

CONTACTORS, RELAYS, AND TRANSFER SWITCHES
 HAVING NO KS DESIGNATIONS AND
 USED IN ENGINE CONTROL CIRCUITS

1. GENERAL

1.01 This section covers contactors, relays, and transfer switches included in the control equipment furnished for use with engines by the engine manufacturers, and not covered separately by KS designations. It applies specifically to engine control circuits as follows:

SD-80971-01	SD-81017-02	
SD-80994-01	SD-81104-01	←
SD-81017-01	SD-81108-01	←

The contactors relays, and transfer switches included are tabulated below:

<u>Manufacturer</u>	<u>Type or Code</u>
<u>Contactors</u>	

Allen-Bradley	Bul 202
Westinghouse	Type 204-SM
	Type 208-SM

Relays

Allen-Bradley	Bul 200
	Bul 700
Automatic Switch Co.	Part of Bul 905
	Bul 907, and
	Bul 908 assemblies ←
	Type 101S7
	Type 107S11
	Type 161S5

Manufacturer

Type or Code

Relays

	Type 1054	
	Type 5406	←
	Type 5426	←
Duplex Truck	Thermal Type -	
	not coded	
General Electric	Thermo-tector	
Struthers-Dunn	2PMX100, etc.	
	8XXA, 8BXX, etc.	
	84XBA, 84BXC, etc.	
	89XBX101, etc.	←
	106PMX100, etc.	←
Ward-Leonard	Bul 105	
	Bul 131	
Westinghouse	Type SG	
	Type TI-2	

Transfer Switches

Automatic Switch Co.	Part of Bul 905
	Bul 907, and
	Bul 908 assemblies

This section, when specified on any SD drawing, applies to equipment comparable to that listed above.

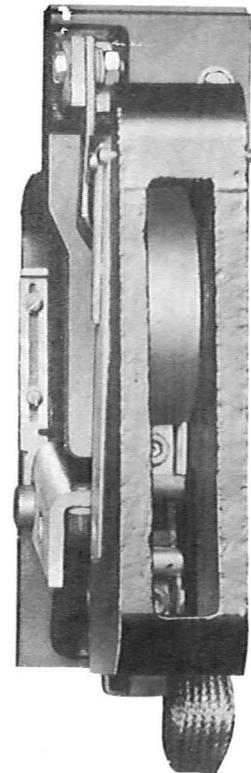
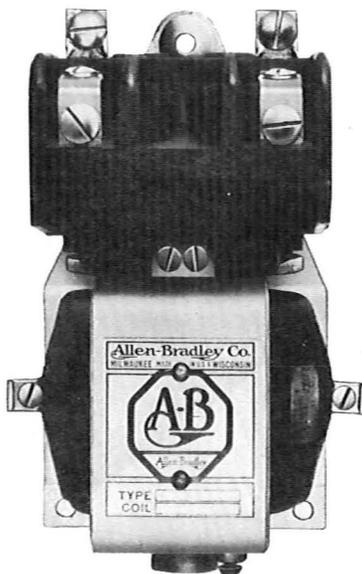


Fig. 1 - Contactor, Allen-Bradley Bul 202

Fig. 2 - Contactor, Westinghouse Type 204-SM

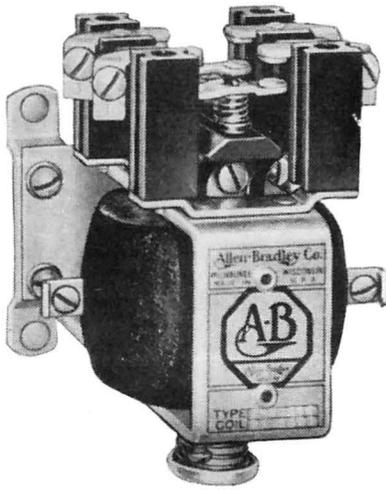


Fig. 3 - Relay, Allen-Bradley Bul 200

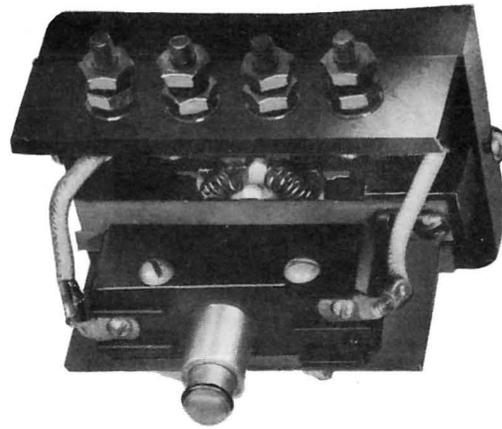


Fig. 4 - Relay, Duplex Trunk

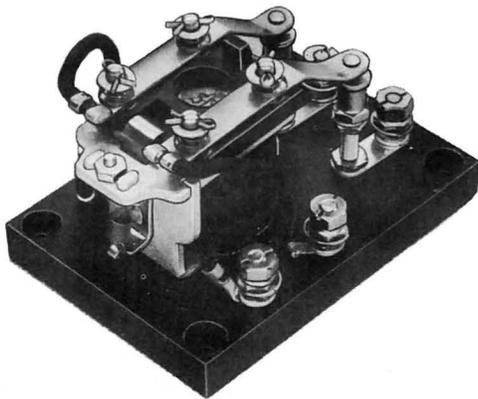


Fig. 5 - Relay, Struthers-Dunn Cat. 8BXX



Fig. 6 - Relay, Ward-Leonard Bul 105

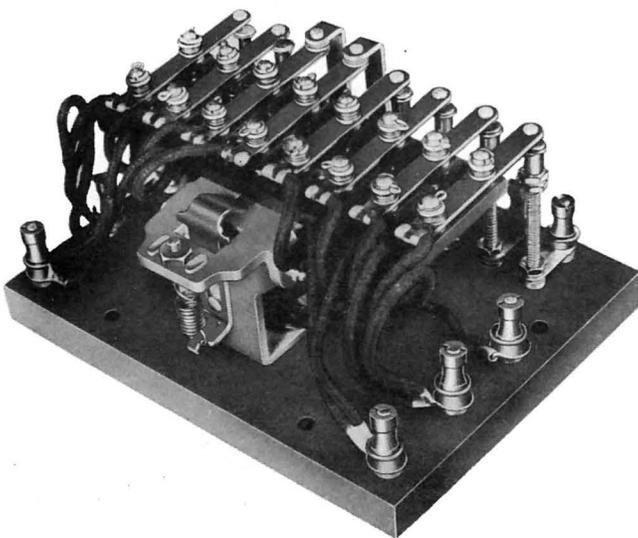


Fig. 7 - Relay, Struthers-Dunn Cat. 2PXM100

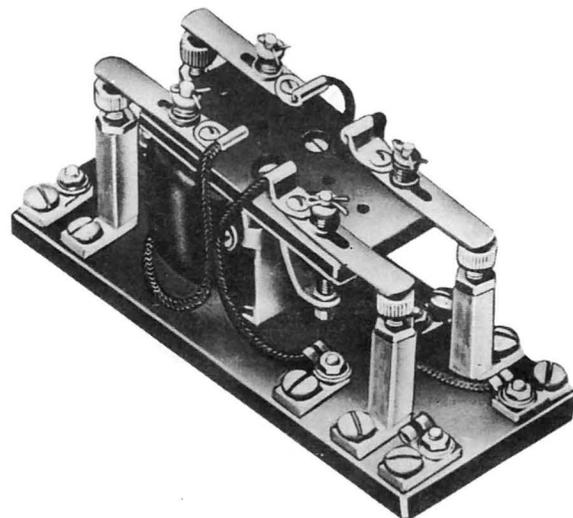


Fig. 8 - Relay, Ward-Leonard Bul 131

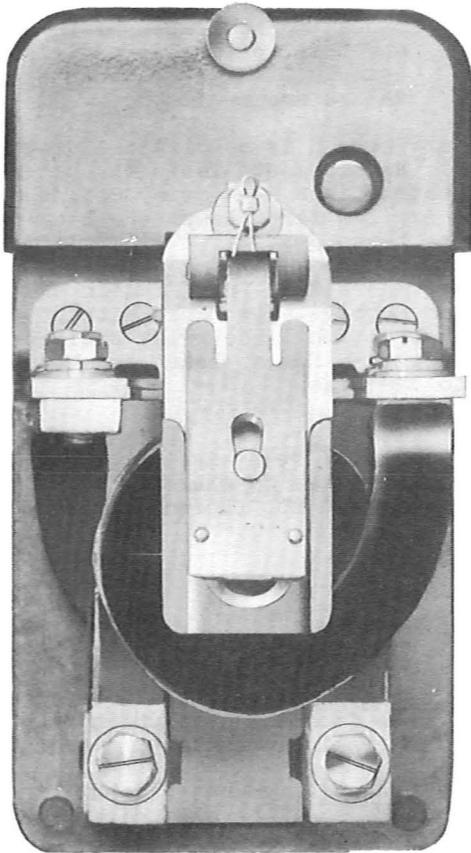


Fig. 9 - Relay, Westinghouse Type TI-2

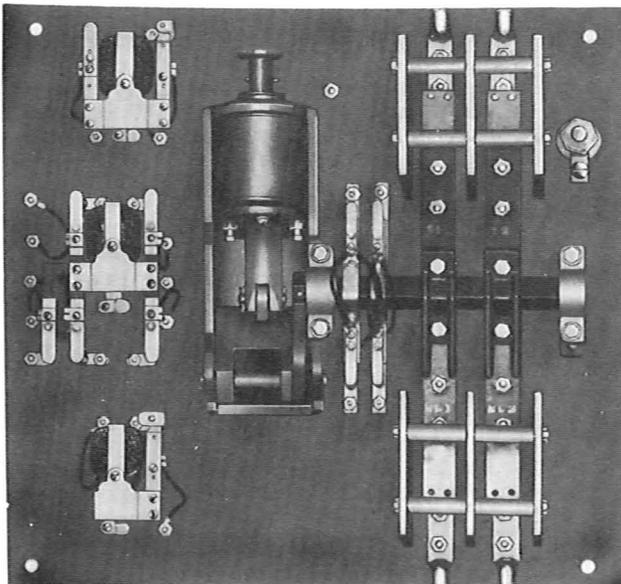


Fig. 10 - Transfer Switch and Relays,
Automatic Switch Company,
Bul 905 Assembly

1.02 It is reissued to add engine control circuits SD-81104-01 and SD-81108-01, and to add to the lists of relays included in the section.

1.03 In the text, the word relay is used to denote contactor, transfer switch, or relay unless specific mention of contactors or transfer switches is required.

1.04 Reference shall be made to section A400.001 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

1.05 Requirements and associated procedures marked with a number sign (#) need not be checked by the installer unless it is thought that the requirement is not being met, or performance indicates that such a check is advisable.

1.06 Requirements and associated procedures marked with an asterisk (*) need not be checked during maintenance unless the apparatus or part is made accessible for other reasons, or performance indicates that such a check is advisable.

1.07 For the purpose of this section, whether contacts of a relay are normally open (NO) or normally closed (NC) depends on the position of these contacts when no operating current is flowing in the coil and not on the position the contact may normally be in for a particular application. NO contacts and NC contacts are sometimes known as front and back contacts, respectively.

1.08 A relay is said to operate when the armature has moved sufficiently for NC contacts to open and NO contacts to close with reliable contact.

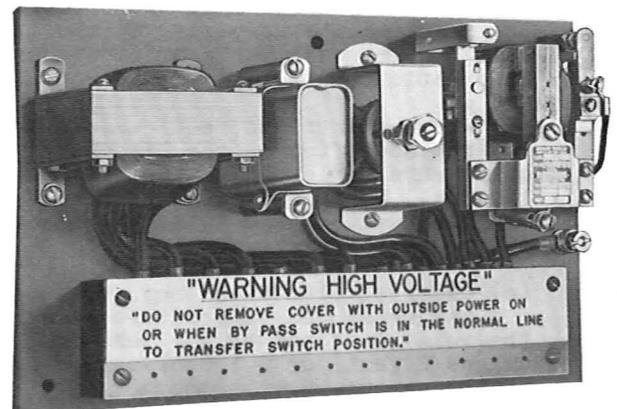


Fig. 11 - Type 107S11 Relay and Associated
Circuit, Automatic Switch
Company

1.09 A relay is said to release when the armature has moved sufficiently for NO contacts to open and NC contacts to close with reliable contact.

1.10 When work is done on a relay in an operating circuit, see that service is maintained. Do not touch at the same time, live terminals or parts which are at different potentials, or otherwise short-circuit them.

1.11 Requirements 2.01 to 2.08 have general application, except as otherwise specified. The following requirements apply to particular apparatus and are to be considered in connection with the general requirements:

2.09 Thermal Relays

2.10 Automatic Switch Company -
Bul 905, Bul 907, and Bul 908
Assemblies

2.11 Allen-Bradley Contactors and
Relays

2.12 Westinghouse TI-2 Relay

1.12 Orders for parts needed for replacement should give the manufacturer's name, his type or code number, nameplate data, if available, and a full description of the part. They should also refer to the KS and list number of the engine set and should be placed on the engine manufacturer.

2. REQUIREMENTS

2.01 Mounting: The relay shall be fastened securely to its mounting. Fastenings holding components together shall be secure. Gauge by feel.

2.02 Electrical Requirements

(a) The relay 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 relay shall be checked at any voltage available within the voltage range on the relay nameplate.

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

Note: Where electrical requirements are not specified in the Circuit Requirements Table or other job information, normal operation of the relay is considered a satisfactory

check, as indicated by (b) and (c), and this would also apply where no nameplate range or other operate values are available.

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

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

*#2.03 Temperature: If the temperature of a magnetic relay is thought to be excessive, measure by thermometer. The temperature shall not exceed

	Maximum
Coils	95C (203F)
Solid Contacts	115C (239F)
Laminated Contacts	90C (194F)

2.04 Contact surfaces shall be clean and free from buildups which might interfere with reliable contact. Gauge by eye.

2.05 Contact Alignment: Each pair of contacts shall be aligned so that when the relay is operated the outer edge of one contact does not overlap the outer edge of the other by more than 1/8 of its diameter or width, at turnover, and not more than 1/4, during life. For large contacts the overlap shall not exceed 1/8". Gauge by eye.

2.06 Contact Sequence: Unless otherwise specified, all NO contacts on the same relay shall make and break approximately simultaneously, and all NC contacts shall break and make approximately simultaneously. Gauge by eye.

2.07 Contact Separation

(a) Contact separation shall be as specified in the Circuit Requirements Table. Use thickness gauge.

(b) If the contact separation is not specified, like contacts on the same relay shall have approximately the same separation. In no case shall the separation be so small that the arc formed at the opening of the circuit is not readily extinguished. Gauge by eye.

2.08 Contact Pressure and Follow

(a) Contact pressure, measured with the contacts closed, shall be as specified in the Circuit Requirements Table. Use fan-type gauge; push-pull tension gauge, or spring-balance, as applicable.

(b) When not specified in the Circuit Requirements Table, the contact pressure or follow shall be as specified in the following table.

<u>Manufacturer</u>	<u>Code</u>	<u>Contact Pressure or Follow</u>
<u>Contactors</u>		
Allen-Bradley	Bul 202	1/16" follow
Westinghouse	204 SM	10 lbs. min. 13 lbs. max.
Westinghouse	208 SM	10 lbs. min. 13 lbs. max.
<u>Relays</u>		
Allen-Bradley	Bul 202 and 700	1/16" follow
Automatic Switch	Bul 905, Bul 907, and Bul 908 Assemblies	Appreciable follow
	Type 1054	Appreciable follow
Duplex Trunk	None	No requirement
General Electric	Thermotector	No requirement
Struthers-Dunn	8XXA, 8BXX, etc.	NO contacts 45 grams min. NC contacts 30 grams min.
	84XBA, 84XBC, etc.	NO contacts 45 grams min. NC contacts 30 grams min.
Ward Leonard	Bul 105	NO contacts 50 grams min. NC contacts 25 grams min.
	Bul 131	NO contacts 50 grams min. NC contacts 45 grams min.
Westinghouse	Type SG	NO contacts 55 grams min. NC contacts 30 grams min.
	Type TI-2	NC contacts 40 grams min.

Transfer Switches

Automatic Switch	Bul 905, Bul 907, and Bul 908	Appreciable follow
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(c) Where no specific values of contact pressure are available there shall be additional movement of the operating mechanism after contacts touch. This usually results in sliding of the contacts or increase in the contact pressure and is known as follow. Gauge by eye and use buzzer or lamp, if necessary.

*#2.09 Thermal Relays: If relays operate reliably, only requirements 2.01 and 2.02 need be checked.

2.10 Automatic Switch Company - Bul 905, Bul 907, and Bul 908

Transfer Switch

(a) Sleeve-type end-bearings shall be lubricated annually with light mineral oil.

(b) The arcing contacts shall make contact before, and break after the laminated main contacts.

*(c) The auxiliary contacts shall break the circuit to the operating coil immediately before the plunger reaches the top of its stroke.

*#2.11 Allen-Bradley Contactors and Relays: Check for follow

*#2.12 Westinghouse TI-2 Relay: Disregard 2.05 and 2.06.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials, and Test Apparatus (Equivalents may be substituted)

Tools

Burnisher, No. 265C
Cord, No. 1W13A
Clip, No. 365 (2 req'd per cord for strapping)
File, Jeweler's, No. 6 cut, KS-2662
Pliers, Duck-bill, KS-6015
Screwdriver, 3-1/2", KS-6854
Screwdriver, 4", regular
Scriber, No. 240
Test Set, 81A
Wrench, Open-end, 3/8" opening, 417A tool (2 req'd for Struthers-Dunn relays)
Wrench, Socket, 3/8" hex. opening, No. 46 tool

Gauges

Balance, Spring, R-2481, 0-30 lbs.
Gauge, No. 68B, 70-0-70 grams
Gauge, push-pull tension, No. 79C, 200 grams
Gauge-nest, thickness, KS-6909
Scale, steel, 6", R-8550
Thermometer, 0-200C, R1032
Voltmeter, a-c, Weston Model 528, ranges 300-150
Voltmeter, d-c, Weston Model 280, ranges 150-60-3

Materials (See Sections A710.011 and A710.012)

Bond Paper, KS-7187
Cloth, abrasive, 150 grade
Cloth, cleaning, twill jean, D-98063
Grease, 260-300P
Oil, mineral, light
Pad, felt
Spirits, petroleum

Test Apparatus

Autotransformer, continuously tapped
(Variac, 2.5-amp. 230V-input, Type V-5,
HMT, or equivalent; General Radio Co.,
Cambridge, Mass. suggested)
Test Set, 35 Type

3.002 Strapping and Insulating: To maintain service while work is being done affecting closed contacts of working circuits, bridge the current-carrying contacts, making the connections at the most convenient points in the circuit other than at the relay, if practicable. For strapping where the voltage does not exceed 150 volts, 1W13A cords (3'-0") or 1W13B cords (6'-0") are suggested, with No. 365 tools (Clips) or KS-6278 clips at both ends. Lengths of wire or flexible cord, such as are commonly used in lighting circuits, with KS-6780 clips or universal test clips (Graybar Catalogue), are required where the voltage exceeds 150 volts. Bond paper should be used for insulating live parts, including open contacts, and should be shaped or bent, as necessary, to provide protection with a minimum of interference with the work being done.

3.003 Relays whose contacts, either NO or NC, normally carry current continuously, should be operated or released, and returned to their normal position periodically, for example, once every month, to prevent the development of high resistance at the contacts.

3.004 General Procedure

- (1) It is recommended that requirements be checked and any required adjustments be made in the order outlined in the following paragraphs.
- (2) When checking mechanical requirements and making readjustments, disconnect the relay from the power supply, if possible. Where it is not possible to disconnect the relay from the power supply, bridge around contacts (see 3.002), insulate between contacts with a strip of bond paper, and disconnect leads, as necessary, in order to maintain circuit conditions unchanged. If it becomes necessary to remove the relay from its mounting in order to obtain access to the parts, proceed as follows. Patch through any working circuit and disconnect all power supply from the relay winding and contact circuits by opening switches, if provided, or by removing the fuse or fuses. Then disconnect the leads from the relay terminals using a suitable screwdriver or wrench. Remove the relay mounting screws with a suitable screwdriver.

Caution: Use care when working in close quarters with live parts.

3.01 Mountings (Rq. 2.01)

- (1) Tighten loose screws with the appropriate screwdriver or wrench.

3.02 Electrical Requirements (Rq. 2.02)

- (1) A check of the operation of a voltage-rated relay, excepting the Automatic Switch Company's type 107S11, is made by connecting a voltmeter across the coil terminals. If there is no reading on the voltmeter, a study of the associated circuit is necessary to find whether the absence of voltage indicates a circuit fault, or is a condition to be overcome by blocking a relay or otherwise changing circuit conditions. Failure to operate with rated voltage at the coil terminals may sometimes be corrected by readjustment, but in some cases, it may be due to an open coil. To check for an open coil, connect the voltmeter in series with the operating voltage and the coil. No reading on the voltmeter when connected in series, after a reading when connected in parallel with the coil, indicates that the coil is open and should be replaced.
- (2) When readjusting or when checking for any electrical requirements except the check of operation discussed in (1) above, the relay should be disconnected from the working circuit, if possible. Where this is not possible, bridge around contacts and insulate between contacts, as necessary, in order to maintain circuit conditions unchanged. Disconnect one or both coil terminals before making test connections discussed below.
- (3) Where requirements are in volts, it is direct current unless otherwise specified, and a 35-type test set arranged for reading volts or a 35-type test set, not so arranged, supplemented by a d-c voltmeter should be used. Where test set preparation has not been specified in the Circuit Requirements Table, it is suggested that both relay coil terminals be disconnected and both battery and ground be furnished through the test set with B/G/V or B/G preparation.
- (4) Where requirements are specified in volts, a-c, an a-c voltmeter should be used, together with a continuously tapped autotransformer, protected by a 2-1/2- or 3-ampere fuse. Connect the relay and the voltmeter across the output of the autotransformer and adjust to specified values.
- ↪ (5) Operate, nonoperate, and release adjustments, except in the case of the Automatic Switch Company's type 107S11 relay, may be made by making changes in the contact pressure or the

tension of the armature spring, as applicable. Whenever any changes are made, care should be taken that the other requirements continue to be met. For the type 107S11 relay, these adjustments are made by changing taps on a reactor and by adjusting a rheostat. Refer to local job information.

Caution: To avoid injury and to insure correct adjustment, the cover must be in place over the terminals whenever the relay and its associated circuit elements are connected to any power supply

(6) If the armature moves toward the core, as the operate current is applied, but fails to pull all the way up to the core or to the stop pin, it is an indication of excessive contact pressure, a bind in the moving parts, an obstruction in the armature gap, or excessive armature spring tension. Remove obstructions and binding or make adjustments as outlined in 3.08.

(7) If the relay does not release, check the armature for binding, and clean or replace it. Check the armature spring to see that it has sufficient tension to return the armature to the nonoperated position. Replace it if sufficient tension cannot be obtained by adjusting the armature spring. In a d-c relay, if the stop pin, which is in the face of the armature, fails to prevent the armature coming in direct contact with the pole face and permits it to stay there after the voltage is removed from the coil, replace the armature if feasible, otherwise replace the relay.

(8) The relay identified by any of the designations in the following table is equipped with a screw (with locknut) for adjusting the tension of the armature spring and a screw for adjusting the air gap. The air gap screw is located near the bottom of the relay, above the armature spring. These screws are utilized when adjusting the relay to close limits.

<u>Control Circuit</u>	<u>Designation</u>
SD-80971-01	LPR
SD-80994-01	PF1
SD-81017-01	PF1
SD-81017-02	PF1,PF2,PF3

When adjusting the air gap, the contact separation should never be less than 0.025".

(9) In rare cases, the armature or pole face may require cleaning with petroleum spirits on a cloth wrapped around the blade of a screwdriver.

(10) When any change is made in mechanical settings during adjustment for electrical requirements, recheck requirements 2.05 to 2.08.

*#3.03 Temperature (Rq. 2.03)

(1) If the temperature is thought to be excessive, hold the bulb of the thermometer against the hottest spot in question, covering that part of the bulb not in contact with the relay by a piece of felt or the equivalent.

(2) If the temperature exceeds the specified limits, see that the other requirements are met. If these requirements are met and the temperature is still above the specified limit, with nameplate rated voltage not exceeded, refer the matter to the supervisor as the coil or contact assembly may have to be replaced.

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

3.04 Contact Surfaces (Rq. 2.04)

(1) In working circuits, contacts which are found closed and carrying current which should not be broken shall be bridged. (See 3.002). In working circuits, contacts which are found open and should not be closed shall be kept separated by inserting a strip of bond paper between the movable and stationary contacts or a lead shall be disconnected. To close an NO contact, hold the armature against the pole face, taking care not to disturb the alignment of the armature. NC contacts of a relay which is found operated in a working circuit may be closed by opening one connection to the coil, after first bridging or insulating the other contacts, as necessary.

(2) The purpose of cleaning contacts is to remove any gummy or dirty substance that would interfere with reliable contact. The oxide which forms on silver contacts is unobjectionable and does not interfere with the contact. It is not necessary or desirable to keep contacts polished or shining. Clean contacts by wiping with a cloth moistened with petroleum spirits, followed by a dry cloth.

(3) There shall be as little smoothing of contacts as is consistent with satisfactory operation. Contacts should be smoothed while closed. For contacts disconnected from the power supply, insert a burnishing tool, or a strip of abrasive cloth (for contacts connected to power, abrasive cloth only) between the contacts to be smoothed, and draw it back and forth until the buildups

are reduced enough to insure reliable contact. For large copper contacts, not connected to the power supply, a fine file may be used. Clean the contacts as outlined in (2) above after smoothing.

(4) Contacts which are badly worn should be replaced, together with their associated springs if attached by riveting.

3.05 Contact Alignment (Rq. 2.05)

- (1) Shape, with pliers, a contact spring that is slightly bent. Any contact spring that becomes badly bent out of shape should be removed and re-shaped, or replaced with a new contact spring. Similarly, a fixed contact supported on a stud which has become bent out of line should be realigned by straightening the stud.
- (2) If alignment can not be obtained, install new contacts or a new relay.

3.06 Contact Sequence (Rq. 2.06)

- (1) If associated contacts do not make or break approximately simultaneously, 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 not susceptible to shaping with the pliers, check for mechanical trouble which may require the replacement of parts. Check 2.02, 2.05, 2.07, and 2.08 after any change.

3.07 Contact Separation (Rq. 2.07)

- (1) If a gauge of conducting material is used, the contacts must be disconnected from the power supply while checking.
- (2) To change the contact separation of relays having both NO and NC contacts, or NC contacts only, raise or lower the stationary NC contacts, as required, by rotating them on their supporting screws or by bending, if the contact is mounted on a flat strip. Where only NO contacts are present the work should be done in a similar manner on the stationary contacts.

3.08 Contact Pressure and Follow (Rq. 2.08)

- (1) In readjusting, it is desirable to have as much tension as possible on the various springs consistent with meeting other requirements. In adjusting the contact springs, tension the corresponding springs of the assemblies on both sides of the armature

so that the tensions are approximately equal, unless difference is necessary to meet other requirements. Either the fan-type gauge or the push-pull tension gauge may be used for measuring contact pressures. When access to the contact springs is impossible with the fan-type gauge, the push-pull gauge must be used. 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 relay.

(2) To measure the contact pressure of the NO contacts, hold the armature securely against the pole face with a screwdriver, taking care not to press on any part of the contact spring which supports the moving contact nor to force the armature out of alignment. 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. Read the gauge as the moving contact leaves the stationary contact. With the larger contacts, it may be necessary to pass a loop of cord between the contact and the hook of the spring-balance.

(3) To measure the contact pressure of the NC contacts, proceed in a manner similar to that outlined in (2), but allow the armature to be held in its nonoperated position by the pull of its spring.

(4) Contact pressure may be adjusted by relocating the stationary contacts (See 3.06). This should be resorted to in the case of NC contacts only after getting whatever adjustment is available by changing the tension of the armature spring. The details of this procedure are different, depending upon the manufacturer of the relay, and can be determined by inspection. In general, the spring is terminated on a screw which can be turned to increase or decrease the tension as required, and finally locked in position by a nut or other means.

(5) In cases where the construction does not permit adjustment of contact pressure, low pressure should be corrected by the replacement of the appropriate parts such as springs or badly worn contacts.

(6) In general, correction for the lack of follow involves either the adjustment of contacts to increase the contact pressure or if this is not feasible, the replacement of weakened springs or other appropriate parts.

3.09 Thermal Relays (Rq. 2.09)

- (1) Two types of thermal relays are included in this section, namely the

Thermo-jector manufactured by General Electric Company, and an assembly made up by the Duplex Truck Company, consisting of a heater, a bimetallic strip, and a microswitch.

(a) If a Thermo-jector fails to operate, inspect it for mechanical trouble. If the failure persists, replace the relay, since the adjustment or replacement of parts is not feasible.

(b) If a thermal relay of the assembled type fails, inspect it for the cause. The separate elements, if defective, should be replaced. Repair of the microswitch is not feasible.

3.10 Automatic Switch Company-Bul 905, Bul 907, and Bul 908 (Rq. 2.10)

Transfer Switch

(1) The switch should be operated electrically and its performance observed. Remove obstructions, if any.

(2) Wipe dirt away from the bearing surfaces with a cleaning cloth, paying particular attention to the surface of the solenoid plunger. Apply light mineral oil sparingly to the joints in the linkage which connects the plunger with the weight and to the sleeve-type end bearings which support the shaft in the smaller sizes.

(3) Ball bearings are used at the end bearings in the larger sizes. They are packed with grease and covered with a cap. If poor operation develops, remove the cap, clean out old grease and dirt, and apply any available ball-bearing grease before recapping.

(4) If the arcing contacts fail to operate as required, check for weakened springs and replace, as required.

(5) Observe the follow of the laminated main contacts to be sure that the leaves spread slightly as the moving contact touches them, and spring back as it is removed.

*(6) To adjust the auxiliary contacts, pull the solenoid plunger to its extreme upward position and scribe a

mark on it at the bottom of the solenoid frame. Release the plunger and scribe a second mark at a distance above the first one, equal to the dimension given in the following table, in which the switches are identified by the KS and list numbers of the associated engine.

KS-5636, Lists 1 & 3	9/32"
KS-5636, Lists 4, 5, & 6	11/32"
KS-5664, List 1	7/32"

Under the leather washer which normally rests on the top of the solenoid, insert a wooden block cut to such dimension as to hold the plunger so that the second mark is at the bottom of the solenoid frame. Manually operate the weight to the back and, bringing the weight forward, adjust the lower auxiliary contacts to break at the blocked position of the plunger. Similarly bring the weight to the front and adjust the other pair of contacts to break at the blocked position of the plunger as the weight is being carried to the back. Remove the block and recheck, operating the weight manually, as before. Use should be made of an 81A test set to indicate the moment at which the contacts break. Adjustment of the contacts is made by raising or lowering the stationary contact, as required, by rotating it in its supporting stud. Use the 417A tool for loosening the locking nut before adjusting and for tightening it after the adjustment is completed.

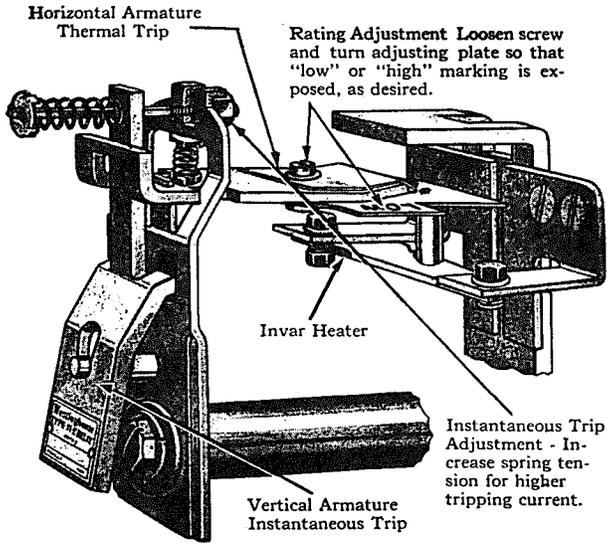
Caution: Disconnect the transfer switch from both sources of power before handling.

Caution: Avoid shock and interruption to service.

3.11 Allen-Bradley Contactors and Relays (Rq. 2.11)

(1) The contacts may be cleaned by wiping with a cloth moistened with petroleum spirits. Little other maintenance of the contacts is possible and in the case of operating difficulties, either the contacts or the entire relay should be replaced.

(2) When checking the contacts for follow, close the contactor or relay slowly by hand, observing the distance the support can move after the contact is first made.



***#3.12 Westinghouse TI-2 Relay**

- (1) To adjust the instantaneous overload trip, change the tension in the armature spring by moving the adjusting nut in or out on the screw, as required.
- (2) To adjust the thermal overload trip, proceed according to the instructions given in Fig. 12.
- (3) To obtain access to the contacts, remove the cover at the top of the relay, which is held in place by a knurled nut.
- (4) If the contact pressure is below the minimum, stretch the contact pressure spring, as required.

Fig. 12 - Adjusting TI-2 Relay

Bell Telephone Laboratories, Inc.