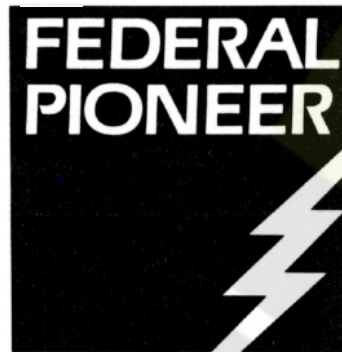
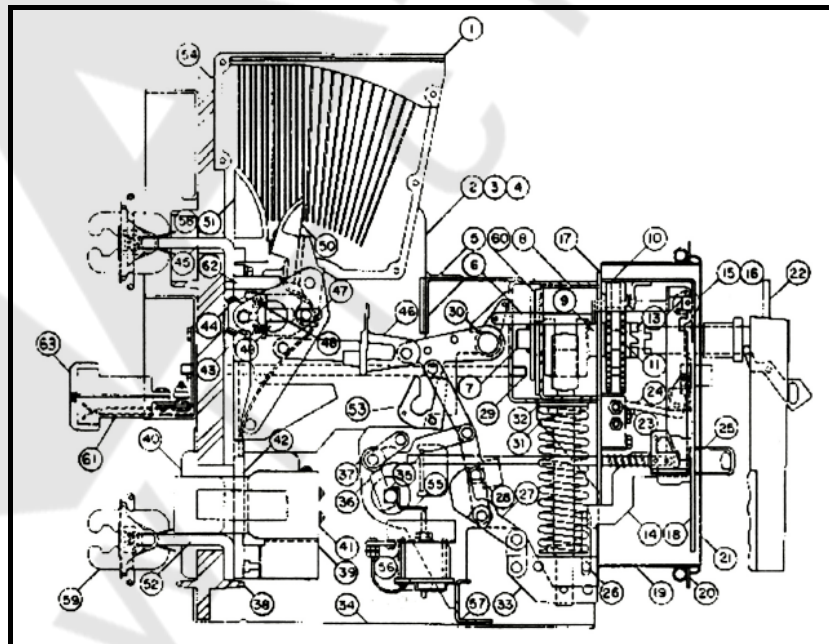




INSTRUCTIONS FOR THE CARE AND MAINTENANCE OF H-3 AND HL-3 CIRCUIT BREAKERS



BEFORE PLACING AN H-3 OR HL-3 AIR CIRCUIT BREAKER IN SERVICE, READ SECTIONS 1 THROUGH 6 OF THIS INSTRUCTION MANUAL COMPLETELY AND PERFORM THE PRE-SERVICE INSPECTION (SEE SECTION 6).

THE PROPER INSTALLATION, MAINTENANCE AND OPERATION OF THESE BREAKERS IS A PRIME SAFETY CONSIDERATION FOR THE PROTECTION OF PERSONNEL AND EQUIPMENT. REFERENCE TO THIS MANUAL AND ADHERENCE ITS RECOMMENDATIONS WILL ENHANCE THE PERFORMANCE OF THESE BREAKERS UNDER ALL CONDITIONS.

THIS MANUAL DOES NOT PURPORT TO COVER ALL DETAILS OR VARIATIONS OF EQUIPMENT NOR TO PROVIDE FOR EVERY POSSIBLE CONTINGENCY TO BE MET IN CONNECTION WITH RECEIVING, STORAGE, INSTALLATION, MAINTENANCE OR OPERATION. SHOULD FURTHER INFORMATION BE REQUIRED OR PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY, PLEASE REFER TO SCHNEIDER ELECTRIC.

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GENERAL DESCRIPTION

Type H - 3 POWER AIR CIRCUIT BREAKERS ARE SUITABLE FOR CONTROLLING AND PROTECTING LOW VOLTAGE POWER CIRCUITS UP TO 250 VOLTS DC AND 600 VOLTS AC. THEY ARE A MEANS OF SAFELY SWITCHING LOADS AND AUTOMATICALLY CLEARING CIRCUITS WHEN ABNORMAL CONDITIONS SUCH AS UNDER- VOLTAGE, SUSTAINED OVERLOADS, AND SHORT-CIRCUITS OCCUR.

THE THREE MAIN FUNCTIONAL COMPONENTS OF THE TYPE H3 BREAKER ARE ITS MECHANISM, THE CONDUCTIVE MEMBERS AND THE INTERRUPTING DEVICES.

1. THE MECHANISM IS DESIGNED TO RECEIVE ENERGY, STORE IT, AND DELIVER IT TO CLOSE THE BREAKER CONTACTS WHEN REQUIRED. UPON ACTIVATION OF THE TRIP DEVICE, THE MECHANISM ALLOWS THE CONTACTS TO OPEN REGARDLESS OF THE STATE OF THE MECHANISM, THAT IS THE BREAKER MECHANISM IS "TRIP-FREE".

HIGH SPEED BREAKER CLOSING OPERATION IS ACHIEVED THROUGH THE RELEASE OF A PRE-CHARGED (STORED ENERGY TYPE) CLOSING SPRING, WHILE THE COMPRESSED MAIN MOVING CONTACT SPRINGS AND THE CLOSING SHAFT TORSION SPRING PROVIDE THE ENERGY FOR THE HIGH SPEED CONTACT SEPARATION AND OPENING OF THE BREAKER.

BREAKERS ARE PROVIDED WITH EITHER A MANUALLY OPERATED HANDLE OR AN ELECTRIC MOTOR FOR COMPRESSING THE CLOSING SPRING.

2. THE CONDUCTIVE MEMBERS ARE ASSEMBLED ON A MOULDED BASE OF FIBERGLASS-REINFORCED POLYESTER. INDIVIDUAL POLE PIECES CAREFULLY INTERLOCKED TOGETHER AND SUPPORTED BY A STEEL FRAME PROVIDE THE MECHANICAL SUPPORT AND INSULATING STRUCTURE REQUIRED. THE CONDUCTIVE MEMBERS COMPRISE THE MAIN POWER TERMINALS OR DRAWOUT CONTACTS, THE MAIN FIXED CONTACTS AND THE MAIN MOVING CONTACTS.

3. THE INTERRUPTING DEVICES ARE THE FIXED AND MOVING ARCING CONTACTS AND THE ARC CHUTES.

IN ADDITION TO THESE MAIN FUNCTIONAL COMPONENTS THE BREAKER IS AVAILABLE WITH OVERLOAD PROTECTION AND OTHER ACCESSORIES AND INTERLOCKING DEVICES.

2. RECEIVING - HANDLING - STORAGE - INSTALLATION

2.1 RECEIVING

IMMEDIATELY UPON RECEIPT OF THE BREAKER AN EXAMINATION SHOULD BE MADE FOR DAMAGE SUSTAINED IN TRANSIT. IF DAMAGE HAS OCCURRED OR THERE IS EVIDENCE OF ROUGH HANDLING, A CLAIM SHOULD BE FILED IMMEDIATELY WITH THE TRANSPORTATION COMPANY AND SCHNEIDER ELECTRIC SHOULD BE NOTIFIED. CHECK ALL PARTS AGAINST THE PACKING LIST TO MAKE SURE ALL THE CORRECT ITEMS HAVE BEEN RECEIVED.

2.2 HANDLING

LIFT THE BREAKER BY THE STEEL CHANNELS AT THE FRONT

AND BACK. DO NOT LIFT BY THE CONNECTING TERMINALS, ARC CHUTES, OR OPERATING HANDLE. SPECIAL LIFTING DEVICES ARE AVAILABLE FOR USE WITH OVERHEAD CRANE OR SIMILAR MEANS (SEE SECTION 9. 1). CHECK THE UNIT THOROUGHLY TO SEE THAT NO PARTS WERE DAMAGED OR FORCED OUT OF ALIGNMENT DURING SHIPMENT. IF REPLACEMENT PARTS ARE REQUIRED, THE MANUFACTURER SHOULD BE NOTIFIED PROMPTLY. THE BREAKER SHOULD BE INSTALLED IN A CLEAN DRY VENTILATED AREA WHICH IS FREE FROM ATMOSPHERIC CONTAMINANTS.

2.3 STORAGE

EACH CIRCUIT BREAKER SHOULD BE STORED IN ITS SHIPPING CONTAINER IN AN UPRIGHT POSITION IN A CLEAN DRY AREA. SHOULD THE UNIT GET WET, IT MUST BE THOROUGHLY DRIED OUT USING FORCED WARM AIR OVER AN EXTENDED PERIOD UNTIL "INFINITE" READINGS ARE OBTAINED USING A 600 VOLT MEGGER.

2.4 MOUNTING

H-3 AND HL-3 CIRCUIT BREAKERS SHOULD BE MOUNTED IN SHEET STEEL ENCLOSURES IN ACCORDANCE WITH RECOMMENDED DIMENSIONS. THE MOUNTING SUPPORT SHOULD BE A RIGID STRUCTURE ABLE TO WITHSTAND THE IMPACT CAUSED BY THE SWITCHING OPERATIONS, WITHOUT ANY DISTORTION AND UNDUE VIBRATION OF THE MECHANISM. ALL H-3 AND HL-3 ENCLOSURES, WITH THE EXCEPTION OF THE 6000A 100H-3, REQUIRE AN INSULATING BARRIER MADE OF 1/16 INCH THICK NEMA GRADE GPO-3 MATERIAL INSTALLED ON THE INSIDE TOP SURFACE USING NON-METALLIC HARDWARE. NOTE THAT THE WIDER BARRIERS MAY REQUIRE ADDITIONAL HARDWARE TO SUPPORT THE OUTER EDGES.

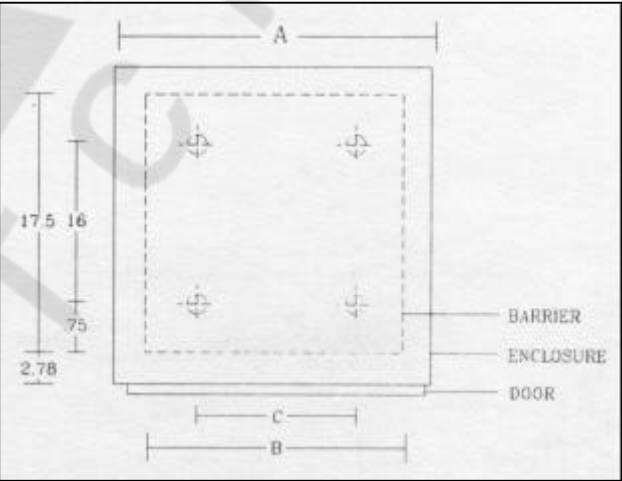


FIG. 2.4 ENCLOSURE INSULATING

ENCL. WIDTH	BARRIER WIDTH	MOUNTING HOLES
"A"	"B"	"C"
18	16	8 3/4
25	17 5/8	15 3/4
30	22 5/8	15 3/4
32	31	15 3/4
36	34	15 3/4
38	37	15 3/4
45	44	15 3/4

2.5 POWER TERMINAL CONNECTIONS

THE H-3 POWER TERMINALS ARE PLATED FOR MAXIMUM JOINT EFFICIENCY AND CABLE OR BUS CONNECTORS MUST BE CLEAN AND FREE FROM DENTS OR BURRS, AND BOLTED SECURELY TO THE TERMINALS. POOR JOINTS LEAD TO OVERHEATING, SUBSEQUENT CONTACT DETERIORATION, AND AN EVENTUAL FAILURE. CONNECTIONS SHOULD BE PROPERLY SUPPORTED SO AS NOT TO TRANSFER ANY UNNECESSARY MECHANICAL OR SHORT CIRCUIT STRESSES TO THE TERMINALS. ANY STRAIN WHICH MAY HAVE NO APPARENT EFFECT INITIALLY MAY AFTER PROLONGED PERIODS OF VIBRATION AND SHOCK FROM NORMAL OPERATION, CAUSE POOR CONTACT ALIGNMENT.

2.6 SECONDARY CONTROL CIRCUITS

CONTROL CIRCUIT WIRING, WHERE APPLICABLE, SHOULD BE MADE IN STRICT ACCORDANCE WITH DETAILED WIRING DIAGRAMS. FIXED MOUNTED BREAKERS ARE PROVIDED WITH TERMINAL BLOCKS FOR CONNECTIONS TO REMOTELY LOCATED CONTROL AND INDICATING DEVICES. REMOTE WIRING SHOULD BE BUNDLED TOGETHER, PROPERLY SUPPORTED AWAY FROM PRIMARY CONNECTIONS.

CONTROL WIRING FROM CRADLE MOUNTED SECONDARY CONTACTS OF DRAWOUT TYPE BREAKERS MUST BE PASSED THROUGH THE HOLES PROVIDED IN THE CRADLE BACKPAN AND SECURED ON THE INSIDE IN SUCH A MANNER THAT IT IS KEPT AWAY FROM THE PATH OF THE BREAKER MAIN DRAWOUT CONTACTS AND SHUTTERS IF PROVIDED.

METER SHUNTS, RESISTORS AND SIMILAR DEVICES THAT OPERATE AT RELATIVELY HIGH TEMPERATURE SHOULD BE MOUNTED AWAY FROM THE CIRCUIT BREAKER SO THEY DO NOT CONTRIBUTE TO THE HEATING OF THE UNIT.

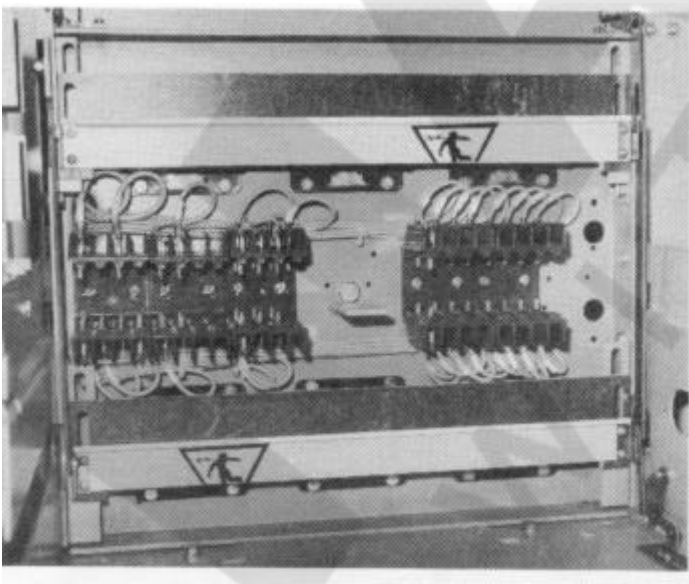
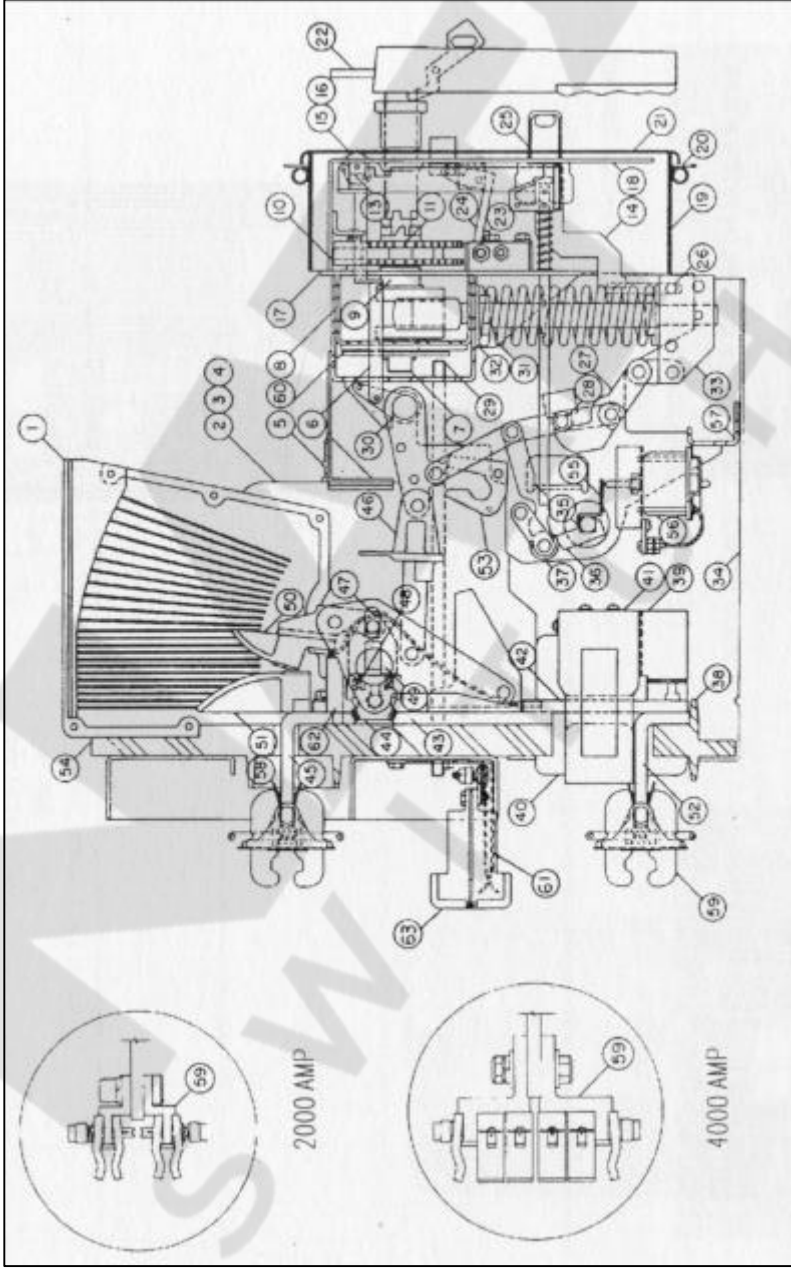


FIG. 2.6 CRADLE WIRING

3. BREAKER COMPONENTS AND CONTROLS

3.1 BREAKER SECTIONAL VIEW

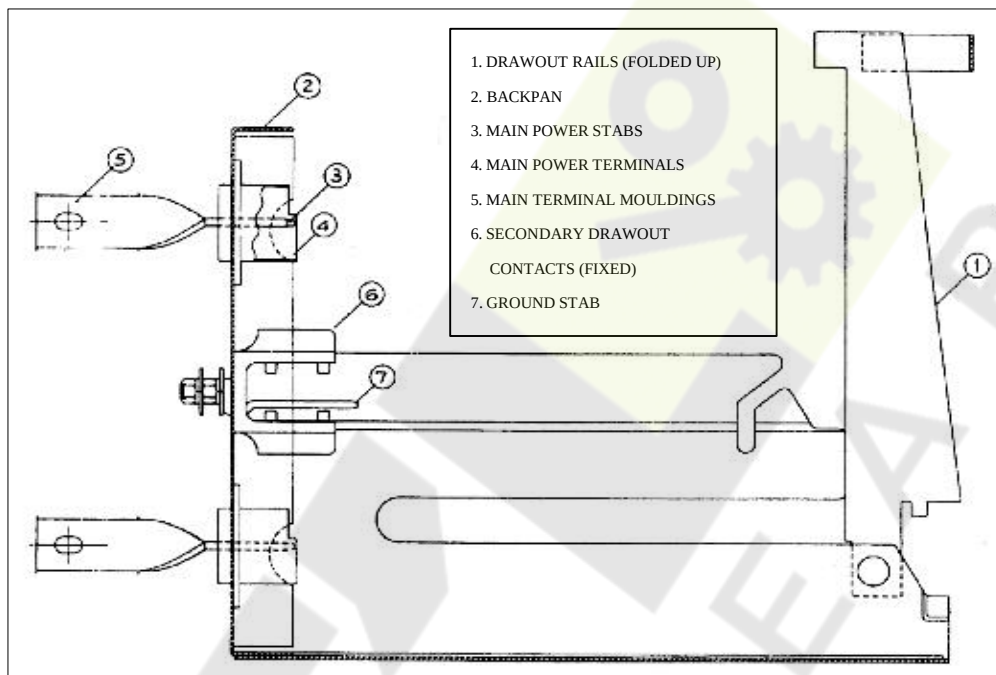


1. ARC CHUTE ASSEMBLY
2. INTERPHASE BARRIER
3. R.H. END BARRIER
4. L.H. END BARRIER
5. FRONT FLASH SHIELD
6. CLOSED-OPEN LINK
7. CRANK ASSEMBLY
8. CRANK BOX
9. CRANK Box BEARINGS
10. HOLDING PAWL
11. RACHET WHEEL
12. OSCILLATING LEVER
13. CLUTCH
14. CHARGED-DISCHARGED LINK
15. CLOSED-OPEN INDICATOR
16. CHARGED-DISCHARGED INDICATOR
17. FRONT PLATE
18. INDICATOR PLATE
19. FACEPLATE Box ASSEMBLY
20. FLOATING TRIM
21. FACEPLATE ASSEMBLY
22. HANDLE ASSEMBLY
23. CLOSING LATCH

24. CLOSE LEVER
25. TRIP ROD ASSEMBLY
26. SPRING GUIDE PIN
27. CLOSING CASTING
28. TOGGLE PIN
29. TIE ROD ASSEMBLY
30. CLOSING SHAFT
31. MAIN SPRING
32. GUIDE BUSHINGS
33. CLAMP ASSEMBLY
34. BREAKER FRAME
35. TRIP SHAFT
36. TRIP LATCH
37. LATCH BEARING
38. LOWER MOULDING
39. SENSOR MOUNTING BRACKET
40. BARRIER
41. SENSOR
42. JUMPER
43. CENTER STATIONARY MAIN CONTACT
44. MAIN MOVING CONTACT (WAFFER ASSY)
45. UPPER MOVING MAIN CONTACT
46. CLOSING LINK ASSEMBLY
47. BRAID

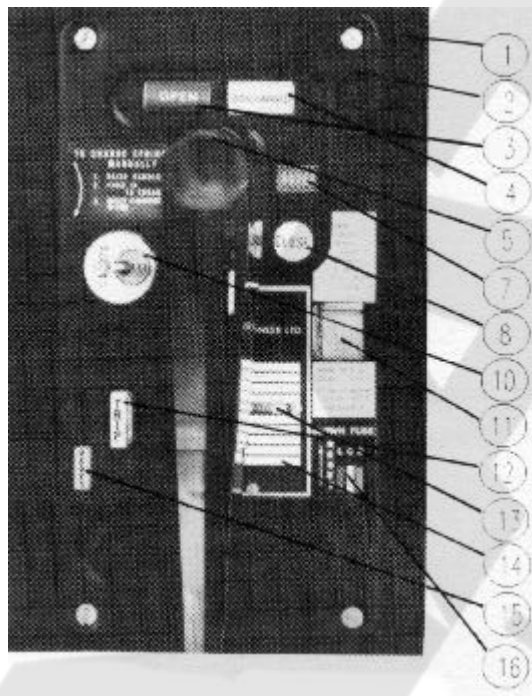
48. WAFER CONTACT SPRING
49. SPRING HOLDER
50. MOVING ARCING CONTACT
51. STATIONARY ARCING CONTACT
52. LOAD TERMINAL
53. ANTI-BOUNCE PLATE
54. BASE MOULDING
55. TRIP FLIPPER
56. TRIP COIL ASSEMBLY
57. LOWER CHANNEL
58. FINGER SPACER
59. DRAWOUT CONTACT ASSEMBLY
60. SLS CAM
61. GROUND CONTACT
62. LOWER FLASH SHIELD
63. SECONDARY DRAWOUT CONTACT (MOVING)

3.2 CRADLE SECTIONAL VIEW



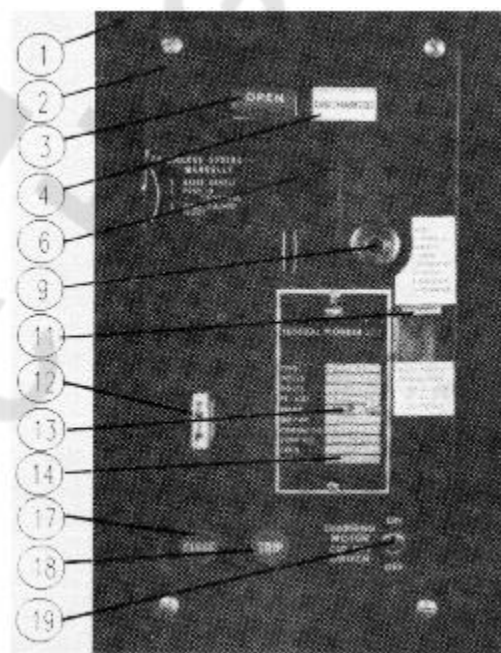
3.3 BREAKER FACEPLATE AND CONTROLS

FIG. 3.3.1 FACEPLATE FOR MANUALLY OPERATED (M.O.) UNIT



1. FLOATING TRIM
2. FACEPLATE
3. CONTACT POSITION INDICATOR
4. MAIN SPRING CHARGED/DISCHARGED INDICATOR
5. MANUAL CHARGING HANDLE (M.O. UNITS ONLY)
6. OPENING FOR EMERGENCY CHARGING HANDLE (E.O. UNITS ONLY)
7. OPERATIONS COUNTER (OPTIONAL)
8. MANUAL CLOSE (M.O. UNITS ONLY)
9. APERTURE FOR EMERGENCY MANUAL CLOSE (E.O. UNITS ONLY)
10. FACEPLATE KEY INTERLOCK (OPTIONAL)

FIG. 3.3.2 FACEPLATE FOR ELECTRICALLY OPERATED (E.O.) UNIT



11. GATE FOR DRAWOUT CRANK (DRAWOUT MOUNTED UNITS ONLY)
12. MANUAL TRIP
13. SENSOR TAP SETTING INDICATOR
14. SERIAL NUMBER
15. OVERLOAD LOCKOUT RESET (OPTIONAL)
16. BLOWN FUSE INDICATOR AND RESET (TYPE HL-3 UNITS ONLY)
17. ELECTRICAL CLOSE (E.O. UNITS ONLY)
18. ELECTRICAL TRIP (E.O. UNITS ONLY)
19. CHARGING MOTOR CUT-OFF SWITCH

4.1 DRAWOUT MECHANISM - BREAKER INSERTION AND REMOVAL

THE THREE POSITIONS OF A DRAWOUT MOUNTED BREAKER ARE SHOWN BELOW.



FIG 4.1.2 TEST POSITION

- DRAWOUT MECHANISM IS ENGAGED, BREAKER IS MECHANICALLY SECURED IN CRADLE
- GROUND CONTACTS ENGAGED
- "TEST POSITION" SECONDARY CONTACTS ENGAGED



FIG. 4.1.1 DISCONNECTED POSITON

- THE CRADLE/BREAKER DRAWOUT MECHANISM IS DISENGAGED
- ALL CONTACTS ARE DISENGAGED

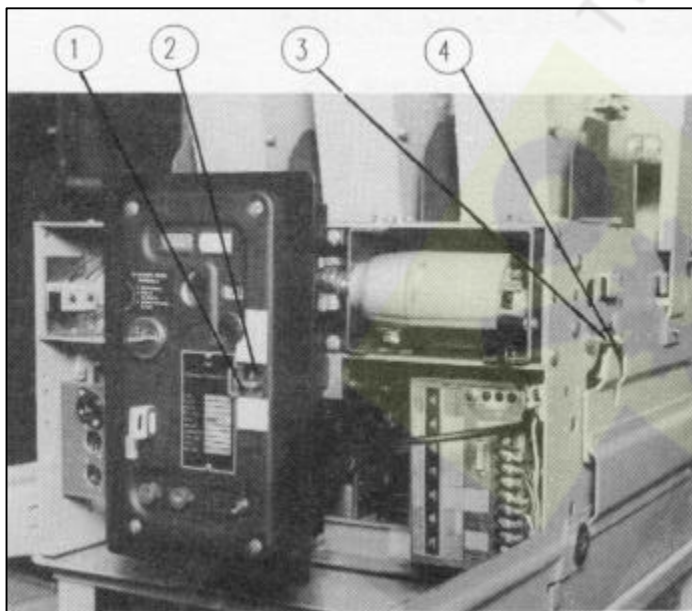


FIG. 4.1.3 OPERATING POSITION

- BREAKER FULLY DRAWN INTO CRADLE
- GROUND CONTACT ENGAGED
- "OPERATING POSITION" SECONDARY CONTACTS ENGAGED
- MAIN POWER CONTACTS ENGAGED.

FIG. 4.1.4 DRAWOUT MECHANISM

1. GATE
2. CRANK SOCKET
3. DRAWOUT LEVER BUSHINGS
4. CRADLE DRAWOUT SLOTS



TO OPERATE THE DRAWOUT MECHANISM, THE GATE IS LOWERED TO EXPOSE THE CRANK SOCKET, AND THE DRAWOUT CRANK INSERTED. THE GATE IS INTERLOCKED TO BOTH THE CHARGING AND TRIPPING MECHANISMS OF THE BREAKER, SUCH THAT IF THE MAIN SPRING IS CHARGED, IT WILL BE DISCHARGED AND IF THE CONTACTS ARE CLOSED, THE BREAKER WILL BE TRIPPED. AS LONG AS THE GATE IS DOWN, THE CONTACTS CANNOT BE CLOSED. AN ADDITIONAL INTERLOCKING MECHANISM WILL NOT ALLOW THE GATE TO BE RAISED IF THE BREAKER IS PART WAY BETWEEN TEST AND OPERATION POSITIONS.

THIS WAY THE MAIN SPRING WILL ALWAYS BE DISCHARGED AND THE CONTACTS OPEN WHEN THE BREAKER IS BEING DRAWN IN OR OUT OR WHEN IT IS LEFT BETWEEN TEST AND OPERATING POSITION.

NOTE THAT LOWERING THE GATE WITH THE MAIN SPRING CHARGED, OR MANUALLY CHARGING THE SPRING WITH THE GATE LOWERED, WILL RESULT IN A "DRY RUN", THAT IS, THE SPRING DISCHARGES WITHOUT CLOSING THE CONTACTS. THIS IS A SAFETY FEATURE AND DRY RUNS DURING DRAWOUT OPERATION MAY SOMETIMES BE UNAVOIDABLE, BUT BECAUSE THEY STRESS THE MECHANISM TO A GREATER EXTENT THAN NORMAL OPERATIONS, DRY RUNS SHOULD BE AVOIDED IF POSSIBLE. REFER TO SECTION 4.8.

TO INSTALL A BREAKER PROCEED AS FOLLOWS:

- OPEN THE CUBICLE DOOR AND FOLD DOWN THE RAILS
- PLACE BREAKER ON THE RAILS AND ROLL IT INTO THE CRADLE
- FOLD THE RAILS UP AND FULLY CLOSE THE DOOR
- INSERT THE DRAWOUT CRANK AND TURN CLOCKWISE UNTIL THE BREAKER IS IN THE TEST POSITION AS SHOWN IN FIG. 4.1.2 OR IN THE OPERATING POSITION AS SHOWN IN FIG. 4.1.3 AND REMOVE THE CRANK. WHEN CRANKING THE BREAKER INTO THE OPERATING POSITION, CONTINUE CRANKING UNTIL THE MECHANISM COMES TO A FIRM STOP.

TO REMOVE A BREAKER, THE PROCEDURE IS JUST THE OPPOSITE TO THE ABOVE. BEFORE INSERTING THE DRAWOUT CRANK, REFER TO SECTION 4.8 TO AVOID UNNECESSARY DRY RUNS.

FOR DRAWOUT GATE ADJUSTMENT REFER TO SECTION 8.4.

4.2 GROUNDING CONTACT

GROUNDING CONTINUITY IS ESTABLISHED 1/8" (3.2mm) BEFORE SECONDARY CONTROL CONTACTS ARE ENGAGED IN THE "TEST" POSITION. IT IS MAINTAINED THROUGHOUT BREAKER POSITIONING IN THE ENCLOSURE UNTIL THE SECONDARY CONTROL CONTACTS HAVE BEEN SEPARATED AGAIN BY THE SAME DIMENSION. GROUNDING CONTINUITY IS ESTABLISHED WHEN THE MOVING GROUND CONTACT ON THE BREAKER (FIG. 3.1 ITEM 61) MATES WITH THE STATIONARY GROUND STAB LOCATED ON THE CRADLE (FIG. 3.2 ITEM 7).

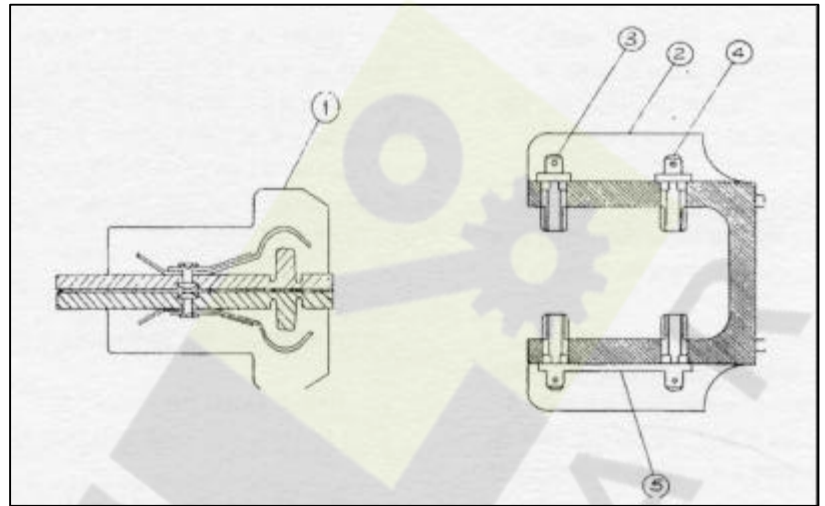
4.3 SECONDARY CONTROL CONTACTS

SECONDARY CONTROL CONTACTS AUTOMATICALLY CONNECT OR DISCONNECT CONTROL CIRCUITS AS THE BREAKER MOVES THROUGH ITS DRAWOUT POSITIONS. A TOTAL of 40 CONTACTS CAN BE PROVIDED ON 14" WIDE BREAKERS (MAXIMUM 1600 AMPS) AND 21" WIDE BREAKERS EQUIPPED WITH MECHANICAL INTERLOCK (MAXIMUM 2000 Amps). ALL OTHER BREAKERS CAN BE PROVIDED WITH 48 CONTACTS. EACH CONTACT HAS A CONTINUOUS CURRENT RATING OF 30 AMPS. IN APPLICATIONS WHERE A CONTROL VOLTAGE SUPPLY IN EXCESS OF 250V IS TO BE USED, THE SECONDARY CONTACTS ARE DOUBLE-SPACED, (I.E. ADJACENT CONTACTS ARE OMITTED).

THE FIXED (CRADLE MOUNTED) CONTACT ASSEMBLIES MAY BE SUPPLIED WITH ELECTRICALLY SEPARATED OR JUMPERED "TEST" AND "OPERATING" POSITION CONTACTS TO PROVIDE A VARIETY OF OPTIONAL CONTROL FUNCTIONS, IE. ISOLATION, BYPASS, ETC.

FIG. 4.3 SECONDARY CONTROL CONTACTS.

1. MOVING (BREAKER MOUNTED) SECONDARY CONTACT ASSEMBLY
2. FIXED (CRADLE MOUNTED) SECONDARY CONTACT ASSEMBLY
3. SEPARATE "TEST POSITION" CONTACT
4. SEPARATE "OPERATING, POSITION" CONTACT
5. "TEST" AND "OPERATING" CONTACTS WITH JUMPER.



4.4 BREAKER CLOSING

BEFORE ATTEMPTING TO CLOSE A BREAKER, MAKE SURE ALL ELECTRICAL AND MECHANICAL CLOSING INTERLOCKS ARE IN THE RESET POSITION. (REFER To 4.8 "MECHANICAL CLOSING INTERLOCKS").

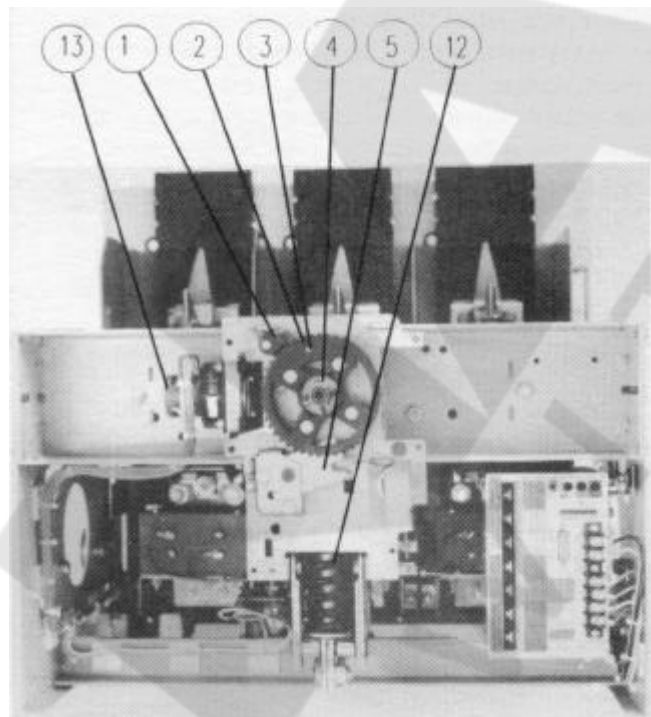


FIG. 4.4.1 MANUALLY OPERATED CLOSING MECHANISM

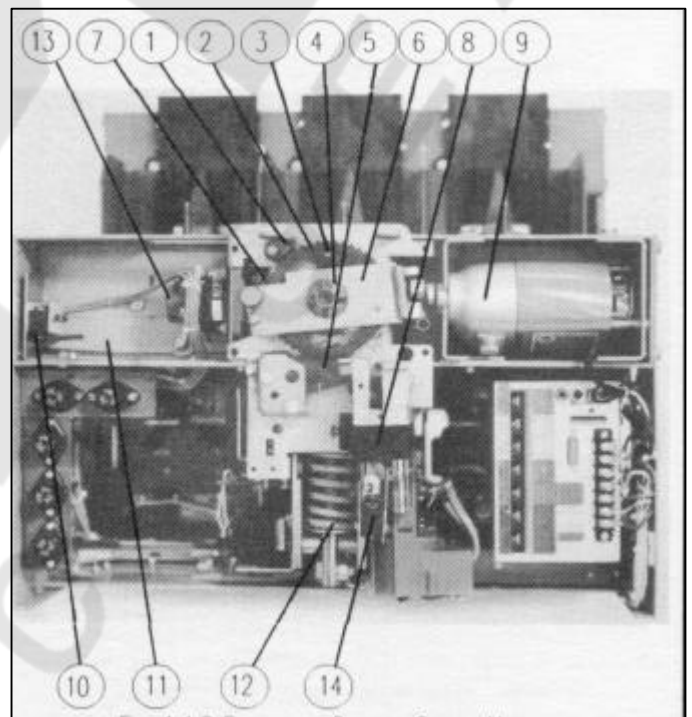


FIG. 4.4.2 ELECTRICALLY OPERATED CLOSING MECHANISM

1. HOLDING PAWL
2. RATCHET WHEEL
3. BEARING IN RATCHET WHEEL
4. CLUTCH
5. CLOSE LATCH
6. OSCILLATING LEVER
7. DRIVING PAWL
8. CLOSE COIL
9. SPRING CHARGING MOTOR
10. SPRING LIMIT SWITCH
11. SPRING LIMIT SWITCH LEVER
12. MAIN SPRING
13. AUXILIARY SWITCH
14. CLOSE COIL LIMIT SWITCH

4.5 CLOSING MANUALLY OPERATED BREAKER

TO CHARGE THE MAIN SPRING, ROTATE THE CHARGING HANDLE COUNTER CLOCKWISE TO THE UPRIGHT POSITION AND PUSH IN TO ENGAGE THE HANDLE WITH THE RATCHET WHEEL CLUTCH. ON FRAME SIZES 1600 AMPS AND ABOVE, THE HANDLE IS A PULLOUT EXTENSION TYPE FOR EASE OF OPERATION.

ROTATE THE HANDLE CLOCKWISE 180 DEGREES TO FULLY CHARGE THE SPRING. A MULTI-TOOTH RATCHET WHEEL AND HOLDING PAWL PREVENT RECOIL AND PERMIT SPRING CHARGING TO BE PERFORMED IN SEVERAL SHORT STROKES IF DESIRED.

AS THE RATCHET WHEEL ROTATES THE INTERNAL CRANK TO A POSITION 13 DEGREES PAST TOP-DEAD-CENTRE, THE CHARGING STROKE IS STOPPED. A BEARING WITHIN THE RATCHET WHEEL COMES TO RESET AGAIN THE CLOSE LATCH AND THE FORCE OF THE COMPRESSED MAIN SPRING IS HELD BY THE LATCH IN READINESS TO CLOSE.

OPERATION OF THE CLOSE LATCH BY PUSHING THE MANUAL CLOSE BUTTON (FIG. 3.3.1, ITEM 8) IN THE FACEPLATE, RELEASES THE SPRING ENERGY TO CLOSE THE BREAKER.

ONLY A RAPID TRIP-RECLOSE OPERATION IS REQUIRED SHOULD THE SPRING BE RECHARGED AT THIS TIME. THIS WILL AVOID UNNECESSARY DRY RUNS WHEN OPERATING THE DRAWOUT MECHANISM.

4.6 CLOSING ELECTRICALLY OPERATED BREAKER

THE ELECTRICALLY OPERATED BREAKER IS EQUIPPED WITH CHARGING MOTOR TO CHARGE THE MAIN SPRING AND A CLOSING COIL TO RELEASE THE CLOSE LATCH.

BEGIN BY PLACING THE MOTOR ISOLATING SWITCH (FIG. 3.3.2 ITEM. 19) TO THE "ON" POSITION. THE MOTOR OPERATED OSCILLATING LEVER WILL ROTATE THE RATCHET WHEEL UNTIL THE MAIN SPRING IS FULLY CHARGED. AT THIS POINT A CAM BEHIND THE CRANKBOX OPERATES THE SPRING LIMIT SWITCH LEVER AND THE SPRING LIMIT SWITCH CUTS OFF THE MOTOR. ROTATION IS STOPPED AND THE RATCHET WHEEL IS HELD IN POSITION BY THE CLOSE LATCH. PUSHING THE "CLOSE" BUTTON ON THE FACEPLATE (FIG. 3.3.2, ITEM 17) ENERGIZES THE CLOSE COIL WHICH RELEASES THE CLOSE LATCH. THE MAIN SPRING DISCHARGES AND THE MAIN CONTACTS CLOSE.

DEPENDING ON CONTROL REQUIREMENTS, INTERNAL BREAKER WIRING WILL PROVIDE FOR EITHER CHARGE AFTER CLOSING OR CHARGE AFTER OPENING OPERATION. (REFER TO 4.18).

A REMOVABLE HANDLE IS PROVIDED TO PERMIT EMERGENCY MANUAL CHARGING OF THE SPRING. A MECHANICAL CLOSE BUTTON LIKE THAT ON THE MANUALLY OPERATED UNIT IS NOT INCLUDED. EMERGENCY OPERATION OF THE CLOSE LATCH IS ACCOMPLISHED BY INSERTION OF A PIN ATTACHED TO THE UPPER END OF THE EMERGENCY CHARGING HANDLE, THROUGH A SMALL APERTURE IN THE FACE PLATE (FIG. 3.3.2, ITEM. 17). PUSH THE PIN GENTLY THROUGH THE APERTURE UNTIL THE BREAKER CLOSSES.

4.7 MECHANICAL CLOSING INTERLOCKS AND PADLOCKING

BREAKERS MAY BE EQUIPPED WITH MECHANICAL DEVICES WHICH TRIP THE BREAKER AND PREVENT THE CONTACTS FROM BEING RECLOSED UNTIL THESE DEVICES HAVE BEEN RESET. SUCH DEVICES ACT ON THE TRIP SHAFT OF THE BREAKER, HOLDING IT IN THE TRIPPED POSITION. IF THE MAIN SPRING IS CHARGED AND RELEASED, A DRY RUN WILL OCCUR BUT THE CONTACTS WILL NOT CLOSE. THE FOLLOWING OPTIONAL DEVICES SERVE THIS FUNCTION. THE ACTION REQUIRED TO RESET THEM IS ALSO INDICATED.

- UNDERVOLTAGE TRIP (REF. SECTION 5.3)
-RESETS AUTOMATICALLY WHEN CONTROL POWER IS APPLIED.
- OVERLOAD LOCKOUT (REF. SECTION 5.5)
-PUSH THE MANUAL RESET BUTTON ON FACEPLATE TO RESET
- DOOR INTERLOCK (REF. SECTION 5.6)
-RESETS WHEN COMPARTMENT DOOR IS CLOSED
- KEY INTERLOCKS (REF. SECTION 5.7)
-RESETS WHEN KEY IS INSERTED AND TURNED
(KEY WILL BE TRAPPED IN THIS POSITION)
- MECHANICAL INTERLOCKS (REF. SECTION 5.8)
-RESETS AUTOMATICALLY WHEN ALTERNATE BREAKER IS OPENED
- ANTI-SINGLE-PHASE DEVICE AND BLOWN FUSE INDICATOR (REF. SECTION 4.1.1)
-RESETS BY PUSHING INDICATORS UP AND IN TO THE LOCKED POSITION

IN ADDITION TO THESE DEVICES, THE MANUAL TRIP BUTTON AND DRAWOUT MECHANISM GATE ARE EQUIPPED WITH PROVISIONS FOR PADLOCKING FOR THE PURPOSE OF LOCKING BREAKER IN OPEN POSITION OR TO PREVENT OPERATION OF DRAWOUT MECHANISM. THE SAFEST METHOD TO PREVENT ACCIDENTAL BREAKER CLOSING AND ENERGIZATION OF A BUS OR FEEDER WHICH MUST REMAIN DE-ENERGIZED, IS TO WITHDRAW BREAKER FROM "OPERATING" POSITION AND TO SECURE A PADLOCK THROUGH THE DRAWOUT MECHANISM GATE PADLOCKING HASP.

FOR BREAKERS LEFT IN "OPERATING" POSITION, ACCIDENTAL BREAKER CLOSING CAN BE PREVENTED BY LEAVING BREAKER WITH CLOSING SPRING DISCHARGED AND ENSURING THAT IT REMAINS DISCHARGED.

ELECTRICALLY OPERATED BREAKERS CAN BE PREVENTED FROM CHARGING BY TURNING OFF MOTOR CUTOFF SWITCH, OR BY REMOVING CONTROL POWER FUSE AND BY KEEPING THE EMERGENCY CHARGING HANDLE REMOVED.

MANUALLY OPERATED BREAKERS WITH THE NON-REMOVABLE CHARGING HANDLE HAVE HANDLE PADLOCKING PROVISION. A LOCK SECURED THROUGH HANDLE HASP PREVENTS ENGAGEMENT WITH RATCHET WHEEL CLUTCH.

IN ADDITION A PADLOCK THROUGH THE MANUAL TRIP BUTTON AND HASP WITH THE BUTTON DEPRESSED WILL PROVIDE FURTHER ASSURANCE THE MANUALLY OR ELECTRICALLY OPERATED BREAKER REMAINS OPEN.

4.8 BREAKER OPENING

THE BREAKER CAN BE OPENED BY PRESSING THE MANUAL TRIP BUTTON WHICH OPERATES DIRECTLY ON THE TRIP SHAFT OF THE BREAKER OR BY PRESSING THE ELECTRICAL TRIP BUTTON (ON ELECTRICALLY OPERATED UNITS) WHICH ACTIVATES THE TRIP COIL.

ALL METHODS OF TRIPPING FUNCTION BY ROTATING THE BREAKER TRIP SHAFT. THE TRIP LATCH, ATTACHED TO THE SHAFT IS ROTATED TOWARD THE REAR OF THE BREAKER, FREEING THE TRIP LATCH BEARING. THIS ALLOWS THE UPPER PORTION OF THE CLOSING MECHANISM LINKAGE TO COLLAPSE AND THE ENERGY STORED IN THE MOVING CONTACT SPRINGS AND THE CLOSING SHAFT TORSION SPRING RAPIDLY OPENS THE CONTACTS.

OTHER DEVICES WHICH OPERATE TO OPEN THE BREAKER ARE SHUNT TRIP COILS FOR REMOTE OR OVERCURRENT PROTECTION TRIPPING; UNDERVOLTAGE TRIP, DOOR INTERLOCK, FACEPLATE OR CELL KEY INTERLOCKS AND THE ANTI-SINGLE PHASE DEVICE.

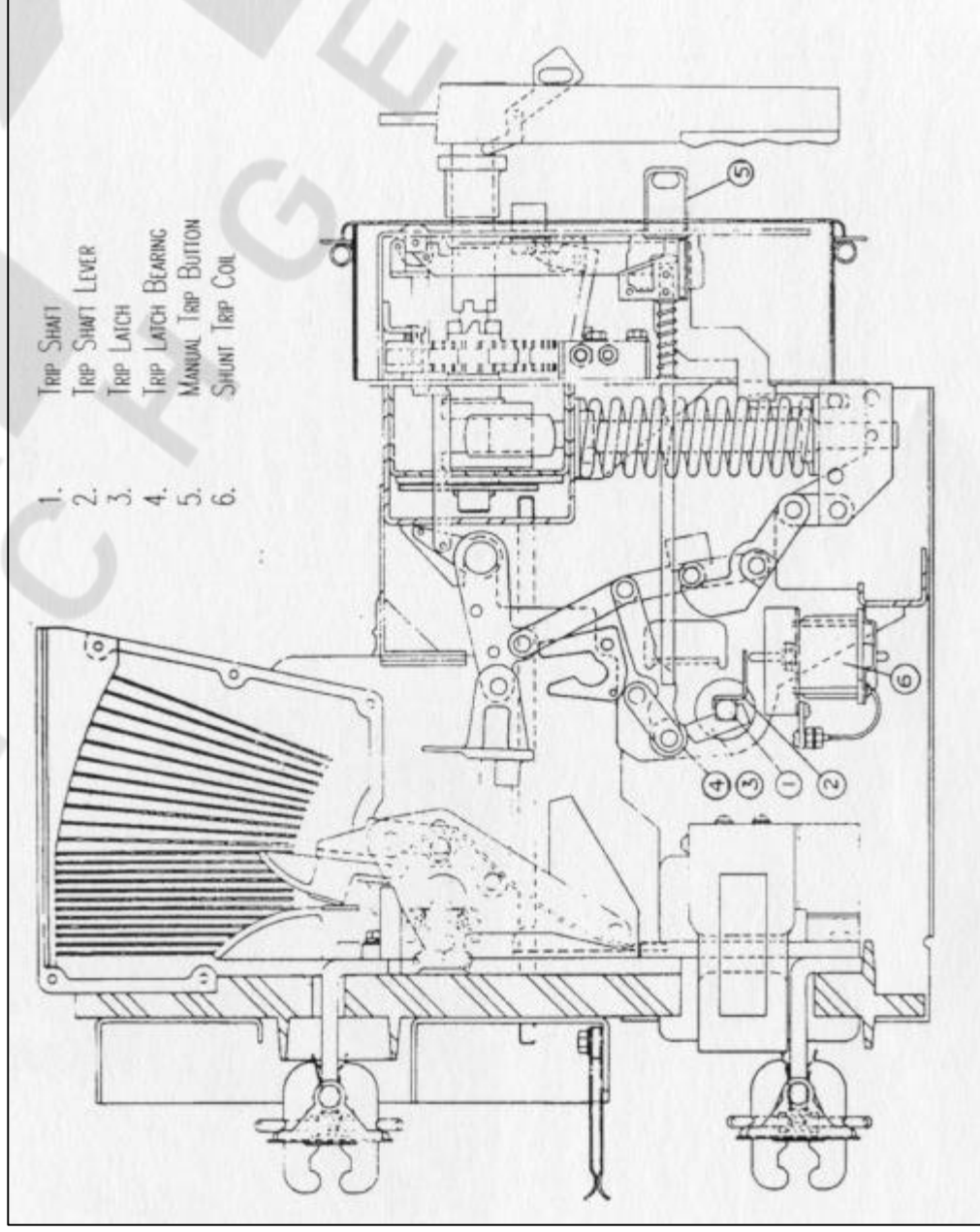


FIG. 4.8 BREAKER OPENING

4.9 REJECTION FEATURE

A REJECTION FEATURE IS PROVIDED ON ALL BREAKERS. IT PREVENTS ENTRY OF A BREAKER INTO A CRADLE OF THE SAME WIDTH BUT DIFFERENT RATING. PINS ON BOTH SIDES OF THE BREAKER FRAME MATCH SLOTS IN BRACKETS MOUNTED ON BOTH SIDES OF THE CRADLE. IF THE CRADLE IS A DIFFERENT RATING THAN THE BREAKER, THE BREAKER PINS WILL NOT MATCH THE SLOTS AND ENTRY OF THE BREAKER IS PREVENTED.

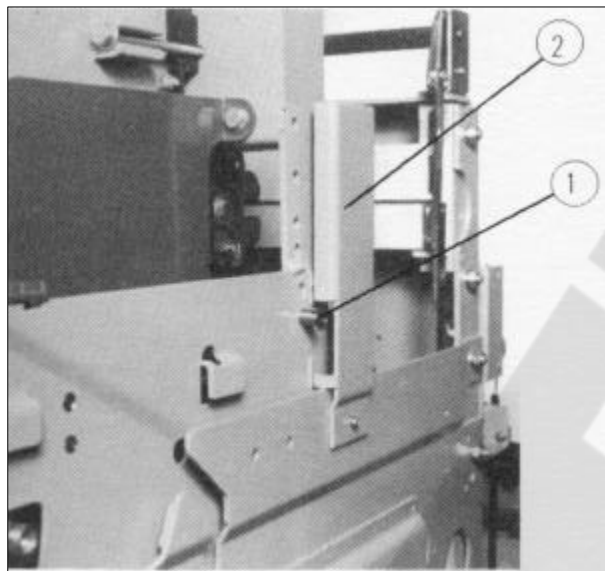


FIG. 4.9 REJECTION FEATURE

1. BREAKER REJECTION PIN
2. CRADLE REJECTION BRACKET

4.10 CLOSING SPRING DISCHARGE AND DRY RUNS

DISCHARGING THE MAIN SPRING WITHOUT CLOSING THE MAIN CONTACTS IS REFERRED TO AS A DRY RUN. THIS TYPE OF OPERATION CREATES MUCH MORE STRESS IN THE BREAKER MECHANISM THAN NORMAL CLOSING OPERATIONS AND SHOULD BE AVOIDED IF POSSIBLE.

TO LIMIT THE NUMBER OF DRY RUNS, THE FOLLOWING METHOD OF SPRING DISCHARGE SHOULD ALWAYS BE USED WHEN BREAKER IS IN "TEST" OR "DISCONNECTED" POSITION OR WHEN REMOVED FROM CRADLE. IT SHOULD ALSO BE USED WHEN IN "OPERATING" POSITION IF POSSIBLE:

1. IF BREAKER IS ELECTRICALLY OPERATED, TURN OFF MOTOR ISOLATING SWITCH.
2. IF BREAKER IS OPEN AND MAIN SPRING CHARGED: CLOSE - THEN TRIP BREAKER.
3. IF BREAKER IS CLOSED: TRIP BREAKER BY USING ELECTRICAL OR MECHANICAL TRIP BUTTONS ON FACEPLATE (DO NOT USE THE DRAWOUT MECHANISM GATE). IF THE MAIN SPRING IS CHARGED, RECLOSE, THEN TRIP BREAKER.

4.11 FAULT PROTECTION

TYPE H-3 AND HL-3 BREAKERS ARE SUPPLIED WITH THE TYPE USD SOLID STATE OVERCURRENT RELAY AS A STANDARD FEATURE. THE USD RELAY PROTECTS LOW VOLTAGE POWER SYSTEMS AGAINST DAMAGE CAUSED BY SHORT CIRCUITS, OVERLOADS AND GROUND FAULTS. THE RELAY MAY HAVE UP TO FOUR PICK UP ELEMENTS: INSTANTANEOUS, SHORT-TIME, LONG-TIME AND GROUND FAULT. LOCAL AND REMOTE INDICATION ARE AVAILABLE. IN ADDITION, ZSLP_(R) (**ZONE SELECTIVE INSTANTANEOUS PROTECTION**) IS AVAILABLE FOR THE SHORT-TIME AND GROUND FAULT ELEMENTS.

TRIPPING ENERGY FOR THE OPERATION OF THE RELAY IS OBTAINED SOLELY FROM THE CIRCUIT BEING PROTECTED.

THREE MULTIPLE-TAP CURRENT SENSORS, MOUNTED ON THE BREAKER PROVIDE THE INPUT TO THE USD RELAY FROM THE PROTECTED CIRCUIT. A FOURTH SENSOR, CAN ALSO BE USED WHERE FOUR-WIRE GROUND FAULT PROTECTION IS REQUIRED. AN ADJUSTABLE SENSOR TAP SETTING INDICATOR IS PROVIDED ON THE BREAKER FACEPLATE (SEE SECTION 8.10).

A DEDICATED DIRECT ACTING SOLENOID TYPE TRIP COIL PROVIDES POSITIVE ACTIVATION OF THE TRIP LATCH ON THE BREAKER, AND POSITIVE RESETTING AFTER OPERATION.

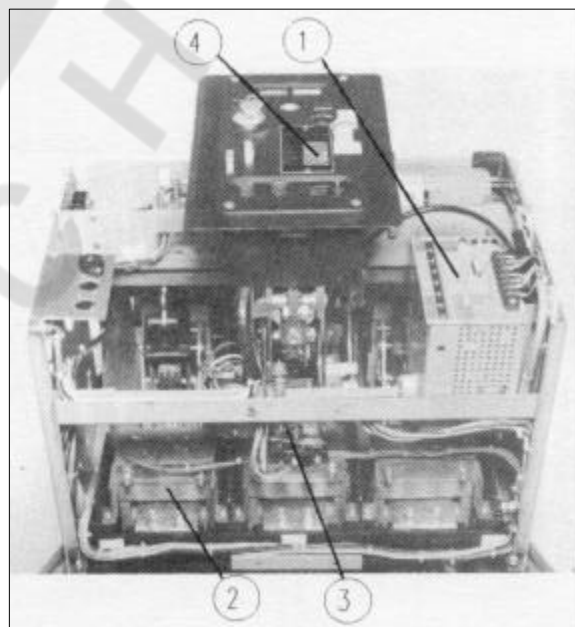


FIG. 4.11 OVERCURRENT PROTECTION

1. USD RELAY
2. CURRENT SENSOR
3. TRIP COIL
4. CURRENT SENSOR TAP INDICATION

4.12 FUSE MOUNTING

ALL HL-3 CIRCUIT BREAKERS IN FRAME SIZES UP TO AND INCLUDING 4000 AMPS HAVE PROVISION FOR MOUNTING NEMA CLASS L HRC FUSES, MOUNTED ON THE LINE SIDE ON A FRAME EXTENSION AT THE REAR OF THE UNIT. IN THE 6000A RATING, A SEPARATE FUSE TRUCK IS AVAILABLE.

IN ALL CASES BUT THE 6000A FRAME, FUSES WITH A HIGHER RATING THAN THE BREAKER FRAME SIZE CAN BE INSTALLED AND STILL MAINTAIN PROPER COORDINATION BETWEEN THE CONTACT AND FUSE INTERRUPTING CAPABILITIES. THE MAXIMUM FUSE RATINGS ARE AS FOLLOW :

HL-3 FRAME (AMPERES)	RELAY RATING (AMPERES)	MAXIMUM FUSE (AMPERES)
600	600	1600 NEMA L
800	800	1600 NEMA L
1600	1600	3000 NEMA L
2000	2000	3000 NEMA L
3000	3000	4000 NEMA L
4000	4000	5000 NEMA L
6000	6000	6000 NEMA L

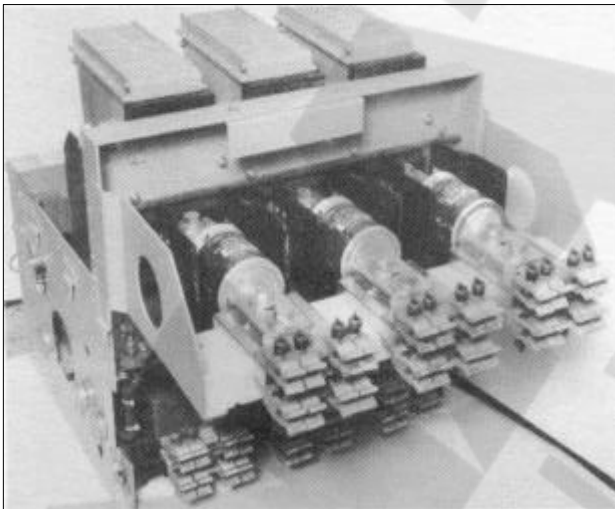


FIGURE 4.12 FUSE MOUNTING

4.13 ANTI-SINGLE-PHASE DEVICE AND BLOWN FUSE INDICATOR

AN ANTI-SINGLE-PHASE DEVICE AND BLOWN FUSE INDICATOR IS SUPPLIED ON ALL HL-3 -BREAKERS. IT CONSISTS OF THREE SOLENOIDS, ONE WIRED IN PARALLEL WITH EACH FUSE. DURING NORMAL OPERATION, THE SOLENOID IS SHORTED OUT BY THE FUSE ITSELF. WHEN A FUSE BLOWS, HOWEVER, LINE VOLTAGE IS THEN PRESENT ACROSS THE SOLENOID AND IT IS ACTIVATED. THE SOLENOID PLUNGER PUSHES A COLOUR CODED SLIDER FORWARD. THE REAR OF THE SLIDER OPERATES THE BREAKER TRIP SHAFT, TRIPPING THE BREAKER, WHILE THE FRONT END OF THE SLIDER PROTRUDES THROUGH THE FACEPLATE PROVIDING AN INDICATION OF WHICH FUSE BLEW. THE SLIDERS ARE COLOUR CODED RED, YELLOW AND BLUE FOR LEFT, CENTER AND RIGHT PHASES. THE BREAKER WILL BE HELD TRIP-FREE UNTIL THE PROTRUDING SLIDER(S) HAVE BEEN RESET. THIS IS ACCOMPLISHED BY LIFTING AND PUSHING ON THE END OF THE SLIDER.

IF THE SLIDER IS RESET BUT THE BLOWN IS NOT REPLACED, THE BREAKER CAN BE RECLOSED, BUT IT WILL BE TRIPPED IMMEDIATELY.

NOTE THAT IF THE MAIN POWER FUSES ARE BEING CHECKED FOR CONTINUITY WHILE IN THE BREAKER, THE CONTROL FUSES IN THE ANTI-SINGLE- PHASE CIRCUIT MUST BE REMOVED, OTHERWISE A BLOWN POWER FUSE WOULD STILL INDICATE CONTINUITY THROUGH THE SOLENOID.

NOTE: THIS DEVICE ONLY PROVIDES ANTI-SINGLE-PHASE PROTECTION FROM A BLOWN FUSE SITUATION. IT DOES NOT PROTECT AGAINST SINGLE- PHASE CONDITIONS FROM THE SOURCE.

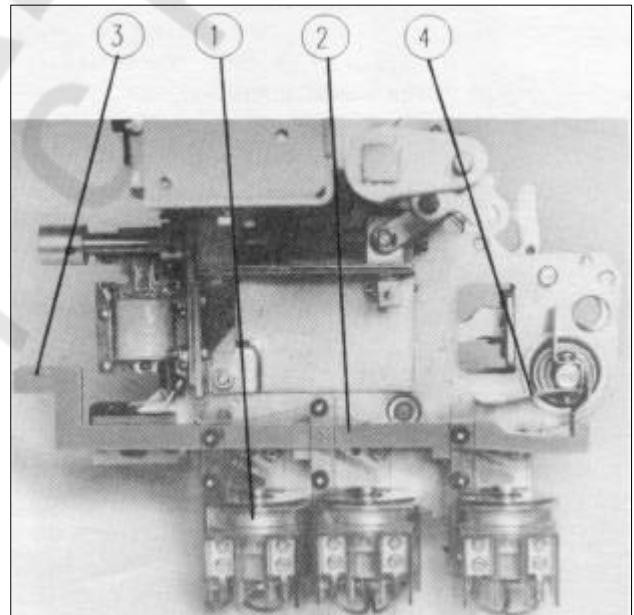


FIG. 4.13 ANTI-SINGLE-PHASE DEVICE

1. SOLENOID
2. SLIDER
3. BLOWN FUSE INDICATOR
4. TRIP SHAFT LEVER

4.14 SHUNT TRIP COIL

THERE MAY BE TWO SHUNT TRIP COILS INSTALLED ON A BREAKER. BREAKERS EQUIPPED WITH A USD RELAY ARE FITTED WITH A SHUNT TRIP COIL OPERATED EXCLUSIVELY BY THE RELAY. THIS DEVICE IS A CYLINDRICAL SOLENOID MOUNTED BELOW THE TRIP SHAFT BETWEEN THE LEFT AND RIGHT HAND MECHANISM SIDEPLATES. THE SECOND, SHUNT TRIP -COIL IF NEEDED FOR COMMON TRIPPING REQUIREMENTS IS MOUNTED ON THE OUTSIDE OF THE LEFT HAND MECHANISM SIDE PLATE. IF A BREAKER IS EQUIPPED WITH UNDERVOLTAGE TRIP DEVICE (NV) AS WELL AS SHUNT TRIP COIL, THE "NV" OCCUPIES THE SHUNT TRIP COIL LOCATION WHILE THE SHUNT TRIP COIL IS MOUNTED ON THE LOWER CROSS CHANNEL TO THE LEFT OF THE "NV". EACH SHUNT TRIP COIL ACTS VERTICALLY ON ITS OWN TRIP SHAFT LEVER. BECAUSE THE COILS ARE NOT CONTINUOUSLY RATED, A NORMALLY OPEN AUXILIARY SWITCH CONTACT IS WIRED IN SERIES WITH THE COIL TO OPEN THE TRIP CIRCUIT WHEN THE BREAKER IS OPEN. AC OR DC POWERED COILS WILL OPERATE TO TRIP AT APPROXIMATELY 50% OF RATED VOLTAGE.

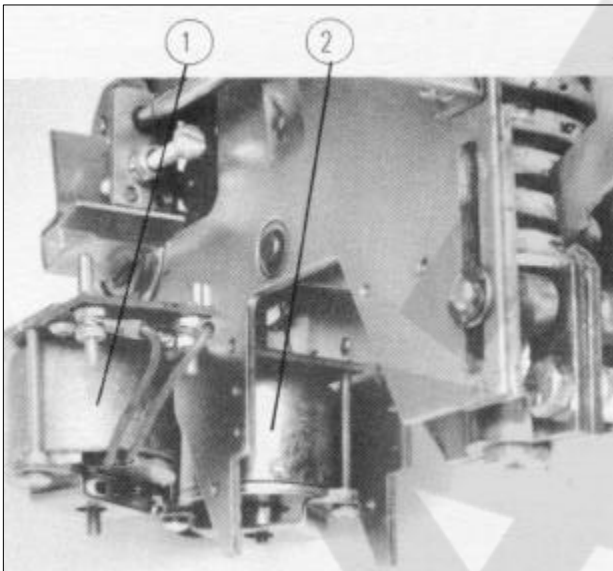


FIG. 4.14 SHUNT TRIP COILS

1. SHUNT TRIP COIL
2. USD RELAY TRIP COIL

4.15 AUXILIARY SWITCH

ON ALL H-3 UNITS A MULTI-SECTION ROTARY TYPE AUXILIARY SWITCH CAN BE PROVIDED (FIG. 4.4. 1, ITEM 1 3). IT IS COUPLED DIRECTLY TO THE CLOSING SHAFT AND OPERATES ON A SNAP-ACTION PRINCIPLE WHICH PROVIDES QUICK BREAK SWITCHING. NO ADJUSTMENT IS REQUIRED AND THE SWITCH IS AVAILABLE IN THE FOLLOWING CONTACT ARRANGEMENTS.

- 4 POLE, PROVIDING 2 NORMALLY OPEN AND 2 NORMALLY CLOSED.
- 8 POLE, PROVIDING 4 NORMALLY OPEN AND 4 NORMALLY CLOSED.
- 12 POLE, PROVIDING 6 NORMALLY OPEN AND 6 NORMALLY CLOSED.
- 16 POLE, PROVIDING 8 NORMALLY OPEN AND 8 NORMALLY CLOSED.
- 20 POLE, PROVIDING 10 NORMALLY OPEN AND 10 NORMALLY CLOSED

NOTE THAT CONTACTS AVAILABLE FOR EXTERNAL USE WILL BE REDUCED BY

THE NUMBER OF CONTACTS REQUIRED FOR VARIOUS INTERNAL BREAKER CONTROL SCHEMES.

THE FOLLOWING CONTACT RATINGS APPLY:

10 AMPERES UP TO 254V A.C.

1 AMPERE AT 250V D.C.

2 AMPERES AT 125V D.C.

DUE TO SPACE LIMITATIONS, A DIFFERENT MODEL IS USED FOR 20 POLE AUXILIARY SWITCHES, AND 12 POLE SWITCHES ON 14" WIDE BREAKER. THESE SWITCHES ARE NOT RATED FOR D.C. SWITCHING FUNCTIONS.

NORMALLY OPEN AUXILIARY SWITCH CONTACTS ARE IDENTIFIED BY THE SYMBOL "a" ON THE WIRING DIAGRAM, NORMALLY CLOSED BY THE SYMBOL "b".

4.16 CLOSING COIL (CC)

THIS DEVICE IS SUPPLIED ON ELECTRICALLY OPERATED CIRCUIT BREAKERS AND CONSISTS OF A RECTANGULAR LAMINATED SOLENOID FRAME MOUNTED WITHIN THE FRONT MECHANISM COMPARTMENT (FIG. 4.4.2, ITEM 8). ITS FUNCTION IS THAT OF ROTATING THE CLOSE LATCH THEREBY INITIATING THE CLOSING STROKE. IT MAY BE ENERGIZED BY THE CLOSE BUTTON ON THE FACEPLATE OR BY A REMOTE CONTROL DEVICE.

FOR THE CLOSING COIL TO BE OPERATIVE THE FOLLOWING CONDITIONS MUST BE MET:

- (A) BREAKER OPEN
- (B) CLOSING SPRING FULLY CHARGED (SPRING LIMIT SWITCH CLOSED).
- (C) TRIP LATCH AND LATCH ROLLER ENGAGED.

LATCH CHECKING SWITCH CLOSED. (REFER TO 4.20).

- (D) ANTI-PUMP RELAY RESET. (IF PROVIDED REFER TO 5.3).

THE CLOSING COIL IS IDENTIFIED ON THE WIRING DIAGRAM BY THE SYMBOL "CC".

4.17 CLOSING COIL LIMIT SWITCH AND ANTIPUMPING FEATURE

ALL ELECTRICALLY OPERATED BREAKERS ARE PROVIDED WITH AN ANTIPUMPING FEATURE. ITS PURPOSE IS TO PREVENT REPEATED CLOSING ATTEMPTS WHEN BREAKER IS TRIPPED WHILE THE CLOSING CIRCUIT REMAINS ENERGIZED. (MAINTAINED AUTOMATIC CONTROL CONTACT, ETC.).

FOR BREAKERS CONTROLLED BY LONG TIME OR PERMANENTLY MAINTAINED CLOSE CONTACTS, THE OPTIONAL ANTPUMP RELAY MUST BE USED. REFER TO SECTION 5.3 FOR DETAILS.

THE STANDARD FEATURE, FOR BREAKERS CONTROLLED BY MOMENTARY, OR SHORT-TIME MAINTAINED CLOSE CONTACTS AND REQUIRING CLOSING SPRING CHARGING IN BREAKER OPEN POSITION ONLY, DOES NOT INCORPORATE THE ANTIPUMP RELAY.

THE ANTIPUMPING FUNCTION IS PROVIDED BY THE CLOSE COIL (CC) LIMIT SWITCHES LOCATED BELOW THE COIL (FIG. 4.4.2, ITEM 14). WHEN THE COIL IS ENERGIZED, OR NORMALLY CLOSED "CC" SWITCH CONTACT IN THE SPRING CHARGING MOTOR CIRCUIT OPENS AND REMAINS OPEN UNTIL THE CLOSE COIL IS DE-ENERGIZED.

SHOULD THE BREAKER BE TRIPPED BEFORE THE CLOSE CIRCUIT HAS BEEN DE-ENERGIZED, SPRING RECHARGING FUNCTION AND CONSEQUENTLY BREAKER CLOSING IS BLOCKED. THE CLOSING COIL SWITCH CONTACTS ARE IDENTIFIED ON THE WIRING DIAGRAM BY THE SYMBOL "CC".

4.18 SPRING CHARGING MOTOR (SCM)

ALL ELECTRICALLY OPERATED BREAKERS EMPLOY A SERIES WOUND GEAR MOTOR TO CHARGE THE CLOSING SPRING (FIG. 4.4.2, ITEM 9). THE REDUCTION GEAR COMPARTMENT IS SEALED AND LUBRICATED FOR LIFE AND THE ARMATURE BEARING SIMILARLY REQUIRES NO MAINTENANCE LUBRICATION.

THE CHARGING MOTOR CUT OFF SWITCH MOUNTED ON THE FACEPLATE PERMITS THE MOTOR TO BE DE-ENERGIZED DURING MAINTENANCE OR INSPECTION (FIG. 3.3.2, ITEM 9). IT TAKES APPROXIMATELY 4 SECONDS FOR THE MOTOR TO CHARGE THE CLOSING SPRING.

TWO CHARGING MOTOR CONTROL CIRCUIT OPTIONS ARE AVAILABLE. BREAKERS NOT REQUIRING IMMEDIATE RECLOSURE AFTER TRIPPING ARE WIRED TO PERMIT MOTOR CHARGING OPERATION WHEN BREAKER IS IN THE OPEN POSITION ONLY. THIS IS THE STANDARD AND PREFERRED ARRANGEMENT.

BREAKERS REQUIRING A FAST TRIPPING RECLOSING FUNCTION (AUTOMATIC CONTROL OR TRANSFER SCHEMES ETC. AS WELL AS ALL BREAKERS EQUIPPED WITH THE ANTI PUMP RELAY) ARE WIRED TO PERMIT THE SPRING TO BE IN THE CHARGED POSITION AT ALL TIMES, I.E. IMMEDIATE RECHARGE AFTER DISCHARGE REGARDLESS OF WHETHER THE BREAKER IS IN THE OPEN OR CLOSED POSITION.

THE CHARGING MOTOR IS IDENTIFIED ON THE WIRING DIAGRAM BY THE SYMBOL "SCM".

THE CHARGING MOTOR CUTOFF SWITCH IS IDENTIFIED BY THE SYMBOL "IS".

4.19 SPRING LIMIT SWITCH (SLS)

ALL ELECTRICALLY OPERATED UNITS ARE EQUIPPED WITH A LIMIT SWITCH WHICH STOPS THE MOTOR AT THE END OF THE CHARGING STROKE (FIG. 4.4.2, ITEM 10). THE SWITCH IS MOUNTED INSIDE THE LEFT HAND END OF THE FRONT CHANNEL (EXCEPT FOR 14" FRAME BREAKERS, WHERE IT IS LOCATED ON THE RIGHT). THE SWITCH IS COUPLED WITH A LEVER (FIG. 4.4.2, ITEM 11) ACTUATED

BY A CAM LOCATED ON THE REAR OF THE CRANK ASSEMBLY. AS THE CRANK PASSES THROUGH TOP-DEAD-CENTRE AND THE RATCHET WHEEL BEARING APPROACHES THE CLOSE LATCH, THE CAM OPERATES THE LEVER AND THE SWITCH DE-ENERGIZES THE MOTOR. THE LEVER IS RESET WHEN THE MAIN SPRING DISCHARGES. NO ADJUSTMENT IS REQUIRED FOR THE SPRING LIMIT SWITCH.

IT IS IDENTIFIED ON THE WIRING DIAGRAM BY THE SYMBOL "SLS".

4.20 LATCH CHECK SWITCH (LCS)

THE LATCH CHECK SWITCH IS PROVIDED ON ELECTRICALLY OPERATED BREAKERS TO PREVENT ANY ATTEMPTED ELECTRICAL CLOSING UNTIL BREAKER CLOSING MECHANISM IS SET AND READY FOR THE CLOSING OPERATION. IT IS INSTALLED TO AN ADJUSTABLE MOUNTING PLATE ON THE OUTSIDE OF THE LEFT HAND MECHANISM SIDE PLATE AND OPERATED BY THE TRIP SHAFT LEVER. THE SWITCH CONTACT IS CONNECTED IN SERIES WITH THE CLOSING COIL AND IS CLOSED ONLY WHEN THE TRIP LATCH AND LATCH ROLLER ARE PROPERLY ENGAGED.

FOR SWITCH TO BE CLOSED THE FOLLOWING CONDITIONS MUST BE MET.

- (A) DRAW-OUT MECHANISM GATE FULLY CLOSED.
- (B) MANUAL TRIP BUTTON RELEASED.
- (C) CLOSING SPRING FULLY-CHARGED.

IF ADDITIONAL OPTIONAL DEVICES ARE PROVIDED, THEIR POSITIONS HAVE TO BE AS FOLLOWS:

- (D) UNDERVOLTAGE TRIP DEVICE - ENERGIZED.
- (E) OVERLOAD LOCKOUT MECHANISM - RESET.
- (F) DOOR INTERLOCK - ENCLOSURE DOOR CLOSED.
- (G) FACEPLATE KEY INTERLOCK - UNLOCKED, KEY TRAPPED.
- (H) BLOWN FUSE INDICATOR - RESET.
- (I) DOOR KEY INTERLOCK - UNLOCKED, KEY TRAPPED.
- (K) MECHANICAL INTERLOCK BETWEEN BREAKERS - ALTERNATE BREAKER(S) OPEN.

ITEMS (I) & (K) ARE APPLICABLE ONLY WHEN THE BREAKER IS IN THE "OPERATING" POSITION.

THE LATCH CHECK SWITCH IS IDENTIFIED ON WIRING DIAGRAMS BY THE SYMBOL "LCS".

5. OPTIONAL COMPONENTS

5.1 MECHANICAL OPERATIONS COUNTER

A FIVE DIGIT MECHANICAL COUNTER CAN BE SUPPLIED, MOUNTED IN THE FACEPLATE OF THE BREAKER (FIG. 3.3.2, ITEM 7).

THIS DEVICE IS MECHANICALLY DRIVEN BY THE "CHARGED/DISCHARGED" INDICATOR. THE COUNTER OPERATES ONCE FOR EACH CHARGING OF THE BREAKER MAIN SPRING. NO ADJUSTMENT OR MAINTENANCE IS REQUIRED FOR SUCCESSFUL COUNTER OPERATION.

OPERATIONS COUNTERS ARE RECOMMENDED WHERE BREAKERS WILL BE SUBJECTED TO FREQUENT OPERATIONS AS AN INDICATOR OF THE RECOMMENDED MAINTENANCE INTERVALS.

5.2 CELL SWITCHES

CELL SWITCHES MOUNTED IN THE CRADLE CAN BE PROVIDED WHEN REQUIRED TO SERVE AS POSITION INDICATORS OR AS INTERLOCK BYPASSES. THE SWITCHES ARE OPERATED BY A BRACKET ATTACHED TO THE BREAKER FRAME WHEN BREAKER IS CRANKED INTO THE "OPERATING" POSITION.

EACH SWITCH CONTAINS ONE NORMALLY CLOSED AND ONE NORMALLY OPEN ELECTRICALLY SEPARATE CONTACT. A TOTAL OF SIX SWITCHES CAN BE SUPPLIED. THESE CONTACTS ARE RATED 10 AMPERES UP TO 300V A.C.

ON BREAKER FRAME SIZES 14 INCH AND 21 INCH (UP TO 2000 AMP), CELL SWITCHES MOUNT ON TOP OF THE CRADLE BACKPAN. ON LARGER FRAME BREAKERS THEY MOUNT IN LINE WITH THE SECONDARY DRAWOUT CONTACTS.

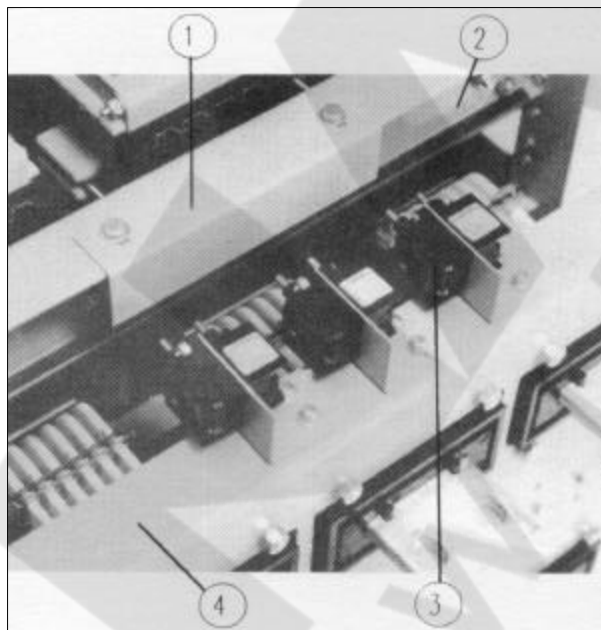


FIG. 5.2.1 CELL SWITCHES

1. CELL SWITCH OPERATING BRACKET
2. BREAKER FRAME
3. CELL SWITCH
4. CRADLE BACKPAN

5.3 ANTIPUMP RELAY

BREAKERS CONTROLLED BY LONG TIME OR PERMANENTLY MAINTAINED CLOSE CONTACTS INCORPORATE TWO CLOSE COIL (CC) LIMIT SWITCHES AND AN ANTIPUMP RELAY (A.P.R.). WHEN THE CLOSING COIL IS ENERGIZED, BOTH "CC" SWITCHES ARE OPERATED. A CLOSING CONTACT OF ONE "CC" SWITCH NOW ENERGIZES THE A.P.R. COIL. ONE OF THE CLOSING A.P.R. CONTACTS PARALLELS THE "CC" SWITCH CONTACT PROVIDING A.P.R. SEAL IN FUNCTION. A CLOSING CONTACT OF THE SECOND "CC" SWITCH PARALLELS A NORMALLY CLOSED A.P.R. CONTACT IN THE CLOSING COIL CIRCUIT MAINTAINING CONTROL POWER TO THE CLOSING COIL UNTIL THE CLOSING SPRING IS FULLY RELEASED AND THE BREAKER CLOSED. SPRING RELEASE CAUSES DE-ENERGIZATION AND RESET OF THE CLOSING COIL AND "CC" SWITCHES WHILE THE A.P.R. REMAINS ENERGIZED AND ITS HELD OPEN CONTACT IN THE CLOSING COIL CIRCUIT BLOCKS RE-ENERGIZATION OF THE SAME UNTIL THE MAINTAINED CLOSING CONTACT IS OPENED. THIS OPTION ALLOWS SPRING CHARGING MOTOR RE-ENERGIZATION IMMEDIATELY AFTER CLOSING SPRING DISCHARGE REGARDLESS OF OPEN OR CLOSED BREAKER POSITION THEREBY PROVIDING FOR FAST TRIP - RECLOSE OPERATION.

THE ANTIPUMP RELAY AND ITS CONTACTS ARE IDENTIFIED ON THE WIRING DIAGRAM BY THE SYMBOL "Y".

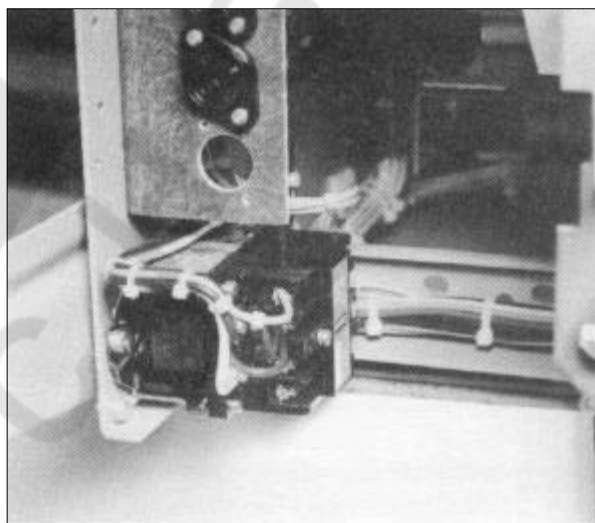


FIGURE 5.3 ANTIPUMP RELAY

5.4 UNDERVOLTAGE TRIP DEVICE

THE UNDERVOLTAGE TRIP DEVICE IS A SPRING LOADED RECTANGULAR SOLENOID WHICH WILL TRIP THE BREAKER WHEN ITS SUPPLY VOLTAGE TO THE SOLENOID DROPS BELOW A PREDETERMINED LEVEL AND HOLDS THE BREAKER IN A TRIP FREE STATE UNTIL SUPPLY VOLTAGE RETURNS. THE UNDERVOLTAGE TRIP WILL DROP TO TRIP THE BREAKER WHEN SUPPLY VOLTAGE DROPS BELOW APPROXIMATELY 50% AND WILL PULL IN OR RESET WHEN VOLTAGE RISES ABOVE 85%.

THIS DEVICE CAN BE SUPPLIED TO OPERATE INSTANTANEOUSLY OR WITH THE ADDITION OF A MECHANICAL ESCAPEMENT MECHANISM, CAN HAVE AN ADJUSTABLE 0 TO 5 SECOND TRIPPING DELAY.

THE UNDERVOLTAGE TRIP IS MOUNTED ON THE LEFT HAND MECHANISM SIDEPLATE AND ACTS DIRECTLY ON THE BREAKER'S LEFT TRIP SHAFT LEVER.

IT IS IDENTIFIED BY THE SYMBOL "NV" ON THE WIRING DIAGRAM.

REFER TO SECTION 8.6 FOR ILLUSTRATION AND ADJUSTMENTS.

5.5 SAFETY INTERLOCK SWITCH (SIS)

THE SAFETY INTERLOCK SWITCH PROVIDES ADDITIONAL SAFETY AGAINST PARALLELING TWO OR MORE BREAKERS USED IN TRANSFER SCHEMES, ETC. THE SWITCH IS OPERATED BY THE CLOSE LATCH RELEASE MECHANISM. ITS NORMALLY OPEN CONTACT IS WIRED IN PARALLEL WITH THE NORMALLY OPEN SHUNT TRIP COIL CLEARING CONTACT. IT MUST BE CONNECTED IN SERIES WITH A NORMALLY OPEN AUXILIARY SWITCH CONTACT FROM THE OTHER BREAKER BEING INTERLOCKED. WITH THE ALTERNATE BREAKER CLOSED ATTEMPTS TO CLOSE THIS BREAKER BY MEANS OF THE MANUAL CLOSE BUTTON OR EMERGENCY HANDLE WILL CLOSE SIS CONTACT AND ENERGIZE THE SHUNT TRIP COIL. THIS OPERATES THE BREAKER TRIP SHAFT BEFORE THE CLOSING SPRING IS RELEASED RESULTING IN DRY RUN AND PREVENTS THE BREAKER FROM CLOSING. NO ADJUSTMENT IS REQUIRED FOR THIS DEVICE. IT IS IDENTIFIED BY THE SYMBOL "SIS" ON THE WIRING DIAGRAM, WHILE THE NORMALLY OPEN AUXILIARY SWITCH CONTACT OF THE ALTERNATE BREAKER IS IDENTIFIED BY THE SYMBOL "52-A".

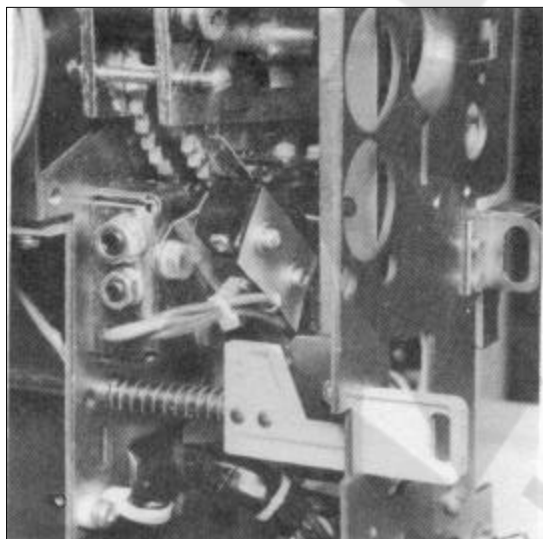


FIG. 5.5 SAFETY INTERLOCK SWITCH

5.6 OVERLOAD LOCKOUT DEVICE

THE OVERLOAD LOCKOUT DEVICE PREVENTS RECLOSING OF THE BREAKER EITHER MANUALLY OR ELECTRICALLY AFTER THE BREAKER HAS BEEN TRIPPED BY THE OVERLOAD RELAY UNTIL THIS DEVICE IS MANUALLY RESET.

A SPECIAL USD RELAY TRIP COIL IS INSTALLED WITH THIS DEVICE, ALONG WITH A SPRING OPERATED MECHANISM LINKING THE TRIP COIL WITH THE MANUAL RESET BUTTON ON THE BREAKER FACEPLATE. WHEN THE TRIP COIL IS ENERGIZED, IT TRIPS THE BREAKER AND AT THE SAME TIME THE SPRING MECHANISM POPS THE RESET BUTTON OUT ON THE FACEPLATE AND HOLDS THE TRIP COIL PLUNGER UP, SO THAT THE BREAKER IS IN A TRIP-FREE STATE.

ON ELECTRICALLY OPERATED BREAKERS, THE LATCH CHECK SWITCH WILL PREVENT OPERATION OF THE CLOSE COIL AND ANY ATTEMPT TO MANUALLY CLOSE THE BREAKER WILL RESULT IN A DRY RUN.

ONE SPDT SWITCH CAN BE PROVIDED WITH THIS DEVICE FOR FAULT INDICATION. THESE CONTACTS ARE IDENTIFIED BY THE SYMBOL "FI" ON THE WIRING DIAGRAM.

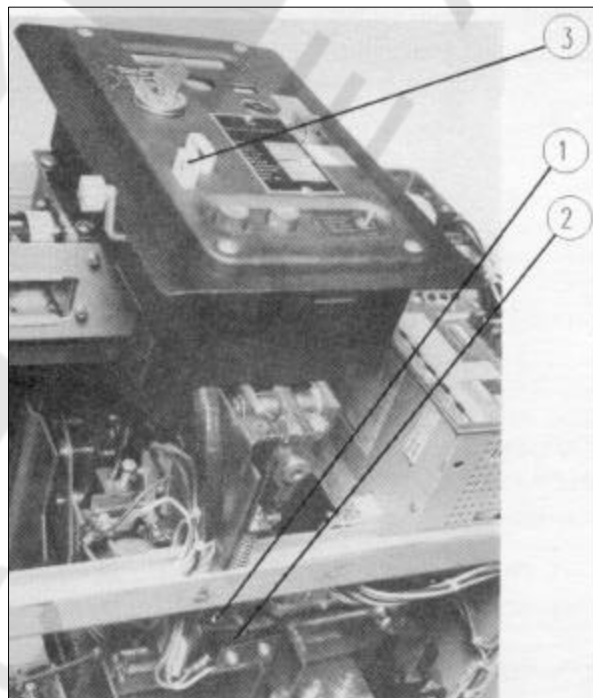


FIG. 5.6 OVERLOAD LOCKOUT

(SHOWN IN OPERATED OR TRIP FREE POSITION)

1. TRIP COIL
2. FAULT INDICATION SWITCH
3. RESET BUTTON

5.7 DOOR INTERLOCK

ALL BREAKERS MAY BE FITTED WITH A DEVICE WHICH ACTS TO TRIP THE BREAKER WHEN THE CELL DOOR IS OPENED. IN OPERATION, THE INTERLOCK LEVER ACTS INTERNALLY ON THE MANUAL TRIP BUTTON CAUSING IT TO BE DEPRESSED AND TRIP THE BREAKER. THIS INTERLOCK MAY BE DEFEATED BY ARRESTING THE MOVEMENT OF THE TRIP BUTTON. A SCREWDRIVE BLADE OR SIMILAR TOOL INSERTED THROUGH THE SLOT IN THE TRIP BUTTON WILL ALLOW THE DOOR TO BE OPENED WITHOUT TRIPPING THE CIRCUIT BREAKER.

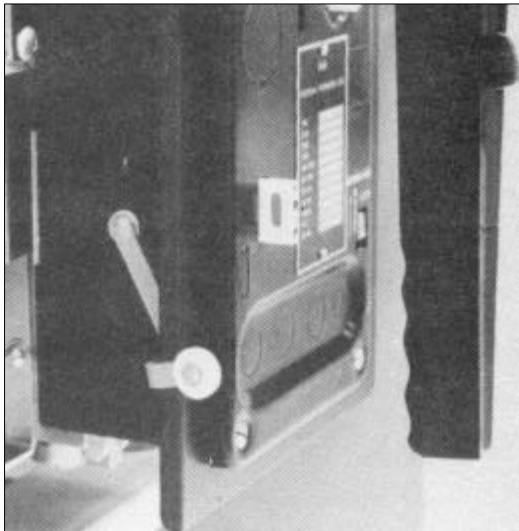


FIG. 5.7 DOOR INTERLOCK

5.8 FACPLATE KEY INTERLOCK AND CELL KEY INTERLOCK

A SINGLE OR DOUBLE FACEPLATE MOUNTED KEY INTERLOCK CAN BE PROVIDED ON ALL BREAKERS. THE PLUNGER OF THE LOCK ACTS INTERNALLY ON THE MANUAL TRIP BUTTON TO HOLD THE BREAKER TRIP FREE AND PREVENT CLOSING WHEN THE KEY HAS BEEN TURNED AND REMOVED. ON ELECTRICALLY OPERATED BREAKERS, THIS ACTION ALSO OPERATES THE LATCH CHECK SWITCH WHICH ISOLATES THE CLOSE COIL CIRCUIT.

THE FACEPLATE KEY INTERLOCK USES A TYPE VF LOCK WITH A 3/8 INCH PROJECTION.

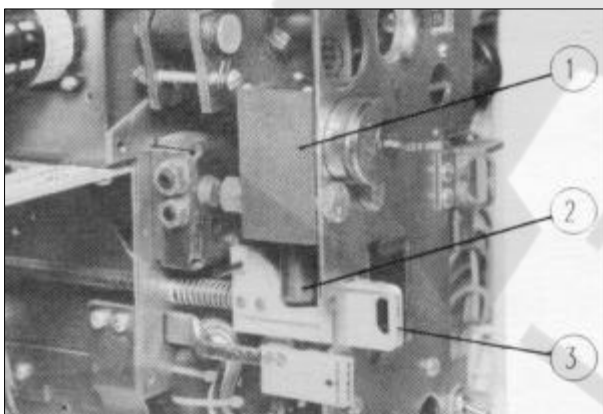


FIG. 5.8.1 FACEPLATE KEY INTERLOCK (SHOWN WITH THE BREAKER HELD TRIP-FREE AND THE KEY FREE FOR REMOVAL).

1. LOCK
2. PLUNGER
3. MANUAL TRIP BUTTON

WHEN IT IS MORE DESIRABLE TO HAVE THE KEY INTERLOCK MOUNTED ON THE BREAKER CUBICLE RATHER THAN ON AN INDIVIDUAL BREAKER, A CELL KEY INTERLOCK CAN BE PROVIDED. THIS IS A CABLE OPERATED DEVICE WHICH EMPLOYS A LOCK MOUNTED ON BREAKER CUBICLE DOOR. A CABLE CONNECTS THE LOCK TO A SHAFT AND LEVER ASSEMBLY MOUNTED ON THE CRADLE. A SEPARATE CABLE SYSTEM ON THE BREAKER IS OPERATED BY THE CRADLE LEVER TO TRIP THE BREAKER, AND HOLD IT TRIP-FREE WHEN THE KEY HAS BEEN REMOVED FROM THE LOCK. THIS INTERLOCK IS ONLY FUNCTIONAL WHEN THE BREAKER IS IN THE "OPERATING" POSITION.

5.9 MECHANICAL INTERLOCK

MECHANICAL INTERLOCKS ARE AVAILABLE ON ALL H-3 BREAKER FRAME SIZES (EXCEPT FOR 14 INCH SIZE). THEY ARE USED TO MECHANICALLY INTERLOCK BREAKERS IN A TRANSFER SCHEME. MECHANICAL INTERLOCKS ENSURE ONLY ONE BREAKER IS CLOSED WHILE THE OTHER IS HELD IN A TRIP FREE POSITION.

MECHANICAL INTERLOCKS CONNECT WITH FLEXIBLE CABLE THE CLOSING SHAFT OF ONE BREAKER TO THE TRIP SHAFT OF A SECOND BREAKER, AND VICE VERSA. DRAWOUT BREAKERS ARE INTERLOCKED BY CABLE CONNECTIONS BETWEEN THE TWO CRADLES. THERE ARE NO PERMANENT CONNECTIONS BETWEEN THE BREAKER AND MATCHING CRADLE WHEN INTERLOCKING IS SUPPLIED, SO THE BREAKER CAN BE FREELY WITHDRAWN FROM THE CELL. MECHANICAL INTERLOCKS ARE OPERABLE ONLY WHEN THE BREAKER IS IN THE "OPERATING" POSITION. WHEN WITHDRAWN TO THE "TEST" POSITION, BREAKERS ARE NOT INTERLOCKED AND CAN BE TEST OPERATED IN THE NORMAL MANNER.

MECHANICAL INTERLOCKS ARE PRESET AT THE FACTORY AND REQUIRE NO ADJUSTMENT.

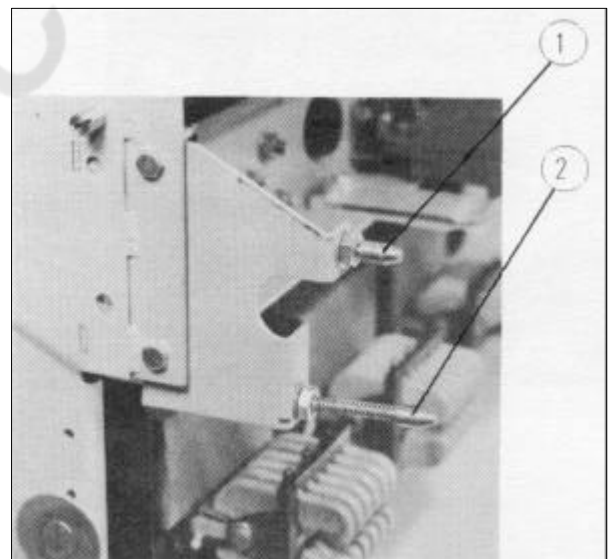


FIG. 5.9.1 BREAKER PORTION OF MECHANICAL INTERLOCK

1. UPPER PLUNGER CONNECTED TO CLOSING SHAFT
2. LOWER PLUNGER CONNECTED TO TRIP SHAFT

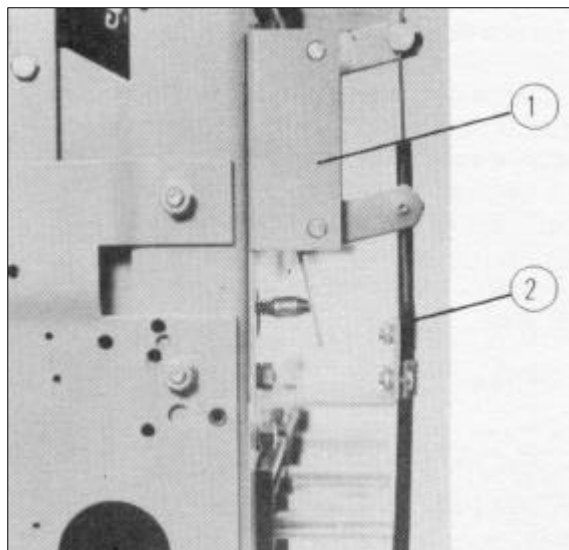


FIG. 5.9.2 CRADLE PORTION OF MECHANICAL INTERLOCK

1. INTERLOCK BRACKET ASSEMBLY
2. CABLES TO OTHER CRADLE

5.10 SHUTTERS

SHUTTERS ARE AVAILABLE ON MOST FRAME SIZES OF BREAKERS TO COVER BOTH LINE AND LOAD MAIN CONTACT STABS INSIDE THE CRADLE.

THEY ARE CLOSED, COVERING THE CONTACTS WHEN BREAKER IS WITHDRAWN FROM THE "OPERATING" POSITION AND ARE OPENED, EXPOSING THE CONTACTS WHEN BREAKER IS CRANKED IN TO THE "OPERATING" POSITION.

A PADLOCK BRACKET IS PROVIDED SO THAT SHUTTERS CAN BE LOCKED IN THE CLOSED POSITION WHEN THE BREAKER IS REMOVED FROM THE CRADLE.

THE SHUTTER MECHANISM IS OPERATED BY THE BREAKER FRAME.

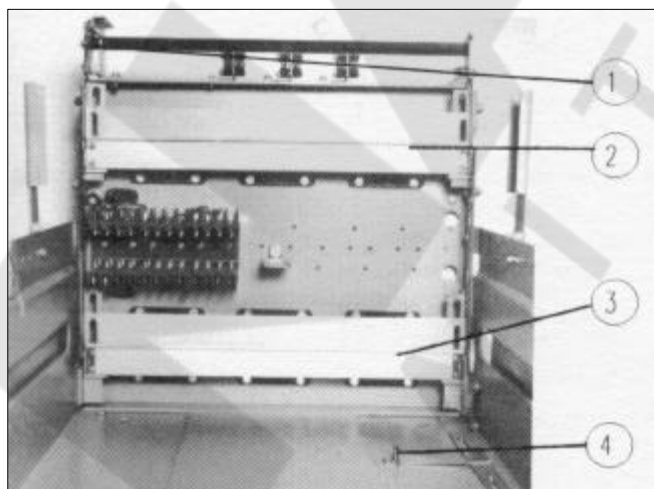


FIG. 5. 10.1 SHUTTERS - CLOSED POSITION

1. OPERATING MECHANISM
2. LINE SIDE BARRIER
3. LOAD SIDE BARRIER
4. PADLOCK BRACKET

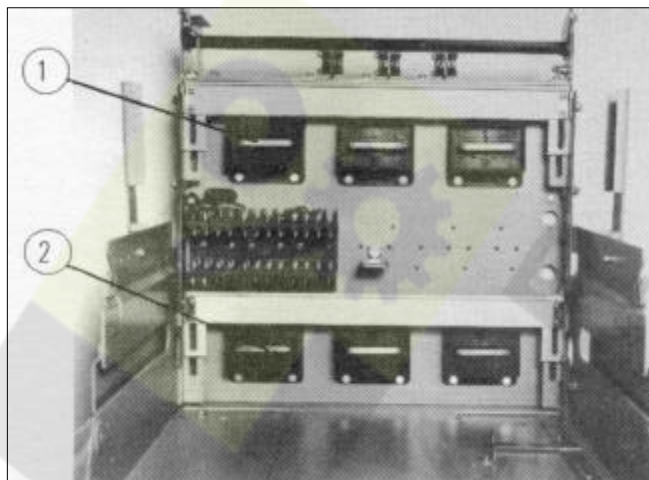


FIG. 5.10.2 SHUTTERS - OPEN POSITION

1. LINE SIDE CONTACT STAB
2. LOAD SIDE CONTACT STAB

6. PRE-SERVICE INSPECTION

THE FOLLOWING ITEMS SHOULD BE SPECIFICALLY CHECKED BEFORE A BREAKER IS PLACED IN SERVICE OR THE CONTROL CIRCUIT IS ENERGIZED.

THE BREAKER SHOULD BE ROLLED OUT OF THE COMPARTMENT ON THE FOLD-DOWN CRADLE RAILS, OR PLACED ON A BENCH FOR BETTER ACCESSIBILITY. FOR FIXED MOUNTED BREAKERS, ENSURE THAT THEY ARE ISOLATED FROM BOTH MAIN AND CONTROL POWER.

- 6.1 MAKE A VISUAL INSPECTION TO ENSURE THAT NO PARTS HAVE BEEN DAMAGED OR FORCED OUT OF ALIGNMENT.
- 6.2 CHECK ALL THE CONTROL WIRING TO ENSURE THAT IT HAS NOT BEEN DAMAGED.
- 6.3 CHECK THE DOOR INTERLOCK LEVER, FACE KEY INTERLOCK AND MECHANICAL INTERLOCK MECHANISM FOR FREEDOM OF MOVEMENT IF SUPPLIED.
- 6.4 ENSURE THAT THE USD RELAY SETTINGS CONFORM WITH THE REQUIRED TRIPPING CHARACTERISTICS.
- 6.5 OPERATE BREAKER SEVERAL TIMES MANUALLY TO ENSURE CORRECT OPERATION. NOTE THAT IF AN UNDERVOLTAGE TRIP DEVICE IS INSTALLED, ITS MECHANISM MUST BE PHYSICALLY BLOCKED IN THE OPERATED POSITION, SINCE WITHOUT CONTROL POWER IT WILL HOLD THE CLOSING MECHANISM IN A TRIP-FREE STATE AND PREVENT CLOSING. THE SAME APPLIES TO A DOOR INTERLOCK IF INSTALLED. THE MANUAL TRIP BUTTON MUST BE LOCKED IN THE "OUT" POSITION, OR THE INTERLOCK LEVER BLOCKED IN THE "IN" POSITION WHEN THE CUBICLE DOOR IS NOT CLOSED.

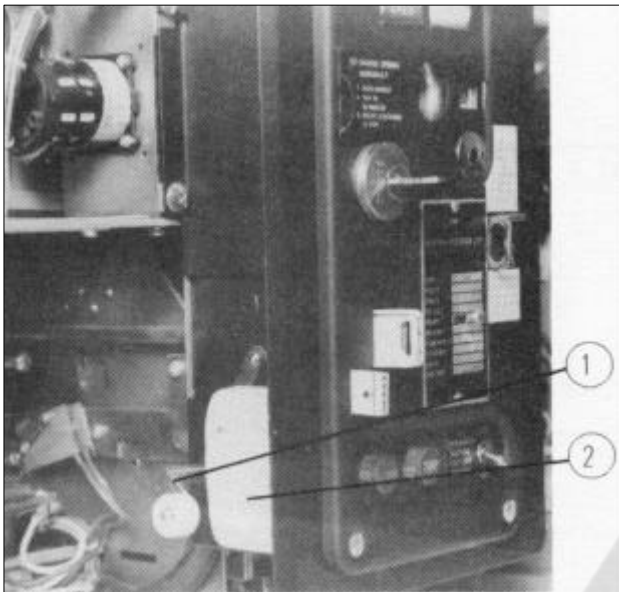


FIG. 6.5 BLOCKING THE DOOR INTERLOCK LEVER

1. DOOR INTERLOCK LEVER
2. WOODEN BLOCK HOLDING LEVER IN OPERATED OR "IN" POSITION

ACTUATE ALL TRIPPING DEVICES MANUALLY TO ESTABLISH THAT THEY OPERATE PROPERLY.

THESE INCLUDE STANDARD AND OPTIONAL DEVICES:

MANUAL TRIP BUTTON -- PUSH TO TRIP

DRAWOUT GATE -- LOWER GATE TO TRIP

TRIP COILS -- RAISE PLUNGER BY HAND FROM BENEATH TO TRIP

UNDERVOLTAGE TRIP -- PUSH THE SOLENOID PLUNGER FULLY INTO THE SOLENOID, CLOSE THE BREAKER THEN RELEASE THE PLUNGER TO TRIP
--CHECK THE DELAY IF TIMER IS INSTALLED

ANTI-SINGLE-PHASE DEVICE -- RAISE EACH SOLENOID PLUNGER FROM BENEATH TO TRIP, RESETTNG EACH BLOWN FUSE INDICATOR WHEN FINISHED

FACEPLATE KEY INTERLOCK -- TURN KEY TO TRIP

CELL KEY INTERLOCK -- PUSH IN PLUNGER AT REAR OF BREAKER TO TRIP

MECHANICAL INTERLOCK -- UPPER PLUNGER SHOULD EXTEND WHEN BREAKER IS CLOSED. PUSH IN LOWER PLUNGER TO TRIP

DOOR INTERLOCK -- REMOVE BLOCKING DEVICE TO TRIP

OVERLOAD LOCKOUT -- RAISE TRIP COIL PLUNGER FROM BENEATH TO TRIP, PUSH IN FACEPLATE BUTTON TO RESET.

REMOVE BLOCKING DEVICES FROM UNDER VOLTAGE TRIP AND DOOR INTERLOCK BEFORE CONTINUING.

6.6 FOR FIXED MOUNTED BREAKERS ONLY:

REMOVE EMERGENCY OPERATING HANDLE FROM ELECTRICALLY OPERATED BREAKERS. CLOSE BREAKER COMPARTMENT DOOR. ENERGIZE ONLY BREAKER CONTROL SOURCE(S) IF SEPARATE CONTROL POWER IS PROVIDED, OR MAIN POWER SOURCE IF USED FOR CONTROL POWER AS WELL. FOR THE LATTER, ISOLATE THE LOAD IF POSSIBLE. CLOSE AND OPEN BREAKER SEVERAL TIMES. ENSURE THAT REMOTE CONTROL, PROTECTION, MONITORING AND ANNUNCIATING CIRCUITS ARE FUNCTIONING AS INTENDED. AFTER COMPLETION OF TEST OPERATIONS, BREAKER IS READY FOR FULL SERVICE.

6.7 FOR DRAWOUT MOUNTED BREAKERS ONLY:

CHECK THE MAIN AND SECONDARY DRAWOUT CONTACTS TO SEE THAT THEY ARE CLEAN AND FREE FROM FOREIGN MATERIAL. PUT ELECTRICALLY OPERATED BREAKER, OR MANUALLY OPERATED BREAKER WITH SHUNT TRIP COIL IN "TEST" POSITION. BEFORE LOWERING THE DRAWOUT GATE ENSURE BREAKER CLOSING SPRING IS DISCHARGED (REFER TO 4.10 CLOSING SPRING DISCHARGE AND DRY RUNS).

ENERGIZE BREAKER CONTROL SOURCE(S). BREAKER COMPARTMENT DOOR MAY BE LEFT OPEN FOR BETTER OBSERVANCE OF BREAKER OPERATION BUT BE AWARE THAT CONTROL POWER IS CONNECTED AND CIRCUITS AND DEVICES ARE ALIVE.

CLOSE AND OPEN BREAKER SEVERAL TIMES. ENSURE THAT ALL MANUAL AND ELECTRICAL FEATURES ARE FUNCTIONING PROPERLY.

ENSURE THAT REMOTE CONTROL, PROTECTION, MONITORING AND ANNUNCIATING CIRCUITS REQUIRED TO BE OPERATIONAL IN "TEST" POSITION ARE FUNCTIONING. CLOSE BREAKER COMPARTMENT DOOR. CRANK BREAKER TO "OPERATING" POSITION. OPERATE BREAKER TO VERIFY OPERATION OF REMOTE PROVISIONS IN "OPERATING" POSITION.

THE BREAKER IS NOW READY FOR FULL SERVICE.

7. BASIC BREAKER MAINTENANCE

7.1 MAINTENANCE REQUIREMENTS

TYPE H-3 AND HL-3 BREAKERS SHOULD UNDERGO SYSTEMATIC INSPECTION, LUBRICATION AND SERVICING AT THE FOLLOWING INTERVALS:

EVERY 1750 OPERATIONS FOR 600 AND 800 AMP BREAKERS.
EVERY 500 OPERATIONS FOR 1600 AND 2000 AMP BREAKERS.
EVERY 250 OPERATIONS FOR 3000 AMP AND ABOVE.

IN MANY INSTALLATIONS, IT MAY TAKE YEARS FOR A BREAKER TO REACH THESE NUMBERS OF OPERATIONS. FOR THESE CASES ANNUAL MAINTENANCE SHOULD BE PROVIDED. FOR BREAKERS OPERATING IN VERY CLEAN ENVIRONMENTS, THIS INSPECTION PERIOD COULD BE EXTENDED TO 2 YEARS. CONVERSELY, BREAKERS THAT OPERATE IN VERY DUSTY, CORROSIVE OR OTHERWISE ADVERSE ENVIRONMENTS REQUIRE INSPECTIONS AND SERVICE EVEN MORE FREQUENTLY.

SECTION 7.2 CONTAINS A LIST OF THE MAINTENANCE TOOLS AND SUPPLIES THAT WILL BE REQUIRED AND SUMMARY/CHECKLIST OF THE BASIC MAINTENANCE PROCEDURES.

SECTION 7.3 DESCRIBES THE FULL PROCEDURE.

7.2 TOOLS AND CHECKLIST

THE FOLLOWING TOOLS AND SUPPLIES WILL BE VALUABLE FOR BASIC BREAKER MAINTENANCE:

- AN ASSORTMENT OF SLOT AND ROBERTSON HEAD SCREWDRIVERS.
- A WRENCH AND SOCKET SET (IN PARTICULAR, A 7/16 INCH "DEEP" SOCKET IS USEFUL FOR REMOVING ARC CHUTES).
- A FEELER GAUGE.
- AN EMERGENCY CHARGING HANDLE FOR ELECTRICALLY OPERATED UNITS.
- A DRAWOUT CRANK (if NONE IS AVAILABLE, A 1/2 INCH DRIVE RATCHET AND EXTENSION CAN BE USED).
- A SLOW-CLOSE HANDLE, DEFLECTION GAUGE, DEFLECTION AND DIFFERENTIAL SHIMS AND A SMALL PIECE OF BEAR-TEX OR SIMILAR ABRASIVE FIBRE MATERIAL, ALL OF WHICH ARE AVAILABLE FROM SCHNEIDER ELECTRIC (SEE SECTION 9.1).
- IF THE MECHANISM IS VERY DIRTY A CLEANING SOLVENT MAY BE REQUIRED.
- FOR LUBRICATION, USE CAT. NO. PJC-8311 HIGH TEMPERATURE LUBRICATING GREASE, PART NO. 70.15.001A.002.

MAINTENANCE SUMMARY CHECK LIST

1. REMOVE OR ISOLATE BREAKER
2. REMOVE AND INSPECT ARC CHUTES, FLASH SHIELDS, FACEPLATE
3. CLEAN BREAKER
4. CLEAN MAIN AND SECONDARY DRAWOUT CONTACTS
5. INSPECT MOULDINGS AND HARDWARE
6. INSPECT ARCING CONTACTS
7. INSPECT BRAIDS
8. INSPECT MAIN CONTACTS
9. CLEAN CLOSING MECHANISM AND DRAWOUT MECHANISMS
10. CHECK TRIP LATCH
11. CHECK CLOSE LATCH

12. LUBRICATE
13. CHECK CLOSING MECHANISM TOGGLE
14. CHECK DIFFERENTIAL
15. CHECK DEFLECTION
16. CHECK AND OPERATE CONTROL AND TRIP DEVICES
17. REASSEMBLE
18. CLEAN CRADLE MOULDINGS, CONTACTS
19. INSPECT CRADLE
20. LUBRICATE CRADLE
21. PLACE BREAKER BACK IN SERVICE

7.3 BASIC MAINTENANCE PROCEDURE

1. REMOVE OR ISOLATE BREAKER.

FOR FIXED MOUNTED BREAKERS, BEGIN BY ENSURING THAT THE BREAKER IS ISOLATED FROM BOTH MAIN AND CONTROL POWER SOURCES. TRIP THE BREAKER AND OPEN THE COMPARTMENT DOOR.

FOR DRAWOUT MOUNTED BREAKERS, WITHDRAW THE BREAKER FROM THE CUBICLE (REFER TO SECTION 4.10 REGARDING DRY RUNS). MOVE THE BREAKER TO A BENCH FOR BETTER ACCESS AND VISIBILITY IF POSSIBLE.

BEFORE BEGINNING WORK ON THE BREAKER, CHECK THE BOTTOM OF THE CRADLE FOR ANY HARDWARE, RETAINERS OR BROKEN PARTS. THE SOURCE OF THESE ITEMS SHOULD BE LOCATED AND MISSING HARDWARE OR BROKEN PARTS REPLACED.

2. REMOVE AND INSPECT ARC CHUTES, FLASH SHIELDS, FACEPLATE

BEGIN DISASSEMBLY AND INSPECTION. AS EACH PART IS REMOVED, WIPE IT CLEAN WITH A DRY RAG AND INSPECT FOR CRACKS OR DISTORTION.

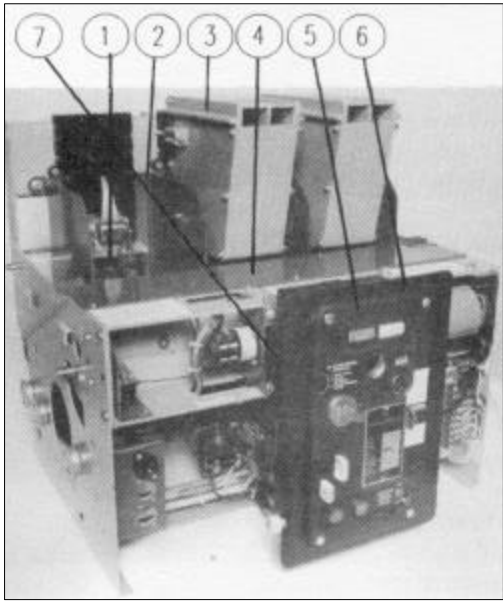


FIG. 7.3.2.1 PARTS TO BE REMOVED FOR MAINTENANCE

1. LOWER FLASH SHIELD
2. INTERPHASE BARRIER
3. ARC CHUTE
4. FRONT FLASH SHIELD
5. FACEPLATE
6. FLOATING TRIM
7. FACEPLATE BOX

REMOVE THE ARC CHUTES INSPECTING EACH CHUTE AS IT IS REMOVED. DISCOLORATION IN THE TOP AND INTERIOR SURFACES ARE NORMAL. THE ARC CHUTE ONLY NEEDS TO BE REPLACED IF HEAVY DEPOSITS OF ARC MATERIAL ARE PRESENT OR IF IT IS CRACKED OR DISTORTED. NEXT REMOVE THE LOWER FLASH SHIELDS FROM BENEATH THE FIXED ARCING CONTACTS AND AGAIN INSPECT EACH FOR DAMAGE.

REMOVE THE FRONT FLASH SHIELD. ON 14 AND 27 INCH FRAME BREAKERS, THE END BARRIERS WILL COME OFF WITH THE FRONT FLASH SHIELD. ON 21 INCH BREAKERS THE END BARRIERS NEED NOT BE REMOVED. FINALLY, LIFT OFF THE INTERPHASE BARRIERS. CHECK ALL THESE PARTS FOR DAMAGE.



FIG. REMOVING FACEPLATE

BEFORE REMOVING THE FACEPLATE, HOOK THE UPPER AND LOWER SPRINGS OVER THE FLOATING TRIM. THIS WILL RETAIN THE FLOATING TRIM WHEN THE FACEPLATE IS REMOVED. ONCE THE FACEPLATE HAS BEEN REMOVED, PULL THE FLOATING TRIM OFF AND REMOVE THE BOX ASSEMBLY. NO FURTHER DISASSEMBLY IS REQUIRED FOR NORMAL MAINTENANCE.

3. CLEAN BREAKER

CLEAN THE BREAKER WITH AIR PRESSURE, A BRUSH, DRY CLOTH OR VACUUM CLEANER. REMOVE ACCUMULATED DIRT FROM ALL ACCESSIBLE SURFACES. WIPE EXCESS GREASE FROM THE DRAWOUT WHEELS.

4. CLEAN MAIN AND SECONDARY DRAWOUT CONTACTS

REMOVE ANY GREASE THAT HAS BECOME DIRTY AND CAKED ON THE MAIN AND SECONDARY DRAWOUT CONTACTS AND GROUND CONTACT. WIPE EACH PART CLEAN BUT DO NOT USE CONTACT CLEANER SPRAY AS THIS MAY DAMAGE ADJACENT PLASTIC PARTS.

5. INSPECT MOULDINGS AND HARDWARE

STARTING AT THE REAR OF THE BREAKER, INSPECT THE UPPER AND LOWER MOULDINGS FOR CRACKS OR SIGNS OF DAMAGE FROM OVER- HEATING. CHECK THAT ALL HARDWARE IS TIGHT, IN PARTICULAR, THE MOUNTING SCREWS OR BOLTS FOR DRAWOUT CONTACTS. CHECK THAT THE MAIN AND SECONDARY DRAWOUT CONTACTS ARE FREE TO MOVE UP AND DOWN FOR SELF ALIGNMENT AND CHECK THAT THE WIRE CONNECTIONS TO THE SECONDARY CONTACTS ARE INTACT.

MOVING TO THE FRONT OF THE BREAKER, AGAIN CHECK THE MOLDINGS AND HARDWARE. LOOK FOR MISSING RETAINERS ON THE PINS IN THE MOVING CONTACT ASSEMBLIES AND CLOSING MECHANISM.

6. INSPECT ARCING CONTACTS

THE MOVING AND STATIONARY ARCING CONTACTS ARE SUBJECTED TO EROSION EVERY TIME CURRENT IS INTERRUPTED. THEY NEED ONLY BE REPLACED IF THEY SHOW SEVERE PITTING OR MATERIAL LOSS. BECAUSE OF THEIR WIPING ACTION, THE ARCING CONTACTS DO NOT REQUIRE CLEANING.

7. INSPECT BRAIDS

CHECK THE BRAIDS ATTACHED TO THE MOVING ARCING CONTACTS. IF THEY ARE DISCOLORED, IF STRANDS ARE BROKEN OR IF THEY DO NOT FEEL FLEXIBLE, THEY SHOULD BE REPLACED.

8. INSPECT MAIN CONTACTS

CHECK THE MOVING AND STATIONARY MAIN CONTACTS SURFACES. WIPE THE CONTACTS CLEAN AND INSPECT VISUALLY. SLIGHT PITTING AND ROUGHNESS WILL OCCUR NORMALLY DURING LOAD SWITCHING. RUB YOUR FINGER OVER EACH CONTACT SURFACE. THIS CAN REVEAL IRREGULARITIES NOT READILY VISIBLE. BADLY PITTED OR SCORED CONTACTS SHOULD BE REPLACED. CLEAN THE CONTACT SURFACES WITH THE FIBRE ABRASIVE. NEVER USE STEEL WOOL FOR CLEANING BREAKER CONTACTS.

ON THE MOVING CONTACT ASSEMBLY, CHECK THAT EACH WAFER MOVES

INDEPENDENTLY AND EACH HAS EVEN SPRING PRESSURE. LOOK FOR SIGNS OF OVERHEATING ON THE INSULATING SPACERS BETWEEN WAFERS, ON THE WAFER SPRINGS AND ON THE MOLDED SPRING HOLDERS.

GENERALLY SIGNS OF OVERHEATING ON THE MOVING CONTACT ASSEMBLY INDICATES A HIGH RESISTANCE ACROSS THE MAIN CONTACTS OR INADEQUATE CONTACT PRESSURE.

9. CLEAN THE CLOSING AND DRAWOUT MECHANISM.

REMOVE ANY ACCUMULATED DIRT AND GREASE FROM THE CLOSING MECHANISM. THE USE OF CLEANING SOLVENTS IS DISCUSSED IN THE FOLLOWING SECTION.

ALSO CLEAN THE DRAWOUT MECHANISM. INSERT THE DRAWOUT CRANK AND TURN IT CLOCKWISE TO STOP, CLEAN OFF THE GREASE FROM THE SCREW SHAFT, THEN CRANK IT ALL THE WAY BACK, AGAIN CLEANING THE GREASE OFF.

10. CHECK TRIP LATCH

CHECK THE MOVEMENT OF THE TRIP SHAFT AND CLOSING MECHANISM. ROTATE THE TRIP SHAFT BACK AND RELEASE IT. IT SHOULD ROTATE FREELY AND SPRING BACK TO POSITION. CHECK THE CLOSING MECHANISM BY PARTIALLY CHARGING THE MAIN SPRING JUST TO THE POINT WHERE THE TRIP LATCH BEARING HITS THE CLOSE LATCH AND BEGINS TO ROTATE IT BACK. AT THIS POINT THE SPRING IS ONLY PARTIALLY CHARGED. IT IS HELD IN PLACE BY THE HOLDING PAWL AND CONTACTS CANNOT BE CLOSED WITHOUT FURTHER CHARGING THE SPRING. PUSH THE TRIP LATCH BEARING FORWARD AND RELEASE IT. THE LINKAGE SHOULD MOVE FREELY AND SPRING BACK TO ITS ORIGINAL POSITION. FOLLOWING THIS, COMPLETE THE CHARGING STROKE, CLOSE, THEN TRIP THE BREAKER.

IF THE TRIP SHAFT OR MECHANISM SHOWS RESISTANCE TO MOVEMENT OR IF THE MECHANISM IS VERY DIRTY, IT MAY REQUIRE CLEANING WITH A SOLVENT. BE SURE THE SOLVENT LEAVES NO RESIDUE AND WILL NOT AFFECT THE PLASTICS, OR OTHER MATERIALS IN THE BREAKER. BE CAREFUL THAT THE CLEANER DOES NOT CONTACT ANY MOLDED PLASTIC PARTS, IN PARTICULAR, THE SECONDARY DRAWOUT CONTACTS OR THE ANTI-SINGLE-PHASE UNIT ON HL-3 BREAKERS. THIS LAST DEVICE WOULD BE BEST COVERED OR EVEN REMOVED IF CLEANING THE MECHANISM WITH SOLVENTS.

11. CHECK CLOSE LATCH

CHECK THE SECURITY OF THE LOCKNUTS ON THE CLOSE LATCH ADJUSTING SCREWS. IF THESE ARE LOOSE, CHECK CLOSE LATCH ADJUSTMENT (SECTION 8.2). USING THE MANUAL CLOSE BUTTON OR CLOSE LEVER, OPERATE THE CLOSE LATCH. IT SHOULD MOVE DOWN FREELY AND SPRING BACK TO ITS UPPER POSITION.

12. LUBRICATE THE BREAKER

REFERRING TO THE ACCOMPANYING FIGURES RE-LUBRICATE THE BREAKER. APPLY **PJC-8311** OIL TO THE FOLLOWING PARTS:

- (1) ALL LINKAGE PIVOTS WITHIN THE MECHANISM.
- (2) CLOSING AND DRAWOUT SHAFT BEARINGS.
- (3) CLOSE LATCH PIVOT.

- (4) CLOSE LEVER PIVOT.
- (5) HOLDING PAWL PIVOT.
- (6) DRAWOUT MECHANISM.
- (7) THRUST BEARINGS ON THE DRAWOUT SCREW SHAFT.
- (8) DRAWOUT GATE PIVOT.

ON ELECTRICALLY OPERATED BREAKERS, ALSO OIL THE FOLLOWING:

- (9) DRIVING PAWL
- (10) SPRING LIMIT SWITCH LEVER PIVOT.
- (11) ON 14" FRAME BREAKERS, THE TOP PIVOT OF THE CHARGING CAM.

APPLY A LIGHT WIPE OF PJC-8311 GREASE TO THE FOLLOWING POINTS:

- (12) SLOTS FOR THE SPRING GUIDE PIN.
- (13) RATCHET WHEEL TEETH.
- (14) DRAWOUT SCREW SHAFT.
- (15) CONTACT SURFACES OF THE MAIN DRAWOUT CONTACTS.
- (16) CONTACT SURFACES OF THE SECONDARY DRAWOUT CONTACTS.
- (17) GROUND CONTACT.
- (18) CLOSING SHAFT SUPPORTS.
- (19) DRAWOUT WHEEL BEARING.

ON ELECTRICALLY OPERATED BREAKERS, ALSO GREASE THE FOLLOWING:

- (20) THE SLOT ON THE RIGHT SIDE OF THE OSCILLATING LEVER (AT THE MOTOR).

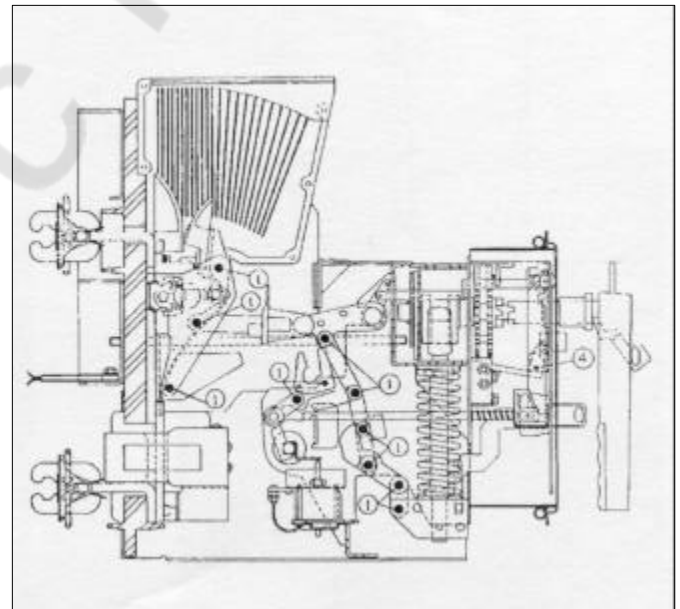


FIG 7.3.12.1 LINKAGE LUBRICATION

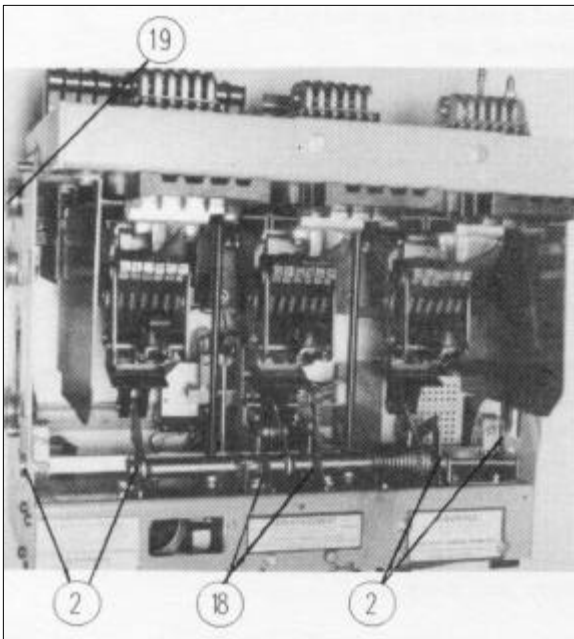


FIG. 7.3.12.2 TOP VIEW LUBRICATION

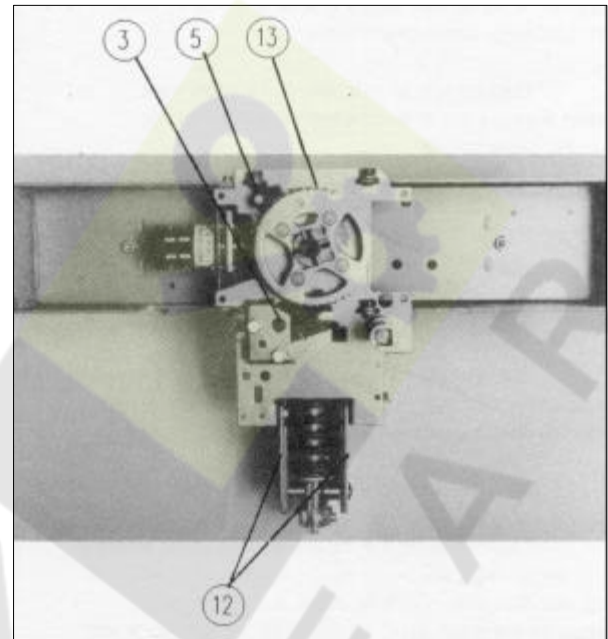


FIG. 7.3.12.4 MANUALLY OPERATED BREAKER LUBRICATION

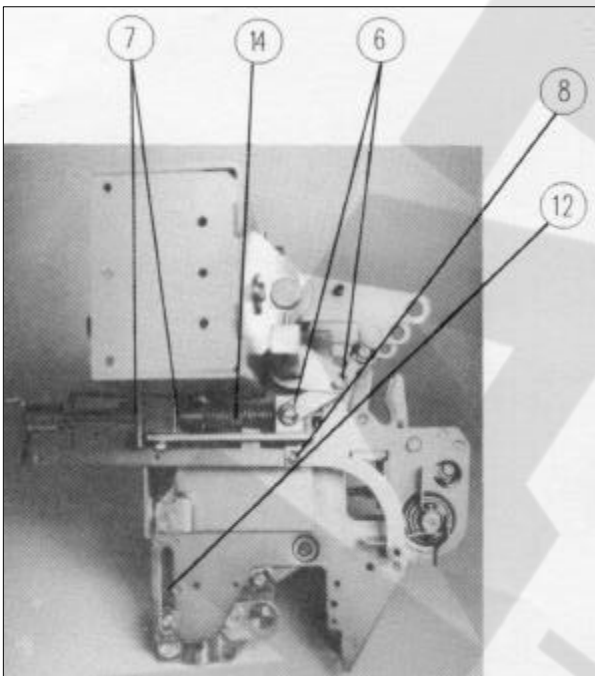


FIG. 7.3.12.3 DRAWOUT MECHANISM LUBRICATION

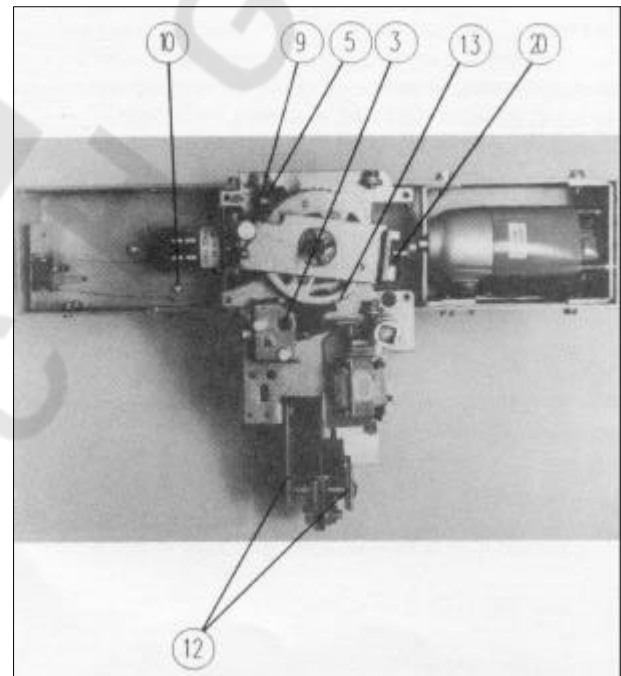


FIG. 7.3.12.5 ELECTRICALLY OPERATED BREAKER LUBRICATION

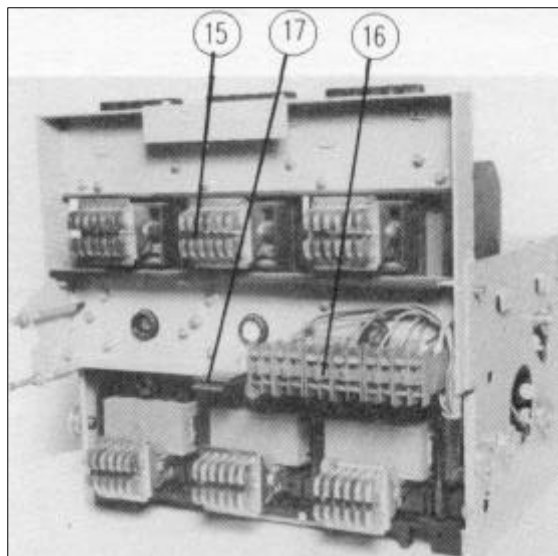


FIG. 7.3.1 2.6 DRAWOUT CONTACT LUBRICATION

13. CHECK CLOSING MECHANISM TOGGLE

NOW, CHARGE AND CLOSE THE BREAKER AND OBSERVE THE POSITION OF THE TOGGLE PIN. THIS IS BEST DONE BY LOOKING DOWN INTO THE CLOSING MECHANISM FROM ABOVE. IN THE CLOSED POSITION, THE TOGGLE PIN MUST REST AGAINST THE STOPS IN THE MECHANISM SIDEPLATES.

IF THE PIN IS NOT AGAINST THE STOPS, ADJUSTMENT OF THE ECCENTRIC MUST BE DONE BEFORE CONTINUING. REFER TO SECTION 8.1 FOR DETAILED INSTRUCTIONS.

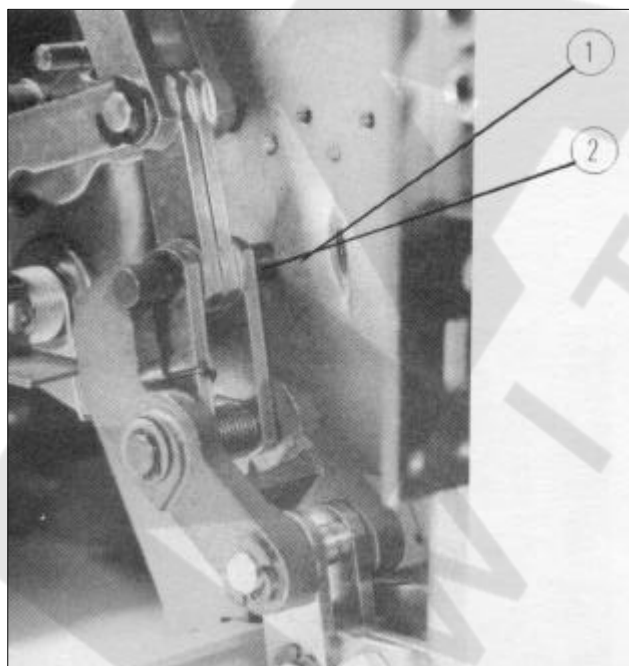


FIG. 7.3.13 TOGGLE PIN.

1. STOP IN MECHANISM SIDEPLATES
2. TOGGLE PIN

14. CHECK DIFFERENTIAL

AS THE MOVING CONTACT CLOSES, THE ARCING CONTACTS TOUCH FIRST. AT THIS POINT, THE UPPER GAP BETWEEN THE MAIN CONTACTS IS TERMED CONTACT DIFFERENTIAL. AS THE MOVING CONTACT CONTINUES, THE ARCING CONTACT BRACKET ROTATES TO BEGIN COMPRESSING THE WAFER SPRINGS. AFTER THE MAIN CONTACTS HAVE TOUCHED, THE FRAME OF THE MOVING CONTACT CONTINUES TO MOVE. THE OVERTRAVEL OF THE FRAME RELATIVE TO THE WAFER CONTACT IS TERMED THE CONTACT DEFLECTION. THIS OVERTRAVEL ALLOWS THE WAFER CONTACTS TO BE FREE FLOATING AND SELF-ALIGNING, HELD AGAINST THE STATIONARY MAIN CONTACTS BY ONLY THE FORCE OF THE WAFER SPRINGS.

BEGIN BY CHECKING THE CONTACT DIFFERENTIAL. WITH THE MAIN SPRING DISCHARGED AND THE CONTACTS OPEN, MANUALLY PUSH THE CONTACTS CLOSED UNTIL THE ARCING CONTACTS TOUCH. THIS IS MOST EASILY DONE USING A SLOW CLOSE DEVICE. THE ARCING CONTACTS OF EACH POLE MAY NOT TOUCH AT EXACTLY THE SAME TIME, SO CHECK EACH POLE SEPARATELY ENSURING THAT THE ARCING CONTACTS ON THAT POLE ARE TOUCHING. USING A FEELER GAUGE, CHECK THE UPPER GAP BETWEEN THE MAIN CONTACTS. THE NORMAL CONTACT DIFFERENTIAL IS BETWEEN 50 AND 65 THOUSANDTHS OF AN INCH, THOUGH HIGHER DIFFERENTIAL READINGS ARE ACCEPTABLE AS LONG AS THE TOGGLE PIN IS AGAINST THE STOPS WHEN THE BREAKER IS CLOSED. IF THE DIFFERENTIAL IS TOO LOW, IT CAN BE INCREASED BY REMOVING THE STATIONARY ARCING CONTACT AND ADDING A SHIM UNDERNEATH IT. CHECK EACH POLE FOR DIFFERENTIAL. IF ANY SHIMS ARE ADDED, BE SURE TO CHANGE AND CLOSE THE BREAKER AND CHECK THAT THE TOGGLE PIN IS STILL AGAINST THE STOPS.

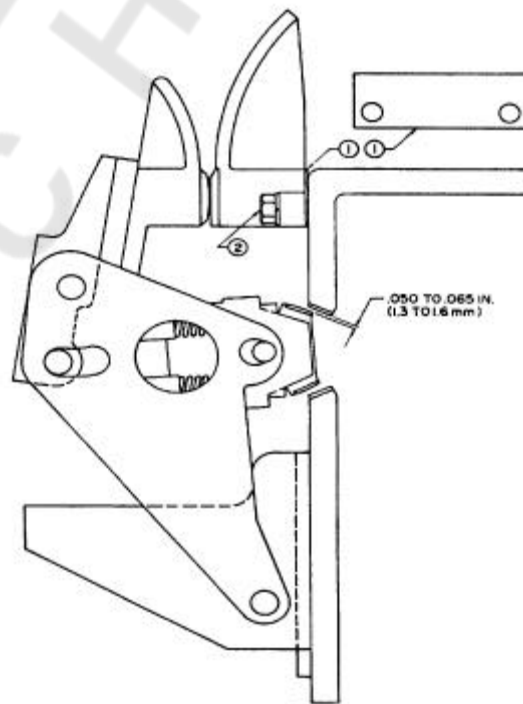


FIG. 7.3.14.1 CONTACT DIFFERENTIAL.

1. SHIM
2. FIXED ARCING CONTACT MOUNTING SCREW

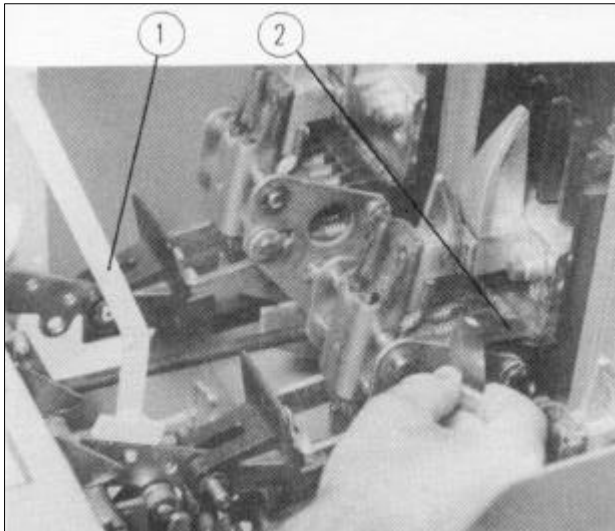


FIG. 7.3.1 4.2 CHECKING CONTACT DIFFERENTIAL

1. SLOW CLOSE HANDLE
2. FEELER GAUGE

15. CHECK DEFLECTION.

BEFORE CHECKING THE CONTACT DEFLECTION, NOTE THAT SHOULD ONE COME IN CONTACT WITH MANUAL TRIP BUTTON WHILE THE BREAKER IS CLOSED, ACCIDENTAL TRIPPING COULD OCCUR. THIS COULD BE INJURIOUS IF HANDLING THE MOVING CONTACTS. A GOOD PRECAUTION AGAINST THIS IS TO INSERT A NUT AND BOLT IN THE TRIP BUTTON.

WITH THE CONTACTS CLOSED, CHECK THE PIN THAT PASSES THROUGH THE WAFER CONTACTS FOR FREEDOM. IF THE CONTACT HAS ADEQUATE DEFLECTION, THE PIN SHOULD BE COMPLETELY FREE TO MOVE. IN THE FRONT-REAR DIRECTION, THE PIN SHOULD MOVE MORE THAN 1/32 INCH. IF THE PIN IS NOT FREE, OR IF THE CONTACT AREA HAS SHOWN ANY SIGNS OF OVERHEATING, THE DEFLECTION SHOULD BE CHECKED WITH A DEFLECTION GAUGE.

TO USE THE GAUGE, BEGIN WITH THE CONTACTS OPEN. PUSH THE INDICATOR ON THE GAUGE TOWARD THE ZERO MARK AND INSERT THE GAUGE INTO THE LEFT SIDE OF THE MOVING CONTACT ASSEMBLY. THE TWO LOWER LOCATORS ON THE GAUGE REST IN THE HOLE IN THE SIDE OF THE CONTACT FRAME SIDEPLATE, THE UPPER ONE ON THE TOP OF THE SIDEPLATE. NOW RELEASE THE INDICATOR AND OBSERVE THE READING. REPEAT FOR EACH CONTACT ON THE BREAKER.

THEN, CLOSE THE BREAKER AND AGAIN TAKE READINGS ON EACH CONTACT. SUBTRACT THE OPEN READING FROM THE CLOSED READING TO GET THE DEFLECTION IN 1/64 INCH. THE CORRECT READING FOR BREAKERS UP TO AND INCLUDING 2000A IS 3/64 TO 5/64, FOR BREAKERS ABOVE 2000A, 2/64 TO 4/64". AS WITH THE DIFFERENTIAL, READINGS ABOVE THESE RANGES ARE ACCEPTABLE AS LONG AS THE TOGGLE PIN IS AGAINST THE STOPS WHEN THE BREAKER IS CLOSED.

IF DEFLECTION IS BELOW THE RANGE SPECIFIED, IT MAY BE INCREASED BY ADDING SHIMS TO THE CLOSING LINK. LOOSEN THE TWO BOLTS, INSERT A SHIM AND RETIGHTEN THE BOLTS FIRMLY.

NOW, CHECK THAT THE TOGGLE PIN IS STILL AGAINST THE STOPS IN THE CLOSED POSITION AND REDO THE DEFLECTION READINGS IN THE CLOSED POSITION. REPEAT UNTIL ACCEPTABLE DEFLECTION READINGS ARE OBTAINED ON ALL CONTACTS.

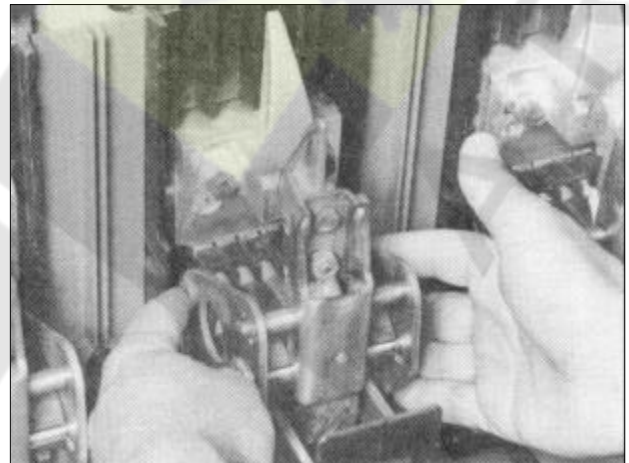


FIG. 7.3.15.1, CHECK MOVING CONTACT PINS.

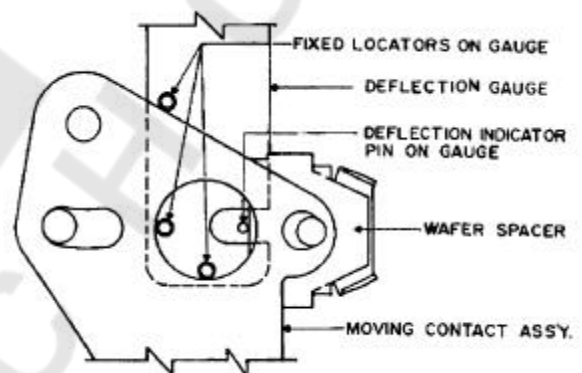


FIG. 7.3.15.2, DEFLECTION GAUGE.



FIG. 7.3.1 5.3, DEFLECTION READING IN OPEN POSITION.

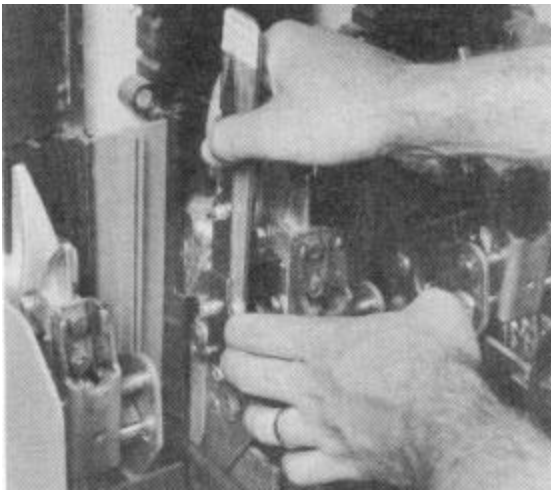


FIG. 7.3.15.4, DEFLECTION READING IN CLOSING POSITION

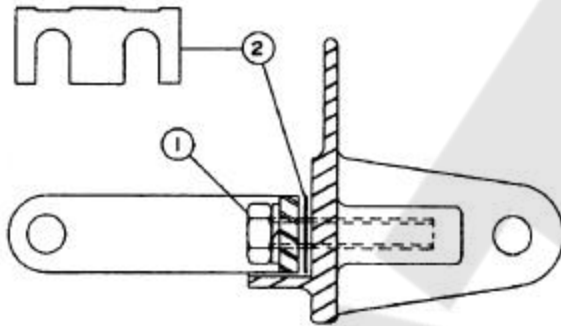


FIG. 7.3.15.5, DEFLECTION ADJUSTMENT.

1. 3/8- 1 6 HEX BOLT
2. SHIM

16. CHECK AND OPERATE CONTROL AND TRIP DEVICES

CHECK THAT ALL HARDWARE AND RETAINERS ARE SECURE THROUGHOUT THE OPERATING MECHANISM. IN PARTICULAR CHECK THE MOUNTING SCREWS OF SHUNT TRIP COILS, THE CLOSING COIL, UNDERVOLTAGE TRIP OR ANY OTHER DEVICE WHICH MOUNTS ON THE CHARGING OR CLOSING MECHANISMS.

MANUALLY OPERATE THE CLOSE COIL, TRIP COIL AND ANTI-SINGLE-PHASE, DOOR INTERLOCK, KEY INTERLOCK AND MECHANIC INTERLOCK TO CHECK FOR FREEDOM OF MOVEMENT AND PROPER OPERATION.

17. REASSEMBLE

AFTER CHECKING FOR ANY PARTS OR TOOLS LEFT IN THE BREAKER, BEGIN REASSEMBLING. REMOUNT THE BOX, FLOATING TRIM AND FACEPLATE. BEFORE FULLY TIGHTENING THE FACEPLATE SCREWS CHECK THAT THE INDICATORS AND VARIOUS OPERATING BUTTONS MOVE FREELY. IF THE BREAKER IS EQUIPPED WITH A DOOR INTERLOCK, BE SURE THAT THE OPERATING LEVER INSIDE THE BOX IS POSITIONED IN FRONT OF THE OPERATING PIN ON THE MANUAL TRIP BUTTON AND CHECK ITS OPERATION AFTER THE BOX IS MOUNTED.

RE-INSTALL THE LOWER FLASH SHIELD, THE INTERPHASE BARRIERS, END BARRIERS (IF REMOVED) AND FRONT FLASH SHIELD. FINALLY, MOUNT THE ARC CHUTES. THE MOUNTING BOLTS FOR THE ARC CHUTES AND LOWER FLASH SHIELDS SHOULD NOT BE TORQUED BEYOND 50 INCH POUNDS. TAKE CARE THAT THE ARC CHUTES ARE PROPERLY SEATED IN THE UPPER BASE MOUNTING.

18. CLEAN CRADLE MOUNTINGS AND CONTACTS

FOR DRAWOUT BREAKERS, THE CRADLE SHOULD BE CLEANED AND INSPECTED AT THIS TIME IF POSSIBLE. THIS SHOULD ONLY BE CARRIED OUT IF ALL POWER, MAIN AND CONTROL, HAS BEEN DISCONNECTED.

WIPE THE MOUNTINGS OF THE MAIN POWER STABS. REMOVE GREASE FROM THE MAIN STAB, SECONDARY DRAWOUT CONTACTS AND GROUND STAB.

19. INSPECT CRADLE

CHECK ALL MOLDINGS FOR DAMAGE AND THE MAIN STABS FOR EXCESSIVE WEAR, SCORING OR PITTING. CHECK THE SECONDARY CONTACT FOR DAMAGE AND CHECK THE SECURITY OF THE WIRING. CLEAN OUT THE BOTTOM OF THE CRADLE. IF A SHUTTER IS INSTALLED, CHECK IT FOR FREEDOM OF OPERATION.

20. CRADLE LUBRICATION

APPLY A LIGHT WIPE OF GREASE TO THE MAIN STABS, THE SECONDARY CONTACTS AND THE GROUND STAB. OIL PIVOT POINTS OF THE SHUTTER MECHANISM, IF PRESENT.

21. PLACE BREAKER BACK IN SERVICE.

8.1 CLOSING LINKAGE ECCENTRIC ADJUSTMENT

DURING THE CLOSING STROKE OF THE BREAKER, THE FORCE OF THE CLOSING SPRING IS TRANSFERRING TO THE CLOSING MECHANISM. IT THEN MOVES THE BREAKER CONTACTS TO THE CLOSED POSITION AND DRIVES THE CLOSING LINKAGE INTO A TOGGLED POSITION THEREBY POSITIVELY LOCKING CONTACTS IN CLOSED POSITION. THE TOGGLE PIN (ITEM 5) ADVANCES PAST DEAD CENTRE, COMING TO REST AGAINST THE STOPS (ITEM 8) PROVIDED IN THE MECHANISM SIDE PLATES. FAILURE OF THE LINKAGE TO TOGGLE WOULD LEAVE MAIN CONTACTS HELD CLOSED BY THE DISCHARGED CLOSING SPRING PRESSURE ONLY. AN ECCENTRIC ADJUSTMENT IS PROVIDED TO ASSURE FULL TOGGING OF CLOSING LINKAGE.

ECCENTRIC ADJUSTMENT IS ACCOMPLISHED BY MEANS OF AN ECCENTRIC BOLT (ITEM 4) ACCESSIBLE FROM THE RIGHT HAND SIDE OF THE OPERATING MECHANISM. THIS ECCENTRIC ALTERS THE LENGTH OF THE LOWER CLOSING MECHANISM LINKAGE, THEREBY CHANGING THE POSITION OF THE CLOSING CASTING (ITEM 7) AND TOGGLE PIN WHEN THE MAIN SPRING IS IN THE FULLY DISCHARGED POSITION.

TO PERFORM THIS ADJUSTMENT, IT IS CRITICAL THAT THE CLOSING SPRING IS FULLY DISCHARGED.

TO DO THIS, APPLY PRESSURE TO THE MANUAL CHARGING HANDLE UNTIL THE DRIVING PAWL IS FREE TO MOVE. ROTATE THE DRIVING PAWL FREE OF THE RACHET WHEEL TEETH AND WEDGE IT THIS WAY WITH A SCREW DRIVER OR OTHER TOOL. NOW, AGAIN APPLY PRESSURE TO THE CHARGING HANDLE AND WITH ANOTHER SCREWDRIVER, LIFT THE HOLDING PAWL FREE. GENTLY RELEASE THE PRESSURE ON THE CHARGING HANDLE AND THE SPRING WILL FULLY DISCHARGE, WITH THE CRANK ASSEMBLY GOING TO THE BOTTOM DEAD CENTRE POSITION, AND THE SPRING GUIDE PIN (ITEM 1) TO ITS LOWEST POINT OF TRAVEL.

NOW CHECK THE POSITION OF THE TOGGLE PIN. IT SHOULD BE 1/16 INCH, OR LESS AWAY FROM THE STOP. IF THE GAP IS MORE THAN 1/16 INCH, ADJUST THE ECCENTRIC UNTIL THE GAP IS LESS THAN 1/16". IF THE GAP IS ALREADY LESS THAN 1/16 INCH ADJUST THE ECCENTRIC TO FURTHER REDUCE THE GAP.

ADJUST THE ECCENTRIC BY LOOSENING THE NUT ON THE LOCKING PLATE (ITEM 3). THEN PULL THE LOCKING PLATE OFF THE HEXAZONAL HEAD OF THE ECCENTRIC PIN AND ROTATE THE ECCENTRIC (USUALLY CLOCKWISE) TO REDUCE THE GAP BETWEEN THE TOGGLE PIN AND STOP. NOW REPLACE THE LOCKING PLATE, ROTATING THE ECCENTRIC SLIGHTLY AS REQUIRED TO ENGAGE WITH THE LOCKING PLATE NOTCHING. RETIGHTEN THE NUT ON THE LOCKING PLATE.

8.1 CLOSING LINKAGE ECCENTRIC ADJUSTMENT

NOW CHARGE AND CLOSE THE BREAKER AND CHECK IF THE TOGGLE PIN IS AGAINST THE STOPS. IF IT IS NOT, REPEAT THE ECCENTRIC ADJUSTMENT AGAIN REDUCING THE GAP BETWEEN PIN AND STOP WITH THE MAIN SPRING FULLY DISCHARGED. THE PROCEDURE MUST BE REPEATED UNTIL THE TOGGLE PIN RESTS ON THE STOP IN THE CLOSED POSITION.

IF TOGGING CANNOT BE ACHIEVED, CHECK THAT THE CONTACT DIFFERENTIAL (SECTION 7.3.1 4) AND DEFLECTION (7.3.1 5) ARE NOT EXCESSIVELY HIGH.

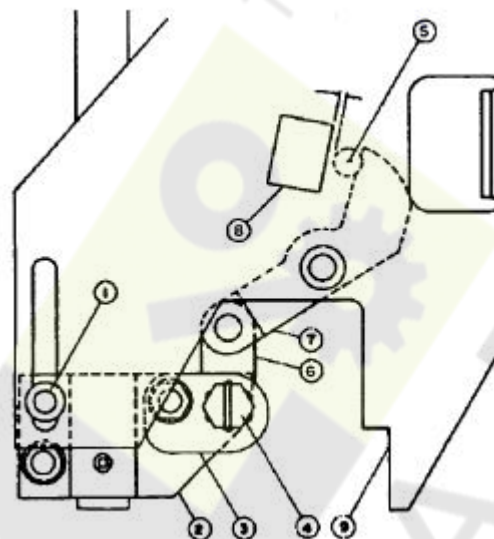


FIG. 8.1.1, CLOSING LINKAGE ECCENTRIC ADJUSTMENT

1. SPRING GUIDE PIN
2. MAIN SPRING CLAMP
3. LOCKING PLATE
4. ECCENTRIC
5. TOGGLE PIN
6. CONNECTING LINK
7. CLOSING CASTING
8. STOP IN MECHANISM SIDEPLATES
9. MECHANISM SIDERATES

8.2 CLOSE LATCH ADJUSTMENT

THE FUNCTION OF THE CLOSE LATCH IS TO ARREST OR HOLD THE RATCHET WHEEL AT A POINT 13 DEGREES PAST TOP- DEAD-CENTRE, WITH THE SPRING FULLY CHARGED IN READINESS TO CLOSE. THE CLOSING STROKE IS INITIATED BY RELEASE OF THE LATCH, EITHER MANUALLY BY MEANS OF THE MECHANICAL PUSH BUTTON IN THE FACEPLATE OR ELECTRICALLY BY MEANS OF THE CLOSE COIL. INSUFFICIENT ENGAGEMENT OF THE LATCH MAY ALLOW THE CLOSING STROKE TO OCCUR UPON COMPLETION OF THE CHARGING OF THE SPRING.

TWO STOP SCREWS ARE PROVIDED FOR ADJUSTMENT. THE UPPER SCREW CONTROLS THE ENGAGEMENT OF THE RATCHET WHEEL BEARING WITH THE CLOSE LATCH. THE LOWER SCREW CONTROLS THE ROTATION OF THE CLOSE LATCH TO A POINT PERMITTING THE RATCHET WHEEL BEARING TO CLEAR THE CLOSE LATCH THEREBY RELEASING THE CLOSING SPRING FOR DISCHARGE.

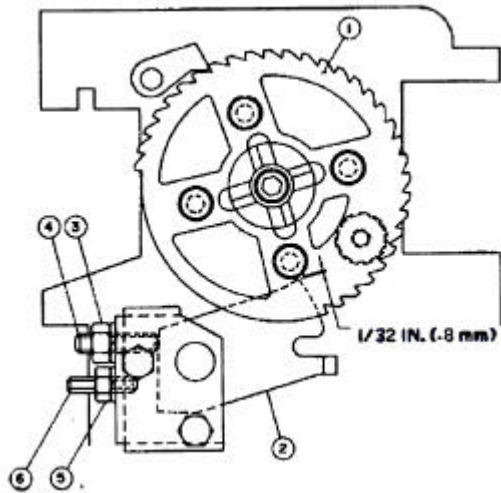


FIG. 8.2.1 CLOSE LATCH ADJUSTMENT

1. RATCHET WHEEL
2. CLOSE LATCH
3. UPPER LOCKNUT
4. UPPER STOPSCREW
5. LOWER LOCKNUT
6. LOWER STOPSCREW

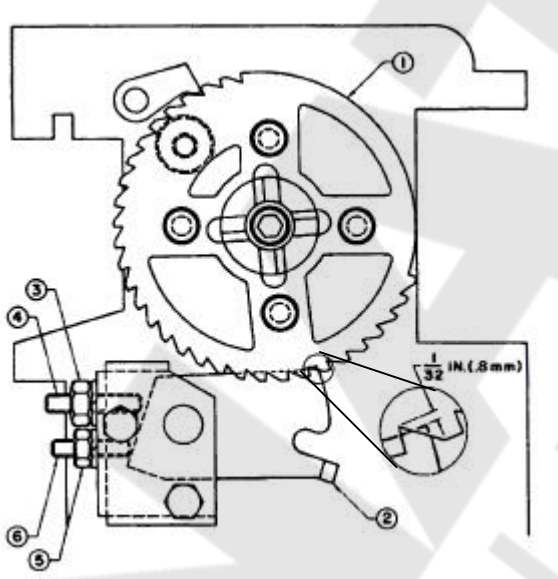


FIG. 8.2.2 CLOSE LATCH ADJUSTMENT

REFERRING TO FIG. 8.2.1 THE ADJUSTMENT PROCEDURE FOR THE UPPER STOPSCREW IS AS FOLLOWS:

THE RATCHET WHEEL ASSEMBLY IS MADE UP OF TWO PLATES RIVETED TOGETHER. THE TWO PLATES ARE HELD APART BY SPACERS LOCATED BETWEEN THE PLATES ON THE FOUR RIVETS. ROTATE THE RATCHET WHEEL UNTIL ONE OF THE SPACERS IS DIRECTLY ABOVE THE NOSE OF THE CLOSE LATCH (ITEM 2). LOOSEN LOCKNUT (ITEM 3).

TURNING THE STOPSCREW (ITEM 4) ADJUST THE CLOSE LATCH HEIGHT UNTIL THERE IS APPROXIMATELY 1/32 INCH (0.8 MM) CLEARANCE BETWEEN THE SPACER AND THE NOSE OF THE CLOSE LATCH. HOLD THE STOPSCREW SECURELY WITH THE ALLEN WRENCH WHILE TIGHTENING THE LOCKNUT.

REFERRING TO FIGURE 8.2.2, THE ADJUSTMENT PROCEDURE FOR THE LOWER STOP SCREW IS AS FOLLOWS. BE SURE THAT THE CLOSING SPRING IS DISCHARGED AND THAT THE MAIN CONTACTS ARE OPEN. LOOSEN LOCKNUT (ITEM 5). MANUALLY DEPRESS THE CLOSE LATCH (ITEM 2) UNTIL IT STOPS ON THE LOWER STOPSCREW (ITEM 6). TURNING THE STOPSCREW, ADJUST THE CLOSE LATCH HEIGHT UNTIL THERE IS APPROXIMATELY 1/32 INCH (0.8 MM) CLEARANCE BETWEEN THE RATCHET WHEEL TOOTH VALLEY AND THE NOSE OF THE CLOSE LATCH. HOLD THE STOPSCREW SECURELY WITH THE ALLEN WRENCH WHILE TIGHTENING THE LOCKNUT.

8.3 TRIP LATCH ADJUSTMENT

THIS ADJUSTMENT, LOCATED ON THE OUTSIDE OF THE LEFT HAND SIDE MECHANISM SIDE PLATE, CONTROLS THE ENGAGEMENT OF THE TRIP LATCH ROLLER. IF THIS ENGAGEMENT IS INSUFFICIENT, THE ROLLER MAY RELEASE DURING THE CLOSING STROKE, RESULTING IN FAILURE TO CLOSE. THE MAIN CONTACTS MAY MOVE BUT NOT COMPLETE THE TRAVEL.

TO ADJUST, THE FOLLOWING PROCEDURE SHOULD BE USED:

WITH TRIP SHAFT LEVER (ITEM 1) RESTING AGAINST ADJUSTING SCREW (ITEM 2), LOOSEN LOCKNUT (ITEM 3) AND TURN ADJUSTING SCREW COUNTER-CLOCKWISE TWO TURNS. CLOSE THE BREAKER AND SLOWLY TURN THE SCREW CLOCKWISE UNTIL THE UNIT TRIPS. NOW TURN THE SCREW COUNTER- CLOSKWISE ONE AND ONE QUARTER TURNS AND TIGHTEN THE LOCKNUT.

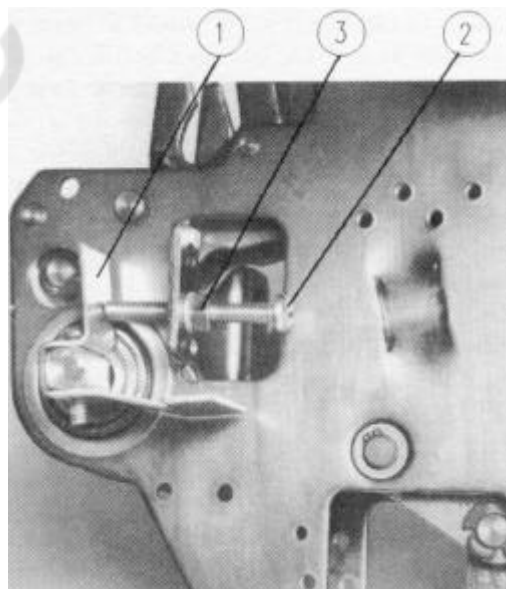


FIG. 8.3.1 TRIP LATCH ADJUSTMENT

1. TRIP SHAFT LEVER
2. ADJUSTMENT SCREW
3. LOCKNUT

NOTE: WHENEVER THIS ADJUSTMENT IS MADE THE FOLLOWING MUST BE CHECKED IF PRESENT ON THE BREAKER:

1. DRAWOUT GATE INTERLOCK LEVER ECCENTRIC ADJUSTMENT ON DRAWOUT BREAKERS. (SECTION 8.4).
2. SHUNT TRIP ADJUSTMENT. (SECTION 8.5).
3. UNDERVOLTAGE TRIP STRIKER ADJUSTMENT. (SECTION 8.6)
4. LATCH CHECK SWITCH SETTING ON ELECTRICALLY OPERATED BREAKERS. (SECTION 8.7).

8.4 DRAWOUT GATE INTERLOCK

ALL DRAWOUT BREAKERS ARE FITTED WITH A DRAWOUT GATE INTERLOCK MECHANISM TO PREVENT CRANKING THE BREAKER IN OR OUT OF THE CRADLE WHILE THE BREAKER IS CLOSED OR THE CLOSING SPRING IS CHARGED. ADJUSTMENT OF THE GATE INTERLOCK IS PERFORMED AS FOLLOWS:

BE SURE THE GATE IS FULLY CLOSED AND THE LEFT SIDE TRIP SHAFT LEVER IS RESTING AGAINST THE ADJUSTING SCREWS. (FIG. 8.3.1, ITEM 2).

CHECK CLEARANCE BETWEEN RIGHT SIDE TRIP SHAFT LEVER (ITEM 4) AND GATE INTERLOCK LEVER ECCENTRIC (ITEM 3) WHICH SHOULD BE APPROXIMATELY $1/32"$ (0.8 mm). IF ADJUSTMENT IS REQUIRED, LOOSEN LOCKNUT (ITEM 1) AND ALLEN HEAD SCREW (ITEM 2).

USING A WRENCH, ROTATE ECCENTRIC UNTIL SPECIFIED CLEARANCE HAS BEEN OBTAINED. HOLDING THE ECCENTRIC IN POSITION WITH WRENCH, TIGHTEN ALLEN SCREW SECURELY, AND THE LOCKNUT.

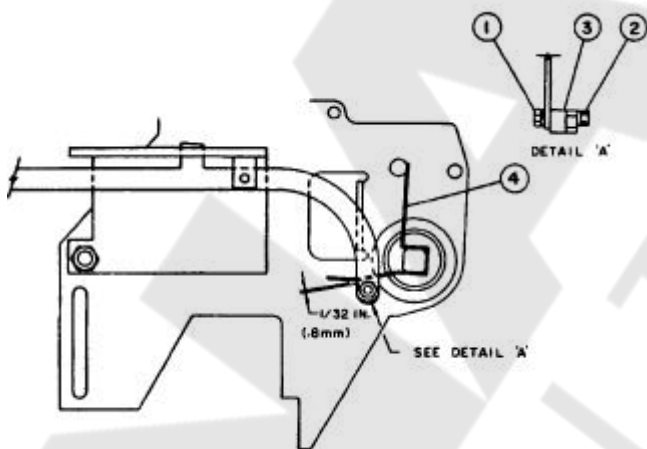


FIG. 8.4.1 DRAWOUT GATE INTERLOCK ADJUSTMENT

1. LOCKNUT
2. CAP SCREW
3. ECCENTRIC
4. TRIP SHAFT LEVER

TO CHECK PROPER OPERATION OF GATE INTERLOCK MECHANISM, CHARGE CLOSING SPRING, THEN PUSH DOWN GATE. THIS ACTION MUST RESULT IN SPRING DISCHARGE WHEN GATE IS APPROXIMATELY HALF WAY OPEN (AND BEFORE DRAWOUT CRANK CAN BE INSERTED IN SOCKET), BUT FAILURE OF BREAKER TO CLOSE, I.E. A DRY-RUN SHOULD OCCUR. IT IS RECOMMENDED TO KEEP DRY RUN OPERATIONS TO A MINIMUM AS REQUIRED TO CHECK PROPER FUNCTION OF INTERLOCK FEATURE. TO CHECK NOW FOR GATE INTERLOCK TRIPPING FUNCTION, CHARGE, THEN CLOSE BREAKER. AGAIN PUSH DOWN GATE. BREAKER MUST TRIP BEFORE CRANK HANDLE CAN BE INSERTED.

8.5 SHUNT TRIP COIL

ONE ADJUSTMENT IS PROVIDED FOR PROPER OPERATION OF THE DEVICE AND TO CONTROL THE EXTEND OF FREE TRAVEL BETWEEN THE PLUNGER AND THE TRIP SHAFT LEVER. BEFORE CHECKING THE SETTING, MAKE SURE THAT THE LEFT TRIP SHAFT LEVER RESTING AGAINST ADJUSTING SCREW. (FIG. 8.3.1, ITEM 2). A GAP OF APPROXIMATELY $1/16$ INCH SHOULD EXIST BETWEEN THE TOP OF THE TRIP ROD (ITEM 2) AND ITS TRIP SHAFT LEVER (ITEM 1). IF ADJUSTMENT IS REQUIRED, LOOSEN THE #8-32 ALLEN HEAD SET SCREW, (ITEM 4) AND TURN THE ROD WITHIN THE PLUNGER (ITEM 3) AS REQUIRED TO OBTAIN THE CORRECT GAP.

REMOVE THE SET SCREW AND APPLY A SMALL AMOUNT OF BLUE LOCTITE TO IT. RE-INSERT AND TIGHTEN SET SCREW FIRMLY. CLOSE BREAKER, THEN PUSH UP ROD SLOWLY FROM BELOW. WHEN THE BREAKER TRIPS, THE PLUNGER SHOULD SLIGHTLY OVER-TRAVEL BEFORE REACHING THE END OF ITS STROKE.

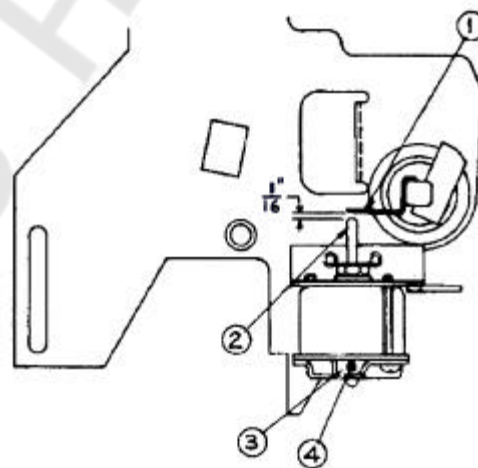


FIG. 8.5, TRIP COIL ADJUSTMENT

1. TRIP SHAFT LEVER
2. TRIP ROD
3. PLUNGER
4. SET SCREW

8.6 UNDERVOLTAGE TRIP DEVICE (NV)

AN ADJUSTABLE STRIKER ON THE UNDERVOLTAGE TRIP DEVICE IS PROVIDED TO CONTROL THE ENGAGEMENT OF THE SOLENOID PLUNGER TO THE TRIP SHAFT LEVER. WITH THE SOLENOID ENERGIZED AND THE PLUNGER SEATED, ADJUST

THE STRIKER AS REQUIRED TO PROVIDE A GAP OF APPROXIMATELY 5/16 INCH (8-MM) BETWEEN THE STRIKER AND THE TRIP SHAFT LEVER. TIGHTEN THE LOCKNUT FIRMLY.

A VERNIER TIME ADJUSTMENT IN THE FORM OF AN ECCENTRIC IS PROVIDED FOR FINE ADJUSTMENT, INDEPENDENT OF THE SCALE SETTING. IF TRIMMING IS REQUIRED, LOOSEN THE LOCKNUT LOCATED ON THE INSIDE OF THE LEVER AND TURN THE ECCENTRIC COUNTER-CLOCKWISE TO INCREASE TIME, AND CLOCKWISE TO SHORTEN TIME. THE LOCKNUT MUST BE FIRMLY TIGHTENED EACH TIME THE ECCENTRIC IS MOVED.

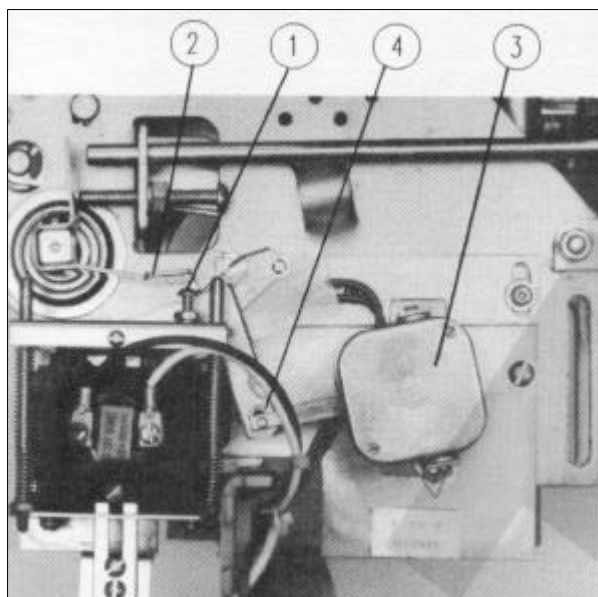


FIG 8.6.1, UNDERVOLTAGE TRIP DEVICE

1. STRIKER
2. TRIP SHAFT LEVER
3. TIMER
4. VERNIER TIMER ADJUSTMENT

8.7 LATCH CHECK SWITCH

THE LATCH CHECK SWITCH IS ADJUSTED AS FOLLOWS:

WITH THE BREAKER OPEN AND THE CLOSING SPRING DISCHARGED, GENTLY RAISE THE TRIP SHAFT LEVER UNTIL OPERATION OF THE LATCH CHECK SWITCH CONTACTS CAN BE HEARD. RELEASE THE TRIP SHAFT LEVER.

THESE SHOULD BE APPROXIMATELY 1/8 INCH OVERTRAVEL (AT THE TIP OF THE SWITCH OPERATING LEVER) FROM THE POINT WHEN THE CONTACTS OPERATE, TO THE POINT WHEN THE TRIP SHAFT LEVER IS RELEASED AND RESTS AGAINST ITS STOP SCREW.

IF ADJUSTMENT IS REQUIRED, LOOSEN THE PIVOT SCREW AND LOCKING SCREW AND RAISE OR LOWER THE SWITCH AS REQUIRED. RETIGHTEN BOTH SCREWS FIRMLY.

IN NORMAL OPERATION THE LATCH CHECK SWITCH SHOULD REQUIRE NO RE-ADJUSTMENT, BUT IF THE TRIP LATCH ADJUSTMENT IS ALTERED, THE LATCH CHECK SWITCH SETTING MUST BE CHECKED AS ABOVE.

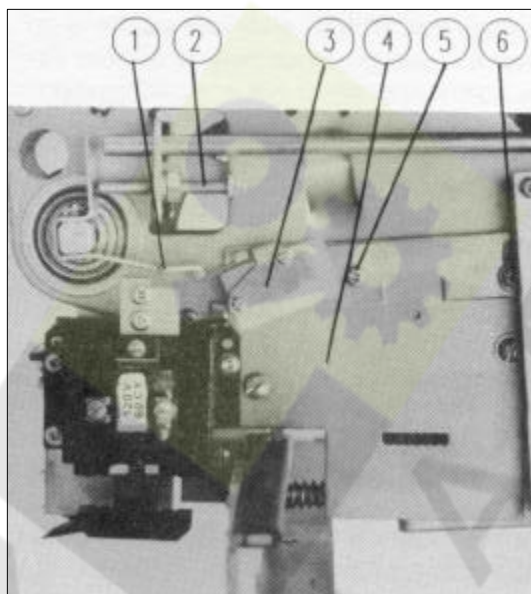


FIG. 8.7, LATCH CHECK SWITCH

1. TRIP SHAFT LEVER
2. TRIP SHAFT STOP SCREW
3. LATCH CHECK SWITCH
4. MOUNTING PLATE
5. PIVOT SCREW
6. LOCKING SCREW

8.8 MECHANICAL INTERLOCK

TO CHECK THE OPERATION OF THE MECHANICAL INTERLOCK MECHANISM, REMOVE THE BREAKER FROM THE CELL. ROTATE THE CLOSING SHAFT BY USING THE SLOW CLOSE DEVICE. THE UPPER PLUNGER CONNECTED BY CABLE TO THE CLOSING SHAFT SHOULD MOVE FREELY. BY PUSHING THE LOWER PLUNGER, ITS CABLE EXTENSION SHOULD PUSH THE TRIP SHAFT LEVER ON RIGHT SIDE OF THE MECHANISM AND ROTATE THE TRIP SHAFT TO DISENGAGE TRIP LATCH AND LATCH ROLLER. MAKE SURE THAT WHEN LOWER PLUNGER IS RELEASED, IT MOVES FREELY TO ITS FULLY RESET POSITION. IN THIS POSITION THERE SHOULD BE APPROXIMATELY 1/16" (1.6 MM) CLEARANCE BETWEEN TRIP SHAFT LEVER AND CABLE, CLOSE THE BREAKER, THEN PUSH LOWER PLUNGER IN SLOWLY TO MAKE SURE BREAKER TRIPS. IF THE PLUNGERS DO NOT MOVE FREELY, THE CABLE MUST BE REMOVED FROM THE SHEATH AND CLEANED TO RESTORE FREE MOVEMENT.

8.9 ANTI-SINGLE-PHASE DEVICE AND BLOWN FUSE INDICATOR

A SIMPLE MECHANICAL CHECK OF PROPER OPERATION OF THE UNIT CAN BE MADE BY FIRST CLOSING THE BREAKER THEN RAISING EACH PLUNGER BY HAND SLOWLY. WHEN THE BREAKER TRIPS, THE PLUNGER SHOULD OVERTRAVEL SLIGHTLY BEFORE REACHING THE END OF ITS STROKE. AN ELECTRICAL TEST MAY BE PERFORMED BY MEANS OF A SINGLE PHASE VARIABLE AC SOURCE, 250 VA OR LARGER. THE TEST SIGNAL IS APPLIED DIRECTLY TO THE TRIP COIL TERMINAL AFTER FIRST REMOVING THE THREE CONTROL FUSES IN THE CIRCUIT. THIS IS NECESSARY TO ISOLATE THE TRIP COIL FROM THE POWER FUSE. THE COIL SHOULD OPERATE AT APPROXIMATELY 50 VOLTS. IN THIS TEST IT SHOULD BE NOTED THAT THESE COILS ARE SHORT-TIME RATED IN NORMAL OPERATION ARE DE-ENERGIZED THE INSTANT THE

INSTANT THE BREAKER OPENS. A PRESET VOLTAGE AND A MOMENTARY ON-OFF SWITCHING ACTION IS RECOMMENDED. DO NOT SUSTAIN THE TEST POWER AFTER THE COIL HAS OPERATED. MAKE SURE ALL LEADS ARE RECONNECTED AFTER THIS TEST.

8.10 SENSOR TAP INDICATOR

THE SPACE MARKED "RELAY" ON THE BREAKER NAMEPLATE PROVIDES AN INDICATION OF THE SENSOR TAP SETTING ON THE BREAKER (FIG. 3.3.1 ITEM 13). SHOULD THE SENSOR TAP BE CHANGED, THIS INDICATOR CAN BE ADJUSTED TO SHOW THE NEW TAP SETTING. THE INDICATOR IS ACTUALLY A WHEEL WITH NUMBERS IMPRINTED ON BOTH SIDES. SIMPLY ROTATE THE WHEEL USING THE SLOT HEAD SCREW TO THE RIGHT OF THE INDICATION WINDOW.

IF THE SIZE OF SENSOR IN THE BREAKER IS CHANGED, IT MAY BE NECESSARY TO REMOVE THE BREAKER FACEPLATE AND FLIP THE WHEEL OVER TO REVEAL THE NUMBERS IMPRINTED ON THE BACK (IF THE REQUIRED TAP SETTING IS NOT INDICATED ON THE EXPOSED SIDE OF THE WHEEL). BE SURE TO CHECK ALL FACEPLATE INDICATORS AND OPERATING BUTTONS, ETC. FOR FREEDOM OF MOVEMENT AFTER REINSTALLING THE FACEPLATE.

9. MAINTENANCE ACCESSORIES AND SPARE PART

9.1 MAINTENANCE ACCESSORIES

LIFTING DEVICES ARE AVAILABLE FOR ALL FRAME SIZES OF BREAKERS. THE LIFTING DEVICE IS A ONE-PIECE YOKE WHICH FITS INTO TABS ON THE BREAKER FROM THE ENCLOSURE DRAWOUT RAILS. LIFTING YOKES ARE ORDERED AS FOLLOWS:

PART NUMBER 266-714
FOR 600, 800 AND 1600 AMPERE 1 4" FRAME H - 3

PART NUMBER 26G-542
FOR 600, 800, 1600 AND 2000 AMPERE 21 " FRAME H - 3

PART NUMBER 26C-151
FOR 3000, 3200 AND 4000 AMPERE H-3

PART NUMBER 26G-601
FOR 600, 800, 1600 AND 2000 AMPERE HL- 3

PART NUMBER 26G-603
FOR 3000 AND 4000 AMPERE HL-3

PART NUMBER 26G-732
FOR 6000 AMPERE H-3

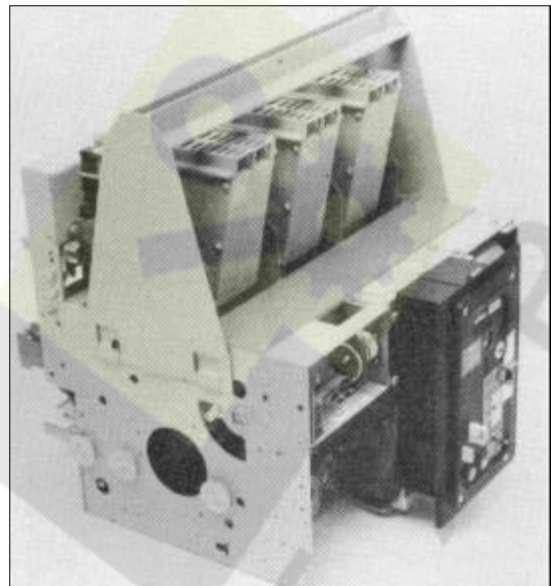


FIG. 9.1.1 LIFTING DEVICE

IN ADDITION TO THE LIFTING DEVICES A NUMBER OF MAINTENANCE ACCESSORIES ARE AVAILABLE AS DESCRIBED IN SECTION 7.

THESE INCLUDE:

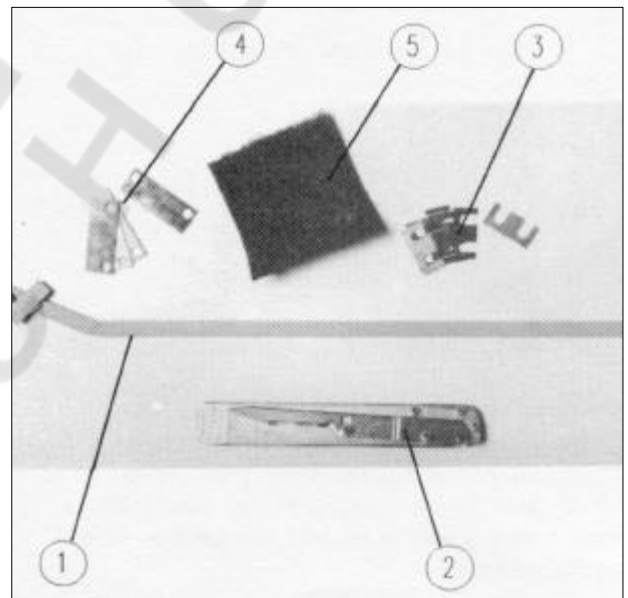


FIG. 9.1.2, MAINTENANCE ACCESSORIES.

1. SLOW CLOSE HANDLE
2. DEFLECTION GAUGE
3. DEFLECTION SHIMS
4. DIFFERENTIAL SHIMS
5. BEAR-TEX ABRASIVE FIBRE

9.2 SPARE PARTS

BY THE NATURE OF ITS APPLICATION AND ITS SWITCHING CAPABILITY SPARE PARTS FOR THE CIRCUIT BREAKER SHOULD NORMALLY NOT BE REQUIRED. IF THE UNIT IS GOING TO BE USED FOR FREQUENT LOAD SWITCHING, THEN THE PARTS SHOWN ON THE RECOMMENDED SPARE PARTS LIST SHOULD BE CARRIED IN STOCK. WHEN ORDERING SPARE PARTS, THE COMPLETE NAMEPLATE DATA, ESPECIALLY THE BREAKER SERIAL NUMBER, SHOULD, BE PROVIDED TO ENSURE THAT THE CORRECT PARTS ARE SUPPLIED.

9.3 COIL DATA (FIG 3.3)

	RATED CONTROL VOLTAGE	OPERATING VOLTAGE	MINIMUM AMPERES		
			DC OHMS	INRUSH	SEALED
SHUNT TRIP	120 AC	60	13.0	1.4	
	240 AC	120	50.0	1.0	
	48 DC	40	13.0	2.0	
	125 DC	40	86.0	2.5	
	250 DC	70	215.0	1.25	
SHUNT CLOSE	120 AC	90	30.0	2.45	0.34
	240 AC	180	312.0	1.5	0.15
	48 DC	40	6.0	8.0	0.2
	125 DC	60	50.0	2.2	0.2
	250 DC	150	312.0	0.8	0.1
U/V TRIP	120 AC	96	23.0	2.45	0.34
	240 AC	190	312.0	0.8	0.1
CHARGING MOTOR	120 AC	85		4	
	240 AC	190		2.5	
	48 DC	40		7	
	125 DC	85		4	
	250 DC	190		2.5	

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TABLE 9.2 RECOMMENDED SPARE PARTS LIST - TYPE H3 DRAW OUT BREAKER

			30H3 (21")	42H3 (21")	50H3 (21")	50H3 (21")
Item No.	Spare Part Description	Qty. per Breaker	600/800	600/800	1600	2000
43	Centre Stationary Main Contact	3	49E-577	49E-577	49E-550	49E-550
52	Lower Stationary Main Contact (Drawout)	3	271A-584	271A-584	271A-507	271A-506
45	Upper Stationary Main Contact (Drawout)	3	49E-554	49E-554	49E-548	49E-549
59	Main Draw-Out Contact Assembly (Finger Cluster)	6	49E-130	49E-130	49E-519	49E-572, -573
5	Front Flash Shield	1	182A-542B	182A-542B	182A-542B	182A-542B
2	Interphase Barrier	2	13A-574C	13A-574C	13A-574C	13A-574C
4	Left Hand End Barrier	1	13A-576C	13A-576C	13A-576C	13A-576C
3	Right Hand End Barrier	1	13A-575C	13A-575C	13A-575C	13A-575C
1	Arc Chute Assembly	3	70.51.011C.001	70.51.011C.001	70.51.011C.001	70.51.011C.001
50	Moving Arcing Contact	3	70.54.001A.001	70.54.001A.001	70.54.001A.001	70.54.001A.001
51	Fixed Arcing Contact	3	49E-673	49E-673	49E-673	49E-673
47	Main Braid	3	70.13.006A.001	70.13.006A.001	70.13.006A.001	70.13.006A.001
Not Shown	Adjustment Shim	Ref.	241A-512	241A-512	241A-512	241A-512
44	Main Moving Contact (Wafer)	12	49E-575	49E-575		
44	Main Moving Contact (Wafer)	18			49E-575	49E-575
48	Main Moving Contact Spring	24	242A-521	242A-520		
48	Main Moving Contact Spring	36			242A-520	242A-520
49	Main Moving Contact Spring Guide	6	55B-502	55B-502	55B-502	55B-502
Not Shown	Spacer for Water (Inner)	12	241B-533	241B-533		
Not Shown	Spacer for Water (Inner)	18			241B-533	241B-533
Not Shown	Spacer for Water (Outer)	3	241B-532	241B-532	241B-532	241B-532
Not Shown	Moulded Water Contact Spacer	6	241A-70	241A-70	NOT REQ'D	NOT REQ'D
No.	Spare Part Description	Qty.	65H3 (27")	75H3 (27")	100H3 (27")	100H3 (33")
			1600/2000	3000/3200	4000	6000
43	Centre Stationary Main Contact	6	49E-577	49E-550	49E-624	Not Applicable
52	Lower Stationary Main Contact (Drawout)	6	271A-584	271A-507	271E-601	49E-646
45	Upper Stationary Main Contact (Drawout)	6	49E-554	49E-548	49E-623	49E-674
59	Main Draw-Out Contact Assembly (Finger Cluster)	12	49E-130	49E-519	49E-509C	49E-668, -671
5	Front Flash Shield (Left Hand Side)	1	182A-41A-1	182A-41A-1	182A-41A-1	182A-617
5	Front Flash Shield (Right Hand Side)	1	182A-40A-1	182A-40A-1	182A-40A-1	182A-618
2	Interphase Barrier	2	13A-578C	13A-578C	13A-578C	13A-634, -635
3	End Barrier	2	13A-172A-1	13A-172A-2	13A-172A-2	13A-632, -633
1	Arc Chute Assembly	6	70.51.011C.001	70.51.011C.001	70.51.011C.001	70.51.011C.003, .004
50	Moving Arcing Contact	6	70.54.001A.001	70.54.001A.001	70.54.001A.001	70.54.001A.001
51	Fixed Arcing Contact	6	49E-673	49E-673	49E-673	49E-673
47	Main Braid	6	70.13.006A.001	70.13.006A.001	70.13.006A.001	70.13.006A.001
Not Shown	Adjustment Shims	Ref.	241A-512	241A-512	241A-547	241A-547
44	Main Moving Contact (Wafer)		49E-575	49E-575	49E-575	49E-575
48	Main Moving Contact Spring		242A-520	242A-521	242A-520	242A-520
Not Shown	Main Moving Contact Spring Guide		55B-502	55B-502	55B-504, -505	55B-504, -505
Not Shown	Spacer for Water (Inner)		241B-533	241B-533	241B-533	241B-533
Not Shown	Spacer for Water (Outer)		241B-532	241B-532	241B-532	241B-532
Not Shown	Moulded Water Contact Spacer		241B-70	NOT REQ'D	NOT REQ'D	NOT REQ'D
No.	Spare Part Description	Qty.	30H3 (14")	42H3 (14")	50H3 (14")	
			600/800	600/800	1600	
43	Centre Stationary Main Contact	3	49E-577	49E-577	49E-550	
52	Lower Stationary Main Contact (Drawout)	3	271A-584	271A-584	271A-507	
45	Upper Stationary Main Contact (Drawout)	3	49E-554	49E-554	49E-584	
59	Main Draw-Out Contact Assembly (Finger Cluster)	6	49E-130	49E-130	49E-519	
5	Front Flash Shield	1	182A-30	182A-39	182A-30	
2	Interphase Barrier	2	13A-574C	13A-574C	13A-574C	
4	End Barrier	2	13A-172A-1	13A-172A-2	13A-172A-2	
1	Arc Chute Assembly	3	70.51.011C.001	70.51.011C.001	70.51.011C.001	
50	Moving Arcing Contact	3	70.54.001A.001	70.54.001A.001	70.54.001A.001	
51	Fixed Arcing Contact	3	49E-673	49E-673	49E-673	
47	Main Braid	3	70.13.006A.001	70.13.006A.001	70.13.006A.001	
Not Shown	Adjustment Shim	Ref.	241A-512	241A-512	241A-512	
44	Main Moving Contact (Wafer)	12	49E-575	49E-575		
44	Main Moving Contact (Wafer)	18			49E-575	
48	Main Moving Contact Spring	24	242A-521	242A-520		
48	Main Moving Contact Spring	36			242A-520	
49	Main Moving Contact Spring Guide	6	55B-502	55B-502	55B-502	
Not Shown	Spacer for Water (Inner)	12	241B-533	241B-533		
Not Shown	Spacer for Water (Inner)	18			241B-533	
Not Shown	Spacer for Water (Outer)	3	241B-532	241B-532	241B-532	
Not Shown	Moulded Water Contact Spacer	6	241-70	241-70	NOT REQ'D	