DS-206, DS-416, DS-632 and SPB-100 Low Voltage Circuit Breaker Shop Maintenance and Testing

Tank Farm Maintenance Procedure

USQ # N/A-4

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1.0 PURPOSE AND SCOPE

1.1 Purpose

To provide instructions for inspection, maintenance and trip testing on low voltage power circuit breakers (< 1000 Volts).

1.2 Scope

Provides instructions on how to clean, lubricate, inspect, and maintain DS-206, DS-416, DS-632, and SPB-100 breakers for mechanical and electrical faults, and perform primary injection testing.

2.0 INTRODUCTION

2.1 Terms and Definitions

- **Voltage Rating** – highest root-mean-square (RMS) voltage at which the circuit breaker is designed to operate.
- **Frame Rating** – maximum continuous current rating in amperes of all parts except the over current device (e.g. stabs, contacts and pivot points).
- **Continuous Current Rating** – over current device setting value; equal or less than frame rating.
- **Interrupting Rating** – highest current at rated voltage the device can interrupt (by opening the circuit) without external damage.
- **Auxiliary Stabs or Secondary Disconnects** – plug in control connection points between the circuit breaker and switchgear cabinet.
- **Ground Stab** – ensures grounding of breaker frame when engaged with the ground bus in the cubicle.
- **Power Stab** – ensures connection of breaker frame when engaged with the power bus in the cubicle.
- **APM** – Auxiliary Power Module; used to power Digitrip RMS/OPTIM units for testing.
- **PTM** – Potential Transformer Module; used to provide voltage for power and energy monitoring.
- **LTM** – a function of the Digitrip RMS/OPTIM units to avoid continuous overload conditions that may damage equipment.
- **Main Disconnecting Contacts** – May also be referred to as “Finger Clusters’’.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

**WARNING** - Stored energy is present in the breaker contacts in the charging springs. Sudden release of spring tension can result in pinch hazards, or being struck by moving mechanisms, resulting in personnel injury and equipment damage.

3.1.1 Protective Equipment as required by DOE–0359, Hanford Site Electrical Safety Program.

3.1.2 All exposed energized electrical conductors shall be shielded with voltage rated plastic, within a restricted workspace.

3.1.3 Unless otherwise specified, inspection and testing must be performed on equipment that is de-energized.

3.1.4 Care must be used during removal and installation of any of the contacts and Main Disconnecting Contacts; they may have travel distance springs behind them.

3.1.5 This activity is done in conjunction with an approved work package. All identified hazards, along with identified personal protective equipment will be addressed in the pre-job safety meeting.

3.1.6 Ensure an Electrical Risk Assessment (ERA) is developed for the breaker test.

3.1.7 Breakers are not to be left unattended with the springs charged.
3.2 Equipment Safety

**CAUTION** - For DS-206, DS-416 and DS-632 breakers, utilizing Digitrip Models RMS 810, RMS 910, and OPTIM 1050 only, applying high voltages > 600 VAC to the primary conductors of the circuit breaker, such as megger testing, can possibly damage the Potential Transfer Module (PTM) on Digitrip Trip Units.

**CAUTION** - Avoid any lubricant on insulation or other electrical parts.

**CAUTION** - Only electrical contact lubricant should be allowed to come in contact with any current carrying contact surface.

**CAUTION** - Reverse rotation of the close cam will cause misalignment of the spring charge indicator.

**CAUTION** - Damage to the breaker may occur if an Inspection and Maintenance of the breaker is not completed prior to Primary injection testing.

**CAUTION** - Damage or Overheating to the breaker may occur if the Multi-Amp Tester current is left on longer than necessary to complete a test.

3.3 Radiation and Contamination Control

**NOTE** - This procedure is in support of maintenance activities. Work will be done in accordance with a Radiological Work Permit incorporated in a specific work package.

3.3.1 Work in radiological areas will be performed using a Radiological Work Permit following review by Radiological Control per the ALARA work planning procedure TFC-ESHQ-RWP-C-03.

3.4 Environmental Compliance

3.4.1 Dispose of any waste generated during this procedure in accordance with TO-100-052.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following Tools and equipment may be needed to perform this procedure:

Tools
- Micro-ohm meter, (Calibrated, accuracy ±5%)
- Digital Volt-ohm Meter, (Calibrated, accuracy ±5%)
- 1000V Megger, (Calibrated, accuracy ± 5%)
- Feeler Gage Set, (0.005 inch minimum)
- Push type scale, measures pressure up to 22.5 kg (50 lbs.) (accuracy ± 10%)
- Multi-Amp Universal Circuit Breaker Test Set or equivalent
- Breaker Lifting Device and Charging Handle.

Equipment
- Voltage rated gloves
- Goggles
- Rubber mat
- Signs and Barricades
- PPE as required by TFC-ESHQ-S_IS-C-02, Personal Protective Equipment
- Breaker spare parts as needed
- Vacuum cleaner with plastic nozzles
- Compressed Air (30 psi Max)
- Flashlight and Inspection Mirror
- Shorting Jumpers for Electronic Overcurrent Trip Devices with Ground Fault Trip.
- APM
4.1 Special Tools, Equipment and Supplies (Cont.)

Supplies

- Material to place a barricade and warning signs to prevent injury to unauthorized personnel
- Soft bristle brush (non-metallic)
- Scotch Brite #7447 or equivalent
- Lint-free/Static-free cleaning cloth
- Contact cleaner, Lexite, denatured alcohol or equivalent solvent
- Replacement battery for Digitrip RMS unit type CR-1/3N (CAT. ID. PC00069247) or DL 1/3N (CAT. ID. PC00083062).
- DS Breaker Fastener Kit (CAT. ID: 678672) Includes all clips
- DS Breaker Roller Kit (CAT. ID: 678674)
- DS Breaker Spring Retainer Kit (CAT. ID: 678677)

4.2 Performance Documents

NOTE – The performance documents below may be necessary to be determined by the breaker/trip unit being cleaned/inspected.

- AVO, Instruction Manual for Circuit Breaker Test Sets
- Amptector model #140D481G03 manual
- Instructions for Low-Voltage Power Circuit Breakers Types DS and DSL, I.B. 33-790-IG.
- Instructions for Installation, Operation and Maintenance of Magnum DS Low Voltage Power Circuit Breakers, I.B. 2C12060H05.
- AD 33-855-4, Instructions for the Applications of DigiTrip RMS 510 Series
- IB-15082, Instructions for the Systems Pow-R Breaker
- IL 29-885B, Instructions for the DigiTrip RMS 510 Trip Unit
- IS-15545, Master Connection Diagram for the SPB Breaker
- TO-100-052, Perform Waste Generation, Segregation, Accumulation, and Clean Up
- Square-D Breaker, Maintenance Manual, #6030-2
- Square-D Breaker, Parts Manual, #6030-3.
5.0 PROCEDURE

NOTE - Data Sheets are tailored for individual breakers and their final cubicle application. Individual measurement specifications will be indicated on Data Sheets.

- Sections in this procedure may be worked in any logical order, and certain sections may be omitted depending on the breaker type being tested.

5.1 Field Preparation

5.1.1 IF any step is not required for Data Sheet completion, RECORD “N/A” in the applicable space(s) on the Data Sheet AND DOCUMENT explanation in the Data Sheet’s Comments/Remarks section.

5.1.2 ARRANGE for removal and transportation of breakers to a clean maintenance area for required servicing.

5.1.3 IF any applicable step is not required for procedure completion, RECORD “N/A” at the procedure step AND DOCUMENT explanation in the Comments Section of the procedure.

5.1.4 Using the Data Sheet for the breaker and trip unit being tested, DETERMINE which Procedure Sections are to be performed.

NOTE - If an Undervoltage Trip Device is installed, it must be energized in order to close the breaker. Otherwise, the breaker will trip-free. Reference figure 14.

5.1.5 IF the breaker has an Undervoltage Trip Device installed, INSTALL 120 volts to the Undervoltage Trip Device secondary contacts.
5.2 As-Found Continuity and Megger Checks

**Micro-Ohmmeter Test**

**NOTE** - A low battery on the micro-ohmmeter may yield higher resistance readings.

5.2.1 **OPERATE** the breaker racking mechanism to the Test Position AND **ENSURE** levering-in device shaft turns freely.

5.2.2 **IDENTIFY** and **MARK** Main Disconnecting Contacts with location identifier if present.

5.2.3 **IF** Main Disconnecting Contacts exist, **REMOVE** Main Disconnecting Contacts.

5.2.4 **CHARGE** the breaker springs.

5.2.4.1 **IF** charging the breaker springs on the SPB-100, **LIFT** handle until charged.

**WARNING**

*Stored energy is present in the breaker contacts in the charging springs. Sudden release of spring tension can result in pinch hazards, or being struck by moving mechanisms, resulting in personnel injury and equipment damage.*

**NOTE** - The circuit breaker may suddenly latch fully closed and apply unexpected force to the charging handle.

5.2.5 **ENSURE** all personnel are clear.

5.2.6 **MAINTAIN** a firm grip on the manual-charging handle during the closing stroke AND **CLOSE** the circuit breaker.

5.2.7 **WITH** breaker in the CLOSED position, **MEASURE** the main contact resistance (micro-ohm continuity check) of each circuit breaker phase pole (line to load).

5.2.8 **RECORD** As-Found Contact Resistance for the three phases on the Data Sheet.
5.2 As-Found Continuity and Megger Checks (Cont.)

Megger Test

CAUTION
For DS-206, DS-416, and DS-632 breakers, applying high voltages > 600 VAC to the primary conductors of the circuit breaker, such as megger testing, can possibly damage the PTM on the Digitrip Trip Units.

5.2.9 IF testing the DS-206, DS-416, or DS-632 breakers, utilizing Digitrip Models RMS 810, RMS 910, and OPTIM 1050 only, REMOVE the VOLTAGE DISCONNECT PLUG from the PTM for the Digitrip Trip Units.

NOTE - When checking the insulation resistance of each main stab to ground, the ground test lead is connected to the circuit breaker frame.

5.2.10 PERFORM megger test at 1000 VDC as indicated on data sheet AND RECORD “As-Found” on Data Sheet.

5.2.11 ENSURE breaker is left in the OPEN position and charging springs discharged.

5.2.12 GO TO Section 5.3 for DS-206, DS-416 and DS-632 Breakers.

OR

GO TO Section 5.4 for SPB-100 Breakers.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers

NOTE - Circuit breaker must be on a stable surface with arc chutes removed during maintenance close operations. For breakers with a charging handle, a firm grip should be maintained on the manual-charging handle while manually charging springs as there may be unexpected force to the charging handle.

- When ensuring energy condition of closing or opening springs the vendor recommends the Trip and Close buttons be operated alternately at least twice.

General Breaker Examination

**WARNING**

Stored energy is present in the breaker contacts in the charging springs. Sudden release of spring tension can result in pinch hazards, or being struck by moving mechanisms, resulting in personnel injury and equipment damage.

5.3.1 ENSURE breaker is in the OPEN position.

5.3.2 CONFIRM the circuit breaker closing springs are discharged per the vendor manual.

5.3.3 IF any mechanical portions of the breaker is not operating smoothly/binding DISASSEMBLE, CLEAN, AND LUBRICATE those portions of the breaker.

5.3.3.1 AFTER cleaning and lubrication is performed REASSEMBLE the mechanical portion of the breaker.

NOTE - Marking Arc Chutes and Barriers with the location removed from prior to removal allows replacement in the same location, preventing potential damage from mechanical stress.

5.3.4 MARK arc chute and barriers with their location as found.

5.3.5 REMOVE arc chutes (3 each), barriers (4 each) and front cover.

5.3.6 VACUUM loose dust from the breaker.

5.3.7 USE Lexite or similar cleaner on clean cloth, WIPE insulators and accessible areas with a clean cloth.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

NOTE - Prior to performing inspection for damaged or worn breaker parts, current transformers must be removed from breaker terminals.

5.3.8 **TIGHTEN AND INSPECT** circuit breaker hardware for the following:

- Missing or loose fasteners, i.e., pin retainers, nuts, bolts, screws
- Signs of worn or damaged parts
- Bottom pan for loose parts
- Secondary contact assembly for cracked or broken parts
- Missing springs and keepers
- Loose parts and General anomalies
- Damaged insulation
- Broken, frozen or damaged bearings.

**WARNING**

*Stored energy is present in the breaker contacts in the charging springs. Sudden release of spring tension can result in pinch hazards, or being struck by moving mechanisms, resulting in personnel injury and equipment damage.*

5.3.9 **CHARGE** the breaker springs **AND** **CHECK** for signs of cracking/breakage.

5.3.10 **ENSURE** the Cut-Off Switch Link has operated properly (see Figure 3).

5.3.11 **ENSURE** all personnel are clear.

5.3.12 **CLOSE** the breaker **AND**

**CONFIRM** the closing springs are discharged.

5.3.13 **OPEN** the beaker **AND**

**CONFIRM** the following:

- opening springs are discharged
- closing springs remained discharged.

5.3.14 **CHECK** spring release device lever for interference by pushing it toward base plate aperture (Refer to Figure 10).
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

5.3.15 INSPECT wiring harness for pinched or damaged wire.

5.3.16 INSPECT all terminations for broken, damaged, loose wires or terminal lugs (breaker contact block, CT terminations, etc.).

5.3.17 CHARGE the breaker springs.

5.3.18 ENSURE all personnel are clear.

5.3.19 CYCLE (close/ open) breaker AND ENSURE mechanism is functioning properly.

General Lubrication

NOTE - In general, the circuit breaker requires only moderate lubrication at regular intervals. The use of special lubricants is required in a few places, and must be applied with care. All excess lubrication must be removed with a clean lint free cloth to prevent any accumulation of dust or dirt. Care must be taken to prevent any lubricant reaching any current carrying contact surface other than electrical contact lubricant.

CAUTION

Avoid any lubricant on insulation, only electrical contact lubricant should be allowed to come in contact with any current carrying contact surface.

5.3.20 IF using Dow Corning ® 557 Silicone dry film lubricant (GHS-SDS and/or MSDS #062283), DON Nitrile gloves while applying lubricant.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

NOTE - Refer to Figure 1 through Figure 5 for lubrication points.

5.3.21 APPLY a small quantity of -approved lubricant to the following points as necessary:

- Spring-charge indicator surface engaging with the cut-off switch link (see Figure 1, Item 1)
- Cam surface operating the cut-off switch link (see Figure 1, Item 2)
- Pins on both ends of the constraining link (see Figure 1, Item 3)
- Shunt trip moving armature surface (For electrically operated breakers only) (see Figure 4, Item 4)
- Curved surface of the trip latch (see Figure 1, Item 5)
- Spring release moving armature surface at the pivot point (see Figure 3, Item 6).
- Trip Shaft (see Figure 4, Item 7)
- Surface of the cut-off switch link (see Figure 1, Item 8)
- Main spring pins on each end of the crankshaft and fixed ends (see Figure 1, Item 9)
- Pins on both ends of the main drive link (see Figure 5, Item 27)
- Trip latch pivot pin - both side frames (Lube at 4 places, on both sides of the 2 side frames) (see Figure 5, Item 4)
- Both sides of the oscillator plate where it pivots on the crankshaft (see Figure 5, Item 14)
- Between oscillator surface and roller (Electric operated breakers only).
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

Rollers on Side of Breaker

5.3.22 REMOVE spring washers and rollers

5.3.22.1 CLEAN Roller and breaker shaft surfaces

5.3.22.2 LUBE roller and breaker Shaft surfaces

5.3.22.3 REINSTALL roller and spring washer

Pole Lever Pin

NOTE - The pole lever pin is located in each of the moving contact arm’s insulating links (See Figure 13)

5.3.23 ENSURE breaker is Open.

5.3.24 REMOVE the two X-clips holding in each of the pole lever pins

5.3.24.1 CLEAN pole lever pins AND surface in the insulating links

5.3.24.2 LUBE pole lever Pins

5.3.24.3 REINSTALL pole lever pins and X-clips.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

**Auxiliary Switches Lube and Inspection**

5.3.25 IF breaker has auxiliary switches, **PERFORM** this section.

5.3.26 **REMOVE** lower X-clip and disconnect auxiliary contacts arm linkage.

5.3.27 **REMOVE** two (2) top screws holding auxiliary covers together.

5.3.28 **REMOVE** both front and back covers to access all contacts.

5.3.29 **ROTATE** carefully auxiliary switches assembly to access individual contacts.

5.3.30 **USE** denatured alcohol (or similar solvent), **CLEAN AND REMOVE** old dried grease and buildup from the switch contacts.

5.3.31 **INSPECT** switches and contacts for excessive wear and loose wiring.

**NOTE** - Contact arm assembly may be actuated up and down to gain access to all contacts.

- Approved lubricants should be applied uniformly over the entire current carrying surface being lubricated, allowing no accumulation or buildup.

5.3.32 **APPLY** Electrical Contact Lubricant sparingly to the contact/switch lube points.

**CAUTION**

Avoid any lubricant on insulation or other electrical parts.

Only electrical contact lubricant should be allowed to come in contact with any current carrying contact surface.

5.3.33 **LUBRICATE** actuating arm with approved lubricant.

5.3.34 **RE-ASSEMBLE** switches and replace X-clip.

**NOTE** - Cycling the breaker will ensure flow of lubrication within the mechanism.

5.3.35 **CYCLE** (open/close) the breaker several times.

5.3.36 **ENSURE** breaker is in the OPEN position.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

General Contact Condition

NOTE - Switching and fault interruptions and the making of motor inrush currents will cause some pitting of the breaker contact parts. A large accumulation of operations will give the contacts, especially the arcing contacts, a mottled, dirty, eroded appearance. This appearance is the normal result of arc burning and in itself is no cause for concern.

- Scotch Brite #7447 or equivalent may be used to lightly clean contacts. No lubricants should be applied to main or arcing contacts.

Moving Arcing Contact Inspection - Dimension A

CAUTION

Reverse rotation of the close cam will cause misalignment of the spring charge indicator.

5.3.37 CHARGE the breaker springs.

5.3.38 ENSURE all personnel are clear.

5.3.39 CLOSE the breaker.

NOTE - Refer to Figure 6 for Dimension “A” information for DS-206 and DS-416 breakers.

- Refer to Figure 12 for Dimension “A” information for DS-632 breaker.

5.3.40 ENSURE the clearance between the stationary arcing contacts is a minimum of 0.020 inch (Dimension “A”) for all phases.

5.3.41 IF clearance(s) is inadequate, PERFORM the following:

5.3.41.1 NOTIFY FWS.

5.3.41.2 IF directed by FWS, ADJUST stationary arcing contacts per vendor manual.

5.3.41.3 IF directed by FWS, REPLACE stationary arcing contacts per vendor manual.

5.3.41.4 IF not within tolerances, REPEAT Moving Arcing Contact Inspection – Dimension A steps.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

5.3.42 RECORD clearance values on Data Sheet.

Arcing Contact Penetration - Dimension B

NOTE - Refer to Figure 6 for Dimension “B” information. Arcing Contact Penetration – Dimension B is NOT APPLICABLE TO DS-632 BREAKER.

5.3.43 INSERT a 0.25” feeler (or equivalent measuring device) through the gap between stationary and movable arcing contacts for each phase.

5.3.44 IF Dimension(s) “B” will not accept the 0.25” measuring device, EXAMINE the Main Contacts AND

PERFORM the following:

5.3.44.1 CONTACT FWS.

5.3.44.2 IF directed by FWS, ADJUST Contact per vendor manual.

5.3.44.3 IF directed by FWS, REPLACE Contact per vendor manual.

5.3.44.4 IF not within tolerances, REPEAT Arcing Contact Penetration – Dimension B steps.

5.3.45 RECORD clearance values on Data Sheet.

Contact Engagement

Special Instructions

Stationary main contact fingers should be parallel to moving main contact cage as shown in Figure 6 for DS-206 and DS-416 breakers, OR on view B in Figure 12 for DS-632 breaker.

5.3.46 ENSURE that the front edges of the Main Contact Fingers are parallel to the front edges of the Main Contact Finger Supports.

5.3.47 IF fingers are not parallel, ADJUST the Fingers by performing the following:

5.3.47.1 ROTATE the insulating link connected to the Moving Contact Assembly.

5.3.47.2 IF not parallel, REPEAT Contact Engagement steps.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

**Stationary Arcing Contact Thickness - Dimension C**

NOTE - Refer to Figure 6 for Dimension “C” information for DS-206 and DS-416 breakers.

- Refer to Figure 12 for Dimension “C” information for DS-632 breaker.

5.3.48 OPEN the breaker.

5.3.49 ENSURE the clearance between the Stationary Arcing Contacts is between 0.34" and 0.50" (Dimension “C”) for each phase.

5.3.50 IF clearance is not within limits, PERFORM the following:

5.3.50.1 CONTACT FWS

5.3.50.2 IF directed by FWS, ADJUST the Contact per vendor manual.

5.3.50.3 IF not within tolerances, RE-PERFORM Stationary Arcing Contact Thickness – Dimension C steps.

5.3.51 RECORD clearance values on Data Sheet.

**Re-Set Open Position Stop**

NOTE - For DS-632 Breaker ONLY, refer to Figure 7.

5.3.52 OPEN breaker AND

MEASURE in-between the Anti-Rebound Latch Stop Lever and Open Position Stop Eccentric Cylinder.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

5.3.53 IF measurement is approximately 0.005”, GO TO
Step 5.3.54

5.3.53.1 IF measurement is not approximately 0.005”, PERFORM the following:

NOTE: The nuts are located on the exterior of the frame sides; not on moving parts.

   a. LOOSEN the open position stop bolt nuts so eccentric cylinders can turn but stay in position.

   b. ROTATE cylinders to obtain a clearance of approximately 0.005” between cylinders and stop levers.

   c. TIGHTEN position stop bolt nuts.

5.3.54 IF not already closed CLOSE breaker.

5.3.55 WHEN servicing model DS-632, ENSURE "PIN X" is free to slide in contact cage when breaker is closed. (Figure 12)

Trip Latch Overlap Adjustment

NOTE - The angular position of the trip shaft latch surface is adjustable in relation to the trip latch surface by means of a screw located in the top of the actuator frame.

   - Refer to Figure 7 for Trip Latch Adjustment

5.3.56 CHARGE the breaker springs.

5.3.57 ENSURE all personnel are clear.

5.3.58 CLOSE the breaker.

NOTE - When the breaker trips this is the "no overlap" position.

5.3.59 SLOWLY ROTATE Trip Shaft Adjust screw (Item 11) in a clock-wise direction, UNTIL the breaker trips.

5.3.60 AFTER breaker trips, ROTATE the Trip Shaft Adjusting screw 4 complete turns in a counter-clockwise direction.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

Pole Shaft Weld Inspection

NOTE - Refer to Figure 8 for Pole Shaft.

5.3.61 ENSURE breaker is OPEN AND Springs are DISCHARGED.

5.3.62 INSPECT the pole shaft welds visually for cracks or separations with tools appropriate for enhancing the inspection (ex., inspection mirror, flashlight, etc.).

5.3.63 IF directed by FWS, DISCONNECT the opening spring (located on the right side of the breaker).

5.3.64 ROTATE the pole shaft as follows:

5.3.64.1 PUSH the Moving Contacts towards the CLOSED position.

5.3.64.2 EXPOSE the inside areas of the welds to view.

5.3.65 IF any weld is found to have developed a crack or separation, NOTIFY FWS.

5.3.66 RE-CONNECT the opening spring.

Main Roller Alignment

CAUTION
Reverse rotation of the close cam will cause misalignment of the spring charge indicator.

NOTE - Refer to Figure 9 for Main Roller Alignment.

5.3.67 ENSURE breaker is OPEN AND Springs are DISCHARGED.

5.3.68 INSPECT roller for free travel.

5.3.69 CONFIRM a visible gap exists between side frame and roller.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

5.3.70 IF either of the two observations in 5.3.68 or 5.3.69 are not satisfactory, NOTIFY FWS.

5.3.71 IF directed by FWS, PERFORM the following:

5.3.71.1 DISCONNECT both closing springs from the Crank Shaft as follows:

5.3.71.2 REMOVE the X-Clips.

5.3.71.3 IF desired, LEAVE other end of spring attached.

NOTE - While rotating the Crankshaft you will observe that the Roller rides on at least a portion of the two outer laminates of the Cam and that a visible gap exists between side frame and roller.

5.3.71.4 ROTATE AND OBSERVE Crankshaft by performing the following:

5.3.71.5 USE Breaker Charging Handle, ROTATE Crankshaft toward the position that represents the Breaker CLOSED position.

5.3.71.6 CONTINUE rotation a full 360° by pushing the CLOSE and OPEN Pushbuttons.

5.3.71.7 ENSURE Roller rides on at least a portion of the two outer laminates of the Cam.

5.3.71.8 ENSURE a visible gap exists between side frame and roller.

5.3.71.9 DEPRESS the Push to CLOSE and TRIP buttons.

5.3.71.10 UNTIL the Spring Discharge Indicator is present, ROTATE the crankshaft.

5.3.72 IF new X-Clips are available, USE them to re-connect the springs.

5.3.73 IF X-Clips are not available, RE-CONNECT both Closing Springs at the Crank Shaft.

5.3.74 RE-INSTALL the front panel to the breaker.
5.3 Maintenance for DS-206, DS-416 and DS-632 Type Breakers (Cont.)

Arc Chute Maintenance

NOTE - Generally if two or more arc plates are cracked then the arc chute must be replaced. Some deterioration of the inside components of the arc chute will occur after many operations. Splitter plates will start to erode especially at the inverted "V". The splitter plate should be replaced after the inverted "V's" erode away more than 1/4". Excessive heating during fault operation will also cause the ceramic plates to erode and glaze. When this becomes excessive, the arc chute should be replaced.

5.3.75 INSPECT Arc Chutes for deterioration/damage.

5.3.76 IF deposits exist, REMOVE deposits from arc chutes by any of the following:

• Light sanding
• Scrapping

5.3.77 IF directed by FWS, REPLACE arc chutes.

5.3.78 INSTALL Arc Chutes (3 each) and barrier (4 each) covers back to locations they were removed from.

Main Disconnecting Contact Maintenance

5.3.79 INSPECT Main Disconnecting Contacts for pitting, corrosion or other signs of degradation.

5.3.79.1 IF significant pitting has occurred, CONTACT FWS

5.3.79.2 IF required by Engineering, PERFORM a contact print test with a blank white piece of paper to determine if less than 80% of the overall contact patch still exists.

5.3.80 CLEAN Main Disconnecting Contacts and busbars using Scotch Brite #7447 or equivalent.
5.4 Maintenance for SPB-100 Type Breakers

NOTE - Circuit breaker must be on a stable surface with arc chutes removed during maintenance close operations. For breakers with a charging handle, a firm grip should be maintained on the manual-charging handle during the "Closing" stroke because the circuit breaker may suddenly latch fully closed and apply unexpected force to the charging handle.

- When ensuring energy condition of closing or opening springs the vendor recommends the Trip and Close buttons be operated alternately at least twice.

General Breaker Examination

![WARNING]

**WARNING**

*Stored energy is present in the breaker contacts in the charging springs. Sudden release of spring tension can result in pinch hazards, or being struck by moving mechanisms, resulting in personnel injury and equipment damage.*

5.4.1 **CONFIRM** the circuit breaker closing springs are discharged per the vendor manual.

NOTE - Marking Arc Chutes and Barriers with the location removed from prior to removal allows replacement in the same location, preventing potential damage from mechanical stress.

5.4.2 **MARK** arc chute and barriers with their location as found.

5.4.3 **REMOVE** arc chutes (3 each), and front cover.

5.4.4 **VACUUM** loose dust from the breaker.

5.4.5 **USE** Lexite or similar cleaner on clean cloth, **WIPE** insulators and accessible areas.
5.4 Maintenance for SPB-100 Type Breakers (Cont.)

5.4.6 TIGHTEN AND INSPECT circuit breaker hardware for the following:
- Missing or loose fasteners, i.e., pin retainers, nuts, bolts, screws
- Signs of worn or damaged parts
- Bottom pan for loose parts
- Secondary contact assembly for cracked or broken parts
- Missing springs and keepers
- Loose parts and General anomalies
- Damaged insulation
- Broken, frozen or damaged bearings.

WARNING

Stored energy is present in the breaker contacts in the charging springs. Sudden release of spring tension can result in pinch hazards, or being struck by moving mechanisms, resulting in personnel injury and equipment damage.

5.4.7 CHARGE the breaker springs by lifting handle until charged.

5.4.8 CHECK for signs of cracking/breakage (i.e., handle, casing).

5.4.9 ENSURE all personnel are clear.

5.4.10 CLOSE the breaker AND
CONFIRM the closing springs are discharged.

5.4.11 OPEN the beaker AND
CONFIRM the following:
- opening springs are discharged
- closing springs remained discharged.

5.4.12 INSPECT wiring harness for pinched or damaged wire.

5.4.13 INSPECT all terminations for broken, damaged, loose wires or terminal lugs.

5.4.14 CHARGE the breaker springs by lifting handle until charged.
5.4 Maintenance for SPB-100 Type Breakers (Cont.)

5.4.15 **ENSURE** all personnel are clear.

5.4.16 **CYCLE** (close/ open) breaker **AND**

**ENSURE** mechanism is functioning properly.

**Arc Chute Maintenance**

**NOTE** - Generally if two or more arc plates are cracked then the arc chute must be replaced. Some deterioration of the inside components of the arc chute will occur after many operations. Splitter plates will start to erode especially at the inverted "V". The splitter plate should be replaced after the inverted "V's" erode away more than 1/4". Excessive heating during fault operation will also cause the ceramic plates to erode and glaze. When this becomes excessive, the arc chute should be replaced.

5.4.17 **INSPECT** Arc Chutes for deterioration/damage.

5.4.18 **IF** deposits exist, **REMOVE** deposits from arc chutes by any of the following:

- Light sanding
- Scraping

5.4.19 **IF** directed by FWS, **REPLACE** arc chutes.

5.4.20 **INSTALL** Arc Chutes (3 each).

**Main Disconnecting Contact Maintenance**

5.4.21 **INSPECT** Main Disconnecting Contacts for pitting, corrosion or other signs of degradation.

5.4.22 **CLEAN** Main Disconnecting Contacts and busbars using Scotch Brite #7447 or equivalent.
5.5 As-Left Continuity and Megger Checks

NOTE - This section applies to the DS-206, DS-416, DS-632 and SPB-100 breakers.

Micro-Ohmmeter Test

NOTE - A low battery on the micro-ohmmeter may yield higher resistance readings.

5.5.1 CHARGE the breaker springs.

5.5.1.1 IF charging the breaker springs on the SPB-100, LIFT handle until charged.

5.5.2 ENSURE all personnel are clear AND

CLOSE the circuit breaker.

5.5.3 WITH breaker in the CLOSED position, MEASURE the main contact resistance (micro-ohm continuity check) of each circuit breaker pole AND

RECORD As-Left Contact Resistance for the three phases on the Data Sheet.

CAUTION

For DS-206, DS-416, and DS-632 breakers, applying high voltages > 600 VAC to the primary conductors of the circuit breaker, such as megger testing, can possibly damage the PTM on Digitrip Trip Units.

Megger Check

5.5.4 IF testing the DS-206, DS-416 or DS-632 breakers, utilizing Digitrip Models RMS 810, RMS 910, and OPTIM 1050 only, ENSURE the VOLTAGE DISCONNECT PLUG from the PTM on Digitrip Trip Unit has been REMOVED.

5.5.5 PERFORM megger check per the Data Sheet.

5.5.6 RECORD As-Left readings on Data Sheet.

5.5.7 INSTALL Main Disconnecting Contacts on each line AND

LOAD side breaker stab.

5.5.8 APPLY Electrical Contact Lubricant sparingly to the Main Disconnecting Contacts.

5.5.9 ENSURE each set of Main Disconnecting Contacts are seated properly.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers

CAUTION
Damage to the breaker may occur if an Inspection and Maintenance of the breaker is not completed prior to Primary Injection Testing.

5.6.1 ENSURE inspection and maintenance of the breaker being tested is complete.

5.6.2 IF equipped with current limited fuses, REMOVE current limited fuses AND INSTALL blanks.

Note - This Primary Injection Test section contains a number of subsections. You will need to look at the corresponding device Data Sheet to determine which subsections are applicable.

5.6.3 IF breaker being tested has a Digitrip RMS or OPTIM unit, REPLACE trip unit battery with new.

5.6.4 SET-UP the breaker for Primary Injection Testing as follows:

5.6.4.1 ENSURE the Breaker Identification and Trip Unit information on the Data Sheet matches the Breaker being tested.

5.6.4.2 IF previously removed and circuit breaker is equipped with a Digitrip RMS 810, RMS 910 or OPTIM unit, INSTALL the VOLTAGE DISCONNECT PLUG from the PTM to the Digitrip Trip Unit.

5.6.4.3 IF the breaker has a spring charging motor THEN INSTALL 120 volts to the breaker charging motor secondary contacts per the vendors manual.

5.6.4.4 INSTALL APM on Digitrip units.

5.6.4.5 INSTALL ground jumper from test set “ISO.GND.” terminal to frame of breaker.

5.6.4.6 IF breaker does not have a spring charging motor, THEN a separate ground must be established to the frame from a separate circuit other than the 480V power supply to the test set.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers (Cont.)

**Ground Fault P/U Current Test**

5.6.5 **ENSURE** trip unit settings are as shown on data sheet for Ground Fault P/U Current Test.

5.6.6 **CONNECT** the test set output terminals to “A”-Phase Poles of the breaker to be tested.

5.6.7 **ENSURE** current on test set is set to 20% of “In”.

5.6.8 For no more than 5 seconds, **ENERGIZE** output of test set **AND**

5.6.8.1 **CONFIRM** the trip unit ground fault LED is off.

5.6.8.2 **CONFIRM** the breaker does not trip.

5.6.8.3 **DOCUMENT** results on data sheet.

5.6.9 **RE-PERFORM** Ground Fault P/U Current Test steps on remaining phases in place of “A” phase.

**Ground Fault Time Test**

5.6.10 If directed by Data Sheet or FWS, **PERFORM** remaining steps of Ground Fault Time Test Steps.

5.6.11 **CONNECT** test set output terminals to “A” Phase Poles of breaker to be tested.

---

**CAUTION**

Damage or Overheating to the breaker may occur if the Multi-Amp Tester current is left on longer than necessary to complete a test.

5.6.12 **SETUP AND PERFORM** testing per values specified on the Data Sheet.

5.6.13 **RECORD** results on the Data Sheet for Ground Fault Time Test Result **AND**

**COMPARE** the results to the Data Sheet Specifications.

5.6.14 If readings do not fall within the specified design parameter, **CONTACT** engineering.

5.6.15 **RE-PERFORM** Ground Fault Time Test Steps as needed for each remaining phase “B” and “C”.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers (Cont.)

Set-Up for Non-Ground Fault Testing Time

5.6.16 IF ground fault is a feature on installed trip unit, INSTALL a jumper between N & G terminals to defeat the ground fault trip for the remainder of the testing.

5.6.16.1 DOCUMENT jumper installed on data sheet.

NOTE- Remaining work sections and associated steps to perform Primary Injection Testing may be worked in any logical order for ease of use (e.g. perform all injection testing on “A” phase first, perform all Long Time testing first, etc.) as long as all applicable data sheet information is properly documented.

Long Time P/U Current Test

5.6.17 ENSURE trip unit settings are as shown on data sheet for Long Time P/U Current Test.

5.6.18 CONNECT the test set output terminals to “A”-Phase Poles of the breaker to be tested.

5.6.19 ENSURE current on test set is set to 100% of “In”.

5.6.20 FOR no more than 5 seconds, ENERGIZE output of test set AND

5.6.20.1 CONFIRM the trip unit long-delay LED is not lit.

5.6.20.2 CONFIRM the breaker does not trip.

5.6.20.3 DOCUMENT results on data sheet.

5.6.21 ENSURE current on test set is set to 115% of “In”.

5.6.22 FOR no more than 5 seconds, ENERGIZE output of test set AND

5.6.22.1 CONFIRM the trip unit long-delay LED is flashing.

5.6.22.2 CONFIRM the breaker does not trip.

5.6.22.3 DOCUMENT results on data sheet.

5.6.23 RE-PERFORM Long Time P/U Current Test steps on remaining phases in place of “A” phase.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers (Cont.)

**Short Time P/U Current Test**

5.6.24 **ENSURE** trip unit settings are as shown on data sheet for Short Time P/U Current Test.

5.6.25 **CONNECT** the test set output terminals to “A”-Phase Poles of the breaker to be tested.

5.6.26 **ENSURE** current on test set is set to 250% of “In”.

5.6.27 **FOR** no more than 5 seconds, **ENERGIZE** output of test set **AND**

5.6.27.1 **CONFIRM** the trip unit long-delay LED is flashing.

5.6.27.2 **CONFIRM** the breaker does not trip.

5.6.27.3 **DOCUMENT** results on data sheet.

5.6.28 **RE-PERFORM** Short Time P/U Current Test steps on remaining phases in place of “A” phase.

**Instantaneous P/U Current Test**

5.6.29 **ENSURE** trip unit settings are as shown on data sheet for Instantaneous P/U Current Test.

5.6.30 **CONNECT** the test set output terminals to “A”-Phase Poles of the breaker to be tested.

5.6.31 **ENSURE** current on test set is set to 250% of “In”.

5.6.32 **FOR** no more than 5 seconds, **ENERGIZE** output of test set **AND**

5.6.32.1 **CONFIRM** the trip unit long-delay LED is flashing.

5.6.32.2 **CONFIRM** the breaker does not trip.

5.6.32.3 **DOCUMENT** results on data sheet.

5.6.33 **RE-PERFORM** Instantaneous P/U Current Test steps on remaining phases in place of “A” phase.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers
(Cont.)

Long Delay Time Test

NOTE - When performing tests on the Long Delay Element be aware that in addition to the standard protection element, the Digitrip RMS Trip Unit also has a Long Term Memory function (LTM). If the LTM feature is active, the LTM must be reset (automatically reset by allowing a minimum of 10 minutes rest time) after each test of overload conditions or test results will be affected. Refer to appropriate vendor manual if LTM will be inactivated.

- In order to prevent pre-mature tripping for each subsequent Long Delay Time Tests, let the trip coil cool down for approximately 5 minutes.

5.6.34 IF directed by FWS or Engineering, ENSURE LTM feature is INACTIVATED (located behind trip unit rating plug, see appropriate trip unit vendor manual).

5.6.35 IF directed by Data Sheet or FWS, PERFORM remaining steps of Long Delay Time Test.

5.6.36 CONNECT the test set output terminals to “A”-Phase Poles of the breaker to be tested.

CAUTION

Damage or Overheating to the breaker may occur if the Multi-Amp Tester current is left on longer than necessary to complete a test.

5.6.37 SETUP AND PERFORM testing per values specified on the Data Sheet.

5.6.38 RECORD results on Data Sheet for Long Delay Time Test AND COMPARE the results to the Data Sheet Specifications.

5.6.39 IF readings do not fall within the specified design parameter, CONTACT engineering.

5.6.40 RE-PERFORM Long Delay Time Test Steps as needed for each remaining phase “B” and “C”.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers (Cont.)

**Short Time Delay Test**

5.6.41 IF directed by Data Sheet or FWS, **PERFORM** remaining steps of **Short Time Delay Test** Steps.

5.6.42 CONNECT the test set output terminals to “A”-Phase Poles of the breaker to be tested.

5.6.43 **SETUP AND PERFORM** testing per values specified on the Data Sheet.

5.6.44 **RECORD** results on Data Sheet for Short Time Delay Test **AND** **COMPARE** the results to the Data Sheet Specifications.

5.6.45 IF readings do not fall within the specified design parameter, **CONTACT** engineering.

5.6.46 **RE-PERFORM Short Time Delay Test** Steps as needed for each remaining phase “B” and “C”.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers (Cont.)

**Instantaneous Test**

NOTE - If breaker is tripping while pulsing the current at a lower value than the defined test current, then it is acceptable to record the test results on the data sheet as any higher current will yield consistent trip times.

5.6.47 **IF** directed by Data Sheet or FWS, **PERFORM** remaining steps of **Instantaneous Test**.

5.6.48 **CONNECT** the test set output terminals to “A”-Phase Poles of the breaker to be tested.

**CAUTION**

Overheating may occur if the Multi-Amp current is left on longer than necessary to complete a test.

5.6.49 **SETUP AND PERFORM** testing per values specified on the Data Sheet.

5.6.50 **RECORD** results on Data Sheet for Instantaneous Pick-up Test Result AND **COMPARE** the results to the Data Sheet Specifications.

5.6.51 **IF** readings do not fall within the specified design parameter, **CONTACT** engineering.

5.6.52 **RE-PERFORM** **Instantaneous Test** Steps as needed for each remaining phase “B” and “C”.
5.6 Primary Injection Test for DS-206, DS-416 and DS-632 Breakers (Cont.)

**Testing Restoration**

5.6.53 IF installed, REMOVE jumper between N & G to defeat enable the ground fault feature testing.

5.6.53.1 DOCUMENT jumper removed on data sheet.

5.6.54 IF current limiting fuses were removed at Step 5.6.2, REMOVE blanks AND

REINSTALL current limiting fuses.

5.6.55 REMOVE APM if installed.

5.6.56 REMOVE 120 volts to charging motor if installed.

5.6.57 IF LTM feature was inactivated for testing, ACTIVATE LTM feature.
5.7 Primary Injection Test for SPB-100 Breakers

CAUTION

Damage to the breaker may occur if an Inspection and Maintenance of the breaker is not completed prior to Primary injection Testing.

5.7.1 ENSURE inspection and maintenance of the breaker being tested is complete.

NOTE - This Primary Injection Test section contains a number of subsections. You will need to look at the corresponding device Data Sheet to determine which subsections are applicable.

5.7.2 OBTAIN the Data Sheet for the breaker and trip unit being tested AND DETERMINE which Primary Injection Test Sections are to be performed.

5.7.3 IF the trip unit does not function properly, REPLACE the trip unit battery.

5.7.4 SET-UP the breaker for Primary Injection Testing as follows:

5.7.4.1 ENSURE the Breaker Identification and Trip Unit information on the Data Sheet matches the Breaker being tested.

5.7.4.2 DOCUMENT the As-Found trip unit settings on Data Sheet.

5.7.5 CHANGE jumper behind rating plug from ACTIVE to INACTIVE by moving the jumper from the top and center jumper holes to the center and bottom jumper holes.

Long Time P/U Current and Long Delay Time Test

5.7.6 IF directed by Data Sheet or FWS, PERFORM remaining steps of Long Time P/U Current and Long Delay Time Test Steps for Long Time Pick-up.

5.7.7 CONNECT the test set output terminals to “A”-Phase Poles of the breaker to be tested.

5.7.8 ENSURE Auxiliary Power Module is connected to trip unit.
5.7 Primary Injection Test for SPB-100 Breakers (Cont.)

5.7.9 ENSURE ground fault function is defeated by ensuring ground fault terminal jumper (yellow) is installed at terminals 1 and 4 (moved from terminals 1 and 2).

OR

ENSURE ground fault function is defeated by ensuring ground fault terminal jumper (yellow) is installed at terminals D6 and D7 (move from terminals D6 and D5, for Breaker AZ156-EDS-BKR-100 located at MCC AZ156-EDS-MCC-001 only).

CAUTION
Damage or Overheating to the breaker may occur if the Multi-Amp Tester current is left on longer than necessary to complete a test.

5.7.10 SETUP AND PERFORM testing per values specified on the Data Sheet.

5.7.11 RECORD results on Data Sheet for Long Time Pick-up Test Result AND COMPARE the results to the Data Sheet Specifications.

5.7.12 IF readings do not fall within the specified design parameter, CONTACT engineering.

5.7.13 RE-PERFORM Long Time P/U Current and Long Delay Time Test Steps as needed for each remaining phase “B” and “C”.

5.7.14 IF no other non-ground fault testing is to be performed on this breaker, REMOVE ground fault defeat by ensuring ground fault terminal jumper (yellow) has been moved from terminals 1 and 4 to terminals 1 and 2.

OR

IF no other non-ground fault testing is to be performed on this breaker, REMOVE ground fault defeat by ensuring ground fault terminal jumper (yellow) has been moved from terminals D6 and D7 to D6 and D5 (for Breaker AZ156-EDS-BKR-100 located at MCC AZ156-EDS-MCC-001 only).
5.7 Primary Injection Test for SPB-100 Breakers (Cont.)

*Short Time P/U Current and Short Time Delay Test*

5.7.15 IF directed by Data Sheet or FWS, **PERFORM** remaining steps of **Short Time P/U Current and Short Time Delay Test** Steps for Short Time Pick-up.

5.7.16 **ENSURE** jumper is connected from D9 to D10 on control terminals (See Figure 11).

5.7.17 **ENSURE** Auxiliary Power Module is connected to trip unit.

5.7.18 **ENSURE** ground fault function is defeated by ensuring ground fault terminal jumper (yellow) is installed at terminals 1 and 4 (moved from terminals 1 and 2).

**OR**

ENSURE ground fault function is defeated by ensuring ground fault terminal jumper (yellow) is installed at terminals D6 and D7 (move from terminals D6 and D5, for Breaker AZ156-EDS-BKR-100 located at MCC AZ156-EDS-MCC-001 only).

5.7.19 **CONNECT** the test set output terminals to A-Phase Poles of the breaker to be tested.

5.7.20 **SETUP AND PERFORM** testing per values specified on the Data Sheet.

5.7.21 **RECORD** results on Data Sheet for Short Time Pick-up Test Result AND **COMPARE** the results to the Data Sheet Specifications.

5.7.22 **IF** readings do not fall within the specified design parameter, **CONTACT** engineering.

5.7.23 **RE-PERFORM** **Short Time P/U Current and Short Time Delay Test** Steps as needed for each remaining phase “B” and “C”.


5.7 Primary Injection Test for SPB-100 Breakers (Cont.)

5.7.24 IF no other non-ground fault testing is to be performed on this breaker, REMOVE ground fault defeat by ensuring ground fault terminal jumper (yellow) has been moved from terminals 1 and 4 to terminals 1 and 2.

OR

IF no other non-ground fault testing is to be performed on this breaker, REMOVE ground fault defeat by ensuring ground fault terminal jumper (yellow) has been moved from terminals D6 and D7 to D6 and D5 (For Breaker AZ156-EDS-BKR-100 located at MCC AZ156-EDS-MCC-001 only).

Ground Fault Pickup and Time Test

5.7.25 IF directed by Data Sheet or FWS, PERFORM remaining steps of Ground Fault Pickup and Time Test Steps for Ground Fault Test.

5.7.26 ENSURE Auxiliary Power Module is connected to trip unit.

5.7.27 ENSURE ground fault function is not defeated by ensuring ground fault terminal jumper (yellow) is installed at terminals 1 and 2.

OR

ENSURE ground fault function is not defeated by ensuring ground fault terminal jumper (yellow) is installed at terminals D6 and D5. (For Breaker AZ156-EDS-BKR-100 located at MCC AZ156-EDS-MCC-001 only).

5.7.28 ENSURE jumper is connected from C4 to C5 on control terminals (See Figure 11).

5.7.29 CONNECT test set output terminals to A-Phase Poles of breaker to be tested.

CAUTION
Damage or Overheating to the breaker may occur if the Multi-Amp Tester current is left on longer than necessary to complete a test.

5.7.30 SETUP AND PERFORM testing per values specified on the Data Sheet.

5.7.31 RECORD results on the Data Sheet for Ground Fault Time Test Result AND COMPARE the results to the Data Sheet Specifications.
5.7 Primary Injection Test for SPB-100 Breakers (Cont.)

5.7.32 IF readings do not fall within the specified design parameter, CONTACT engineering.

5.7.33 RE-PERFORM **Ground Fault Pickup and Time Test** Steps as needed for each remaining phase, “B” and “C”.

**Trip Unit Restoration**

NOTE - Trip Unit Restoration Steps will be performed after all primary injection breaker testing is complete.

5.7.34 ENSURE As-Found trip unit settings match As-Left trip unit settings, OR

PERFORM the following:

5.7.34.1 SET per engineering direction

5.7.34.2 DOCUMENT engineering directions on data sheet.

5.7.35 RETURN jumper behind rating plug from INACTIVE back to ACTIVE by moving the jumper from the bottom and center jumper holes to the center and top jumper holes.

5.7.36 ENSURE ground fault terminal jumper (yellow) is back to terminals 1 to 2, OR

ENSURE ground fault terminal jumper (yellow is back to terminals D6 and D5 (for Breaker AZ156-EDS-BKR-100 located at MCC AZ156-EDS-MCC-001 only).

5.7.37 ENSURE jumpers from C4 to C5 and D9 to D10 on control terminals are removed.

5.7.38 REMOVE Auxiliary Power Module from trip unit.
5.8 Restoration

5.8.1 IF any problems were encountered with calibration, INFORM FWS.

5.8.2 ENSURE all Test Equipment has been disconnected and removed.

5.8.3 ENSURE Test Equipment information and calibration status are recorded on Data Sheet.

5.9 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.

5.10 Review

5.10.1 INFORM FWS test is complete

5.10.2 FWS REVIEW AND ENSURE the following:
   • Completed Data Sheets meet the acceptance criteria.
   • Comments section is filled out appropriately.
   • Work requests needed as a result of this procedure are identified and generated.
   • Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the Data Sheet.

5.11 Records

The performance of this procedure generates no records. However PM data sheets associated with the procedure are records and are maintained in the work package as record material.

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible
Figure 1 - Lubrication Points on Left Side of Charging Mechanism
Figure 2 - Lubrication Points on Right Side of Charging Mechanism
Figure 3 - Lubrication Point Spring Release Device

- Insulation
- Mounting Bracket
- Motor Cut-Off Switch
- Coil
- Spring Release
- Moving Armature
- Antipump Relay

Spring Release Details
Figure 4 - Lubrication Points-Trip Coil and Trip Shaft
Figure 5 - Electrically Operated Breaker Mechanism

1. Shunt Trip Device
2. Trip Shaft
3. Roller Contraining Latch
4. Trip Latch
5. Close Cam
6. Stop Roller
7. Spring Release Latch
8. Spring Release Device
9. Oscillator Pawl
10. Ratchet Wheel
11. Hold Pawl
12. Drive Plate
13. Emergency Charge Pawl
14. Oscillator
15. Crank Shaft
16. Emergency Charge Device
17. Crank Arm
18. Closing Spring
19. Reset Spring
20. Closing Spring Anchor
21. Pole Shaft
22. Motor
23. Emergency Charge Handle
24. Motor Crank and Handle
25. Moving Contact Assembly
26. Insulating Link
27. Main Drive Link

Main Drive Link
Lube at (4) places with W53701GW kit or Moly Kote BR-2 Grease

Oscillator
Lube between oscillator surface and roller with W53701GW kit or Moly Kote BR-2 Grease
Figure 6 - DS-206 and DS-416 Contact Measurements and Alignment

Dimension A
0.020 inches Minimum Both Sides

Dimension B
0.25 inches Minimum

Dimension C
0.34 – 0.50 inches

These Faces Parallel

Breaker Closed

These Faces Parallel

Breaker Open
Figure 7 - Trip Adjusting Screw and Open Position Stop

1. Anti-Rebound Latch
2. Open Position Stop (adjustable for DS-632 only)
3. Stop Lever
Figure 8 - Pole Shaft Assembly Weld Inspection

POLE SHAFT ASSEMBLY

3 / 16 Fillet weld
(all levers)

SECTION A-A

PARTIAL VIEW OF BREAKER COMPONENTS

Front of Breaker

INDEX:
1. Stop Lever (left)
2. Left Pole Lever
3. Center Pole Lever
4. Anti-bounce Lever
5. Lever for Auxiliary Switch
6. Right Pole Lever
7. Stop Lever (right)
Figure 9 - Cam Shaft Roller Inspection

- Mechanism Side Frame
- Main Drive Link
- Roller Containing Link
- Inspect for Visible Gap
- Main Roller
- Cam
- Outer Laminates
- Roller rides on portion of outer laminate is acceptable
Figure 10 - Spring Release Device
Figure 11 – SPB-100 Jumper Diagrams
Figure 12 – DS-632 Contact Dimensions and Alignment

VIEW "B"

STATIONARY ARCING CONTACTS

DIMENSION A
0.020" MINIMUM BOTH SIDES

BREAKER CLOSED

DIMENSION C
0.42" ± 0.08"

BREAKER OPEN

PIN X

BREAKER CLOSED

PIN X

BREAKER OPEN
Figure 13 – Moving and Stationary Contact Details
Figure 14 – Undervoltage Trip Device Details