

AUTOTRANSFORMER-TYPE MANUAL AC STARTERS
GENERAL ELECTRIC COMPANY
REPLACEMENT PARTS AND PROCEDURES

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the KS-5092, KS-5140, KS-5140-01, KS-5292, KS-5292-01, and KS-5310 manual-type ac starters.

1.02 This section is reissued to change the title, to add new Fig. 2, 3, 4, 5, 13, 14, 15, and 16, to revise the procedure for oil level, to add procedures for thermal overload relays, autotransformers, and undervoltage release coils, and to bring the section generally up to date. Detailed reasons for reissue will be found at the end of the section. Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 Part 2 of this section covers the various parts which it is practicable to replace in the field in the maintenance of this equipment. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Replacement Parts.

1.04 Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

2. REPLACEMENT PARTS

2.01 The figures included in this part show the various replacement parts in their proper relation to other parts of the apparatus together with their corresponding names.

2.02 When ordering replacement parts, give the name of the part as shown in the figure of this section and the complete nameplate data of the starter including the manufacturer's name, for example: ---set of finger and wedge contacts with screws and washers for the General Electric Company, CR-1034 K1B starter per KS-5140-01, List 01, D.L. #2237469G2 for 20HP, 3 phase, 60 cycle, 220 volt motor. Do not refer to the section number.

2.03 Miscellaneous parts, such as screws, nuts, washers, etc, which are not named in the figures and which cannot be obtained locally should be ordered by describing the part and giving the nameplate data on the starter.

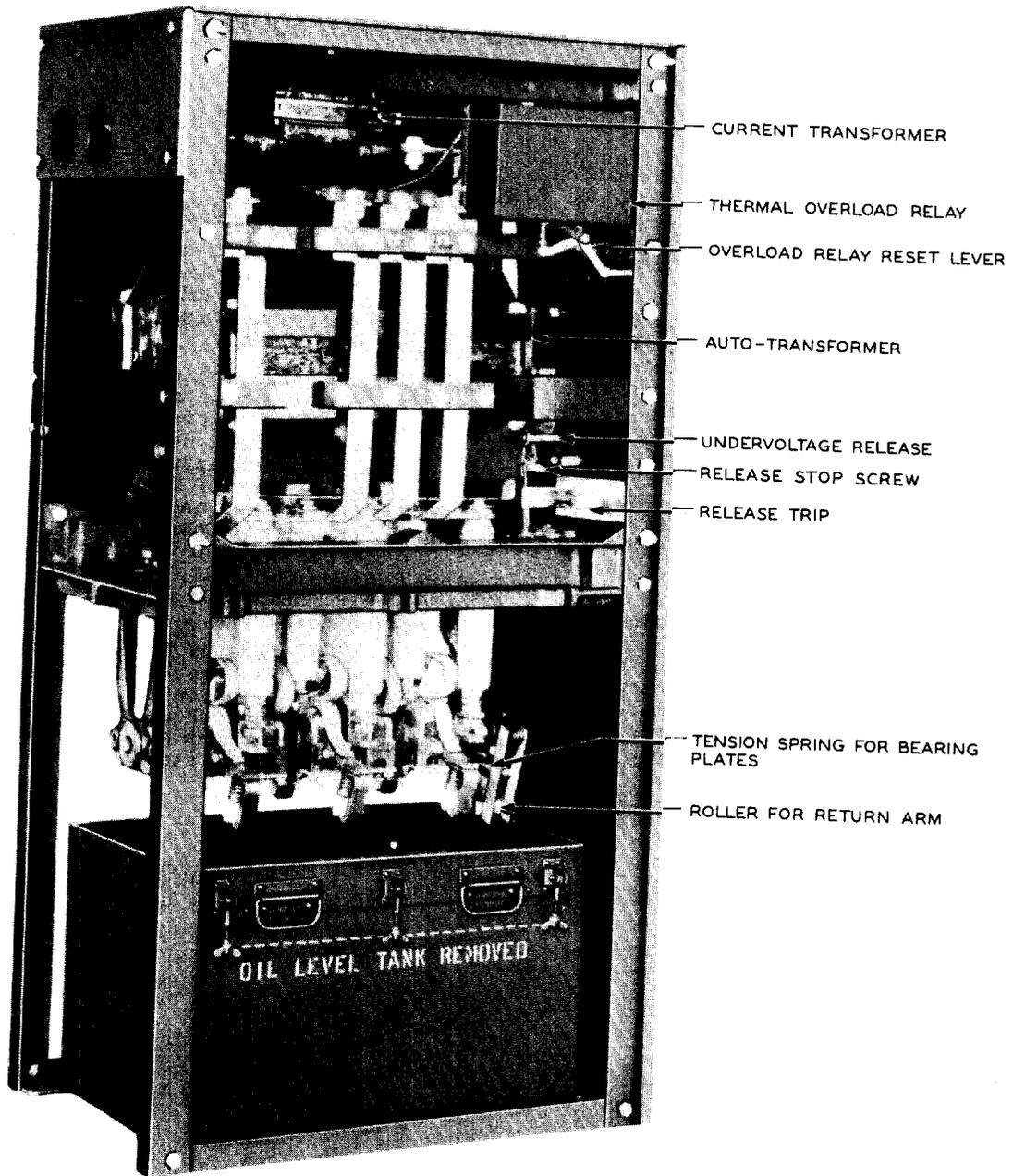


Fig. 1 - KS-5310 Manual-type AC Starter (Form K22 with Two Sides and Oil Tank Removed)

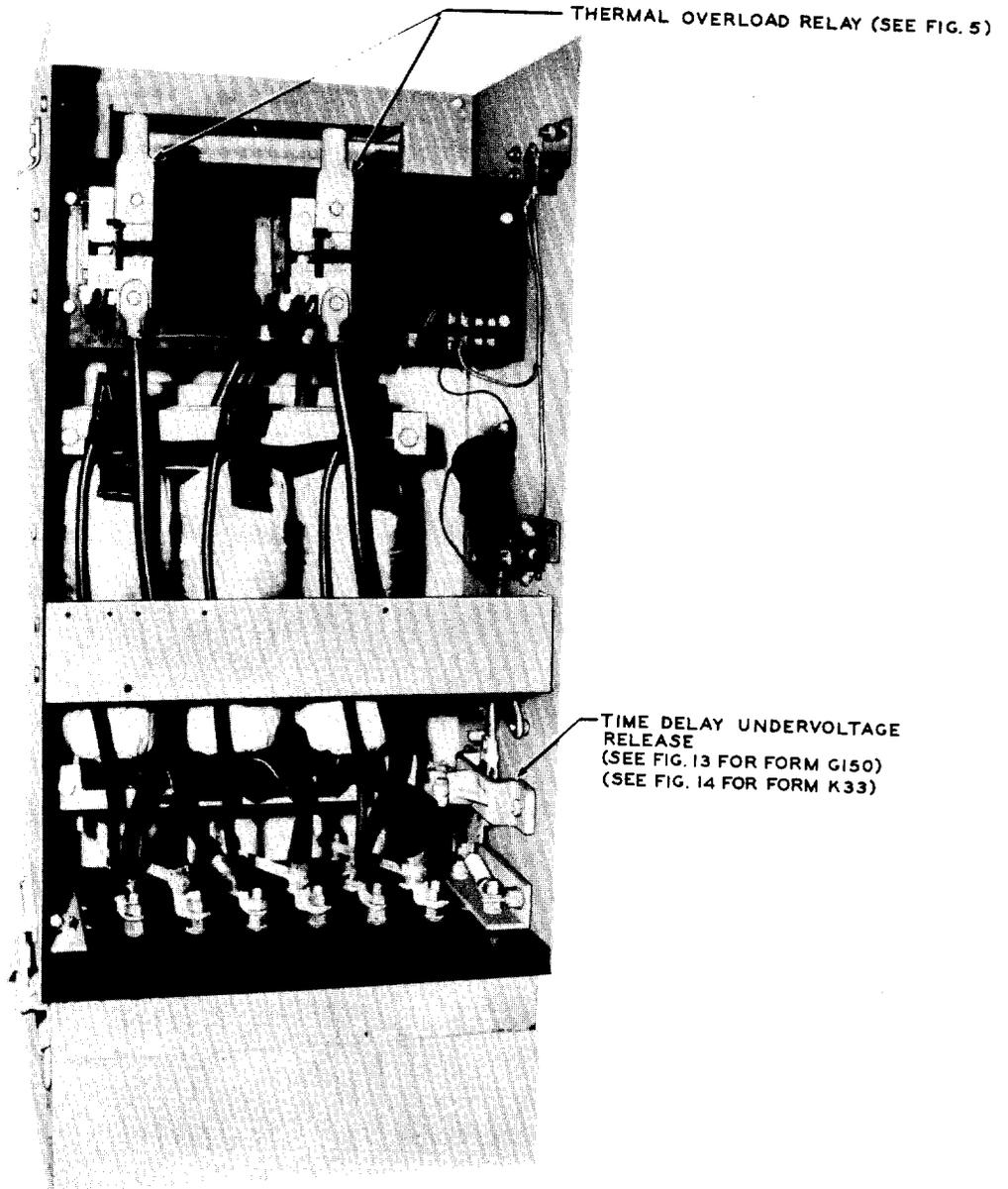


Fig. 2 - KS-5140-01 Manual-type AC Starter

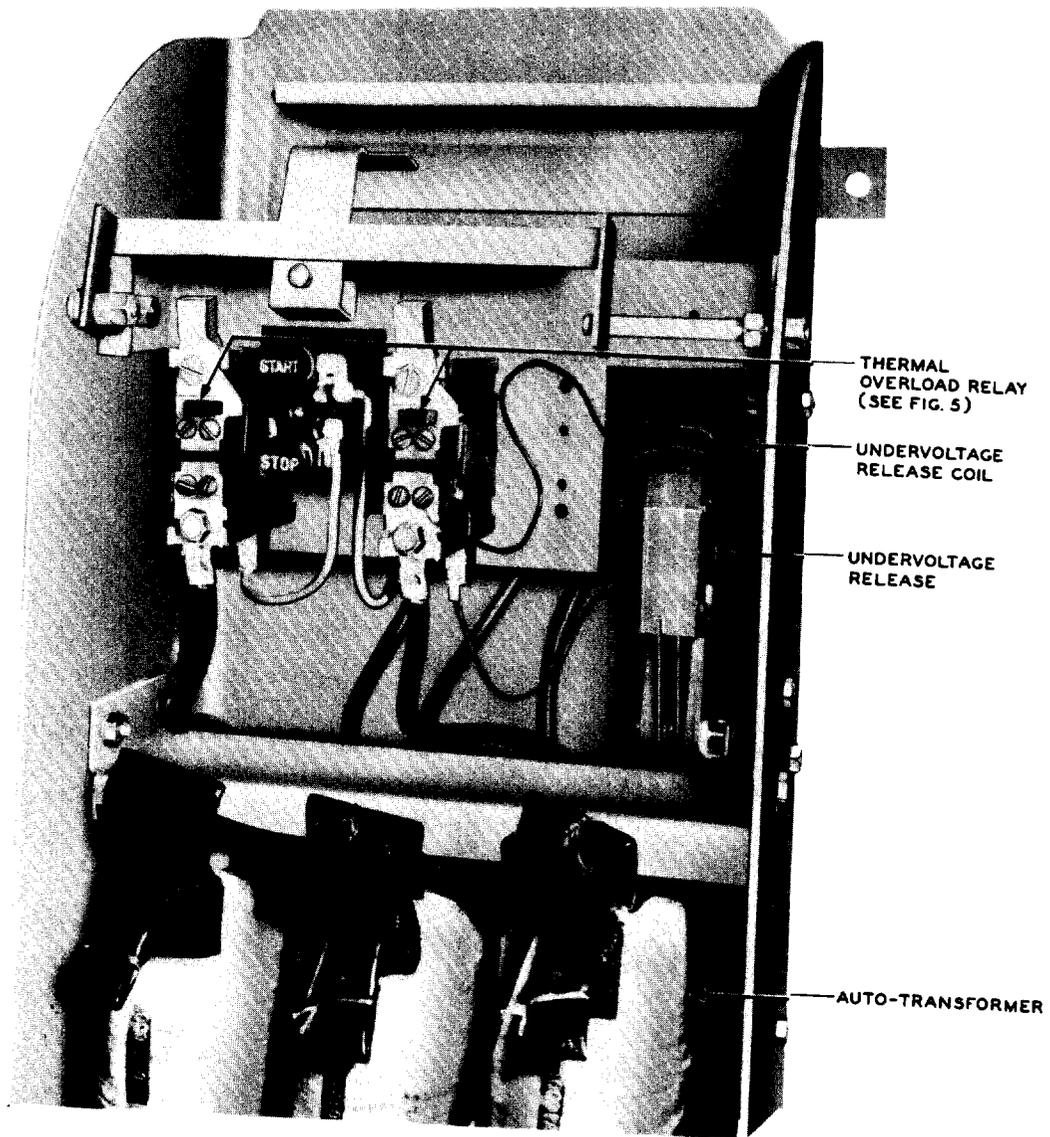


Fig. 3 - KS-5140-01 Manual-type AC Starter - Form E

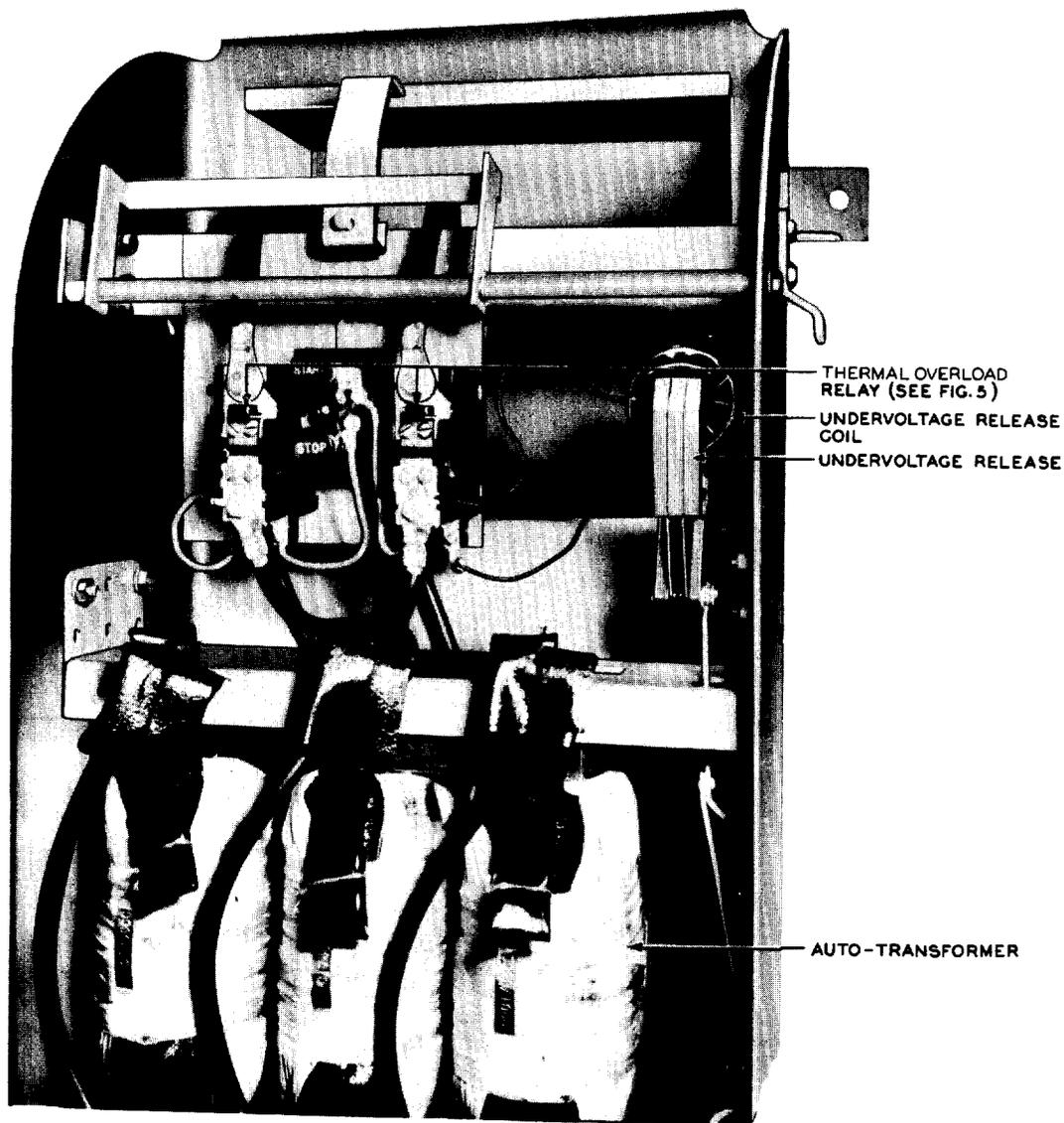


Fig. 4 - KS-5140-01 Manual-type AC Starter - Form F

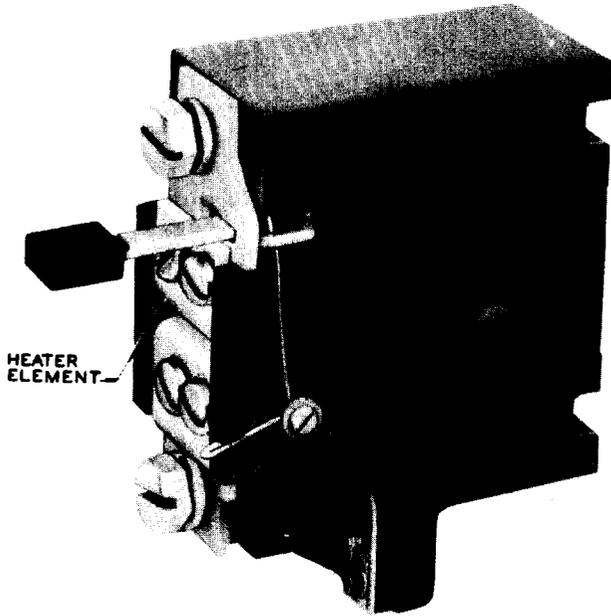


Fig. 5 - CR-2824-42-type Thermal Overload Relay

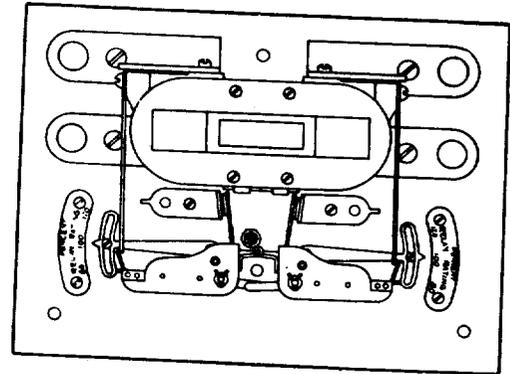


Fig. 6 - CR-2824-TC221-C Thermal Overload Relay

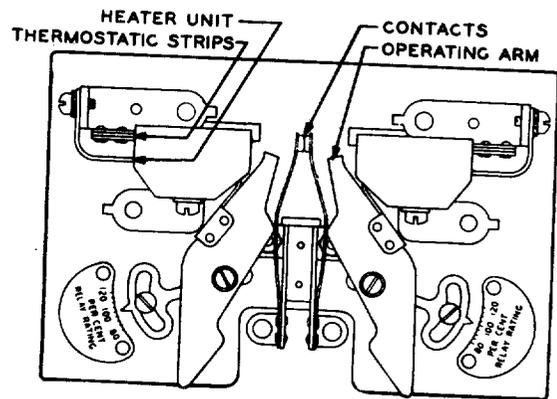


Fig. 7 - CR-2824-TC121-C Thermal Overload Relay

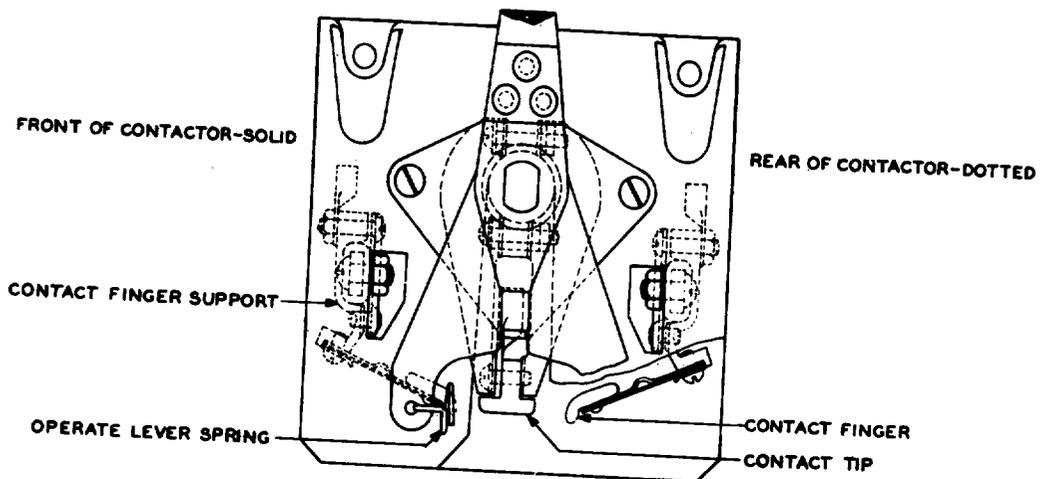


Fig. 8 - Rotary-type Contactor Mechanism on Form K1 Starter

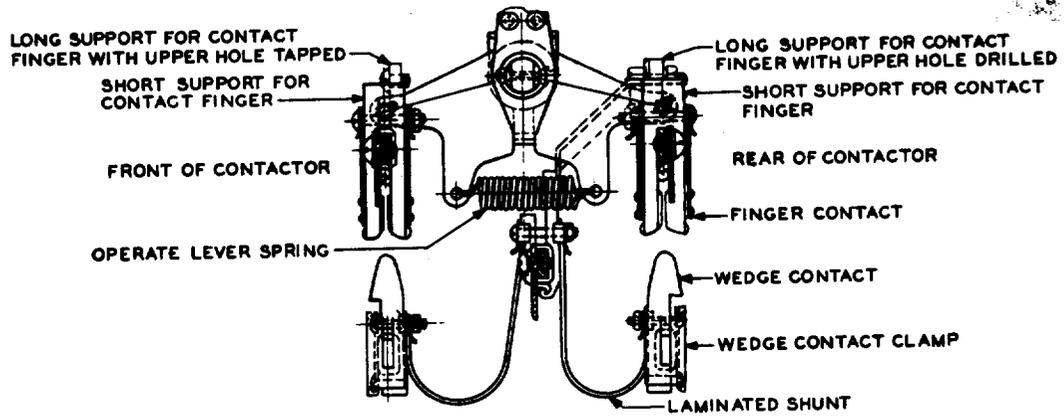


Fig. 9 - Parallel-type Contactor Mechanism on Form K19 Starter

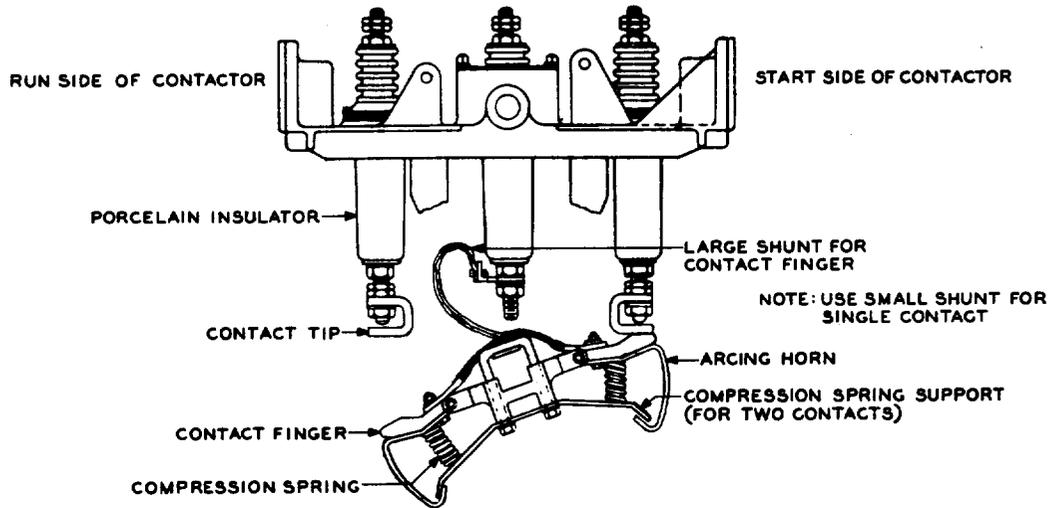


Fig. 10 - Contactor Mechanism on Form K22 Starter - In Start Position

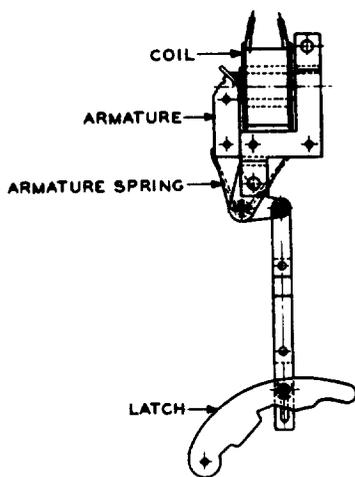


Fig. 11 - Contactor-type Undervoltage Release - Without Time-delay Feature

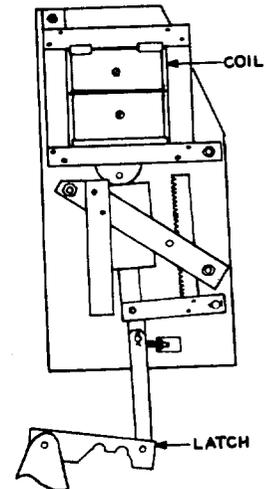


Fig. 12 - Solenoid-type Undervoltage Release - Without Time-delay Feature

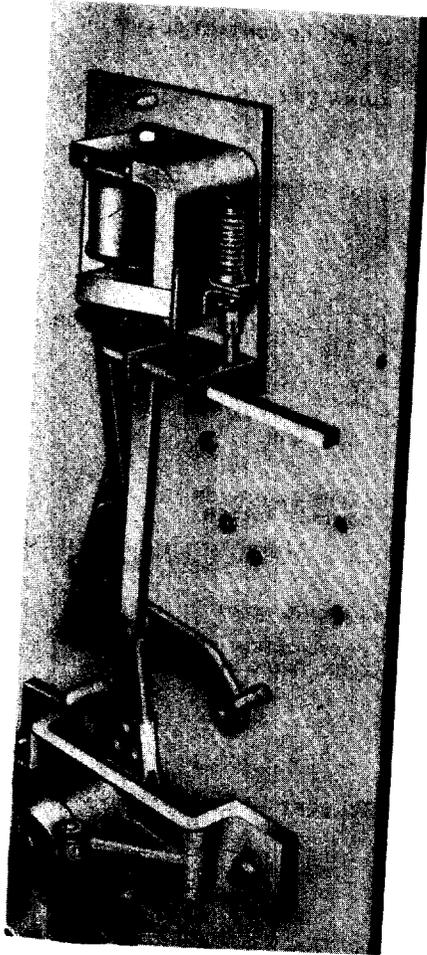


Fig. 13 - Contactor-type Undervoltage Release - With Time-delay Feature on Form G150 Starter

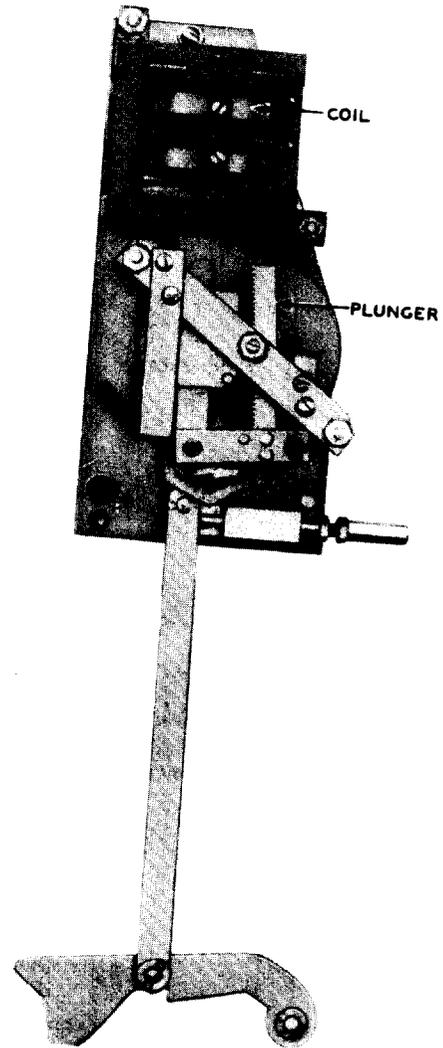


Fig. 14 - Solenoid-type Undervoltage Release - With Time-delay Feature on Form K33 Starter

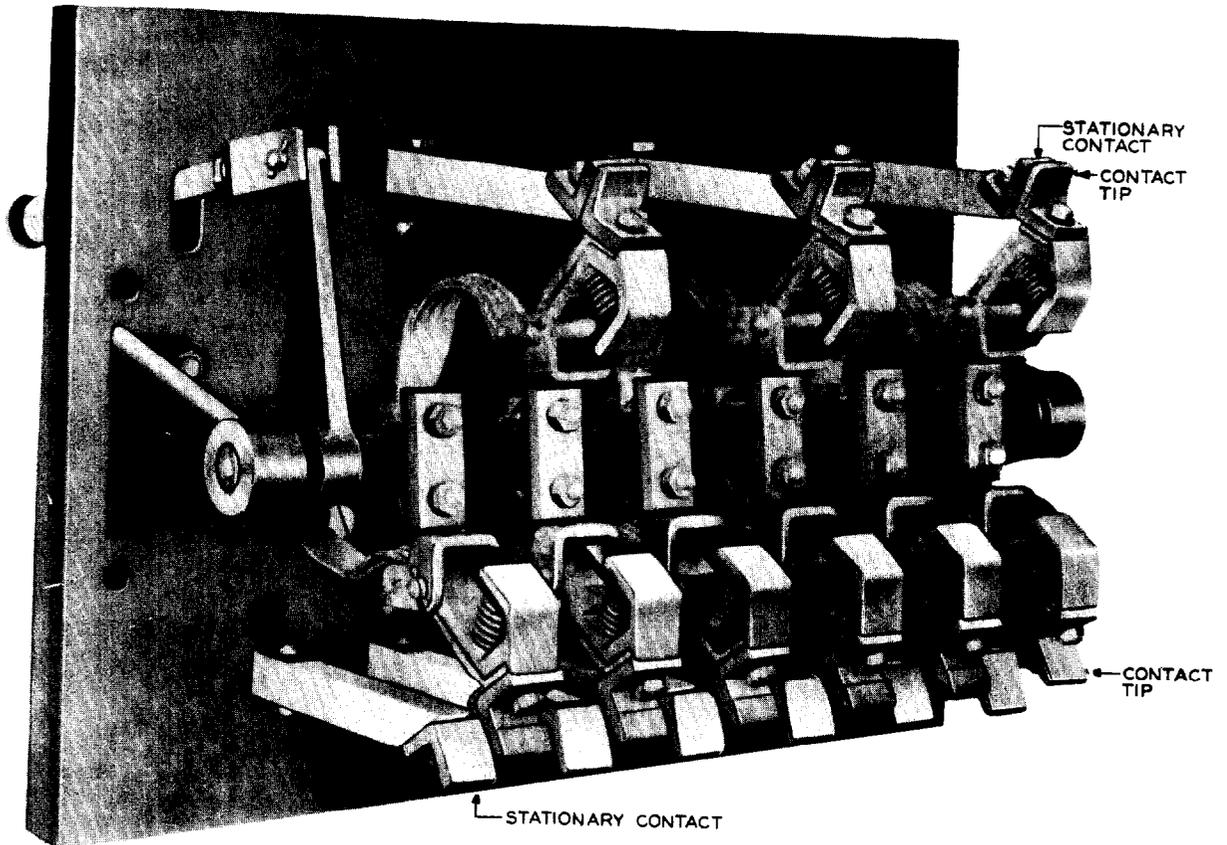


Fig. 15 - Contactor Mechanism on Form K33 and G150 Starters

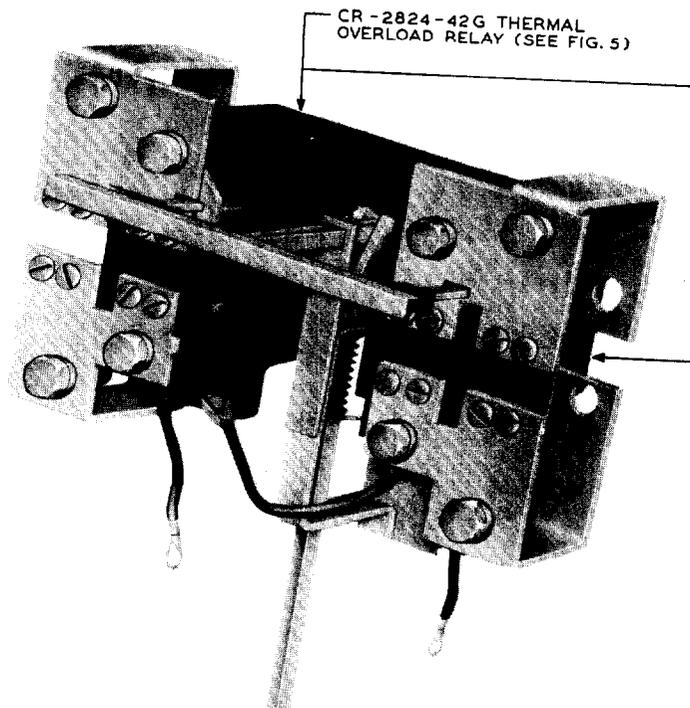


Fig. 16 - CR9905G101A2 Thermal Overload Relay

3. REPLACEMENT PROCEDURES3.01 List of Tools and Materials

<u>Code or Spec No.</u>	<u>Description</u>
<u>Tools</u>	
*245	3/8- and 7/16-inch Hex. Open Double-end Flat Wrench
*KS-13816	15/16- and 1-inch Open Double-end Flat Wrench - J.H. Williams Co., Cat. No. 33C.
R-1542	Adjustable Wrench
*R-1770	1/2- and 9/16-inch Open Double-end Flat Wrench
R-2512	Adjustable Wrench
*R-2593	7/8- and 1-1/16-inch Open Double-end Flat Wrench
*-	1-7/16- and 1-13/16-inch Open Double-end Flat Wrench - J.H. Williams Co., Cat. No. 42.
-	Combination Pliers
-	6-1/2-inch P-long Nose Pliers
-	5-inch Regular Screwdriver
-	4-inch Regular Screwdriver

* Required for form K22 only.

Materials

KS-14666 Cleaning Cloth

3.02 The ac service shall be disconnected directly ahead of the starter before removing the case covers or lowering the oil tank, since the live parts have line voltage on them.

3.03 The oil tank on the form K22 starter weighs approximately 180 pounds when filled and it is recommended that at least three men be used to handle it, one on each side to hold the tank and the third to release or secure it.

3.04 After making any replacement of parts, the apparatus should be checked and, where necessary, readjusted to meet the requirements specified in Section 026-380-701.

3.05 No replacement procedures are specified for screws and other parts where the replacement consists of a simple operation.

Oil Level

3.06 Oil Tanks on all Starters Except Form K22: To release the oil tank, squeeze

the two handles together at each end of the tank. Except on the form K33 starter, the oil tanks may be lowered and suspended in an intermediate position during switch inspection. The oil tank on the form K33 starter must be set on the floor under the starter where it can catch the oil drip; the oil tanks on other forms may be set on the floor, when necessary. Because of the handles which protrude from the oil tanks, the tanks cannot be dropped vertically to the floor. To set the tank on the floor, remove the tank, turn it 90 degrees, and place it on the floor between the braces to catch the oil drip. If it is desirable to place the tank on the floor in the same relative position it has when installed, remove the tank, put one handle under one brace, and turn the tank to get the other handle under the brace on its side. When restoring the tank, be sure that the upper handles are raised in position sufficiently to engage the slots in the sides of the case.

3.07 The oil tank on the form K22 starter may be provided with drain and fill plugs on the left side of the tank as viewed from the operating handle end of the starter. The plugs facilitate lowering and raising the tank when necessary for inspection of the switch. Where plugs are provided, drain the tank before lowering it. When the tank is restored, refill it with oil up to the level determined by the fill plug opening. Since the tank is held by three thumbscrews on each side, it is suggested that the thumbscrews in the middle be unscrewed last when the tank is to be lowered, and tightened first when the tank is to be restored. See 3.03.

Thermal Overload Relays

3.08 The CR-2824-TC221-C thermal overload relay shown in Fig. 6, is replaced only as a unit by the CR9905G101A2 thermal overload relay shown in Fig. 16. On the form K22 starter, the leads can be disconnected easily after removing the three mounting screws and tipping the panel forward.

3.09 The CR-2824-TC121-C thermal overload relay shown in Fig. 7, can be replaced as a unit or in parts, including the heater units if the thermostatic strips are satisfactory. If the thermostatic strips are damaged, the relay should be replaced as a unit or returned to the manufacturer for repair and adjustment.

3.10 The CR9905G101A2 thermal overload relay shown in Fig. 16, can be replaced as a unit, or the heater elements in the relay can be replaced. See 3.11.

3.11 To replace the heater element on the CR-2824-42A, 42C, 42F, and 42G thermal overload relays, shown in Fig. 5

remove the screws and lockwashers holding it with a screwdriver. Remove the heater element. Install a new heater element of the proper rating.

3.12 The CR-2824-42A, 42C, 42F, and 42G thermal overload relays, shown in Fig. 5, may be replaced as a unit which can be done readily, being careful to reconnect the leads properly and not to injure any of the working parts.

Current Transformers on Form K22 Starter

3.13 To replace a current transformer on the K22 starter shown in Fig. 1, be sure the ac service is disconnected ahead of the starter. Note the position of the connections on the transformer and remove them, being careful not to drop any of the washers or nuts. The transformers may then be released individually by removing the nut from the transformer bracket. Replace in the reverse order.

Autotransformer on Form K1 and K19 Starters

3.14 To replace the autotransformer, remove the starter case cover and the oil tank. Remove the electrical connections of the transformer at the contactor switch and note their positions and also note the washers under the bolts. Loosen the two large hold-down cap screws with check nuts at the upper support and remove the securing bolts at the sides of the case. Raise the support and remove the coverplate, the sheet of insulation, and the transformer.

3.15 With the transformer on a bench, transfer the connections from the old transformer to the corresponding taps on the new transformer (see note in 3.21) and insulate each connection individually as before. Mount the new transformer in place together with the insulation and coverplate. Be sure that the transformer fits down into place properly and that the insulation and coverplate fit over the laminations. Tighten the securing bolts at the sides of the securing plate and then the hold-down cap screws and check nuts to secure the transformer firmly. Make the electrical connections to the contactor. Put the oil tank and the cover back on and check the operation.

Autotransformer on Form K22 Starter

3.16 The autotransformer on the form K22 starter weighs approximately 400 pounds and it is recommended that it be taken out through the top of the cabinet with suitable tackle. Be sure the ac service is disconnected directly ahead of the starter. Remove the back, left side and top of the cabinet, as viewed from the control side. Be careful not to drop anything or allow a wrench to

slip and break the porcelain insulators. Remove the overload relay and then disconnect its leads. Designate the line and motor leads on the current transformers and vertical bus bars, etc, and disconnect the leads, noting the positions of any washers, etc. If the vertical bus bars or supporting brackets will interfere with the removal of the transformer or its connections, disconnect them. Take out the current transformers and brackets as required to allow the autotransformer to be lifted out.

3.17 Release the check nut and hold-down bolt on each side of the autotransformer and take off the hold-down plates, insulation, etc. Since the bus bars are not readily accessible for disconnection at the transformer taps, they should be disconnected at the other ends and taken out with the transformer. In raising the transformer, be careful to guide the bus bars connected to it. It is recommended that use be made of a rope sling in removing the transformer. Place a loop around each end of the outside coils, being sure the loops are attached so that they will not slip.

3.18 Transfer the bus bar connections to the corresponding taps on the new transformer (see note in 3.21) and insulate them in a similar manner. Install the new transformer in the reverse order, taking precautions to prevent injury to the insulation on the coils and firmly tighten the check nuts and hold-down bolts. Note that the long transformer tap under each coil and the bus bars do not touch anything. Check the operation.

Autotransformer on Form E Starter

3.19 To replace the autotransformer on the form E starter shown in Fig. 3, be sure the ac service is disconnected ahead of the starter. Remove the box cover. After noting their positions, disconnect the autotransformer leads from the contactor. Remove the screws, nuts, and washers used to fasten the top core support to the box and remove the support. As these autotransformers are heavy, it may be necessary to use suitable tackle to lift the autotransformer off the switch frame and autotransformer support and out of the box. Replace with a new transformer and reassemble in the reverse order. (See note in 3.21.)

Autotransformer on Form F Starter

3.20 To replace the autotransformer on the form F starter shown in Fig. 4, be sure the ac service is disconnected ahead of the starter. Remove the box cover. After noting their positions, disconnect the autotransformer leads from the contactor. Remove the screws, nuts, and lockwashers used

to fasten the top core support to the box. Lift the top core support in a vertical direction, being careful not to put any undue strain on the operating link of the undervoltage release. As these autotransformers are heavy, it may be necessary to use suitable tackle to lift the autotransformer off the switch frame and autotransformer support and out of the box. Replace with a new transformer and reassemble in the reverse order. (See note in 3.21.)

Autotransformer on Form K33 and G150 Starters

3.21 To replace the autotransformer on the form K33 and G150 starters shown in Fig. 2, be sure the ac service is disconnected ahead of the starter. Remove the box cover. After noting their positions, disconnect the autotransformer leads from the contactor. Remove the screws, nuts, and lockwashers that fasten the transformer clamps to the box. Remove the clamps. As these autotransformers are heavy, it may be necessary to use suitable tackle to lift the autotransformer out of the box. Replace with a new transformer and reassemble in the reverse order.

Note: Connect the tap or taps to the contactor, as outlined in Section 026-380-701. The remaining taps must be taped and bent back so as not to interfere with other leads.

Undervoltage Release Coil on Form E and F Starters

3.22 To replace the undervoltage release coil on the undervoltage release shown in Fig. 3 and 4, disconnect the coil leads after noting their positions. Remove the armature hinge pin after removing a cotter pin and remove the armature, thus permitting access to the coil. Remove the pole shaver and the insulation washer and slide the coil off the magnet core. Replace with a new coil and reassemble in the reverse order. The undervoltage release coil is identified by the catalogue number stamped on the coil.

Undervoltage Release Coil on Form K33 Starter

3.23 To replace the undervoltage release coil on the form K33 starter shown in Fig. 14, note the position of the coil leads and disconnect the leads after loosening the coil terminal screws. Remove the two nuts that fasten the magnet frame to the base. Release the retaining springs which hold the coil in the magnet frame. Remove the magnet frame. Slide the plunger out of the coil. Pull out the coil. Insert a new coil and reassemble in the reverse order.

Porcelain Insulators on Form K22 Starter

3.24 To replace an insulator on the RUN side, it will be necessary to raise

the autotransformer which weighs approximately 400 pounds. To replace any of the other insulators, it will be necessary to remove the autotransformer, as covered in 3.16, 3.17, and 3.18. Remove the left side of the cabinet and the back, if necessary, and disconnect the bus bars from the top and the flexible connections at the bottom of the insulators as required. Hold one hand over the wrench at the insulator nut while loosening the nuts to prevent the wrench from slipping off and breaking other insulators. Remove the insulator clamping plate to release the insulator. Transfer the stud with nuts and lockwashers to the new insulator and tighten the securing nuts carefully and firmly, holding the nut on one end in a vise. Assemble the starter.

Operating Lever Springs, Undervoltage Release or Parts, and Stop Switch or Parts

3.25 Since the methods of replacing these items are apparent from observation, no procedures are included except as covered in 3.22 and 3.23.

Main Contacts

3.26 Parts of the main contacts may be readily replaced after removing the case cover and the oil tank. With the rotary type of contactor on the form K1 starter, the contact tips should be mounted with the wide edge toward the front as shown. Be sure that all lockwashers are put back and that the contacts and connections are aligned and secured firmly. After replacing the contacts on the form K22 starter, adjust the contactor mechanism.

REASONS FOR REISSUE

1. To change the name of the apparatus from ac motor starting compensators, hand operated, to manual-type ac starters, and to revise the title accordingly.
2. To add new Fig. 2, 3, and 4 for the KS-5140-01 starters.
3. To add new Fig. 5 for the CR-2824-42-type thermal overload relays.
4. To revise titles of Fig. 1, 6, 7, 11, and 12.
5. To revise Fig. 8, 9, and 10.
6. To add new Fig. 13 (form G150 starter) for the contactor-type undervoltage release with time-delay feature.
7. To add new Fig. 14 for the solenoid-type undervoltage release with time-delay feature on form K33 starter.
8. To add new Fig. 15 for the contactor mechanism on form K33 and G150 starters.

9. To add new Fig. 16 for the CR9905G101A2 thermal overload relay.
10. To revise the list of tools and materials.
11. To revise the procedure for oil level (3.06 and 3.07).
12. To revise the procedure for the CR-2824-TC221-C thermal overload relay (3.08), and to add a procedure for the CR9905G101A2 thermal overload relay (3.10).
13. To add replacement procedures for the CR-2824-42A, 42C, 42F, and 42G thermal overload relay (3.11 and 3.12).
14. To add replacement procedures for autotransformers on forms E, F, K33, and G150 starters (3.19, 3.20, and 3.21).
15. To add replacement procedures for under-voltage release coils on forms E, F, and K33 starters (3.22 and 3.23).