

87-TYPE RELAYS

REQUIREMENTS AND ADJUSTING PROCEDURES

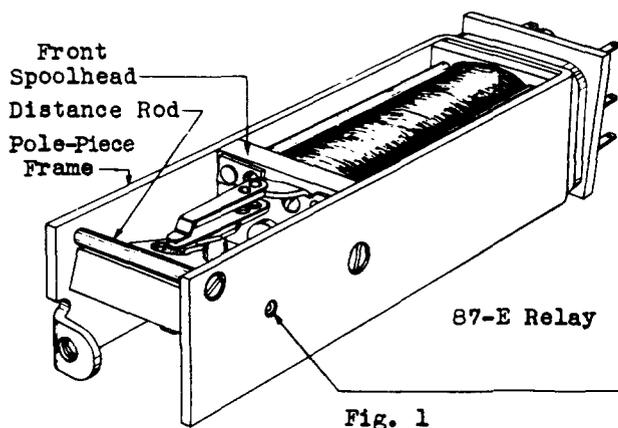
1. GENERAL

- 1.01 This section covers 87 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 dismantling 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 Release means that when the current is reduced from the operate or soak value to the release value (or open circuit) the armature shall move from the operated position sufficiently to break the contact that has been made and to make reliably the contact that has been broken.

2. REQUIREMENTS



2.01 Cleaning

- (a) The 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 Relay Mounting Relays shall be mounted securely. Gauge by feel.

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



2.04 Contact Alignment Contacts shall line up so that the point of contact falls wholly within the circumference of the opposing contact disc. Gauge by eye.

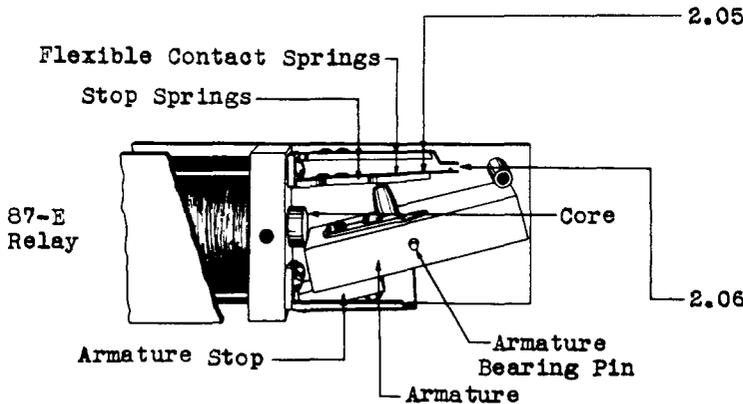


Fig. 3

2.05 Flexible Contact Spring Position The flexible contact spring shall rest on the stop spring at least on the end of the stop spring that is nearest the contact on the flexible contact spring when the relay is unoperated. Gauge by eye.

2.06 Contact Separation The separation between contacts normally open or between contacts that are opened when the relay is operated shall be Min. .005" Gauge by eye.

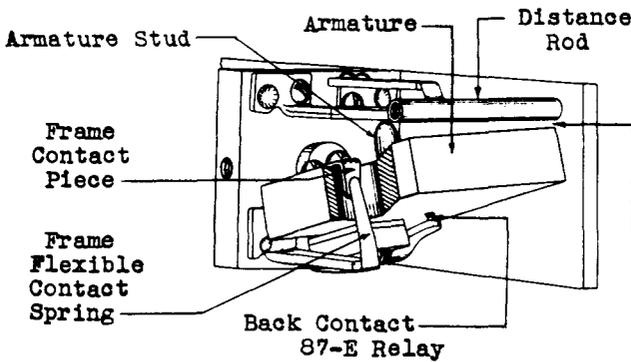
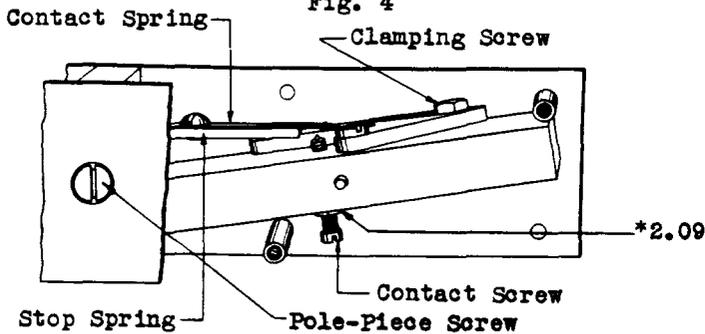


Fig. 4

2.07 Contact Follow The contact follow shall be perceptible (approximately .005") when the armature is manually operated to its fully operated position against the core. Gauge by eye.

2.08 Armature and Distance Rod Clearance On relays having a back contact there shall be a perceptible clearance (approximately .005") between the armature and the distance rod when the relay is unoperated. Gauge by eye and feel.



87-K Relay

Fig. 5

*2.09 Tightness of Lock Nut The lock nut on the contact screw shall be sufficiently tight to hold the screw in any adjusted position. Gauge by feel.

2.10 Electrical Requirements A relay shall meet the electrical requirements specified on the circuit requirement table.



87-K Relay

Fig. 6

3. ADJUSTING PROCEDURES**TOOLS**

<u>Code No.</u>	<u>Description</u>
35	Screw-driver - 3-1/2"
72	Wrench - 5/32" and 3/16" Hex. Socket Double-end and Screw-driver
206	Screw-driver - 30° Offset
207	Screw-driver - 90° Offset
349	Wrench - 3/16" and 7/32" Hex. Closed - Double-end Offset
363	Spring Adjuster
-	Bell System Cabinet Screw- driver - 3-1/2" per A.T.&T. Co. Drawing 46-X-40
-	Bell System P-Long-Nose Pliers - 6-1/2" per A.T.&T. Co. Drawing 46-X-56

TEST APPARATUS

35-C Test Set

MATERIALS

KS-7860 Petroleum Spirits

- Toothpicks - hardwood -
flat at one end and point-
ed at the other

3.01 CLEANING (Rq.2.01)

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

M-2 Clean the armature bearings, armature stop and core in accordance with procedure 3.03.

3.02 RELAY MOUNTING (Rq.2.02)

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

M-2 If the mounting screws are tight but the relay coil is loose, remove the relay mounting screws with the 3-1/2" cabinet screw-driver and remove the relay from the mounting plate. Tighten the screw which holds the coil to the pole-piece with the 3-1/2"

cabinet screw-driver. In those cases where the mounting plate and insulator are provided with a hole through which the screw-driver can be applied it will not be necessary to remove the relay from the mounting plate.

3.03 ARMATURE MOVEMENT (Rq.2.03)

M-1 If the armature does not move freely in its bearings this may be due to lack of side play or too much side play on relays having rubber bearings, broken or dirty bearings, the bearing pins being bent or the armature stud not clearing the stop spring. If faulty movement is due to lack of side play insert the No. 35 screw-driver between the armature and pole-piece frame and pry slightly. In the case of rubber bearings this will force one of the bearings out slightly. Exercise care not to obtain too much side play.

M-2 If there is too much side play on relays having rubber bearings, remove the relay from the mounting plate and force the bearings in with the No. 35 screw-driver.

M-3 If the armature stud rubs on the stop spring, position the bearings as outlined above.

M-4 If this does not provide free movement remove the mounting screws with the 3-1/2" cabinet screw-driver and remove the relay from the mounting plate. Remove the screws which hold the pole-piece frame to the distance rod with the No. 35 screw-driver and remove the distance rod. Loosen the screws which hold the pole-piece frame to the front spoolhead using the 3-1/2" cabinet screw-driver. Spread the pole-piece frame apart and remove the armature assembly from its bearings, exercising care not to damage the frame flexible spring, if equipped. Clean the bearing pins and also the bearings, if the bearings are of metal, with petroleum spirits applied with a clean toothpick. If the bearings are made of hard rubber clean the bearings with a clean dry toothpick.

M-5 Clean the core face and armature stop with petroleum spirits also at this time.

M-6 Exercise care when applying the petroleum spirits to prevent its coming in contact with the spoolhead, studs and insulators and rubber bearings.

M-7 At this time, advantage should be taken to make the following adjustments.

3.04 CONTACT ALIGNMENT (Rq.2.04)

M-1 If the contacts are out of alignment remove the relay from the mounting plate as described in procedure 3.02, M-2.

M-2 If the contacts are out of alignment laterally, adjust the stop spring sideways with the long nose pliers. On relays where the flexible contact spring is fastened to the stop spring with a screw, loosen the screw with the No. 35 screw-driver and shift the spring as required. Tighten the screw securely.

M-3 To align the frame flexible spring contacts loosen the two screws that hold the frame contact piece to the armature with the No. 35 screw-driver and then shift the piece as required. Tighten the screws securely.

M-4 Excessive side play may also cause misalignment. On relays having rubber bearings this can be corrected by forcing the bearings in with the No. 35 screw-driver. Do not reduce the side play so that the armature binds.

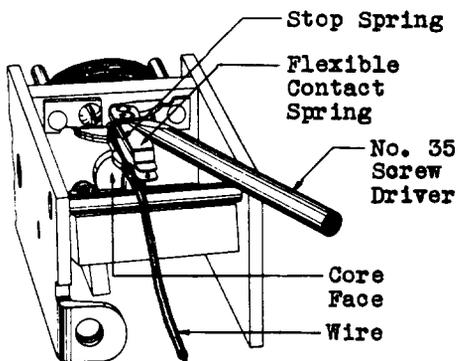


Fig. 7 - Method of Adjusting Flexible Front Contact

3.05 FLEXIBLE CONTACT SPRING POSITION (Rq.2.05)

M-1 If the flexible front contact spring does not rest on the stop spring at its contact end, insert the end of a piece of No. 22 bare tinned copper wire bent at a right angle and flattened slightly with the long nose pliers, between the flexible spring and the stop spring as near as possible to the rivets (or screw) that hold the flexible spring to the stop spring. Exert a slight downward pressure to the flexible contact spring with the No. 35 screw-driver as shown in Fig. 7 and then remove the wire. Exercise care not to get excessive bowing.

- 3.06 CONTACT SEPARATION (Rq.2.06)
- 3.07 CONTACT FOLLOW (Rq.2.07)
- 3.08 ARMATURE AND DISTANCE ROD CLEARANCE (Rq.2.08)
- 3.09 TIGHTNESS OF LOCK NUTS (Rq.2.09)
- 3.10 ELECTRICAL REQUIREMENTS (Rq.2.10)

M-1 The adjustment for contact separation and contact follow may be made with the relay mounted. To increase the contact separation or to decrease the contact follow apply the blade of the No. 35 screw-driver between the upper stop spring and the lower flexible contact spring and exert a slight upward pressure on the screw-driver. To decrease the contact separation or to increase the contact follow apply the blade of the No. 35 screw-driver near the base of the upper flexible contact spring and exert a downward pressure or apply the blade near the base of the lower stop spring and exert an upward pressure.

M-2 Contact Separation If necessary to adjust for contact separation it is advisable to position the springs so that the contacts do not make until the armature nears the fully operated position. This will aid in the operation of the relay. This adjustment, however, should be consistent with meeting all other requirements.

M-3 The separation may also be obtained by removing the relay from the mounting plate as outlined in procedure 3.02, M-2 and adjusting the shoulder of the upper flexible contact spring with the No. 363 spring adjuster. In making this adjustment see that the adjustment for the spring resting on the stop spring is not destroyed.

M-4 On relays having a contact screw this adjustment may also be met by turning the screw in a clockwise or counter-clockwise direction as the case may demand using the No. 72 combination wrench and screw-driver to turn the screw and to loosen and tighten the locknut. It will be necessary to remove the relay from the mounting plate as outlined in procedure 3.02 to make this adjustment.

M-5 Contact Follow If the contact follow is insufficient it may be due to excessive contact separation in which case the separation should be decreased as outlined in M-1 to M-4. The contact follow will be satisfactory when with the armature in the fully operated position there is a clearance between the upper flexible contact spring and its stop spring. If, however, the relay is operating on alternating current, it will be satisfactory if the contacts only make and insure a reliable electrical circuit through them.

M-6 If the lock nut on the front contact screw is loose remove the relay from the mounting plate and tighten it with the wrench portion of the No. 72 combination wrench and screw-driver holding the screw in position with the screw-driver portion of the same tool.

M-7 Electrical Requirements If the relay fails to release increase the contact follow by adjusting the springs, or contact screw, as outlined in M-1 and M-4. Note that the contact separation requirement is still met and that the flexible contact spring rests on its stop spring. In the case of relays equipped with a balancing piece, moving the piece towards the core will also aid in meeting the release requirement. The balancing piece may be moved as follows: Loosen the balancing piece clamping screw with the No. 349 wrench and attempt to move the balancing piece towards the core with the No. 35 screw-driver. If the balancing piece pivot screw is too tight to permit this, loosen the screw slightly with the No. 206 and No. 207 offset screw-drivers and then move the piece, after which tighten the screws.

M-8 Failure to meet the release requirement may also be due to an accumulation of dirt on the armature stop, on the surface of the core or may be due to dirty bearings. In this case remove the dirt as outlined in procedure 3.03.

M-9 If the relay still fails to release, examine the armature to determine whether there is sufficient clearance between it and the core when the relay is energized. An insufficient clearance between the armature and core with the armature in the operated position may result from worn bearings.

M-10 If the relay fails to operate, reposition the springs or contact screw, as outlined in M-1 and M-4, so that the contacts do not make until the armature approaches the fully operated position.

M-11 In the case of relays equipped with a balancing piece, moving the piece away from the core, will also aid in meeting the operate requirement. Move the balancing piece as outlined under M-7 except in this case use the No. 206 or No. 207 offset screw-driver as shown in Fig. 8 to pull the piece away from the core.

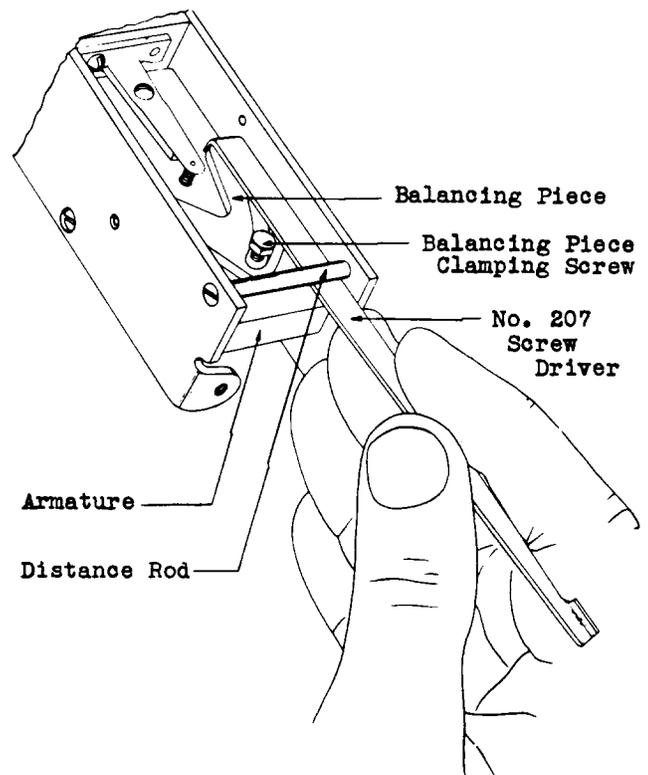


Fig. 8 - Method of Adjusting Relay Equipped with a Balancing Piece

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M-12 Failure to operate may also be due to bind in the bearings, in which case, clean them in accordance with procedure 3.03.

M-13 If the relay releases but the circuit through the back contacts is not closed, although the armature contact is touching the back contact, the frame flexible contact spring is probably not touching the frame piece contact. Check by pushing the flexible

spring forward and noting that the circuit is closed. Correct by removing the relay from the mounting plate and adjusting the spring with the No. 363 spring adjuster.

M-14 To adjust for clearance between the armature and distance rod on relays having back contacts, push the back contact spring upward with the 3-1/2" cabinet screw-driver.