CONTACTORS
KS-15514 AND KS-15934
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers KS-15514 and KS-15934 contactors which are used in J86621 control cabinets associated with 900-type engine-alternator plants.

1.02 This section is reissued to add KS-15934 contactors, to revise the auxiliary contact adjustment and plunger setting, to revise the method of cleaning contacts, to revise the temperature requirement, and to add a procedure for adjusting butt-type main contacts. Detailed reasons for reissue will be found at the end of the section.

1.03 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.

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

1.05 *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.

1.06 ***Precautions Against High Voltage:*** Before performing any work on the contactor or checking requirements other than electrical or temperature requirements, disconnect the contactor from the power supply. If the contactor operates in an automatic control circuit, the automatic control should be made inoperative as described in the appropriate section covering the apparatus.

1.07 Where the KS-15514 contactors fail to operate satisfactorily after meeting the requirements of this section, it is recommended that they be replaced by or converted to the KS-15934 contactors. Refer to Section 026-360-801 for information regarding the conversion of KS-15514 contactors.

2. REQUIREMENTS

ϕ2.01 ***Mounting:*** The contactor shall be fastened securely to its mountings. Fastenings holding components together shall be secure.

Gauge by feel.

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

ϕ2.02 ***Cleaning Contacts and Removing Build-Ups:*** Contacts shall be clean and free from build-ups 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:*** 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 contactor shall make at approximately the same time.

Gauge by eye.

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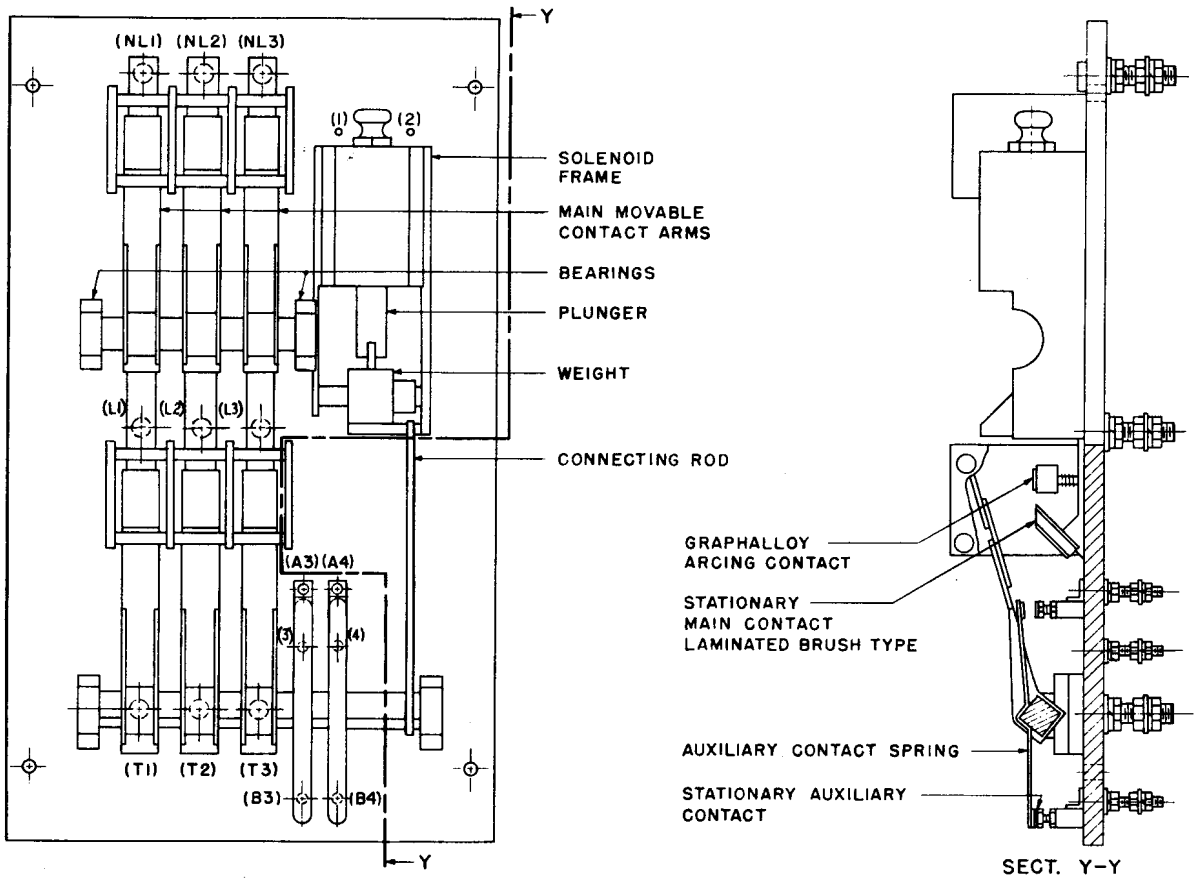

Fig. 1 – Contactor With Laminated Brush-Type Main Contacts

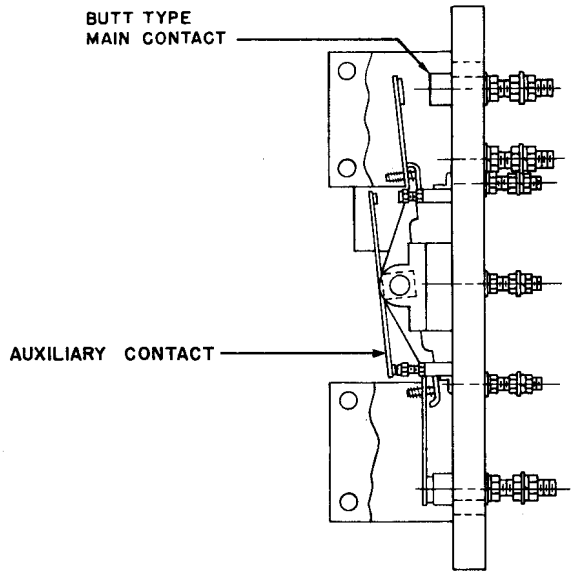

Fig. 2 – Contactor With Butt-Type Main Contacts

2.05 ***Plunger and Auxiliary Contact Setting:*** 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	DIMENSION B (See Fig. 3)
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.

2.06 ***Contact Pressure and Follow***

(a) The pressure of auxiliary contacts, when closed, shall be
Min 40 grams

Use 70D gauge.

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

Gauge by eye.

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

Gauge by feel.

2.08 ***Electrical Requirements***

(a) The contactor 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 contactor 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 contactor 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 contactor 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 Contacts	65 C (149 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-6320	Orange Stick
KS-14208 (2 reqd)	Brush
R-1542	6-inch Single-end Adjustable Wrench
—	Long-nose Pliers
—	3-inch C Screwdriver or the Replaced 3-inch Cabinet Screwdriver
—	4-inch E Screwdriver or the Replaced 4-inch Regular Screwdriver
GAUGES	
70D	50-0-50 Gram Gauge
R-1032, Detail 1	Thermometer −5° to +150 C

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
R-8550	6-inch Steel Scale
—	Voltmeter, AC, Weston Model 528, Ranges 300/150
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
—	Enclosed Safety Switch, 30 Ampere, 250 Volt, Double-pole, Double-throw (BullDog Electric Products Co, Detroit, Mich., or Square D Co, Milwaukee, Wis., suggested.)

3.002 ***General Procedure***

(1) It is recommended that requirements be checked and any required adjustments be made in the order outlined in the following paragraphs.

Caution: See that this apparatus is disconnected from both sources of power before handling.

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 build-ups, disconnect the power supply from the contacts (see 1.06).

(2) ***Cleaning Contacts:*** To remove dirt and gummy substance, clean the contacts with KS-8372 tricholoroethylene 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 Build-Ups:*** There shall be as little smoothing of contacts as is consistent with satisfactory operation. Contacts should be smoothed while closed. Care must be taken that contacts are not forced out of their normal position while being held closed manually. Where practicable, use a KS-6320 orange stick to hold the contacts closed.

(a) To remove build-ups 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) above 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 build-ups 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.

(4) Replace contacts which are badly worn. Contact springs and pigtails associated with movable contacts should also be replaced when the contacts are replaced. Refer to Section 026-360-801 for replacement information.

3.03 ***Contact Alignment*** (Reqt 2.03)

(1) Shape, with the pliers, 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) Remove dirt or other obstructions from graphalloy arcing contacts of the type shown in Fig. 1 or replace springs as required.

(2) The arcing tips (see Fig. 5) should be shaped with pliers or replaced when required.

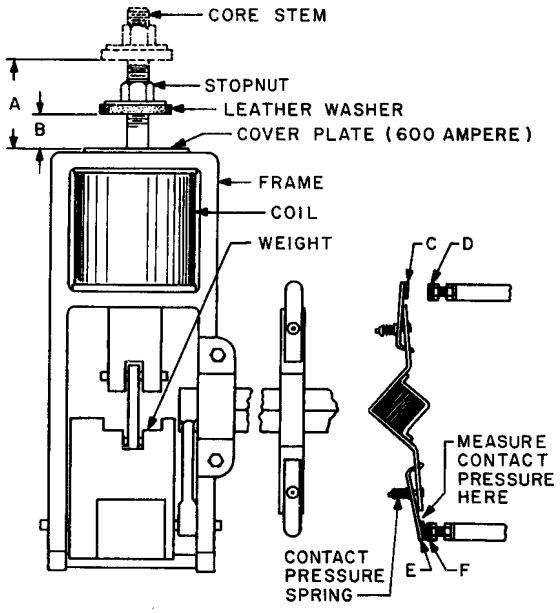

Fig. 3 – Plunger and Auxiliary Contact Adjustment

3.05 ***Plunger and Auxiliary Contact Setting — See Fig. 3*** (Reqt 2.05)

(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 cover plate where one is provided, is set at dimension A as follows.

AMPERE CAPACITY	DIMENSION A (SEE FIG. 3)
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 cover plate. 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.

3.06 ***Contact Pressure and Follow*** (Reqt 2.06)

(1) ***Auxiliary Contacts — See Fig. 3:*** To measure contact pressure of auxiliary contacts, operate the contactor 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.

(2) ***Butt-Type Main Contacts — See Fig. 4:*** The main contacts of the 75- and 100-ampere contactors 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.

(3) ***Brush-Type Main Contact — See Fig. 5:*** On contactors having laminated brush main contacts of the type shown in Fig. 5, first adjust the graphalloy arcing contacts, if any, in accordance with (a) below and then adjust the laminated brush contact in accordance with (b), (c), (d), and (e). On multipole contactors 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.

(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) bushing 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 contactor 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 contactor to lock in when operated. Replace as necessary.

3.07 ***Freedom of Operation*** (Reqt 2.07)

(1) Operate the contactor 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 contactor 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 contactors are equipped with Oilite bearings and do not require lubrication.

(4) If the solenoid plunger of the KS-15514 contactor binds and vibrates and the contactor fails to transfer completely, check for friction and binding as covered in (1), (2), and (3). If the plunger continues to bind, it is recommended that the KS-15514 contactor be converted to or replaced by the KS-15934 contactor. Refer to Section 026-360-801 for information regarding the conversion.

Note: To operate the switch, the KS-15934 contactor has a rectifier and a dc solenoid to avoid the large momentary current inrush required by an ac solenoid.

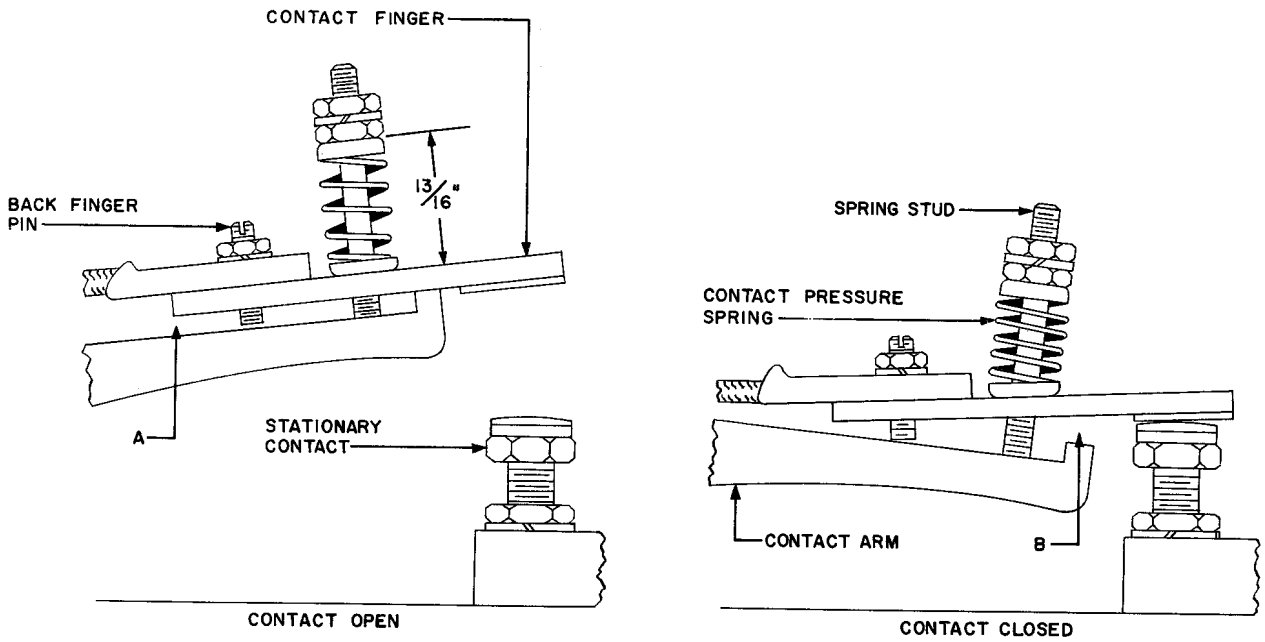

Fig. 4 – Contact Adjustment for Butt-Type Main Contacts (75- and 100-Ampere Contactors)

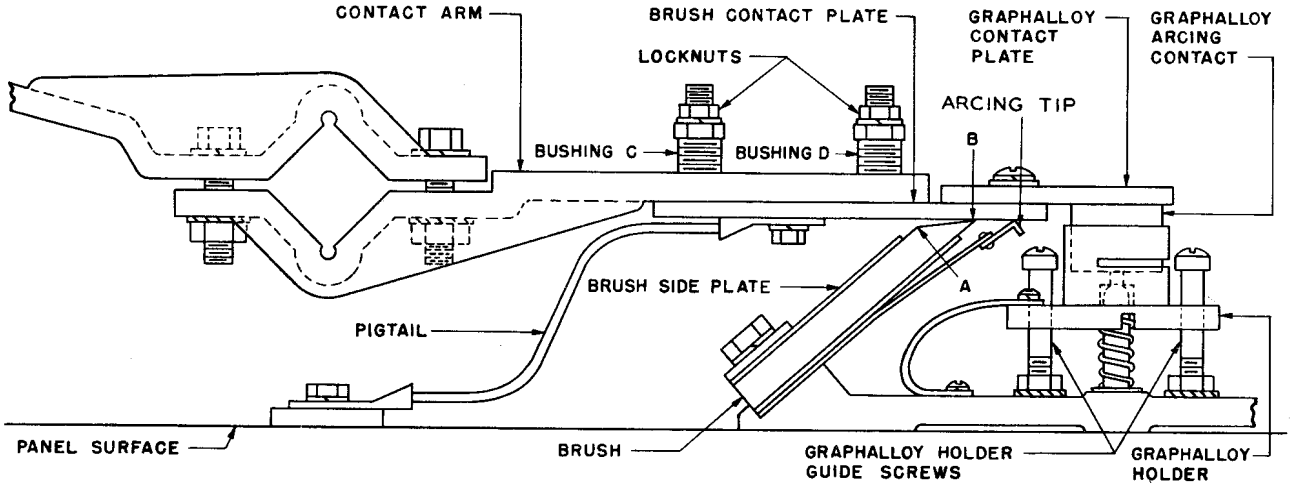

Fig. 5 – Contact Adjustment for Laminated-Type Contacts and Graphalloy Arcing Contacts

3.08 ***Electrical Requirements*** (Reqt 2.08)

(1) When checking for the electrical requirements, the contactor should be disconnected from the working circuit. This can usually be accomplished by operating a switch. Disconnect and tape the leads at B3, B4, A3, and A4 terminals. Set up the checking circuit shown in Fig. 6 or 7, using wire of the size specified below. The operating coil is designed for momentary duty only and for that reason the contactor should not be operated more often than once per minute.

CAPACITY OF CONTACTOR AMPERES	WIRE SIZE MINIMUM
30, 75, and 100	No. 14
150	No. 12
→ 200, 300, 400, and 600	No. 8

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

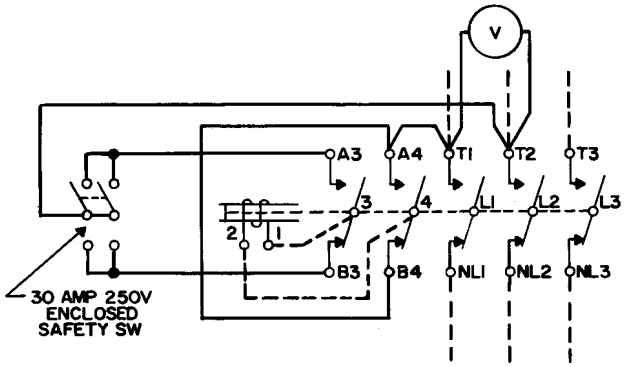

Fig. 6 – Checking Circuit for KS-15514 Contactors

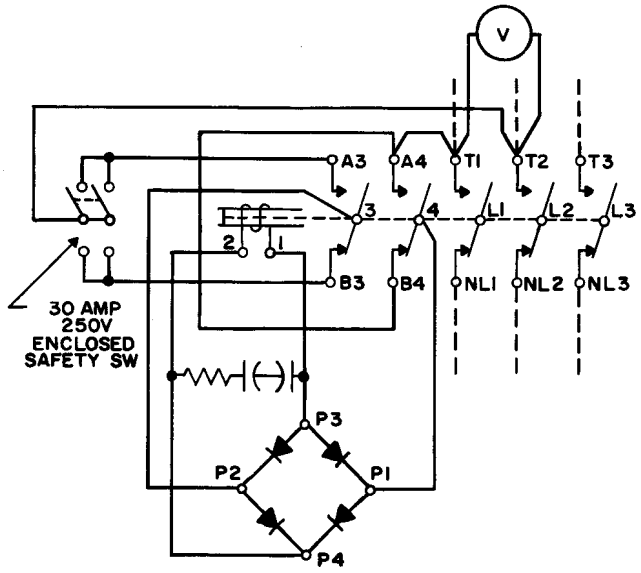

Fig. 7 – Checking Circuit for KS-15934 Contactors

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.

REASONS FOR REISSUE

1. To revise the title to include KS-15934.
2. To remove former 1.04 covering the (#) sign and to add a new 1.04 covering the (ϕ) sign.
3. To revise 1.05 covering the (*) sign.
4. To include information on automatic control circuits (1.06).
5. To add information regarding conversion and replacement of KS-15514 contactors. [1.07 and 3.07(4)]
6. To add the (ϕ) sign to 2.01 and 2.02.
7. To revise the auxiliary contact adjustment and plunger setting (2.05 and 3.05).
8. To specify ambient temperature and revise the temperature of contacts (2.09).
9. To remove the (#) sign from 2.09 and 3.09.
10. To revise the list of tools, gauges, and materials (3.001).
11. To replace petroleum spirits with trichloroethylene. [3.02(2), 3.07(1), and 3.07(2)]
12. To revise the method of cleaning contacts. [3.02(2)]
13. To specify care in handling movable contacts and reducing the height of contacts; and to include information regarding silver contacts and movable contact pigtails. [3.02(3), 3.02(4)]
14. To add Fig. 3, 4, and 7.
15. To add a procedure for adjusting butt-type main contacts. [3.06(2)]
16. To include 400-ampere contactors. [3.08(1)]
17. To remove the (*) sign from 3.09.