

BSM #830 B
**KS-5312 EMERGENCY CELL SWITCH, AND
AUTOMATIC SWITCH COMPANY TRANSFER SWITCHES
HAVING NO KS DESIGNATIONS
REQUIREMENTS AND ADJUSTING PROCEDURES**

1. GENERAL

1.01 This section covers the following switches.

EMERGENCY CELL SWITCH	TRANSFER SWITCHES
Palmer Electric KS-5312	Automatic Switch Co Part of Bulletins 905, 907, and 908 Assemblies Catalog No. 119S8C

The transfer switches are used mainly in engine control circuits. Information covering the KS-5312 switch and the transfer switches was formerly covered in Sections 026-356-701 and 026-365-701 respectively.

1.02 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper applications of the requirements listed herein.

1.03 *Phi* (ϕ): Requirements are marked with a phi when they are not required to be checked before turnover.

1.04 *Asterisk* (*): Requirements are marked with an asterisk when to check for them would necessitate dismantling or dismounting of apparatus, or would affect the adjustment involved, or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons, or its performance indicates that such a check is advisable.

1.05 *Caution: Before performing any work on a switch or checking requirements other than electrical or temperature requirements, disconnect the switch from the power supply. If the switch operates in an automatic control circuit, the automatic control should be made inoperative as described in the appropriate section covering the apparatus.*

1.06 For maintenance of Automatic Switch Company relays which are part of Bul-

letin 905, 907, and 908 assemblies, refer to Section 040-804-701.

1.07 Orders for parts needed for replacement should give the nameplate data of the contactor, including manufacturer's name, type or bulletin number, and serial number, KS and list numbers if any, together with a description of the part.

2. REQUIREMENTS

ϕ 2.01 *Mounting:* The switch shall be fastened securely to its mountings. Fasteners holding components together shall be secure.

Gauge by feel.

Caution: Do not touch or short-circuit live terminals or parts.

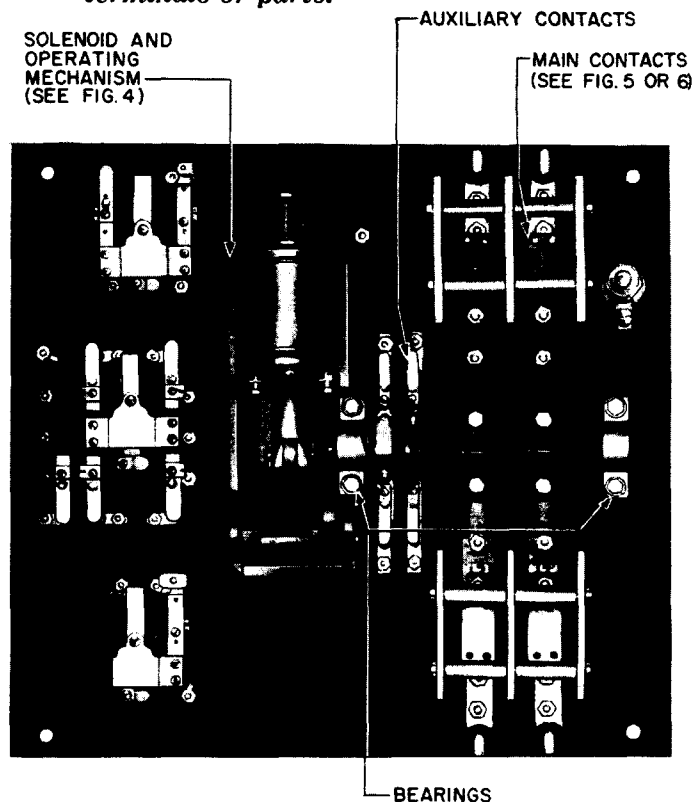


Fig. 1 – Automatic Switch Company, Transfer Switch, Bulletin 905

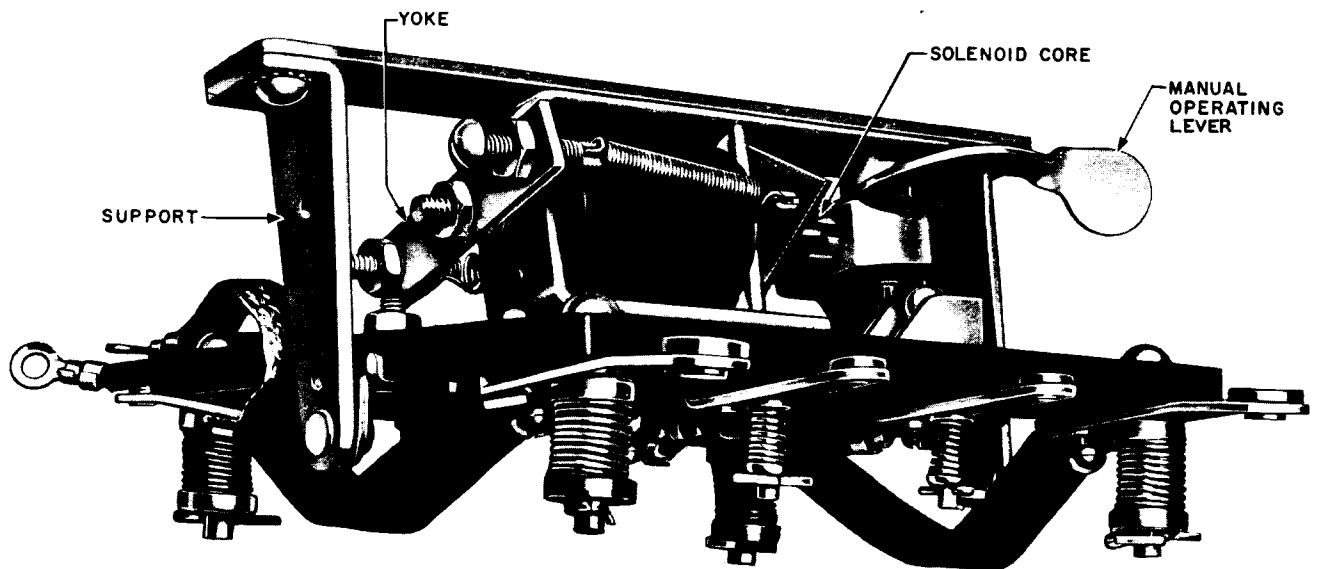


Fig. 2 - Automatic Switch Company Transfer Switch, Catalog No. 11958C

2.02 Cleaning Contacts and Removing Build-ups: Contacts shall be clean and free from buildups which might interfere with reliable contact.

Gauge by eye.

2.03 Contact Alignment: When the contacts are completely closed, the centers of the contact surfaces shall coincide within the limits specified below.

CONTACTS	MAX
Main	1/8 inch
Auxiliary	1/32 inch

Gauge by eye.

2.04 Contact Sequence

KS-5312 Emergency Cell Switch

(a) Contact sequence when operating shall be

Contacts 4 and 5	make
Contacts 2 and 3	break
Contacts 6 and 7 (mechanical latch operates)	make
Closing coil contacts	break
Tripping coil contacts	make

Gauge by eye.

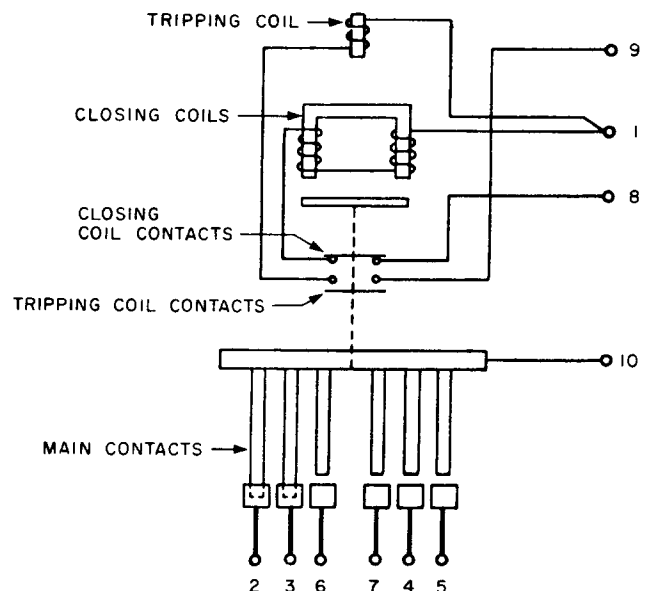


Fig. 3 - KS-5312 Emergency Cell Switch Schematic

Bul 905, 907, and 908 Switches

(b) The laminated brush main contacts shall break first, the arc tip contacts second, and the graphalloy arcing contacts, if provided, third. They shall make in the reverse order. All like contacts of a multipole switch shall make at approximately the same time.

Gauge by eye.

No. 119S8C Switch

(c) All NO contacts shall make at approximately the same time.

Gauge by eye.

(d) All NC contacts shall break at approximately the same time.

Gauge by eye.

***2.05 Plunger and Auxiliary Contact Setting:**

(a) **Bul 905, 907, and 908 Switches:** As the solenoid moves into the coil, the auxiliary contacts shall break when the distance as measured from the bottom surface of the leather washer to the top surface of the solenoid frame or to the top surface of the cover-plate (where one is provided) is in accordance with dimension B.

AMPERE CAPACITY	DIVISION B (See Fig. 4)
30, 75, and 100	1 inch
150	1-7/32 inch
200, 300, and 400	2-5/32 inch
600	2-17/32 inch

Use R-8550 scale and 81A test set.

Caution: Disconnect the transfer switch from both sources of power before handling.

(b) **No. 119S8C Switch:** The auxiliary contacts shall be adjusted to break when the solenoid core has moved from its normal position.

Min 1/4 inch

Max 5/16 inch

Use the R-8550 scale.

2.06 Contact Pressure and Follow

(a) **KS-5312 Switch:** The laminated main contacts of the KS-5312 emergency cell switch shall flex noticeably when making and breaking contact. When fully closed, all leaves of the laminated contact shall be separated one from the other.

Gauge by eye.

(b) **Bul 905, 907, and 908 Switches**

(1) The pressure of auxiliary contacts, when closed, shall be

Min 40 grams

Use 70D gauge.

(2) There shall be appreciable follow and adequate pressure in the main contacts.

Gauge by eye.

(c) **No. 119S8C Switch:** Contact pressure, measured with the contacts closed, shall be as follows.

	OUNCES	MIN	GRAMS
Main Contacts	10		300
Auxiliary Contacts	—		40

Use the 70D or 79B gauge or the R-2771 spring balance as applicable.

2.07 Freedom of Operation: The operating mechanism shall move freely without binding.

Gauge by feel.

2.08 Electrical Requirements

(a) The switch shall meet the electrical requirements specified in the Circuit Requirements Table or other job information.

(b) Where electrical requirements are not specified in the Circuit Requirements Table, operation of the switch shall be checked at the minimum coil voltage specified on the nameplate.

(c) Check of electrical requirements may be at the temperature at which the switch is found unless H (hot) or C (cold) is specified in the Circuit Requirements Table.

(d) Where H is specified in the Circuit Requirements Table without heating instructions, the operating coil shall be energized for at least 1 hour prior to the test.

(e) Where C is specified in the Circuit Requirements Table without cooling instructions, the operating coil shall be de-energized for at least 2 hours prior to the test.

***2.09 Temperature:** The rise in temperature of the switch parts above an ambient temperature between the limits of 10 C and 40 C shall not exceed the following.

	MAXIMUM RISE ABOVE AMBIENT
Coils and Solid Contacts	65 C (149 F)
Laminated Contacts	30 C (86 F)

Use a thermometer.

If the temperature is thought to be excessive, check as follows. Hold the bulb of the thermometer against the hottest spot in question,

covering the part of the bulb not in contact with the part being measured by a pad of asbestos. Observe the highest temperature indicated after it has stabilized.

Caution: Various parts reach temperatures at which it is dangerous to touch them.

3. ADJUSTING PROCEDURES

3.001 *List of Tools, Gauges, Materials, and Test Apparatus*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
373D	Contact Burnisher Holder
374A	Burnisher Blade
417A (2 reqd)	1/4- and 3/8-Inch Hex. Open Double-End Flat Wrench
KS-2662	File
KS-6015	Duckbill Pliers
KS-14208 (2 reqd)	Brush
R-1542	6-Inch Single-End Adjustable Wrench
—	Long-Nose Pliers
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
—	5-Inch E Screwdriver
GAUGES	
70D	50-0-50 Gram Gauge
79B	0-1000 Gram Push-Pull Tension Gauge
R-2771	0- to 6-Pound Spring Balance
R-1032, Detail 1	Thermometer -5° to +150 C
R-8550	6-Inch Steel Scale
—	Voltmeter, AC, Weston Model 528, Ranges 300/150

CODE OR SPEC NO.	DESCRIPTION
MATERIALS	
KS-2423	Cotton Twill Cloth
KS-6232	Light Mineral Oil
KS-8372	Stabilized Trichloroethylene
—	Grease 260-300P
—	Abrasive Cloth, 150 Grade
—	Asbestos Pad
—	1-Ounce Bottle
TEST APPARATUS	
81A	Test Set (buzzer)
—	Enclosed Safety Switch, 30 Ampere, 250 Volt, Double-Pole, Double-Throw (Bulldog Electric Products Co, or Square D Co, suggested)
—	Autotransformer, Continuous Tap (Variac, 2.5-ampere 230-volt input, type V-5HMT, General Radio Co, or equivalent)
(as reqd)	Fuses, 3 Amperes, 250 Volts

- 3.01 *Mounting* (Reqt 2.01)
- (1) Tighten loose mounting screws and terminal nuts.
- 3.02 *Cleaning Contacts and Removing Build-ups* (Reqt 2.02)
- (1) *General:* The purpose of cleaning contacts is to remove any gummy or dirty substances that would interfere with reliable contact. It is not necessary or desirable to keep contacts polished or shining. Before cleaning contacts or removing buildups, disconnect the power supply from the contacts (see 1.05).
- (2) *Cleaning Contacts:* To remove dirt and gummy substance, clean the contacts with KS-8372 trichloroethylene as covered in (a) and (b) and then brush them with a dry, clean KS-14208 brush as covered in (c).
- (a) Pour a small quantity of the trichloroethylene into a 1-ounce bottle. It is important to avoid the use of contaminated trichloroethylene in cleaning the contacts. Therefore, discard the trichloroethylene as soon as it appears slightly dirty.

(b) Dip the hairs of a clean KS-14208 brush their full length in the trichloroethylene. Remove excess fluid by wiping the brush on the edge of the bottle. Then, with the pair of contacts open, brush the entire surface of the contact to be cleaned with the moist brush.

(c) Brush the contacts with a dry, clean KS-14208 brush.

(3) **Removing Buildups:** There shall be as little smoothing of contacts as is consistent with satisfactory operation. Contacts should be smoothed while closed, where practicable.

(a) To remove buildups, use a strip of 150 grade abrasive cloth or the 374A burnisher blade held in the 373D contact burnisher holder. Do not use abrasive cloth on silver contacts as it only results in a loss of silver and a reduction of life. Clean silver contacts as in (2) or smooth with the burnishing tool.

(b) Insert the abrasive cloth or burnisher blade between the contacts to be smoothed, and draw it back and forth until the buildups are reduced sufficiently to insure reliable contact. Exercise care to avoid reducing the height of the contact. After burnishing, brush the contacts with a dry, clean KS-14208 brush.

(c) For large copper contacts a KS-2662 file may be used as necessary. Clean the contacts as outlined in (2) after smoothing.

(4) Replace contacts which are badly worn. Contact springs and pigtails associated with movable contacts should also be replaced when the contacts are replaced.

3.03 Contact Alignment (Reqt 2.03)

(1) With the pliers, shape an auxiliary contact spring that is slightly bent or out of alignment. Any contact spring that becomes badly bent out of shape should be removed and reshaped or replaced with a new contact spring.

(2) In the case of main contacts, correct misalignment by loosening the movable contact arm at the point of attachment to the shaft. Adjust as required and retighten.

3.04 Contact Sequence (Reqt 2.04)

(1) If contacts do not make or break approximately at the same time, inspect the group for any that are out of alignment with the others. Correct by shaping the contact springs with the pliers or raising or lowering stationary contact assemblies, as required, to bring them into alignment with the others of the group. When the contacts are supported by heavy members which cannot be shaped with the pliers, check for mechanical trouble which may require the replacement of parts. Remove dirt or other obstructions from graphalloy arcing contacts of the type shown in Fig. 6 by wiping with a clean cloth or replace springs as required. The arcing tips (see Fig. 6) should be shaped with pliers or replaced when required.

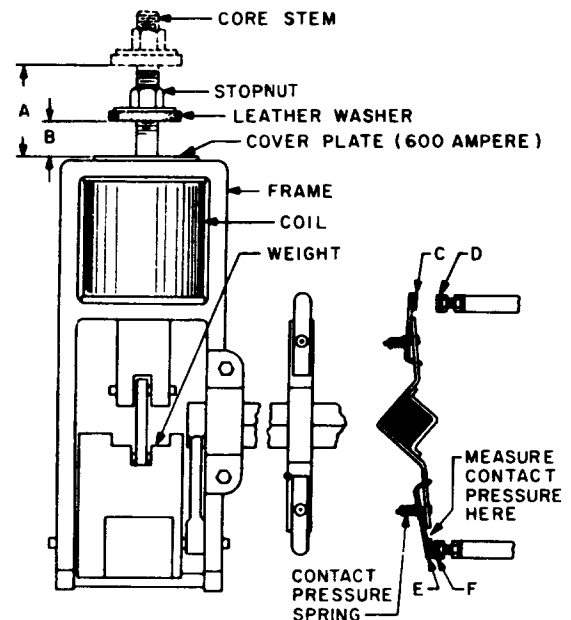


Fig. 4 — Plunger and Auxiliary Contact Adjustment — Bulletin 905, 907, and 908 Switches

3.05 Plunger and Auxiliary Contact Setting — (Reqt 2.05)

Bul 905, 907, and 908 Switches (see Fig. 4)

(1) Before adjusting the auxiliary contacts, be sure that the top position of the plunger core stem, as measured from the bottom surface of the leather washer to the top surface of the solenoid frame or to the top surface of

the coverplate where one is provided, is set at dimension A as follows.

AMPERE CAPACITY	DIMENSION A (see Fig. 4)
30, 75, and 100	1-7/32 inch
150	1-1/2 inch
200, 300, and 400	2-1/2 inch
600	3 inch

The required dimension can easily be obtained by adjusting the stopnut on the core stem.

(2) To adjust the auxiliary contacts, pull up the core stem manually and insert a wooden block between the leather washer and the top of the solenoid frame or coverplate. The height of the wooden block must be cut to dimension B as indicated in the requirement.

(3) With the block in position, one set of contacts (C) and (D) or (E) and (F) should just make contact. Adjustments can be made by raising or lowering the adjustable stationary contact screws (D) and (F) to obtain the proper setting. Use the 417A tool for loosening the locking nut before adjusting and for retightening it after the adjustment is completed.

(4) Adjust the opposite set of contacts by lifting the core stem to its extended stroke and let the weight fall in the opposite direction. Adjust the stationary contacts as in (3).

(5) Remove the block and recheck, operating the core stem manually as before. Use should be made of an 81A test set to indicate the moment at which the contacts break. Check requirement 2.06 for proper auxiliary movable contact pressure.

No. 119S8C Switch

(6) The stationary contacts are adjusted by rotating them, as required, on their supporting studs. Connect the 81A test set to the pair of contacts being checked. Obtain partial operation of the switch by slowly moving the manual operating lever in the required direction. With the steel scale held against the support with its end against the yoke, observe the travel of the core, to which the yoke is attached, at the moment the contacts break.

Adjust the stationary contact as required. See Fig. 2, which shows the operating mechanism and movable contact assembly, omitting the stationary contacts.

3.06 Contact Pressure and Follow (Reqt 2.06)

KS-5312 Switch

(1) If the laminated contacts of KS-5312 emergency cell switch fail to meet the requirement for flexing, look for softening of the metal and replace as required.

Bul 905, 907, and 908 Switches

(2) *Auxiliary Contacts* — See Fig. 1: To measure contact pressure of auxiliary contacts, operate the switch manually to the desired position. Place the gauge against the contact spring as near to the moving contact as possible and exert a pressure with the gauge away from the stationary contact. Observe the gauge as the moving contact leaves the stationary contact. Replace contact springs which have low contact pressure.

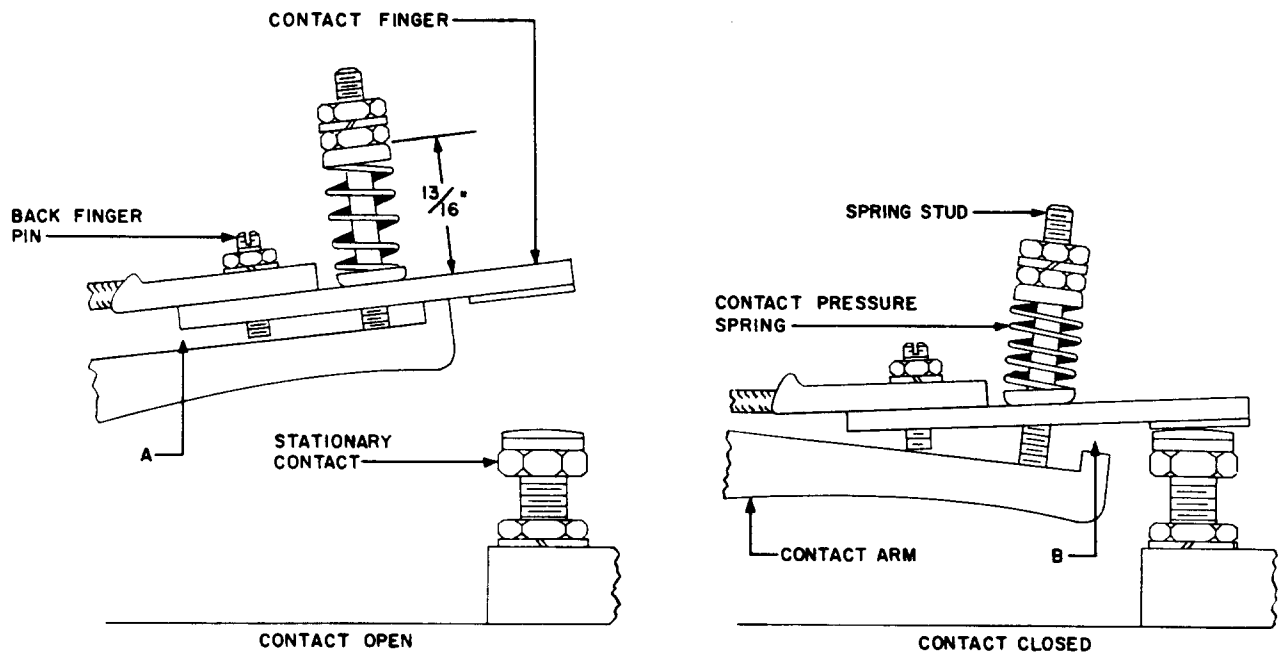
(3) *Butt-Type Main Contacts* — See Fig. 5:

The main contacts are adjustable as follows. With the contacts in the open position, adjust the nuts above the spring until the spring height is 13/16 inch. Adjust the back finger pin until the gap at point A is 1/8 inch. With the contacts in the closed position, adjust the stationary contact screw until the gap at point B is 1/8 inch. After making adjustments, tighten all locknuts and operate the contactor manually several times to recheck the adjustment. Replace weak contact springs and worn contacts as required.

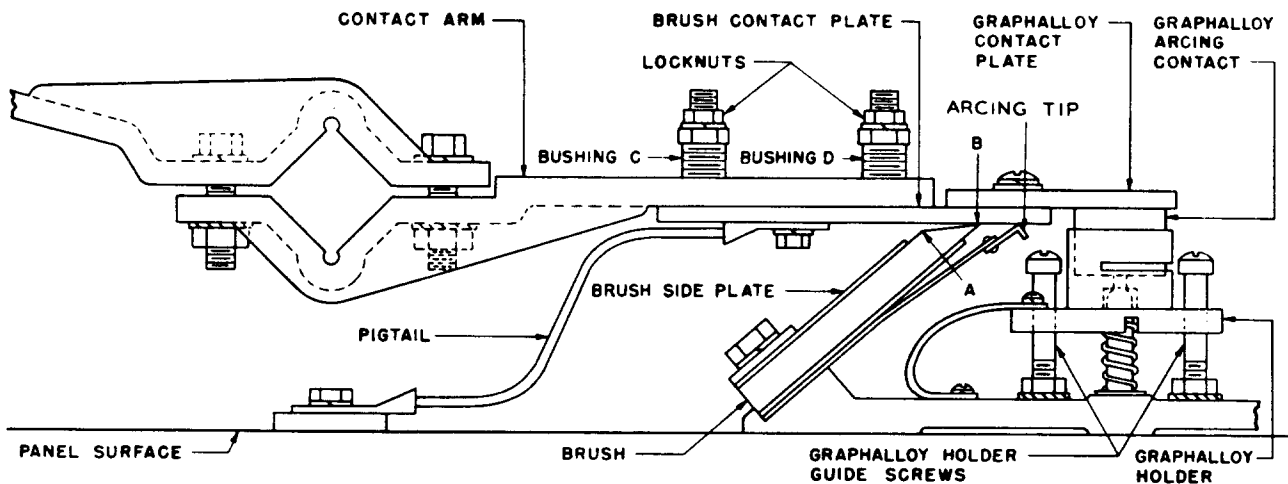
(4) *Brush-Type Main Contact* — See Fig. 6:

On switches having laminated brush main contacts of the type shown in Fig. 6, first adjust the graphalloy arcing contacts, if any, in accordance with (a) and then adjust the laminated brush contact in accordance with (b), (c), (d), and (e). On multipole switches do each step on all like contacts before proceeding to next step.

(a) By means of the graphalloy holder guide screws, adjust the graphalloy arcing contact so that it springs out 1/4 inch when the contact arm is opened but is parallel with the graphalloy contact plate when the contact arm is closed.



**Fig. 5 – Contact Adjustment for Butt-Type Main Contacts —
Bulletin 905, 907, and 908 Switches**



**Fig. 6 – Contact Adjustment for Laminated-Type Contacts and Graphalloy
Arcing Contacts — Bulletin 905, 907, and 908 Switches**

- (b) Loosen the (C) and (D) bushings until the brush contact plate is stopped up against the underside of the contact arm.
- (c) With the contact arm closed, advance the (C) and (D) bushings until point B is in contact and point A is not in contact by 1/16 to 3/32 inch.

- (d) Further advance the (C) and (D) bushings equal amounts until point A is also in contact and deflected 1/64 to 1/32 inch away from the brush side plate.
- (e) Tighten all locknuts, operate the switch manually several times, and check all adjustments and the sequence of operation

per 2.04. The arcing tip contacts may be shaped with pliers if necessary. These adjustments are critical as insufficient contact pressure will result in overheating or excessive contact pressure will not allow the switch to lock in when operated. Replace as necessary.

No. 11958C Switch

(5) When necessary to close contacts to check the requirement, manually operate the switch by actuating the solenoid plunger. To measure contact pressure, apply the tip of the gauge to the movable contact spring as near to the contact as practicable and pull the gauge to lift the spring. Read the gauge when the movable contact just leaves the stationary contact.

(6) Contact pressure may be adjusted by relocating the stationary contacts. This should be resorted to only after getting whatever adjustment is available by changing the tension of the contact springs. When one contact spring has been shaped or otherwise changed, or when the position of a stationary contact is changed, recheck the contact pressure on all the contacts on the switch.

3.07 Freedom of Operation (Reqt 2.07)

Bul 905, 907, and 908 Switches

(1) Operate the switch manually. If friction or binding is observed in the joints in the linkage, remove dirt with a cleaning cloth moistened with KS-8372 trichloroethylene as required and apply KS-6232 light mineral oil sparingly. Apply one or two drops of light mineral oil at the bearings which support the weight if the action appears to be sluggish.

(2) Remove dirt from the surface of the plunger or the brass sleeve in which it operates. Rub with a cleaning cloth moistened with KS-8372 trichloroethylene if necessary. Avoid the use of oil.

(3) If poor operation is traced to the ball bearings (see note) which support the shaft carrying the main movable contact arms, remove the caps which cover them. Pick away old grease with the KS-6320 orange stick and wipe with a cleaning cloth. Apply one or two drops of KS-6232 light mineral oil and operate the switch several times to assist the oil

to work its way into the bearing. Apply 260-300P grease, filling the space between the inner and outer ball races nearly full. Replace the caps.

Note: The shafts carrying the main movable contact arms of later models of the 30-, 75-, and 100-ampere switches are equipped with Oilite bearings and do not require lubrication.

No. 11958C Switch

(4) Examine the surface of the solenoid plunger and the brass sleeve in which it operates and, if found dirty, clean the surface as required using a KS-2423 cloth moistened with trichloroethylene followed by a dry cloth.

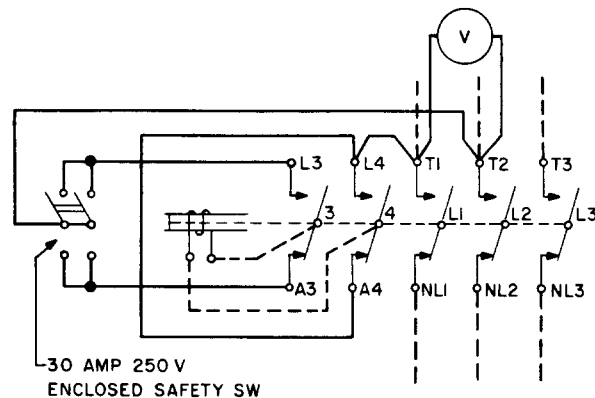


Fig. 7 – Checking Circuit for Bulletin 905, 907, and 908 Switches

3.08 Electrical Requirements (Reqt 2.08)

Bul 905, 907, and 908 Switches

(1) When checking for the electrical requirements, disconnect the switch from the working circuit. Disconnect and tape the leads at terminals L3, L4, A3, and A4. Set up the checking circuit shown in Fig. 7 using wire of the sizes specified below. The operating coil is designed for momentary duty only and for that reason the switch should not be operated more often than once per minute.

CAPACITY OF CONTACTOR AMPERES	WIRE SIZE MINIMUM
300, 75, and 100	No. 14
150	No. 12
200, 300, 400, and 600	No. 8

Where practical use the engine-alternator under manual control as the source of voltage. If the switch fails to operate as required, recheck the auxiliary contacts in 2.02, 2.03, 2.05, and 2.06. Check 2.07.

No. 119S8C Switch

(2) A check of the operation of the No. 119S8C switch is made as follows. Disconnect the switch from the working circuit. Restore the switch to its normal position by manually actuating the solenoid plunger. With the switch in its normal position connect the solenoid coil across the output of a continuous tap autotransformer. Connect the Weston

Model 528 voltmeter across the output of the autotransformer. Connect the input of the autotransformer to the ac supply through 3-ampere fuses. Adjust the output of the autotransformer to the values specified in the Circuit Requirements Table. If the switch fails to operate, check requirements 2.06(c) and 2.07.

3.09 Temperature (Reqt 2.09)

(1) If the temperature exceeds the specified limit, see that 2.02, 2.03, 2.06, and 2.07 are met. If these requirements are met and the temperature is above the specified limit, refer the matter to the supervisor as the coil or the contacts may have to be replaced.