertical position.

      (3) Tighten the clamps on the guide rod.

   If a movable contact member (Figure 5) is not vertical:

   A. With the breaker open, loosen movable contact member clamps on the crosshead (Figure 5).

   B. Place the movable contact member in the vertical position.

   C. Tighten the movable contact member clamps on the crosshead (Figure 5).

2. Movable contact member alignment.

   Normally, movable contact member alignment is only required when a bushing or contact assembly is replaced.

   Basically, proper alignment ensures that the movable contact member passes through the interrupter chamber without excessive rubbing and enters the stationary contact cluster on center.

   A. Prior to making movable contact member alignment adjustments, (with the breaker in the open position and interrupter chambers removed), make sure the liftrods are vertical (Figure 5).

      (1) Make sure the contact support casting machined surface is level (Figures 6 and 10).

      See Figure 6 for bushing stud engagement into the support casting.

      (2) Using the operating mechanism maintenance-positioning valve slow-close the breaker until the movable contact member is about to enter the stationary contact cluster (Figure 6).

      (3) Center the moving contact member on the stationary contact cluster by one or a combination of both of the following methods (Figure 6).

         (a) Free the moving contact member clamp by sufficiently loosening the bolts retaining the clamp in the crosshead (Figure 6).

            - Slide the whole assembly within crosshead (holes are slotted for this purpose) to achieve alignment.
            - Retighten the bolts retaining the clamp.

         (b) Free the movable contact member in the clamp by slightly loosening the bolts retaining the clamp in the crosshead (Figure 6).

            - Screw the moving contact member into or out of the clamp to achieve alignment.
            - Retighten bolts retaining the clamp.

         Adjustments should be made in small increments. Precise tolerances are not given for these adjustments since alignment is not highly critical due to the flexibility of moving parts.

      (4) Slow-operate the breaker several times making sure the movable contact member enters the stationary contact cluster on center, and spreads the contact shoes an equal distance from each other (Figure 6).

         NOTE: Since this adjustment may cause a change in movable contact member penetration, before proceeding, check the penetration in accordance with the appropriate instructions in this section.

      (5) With the breaker open, reinstall the interrupter chambers (Figure 6).

NOTE: The interrupter port axis must form a 90-degree angle with respect to the line formed by the clamping surfaces of the contact support casting (Figure 6).

(6) Slow-operate the breaker several times to make sure the movable contact members pass through the interrupter chambers freely (Figure 6).

3. Movable contact member penetration.

If the penetration of a movable contact member into its stationary contact cluster (Figure 6) is not 1-1/4 inches ± 1/16 inch:

A. Determine whether the movable contact member must be shifted up or down to obtain a penetration of 1-1/4 inches ± 1/16 inch.

B. With the interrupter chamber removed, using the operating mechanism maintenance-positioning valve slow-open the breaker.

C. Loosen the clamping bolts slightly on crosshead, to free the movable contact member in the clamp (Figure 6).

D. Screw the movable contact member into or out of the clamp to obtain penetration of 1-1/4 inches ± 1/16 inch.

NOTE: This adjustment must be made in 360-degree increments to maintain movable contact member alignment.

E. Retighten the bolts retaining the movable contact member clamp.

F. Using the operating mechanism maintenance-positioning valve slow-close the breaker until the movable contact member is about to enter the stationary contact cluster (Figure 6).

G. After checking for proper alignment, slow-close the breaker and:

(1) Verify 1-1/4 inches ± 1/16-inch penetration.

(2) Check for equidistant spreading of contact shoes.

4. Electrical resistance of liftrods.

If the electrical resistance of a liftrod (Figure 5) is less than 10,000 megohms:

A. With the breaker open, heat the tank air to a value about 20C (68F) above ambient temperature.

NOTE: Space heaters may be used, but care must be taken to prevent heating the insulating materials to a temperature over 100C (212F). Air circulation through available openings must be provided.

5. Interrupter parts.

If all interrupter parts are not dry:

A. With the breaker open, heat the tank air to a value about 20C (68F) above ambient temperature.

NOTE: Space heaters may be used, but care must be taken to prevent heating the interrupter parts to a temperature over 100C (212F). Air circulation through available openings must be provided.

6. Movable and stationary contacts.

To dress slightly eroded movable contact members and stationary contact shoes (Figures 6 and 10):

A. With the interrupter chambers (Figure 6) removed, dress the mating surface of the contacts lightly with a fine file. Since filings will contaminate the insulating oil, be very careful not to drop any filings in the tank.

B. Reinstall the interrupter chambers in their original pole locations (Figure 2) and positions (Figure 6).

NOTE: The interrupter port axis must form a 90-degree angle with respect to the line formed by the clamping surfaces of the contact support casing (Figure 6).

If the contacts are severely eroded refer to Movable and Stationary contacts in the Parts Replacement section.

7. Top-of-bushing, terminal-to-terminal resistance test.

If the top-of-bushing, terminal-to-terminal resistance value of a breaker pole is 230 microohms or higher:

A. With the interrupter chambers removed, check the movable contact members and the stationary contact shoes (Figure 6).

(1) If the contacts are only slightly eroded, dress the mating surfaces with a fine file.

Since the filings will contaminate the insulating oil, be very careful not to drop any filings in the tank.

(2) If the contacts are severely eroded refer to Movable and stationary contacts in the Parts Replacement section.

(3) For 31.5 to 40 ka contacts check that retaining clip is 1/16 ± 1/64 inch beyond contact ring when movable contact member is inserted (Figure 10).

B. Reinstall the interrupter chambers in their original locations (Figure 2) and positions (Figure 6).

NOTE: The interrupter port axis must form a 90-degree angle with respect to the line formed by the clamping surfaces of the contact support casting (Figure 6).

C. Retest the top-of-bushing, terminal-to-terminal resistance.

8. Opening shock absorbers.

If the distance between the top of the dashpot and the bottom of the crosshead is not 1-1/8 inches (Figure 5) detail:

A. Using the maintenance-positioning valve, slow-open the breaker.

B. Loosen the locknut on the bottom of dashpot cup (Figure 5).

C. Screw the dashpot cup up or down to obtain a distance of 1-1/8 inches between the bottom of the crosshead and the top of the dashpot cup.

PARTS REPLACEMENT

SAFETY PRECAUTIONS

Before replacing any part in a CG-38 or CG-48 oil circuit breaker, the breaker must be out of service. Prior to replacing any parts refer to – and follow – Instructions in Service Information S290-50-1, Type OA-3 Operating Mechanism.

The OA-3 operating mechanism maintenance-positioning valve must be used when replacing some parts. Observe all safety precautions in Service Information S290-50-1, OA-3 Operating-Mechanism Instructions as well as those throughout these instructions when using this valve.

When pressure is not required in the OA-3 operating-mechanism accumulator for operational checks, drain the hydraulic oil from the accumulator to discharge the pressure to assure safe working conditions. To balance pressure on the accumulator piston seals, a pressure of precharge plus ten strokes of the hand pump (that is, five cu in.) must be maintained at all times when the breaker is not in service or under test.

If there is no oil in the tank and the interrupter chambers are not in place a CG-38 or CG-48 breaker must be slow-operated only – never operate at full speed.

Before operating a CG-38 or CG-48 at full speed, it should always be slow-operated several times.

When it is necessary to use the operating mechanism for operational checks, stay clear of all moving parts.

Personnel performing work on a CG-38 or CG-48 oil circuit breaker or an OA-3 operating mechanism must clearly understand – and follow – both the breaker instructions and the operating-mechanism instructions. The power and speed of CG-38 or CG-48 breaker in operation make observation of all safety procedures extremely important.

Refer to the Spare Parts section for parts-ordering data.

Keep complete records of all parts replaced.

1. Bushings

To replace a bushing:

A. With the breaker open make a scribe mark 1-1/4 inches from the top of the movable contact member (Figure 5).

B. With a non-carbon grease-base pencil, mark the location (Figure 2) and position (Figure 5) of the interrupter assembly.

C. Remove the entire interrupter assembly by loosening the bolts on the stationary contact support casting (Figure 5) and turning the support casting from the bushing stud.

D. Remove the damaged bushing by removing the nuts from the bushing studs (Figure 5).

E. Using a new gasket, with both sides cemented, install the new bushing and hand-tighten the nuts on the bushing studs. *Center the bushing flange as evenly as possible on the bushing studs.*

NOTE: CG breakers furnished with transformer-breaker interchangeable bushings include an adapter flange and o-ring.

F. Remove the interrupter chamber from the support casting and stationary contact assembly.

NOTE: Do not invert interrupter chamber since baffle assembly may fall out.

G. Reinstall the support casting and contact assembly on the bushing. Bushing stud engagement into the casting should be two inches (Figure 6).

NOTE: The line formed by the clamping surfaces of the support casting should point to the center of the breaker (middle liftrod) (Figure 6).

H. The clamping bolts on the contact support casting should be drawn up hand-tight (Figure 6).

NOTE: Make sure the machined surface of the contact support casting is level (Figure 6).

I. Reinstall the interrupter chamber.

NOTE: Make sure the interrupter chamber port axis is at a 90-degree angle with respect to the line formed by the clamping surfaces of the support casting (Figure 6).

J. Using the operating mechanism maintenance-positioning valve, slow-close the breaker until the movable contact members are about to enter the interrupter chamber (Figure 5).

(1) Make sure the movable contact members are properly aligned with interrupter chambers so that on closing the movable contact will enter the interrupter chamber on center.

a. Make sure the movable contact members are vertical.

b. Make sure the interrupter chambers are vertical and coaxial with the movable contact members.

K. Using the operating mechanism maintenance-positioning valve, continue to slow-close the breaker, allowing it to settle on the latch with no overtravel.

L. Slow-operate the breaker several times to make sure the movable contact members enter and pass through the interrupter chambers freely (Figure 5).

(1) If a movable contact member binds when passing through the interrupter chamber refer to movable member alignment in the Adjustments section.

(2) After adjusting the movable contact member for proper alignment tighten the clamping bolts on the stationary contact support casting (Figure 6).

NOTE: In accordance with alignment adjustment instructions, if movable contact member is screwed into or out of the clamp (Figure 6) in

the crosshead, contact penetration check must be made.

(3) Tighten the nuts on the four bushing studs (Figure 5).

(4) Slow-operate the breaker several times making sure the movable contact member passes through the interrupter chamber freely.

2. Bushing current transformers.

Refer to – and follow – Service Information S290-80-2, Type OE Bushing Current Transformer Instructions.

To replace a bushing current transformer:

A. Using a McGraw-Edison hydraulic or manual tank hoist lower the breaker tank carefully to avoid damage to the sealing gasket.

B. Slow-open the breaker using the operating mechanism maintenance-positioning valve.

WARNING

Block the operating mechanism in the open position in accordance with Service Information S290-50-1, Type OA-3 Operating Mechanism.

C. Cut the secondary leads near the current transformer to be removed.

D. Remove lugs holding the current transformer in place (Figure 5).

E. Carefully remove the ring and current transformer by lowering them over the bushing and interrupter assembly (Figure 5).

F. Install the new current transformer.

(1) Tighten the lugs to the ring and secure the transformer to the underside of the breaker head.

Refer to – and follow – Service Information S290-80-2, Type OE Bushing Current Transformer Instructions, for:

a. polarity marks;

b. wiring and connections;

c. short-circuiting at the terminal block.

3. Interrupter chamber baffle assembly.

CAUTION

Handle all insulating parts carefully. Protect them from abrasion or other damage.

Do not overexpose insulating parts to air with a relative humidity of over 50 percent.

To replace a baffle assembly in an interrupter chamber:

A. Using the operating mechanism maintenance-positioning valve slow-open the breaker.

WARNING

Block the operating mechanism in the open position in accordance with Service Information S290-50-1 Type OA-3 Operating Mechanism.

B. With a non-carbon, grease-base pencil, mark the location (Figure 2) and position (Figure 6) of the interrupter chamber so that, after being removed, it can be returned to its original location and position.

C. Remove nuts (Figure 6) holding interrupter chamber in place.

D. Remove the interrupter chamber (Figure 6).

NOTE: Hold interrupter assembly upright so that baffle assembly does not fall out.

E. Remove spacer (Figure 9) which holds the baffle assembly in place.

F. Remove baffle assembly (Figure 9).

G. Install the new baffle assembly. Check alignment of baffle ports with interrupter ports.

H. Reinstall spacer (Figure 9).

I. Reinstall interrupter chamber (Figure 6) in its original location (Figure 2) and position (Figure 6).

NOTE: The interrupter port axis must form a 90-degree angle with respect to the line formed by the clamping surfaces of the contact support casting (Figure 6).

J. Make sure nuts (Figure 6) are tight.

4. Stationary contacts.

With the breaker-operating mechanism blocked open and the interrupter chamber removed:

A. To replace an entire 20 ka stationary contact assembly:

(1) Remove the four garter springs and six contact shoes from the supporting casting (Figure 10).

(2) Using the contact retainer as a spacer replace all six shoes and secure with the garter springs which are color coded for position (Figure 10).

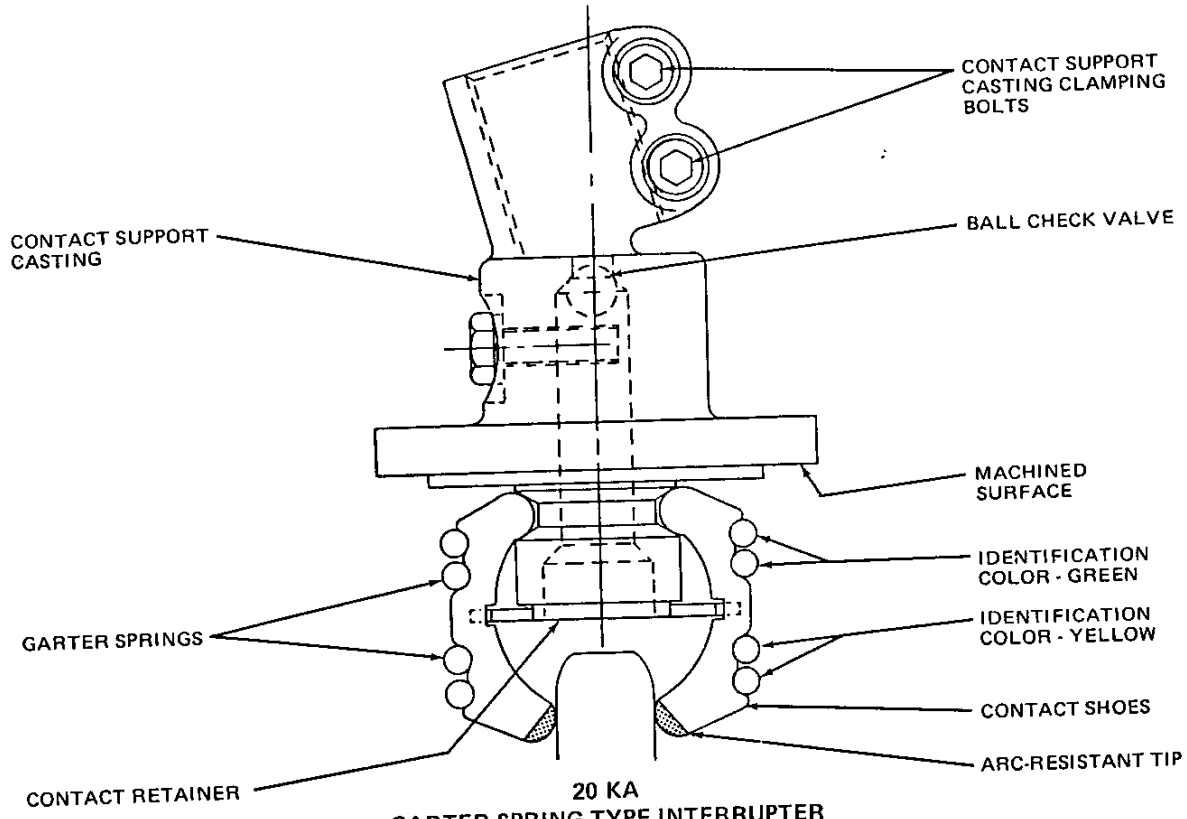
NOTE: When the entire stationary contact assembly is replaced, the movable contact member should also be replaced.

CAUTION

Make certain the arc-resistant tip of each contact shoe is on the end making contact with the movable contact member (Figure 10).

(3) Check contact alignment and penetration in accordance with the Adjustments section.

(4) Reinstall the interrupter chamber to its original location and position.



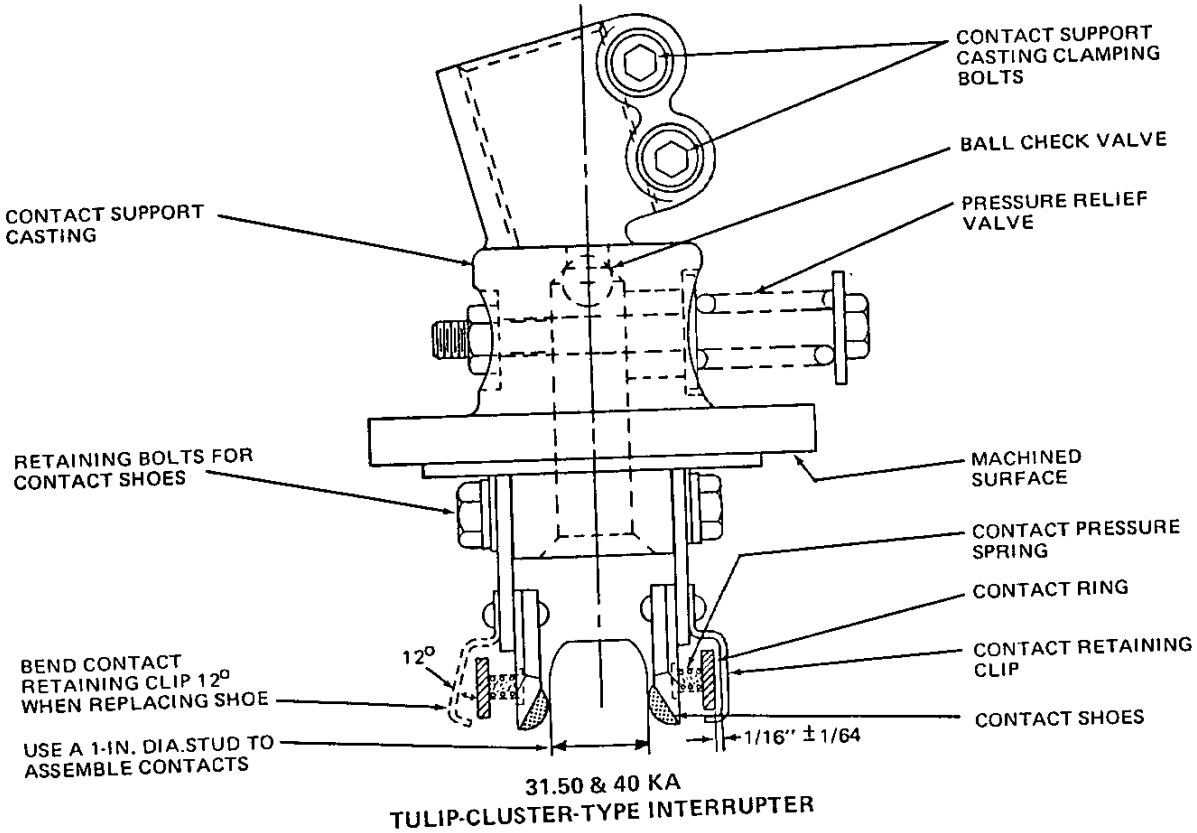


Figure 10
Stationary contact assemblies.

B. To replace a single 20 ka contact shoe:

(1) Remove the bottom three garter springs from the support casting (Figure 10).

(2) Remove the damaged contact shoe.

> **CAUTION**
>
> Insert the replacement shoe, making sure the arc-resistant tip is on the end making contact with the movable contact member.

(3) Secure the three garter springs which are color coded for position (Figure 10).

(4) Reinstall interrupter chamber to its original location and position.

C. To replace an entire 31.5 ka or 40 ka stationary contact assembly:

(1) Remove the six-shoe contact assembly by loosening six retaining bolts (Figure 10).

(2) Reinstall new shoes.

(3) Make sure contact pressure springs are properly positioned and retained by contact ring (Figure 10).

(4) After checking for proper alignment, slow-close the breaker and check for 1/16 ± 1/64-inch space between contact ring and retaining clip (Figure 10).

(5) Check contact penetration in accordance with the Adjustments section.

(6) Reinstall the interrupter chamber to its original location and position.

NOTE: When the entire stationary contact assembly is replaced the movable contact member should also be replaced.

D. To replace a single 31.5 ka or 40 ka stationary contact shoe:

(1) Loosen the six retaining bolts and remove the entire stationary contact assembly from the casting (Figure 10).

(2) Bend the retaining clip out approximately 12 degrees (Figure 10) and move the shoe out of the cluster.

NOTE: In cases of multi-shoe replacements it is recommended that the assembly be assembled with a one-inch rod in place to simulate a movable contact member.

(3) Bend the replacement shoe contact retaining clip approximately 12 degrees and place it in the cluster. Straighten the clip.

(4) Reinstall the entire stationary contact assembly on the support casting making sure all bolts are tight.

(5) Check contact alignment and penetration in accordance with the Adjustments section.

(6) Check for 1/16 ± 1/64 space between contact ring and retaining clip (Figure 10), with movable contact member inserted.

(7) Reinstall the interrupter chamber to its original location and position.

5. Movable contact member.

To replace a movable contact member (Figure 6):

A. With the breaker in the open position loosen the bolts fastening the clamp to the crosshead (Figure 6).

B. Screw the movable contact member out of the clamp.

C. Install the new movable contact member by screwing it into the clamp.

NOTE: Check the movable contact member for alignment and penetration in accordance with the Adjustments section.

D. Make sure the bolts fastening the clamp are secured after alignment and penetration are checked.

6. Tank gasket.

To replace a tank gasket (Figure 5):

A. Using a McGraw-Edison hydraulic, windlass or manual tank hoist lower the tank carefully.

B. Remove the damaged gasket cemented in the grooved flange in the head of the breaker.

C. Cement the new gasket (Buta-N cork, 5/16 x 13/16 cross section) into the groove in the flange using the cement – or its equivalent – specified under Materials in the Maintenance section.

D. Grease coat the gasket so that it will not stick.

SPARE PARTS LIST

It is recommended that spare parts stock include a sufficient quantity of parts for one pole of movable and stationary contacts, and baffle assemblies for each quantity of one to six breakers.

Item	Description	Identification	Quantity Per Pole	Suggested Stock
1	Movable Contact Member	SCB00374A00A	2	2
	Stationary Contact Shoe			
2	20 ka	SCA01146A00A	12	12
3	31.5 and 40 ka	SCA01437A00A	12	12
4	Interrupter Assembly includes chamber and baffling	SCC00312A00A	2	0
	Interrupter Components			
5	Interrupter Chamber	SCC00301A001	2	0
6	Baffle Assembly	SCB00384A001	2	2
7	Spacer, Top	SCA01234A001	2	0
8	Spacer, Lower	FA-9656J	2	0
9	Spacer, Bottom	SCA01243A002	as required	0

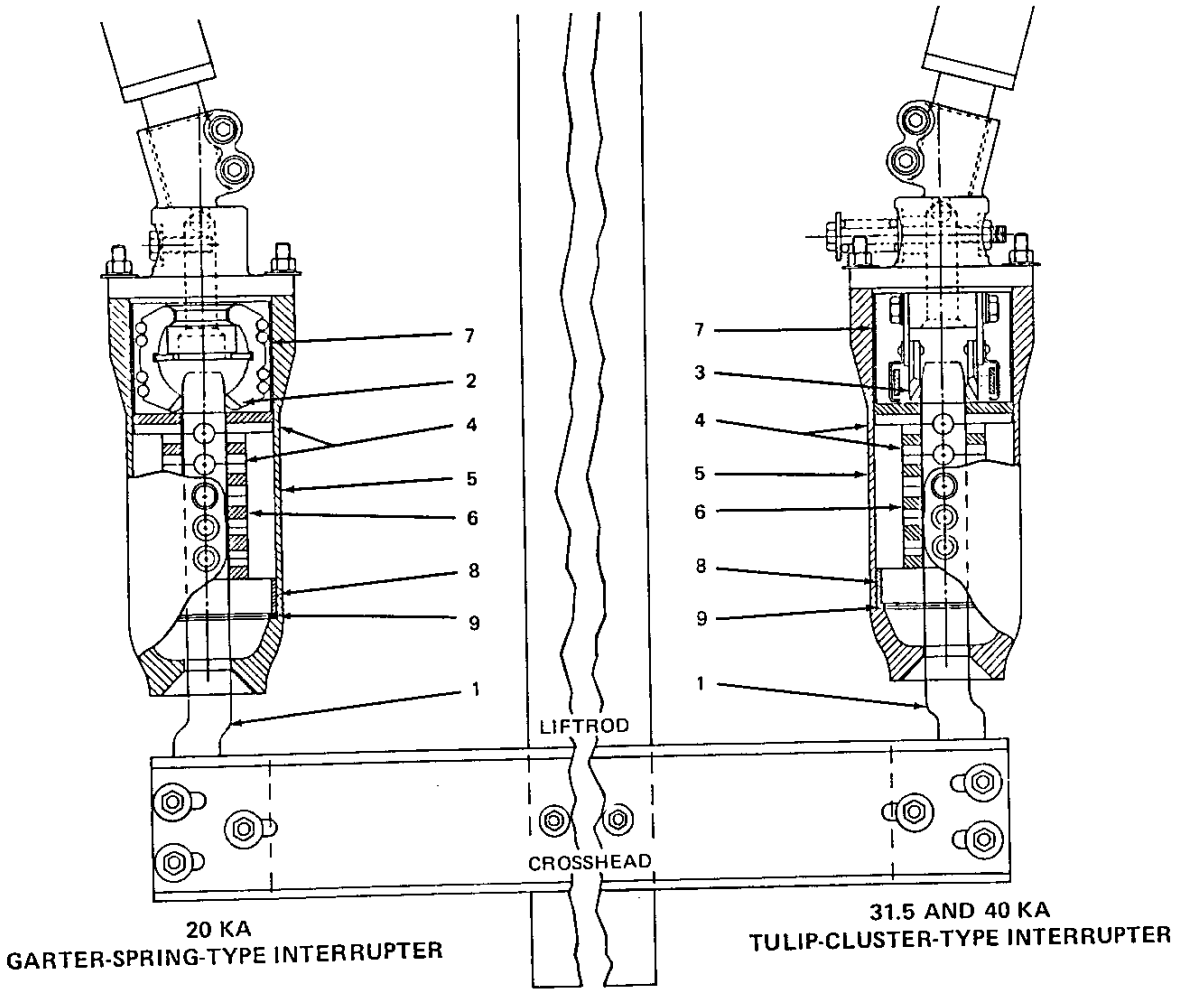


Figure 11
Spare parts identification