

STARTERS KS-5755, KS-15868, AND KS-15983 REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the KS-5755 L1 and L2, KS-15868 L1, and KS-15983 L1, L2, L3, L11, L21 and L31 starters manufactured by the Ward Leonard Electric Company.

1.02 This section is reissued to include the KS-15983 L3, L11, L21, and L31 starters. This reissue does not affect the Equipment Test List.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application 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 For the purpose of this section, whether contacts are said to be 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.

1.07 *Operate*: 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.

1.08 *Release*: 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.

1.09 *Precautions Against High Voltage*: If this type relay is in a circuit where 150 volts or more are applied across terminals on the relay, the voltage should be removed from the terminals before performing any work on the relay or checking requirements other than electrical or temperature requirements. If the relay operates in an automatic control circuit, before work is started on the relay, the automatic control should be made inoperative as described in the appropriate section covering the apparatus. In circuits where less than 150 volts are applied across terminals on the relay, service may be maintained while working on the relay by bridging and insulating the contacts as covered in 3.002. In some cases, it may be necessary to disconnect leads to maintain service.

1.10 When work is being done on a relay in an operating circuit, see that service is maintained. Typical starters are shown in Fig. 1 and 2. Schematics for the starters are given in Fig. 3 through 6.

2. REQUIREMENTS

2.01 ϕ *Mounting*

(a) The controller and starter shall be securely mounted.

(b) All components shall be securely mounted to their respective supports. Screws or bolts used for holding components together shall be drawn up tightly.

Gauge by feel.

2.02 ϕ *Cleaning Contacts*

(a) Contacts shall be clean and free from buildups which might interfere with reliable contact.

Gauge by eye.

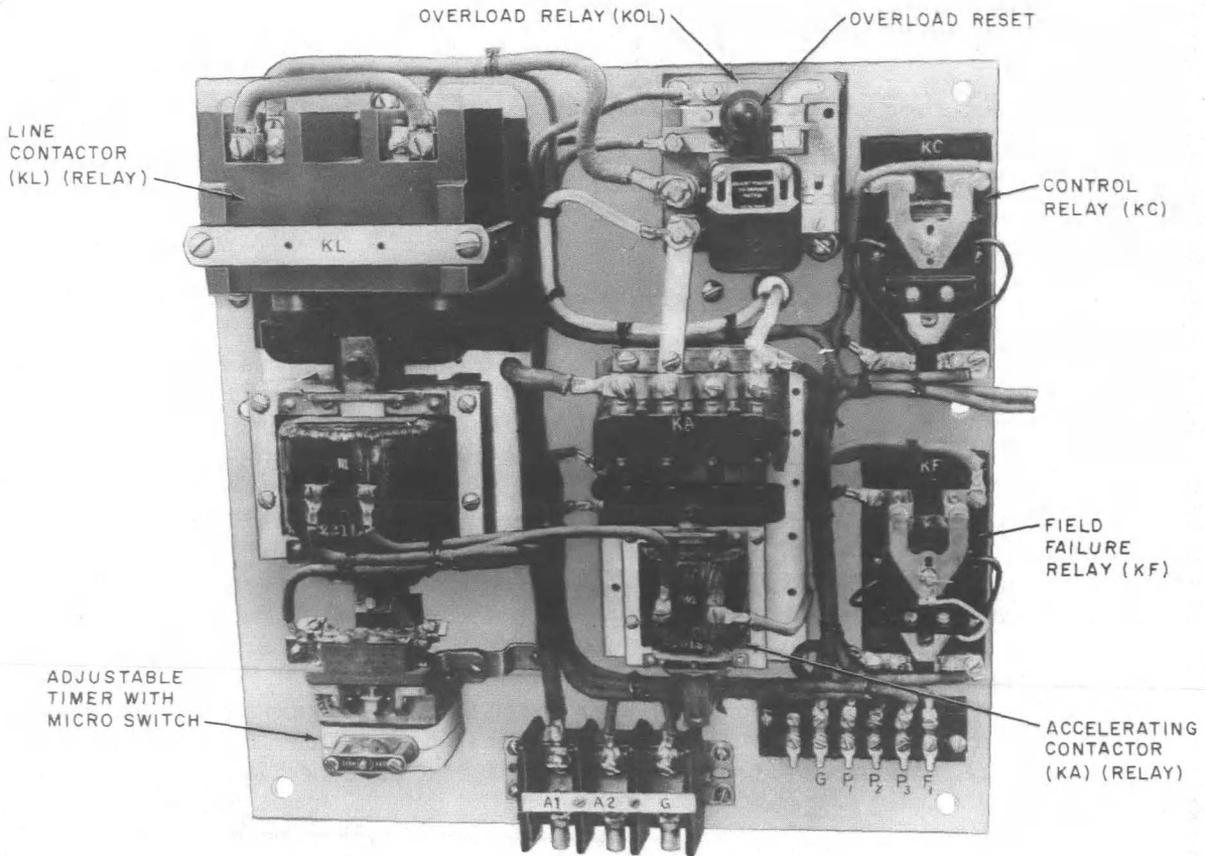


Fig. 1—General View of KS-15983 L1 Starter (Resistor Mounted on Rear of Plate—Cabinet Removed)

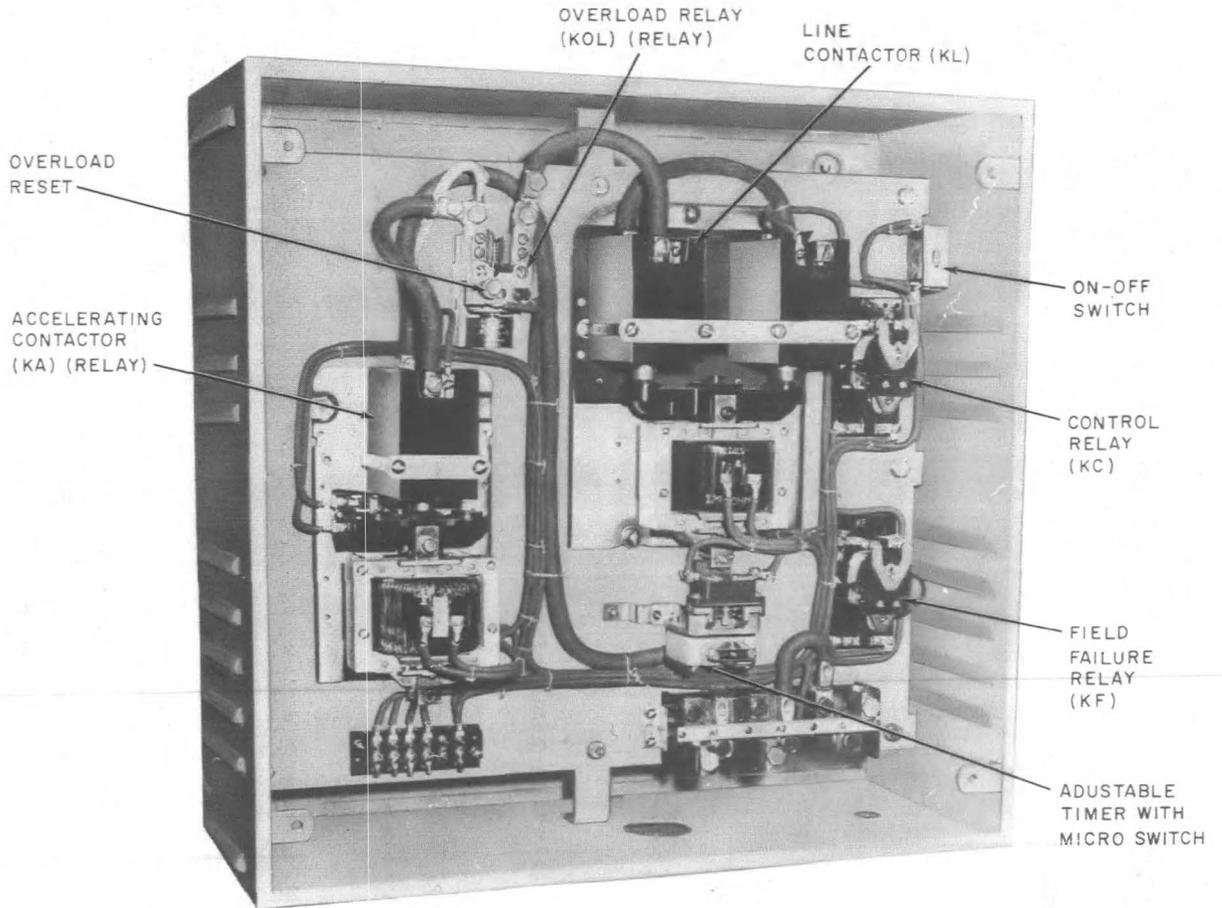


Fig. 2—General View of KS-15983 L2 Starter (Resistor Mounted on Rear of Plate)

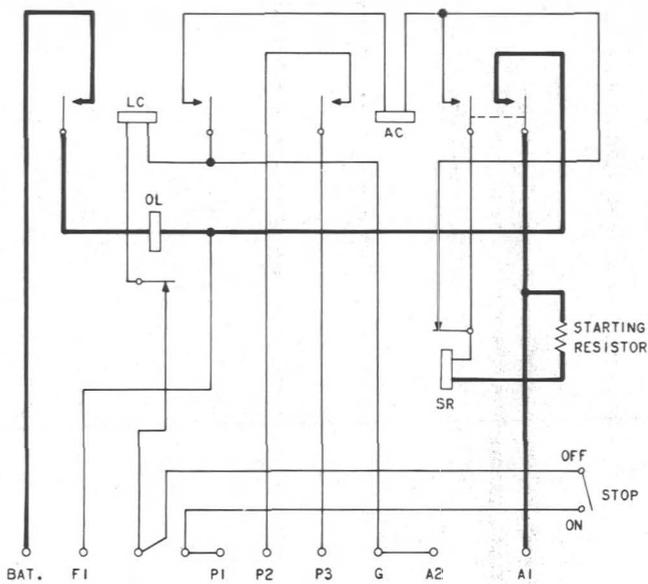


Fig. 3—KS-5755 L1 Starter Schematic

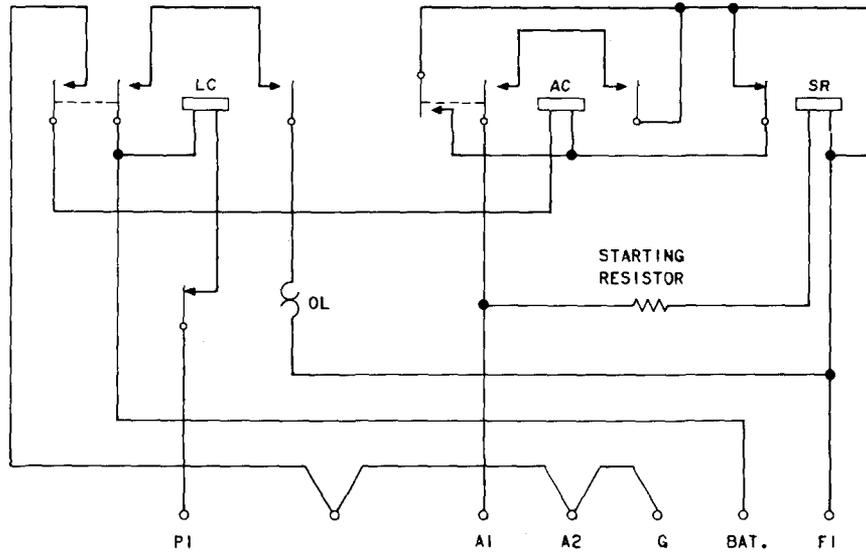
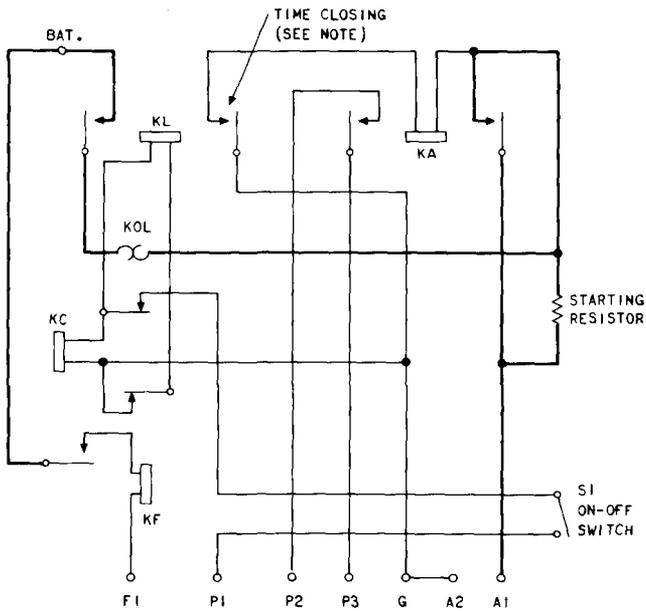
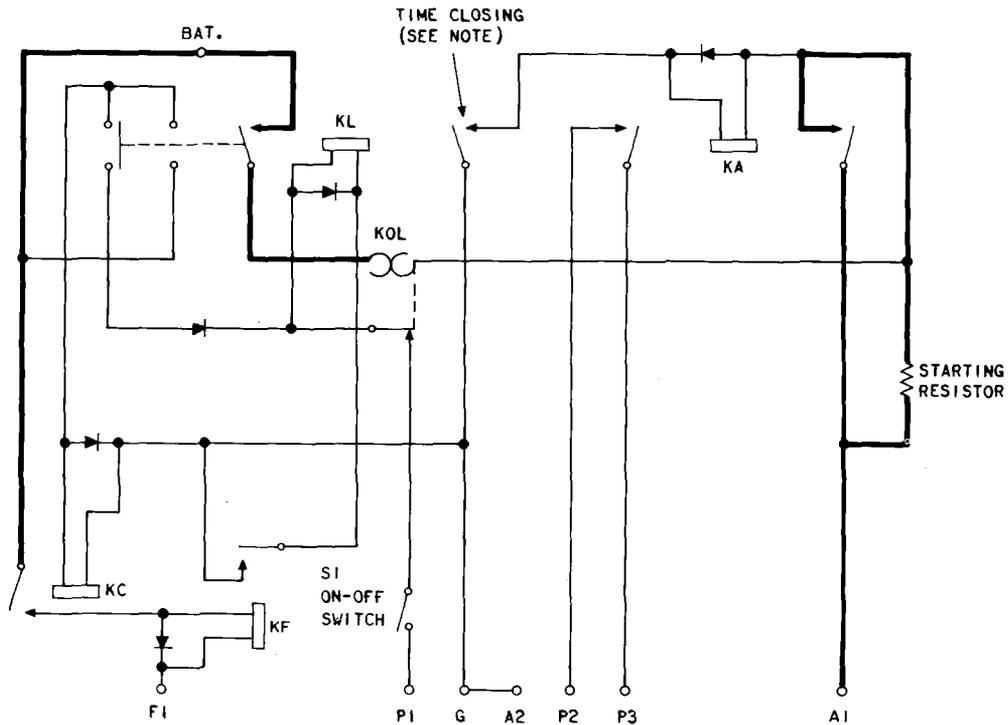


Fig. 4—KS-15868 L1 Starter Schematic



NOTE:
THIS IS A MICRO SWITCH CONTROLLED
BY A TIMER WHICH IS OPERATED
BY THE KL CONTACTOR.

Fig. 5—KS-15983 L1, L2, and L3 Starter Schematic



NOTE:
THIS IS A MICRO SWITCH CONTROLLED
BY A TIMER WHICH IS OPERATED
BY THE KL CONTACTOR.

Fig. 6—KS-15983 L11, L21, and L31 Starter Schematic

(b) Contacts shall not be lubricated.

Use R-2771 spring balance.

2.03 Contact Pressure

(a) The pressure between main closed contacts shall be:

To check this requirement, pass a loop of cord around the head of the bolt which attaches the moving contacts to its support. Place the hook of the spring balance in this loop and, with the relay held operated manually, exert a pressure away from the stationary contact. Read the balance as the moving contact leaves the stationary contact.

CODE	RELAY DESIGNATIONS	PRESSURE (pounds)
KS-5755 L1	AC, LC	Min 3-1/2
KS-5755 L2	AC, LC	Min 4-1/2

(b) The pressure between contacts of the KC and KF relays shall be:

KS-15983 L1, L3, L11, and L31	KL	Nom 2
KS-15983 L1, L3, L11, and L31	KA	Nom 1/2
KS-15983 L2 and L21	KL, KA	Nom 4

CODE	PRESSURE
KS-15983 L1, L2, L3, L11, L21, and L31	Nom 60 Grams

Use the 68B gauge.

SECTION 024-346-701

To check this requirement, hold the armature firmly against the pole face, taking care not to press on any part of the contact finger or to force the armature out of alignment. Place the gauge against the contact finger as near the moving contact as possible and exert pressure with the gauge away from the stationary contact. Read the gauge as the moving contact leaves the stationary contact.

(c) For relays not specified above, the contact pressure shall be such that contacts operate without excessive heating or roughening of their surfaces.

Gauge by eye.

2.04 Contact Follow

(a) The follow of the NO auxiliary contacts of the relays when making contact shall be:

CODE	RELAY DESIGNATIONS	FOLLOW (inch)
KS-5755 L1 and L2	LC, AC	Min 3/64
◆KS-15983 L1, L2, L3, L11, L21, and L31◆	KA	Nom 1/4
◆KS-15983 L1, L2, L3, L11, L21, and L31◆	KF, KC	Nom 1/32

(b) The follow of the main contacts on the relays when making contact shall be:

CODE	RELAY DESIGNATIONS	FOLLOW (inch)
◆KS-15868 L1	LC, AC	Min 1/16
KS-15983 L1, L3, L11, and L31	KA	Nom 0.082; Min 1/16
KS-15983 L2 and L21	KA	Nom 1/8
KS-15983 L1, L2, L3, L11, L21, and L31	KL	Nom 1/8◆

(c) **Fig. 7(B):** For the KC and KF relays, the follow shall be:

Nom .020 inch

Gauge by eye.

2.05 Contact Gap and Operated Magnetic Gap

(a) The contact gaps for relays designated AC, LC, KL, and KA measured between contacting surfaces shall be:

CODE	MAIN CONTACTS (inch)	NO AUXILIARY CONTACTS (inch)
◆LS-5755 L1 and L2	Min 3/4	Min 1/2
KS-15868 L1	Nom 13/32	—
KS-15983 L1, L3, L11, and L31 (KL)	Nom 3/8	—
KS-15983 L2 and L21, (KL)	Nom 1/2	—
KS-15983 L1, L3, L11, and L31 (KA)	Nom 13/32	Nom 1/16
KS-15983 L2 and L21, (KA)	Nom 1/2	Nom 1/16◆

Use R-8550 scale.

(b) **Fig. 7(A):** For the SR, KF, or KC relays, the contact gaps and operated magnetic gaps shall be:

CODE	CONTACT GAP (inch)	OPERATED MAGNETIC GAP (inch)
KS-5755 L1 & L2	Min 0.025	Max 0.180
KS-15868 L1	Min 0.025	Max 0.190
◆KS-15983 L1, L2, L3, L11, L22 and L31◆	Nom 1/8	◆Max 0.003◆

Use the KS-6909 gauge.

(b) Where electrical requirements are not specified in the circuit requirement table, the following shall apply.

(1) Relays shall operate on the following voltages.

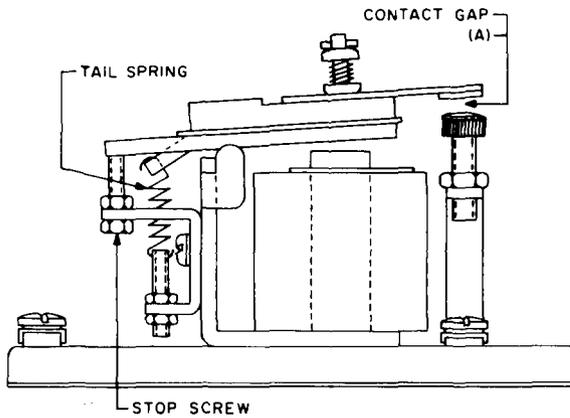
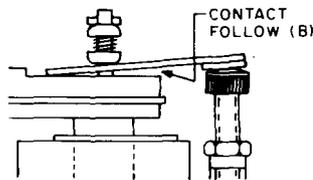
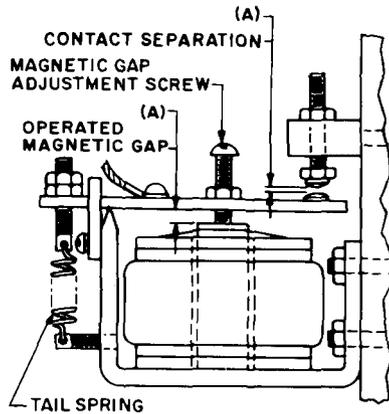


Fig. 7—Control Relays

2.06 *Electrical Requirements*

(a) The relays shall meet the electrical requirements specified in the circuit requirement table or other job information.

CODE	RELAY DESIGNATIONS	VOLTS (MINIMUM)
KS-5755 L1 and L2	LC, AC	44
KS-15868 L1	LC, AC	125
◆ KS-15983 L1, L2, L3, L11, L21, and L31◆	KL, KA	44

Use 35-type test set.

(2) SR relay shall operate on the motor starting inrush current, opening its NC contacts before its associated AC relay operates. It shall release as the current decreases as follows.

CODE	AMPERES	
	MIN	MAX
KS-5755 L1	55	61
KS-5755 L2	135	145
KS-15868 L1	23	27

Use an ammeter.

(3) OL relay shall release on:

CODE	AMPERES
KS-5755 L1	71
KS-5755 L2	210

φ (4) The OL relay of the KS-15868 L1 starter shall release the starter within 2 hours on a current of 27 amperes.

φ (5) The KOL relay of the KS-15983 starters shall release the starter within 1 hour on currents of 75 amperes or 240 amperes, respectively.

φ (6) The KF relay of the KS-15983 starters shall operate on a current as follows:

COILS	MAX
Class A insulation	85C (185F)
Class H insulation	105C (221F)
Frames and other parts in contact with insulation	95C (203F)

CODE	AMPERES
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Use a thermometer.

◆KS-15983 L1 and L11	0.4
KS-15983 L2 and L21	0.65
KS-15983 L3 and L31	1.4◆

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 apparatus by a piece of felt or the equivalent.

φ (7) The time-delay device associated with the KC contactor of the KS-15983 starter shall operate at 5 ±10% seconds as indicated by the time between the operation of the KL and KA contactors.

3. ADJUSTING PROCEDURES

Use an ammeter and KS-3008 stopwatch.

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

(8) When the coil of the KL contactor of the KS-15983 starter is de-energized, the pneumatic timing mechanism shall reset instantly.

CODE OR SPEC NO.	DESCRIPTION
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Gauge by eye.

TOOLS

(c) Check of the electrical requirements may be made at the temperature at which the relay is found unless H (hot) or C (cold) is specified on the circuit requirement table.

265C	Contact burnisher holder
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(d) Where H is specified in the circuit requirement table without heating instructions, the relay coils shall be energized for at least 1 hour prior to the test.

365	Connecting clip (as reqd)
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417A	1/4- by 3/8-Inch Hex. open double-end flat wrench
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(e) Where C is specified on the circuit requirement table without cooling instructions, the relay shall be de-energized for at least 2 hours prior to the test.

418A	5/16- by 7/32-Inch Hex. open double-end flat wrench
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KS-6367	7/16- by 5/8-Inch open double-end flat wrench
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KS-6780	Connecting clip (jaws insulated with 108 cord tip)
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KS-6854	Screwdriver
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KS-14208	Brush (2 reqd)
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φ *2.07 **Temperature:** The temperature shall not exceed:

—	5-Inch E screwdriver
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GAUGES

68B	Gauge
KS-3008	Stopwatch
KS-6909	Gauge
R-1032	Thermometer
	Detail 1
R-2771	0- to 6-pound spring balance
R-8550	6-inch steel scale
TP-91681	0.160- and 0.180-inch thickness gauge

MATERIALS

KS-7187	Bond paper
KS-19578 L1	Trichloroethane
—	Abrasive paper 150 grade
—	Felt pad
—	1-ounce bottle

TEST APPARATUS

35 Type	Test set
1W13A	Cord (each end equipped with a 365 connecting clip or KS-6278 connecting clip) (as reqd)
1W13B	Cord (each end equipped with a 365 connecting clip or KS-6278 connecting clip) (as reqd)
—	Voltmeter, DC, Weston Model 931, ranges 300/150/75/30 (or replaced 281) (if 35-type test set equipped to indicate voltage is not available)
—	Ammeter, DC, Weston Model 901, with 50-millivolt drop external shunt, KS-9442 L6 for 150 amperes or KS-9442 L14 for 1500 amperes as required.
—	Wire, 14 gauge or lamp cord, 2 conductor

3.002 *Maintaining Service While Working on Relay*

(1) **General:** If less than 150 volts are applied across terminals and it is not practicable to disconnect the relay from the power supply (see 1.09), bridge the current-carrying contacts and insulate live parts as covered in (2) and (3), respectively.

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

(2) **Bridging Contacts:** To maintain service while work is being done affecting closed contacts carrying current in working circuits, bridge the contacts at the most convenient points in the circuit other than at the relay if practicable. 1W13A cords (3 feet long) or 1W13B cords (6 feet long) with KS-6278 connecting clips (jaws insulated with 108 cord tips) are satisfactory for strapping purposes. Lengths of 14 gauge insulated wire or flexible cord such as is commonly used in lighting circuits, with KS-6780 connecting clips (jaws insulated with 108 cord tips), are equally satisfactory.

(3) **Insulating Contacts and Parts:** KS-7187 bond paper should be used for insulating live parts and should be shaped or bent as necessary to provide protection with minimum interference to the work being done. To prevent closure of open contacts in a live circuit, place bond paper, as required, around the fixed contact or disconnect the lead to the contact spring.

3.003 *General Procedure*

(1) Where it is not practicable to disconnect the relay from the power supply, bridge around the 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 winding and contact circuits by opening switches, if provided, or by removing the fuse or fuses. Then disconnect the leads from terminals. Remove the mounting screws.

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

(2) In working circuits, contacts which are found closed and carrying current which should not be interrupted should be bridged. (See 3.002.) In working circuits, contacts which are found open and which should not be closed shall be kept separated by inserting a strip of bond paper between the movable and stationary contacts or by disconnecting a lead. To close a 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.

3.01 Mounting (Reqt 2.01)

(1) Tighten all loose screws and nuts using a screwdriver or wrench as required.

3.02 Cleaning Contacts (Reqt 2.02)

(1) The purpose of cleaning contacts is to remove any gummy or dirty substance that would interfere with reliable contact. It is not necessary or desirable to keep contacts polished or shining. The contacts should be disconnected from the power supply during the cleaning operation. To remove dirt and gummy substance, clean the contacts with KS-19578 L1 trichloroethane 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 trichloroethane into a 1-ounce bottle. It is important to avoid the use of contaminated trichloroethane in cleaning the contacts; therefore, discard the trichloroethane as soon as it appears dirty.

(b) Dip the hairs of a clean KS-14208 brush full length into the trichloroethane. Remove excess fluid by wiping the brush on the edge of the bottle. Then with the 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. If necessary, burnish the contacts as covered in (2).

(2) There shall be as little smoothing of contacts as is consistent with satisfactory operation. Contacts should be smoothed while closed. To close NO contacts, hold the relay operated manually or electrically. In the case of contacts not connected to the power supply, insert a 265C burnishing tool or strip of abrasive paper (with contacts connected to the power supply, abrasive paper only) between the contacts to be cleaned, and draw it back and forth until the buildups are removed entirely or are reduced sufficiently to insure reliable contact. Then clean the contacts as outlined in (1).

(3) If the contacts become badly worn, replace the contacts where possible; if not, replace the relay in question.

3.03 Contact Pressure (Reqt 2.03)

(1) Contact pressure for the main contacts of the LC, AC, KL, and KA relays is not adjustable and will fall below minimum values given for the KS-5755 and KS-15983 controllers only as a result of excessive wear or filing of the contacts or weakening of the pressure spring. If contact heating or excessive buildups develop, check the pressure and replace the contacts and the spring.

(2) The contact pressure of the SR relays is dependent upon the tension in the tail spring. If the pressure of the contact is thought to be insufficient, readjust the contact gap toward the minimum and increase the tension of the tail spring. See that requirements 2.05 and 2.06 are met. For adjustment of the KC and KF relays, follow the procedures given in Section 040-811-701.

3.04 Contact Follow (Reqt 2.04)

(1) The NO auxiliary contacts of the LC and AC relays are adjusted for follow by loosening the mounting nuts which hold the stationary contact post in the panel and by moving the post as required. Tighten the nuts after the adjustment is completed.

(2) If the contacts of the OL or KOL relay show overheating or roughening, the entire relay should be replaced.

3.05 Contact Gap and Operated Magnetic Gap (Reqt 2.05)

