I.L. 3810-101

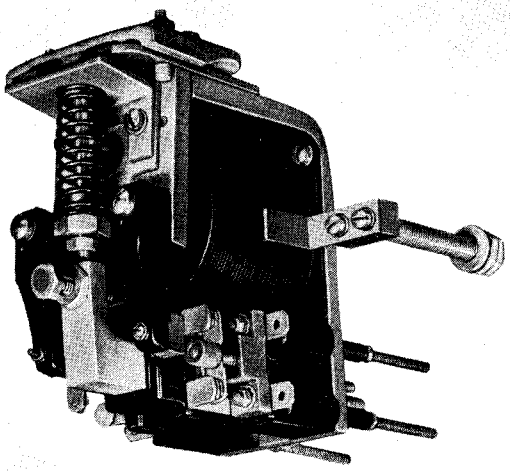
DESCRIPTION • OPERATION • MAINTENANCE

INSTRUCTIONS

Navy Service A

D-C OVERLOAD AND JAMMING RELAYS

Type IAYJ **Single Pole** **Normally Closed**



TYPE IAYJ RELAYS are d-c, magnetically-operated devices which provide overload and jamming protection. These relays are used on marine control to prevent damage to hoist, windlass, and capstan equipment when the load or cable jams. They may also be used to provide almost instantaneous magnetic overload protection on d-c general purpose and mill motor applications.

Rating. The single-break, normally-closed main contacts and the double-break auxiliary contacts are rated as indicated in the table below.

The interrupting rating will be decreased if the main stationary contact is adjusted for less than 1/4-inch contact gap.

MAIN AND AUXILIARY CONTACTS

D-C RATING		
Amperes Continuous Carrying Capacity	Amperes Interrupting Capacity for Inductive Loads	
	115 Volts	230 Volts
5	1.3	.65

Type IAYJ relays are operated by a series or copper strap-wound type of coil. Coils and coil studs are available for currents ranging from approximately 75 to 625 amperes. The continuous current-carrying rating of a coil is usually based upon a current density of 2000 amperes per square inch.

The coils and auxiliary contact parts are insulated from the relay frames for 600 volts.

DESCRIPTION

Type IAYJ relays are of exceptionally sturdy unit construction and have a knife-edge bearing between the armature and the frame. They are completely assembled and tested at the factory before shipment. They can be obtained with contact terminals for either front or rear connection.

As these relays have a knife-edge bearing and as there are very few moving parts, the relays are suitable for withstanding a very large number of operations. The knife-edge type of bearing is not greatly affected by dust or dirt. The ground armature and frame surfaces are plated with hard chromium. In addition to providing good protection against corrosion, the chromium plating provides a surface that will not wear with operation.

The normally-closed main contact also serves as the armature stop and is electrically and mechanically connected to the armature and the frame. A flexible shunt which bridges the knife-edge bearing also connects the main contact and armature assembly electrically to the frame. All contact buttons are fine silver.

The contact assembly is indicated by the type numbers. The first numeral following the letters "IAYJ" indicates the number of normally-open contacts; the second numeral indicates the number of normally-closed contacts (it includes the normally-closed main contact); and the letter "S" indicates a small frame size. The relay assembly for overload application is usually assembled with only a normally-closed main contact. For a jamming application, the relay is usually assembled with a normally-open auxiliary and a normally-closed main contact. The hot-molded base is the same for all relay as-

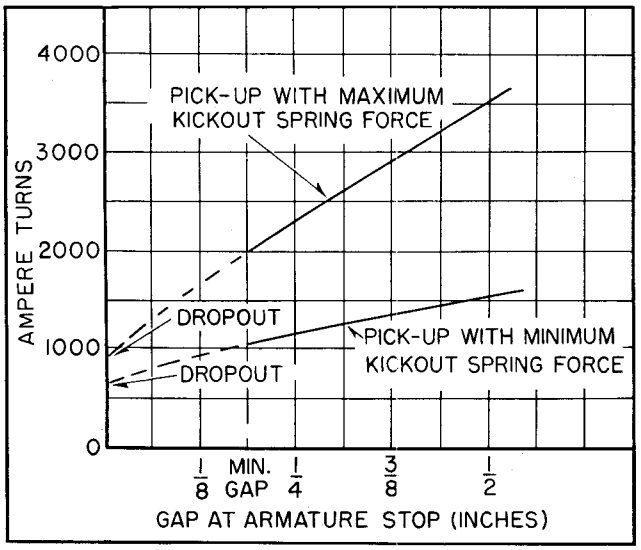


FIG. 1. Pick-up and Drop-out Characteristics of Type IAYJ-11 Relay

semblies and is suitable for mounting an additional normally-open auxiliary contact assembly.

These relays are operated by means of a strap-wound coil for either the overload or jamming applications. The coils can be removed from the front of the relay and the only tool required is a screwdriver.

A 1/8-inch thick non-magnetic spacer is assembled between the core and the core pole-face so that the relay will have a certain pick-up and drop-out characteristic. The kick-out spring support stud and the acorn nut are assembled and adjusted at the time of manufacture so that the spring can not be set below a minimum force value.

OPERATION

These relays function similar to other current and series coil-operated magnetic overload devices. Means have been provided for varying the current value at which the armature will pick-up when the coil is energized or will be released when the coil current is decreased.

When a d-c current that is within the operating limits flow through the coil, the armature will be attracted toward and will seal against the core pole-face. The pick-up current will be determined by the armature kick-out spring force and the main contact gap. The pick-up value may be varied in approximately a 3 to 1 range, or between approximately 1500 and 4500 ampere-turns, by adjusting the kick-out spring and the contact gap. The main stationary contact position determines the armature travel and the air gap in the magnetic circuit. The operating coil is supported on a heavy cross-section copper tube; this tube provides some damping action and prevents the relay from operating on transient currents.

The current value at which the armature will drop-out or be released can be varied in approximately a 1.8 to 1 range, or between approximately 750 and 1350 ampere-turns, by changing the armature kick-out spring pressure. The drop-out is affected only by a change in the spring pressure; for a given pressure, the drop-out current value will be the same regardless of the main contact gap.

The pick-up and drop-out characteristics are shown on the curves in Fig. 1.

For a Type IAYJ-01S relay which has only a normally-closed main contact, the drop-out will be approximately 60 to 80 ampere-turns less than the values indicated on the curves in Fig. 1.

The current rating of a particular operating coil will be determined by the cross-section area of the copper strap. All coils produce approximately the same number of ampere-turns; a coil with a small copper cross-section area usually has a large number of turns and a coil with a large cross-section area generally has a small number of turns. The number of effective electrical turns may be different from the number of mechanical turns. A turn is effective electrically only when it is encircled by a complete iron loop.

ADJUSTMENT

When the relay is used as an overload relay only, the pick-up current value may be varied by adjusting both the spring pressure and the setting of the main stationary contact.

For jamming applications, the relay is usually calibrated to operate with a definite ratio of the pick-up current to the drop-out current. This ratio is often 2 to 1 (or the pick-up, ampere-turn value is twice the drop-out value). The drop-out current value can be varied only by adjusting the armature kick-out spring pressure and the relay should always be calibrated for the drop-out current value first. The pick-up current value can then be varied by adjusting the stationary contact position.

MAINTENANCE

Failure to Operate. Failure of the relay armature to close may be caused by an insufficient amount of current flowing through the coil, or mechanical interference. Failure of the relay armature to drop-out or be released may result from the coil circuit being energized, mechanical interference, or a broken or weak kick-out spring.

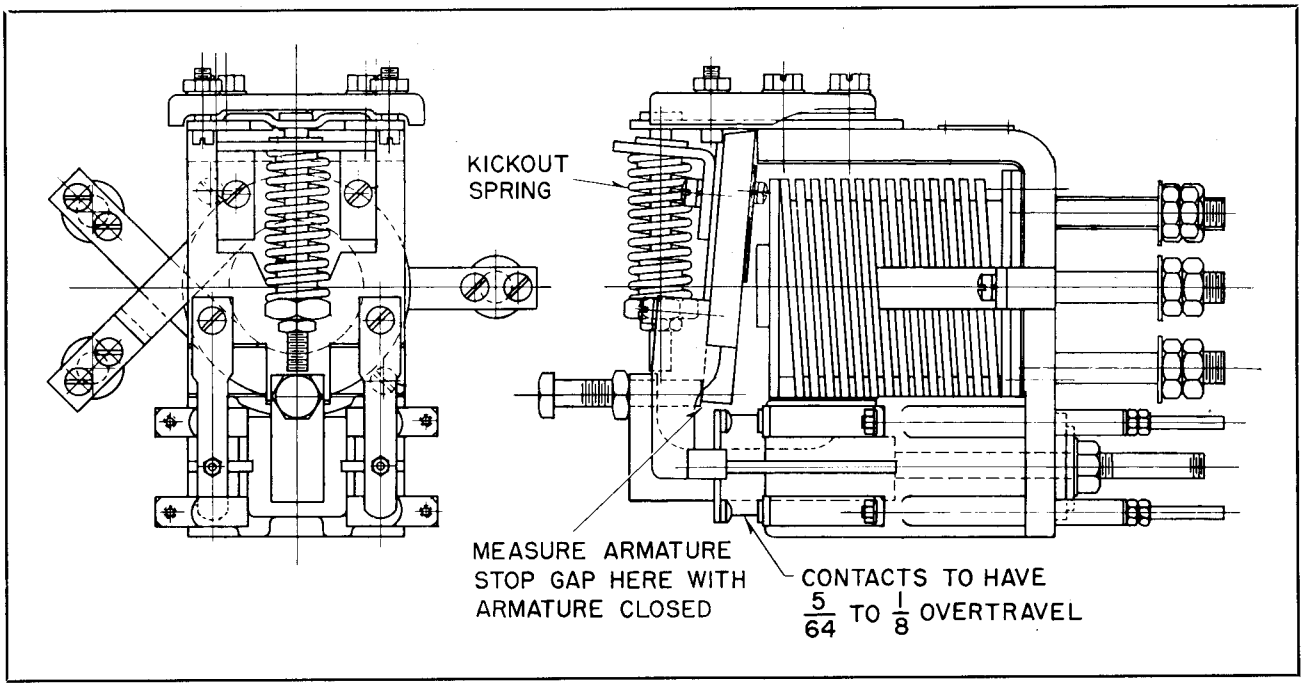


FIG. 2. Detail Views of Type IAYJ Relay

Contact Pressure. The normally-closed main contact pressure can be varied in a range from 1 to 5 pounds when the main contact gap is adjusted for 1/4 inch. The auxiliary contact pressures should be approximately 4 ounces initial and 6 ounces final.

Contact Gap and Overtravel. (See Fig. 2). An operating coil should be selected so that the stationary contact may be set for 1/4 inch or longer contact gap to provide the full interrupting capacity. The main contact gap is the distance between the stationary and moving contacts when the armature is in the fully closed position. In general, a relay should not be operated with a main contact gap shorter than 3/16 inch or with one exceeding 1/2 inch.

For a 1/4-inch main contact gap, the auxiliary normally-open contact assembly will have a total gap of 1/2 inch (two gaps in series). The auxiliary contact overtravel will vary from 5/64 to 1/8 inch.

Contact Replacement. The contacts should be replaced when they become severely burned or worn away. In general, the auxiliary contacts should be replaced when the overtravel decreases to 1/32 inch. Moderately burned or blackened silver contacts usually do not require replacement or dressing as the discolored surface is generally still a good conductor. The auxiliary moving contacts should move freely in their guides and on their guide pins. To remove the auxiliary stationary contacts, the studs or screws which hold them to the molded base must be removed. This can usually be done easiest by removing the complete base assembly from the relay.

Lubrication is not required for the contacts. The use of oil or grease is very undesirable as it helps to collect dirt and dust.

Frame and Armature. The magnetic sealing surfaces of the armature, frame, and core should be kept as clean as possible so that the armature will seal properly. Dirt or foreign matter between the armature and the frame will change the drop-out ampere-turn characteristic. A knife-edge bearing operates best without lubrication.

Coil Replacement. The armature assembly can be removed by disconnecting one end of the shunt, by compressing the armature kick-out spring until the ends of the spring stud yoke which engage in the slots in the top bearing plate are free of the plate, and then by pulling the top of the armature in a forward direction.

After the armature has been removed, the coil ends disconnected from the coil studs, and the single coil mounting screw taken out, the coil assembly can be taken off by pulling it in a forward direction. The insulating cup washer which surrounds the head of the coil mounting screw should always be replaced as it provides insulation between the coil and the frame.

WESTINGHOUSE ELECTRIC CORPORATION
BUFFALO PLANT • MOTOR AND CONTROL DIVISION • BUFFALO 5, N.Y.

Printed in U.S.A.

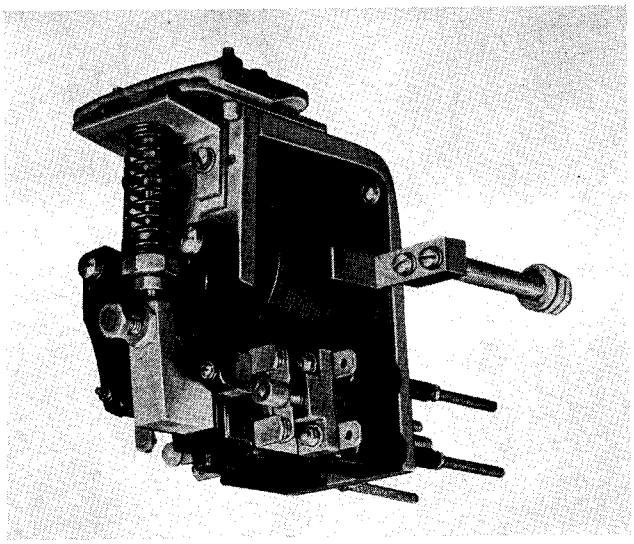
DESCRIPTION • OPERATION • MAINTENANCE

INSTRUCTIONS

Navy Service A

D-C OVERLOAD AND JAMMING RELAYS

Type IAYJ **Single Pole** **Normally Closed**



TYPE IAYJ RELAYS are d-c, magnetically-operated devices which provide overload and jamming protection. These relays are used on marine control to prevent damage to hoist, windlass, and capstan equipment when the load or cable jams. They may also be used to provide almost instantaneous magnetic overload protection on d-c general purpose and mill motor applications.

Rating. The single-break, normally-closed main contacts and the double-break auxiliary contacts are rated as indicated in the table below.

The interrupting rating will be decreased if the main stationary contact is adjusted for less than 1/4-inch contact gap.

MAIN AND AUXILIARY CONTACTS

D-C RATING		
Amperes Continuous Carrying Capacity	Amperes Interrupting Capacity for Inductive Loads	
	115 Volts	230 Volts
5	1.3	.65

Type IAYJ relays are operated by a series or copper strap-wound type of coil. Coils and coil studs are available for currents ranging from approximately 75 to 625 amperes. The continuous current-carrying rating of a coil is usually based upon a current density of 2000 amperes per square inch.

The coils and auxiliary contact parts are insulated from the relay frames for 600 volts.

DESCRIPTION

Type IAYJ relays are of exceptionally sturdy unit construction and have a knife-edge bearing between the armature and the frame. They are completely assembled and tested at the factory before shipment. They can be obtained with contact terminals for either front or rear connection.

As these relays have a knife-edge bearing and as there are very few moving parts, the relays are suitable for withstanding a very large number of operations. The knife-edge type of bearing is not greatly affected by dust or dirt. The ground armature and frame surfaces are plated with hard chromium. In addition to providing good protection against corrosion, the chromium plating provides a surface that will not wear with operation.

The normally-closed main contact also serves as the armature stop and is electrically and mechanically connected to the armature and the frame. A flexible shunt which bridges the knife-edge bearing also connects the main contact and armature assembly electrically to the frame. All contact buttons are fine silver.

The contact assembly is indicated by the type numbers. The first numeral following the letters "IAYJ" indicates the number of normally-open contacts; the second numeral indicates the number of normally-closed contacts (it includes the normally-closed main contact); and the letter "S" indicates a small frame size. The relay assembly for overload application is usually assembled with only a normally-closed main contact. For a jamming application, the relay is usually assembled with a normally-open auxiliary and a normally-closed main contact. The hot-molded base is the same for all relay as-

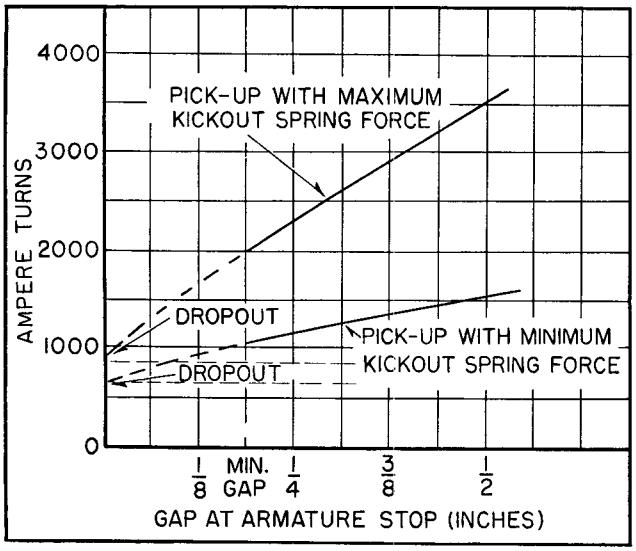


FIG. 1. Pick-up and Drop-out Characteristics of Type IAYJ-11 Relay

semblies and is suitable for mounting an additional normally-open auxiliary contact assembly.

These relays are operated by means of a strap-wound coil for either the overload or jamming applications. The coils can be removed from the front of the relay and the only tool required is a screwdriver.

A 1/8-inch thick non-magnetic spacer is assembled between the core and the core pole-face so that the relay will have a certain pick-up and drop-out characteristic. The kick-out spring support stud and the acorn nut are assembled and adjusted at the time of manufacture so that the spring can not be set below a minimum force value.

OPERATION

These relays function similar to other current and series coil-operated magnetic overload devices. Means have been provided for varying the current value at which the armature will pick-up when the coil is energized or will be released when the coil current is decreased.

When a d-c current that is within the operating limits flow through the coil, the armature will be attracted toward and will seal against the core pole-face. The pick-up current will be determined by the armature kick-out spring force and the main contact gap. The pick-up value may be varied in approximately a 3 to 1 range, or between approximately 1100 and 3300 ampere-turns, by adjusting the kick-out spring and the contact gap. The main stationary contact position determines the armature travel and the air gap in the magnetic circuit. The operating coil is supported on a heavy cross-section copper tube; this tube provides some damping action and prevents the relay from operating on transient currents.

The current value at which the armature will drop-out or be released can be varied in approximately a 1.3 to 1 range, or between approximately 650 and 850 ampere-turns, by changing the armature kick-out spring pressure. The drop-out is affected only by a change in the spring pressure; for a given pressure, the drop-out current value will be the same regardless of the main contact gap.

The pick-up and drop-out characteristics are shown on the curves in Fig. 1.

For a Type IAYJ-01S relay which has only a normally-closed main contact, the drop-out will be approximately 60 to 80 ampere-turns less than the values indicated on the curves in Fig. 1.

The current rating of a particular operating coil will be determined by the cross-section area of the copper strap. All coils produce approximately the same number of ampere-turns; a coil with a small copper cross-section area usually has a large number of turns and a coil with a large cross-section area generally has a small number of turns. The number of effective electrical turns may be different from the number of mechanical turns. A turn is effective electrically only when it is encircled by a complete iron loop.

ADJUSTMENT

When the relay is used as an overload relay only, the pick-up current value may be varied by adjusting both the spring pressure and the setting of the main stationary contact.

For jamming applications, the relay is usually calibrated to operate with a definite ratio of the pick-up current to the drop-out current. This ratio is often 2 to 1 (or the pick-up, ampere-turn value is twice the drop-out value). The drop-out current value can be varied only by adjusting the armature kick-out spring pressure and the relay should always be calibrated for the drop-out current value first. The pick-up current value can then be varied by adjusting the stationary contact position.

MAINTENANCE

Failure to Operate. Failure of the relay armature to close may be caused by an insufficient amount of current flowing through the coil, or mechanical interference. Failure of the relay armature to drop-out or be released may result from the coil circuit being energized, mechanical interference, or a broken or weak kick-out spring.

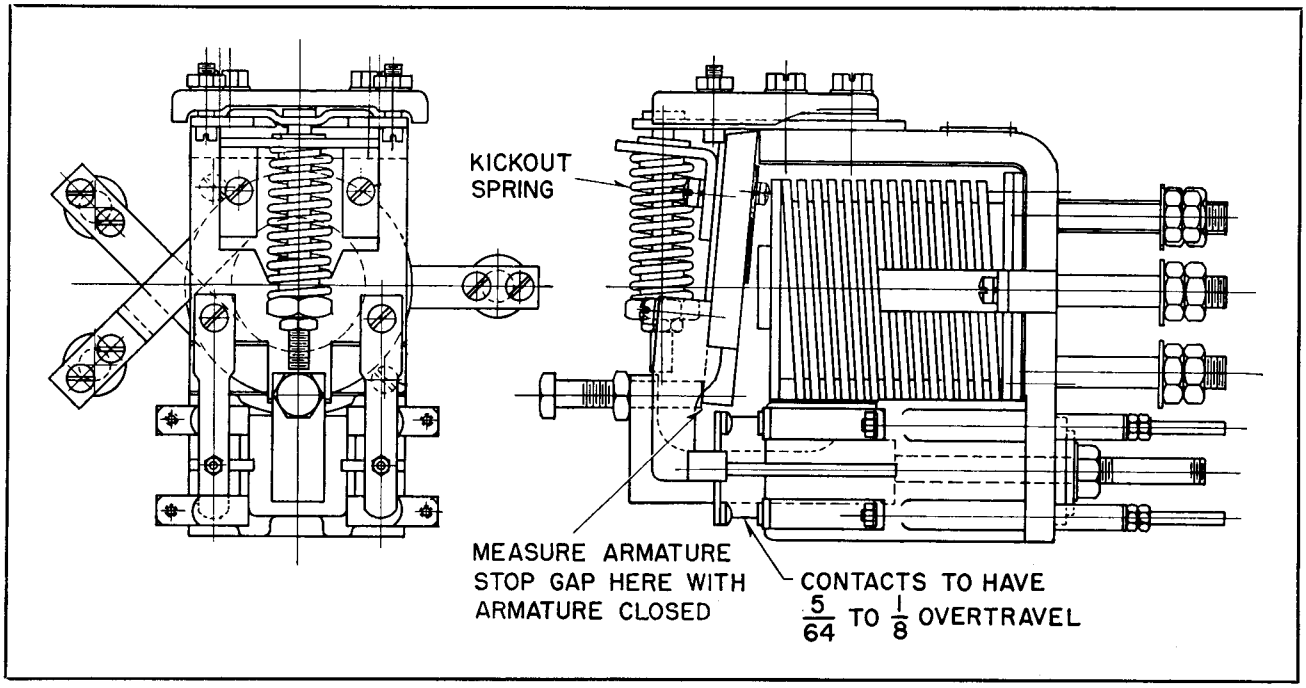


FIG. 2. Detail Views of Type IAYJ Relay

Contact Pressure. The normally-closed main contact pressure can be varied in a range from 1 to 5 pounds when the main contact gap is adjusted for 1/4 inch. The auxiliary contact pressures should be approximately 4 ounces initial and 6 ounces final.

Contact Gap and Overtravel. (See Fig. 2). An operating coil should be selected so that the stationary contact may be set for 1/4 inch or longer contact gap to provide the full interrupting capacity. The main contact gap is the distance between the stationary and moving contacts when the armature is in the fully closed position. In general, a relay should not be operated with a main contact gap shorter than 3/16 inch or with one exceeding 1/2 inch.

For a 1/4-inch main contact gap, the auxiliary normally-open contact assembly will have a total gap of 1/2 inch (two gaps in series). The auxiliary contact overtravel will vary from 5/64 to 1/8 inch.

Contact Replacement. The contacts should be replaced when they become severely burned or worn away. In general, the auxiliary contacts should be replaced when the overtravel decreases to 1/32 inch. Moderately burned or blackened silver contacts usually do not require replacement or dressing as the discolored surface is generally still a good conductor. The auxiliary moving contacts should move freely in their guides and on their guide pins. To remove the auxiliary stationary contacts, the studs or screws which hold them to the molded base must be removed. This can usually be done easiest by removing the complete base assembly from the relay.

Lubrication is not required for the contacts. The use of oil or grease is very undesirable as it helps to collect dirt and dust.

Frame and Armature. The magnetic sealing surfaces of the armature, frame, and core should be kept as clean as possible so that the armature will seal properly. Dirt or foreign matter between the armature and the frame will change the drop-out ampere-turn characteristic. A knife-edge bearing operates best without lubrication.

Coil Replacement. The armature assembly can be removed by disconnecting one end of the shunt, by compressing the armature kick-out spring until the ends of the spring stud yoke which engage in the slots in the top bearing plate are free of the plate, and then by pulling the top of the armature in a forward direction.

After the armature has been removed, the coil ends disconnected from the coil studs, and the single coil mounting screw taken out, the coil assembly can be taken off by pulling it in a forward direction. The insulating cup washer which surrounds the head of the coil mounting screw should always be replaced as it provides insulation between the coil and the frame.

WESTINGHOUSE ELECTRIC CORPORATION

BUFFALO PLANT • MOTOR AND CONTROL DIVISION • BUFFALO 5, N. Y.

Printed in U.S.A.