RELAYS
229, 230, AND 232 TYPES
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers 229, 230 and 232 type relays.

1.02 This section is reissued to incorporate material from the addendum in its proper location. 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 Part 1, "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department handbook.

1.05 Requirements are marked with an asterisk (*) when to check for them would necessitate the 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 Normal (unoperated) position is that position in which the armature arm is resting against the armature travel adjusting screw with the normally open contacts open, and the normally closed contacts closed.

1.07 Operate means that when the operate current is applied the armature shall move all the way up to the core, except when non-freezing discs are provided, in which case the non-freezing discs shall touch the core. The back contacts shall be broken and the front contacts shall be made reliably.

1.08 Release means that when the current is reduced from the operate value to the release value, (open circuit), the armature shall move from the operated position sufficiently to break contacts that have been made and make reliably contacts that have been broken.

2. REQUIREMENTS

2.01 Cleaning

(a) Contacts shall be cleaned when necessary in accordance with the section covering cleaning of relay contacts and parts.

(b) Other parts shall be cleaned when necessary in accordance with approved procedures.

2.02 Cover Fit The cover shall fit snugly but shall not be so tight as to prevent placing or removing it with the fingers. Gauge by feel.

2.03 Relay Mounting

(a) The magnets and spring assemblies shall be securely fastened to the mounting plate. Gauge by feel.

(b) There shall be a clearance between the contact springs and the edges of the slots in the mounting plate of
Min. 1/32"
Gauge by eye.

2.04 Tightness of Assembly - Fig. 1 (A) - All springs in a given assembly shall be held in their relative positions to one another by being securely fastened to the mounting bracket at their bases. Gauge by feel.

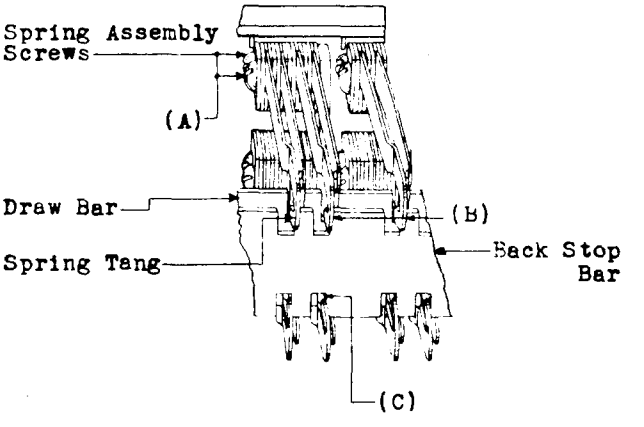


Fig. 1

2.05 Contact and Spring Alignment - Fig. 2 (A) - Contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact. Springs shall not touch the relay cover. Gauge by eye.

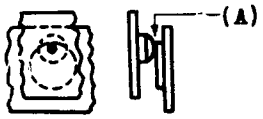


Fig. 2

2.06 Spring Tang Position - When the drawbar is moved laterally in either direction in a vertical plane, as far as clearance in the slots of the locating springs will permit,

(a) Fig. 1 (B) - The spring tangs shall engage vertically with the sides of the notches in the draw bar and back stop bar.
Test - Min. 1/32"
Readjust - Min. 1/16"
Gauge by eye.

(b) Fig. 1 (C) - The spring tangs shall clear the bottoms of the notches in the draw bar and back stop bar. Gauge by eye.

2.07 Armature Movement - Fig. 3 (A) - The armature shall move freely in its bearings when relieved of the load of the draw bar. Gauge by feel. To relieve the armature of the load, insert the 3-1/2" cabinet screwdriver between the back stop bar support at the end farther from the magnet and the draw bar and force the draw bar towards the magnet.

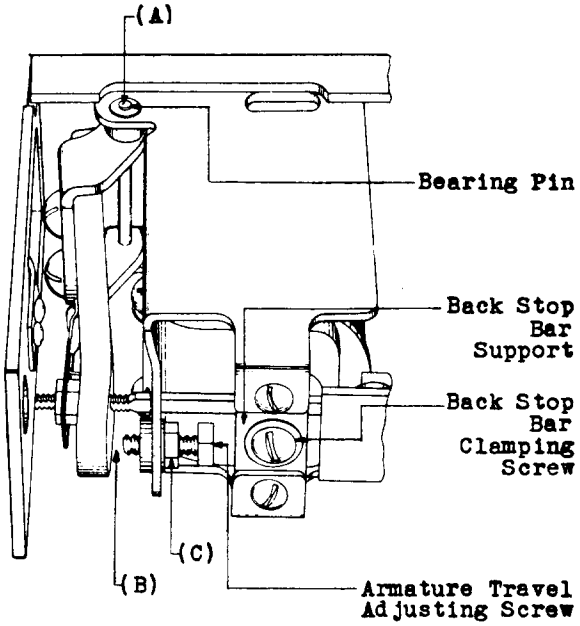
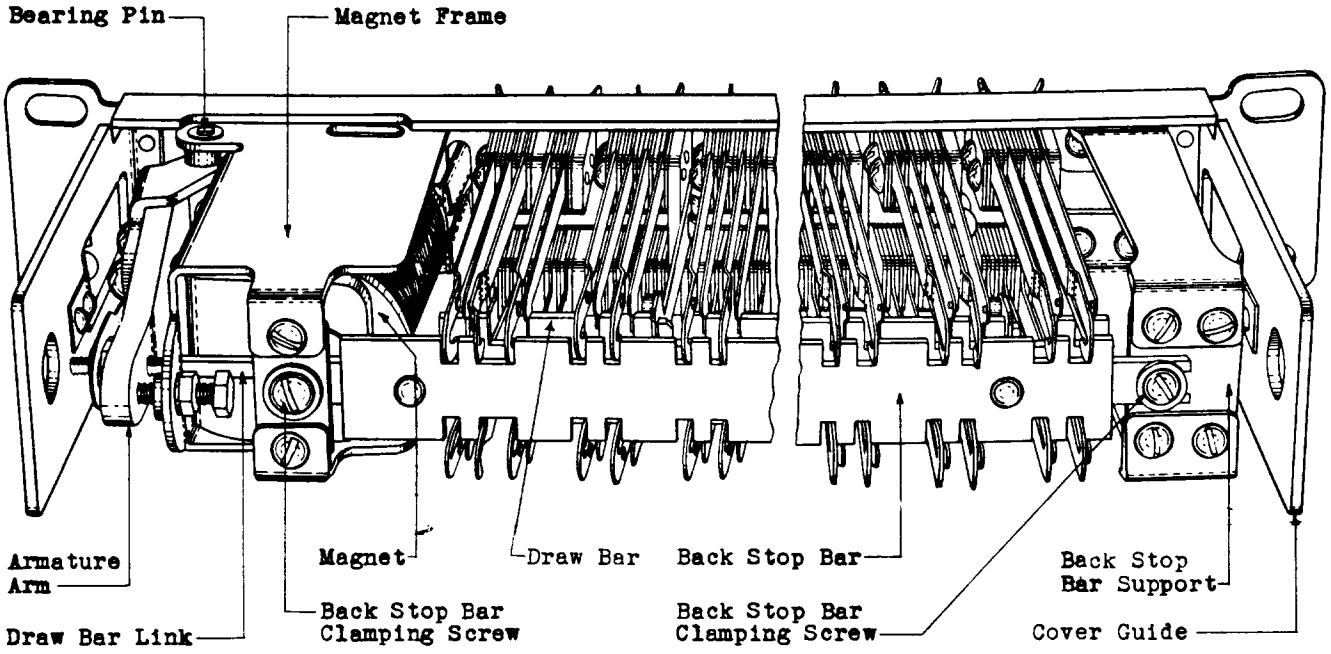


Fig. 4



229 Type Relay

Fig. 4

2.08 Armature Travel - Fig. 3 (B) - The armature travel measured between the armature arm and the armature travel adjusting screw, with the relay electrically operated, shall be:

Test - Min. .047", Max. .053"
Readjust - Min. .047", Max. .051"

Use the No. 109-A gauge.

2.09 Tightness of Lock Nut - Fig. 3 (C) - The lock nut on the armature travel adjusting screw shall be sufficiently tight to hold the screw in the adjusted position. Gauge by feel.

2.10 Contact Separation

(a) 229 and 230 Type Relays - Fig. 5 (A) - The separation between any pair of contacts normally open or between any pair of contacts that are opened when the relay is electrically operated, shall be as given in the table below.

			Cont. Sep.	Equivalent Gauging At Armature Travel Screw	Gauge No.
Make Contacts	Test	Min.	.010"	.011"	74-D
		Max.	.033"	.035"	66-D
	Readj.	Min.	.011"	.012"	74-D
		Max.	.023"	.025"	66-D
Transfer Make Contacts	Test	Min.	.010"	.011"	74-D
		Max.	.033"	.035"	66-D
	Readj.	Min.	.011"	.012"	74-D
		Max.	.018"	.020"	66-D
Transfer Break Contacts	Test	Min.	.011"	.035"	66-D
		Max.	.025"	.025"	66-D
	Readj.	Min.	.011"	.035"	66-D
		Max.	.020"	.030"	66-D

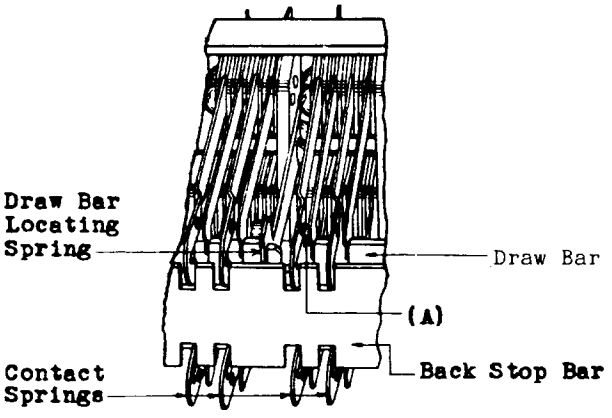


Fig. 5

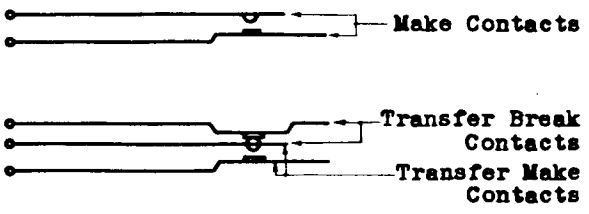


Fig. 6

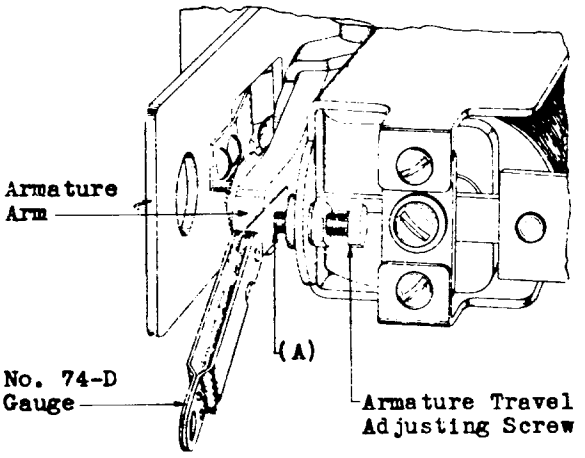


Fig. 7

(b) 229 and 230 Type Relays - Fig. 7 (A) - The requirements may be checked and adjusted for by inserting the gauge specified in the table between the armature arm and the armature travel adjusting screw and gauging by eye at the contacts. Contacts shall be open with the gauge specified for minimum contact separation inserted and closed with the gauge specified for maximum contact separation inserted.

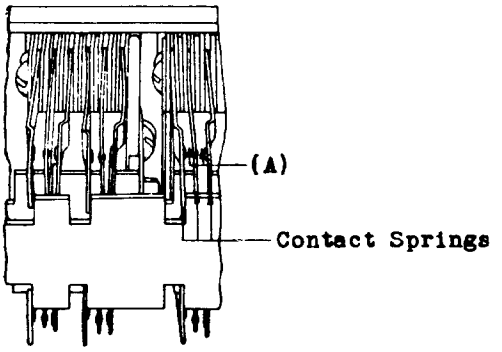


Fig. 8

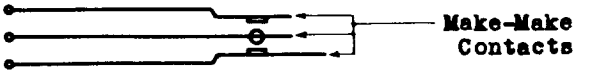


Fig. 9

2.10 (Continued)

(c) 232 Type Relays - Fig. 8 (A) - The separation between any pair of contacts that are normally open, shall be:
Test - Min. .008", Max. .018"
Readjust - Min. .009", Max. .015"
Use the Nos. 66-D and 74-D gauges.

*2.11 Tightness of Back Stop Bar Clamping Screws The back stop bar clamping screws shall be sufficiently tight to hold the back stop bar in the adjusted position. Gauge by feel.

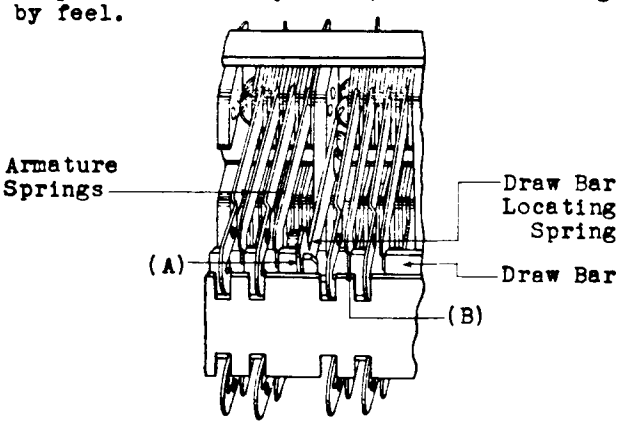


Fig. 10

2.12 Draw Bar Locating Spring Tension - Fig. 10 (A) - The draw bar locating springs shall rest against the shoulders of the draw bar with the relay operated. Gauge by feel.

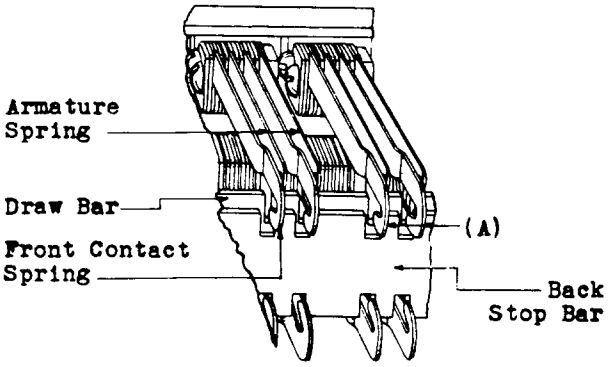


Fig. 11

2.13 Armature Spring Tension

(a) 229 and 230 Type Relays - Fig. 10 (B) - Each armature spring shall rest against the side of the draw bar slot farther from the armature arm when the relay is unoperated. Gauge by feel.

(b) 229- and 230- type Relays: Fig. 10(B) - The combined tension of all armature springs against the draw bar, when the relay is unoperated, including the opposing tension of the draw bar locating springs, measured at the front end of the armature arm and as the draw bar starts to move, shall be:

229-type Relays	- Min 150 grams
	- Max 250 grams
230-type Relays	- Min 100 grams
	- Max 200 grams

Use the No. 62-B gauge.

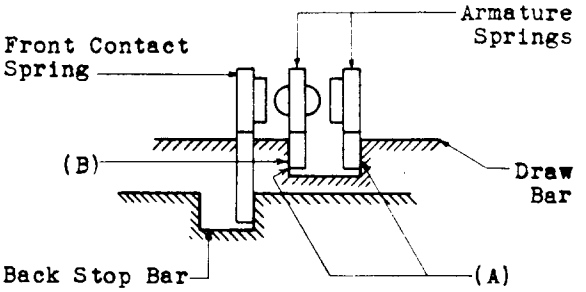


Fig. 12

(c) 232 Type Relays - Fig. 12 (A) - The armature springs shall rest against the adjacent sides of the draw bar slot when the relay is unoperated.

(d) 232 Type Relays - Fig. 12 (B) - The tension of each of the armature springs against the side of the draw bar slot nearer the armature, measured in proximity to the contact with the relay unoperated, shall be:
Max. 10 grams
Use the No. 70-D gauge.

(e) 232-A and 232-B Relays - Fig. 12 (A) - The combined tension away from the magnet of all the armature springs against the sides of the draw bar slots when the relay is unoperated, including the tension of the draw bar locating springs, measured at the front end of the armature arm as the draw bar starts to move, shall be:
Min. 100 grams
Max. 200 grams
Use the No. 62-B gauge.

2.14 Front Contact Spring Tension: Fig. 11(A) - The tension of each front contact spring against the backstop bar measured in proximity to the contact and as the tang starts to move from the backstop bar, shall be:

229- and 230-type Relays	- Min 15 grams
	- Max 25 grams
232-type Relays	- Min 20 grams
	- Max 30 grams

Use the No. 70-D gauge.

2.15 Back Contact Spring Tension The back contact spring of each transfer spring combination shall have a tension against the back stop bar measured in proximity to the contact with the relay in the operated position, and as the tang starts to move from the back stop bar of

Min. 15 grams
Max. 25 grams

Use the No. 70-D gauge.

2.16 Straightness of Springs All springs shall be free of sharp bends or kinks due to adjustment. A gradual bow in a spring is permissible. Gauge by eye.

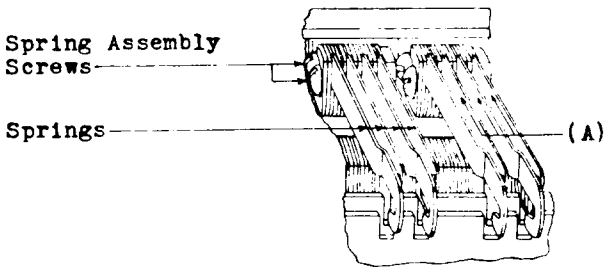


Fig. 13

2.17 Separation Between Springs - Fig. 13 (A) - There shall be a clearance between adjacent springs whether in the operated or unoperated position of the relay of

Min. .008"

Gauge by eye.

2.18 Electrical Requirements

(a) The relay shall meet the electrical requirements specified on the circuit requirement table.

(b) Unless otherwise specified the cover of the relay may be either on or off when applying the electrical requirements.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials and Test Apparatus

Code No.	Description
Tools	
310 (2 required)	Wrench 9/32" Hex. Open Double-end Offset
412-A	Spring Adjuster
416-A	Spring Adjuster
KS-6320	Orange Stick
-	Bell System Cabinet Screwdriver - 3-1/2" per A.T.& T.Co. Drawing 46-X-40
-	Bell System Regular Screwdriver - 4" per A.T.& T. Co. Drawing 46-X-34
-	Bell System P-Long Nose Pliers - 6-1/2" per Spec. No. 6267
Gauges	
62-B	0-700 Gram Gauge
66-D (or the replaced 66-C)	Thickness Gauge Nest
70-D	50-0-50 Gram Gauge
74-D	Thickness Gauge Nest
109-A	.049" and .047" - .053" Double End Thickness Gauge
Materials	
KS-6232	Oil
KS-7860	Petroleum Spirits
-	Toothpicks, Hardwood, Flat at One End, Pointed at Other
-	Bell Seal Bond Paper Substence No. 20
Test Apparatus	
35-C	Test Set

3.001 If necessary, in order to prevent unfavorable circuit reaction, remove the relay from service by blocking circuits and removing fuses while making adjustments necessitating removal of the draw bar.

3.01 Cleaning (Rq.2.01)

(1) Clean the contacts in accordance with the section covering cleaning of relay contacts and parts. Clean the armature bearings, armature and core face as outlined in procedure 3.07.

3.02 Cover Fit (Rq.2.02)

(1) To increase or decrease the tension of the cover springs against the cover, adjust them to the right or left as required with the fingers.

3.03 Relay Mounting (Rq.2.03)

(1) To fasten loose magnets or loose spring assemblies to the mounting plate use the 4" regular screw-driver to tighten the mounting screws.

(2) If the contact springs are too close to the edges of the slots in the mounting plate, loosen the spring assembly bracket mounting screws and shift the spring assembly as required. Tighten the spring assembly bracket mounting screws securely.

3.04 Tightness of Assembly (Rq.2.04)

(1) To tighten loose spring assembly screws remove the spring assembly from the mounting plate as follows. First note the separation between any pair of contacts for use as a reference when replacing the back stop bar, which must be removed in making this adjustment. Then, using the 3-1/2" cabinet screw-driver, remove the two screws which hold the back stop bar support to the magnet frame and also the back stop bar clamping screw or screws at the end of the back stop bar farther from the magnet. Do not loosen the back stop bar clamping screw at the magnet end. Remove the back stop bar by pulling the end farther from the magnet forward and then sliding the back stop bar support from behind the prongs of the magnet frame towards the contact springs.

(2) Relieve the draw bar link of the spring load and disconnect it from the draw bar as follows: Insert the 3-1/2" cabinet screw-driver between the draw bar and the adjacent back stop bar support farther from the magnet, as shown in Fig. 14, and move the draw bar toward the magnet by twisting the screw-driver. Grasp the draw bar link with the long nose pliers and disconnect it from the draw bar pin. Do not turn the draw bar adjusting nut.

(3) Remove the locating spring from the shoulders of the draw bar at the end farther from the magnet, simultaneously pressing the draw bar pin inward, thus permitting the other end of the draw bar to move outward. Remove the remaining locating spring from the draw bar. Grasp the draw bar near the pin with the fingers, and pull it outward in such a manner that the tangs of the back stop springs pass through the slots of the draw bar.

(4) Unsolder the wires from the terminals of the spring assembly requiring adjustment. Remove the spring assembly bracket mounting screws using the 4" regular screw-driver, and remove the spring assembly. Tighten the spring assembly screws using the same screw-driver.

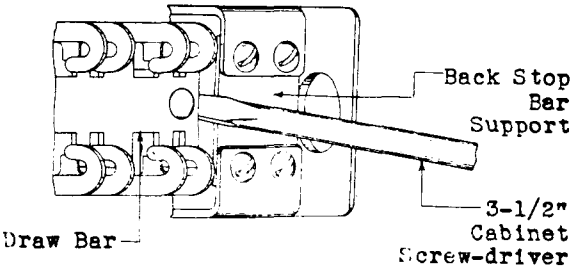


Fig. 14 - Method of Relieving Draw Bar Link of Spring Load

(5) Before replacing the spring assembly on the mounting plate see that the contact and spring alignment requirements are met on all the spring assemblies of the relay.

(6) Mount the contact spring assembly on the mounting plate and tighten the spring assembly bracket mounting screws securely, using the 4" regular screw-driver. Make sure that the terminal ends of the contact springs clear the mounting plate sufficiently, and that the springs of each assembly line up with the springs of every other assembly.

(7) 229 and 230 Type Insert the draw bar in its normal position, so that the tangs of the back stop springs pass through the slots of the draw bar. Move the locating springs away from the magnet while applying an inward pressure on the draw bar until these springs fall into their proper slots. Remove the inward pressure on the draw bar, and apply a longitudinal pressure to it in a direction away from

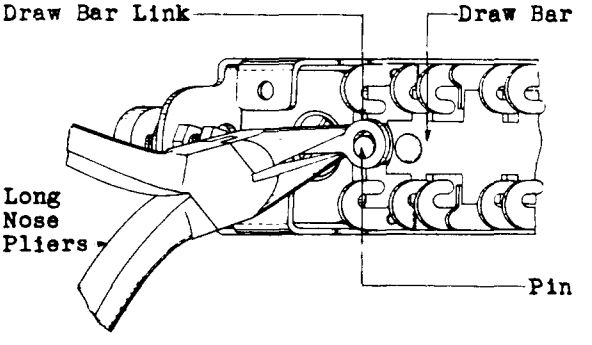


Fig. 15 - Method of Disconnecting Draw Bar Link from Spring Load

3.04 (Continued)

the magnet, moving the draw bar until the slots in it line up with the tangs of the armature springs. Apply a slight inward pressure on the draw bar, causing it to slide into place. If necessary, move the draw bar slightly until the locating springs snap into their final position on the shoulders of the draw bar.

(8) 232 Type Insert the draw bar in its normal position, so that the tangs of the back stop springs pass through the slots of the draw bar until it comes to rest against the outer edges of the locating springs. Apply an inward pressure to the draw bar at the draw bar pin and at the far rivet head, using the forefinger and fourth finger of the left hand as shown in Fig. 16. With the orange stick in the right hand, move the locating spring which is nearer to the magnet, into the proper slot of the draw bar. Make sure that the draw bar link is not behind the draw bar metallic strip. Starting with the spring assembly nearest the magnet, move the armature springs to the right or left until their tangs slip into the proper slots of the draw bar, still maintaining the pressure as indicated. To facilitate this, it will probably be necessary to rock the draw bar about a vertical axis, pushing the magnet end of it in toward the frame. If it is found impossible to rock the draw bar sufficiently, move it longitudinally away from the magnet until the tangs of the armature springs fall into the slots at the outward end of the draw bar, thus permitting further movement. Proceed away from the magnet until the tangs of the armature springs fail to slip into the proper slots of the draw bar. Then move the remaining locating spring away from the magnet until it slips into its proper slot. Proceed with the armature springs, working away from the magnet until all springs are in position. Move the locating springs into their final position on the shoulders of the draw bar.

(9) Insert the 3-1/2" screw-driver between the end of the draw bar farther from the magnet and the adjacent back stop spring support as shown in Fig. 14, and move the draw bar toward the magnet by twisting the screw-driver. Replace the draw bar link over the draw bar pin.

(10) Replace the back stop bar by inserting the back stop bar support attached to the back stop bar behind the prongs of the magnet frame. Then gradually worm the back stop bar into place exercising care that each spring is engaged by the proper slot in the back stop bar. Replace the two screws which hold the back stop bar support to the magnet frame, locating the back stop bar so that the separation between the contacts previously taken for reference, as outlined in (1), is the same as it was before any screws were loosened or removed, and then tighten the two screws securely. Replace and securely tighten the back stop bar clamping screw or screws.

3.05 Contact and Spring Alignment (Rq.2.05)
3.06 Spring Tang Position (Rq.2.06)

(1) If the contacts do not line up properly, or the springs are not approximately parallel, or if the tangs of the springs rub on the back stop bar or draw

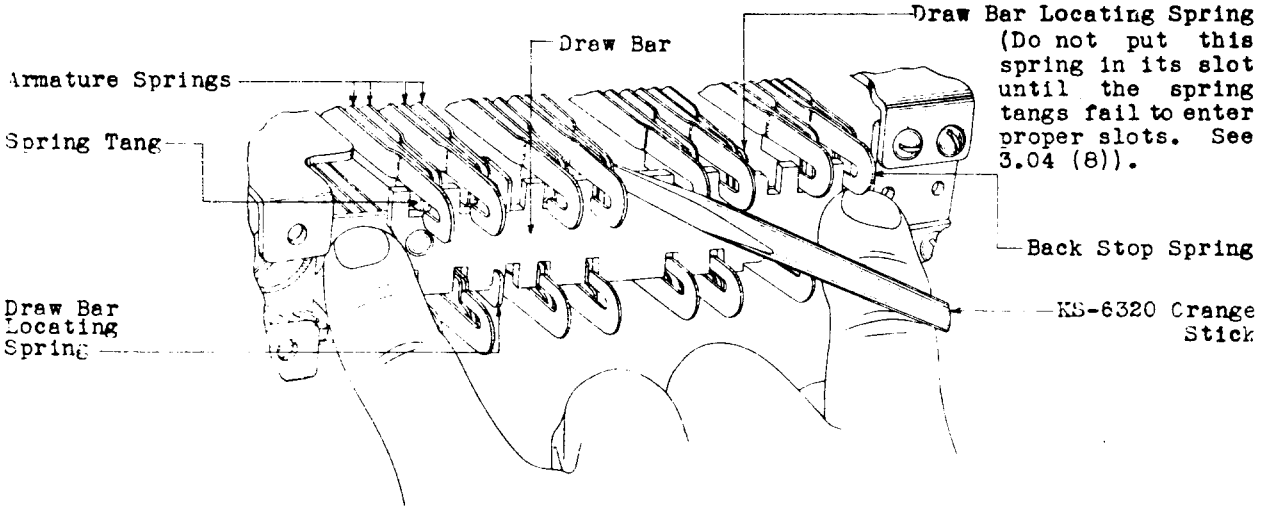


Fig. 16 - Method of Replacing Draw Bar

3.05-3.06 (Continued)

bar, or do not overlap the back stop bar or draw bar sufficiently, apply pressure to the end of the springs exercising care not to distort or otherwise damage them.

(2) If the springs cannot be shifted in this manner and the contacts and springs are lined up properly loosen the back stop bar clamping screws with the 3-1/2" cabinet screw-driver and shift the back stop bar up or down as required, exercising care not to destroy the contact separation.

(3) If the trouble cannot be corrected in this manner, or if the contacts are not lined up properly or the springs are not approximately parallel, remove the spring assembly at fault from the mounting plate as outlined in procedure 3.04. Loosen the spring assembly screws with the 4" regular screw-driver sufficiently to shift the springs so as to correct the fault. Tighten the screws securely and replace the spring assembly on the mounting plate.

3.07 Armature Movement (Rq.2.07)

(1) If the armature does not move freely in its bearings when relieved of the draw bar load remove the magnet from the mounting plate as follows:

(2) Remove the back stop bar and disconnect the draw bar link from the draw bar as outlined in procedure 3.04, (1) and (2).

(3) Remove the magnet mounting screws with the 4" regular screw-driver and remove the magnet from the mounting plate.

(4) Remove the armature bearing pin support screw, which is on the underside of the armature arm, with the 3-1/2" cabinet screw-driver and draw the pin out of its bearings. Clean the bearings and bearing pin with petroleum spirits applied with a clean toothpick.

(5) Before replacing the bearing pin, examine the surface of the core and armature to make sure they are clean. If they are dirty, place a strip of Bell Seal Bond Paper substance No. 20 between the two surfaces, press them together and draw the paper out. Examine the surfaces again and if still dirty, repeat the operation as required using a clean strip of paper for each operation. Lubricate the bearing pin with KS-6232 oil by applying one drop of oil to the bearing pin with a piece of No. 22 B&S gauge wire.

(6) Replace the bearing pin and the armature bearing pin support screw, tightening the screw securely.

(7) Replace the magnet on the mounting plate tightening the mounting screws securely.

(8) Connect the draw bar link to the draw bar and replace the back stop bar as outlined in procedure 3.04, (9) and (10).

3.08 Armature Travel (Rq.2.08)
3.09 Tightness of Lock Nut (Rq.2.09)

(1) If the armature travel is not satisfactory, loosen the lock nut on the armature travel adjusting screw with the No. 310 wrench. Insert the .049" portion of the No. 109-A gauge between the armature travel adjusting screw and the armature arm as shown in Fig. 17 with the relay electrically operated and turn the armature travel adjusting screw in a clockwise direction with the No. 310 wrench until the gauge fits tightly. Remove the gauge and tighten the lock nut securely as shown in Fig. 17 with another No. 310 wrench while holding the screw in position with the wrench used to turn it.

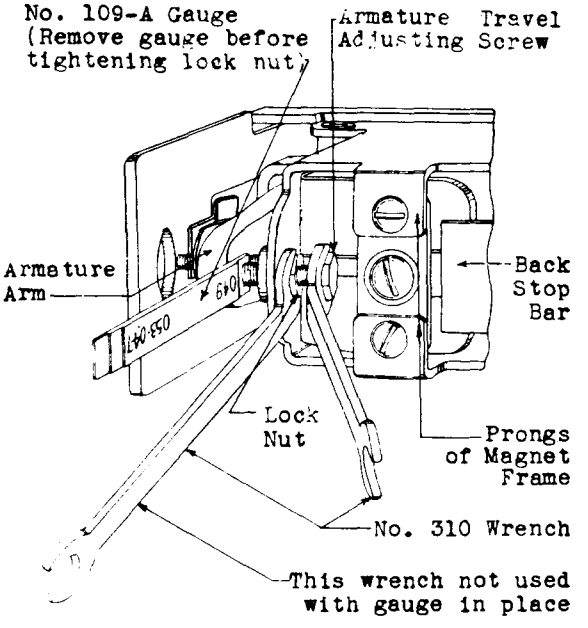


Fig. 17 - Method of Adjusting for Armature Travel

(2) If the lock nut is loose, tighten it with a No. 310 wrench, holding the screw in position with the other No. 310 wrench.

3.10 Contact Separation (Rq.2.10)
3.11 Tightness of Back Stop Bar Clamping Screws (Rq.2.11)

(1) If the separation requirement is not met determine whether or not the springs are correctly tensioned against the draw bar or back stop bar before making any adjustment. If necessary tension them as outlined in procedures 3.13, 3.14 and 3.15.

(2) Adjust 229 and 230 type relays as outlined in (3) to (8), inclusive. Adjust 232 type relays as outlined in (9) to (12), inclusive. The other procedures apply to the 229, 230 and 232 type relays.

229 and 230 Type Relays

(3) Normally Open Contact (Except normally open contact of transfer combinations). If the contact separation is not satisfactory insert the .012" blade of the No. -D gauge between the armature arm and the arma travel adjusting screw. If most of the contacts are open under this condition adjust the tangs of the front contact springs that closed when the gauge was inserted, using the long-nose pliers while holding the spring with the No. 416-A spring adjuster as shown in Fig. 18.

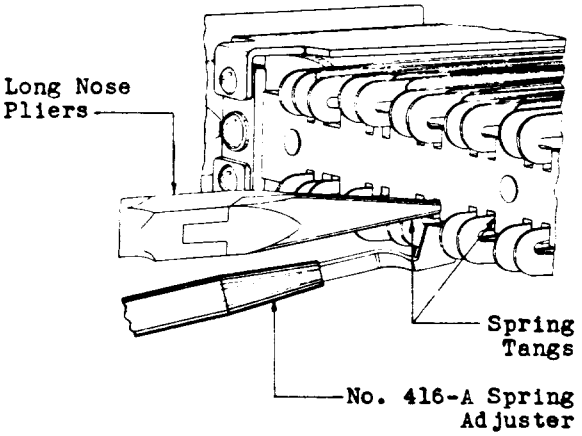


Fig. 18 - Method of Adjusting Spring Tang for Contact Separation

(4) If many of the contacts are closed, with the .012" gauge in place, move the back stop bar. To do this, loosen the back stop bar clamping screws slightly with the 3-1/2" cabinet screw-driver at the same time holding the bar from moving away from the magnet, due to the tension of the front contact springs, with the 4" regular screw-driver inserted between the end of the bar farthest from the magnet and the back stop bar support as shown in Fig. 19.

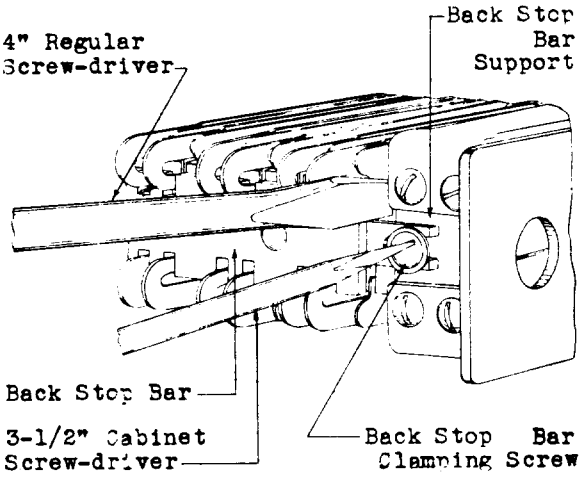


Fig. 19 - Method of Moving Back Stop Bar for Contact Separation

(5) Then shift the back stop bar by moving the 4" regular screw-driver to the left or right until the maximum number of contacts are open with the .012" gauge inserted as outlined in (3) and closed with the .025" blade of the No. 66-D gauge inserted in its place. Then tighten the back stop bar clamping screws securely with the 3-1/2" cabinet screw-driver.

(6) If necessary, adjust the tangs of the front contact springs that did not open with the .012" gauge inserted or did not close with the .025" gauge inserted until they meet the required gauging. Adjust the tangs as outlined in (3).

(7) Normally Open Contact of Transfer Combinations If the contact separation is not satisfactory on the normally open contacts of the transfer spring combinations adjust the tang of the front contact spring with the long-nose pliers holding the spring with the No. 416-A spring adjuster as shown in Fig. 18 until the contact does not make with the .012" blade of the No. 74-D gauge inserted between the armature arm and the armature travel adjusting screw and does make with the .020" blade of the No. 66-D gauge inserted in the same place.

(8) Normally Closed Contacts of Transfer Combinations If the contact separation is not satisfactory on the normally closed contacts of the transfer combinations adjust the tang of the back contact spring with the long-nose pliers, holding the spring with the No. 416-A spring adjuster as shown in Fig. 18 until the contact does not make with the .035" blade of the No. 66-D gauge inserted between the armature arm and the armature travel adjusting screw and does make with the .030" blade of the same gauge inserted in the same place.

3.10-3.11 (Continued)

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(9) If the separation between the contacts of those springs of the make make spring combinations which are tensioned against opposite sides of the slots in the draw bar is not satisfactory, correct by adjusting the tang of one of the springs as follows: Determine approximately the amount of adjustment necessary and then remove the back stop bar and draw bar as outlined in procedure 3.04, (1) to (3), inclusive. Adjust the tang using the long-nose pliers while holding the spring with the No. 416-A spring adjuster. Replace the draw bar and back stop bar as outlined in procedure 3.04, (7) to (10), inclusive.

(10) If the separation between the contacts of those springs of the make make spring combinations which are tensioned against the back stop bar and against the draw bar in the direction toward the magnet is not satisfactory, correct as follows:

(11) If only a few of the contacts do not meet the requirement, adjust the tang of the back stop spring using the long-nose pliers while holding the spring with the No. 416-A spring adjuster as shown in Fig. 18.

(12) If many of the contacts do not meet the requirement, loosen the back stop bar clamping screws slightly with the 3-1/2" cabinet screw-driver, at the same time holding the bar from moving away from the magnet, due to the tension of the contact springs, with the 4" regular screw-driver inserted between the end of the bar farthest from the magnet and the back stop bar support, as shown in Fig. 19. Then shift the back stop bar by moving the 4" regular screw-driver to the left or right until the requirement is met on the maximum number of contacts. Tighten the clamping screws securely, using the 3-1/2" cabinet screw-driver. Adjust as outlined in (11), the tangs of any back stop springs which it is not possible to adjust by moving the back stop bar.

(13) After considerable contact wear an initial adjustment of the separation may be made by holding the locking spring away from the draw bar adjusting nut and turning the adjusting nut in with the No. 310 wrench.

(14) Then make the final adjustment by adjusting the spring tangs and moving the back stop bar. If with the springs in adjustment, they are not approximately perpendicular to the draw bar and back stop bar, it is an indication that the draw bar adjusting nut is not located properly on the draw bar link. In this case first turn the draw bar adjusting nut and then shift the back stop bar as required.

(15) If the back stop bar clamping screws are loose, tighten them securely with the 3-1/2" cabinet screw-driver, exercising care that none of the contact separation requirements are affected.

3.12 Draw Bar Locating Spring Tension (Rq.2.12)
3.13 Armature Spring Tension (Rq.2.13)
3.14 Front Contact Spring Tension (Rq.2.14)
3.15 Back Contact Spring Tension (Rq.2.15)

(1) Draw Bar Locating Spring Tension If the draw bar locating springs do not have sufficient tension toward the magnet to keep them against the shoulders of the draw bar, thereby insuring that the draw bar will be held in position, increase the tension of the springs using the No. 412-A spring Adjuster. Place the adjuster on the spring directly in back of the rubber stud and slide it back to a point approximately 1/4" from the spring assembly bracket, as shown in Fig. 20, and adjust the spring slightly towards the magnet.

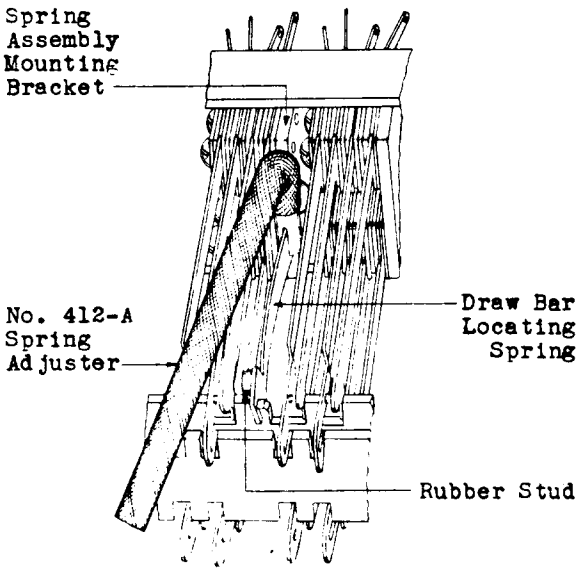

Fig. 20 - Method of Tensioning Draw Bar Locating Spring

(2) Armature and Contact Spring Tension To check for the combined armature spring tensions apply the No. 62-B gauge to the front end of the armature arm as shown in Fig. 21. The gauge should read the proper tension as the draw bar starts to move.

3.12-3.15 (Continued)

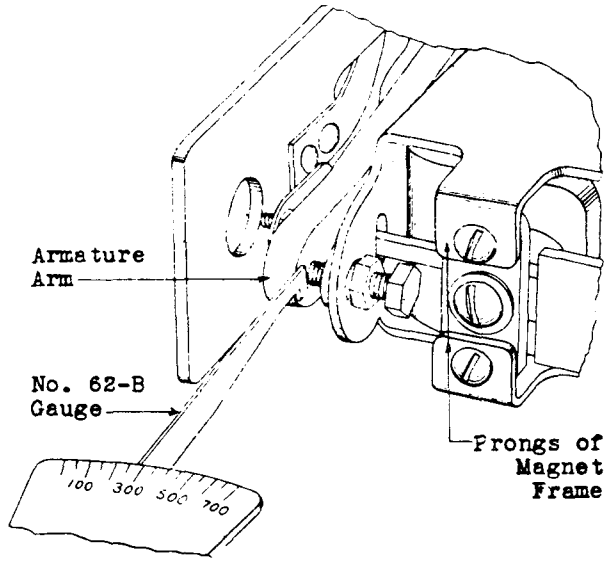

Fig. 21 - Method of Gauging Combined Armature Spring Tension

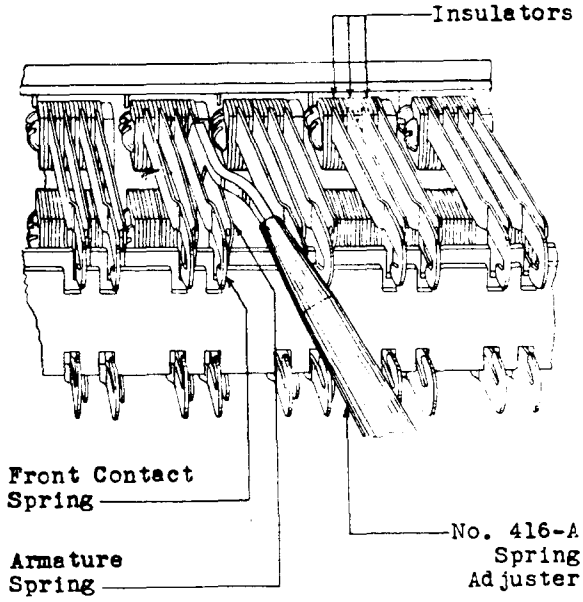

Fig. 22 - Method of Tensioning Armature and Contact Springs

(3) If the tension of the armature and contact springs is not satisfactory, correct this using the No. 416-A spring adjuster. Place the adjuster on the front end of the spring, but back of the contact, and then slide it back to a point approximately 1/4" from the spring assembly insulators as shown in Fig. 22. Adjust the springs to the right or left as required, exercising care not to disturb adjacent springs.

(4) If, after tensioning the individual armature springs to meet the minimum or maximum requirement, the combined tension requirement is not met, increase the opposing tension of the draw bar locating springs as outlined in (1) to meet the maximum combined tension or decrease the tension to meet the minimum combined tension.

3.16 Straightness of Springs (Rq.2.16)
3.17 Separation Between Springs (Rq.2.17)

(1) If the springs are not straight and have sharp bends or kinks due to adjustment, or if there is insufficient clearance between the springs, adjust the springs where they are bent or where the clearance is insufficient. Use a No. 416-A spring adjuster exercising care not to destroy the adjustment made in procedures 3.12, 3.13, 3.14 and 3.15.

3.18 Electrical Requirements (Rq.2.18)

(1) Operate the relay electrically and note whether the armature or nonfreezing disc moves all the way up to the core. To do this, momentarily relieve the draw bar link of its spring load as outlined in procedure 3.04, (3). If the armature under this condition moves further toward the core, decrease the tension of the front contact springs using the No. 416-A spring adjuster until the relay operates satisfactorily. Increasing the tension of the draw bar locating springs will also aid in this adjustment. At this time recheck the armature travel and if necessary readjust in accordance with procedure 3.08, (1). If the relay fails to release properly, increase the tension of the front contact springs slightly.