

## 118-TYPE RELAYS REQUIREMENTS AND ADJUSTING PROCEDURES

### 1. GENERAL

- 1.01 This section covers 118 Type Relays.
- 1.02 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.
- 1.03 Part 1, "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department handbook.
- 1.04 Operate means that when the operate current is applied the armature shall move sufficiently to break the back contact and make the front contact reliably.
- 1.05 Non-operate means that when the specified non-operate current is applied, the armature shall not break the back contact or make the front contact.
- 1.06 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 the contact which has been made or to make the contact which has been broken.
- 1.07 Release means that when the current is reduced from the soak, operate or hold value to the release value, the armature shall move from the operated position sufficiently to break the contact that has been made and make reliably the contact that has been broken.

### 2. REQUIREMENTS

- 2.01 Cleaning The contacts and other parts shall be cleaned when necessary in accordance with the section covering cleaning of relay contacts and parts.
- 2.02 Relay Mounting Relays shall be mounted securely and approximately level. This shall be checked by applying a vertical and a horizontal pressure to the relay and not by attempting to turn the relay. Gauge by eye and feel.
- 2.03 Tightness of Cover Cap The cover cap shall fit snugly but shall not be so tight as to prevent placing or removing with the fingers. Gauge by feel.

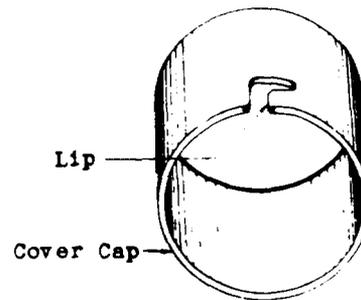


Fig. 1

- 2.04 Front Contact Spring Position - Fig. 2 (A) - The front contact spring shall rest firmly against the spoolhead at least near the contact end. Gauge by eye.

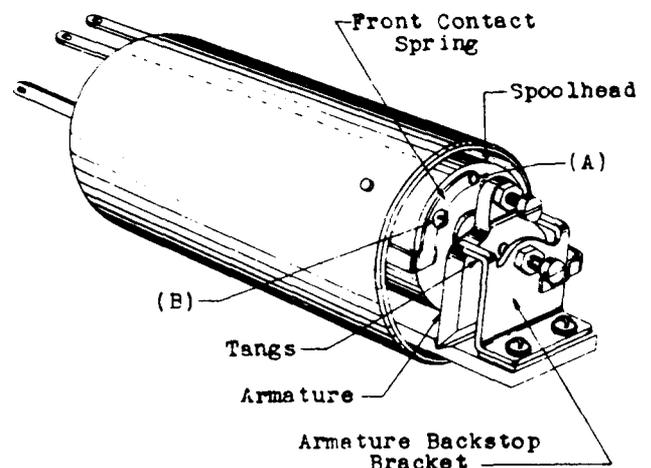


Fig. 2

- 2.05 Tightness of Front Contact Spring Screw - Fig. 2 (B) - The front contact spring screw shall be sufficiently tight to hold the front contact spring in the adjusted position.

2.06 Contact Alignment - Fig. 3 (A) - Contacts shall line up so that the point of the contact falls wholly within the circumference of the opposing contact disc. Gauge by eye.

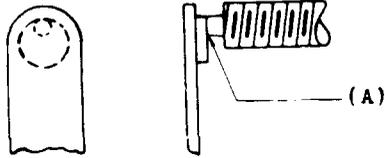


Fig. 3

2.07 Armature Movement The armature shall not bind or ride on the top of the pin in the armature slot and shall clear the tangs of the armature back stop bracket. Gauge by eye and feel.

2.08 Tightness of Lock Nuts - Fig. 4 (B) - The lock nuts shall be sufficiently tight to hold the screws in the adjusted position. Gauge by feel.

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

2.10 Contact Separation - Fig. 4 (A) - 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. .005"  
Use the No. 74-D gauge.

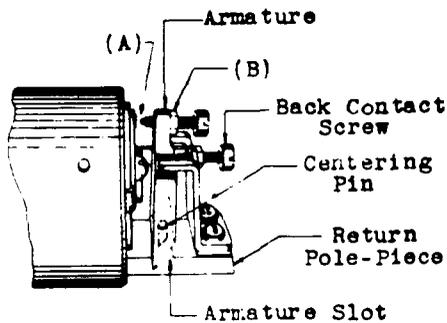


Fig. 4

2.11 Feather Contact Spring Position - Fig. 5 (A) - The feather contact spring shall rest against the turned over portion of the front contact spring when it is not engaged by the front contact screw. Gauge by eye.

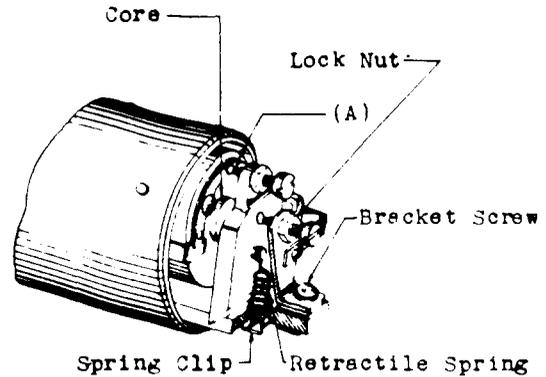


Fig. 5

2.12 Flashing Requirement "A"

(a) Supervisory relays in cord circuits of No. 1 Manual switchboards, and 118-A and 118-F supervisory relays in incoming trunk circuits in manual offices, or when flashing requirements are specified on the circuit requirement table, shall follow interruptions at the rate of three times per second (180 per minute) with a ratio of make to break or on to off of 2 to 1. The operation of cord circuit supervisory relays shall be gauged by the flashing of the associated supervisory lamp or equivalent signal but it will be satisfactory to gauge the operation of incoming trunk supervisory relays by observing the relay itself.

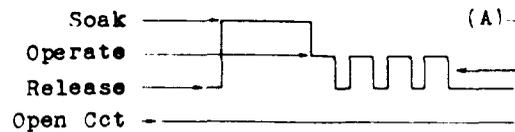


Fig. 6

(b) Fig. 6 (A) - The current values specified on the circuit requirement table or elsewhere shall be applied in the following order in testing and readjusting. With the "Release" current applied continuously connect both the "Soak" and "Operate" currents. After one second disconnect the "Soak" current and follow immediately by interrupting the "Operate" current at the above speed and ratio of make to break for 3 interruptions. The foregoing cycle of tests, when repeated, shall always proceed in the same sequence starting with the application of the combined "Soak" and "Operate" currents.

2.13 Flashing Requirement "C"

(a) Supervisory relays in cord circuits of No. 10 manual switchboards or when flashing requirement "C" is specified on the circuit requirement table, shall follow interruptions at the rate of two times per second (120 per minute) with a ratio of make to break or on to off of 3 to 2. For test, the operation of the cord circuit supervisory relays shall be gauged by the flashing of the associated supervisory lamp. For readjust, the operation of cord circuit supervisory relay shall be gauged by observing the relay itself.



Fig. 7

(b) Fig. 7 (A) - The current values specified on the circuit requirement table shall be applied in the following order in testing and readjusting: With the "Release" current disconnected, connect the "Soak" current and disconnect it after approximately one second. Approximately one-half second thereafter apply the "Operate" current at the above speed and ratio of make to break for four interruptions. The foregoing cycle of tests when repeated shall always proceed in the same sequence starting with the application of the "Soak" current.

3. ADJUSTING PROCEDURESTools

<u>Code No.</u>	<u>Description</u>
35 (Part of Tool 221)	Screw-driver - 3-1/2"
102	Wrench - 3/8" Hex.Socket
220 (Part of Tool 221)	Wrench - 3/16" Hex.Socket
350	Spring Adjuster
-	Bell System P-Long Nose Pliers - 6", per A.T.& T. Co. Dwg. 46-X-54
-	File, Half-Round 4" Smooth

Gauges

74-D Thickness Gauge Nest

Test Apparatus

35-C Test Set

- 163 Type Interrupter and  
Associated Circuit or  
Equivalent for Use in  
Making "Flashing" tests  
when Equipped in the  
Office

Materials

- Toothpicks, Hardwood,  
Flat at One End and  
Pointed at the Other

3.01 Cleaning (Rq.2.01)

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

3.02 Relay Mounting (Rq.2.02)

M-1 To tighten relays that are loose  
on the mounting plate tighten the  
mounting nuts securely with the No. 102  
wrench. It is particularly important  
that these relays be mounted approxi-  
mately level (as regards the armature  
knife edge), with the sides at right  
angles to the return pole-piece. There-  
fore, when tightening the mounting nut  
note that the relay is mounted approxi-  
mately level. Do not fasten the mount-  
ing nut too tightly as otherwise undue  
pressure will be exerted on the  
fibre insulators and the threads  
of the mounting stud may be  
stripped.

M-2 If the mounting nut is tight but  
the coil is loose remove the re-  
lay from the mounting plate. Then tight-  
en the nut on the mounting stud, which  
holds the pole-piece to the core at the  
rear of the relay, with the No. 102  
wrench. At the same time align the con-  
tacts by shifting the coil and pole-  
piece until they are in their correct  
relative positions.

3.03 Tightness of Cover Cap (Rq.2.03)

M-1 If the cover cap binds or fits  
too tightly it is probably due to  
a "turning in" effect of the part of the  
rim which is slotted. Overcome this  
condition by adjusting the lip part of  
the cover slightly outward with the long  
nose pliers.

M-2 Burrs on the inside of the rim  
may also cause the cover to bind.  
In this case remove the burrs using the  
smooth file.

M-3 If the cover fits too loosely ad-  
just the lip part of the cover  
inward sufficiently to insure a snug but  
not a tight fit.

3.04 Front Contact Spring Position (Rq.2.04)3.05 Tightness of Front Contact Spring  
Screw (Rq.2.05)

M-1 Front Contact Spring Position  
To position the front contact  
spring against the spoolhead, first  
turn the front contact spring screw in  
a clockwise direction if loose with  
the No. 35 screw-driver. If this does  
not correct the trouble, turn the screw  
in a counter clockwise direction until  
the No. 350 spring adjuster can be in-  
serted between the front contact spring  
and the spoolhead. Insert the No. 350  
spring adjuster between the front con-  
tact spring and spoolhead so that its  
forked end spans the screw. Turn the  
screw in a clockwise direction until  
the contact spring is held firmly  
against the spring adjuster and then  
force the contact spring toward the  
spoolhead by applying pressure to the  
contact end of the spring with the No.  
35 screw-driver as shown in Fig. 8.  
Exercise care to place the screw-driver  
on the tip of the spring and not on the  
contact to avoid marring the contact.  
After making this adjustment loosen the  
screw and remove the spring adjuster.  
Then retighten the screw securely. In  
tightening the screw press the front  
contact spring against the spoolhead  
adjacent to the head of the screw in  
order to relieve the pressure against  
the screw head while tightening to prevent  
stripping of the threads in the spoolhead.

## 3.05 (Continued)

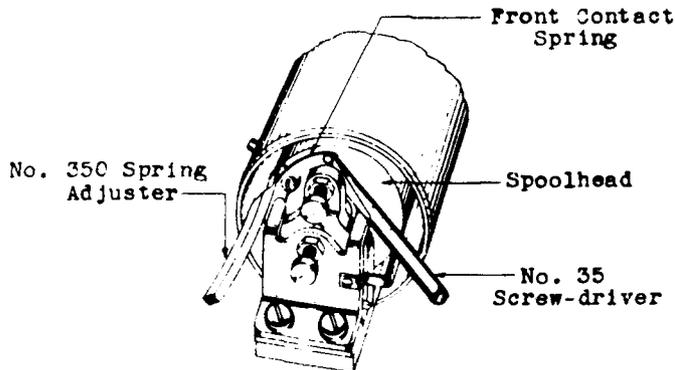


Fig. 8 - Method of Adjusting the Front Contact Spring

M-2 Front Contact Spring Screw To tighten this screw use the No. 35 screw-driver and at the same time align the contact as described in procedure 3.06.

3.06 Contact Alignment (Rq.2.06)

M-1 Front Contacts To align the front contacts turn the front contact spring screw in a counter clockwise direction with the No. 35 screw-driver and shift the front contact spring as required. Tighten the front contact spring screw securely.

M-2 Back Contacts To align the back contacts, loosen the armature back stop bracket screws with the No. 35 screw-driver and shift the back stop bracket so that the contacts rest wholly within their associated contact discs and as near the center as possible. Tighten the screws securely.

3.07 Armature Movement (Rq.2.07)

M-1 Tangs If the armature does not clear the tangs of the armature back stop bracket, adjust the tangs with the long nose pliers until the armature moves freely.

M-2 Centering Pin and Armature Slot If

the armature clears the tangs but does not move freely it may be due to the centering pin located in the armature slot being bent or to burrs in the slot in the armature. Ordinarily, in the process of checking it will not be necessary to remove the armatures to inspect the knife edge. If it is defective, proceed as follows: Remove one of the armature back stop bracket screws with the No. 35 screw-driver, turn the armature back stop bracket at an angle and remove the armature.

M-3 If the centering pin is bent straighten it with the long nose pliers. Note that the slot in the armature clears the pin and the knife edge of the armature is not burred. Do not remove burrs by filing or other means, since this injures the finish which protects the part from corrosion.

M-4 At this time clean the armature and armature slot thoroughly as outlined in procedure 3.01.

M-5 Reassemble the parts and tighten all screws securely. Align the back contacts at this time as outlined in procedure 3.06.

3.08 Tightness of Lock Nuts (Rq.2.08)

M-1 To tighten loose lock nuts use the No. 220 wrench, holding the screw in position with the No. 35 screw-driver.

3.09 Electrical Requirements (Rq.2.09)3.10 Contact Separation (Rq.2.10)3.11 Feather Contact Spring Position (Rq.2.11)

M-1 If the relay fails to meet the electrical requirements proceed as follows:

M-2 Operated Position of Armature With the "Release" current connected continuously to the proper winding or windings of the relay as specified on the circuit requirement table or elsewhere, apply the "Soak" current, or if no "Soak" current is specified apply the "Operate" current. Then loosen the lock nut on the front contact (or stop) screw with the No. 220 wrench and turn the front contact screw in a counter clockwise direction with the No. 35 screw-driver to a point where the armature just sticks when the "Soak" or "Operate" current is disconnected. Again apply the "Soak" or "Operate" current and turn the front contact (or stop) screw slightly in a clockwise direction until it has reached the point where the armature just releases when the "Soak" or "Operate" current is disconnected. Then turn the front contact screw approximately 1/16 of a turn farther in a clockwise direction

## 3.09-3.11 (Continued)

and tighten the lock nut.

**M-3** Unoperated Position of the Armature (Contact Separation)

With the lock nut on the back contact (or stop) screw slightly loosened with the No. 220 wrench, turn the back contact (or stop) screw in a clockwise direction with the No. 35 screw-driver until the front contact-screw just touches the front contact. Then turn the back contact (or stop) screw in a counter clockwise direction approximately 1/4 of a turn, which will allow a clearance between the front contact and the screw of .005" to .007". Retighten the lock nut and check that the relay meets all electrical requirements. If it does not proceed as follows:

**M-4** Hold and Release Failure to meet either of these requirements is probably due to the air-gap between the armature and the core when the relay is in the operated position being incorrect. If the relay fails to release increase the operated armature air-gap. To do this loosen the lock nut on the front contact screw with the No. 220 wrench and then turn this screw in a clockwise direction with the No. 35 screw-driver, noting that the contact separation requirement is still met. Tighten the lock nut securely. If the relay fails to meet the "Hold" requirement, decrease the operated armature air-gap. To do this loosen the lock nut on the front contact screw with the No. 220 wrench and turn this screw in a counter clockwise direction with the No. 35 screw-driver. Note that the back contact separation requirement is still met. Tighten the lock nut securely.

**M-5** Operate and Non-Operate Failure to meet either of these requirements is probably due to the air-gap between the armature and core when the armature is in the unoperated position being incorrect. If the relay fails to meet the operate requirement decrease the unoperated armature air-gap. To do this loosen the lock nut on the back contact (or stop) screw with the No. 220 wrench and turn the screw in a clockwise direction with the No. 35 screw-driver, noting that the contact separation requirement is still met. Tighten the lock nut securely. If the relay fails to meet the non-operate requirement, increase the unoperated armature air-gap. To do this turn the back contact (or stop) screw in a counter clockwise direction. If it is impossible to meet the operate and non-operate requirements by means of this adjustment of the unoperated air-gap and still meet the contact separation requirement, change the operated air-gap slightly as specified under M-4 consistent with meeting the hold and release requirements.

**M-6** If the relay is equipped with a retractile spring, failure to meet the hold, release, operate or non-operate requirements may be due to incorrect armature tension. In this case increase or decrease the tension as required by adjusting the spring clip with the long nose pliers.

**M-7** Feather Contact Spring Position  
The adjustment of the feather contact spring also affects the operation of the relay and the tension of it against the turned over portion should be considered in adjusting to meet the electrical requirements. To increase the tension insert the flat end of a toothpick between the spring and the front contact spring and slide the toothpick towards the contact spring screw until the spring rests firmly against the inside of the front contact spring. Take care not to kink the spring or give it an excessive bow. In case the spring is bowed excessively the bow may be reduced by rubbing the spring with the No. 35 screw-driver adjacent to the front contact spring screw. In its final adjusted position, the spring should curve slightly outward toward the armature rather than inward toward the front spring so that the front contact screw in its travel will make contact as long as possible.

**M-8** Final Check In all cases after a relay has been adjusted replace the cover cap and check to insure that the relay meets its electrical requirements. The check can usually be made by observing the operation of the associated apparatus in the circuit.

**3.12** Flashing Requirement "A" (Rq.2.12)

**M-1** With the relay adjusted in accordance with procedures 3.02 to 3.08, it shall when required be adjusted to meet flashing requirements as follows. These procedures supplement the procedures given in 3.09 and 3.10 to meet the electrical requirements.

**M-2** Connect the No. 35-C test set as specified on the circuit requirement table and connect the interrupter circuit to the test set. Where no interrupter circuit is available, the interrupters shall be produced manually.

With Interrupter Circuit

**M-3** Operated Position of the Armature  
With the "Release" key operated continuously, depress and release the "Soak" key at approximately one second intervals, that is operate the "Soak" key for approximately one second and release it for approximately one second. While doing this loosen the lock nut on the front contact screw with the No. 220

## 3.12 (Continued)

wrench and turn the front contact screw in a counter clockwise direction with the No. 35 screw-driver until the armature just sticks when the "Soak" key is released. Again depress and release the "Soak" key at one second intervals and turn the front contact screw slowly in a clockwise direction until the armature just releases when the "Soak" key is released. Then turn the front contact screw approximately 1/16 of a turn farther in the clockwise direction and tighten the lock nut.

M-4 After this adjustment has been made and with the "Release" current still connected, depress the "Soak" and "Operate" keys. After approximately one second release the "Soak" key but keep the "Operate" key depressed. Immediately after releasing the "Soak" key release the "Operate" key but keep the "Release" current connected. If the armature fails to release promptly under this condition turn the front contact screw in a clockwise direction and repeat the above sequence until it does.

M-5 Unoperated Position of the Armature After establishing the operated position of the armature, turn the back stop screw in a clockwise direction until the front contact screw just touches the front contact. Then turn the back stop screw in a counter clockwise direction approximately 1/4 turn which will provide a clearance between the contacts of from .005" to .007".

M-6 After this adjustment has been made and with the "Release" current still connected depress the "Soak" key and release it after one second. Follow immediately (approximately one-half second) by depressing the "Operate" key until three flashes are obtained, (approximately one second).

M-7 Note that the associated cord supervisory lamp or equivalent signal or the relay in the case of trunk circuit relays follows the application and removal of the "Soak" and "Operate" currents. If the armature seems to respond properly but the associated cord lamp or equivalent signal does not follow each operation of the relay, the trouble is probably due to the front contact spring not resting properly against the spoolhead. It is well, therefore, to make a final check for the correct position of the front contact spring. If it is necessary to change this position, note that the contact separation requirement is still met.

M-8 If the signal (or the relay) follows the three applications of the "Operate" current, the relay may be considered in a satisfactory adjustment. If the armature fails to respond

properly readjust it slightly in accordance with the procedure covered in M-5 and if necessary M-3 and M-4. Take care, however, to maintain the proper release adjustment and that the contact separation is not less than .005".

M-9 As a final check after all adjustments have been made and the cover is on the relay, connect the "Release" current and then depress the "Soak" and "Operate" keys. After approximately one second release the "Soak" key. Keep the "Operate" key depressed until three flashes are obtained. If relay fails readjust it as outlined previously.

Without Interrupter Circuit

M-10 Operated Position of the Armature With the "Release" key operated continuously, depress and release the "Soak" key at approximately one second intervals, that is operate the "Soak" key for approximately one second and release it for approximately one second. While doing this loosen the lock nut on the front contact screw slightly with the No. 220 wrench and turn the front contact screw in a counter clockwise direction with the No. 35 screw-driver until the armature just sticks when the "Soak" key is released. Again depress and release the "Soak" key at one second intervals and turn the front contact screw slowly in a clockwise direction until the armature just releases when the "Soak" key is released. Then turn the front contact screw approximately 1/16 of a turn farther in a clockwise direction and tighten the lock nut.

M-11 After this adjustment has been made and with the "Release" current still connected, depress the "Soak" and "Operate" keys. After approximately one second release the "Soak" key and keep the "Operate" key depressed. Immediately after releasing the "Soak" key release the "Operate" key but keep the "Release" current connected. If the armature fails to release promptly under this condition, turn the front contact screw in a clockwise direction and repeat the above sequence until it does.

M-12 Unoperated Position of the Armature After establishing the operated position of the armature, turn the back stop screw in a clockwise direction until the front contact screw just touches the front contact. Then turn the back stop screw in a counter clockwise direction approximately 1/4 turn which will provide a clearance between the contacts of from .005" to .007".

M-13 After this adjustment has been made and with the "Release" current still connected, depress the "Soak"

## 3.12 (Continued)

key and release it after one second. Follow immediately (approximately one-half second) by depressing and releasing the operate key three times at the rate of three times per second, the relation of "make" to "break" being approximately 2 to 1.

M-14 The associated cord supervisory lamp or equivalent signal or the relay in the case of the trunk circuit relays follows the application of the "Soak" and "Operate" currents. If the armature seems to respond properly but the associated cord lamp or equivalent signal does not follow each operation of the relay, the trouble is probably due to the front contact spring not resting properly against the spoolhead. It is well, therefore, to make a final check for the correct position of the front contact spring. If it is found necessary to change this position note that the contact separation requirement is still met.

M-15 If the signal follows the three applications of the "Operate" current the relay may be considered in a satisfactory adjustment. If the armature fails to respond properly readjust in accordance with the procedure outlined in M-12 and if necessary M-10 and M-11. Take care however to maintain the proper release adjustment and that the contact separation is not less than .005".

M-16 As a final check after all adjustments have been made and the cover is on the relay and with the "Release" current connected continuously, depress the "Soak" and "Operate" keys. After approximately one second release the "Soak" key. Follow immediately by releasing and depressing the "Operate" key three times at the rate of approximately three times per second. The ratio of make to break being approximately 2 to 1. If the relay fails readjust it as outlined previously.

3.13 Flashing Requirement "C" (Rq.2.13)

M-1 With the relay adjusted in accordance with procedures 3.02 to 3.08, it shall when required be adjusted to meet flashing requirements as follows. These procedures supplement those given under procedures 3.09 and 3.10 to meet the electrical requirements.

M-2 Connect the No. 35-C test set as specified on the circuit requirement table.

M-3 Operated Position of Armature  
With the "Release" key operated continuously depress and release the soak key at approximately one second intervals, that is operate the "Soak"

key for approximately one second and release it for approximately one second. While doing this loosen the lock nut on the front contact screw slightly with the No. 220 wrench and turn the front contact screw in a counter clockwise direction with the No. 35 screw-driver until the armature just sticks when the "Soak" key is released. Again depress and release the "Soak" key at one second intervals and turn the front contact screw slowly in a clockwise direction until the armature just releases when the "Soak" key is released. Then turn the front contact screw approximately 1/16 of a turn farther in a clockwise direction and tighten the lock nut.

M-4 Unoperated Position of Armature

After establishing the operated position of the armature, turn the back contact screw in a clockwise direction until the front contact screw just touches the front contact. Then turn the back contact screw in a counter clockwise direction approximately one-quarter turn, which will provide a clearance between the contacts of from .005" to .007".

M-5 After this adjustment has been made and with the "Release" current disconnected, depress the "Soak" key and release it after one second. Follow immediately (approximately one-half second) by depressing and releasing the operate key four times at the rate of two times per second, the ratio of make to break being approximately 3 to 2.

M-6 If the relay follows the four applications of the "Operate" current gauged by observing the armature of the relay, it may be considered in satisfactory adjustment. If the armature fails to respond properly, readjust slightly in accordance with the procedures outlined under M-5 and if necessary M-3 and M-4. Take care, however, to maintain the proper release adjustment and that the contact separation is not less than .005".

M-7 As a final check after all adjustments have been made and the cover is on the relay and with the "Release" current disconnected, depress the "Soak" key. After approximately one second release the "Soak" key and follow immediately by depressing and releasing the "Operate" key four times at the ratio of approximately two times per second, the ratio of make to break being approximately 3 to 2. If the relay fails readjust it as previously outlined.