

RELAYS
177 AND 203 TYPES
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

- 1.01 This section covers 177 and 203 type relays and replaces specification X-70068-01, Issue 1.
- 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 Operate means that when the operate current is applied, the armature shall move sufficiently to break the back contact and to make the front contact reliably.
- 1.07 Non-operate means that when the non-operate current is applied, the armature shall not move sufficiently to make the front contact or to reduce its back contact pressure enough to cause an unreliable contact.
- 1.08 Release means that when the current is reduced from the operate or hold value to the release value, the armature shall move sufficiently to break the contacts that have been made and to make reliably the contacts that have been broken.
- 1.09 Hold means that when the current is reduced abruptly from the operate to the hold value the armature shall not move from its operated position sufficiently to break contacts which have been made or to make contacts which have been broken.

1.10 Fig. 1 - This figure, formerly referred to on circuit requirement tables is covered by requirements given in part 2.

2. REQUIREMENTS

2.01 Cleaning

- (a) Contacts shall be cleaned in accordance with the section covering cleaning of relay contacts and parts.
- (b) Other parts shall be cleaned in accordance with approved procedures.

2.02 Relay Mounting The coils shall be fastened securely to the base plate and the relay shall be fastened securely to the mounting plate or base. Gauge by feel.

2.03 Cover Fit The cover cap on relays so equipped shall fit securely but shall not be so tight as to prevent removing and replacing it readily with the fingers. Gauge by feel.

2.04 Armature Movement The armature shall move freely in its bearings. Gauge by feel.

2.05 Tightness of Assembly All springs in a given assembly shall be held in their relative position to one another and to the bridge piece by being securely fastened at their bases. Gauge by feel.

2.06 Contact Alignment - Fig. 1 (A) - Contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact. Gauge by eye.

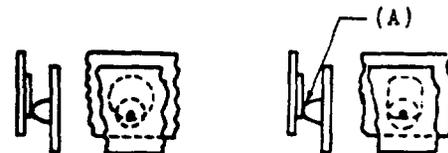


Fig. 1

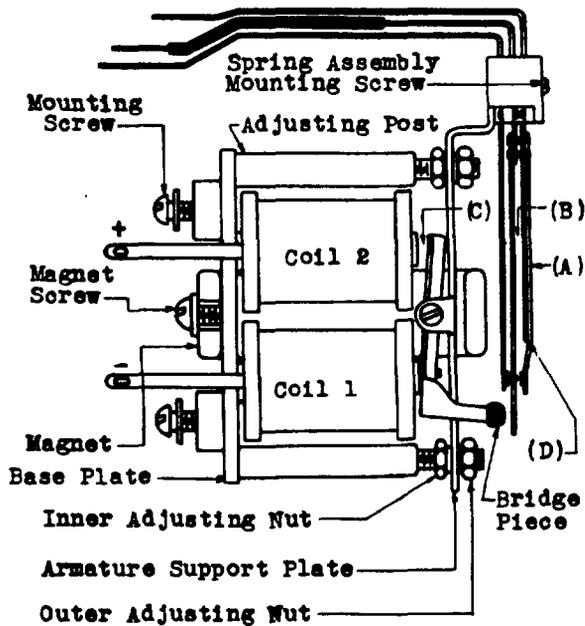


Fig. 2

- *2.07 Adjusting Nut Tightness** The adjusting nuts shall be sufficiently tight to hold the armature support plate in any adjusted position on the adjusting posts. Gauge by feel.
- 2.08 Straightness of Springs:** Fig. 2(A) - All springs from the point where they leave the assembly clamping plates and insulators, to the ends of the springs, shall be free of sharp bends or kinks due to adjustment, but a gradual bow in the springs is permissible. Gauge by eye.
- 2.09 Separation Between Springs - Fig. 2 (B) -** There shall be a clearance between adjacent springs whether in the operated or unoperated positions of the relay of Min. .015" Gauge by eye.
- 2.10 Armature Travel - Fig. 2 (C) -** Unless otherwise specified on the circuit requirement table the armature travel shall be:
Min. .012"
Max. .022"
This shall be measured between the armature and the core of coil 2 at approximately the point where the armature strikes the core. Use the Nos. 66-C and 74-D gauges.
- 2.11 Flexible Front Contact Spring Position** Fig. 2 (D) - The flexible front contact spring shall rest against the stop spring, at least on the end of the stop spring that is nearest the contact, when the relay is unoperated. Gauge by eye.
- 2.12 Stud Gap - Fig. 3 (A) -** On relays equipped with back contacts, there shall

be a perceptible clearance (.003") between the bridge piece and the traveling contact spring when the armature is resting against the core of coil 1. Gauge by eye.

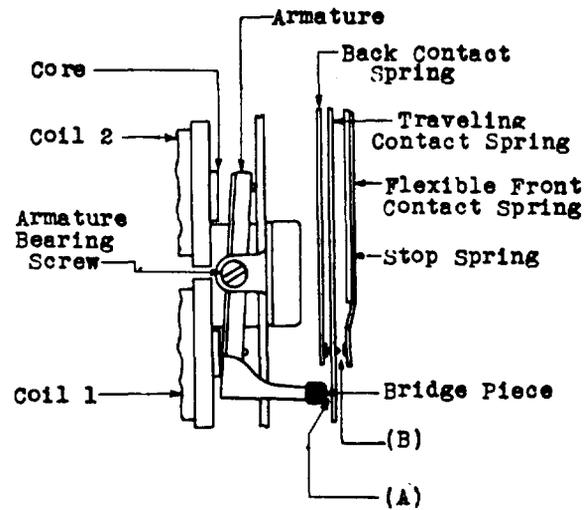


Fig. 3

- 2.13 Contact Separation - Fig. 3 (B) -** The separation between any pair of contacts normally open or between any pair of contacts that are opened when the relay is operated shall be Min. .003" Use the No. 74-D gauge.
- 2.14 Contact Pressure** The pressure between all closed contacts shall be sufficient to insure a reliable contact. Gauge by ear.
- 2.15 Contact Follow** The contact follow shall be perceptible (.005"). This is considered satisfactory if the contacts make with a .003" gauge (Test) or .004" gauge (Readjust) inserted between the armature and the core of coil 2 at the point where the armature strikes the core. This shall be checked with the relay electrically energized on its operate test or readjust current. Use the No. 74-D gauge.
- 2.16 Electrical Requirements** The relay shall meet the electrical requirement specified on the circuit requirement table.
- 2.17 Application of KS-7246 Separator:** When difficulty is experienced in meeting the specified release requirements due to sticking conditions between the armature and the core, the KS-7246 separator may be applied in accordance with Section 040-014-811, covering the list of relays on which removable paper armature stops and separators may be applied.

3. ADJUSTING PROCEDURES3.001 List of Tools, Gauges, Materials and Test Apparatus

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
35	Screw-driver 3-1/2"
303	Spring Adjuster
371	Spring Adjuster
372	Wrench 5/16" Hex., Open-end - Offset
KS-6015	Duck-bill Pliers
-	Bell System Regular Screw-driver - 4" per A.T.&T. Co. Dwg. 46-X-34
-	Bell System 3-1/2" Screw-driver, per A.T.&T. Dwg. 46-X-40
-	Bell System, P-long Nose Pliers, 6-1/2" per A.T.&T. Dwg. 46-X-56
<u>Gauges</u>	
66-C	Thickness Gauge Nest
74-D or (the re- placed 74-C)	Thickness Gauge Nest
<u>Materials</u>	
KS-2423	Cloth
-	No. 22 Bare Tinned Copper Wire
KS-7246	Separator
KS-7860	Petroleum Spirits
-	Rubber Pencil Eraser
-	Toothpicks - Hard Wood Flat on one end, Pointed on the other.
<u>Test Apparatus</u>	
35-C	Test Set

3.01 Cleaning (Rq.2.01)

M-1 Clean the contacts and other parts in accordance with the section covering cleaning of relay contacts and parts. Clean the bearing pins and screws in accordance

with the procedures outlined in procedure 3.04 M-1 and M-5.

3.02 Relay Mounting (Rq.2.02)

M-1 If the relay is loose on the mounting plate or base tighten the mounting screws securely with the 3-1/2" cabinet screw-driver.

M-2 If the mounting screws are tight but the relay coil is loose remove the relay from the frame and tighten the screw which holds the coil to the baseplate, with the 4" regular screw-driver.

3.03 Cover Fit (Rq.2.03)

M-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.

3.04 Armature Movement (Rq. 2.04)

M-1 If the armature binds in its bearings attempt to clear the trouble by flushing the bearings with KS-7860 petroleum spirits. To do this apply KS-7860 petroleum spirits at each of the bearing points with a toothpick. Do not use the toothpick for more than one operation.

M-2 If the armature still binds in the bearings, remove the relay from its mounting by removing the mounting screws with the 3-1/2" cabinet screw-driver. Loosen the magnet screw with the 3-1/2" cabinet screw-driver and remove the magnet from the relay. Remove the front adjusting nuts from the adjusting posts with the No. 372 wrench and lift the armature support plate from the adjusting posts. Then loosen the armature bearing screws with the No. 35 screw-driver.

M-3 If the bearing lugs on the armature are bent or burred replace the armature.

M-4 If the armature bearing screws are defective, replace them.

M-5 If the bearing pins and screws are in good condition but appear to be dirty or gummy, clean them with KS-7860 petroleum spirits. To do this, rub the inside of the screw and the pins with a toothpick which has been dipped in petroleum spirits. After rubbing the parts flush them with the liquid taken up on the clean end of the toothpick. Never dip a toothpick that is not clean into the petroleum spirits.

M-6 Reassemble the relay and make all other mechanical adjustments before mounting the relay on the

frame. After the relay has been mounted, make a complete check of all the requirements.

3.05 Tightness of Assembly (Rq.2.05)

M-1 To tighten loose spring assembly mounting screws use the 3-1/2" cabinet screw-driver. Take care not to shift the springs so that they will fail to meet the other requirements.

3.06 Contact Alignment (Rq.2.06)

M-1 If the contacts are not properly aligned, loosen the spring assembly mounting screw or screws with the No. 35 screw-driver and shift the springs as required. Retighten the mounting screws securely.

3.07 Adjusting Nut Tightness (Rq.2.07)

M-1 To tighten loose adjusting nuts use the No. 372 wrench. After making this adjustment, check the armature travel to insure that it has not been changed in making this adjustment.

3.08 Straightness of Springs (Rq.2.08)

3.09 Separation Between Springs (Rq.2.09)

M-1 If the springs are not straight or if there is insufficient clearance between the springs correct by adjusting the springs where they are bent or where the clearance is insufficient. If mounting conditions

permit use the duck-bill pliers applied as shown in Fig. 4. If not use the No. 371 spring adjuster in adjusting the flexible front contact spring and the No. 303 spring adjuster when adjusting the back contact spring. It will be satisfactory to have a slight kink in the flexible front contact spring where it is riveted to the stop spring. This kink may be introduced in adjusting to meet requirement 2.11.

3.10 Armature Travel (Rq.2.10)

M-1 To adjust the armature travel proceed as follows: In general the best armature travel for any relay of this type will be as near the minimum requirement as is consistent with meeting the contact separation, contact follow, stud gap and electrical requirements.

M-2 If the travel is excessive, turn the inner adjusting nuts in a clockwise direction away from the armature support plate with No. 372 wrench and lock the armature support plate by turning the outer adjusting nuts in a clockwise direction. If the travel is insufficient, turn the outer adjusting nuts in a counter-clockwise direction away from the armature support plate and lock the armature support by turning the inner adjusting nuts in a counter-clockwise direction. In general it will be necessary to adjust only one pair of the adjusting nuts.

3.11 Flexible Front Contact Spring

Position (Rq.2.11)

3.12 Stud Gap (Rq.2.12)

3.13 Contact Separation (Rq.2.13)

3.14 Contact Pressure (Rq.2.14)

3.15 Contact Follow (Rq.2.15)

3.16 Electrical Requirements (Rq.2.16)

M-1 In making the adjustments for stud gap and contact separation it is desirable to keep them as near the minimum as possible consistent with meeting the other requirements.

M-2 Flexible Front Contact Spring

Position If the front contact spring does not rest on the stop spring at its contact end, adjust as follows: Place the No. 371 spring adjuster over the stop spring and front contact spring near the contact end of the spring. Insert a piece of No. 22 bare tinned copper wire between the two springs as close as possible to the point where they are riveted together as shown in Fig. 5. Then slide the No. 371 spring adjuster back toward the rivets. Remove the wire and then the spring adjuster.

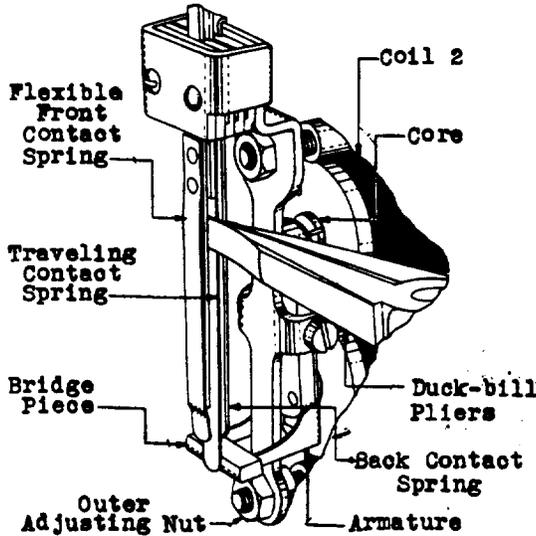


Fig. 4 - Method of Adjusting Contact Springs

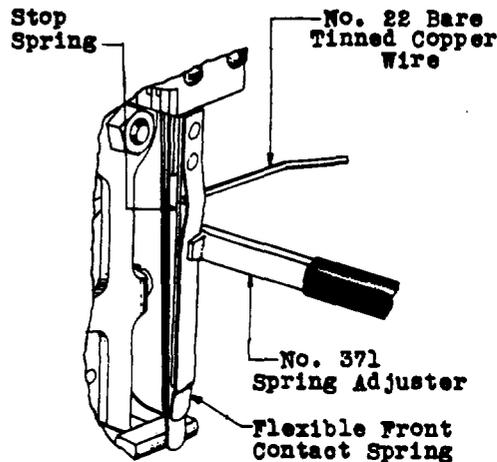


Fig. 5 - Method of Adjusting Flexible Contact Spring

contact spring at the shoulder with the long nose pliers applied as shown in Fig. 6. This practice should, however, be avoided wherever possible.

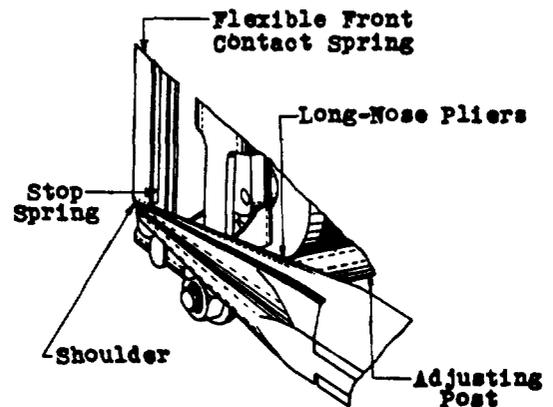


Fig. 6 - Method of Adjusting Tip of Flexible Front Contact Spring

M-3 Stud Gap - To adjust the stud gap, adjust the back contact or traveling springs or both. Before adjusting either spring however, check to see that the bridge piece is seated firmly in place on the armature tangs, and note that the bridge piece is not dirty. If the bridge piece is dirty or gummy, clean it by rubbing it with a clean KS-2423 cloth.

M-4 Where mounting conditions permit use the duck-bill pliers applied as shown in Fig. 4 to adjust the springs. Otherwise use the No. 371 spring adjuster on the front contact springs and the No. 303 spring adjuster on the back contact springs. To adjust the springs on relays so mounted place the spring adjuster over the spring approximately 1/4" from the point where the spring leaves the spring assembly insulators and then adjust the spring toward or away from the armature support plate as required.

M-5 Contact Separation, Contact Follow, Contact Pressure - To change the contact separation, contact follow or contact pressure, adjust the springs as outlined in M-4. If necessary adjust the tip of the flexible

M-6 Electrical Requirements - In general, failure to meet the operate requirement indicates that the tension of the traveling spring is too great and failure to meet a non-operate requirement indicates that the tension of the traveling spring is too light. Failure to meet the release requirement may indicate insufficient tension of the traveling spring or insufficient follow in the front contact spring. Adjust the springs following the procedures outlined above. If the operate requirement cannot be met by changing the spring tension, reduce the armature travel toward the minimum readjust requirement.

M-7 If the relay still fails to operate promptly when the specified operating current is applied or fails to release promptly when the specified release current is applied clean their core faces and armature faces in accordance with the procedures covered in the section covering cleaning of relay contacts and parts.

M-8 Final Check If any one of the adjustments is made, check to see that the relay meets the other requirements. If the relay fails re-adjust it as previously outlined.

3.17 Application of KS-7246 Separator
(Rq. 2.17)

- (1) Before applying the separator, clean the relay as covered in 3.01.
- (2) The addition of paper (approximately 0.002-inch thick) to the core of the relay reduces the armature travel by approximately twice the thickness of the paper. After the paper is applied, check the relay for armature travel, contact separation, contact follow, and electrical requirements, and if necessary, readjust as covered in 3.10, 3.13, and 3.15, making any necessary corrections after allowing for the thickness of the paper.
- (3) Wrap a strip of the KS-7246 separator around the relay coil immediately adjacent to the spoolhead at the armature end of the coil. The length of this strip should be such that one end overlaps the other by at least 1/4 inch.
- (4) Moisten one end of this strip for the full length of the overlap. Position the strip so that it lays snugly against the spoolhead of the coil and stick the moistened end of the strip to the dry end making sure that this band of separator is tight around the coil.
- (5) Place another strip of separator about 2-1/2 inch long between the relay armature and pole piece with the gummed side toward the pole face.

- (6) Moisten the ends of this strip and stick them fast to the band of separator previously placed around the coil exercising care to tuck the strip under the edge of the spoolhead at the points designated A and B in Fig. 7. Use the eraser when this work cannot be done with the fingers. Cut or tear off the ends of the separator strips if they are too long.
- (7) If the relay is already equipped with a separator and the portion between the armature and core is torn, dirty, or damaged in any way, replace the separator. When removing the separator exercise extreme care that no residue of the paper is left on the core.

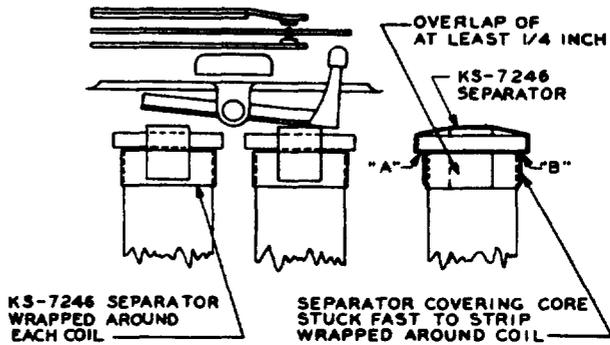


Fig. 7 - Application of KS-7246 Separator