J-TYPE RELAYS
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers J-type relays.

1.02 This section has been reissued to revise the definition of release (1.07) and to provide correct references to other Plant Series sections. In this process marginal arrows have been omitted.

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 ***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.

1.05 ***Operate:*** A relay is said to ***operate*** if, when current (ac, dc, or both) is connected to its winding, the armature moves sufficiently to cause the back contact, when one is used, to break and all front contacts to make a continuous reliable contact, except in the case of relays equipped with a spring combination per Fig. 9, in which case it shall close the pendulum contact sufficiently to lock up or cause the associated relay to operate reliably.

1.06 ***Nonoperate:*** A relay is said to ***nonoperate*** if, when current is connected to its winding, the armature does not move sufficiently to close any front contact or to reduce the back contact pressure enough to cause an unreliable contact.

1.07 ***Release:*** A relay is said to release if, when the current is reduced to the release value or the current is removed, the armature moves from the operated position sufficiently to break contacts that have been made and to make reliably contacts that have been opened. On relays having no back contact or a back contact that is used for armature stop purposes, the armature need not touch the backstop or back contact.

1.08 ***Hold:*** A relay is said to ***hold*** if, after the relay has operated and the current is either reduced abruptly or is interrupted momentarily, the armature does not move sufficiently to cause contacts that have been made to become unreliable or to make contacts that have been broken.

1.09 ***Armature Travel:*** The armature travel is the gap between the pole pieces and the armature measured at the nearest point when the armature is resting against the back contact or stop.

1.10 Unless otherwise specified, on relays equipped with the earlier type of 2-piece cover which is held in place by a cover spring of the type shown in Fig. 103, check the requirements with the cover in place. If the cover is removed for any reason, the contact follow, contact separation, armature tension, and electrical requirements shall be rechecked after the cover is remounted. The cover cap may be either on or off when checking the requirements.

2. REQUIREMENTS

2.01 ***Cleaning:*** Contacts and other parts of the relay shall be cleaned when necessary in accordance with Section 069-306-801.

2.02 ***Relay Mounting:*** Relays shall be mounted approximately level and fastened securely to the mounting plate.

Gauge by eye and feel.

2.03 *Cover Clearance*

(a) The clearance between the relay cover and any adjacent apparatus, including relay covers, shall be

Min 1/64 inch

Gauge by eye.

(b) There shall be a clearance at all points between the adjusting plate and the relay cover, with the cover in place and cover cap removed. When checking the requirement, the cover shall be pushed back against the mounting plate.

Note: For relays equipped with one-piece covers, this requirement is met if a clearance exists between the adjusting plate and the cover when a cover (shell) of a 2-piece cover is applied to the relay.

2.04 ***Cover and Cover Cap Tightness***

(a) The cover springs shall have sufficient pressure against the cover to hold it firmly in place.

Gauge by feel.

(b) The cover cap of 2-piece covers shall fit snugly, but shall not be so tight as to prevent placing or removing with the fingers.

Gauge by feel.

(c) On 2-piece covers, the cover shall remain in place when the cover cap is being removed.

Gauge by eye.

2.05 ***Application of D-95367 Removable Paper Backstops***

(a) If springs have embossings or contacts used as armature stops, D-95367 removable paper backstops may be applied unconditionally to these springs, when necessary to relieve sticking conditions.

(b) Before the paper backstop is mounted it shall be flattened so that the lap joint is wholly between the two creases.

(c) Fig. 101(A) — The backstop shall be placed over the stop spring so that the single layer of paper is between the backstop and the armature.

Gauge by eye.

(d) Fig. 101(B) — The end of the removable paper backstop shall be approximately flush with the end of the stop spring.

Gauge by eye.

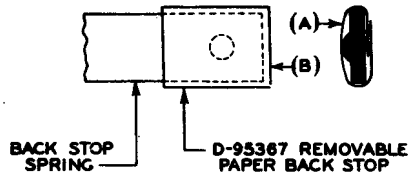

Fig. 101 – Application of Paper Backstops

2.06 ***Contact Alignment:*** Fig. 102(A) — The point of contact shall fall wholly within the boundary of the opposing contact.

Gauge by eye.

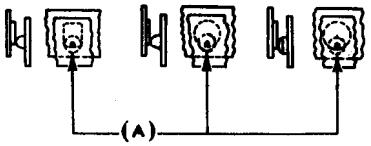

Fig. 102 – Contact Alignment

2.07 ***Position of Adjusting Screws:*** At the time of turnover to the telephone company after the relay has been finally adjusted, there shall be a clearance between the inner surface of the head of the adjusting screws and the front of the adjusting plate of

Min 1/16 inch

Gauge by eye.

2.08** ***Tightness of Adjusting Screws: Fig. 103(A) — The adjusting screws shall be sufficiently tight to prevent the relay changing its adjustment but shall not be so tight that it is necessary to use undue pressure in turning them.

Gauge by feel.

2.09 ***Contact Spring Tension***

(a) The No. 2 spring in Fig. 4 and 5 shall rest against the front armature stud with a tension of

Max 4 grams

measured as the spring leaves the stud.

Use the No. 70F gauge.

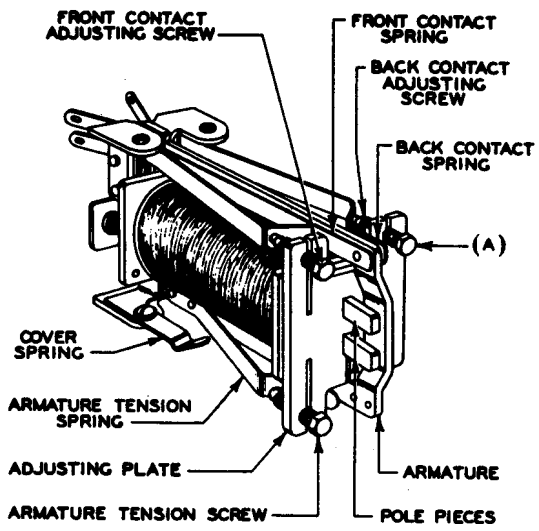

Fig. 103 – J-type Relay — Earlier Type Cover Spring

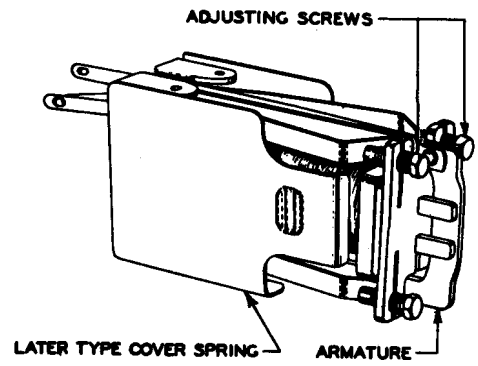

Fig. 104 – J-type Relay — Later Type Cover Spring

(b) The tension of the No. 1 spring in Fig. 9 against its support measured as it leaves the support shall be

Min 5 grams

Use the No. 70F gauge.

Remove the cover to check this requirement.

2.10 *Armature Travel* — Fig. 105(A)

(a) Unless otherwise specified herein, or on the circuit requirement table, the armature travel shall be

Min 0.023 inch

Use the No. 66D gauge.

(b) On the following relays the armature travel shall be

RELAY	ARMATURE TRAVEL
J17	Min 0.010 inch
J26	Min 0.035 inch
J28	Min 0.035 inch
J30	Min 0.035 inch
J38	Min 0.035 inch

Use the No. 66D gauge.

(c) On relays having a spring combination per Fig. 9, the armature travel shall be as specified on the circuit requirement table and the tolerance for test and readjust shall be +0.005 inch, −0.000 inch.

Use the No. 66D gauge.

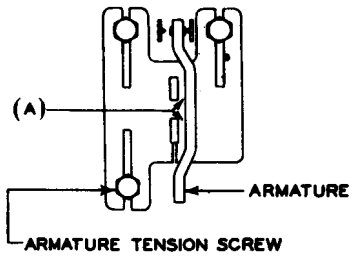

Fig. 105 – Armature Travel

2.11 *Contact Follow*

(a) Fig. 106(A) — Unless otherwise specified herein, or on the circuit requirement table, the contact follow shall be

Min 0.003 inch

Use the No. 66D gauge.

(b) Fig. 106(A) — On the J9 relay, the contact follow shall be

Min 0.004 inch

Use the No. 66D gauge.

(c) This requirement is met if the contacts make with a gauge of the thickness of the follow specified inserted between the armature and the pole pieces and the armature held against the gauge by applying just enough pressure directly back of the pole pieces (see Fig. 106) to hold the armature against the gauge but not enough to distort the armature.

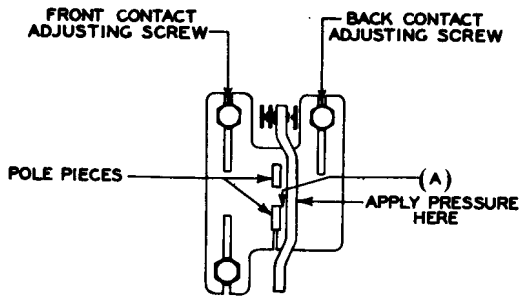

Fig. 106 – Contact Follow

(d) On relays having a spring combination per Fig. 2 or 8, no contact follow is specified.

(e) Fig. 107(A)(B) — On relays having a spring combination per Fig. 9 (pendulum type) the contact follow on contact B (in back of the armature) shall be as specified in (a) above.

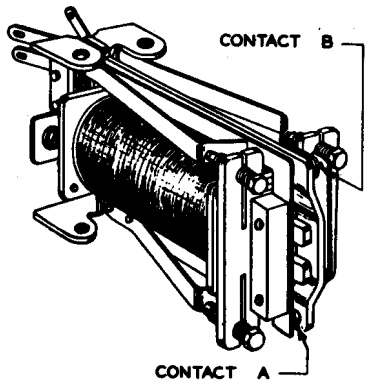

Fig. 107 – Pendulum-type Relay

The contact follow on contact A (pendulum contact) shall be as specified in Table A.

TABLE A

ARM. TRVL	CONTACT FOLLOW MIN	MAX
0.025 inch	0.008 inch	0.013 inch
0.030 inch	0.013 inch	0.018 inch
0.035 inch	0.015 inch	0.020 inch
0.040 inch	0.020 inch	0.025 inch

Use the No. 66D or No. 131A gauge.

The follow on contact A is considered satisfactory if, with a gauge of the thickness of the maximum follow specified in Table A above, corresponding to the armature travel given in the Arm. Trvl column of the circuit requirement table, inserted between the armature and the pole pieces, the contact does not make and with a gauge of the minimum follow specified inserted in the same place the contact does make. The relay shall be operated electrically in those cases where a dc operate value is specified, otherwise the armature shall be held against the gauge with sufficient pressure applied directly in back of the gauge to hold it against the gauge but not enough to distort the armature (see Fig. 106).

2.12 *Contact Separation*

(a) Fig. 108(A) — Unless otherwise specified herein, or on the circuit requirement table, the separation between contacts normally open or between contacts that are opened when the relay is operated shall be

Min 0.005 inch

Use the No. 74D gauge.

(b) No separation is specified for contact A (pendulum contact) in Fig. 9 since this will be satisfactory if the armature travel and contact follow requirements are met.

2.13 *Armature Tension* — Fig. 108(B)

(a) The tension of the armature against the back contact or stop, unless otherwise specified herein, or on the circuit requirement table, shall be

Min 5 grams

Use the No. 70F gauge.

To check, apply the gauge to the armature, midway with respect to the pole pieces, in a direction to move the armature toward the pole pieces. The gauge shall register at least the required tension when the armature breaks from the back contact or stop.

(b) On the following relays the armature tension shall be

RELAY	ARMATURE
J4,5,6,8	No tension specified
J22,33,34,36,52,53	Min 3 grams
J55	Min 4 grams
J26,28	Min 7 grams
J30,38	Min 8 grams

Use the No. 70F gauge applied as in (a).

(c) In all cases, the armature tension shall be sufficient to insure that the relay releases on open circuit.

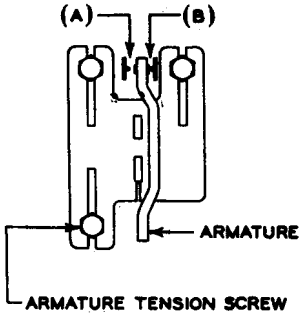

Fig. 108 – Contact Separation

2.14 *Electrical Requirements*

(a) Except as specified in (b), all relays shall meet the electrical requirements specified on the circuit requirement table.

(b) When the relay is used in a toll or telegraph circuit in a toll office and the ac voltage requirements are not shown on the circuit requirement table, the ac voltage requirements outlined in Table B shall be used if an ac voltage test set is available.

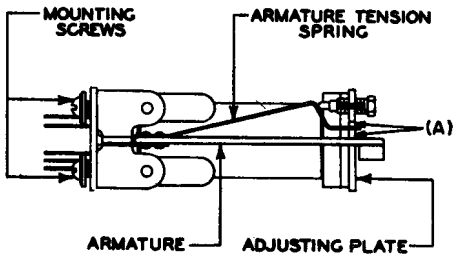

Fig. 109 – Armature Tension Spring Position

(c) All relays except those equipped with spring combinations per Fig. 2 or 8 shall also operate satisfactorily on full ac energy without appreciable chatter. This shall be obtained by short circuiting the series test resistance specified on the circuit requirement table or by using the facilities provided by the test circuit.

(d) On relays equipped with a 2-piece cover, the cover must be firmly in place when applying the electrical requirements but the cover cap may be either on or off. On relays equipped with a one-piece cover, the cover shall be off when applying the electrical requirements.

2.15 ***Armature Tension Spring Position:*** Fig. 109(A) — On relays equipped with the type of armature tension spring shown in Fig. 109, there shall be a clearance between the armature and the spring with the relay in its operated position and between the spring and the adjusting plate with the relay in its unoperated position of

0.005 inch

Gauge by eye.

2.16 ***Position of Spring Attached to Armature*** (J53 Relay Only): Fig. 110(A) — With the relay in the nonoperated position, it is permissible for the spring attached to the armature to touch the back contact adjusting screw.

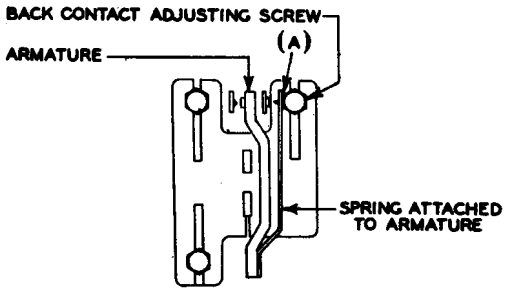

Fig. 110 – Position of Spring Attached to Armature on J53 Relays

TABLE B

AC VOLTAGE REQUIREMENTS								
RELAY CODE	TYPE OF CIRCUIT	SERIES CONN.	FREQ IN CYCLES	AC TEST AND READJUST REQUIREMENTS — METER SETTINGS VOLTS ACROSS T AND R LEADS. TEST OPR	TEST NONOPR	READJUST OPR	READJUST NONOPR	§ SHUNT RES
J1	Terminal Ringers	Ret Coil and 1 MF	16-2/3	22.5		20.0		225
			20	35.0		32.5		
				METER SETTINGS VOLTS ACROSS RELAY WDG TEST OPR	TEST NONOPR	READJUST OPR	READJUST NONOPR	
† J1 J2	Misc	Wdg Alone	16-2/3	33.0		30.0		225
			20	38.0		34.0		
J3,J7,J11, J12,J13, J24,J37	Misc	Wdg Alone	16-2/3	30.0		27.0		225
			20	36.0		32.0		
J4 J6	Misc	Wdg Alone	16-2/3	33.0	13.5	30.0	14.5	225
			20	38.0	16.0	34.0	17.0	
J9	Misc	Wdg Alone	16-2/3	14.0		12.5		225
			20	16.5		15.0		
J15,J20, J51	Misc	Wdg Alone	16-2/3	34.0		31.0		225
			20	40.0		36.0		
J18,J22, J36	Misc	Wdg Alone	16-2/3	28.0		25.0		225
			20	32.0		29.0		
J19	Misc	Wdg Alone	16-2/3	20.0		18.0		225
			20	22.0		20.0		
J23	Misc	Wdg Alone	16-2/3	30.0		27.0		225
			20	33.0		30.0		
J25	Misc	Wdg Alone	16-2/3	34.0		31.0		225
			20	40.0		36.0		
J26	Misc	Wdg Alone	16-2/3	31.0		28.0		225
			20	37.0		33.0		
J28	Misc	Wdg Alone	16-2/3	31.0	16.5	28.0	17.5	225
			20	37.0	20.0	33.0	21.0	
J31	Misc	Wdg Alone	16-2/3	9.5		8.5		225
			20	10.0		9.0		
J34	Misc	Wdg Alone	16-2/3	29.0		26.0		225
			20	33.0		30.0		
J43	Misc	Wdg Alone	16-2/3	37.0		33.0		225
			20	42.5		38.0		

† When the J1 relay is used in terminal ringers, these requirements may be used for locating trouble.

§ These shunts facilitate the testing or readjusting of a group of relays by stabilizing the test circuit output and making it unnecessary to re-establish the test circuit output voltage for each relay. When a test circuit is used that is not equipped with the resistance specified, the voltage value must be re-established for each relay tested or readjusted.

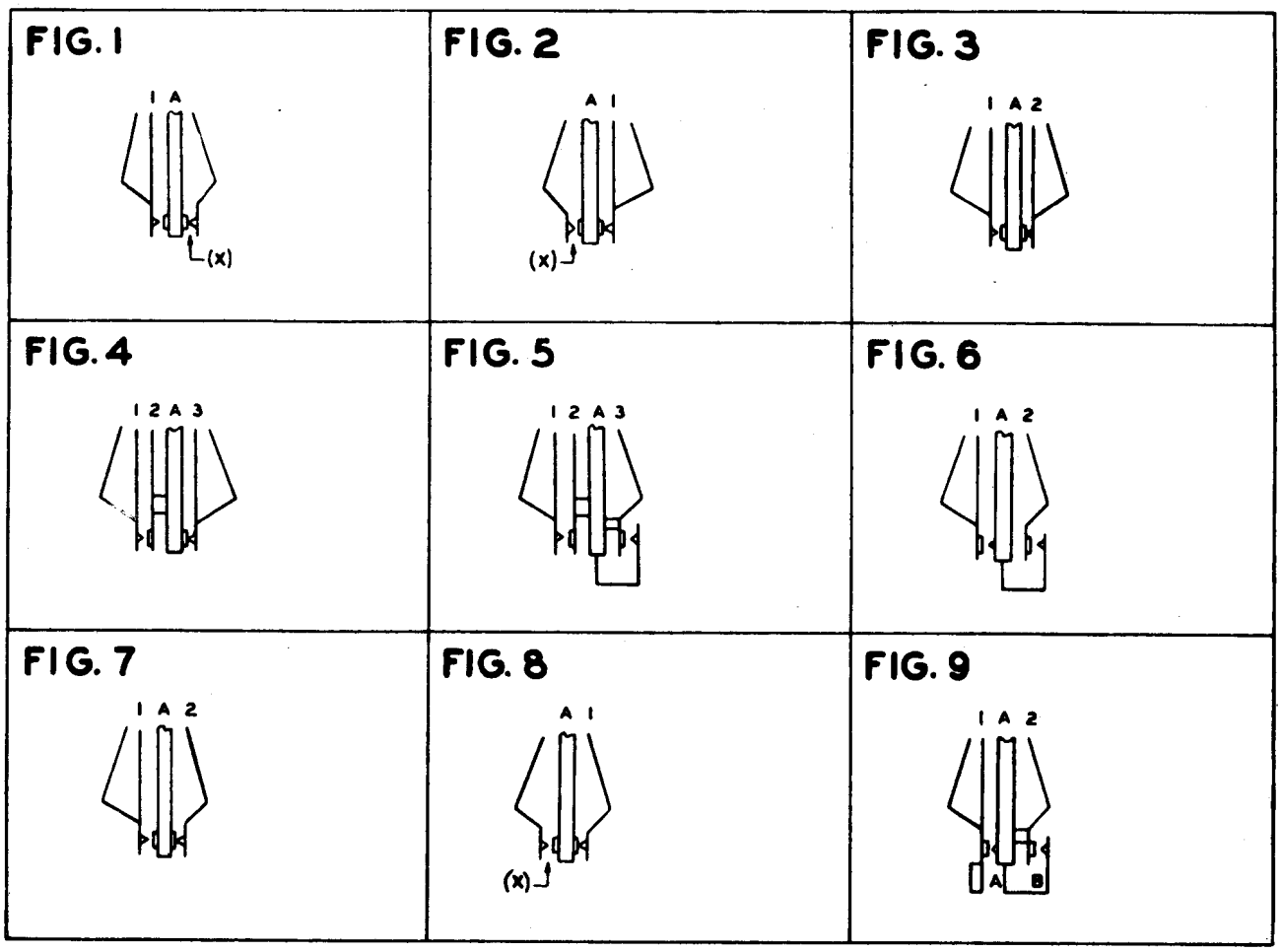

Fig. 2 and 8 are equipped with heavy front stop springs. Contacts marked (X) are used for armature stop purposes and do not form part of the electrical circuit.

3. ADJUSTING PROCEDURES

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

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
206	30-degree Offset Screwdriver
207	90-degree Offset Screwdriver
220	3/16-inch Hex. Socket Wrench
259	Spring Adjuster
300	Spring Adjuster
363	Spring Adjuster
KS-6015 (2 req)	6-inch Duck-bill Pliers
—	6-1/2-inch P-Long-nose Pliers
—	3-inch Cabinet Screwdriver
—	4-inch Regular Screwdriver
GAUGES	
66D	Thickness Gauge Nest
70F	10-0-10 Gram Gauge
74D	Thickness Gauge Nest
131A	Thickness Gauge Nest
MATERIALS	
D-95367	Removable Paper Backstop
TEST APPARATUS	
35 Type	Test Set
J68602AH	Test Set
J68602AJ	Test Set

3.002 Where relays are equipped with the type of cover spring as shown in Fig. 112, do not remove the relay cover except when specified in the section or on the circuit requirement table. When remounting the cover, exercise care not to disturb any of the adjustments. Also exercise care when remounting the cover cap.

3.01 ***Cleaning*** (Rq 2.01)

(1) Clean the contacts and other parts of the relay in accordance with Section 069-306-801.

3.02 ***Relay Mounting*** (Rq 2.02)
3.03 ***Cover Clearance*** (Rq 2.03)

(1) To align relays so that they are approximately level or to obtain the necessary clearance between the cover and adjacent apparatus, loosen the relay mounting screws with the 4-inch regular screwdriver, shift the relay as required and tighten the mounting screws securely.

(2) If necessary, additional clearance between the cover and adjacent apparatus may be obtained on relays having the cover mounted by cover screws (pendulum-type relays per Fig. 9) as follows. Unsolder the leads and remove the relay from the mounting plate using the 4-inch regular screwdriver. Loosen the cover screws with the 3-inch cabinet screwdriver and shift the cover with respect to the relay as required. Tighten the cover screws securely, remount the relay on the mounting plate, tighten the mounting screws securely. Exercise care that the relay is mounted approximately level and that the cover clearance requirement is met. Resolder the leads on the relay and check the electrical and mechanical requirements of the relay. Readjust, if necessary, as covered in 3.10 to 3.15, inclusive.

(3) On relays having the type of cover springs as shown in Fig. 111, additional clearance between the cover and adjacent apparatus may be obtained as follows. Unsolder the leads and remove the relay from the mounting plate using the 4-inch regular screwdriver. Loosen the cover guide mounting screws using the 3-inch cabinet screwdriver and shift the cover guide with respect to the relay as required. Tighten the cover guide mounting screws securely, remount the relay on the mounting plate, tighten the mounting screws securely. Exercise care that the relay is mounted approximately level and that the cover clearance requirement is met. Resolder the leads on the relay and check the electrical and mechanical requirements of the relay. Readjust, if necessary, as covered in 3.10 to 3.15, inclusive.

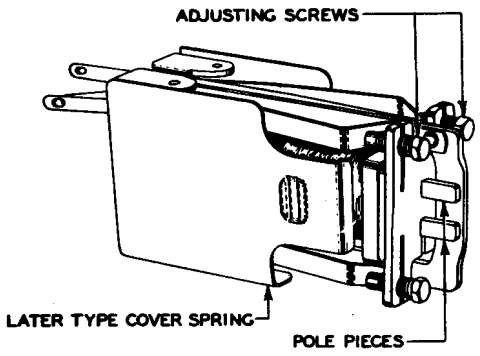

Fig. 111 – J-type Relay Equipped With Later Type Cover Spring

(4) On relays having the type of cover spring as shown in Fig. 112, do not attempt to obtain additional cover clearance by adjusting the cover springs. If the clearance is not satisfactory, refer the matter to the supervisor.

(5) To obtain the necessary clearance between the cover and adjusting plate on relays having covers secured by mounting screws, proceed as follows. Unsolder the leads and remove the relay from the mounting plate using the 4-inch regular screwdriver. Loosen the cover mounting screws with the 3-inch cabinet screwdriver and move the cover as required to obtain clearance when the screws are again tightened. Remount the relay on the mounting plate and tighten the mounting screws securely. Exercise care that the relay is mounted approximately level and that the cover clearance requirement with respect to adjacent apparatus is met. Resolder the leads on the relay and check the electrical and mechanical requirements of the relay. Readjust, if necessary, as covered in 3.10 to 3.15, inclusive.

(6) To obtain the necessary clearance between the cover and adjusting plate on relays equipped with the type of cover springs

as shown in Fig. 111, proceed as follows. Unsolder the leads and remove the relay from the mounting plate using the 4-inch regular screwdriver. With the cover cap removed, loosen the cover spring mounting screws with the 3-inch cabinet screwdriver and move the cover and cover springs as required to give clearance when the cover spring mounting screws are again tightened. If necessary, remove the cover and adjust the cover springs with the P-long-nose pliers to hold the cover in the proper position. Remount the relay on the mounting plate and tighten the mounting screws securely. Exercise care that the relay is mounted approximately level and that the cover clearance requirement with respect to adjacent apparatus is met. Resolder the leads on the relay and check the electrical and mechanical requirements of the relay. Readjust, if necessary, as covered in 3.10 to 3.15, inclusive.

(7) On relays having the type of cover spring as shown in Fig. 112, do not attempt to obtain additional cover clearance by adjusting the cover springs. If the clearance is not satisfactory, refer the matter to the supervisor.

3.04 ***Cover and Cover Cap Tightness*** (Rq 2.04)

(1) If the cover does not fit properly, adjust the cover springs as required using the P-long-nose pliers.

(2) If a metal cover cap does not fit properly, adjust the cover cap prongs as required using the P-long-nose pliers.

(3) If a plastic cover cap does not fit properly, replace the cover cap.

(4) If the cover does not remain in place when the cover cap is being removed, the tension of the cover springs is insufficient or the tension of the cover cap prongs is too high. To correct this, either increase the tension of the cover springs or if the relay has a metal cover cap reduce the tension of the cover cap prongs using the P-long-nose pliers. If the relay has a plastic cover cap and the tension of the prongs is too high, replace the cover cap.

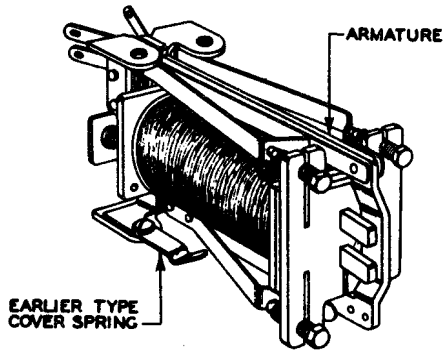

Fig. 112 – J-type Relay Equipped With Earlier Type Cover Spring

3.05 ***Application of D-95367 Removable Paper Backstops*** (Rq 2.05)

(1) When it is necessary to apply a removable paper backstop to a relay, clean the relay in accordance with 3.01. Grasp the D-95367 removable paper backstop between the thumb and forefinger and press the stop firmly together taking care that the lap joint is entirely within one of the flattened sides of the stop. Slip the stop over the stop spring in such a position that the single layer of paper is between the armature and the embossing on the stop spring. See that the paper is approximately flush with the front end of the stop spring as indicated in Fig. 101. Take care that the paper backstop is not pushed on the stop spring so far that the rear end extends over the bend in the stop spring.

(2) The addition of the removable paper backstop will decrease the armature travel of the relay by the thickness of the paper (approximately 0.002 inch). After mounting the paper stop, check the mechanical requirements for the relay and, if necessary, readjust the relay.

3.06 ***Contact Alignment*** (Rq 2.06)

(1) If the contacts are misaligned, refer the matter to the supervisor. ←

3.07 ***Position of Adjusting Screws*** (Rq 2.07) (No procedure)

3.08 ***Tightness of Adjusting Screws*** (Rq 2.08)

(1) If the adjusting screws are too tight, remove the cover and widen the slot in the adjusting plate using the 3-inch cabinet screwdriver.

(2) If the adjusting screws are too loose, remove the ones at fault with the No. 220 wrench and close up the slot in the adjusting plate, using the P-long-nose pliers. If the relay is equipped with slotted adjusting screws instead of the hexagonal head adjusting screws, use the 3-inch cabinet screwdriver to remove the screws.

(3) Exercise care not to loosen the adjusting plate in making this adjustment.

3.09 ***Contact Spring Tension*** (Rq 2.09)

(1) To increase or decrease the tension of the No. 2 spring in spring combinations per Fig. 4 or 5 or the No. 1 spring in a spring combination per Fig. 9, remove the relay cover and adjust the spring with the No. 259 spring adjuster. Place the adjuster on the front end of the spring and slide it back as far as possible. Adjust the spring at this point with a slight twist to the left or right as required exercising care not to distort the spring.

(2) Adjust any contact or adjusting spring which does not rest against its associated adjusting screw in both the operated and nonoperated position of the armature by turning in the adjusting screw with the No. 220 wrench or if necessary, by tensioning the spring against the screw using the No. 259 spring adjuster on thin springs and the No. 300 spring adjuster on heavy springs.

3.10 ***Armature Travel*** (Rq 2.10)
3.11 ***Contact Follow*** (Rq 2.11)
3.12 ***Contact Separation*** (Rq 2.12)

(1) ***Armature Travel:*** The term "armature travel" is used instead of "unoperated armature airgap" in order to facilitate putting the requirement on the circuit requirement tables. It will be given in the column having the heading Arm. Trvl. Check it with the proper gauge to see that the gap is not less than the minimum limit. In the case of relays equipped with a spring combination per Fig. 9, also check to see that it does not exceed the maximum limit.

(2) With the proper gauge inserted between the armature and pole pieces and the armature held against the gauge, turn the back contact screw with the No. 220 wrench until the back contact or stop just touches the armature as shown in Fig. 113.

(3) When adjusting the armature travel, keep the adjustment as near the minimum limit as is consistent with meeting requirements 2.11, 2.12, and 2.14.

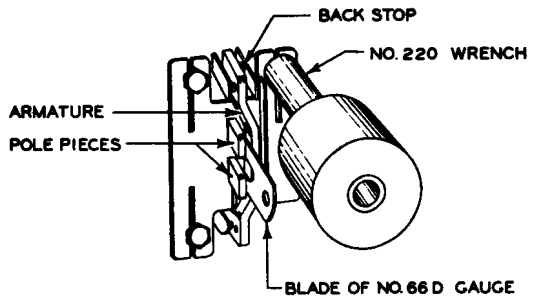

Fig. 113 – Method of Adjusting for Armature Travel

(4) ***Contact Follow and Contact Separation:*** In order to insure sufficient contact separation and contact follow, insert the proper blade of the No. 66D or 131A gauge between the armature and pole pieces and operate the relay electrically in those cases where a dc operate value is specified or if none is specified hold the armature against the gauge (Fig. 114) and turn the front contact adjusting screw with the No. 220 wrench until the front contacts just make. This will insure a minimum contact follow and at the same time provide a contact separation far above the minimum value. In those cases where the relay is operated manually, apply only sufficient pressure to hold the armature against the gauge but not enough to distort the armature since this will provide a different follow. This contact follow should be kept near the minimum in order to avoid chattering of the relay contacts. In the case of relays equipped with a spring combination per Fig. 9, adjust the front contact adjusting screw until the front (pendulum) contact makes with the minimum gauge but does not make with the maximum gauge specified inserted between the armature and the pole pieces and with the relay operated as outlined above.

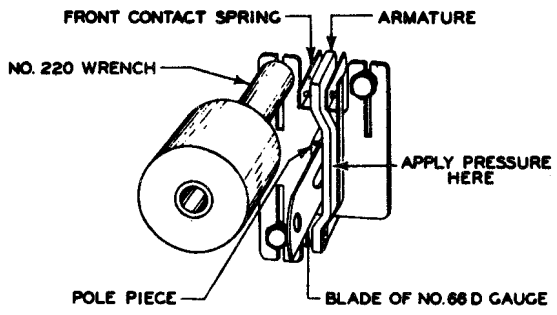

Fig. 114 – Method of Adjusting For Contact Follow and Contact Separation

(5) On relays equipped with spring combinations per Fig. 2 or 8, there is no follow specified. Turn the front contact screw in a clockwise direction only when the relay fails to release properly.

(6) The above procedure will not take care of the spring attached to the armature. To position this spring for contact follow, adjust it with the No. 363 spring adjuster until it makes contact with the proper gauge inserted between the armature and the pole pieces and the relay operated as covered in (4). Apply the adjuster slightly above the bend in the spring as shown in Fig. 115.

3.13 ***Armature Tension*** (Rq 2.13)
3.14 ***Electrical Requirements*** (Rq 2.14)
3.15 ***Armature Tension Spring Position*** (Rq 2.15)

General

(1) Proceed as follows in adjusting for these requirements. The procedures are divided into two sections; method A for relays in general and method B for relays used in toll circuits including relays used in the local office end of toll switching and recording completing trunks where the meter method of adjusting is employed.

(2) After any contact adjusting screw has been turned for the purpose of making adjustment, lift the spring slightly away from the screw and allow it to return to its normal position. This is necessary since turning the screw tends to displace the spring from its normal position temporarily and the vibration of the relay in operating will ultimately cause the spring to resume its normal position which may materially affect the adjustment of the relay.

Method A

(3) To adjust for armature tension, turn the armature tension screw (Fig. 116) with the No. 220 wrench. Keep the armature tension near the minimum limit except in the case of relays used in toll circuits, including the local office end of toll switching and recording completing trunks, in which case the armature tension should be as high as is consistent with meeting the electrical requirements. Check the electrical requirements and if necessary adjust the tension as outlined in (4) or (5) to meet the operate, hold, nonoperate, and release.

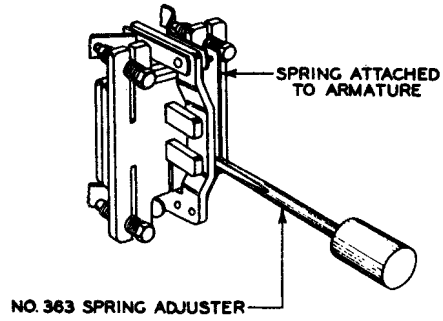

Fig. 115 – Method of Adjusting for Contact Follow

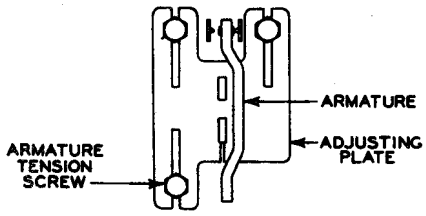

Fig. 116 – Method of Adjusting for Armature Tension

(4) ***Operate and Hold:*** If the relay fails to meet the operate or the hold requirement, the backward tension of the armature is probably too high. Turning the armature tension screw in a counterclockwise direction decreases the backward tension of the armature and turning it in a clockwise direction increases the tension. Use the No. 220 wrench.

(5) *Nonoperate and Release:* If the relay fails to meet the nonoperate or release requirements, the backward tension of the armature may not be sufficient, in which case increase it by turning the armature tension screw in a clockwise direction. Use the No. 220 wrench to turn the screw. Ordinarily it will be possible to regulate the tension by the adjustment of the armature tension screw. In some cases it may be necessary to remove the cover and tension the No. 2 spring in Fig. 4 and 5 against the armature stud or to tension the armature tension spring sufficiently to permit a satisfactory adjustment of the armature tension. Use the No. 259 spring adjuster to tension these springs.

(6) If upon making the armature tension spring adjustment as described in (4) and (5) it is not possible, due to the characteristics of the particular relay involved, to meet the release or open-circuit requirement, turn the front contact screw in a clockwise direction with the No. 220 wrench so that it makes contact earlier, that is, by reducing the contact separation. This contact separation, however, should not be such that the contact separation requirement is not met. If it is necessary to change the contact separation, make sure that the contact follow is kept within the specified limits.

(7) Note that increasing or decreasing the backward tension of the armature to meet a nonoperate or release requirement affects the operate requirement.

(8) If a relay operates satisfactorily on its dc requirements but chatters when the ac requirement is applied, this may be due to the contact follow being in excess of the minimum value. Adjust it in accordance with 3.11(4). If the chattering is not eliminated by this readjustment, turn the front contact screw in a clockwise or counterclockwise direction with the No. 220 wrench, in a further attempt to eliminate the chattering by changing the contact follow. If the chattering is still not eliminated, attempt to do so on relays having the type of cover spring as shown in Fig. 112 by shifting the relay cover taking care to see that the cover clearance requirement is met. If the relay still chatters, it may be due to the armature bearing against only one of the pole pieces. In this case proceed as follows. Check the alignment of the pole pieces by operating the relay on ac with the series test resistance specified on the circuit requirement table short-circuited, and inspect the pole pieces to determine in which direction each must be adjusted so that they will be properly aligned. To align the pole pieces, firmly grasp each pole piece with KS-6015 duck-bill pliers as shown in Fig. 117 and adjust them simultaneously, one to the right and the other to the left, until the armature strikes both pole pieces simultaneously when the relay is operated manually.

Caution: Exercise great care not to adjust the pole pieces further than necessary, since they are brittle and break off easily.

To check the alignment, again operate the relay on ac with the series test resistance specified on the circuit requirement table short-circuited and determine whether the chattering has been eliminated. If the chattering cannot be eliminated by this method, or if the pole pieces have been broken while attempting to adjust them, replace the relay. After changing the alignment of the pole pieces, check the mechanical and electrical requirements for the relay and if necessary readjust.

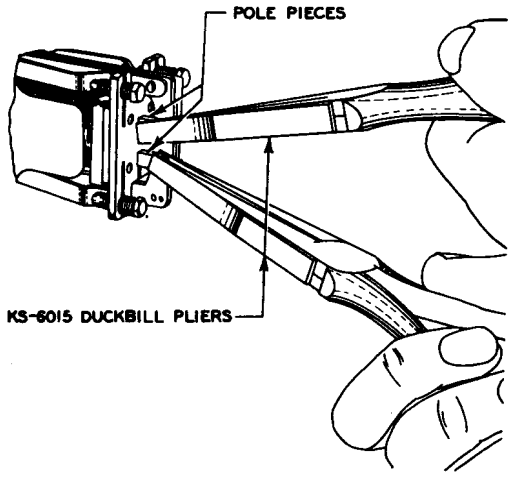

Fig. 117 – Method of Aligning Pole Pieces

(9) Difficulty in making the electrical adjustment of the relay is sometimes due to the armature tension spring having slipped from its normal position against the adjusting screw. If the armature tension spring is not in its correct position, turning the armature tension screw forward will not force the armature against the back contact or stop. In such cases, remove the cover and return the armature tension spring to its normal position.

(10) ***Armature Tension Spring Position:*** In those cases where the armature tension spring is of such a design that the tip of it extends forward between the armature and the adjusting plate, note that when the relay is in its final adjustment there is a clearance of approximately 0.005 inch between the tip of the spring and both the adjusting plate and armature in both the operated and nonoperated positions.

(11) If the clearance between the armature tension spring and the adjusting plate or the armature is not met, remove the cover and reduce or increase as required the tension of the spring with the No. 259 spring adjuster, applying the adjuster at the rear of the spring. If the relay is so mounted that there is insufficient clearance to use the spring adjuster, remove the relay from the mounting plate with the 3-inch cabinet screwdriver, remove the cover, and tension the spring with the spring adjuster. Remount the relay, tightening the screws securely.

(12) ***Final Check:*** Replace the cover cap and check to insure that the relays meets its electrical requirements. This check can generally be made by observing the operation of associated apparatus.

Method B

(13) While intermittently operating and releasing the key which applies the operate current to the relay, increase the armature spring tension gradually by turning the armature tension screw in a clockwise direction until the aramture does not leave the backstop. Use the No. 220 wrench to turn the screw. Ordinarily it will be possible to regulate the tension by the adjustment of the armature tension screw. In some cases it may be necessary to remove the cover and tension the No. 2 spring in Fig. 4 and 5 against the armature stud or to tension the armature tension spring sufficiently to permit a satisfactory adjustment of the armature tension. Use the No. 259 spring adjuster to tension these springs. Then slowly decrease the tension by turning the screw in a counterclockwise direction just enough to permit the armature when operating to rest firmly against the pole pieces without chattering, as judged by the eye. Then decrease the tension further by turning the screw in a counterclockwise direction approximately 1/8 of a turn. Check that the relay operates satisfactorily, without appreciable chatter, with the series test resistance specified on the circuit requirement table short-circuited or on full ac energy as applied by the test circuit.

(14) If it is impossible to adjust the relay as above and eliminate the chattering, it may be due to the contact follow being in excess of the minimum value. Adjust it in accordance with 3.11(4). If the chattering is not eliminated by this readjustment, turn the front contact screw in a clockwise or counterclockwise direction with the No. 220 wrench, in a further attempt to eliminate the chattering by changing the contact follow. If the chattering is still not eliminated, attempt to do so on relays having the type of cover spring as shown in Fig. 112 by shifting the relay cover taking care to see that the cover clearance requirement is met. If the relay still chatters, it may be due to the armature bearing against only one of the pole pieces. In this case proceed as follows. Check the alignment of the pole pieces by operating the relay with the series test resistance specified on the circuit requirement table short-circuited or with full ac energy applied, and inspect the pole pieces to determine in which direction each must be adjusted so that they will be properly aligned. To align the pole pieces, firmly grasp each pole piece with KS-6015 duck-bill pliers as shown in Fig. 117 and adjust them simultaneously one to the right and the other to the left, until the armature strikes both pole pieces simultaneously when the relay is operated manually.

Caution: Exercise great care not to adjust the pole pieces further than necessary, since they are brittle and break off easily.

To check the alignment, again operate the relay with the series test resistance specified on the circuit requirement table short-circuited or with full ac energy applied and determine whether the chattering has been eliminated. If the chattering cannot be eliminated by this method, or if the pole pieces have been broken while attempting to adjust them, replace the relay. After changing the alignment of the pole pieces check the mechanical and electrical requirements for the relay and if necessary readjust as covered in procedures 3.10 to 3.15, inclusive.

(15) Difficulty in making the electrical adjustment of the relay is sometimes due to the armature tension spring having slipped from its normal position against the adjusting screw. If the armature tension spring is not in its correct position, turning the armature tension screw forward will not force the armature against the back contact or stop. In such cases, remove the cover and return the armature tension spring to its normal position.

(16) ***Armature Tension Spring Position:*** In those cases where the armature tension spring is of such a design that the tip of it extends forward between the armature and the adjusting plate, note that when the relay is in its final adjustment there is a clearance of approximately 0.005 inch between the tip of the spring and both the adjusting plate and armature in both the operated and nonoperated positions.

(17) If the clearance between the armature tension spring and the adjusting plate or the armature is not met, remove the cover and reduce or increase as required the tension of the spring with the No. 259 spring adjuster, applying the adjuster at the rear of the spring. If the relay is so mounted that there is insufficient clearance to use the spring adjuster, remove the relay from the mounting plate with the 3-inch cabinet screwdriver, remove the cover, and tension the spring with the spring adjuster. Remount the relay, tightening the screws securely.

(18) ***Final Check:*** Replace the cover cap and check to insure that the relay meets its electrical requirements. This check can generally be made by observing the operation of associated apparatus.

3.16 ***Position of Spring Attached to Armature*** (Rq 2.16)

(No procedure)