

KEYS  
519-TYPE  
REQUIREMENTS AND ADJUSTING PROCEDURES

1. General

- 1.01 This section covers 519-type keys.
- 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 The operated position of a spring assembly is that position in which the normally open contacts are closed and the normally closed contacts are open.
- 1.07 The unoperated position of a spring assembly is that position in which the normally open contacts are open and the normally closed contacts are closed.
- 1.08 The normal (unoperated) position of a plunger is that position in which the plunger locking or stop cone rests flat against the bearing plate or buffer plates, and the spring assemblies are unoperated.
- 1.09 The operated position of a locking plunger is that position in which the plunger locking or stop cone rests under and against the slide plate or roller and is held depressed by the slide plate; in this position the spring assembly is operated.
- 1.10 The normal (unoperated) position of a rotating plunger type key is that position in which the plunger springs rest against the wider surface of the plunger and the spring assemblies are unoperated.
- 1.11 The operated position of a rotating plunger type key is that position in which the plunger springs rest against the narrower surface of the plunger and the spring assemblies involved are operated.

2. REQUIREMENTSPLUNGER TYPE KEYS2.01 Cleaning

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

2.02 Plunger Movement The plungers shall work freely in their bearings and when released unrestrained shall return to their normal position with a snap. Gauge by eye and feel.

\*2.03 Slide Plate Operating Spring Tension  
 The pressure of the slide plate operating spring against the pin in the slide plate with all the plungers in the normal position shall be:

<u>Test</u>	- Min. 130 grams,
	Max. 200 grams
<u>Readjust</u>	- Min. 140 grams,
	Max. 200 grams

Use the No. 79-C gauge.

2.04 Plunger Release

- (a) Any plunger locked in the operated position shall release when any other plunger is depressed to the operated position.  
 (b) The locking plunger shall lock reliably and shall release when the non-locking plunger is depressed to the limit of its stroke.

\*2.05 Contact Alignment The contacts shall line up so that the point of contact falls wholly within the circumference of the opposing contact disc. Gauge by eye.

\*2.06 Contact Separation Unless otherwise specified the separation between any pair of contacts normally open or between any pair of contacts that are opened when the key is operated shall be:

<u>Test</u>	- Min. .014"
<u>Readjust</u>	- Min. .016"

Gauge by eye.

\*2.07 Spring Clearance

- (a) There shall be a clearance between the springs designed never to make contact and between any spring and the frame, whether in the operated or unoperated position of the key of:

<u>Test</u>	- Min. .014"
<u>Readjust</u>	- Min. .016"

Gauge by eye.

- (b) With the plunger in the normal position there shall be a clearance between the plunger spring and plunger in at least one position of the plunger as the plunger is rotated.

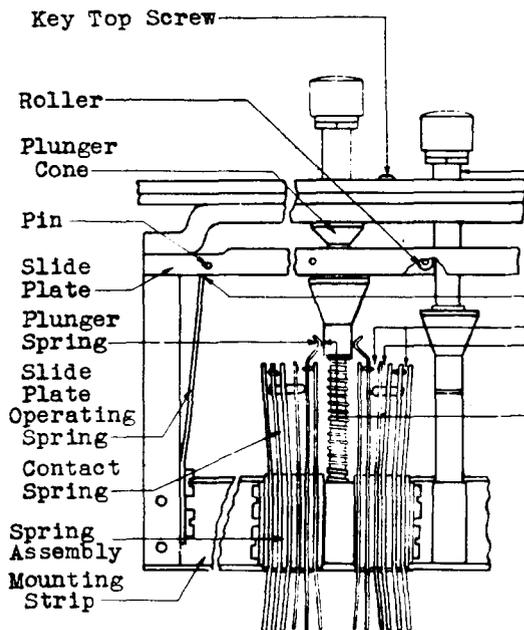


Fig. 1



Fig. 2

Roller  
Slide  
Plate  
Plunger  
Springs  
Metal  
Washer  
Helical  
Spring  
Hard  
Rubber  
Plunger  
Contact  
Springs  
Mounting  
Strip

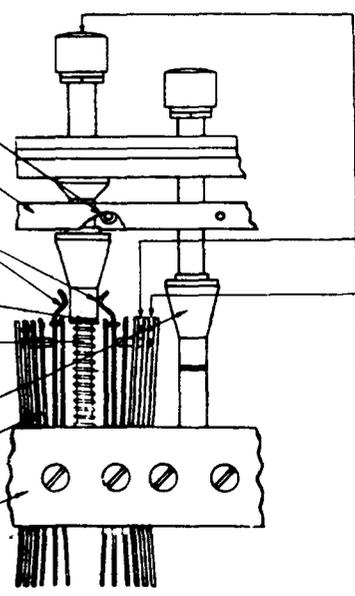


Fig. 3

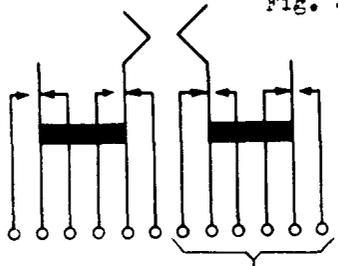


Fig. 4

Plunger  
Retaining  
Screw  
Key Shell  
Spring Assembly  
Mounting Screws  
Spring Assembly  
Screw

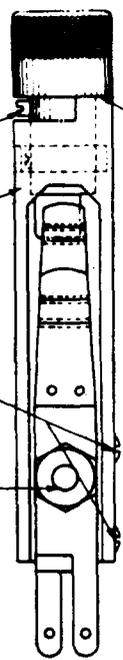


Fig. 5

\*2.08 Contact Pressure There shall be a pressure between all closed contacts of:  
Test - Min. 50 grams  
Readjust - Min. 55 grams  
Use the NO. 68-B gauge.

\*2.09 Contact Follow There shall be a follow on all contacts of:  
Test - Min. .008"  
Readjust - Min. .010"  
Gauge by eye.

\*2.10 Contact Sequence  
(a) Normal Contact Sequence - Break-Make Combinations Unless otherwise specified, the normally closed contacts operated directly by a plunger spring of an individual spring assembly shall break before the normally open contacts of the same spring assembly directly associated with the plunger spring make by:  
Test - Min. .005"  
Readjust - Min. .006"  
Gauge by eye.  
(b) Other Contact Sequence When specified on the circuit requirement table or circuit drawing.

2.11 Plunger Operate Pressure  
(a) The pressure required to depress a plunger to the end of its stroke shall be:  
Test - Max. 2265 grams  
Readjust - Max. 2040 grams

2.12 Plunger Non-Operate Pressure A pressure of  
Test - 180 grams  
Readjust - 200 grams  
shall not move a plunger from its normal position.

ROTATING PLUNGER TYPE KEY

2.13 Cleaning  
(a) Contacts shall be cleaned in accordance with the section covering cleaning procedures for key contacts.  
(b) Other parts shall be cleaned in accordance with approved procedures.

2.14 Plunger Movement  
(a) The plunger shall operate freely in the key frame. Gauge by feel.  
\*(b) It shall not be possible to operate the contacts by any side-thrust on the plunger when the key is in either its operated or unoperated position. Gauge by feel.

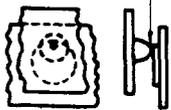


Fig. 6

\*2.15 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.

\*2.16 Spring Clearance There shall be a clearance between springs designed never to make contact and between any spring and the frame whether in the operated or unoperated position of the key of:

Test - Min. .014"  
Readjust - Min. .016"

Gauge by eye.

\*2.17 Contact Separation Unless otherwise specified, the separation between any pair of contacts normally open or between any pair of contacts that are opened when the key is operated shall be:

Test - Min. .014"  
Readjust - Min. .016"

Gauge by eye.

\*2.18 Contact Pressure Unless otherwise specified there shall be a pressure between all closed contacts of:

Test - Min. 50 grams  
Readjust - Min. 55 grams

Use the 68-B gauge.

\*2.19 Flexible Contact Spring Position The flexible contact springs shall rest on their respective stop springs when the plunger is in the unoperated position for normally open contacts and in the operated position for normally closed contacts. It is not necessary for the spring to rest on the stop spring for its entire length but it must rest on the end of the stop spring nearest the contact. Gauge by eye.

\*2.20 Plunger Spring Position Both plunger springs shall rest against the plunger in the unoperated position. Gauge by eye.

\*2.21 Contact Follow  
(a) Unless otherwise specified there shall be a follow on all outside contacts of:

Test - Min. .008"  
Readjust - Min. .010"

Gauge by eye.

(b) On inside contacts the follow shall be sufficient to insure that they cannot be operated by any side thrust of the plunger. Gauge by eye.

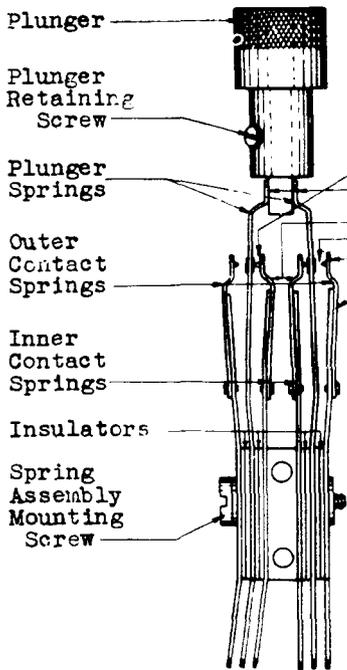


Fig. 7

**\*2.22 Contact Sequence**

- (a) Normal Contact Sequence - Break-Make Combinations Unless otherwise specified the normally closed contacts in each set of break-before-make contacts shall break before its associated open contact makes by:  
Test - Min. .005"  
Readjust - Min. .006"  
 Gauge by eye.
- (b) Other Contact Sequences When specified on the circuit drawing.

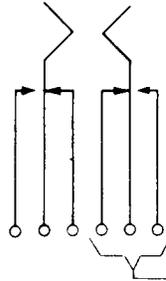


Fig. 8

**SECTION 032-721-701**

**3. ADJUSTING PROCEDURES**

TOOLS

<u>Code No.</u>	<u>Description</u>
35	Screw-driver - 3-1/2"
206	Screw-driver - 30° Offset
207	Screw-driver - 90° Offset
209	Wrench - 5/16" Hex. Open End Offset
210	Pliers
363	Spring Adjuster
KS-2348	Cord Repair Screw-driver
KS-6015	Duck-bill Pliers
-	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

GAUGES

68-B (or the replaced 68)	70-0-70 Gram Gauge
79-C (or the replaced 79-A)	0-200 Gram Push-Pull Tension Gauge

MATERIALS

KS-2423	Cloth
KS-6232	Oil
KS-7860	Petroleum Spirits
-	Toothpicks, Hardwood, Flat at one End and Pointed at the Other.
-	No. 20 Bare Copper Wire

PLUNGER TYPE KEYS

**3.01 CLEANING (Rq.2.01)**

M-1 Clean the contacts in accordance with the section covering cleaning procedures for cleaning key contacts. Clean other parts in accordance with procedures 3.02, M-5 and M-10, 3.03-3.04, M-1, 3.08, M-4 and 3.11-3.12, M-1.

**3.02 PLUNGER MOVEMENT (Rq.2.02)**

M-1 If a plunger binds in the key top slot, remove the key top and ream out the slot. To remove the key top it will first be necessary to remove the key buttons.

M-2 When removing the key button, loosen the lock nut by turning it away from the button with the No. 209 wrench. Place 3 or 4 thicknesses of the KS-2423 cloth over the button, grip it firmly with the No. 210 pliers, and then while holding the lock nut with the No. 209 wrench, remove the button. With the No. 35 screw-driver remove the key top screws. If the key top is not readily removable, push it up from the bottom with the screw-driver.

M-3 Loose or missing screws in the key top may allow it to move and thereby cause the plunger rods to bind. Replace any missing screws and tighten all loose screws with the No. 35 screw-driver.

M-4 Key buttons, loose or not properly seated on the plunger rod may, when the plunger is depressed far enough allow the plunger springs to slip over the top of the rubber plunger, and thereby prevent or delay the release of the key plunger. If this has occurred, loosen the mounting screws with the 3-1/2" cabinet screw-driver and then raise the key above the keyshelf without unsoldering any form wires. Then pry the plunger springs apart by hand and allow the plunger rod to restore to its normal position. Change any defective buttons.

M-5 If a plunger rod binds in the key frame it is probably due to dirt. Place a few drops of petroleum spirits in the slot between the plunger rod and the key frame. Operate the plunger rod a few times and then wipe the plunger rod with the KS-2423 cloth. Repeat this operation until all dirt has been removed.

M-6 If the plunger rod binds in the spring assembly mounting block, loosen the screws holding the spring assembly mounting block to the key frame with the 3-1/2" cabinet screw-driver and shift the block slightly so as to eliminate the bind. Then retighten the block firmly.

## 3.02 (Continued)

M-7 Bind may be due to a roughened, bent or dirty plunger rod. To determine whether the plunger rod is bent, revolve it and watch for side motion of the rubber plunger. At the same time it is advisable to see whether the rubber plunger is worn. Whenever necessary take the key apart in the following manner.

M-8 Loosen the mounting screws with the 3-1/2" cabinet screw-driver and then raise the key above the key-shelf without unsoldering any form wires. Remove the key button, lock washer and lock nut as described in paragraphs M-2 and M-3 and proceed as follows:

M-9 Loosen the spring assembly mounting block screws with the 3-1/2" cabinet screw-driver and remove the spring assembly mounting block, the helical spring and finally the plunger rod.

M-10 If the bind is merely due to a dirty plunger rod, clean it and the plunger slot thoroughly with petroleum spirits. When thoroughly dry, rub a small amount of KS-6232 oil over the plunger rod and wipe it off with the KS-2423 cloth.

M-11 Replace any plungers which show flat spots. If, however the bind is due to a bent or roughened plunger rod replace it with a new one. Reassemble the key.

M-12 If the bind still occurs examine the key to determine whether it is caused by friction between the phosphor bronze buffer plates and the plunger rod. This trouble and trouble caused by worn bushings allowing dirt to enter around the plunger rods may be detected by removing the key from the key shelf and holding the slide plate over against the slide plate operating spring so that the plungers operate clear of the slide plates. Any excessive friction will then be noted. If friction occurs and is caused by the buffer plates, change the key.

M-13 In resetting the key buttons, turn down the lock nut as far as it will go and set the button so that it will line up with the button on adjacent keys. Place three or four thicknesses of the KS-2423 cloth over the button, grip it firmly with the No. 210 pliers, and then while holding it firmly tighten the lock nut up against the key button.

3.03 SLIDE PLATE OPERATING SPRING TENSION (Rq.2.03)  
3.04 PLUNGER RELEASE (Rq.2.04)

M-1 See that the slide plate has full travel when any plunger is depressed. Foreign matter between the slide plate and key base will hamper the movement of the slide plate and thereby prevent the proper release of a plunger from the locked to the normal position. Place a few drops of petroleum spirits between the slide plate and key base and operate the slide plate by hand a number of times, then take a toothpick which has been dipped in petroleum spirits and remove whatever dirt may remain. Exercise care not to break the toothpick so as to leave portions of it between the key base and slide plate. At the same time remove any dirt that might have collected on the rollers.

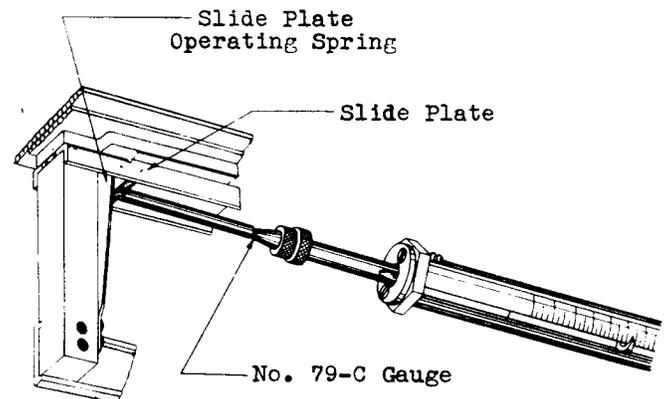


Fig. 9 - Method of Gauging Slide Plate Operating Spring Tension

M-2 A weakened or damaged slide plate spring will result in failure to lock the plungers in the operated position. To increase the tension on a weak spring adjust it close to the base of the spring with the duck-bill pliers so that a greater pressure will be exerted against the slide plate. Damaged springs should be replaced using the Nos. 206 and 207 offset screw-drivers to remove the mounting screw.

## 3.03-3.04 (Continued)

M-3 After this adjustment is made check that the plunger operate pressure requirement is met.

M-4 See whether the slide plate is bent. This would cause bind and prevent the proper operation of the slide plate. In this case, replace the key.

M-5 See whether the helical spring is broken or distorted in any way. The tension of this spring should be sufficient to release the plunger from a locked position with a snap when any other plunger is depressed to a locked or unlocked position. If the helical spring is broken or distorted replace it, taking the key apart in the manner described in procedure 3.02, M-8 and M-9.

- 3.05 CONTACT ALIGNMENT (Rq.2.05)
- 3.06 CONTACT SEPARATION (Rq.2.06)
- 3.07 SPRING CLEARANCE (Rq.2.07)
- 3.08 CONTACT PRESSURE (Rq.2.08)
- 3.09 CONTACT FOLLOW (Rq.2.09)
- 3.10 CONTACT SEQUENCE (Rq.2.10)

M-1 In making these adjustments consult the associated circuit drawing and circuit requirement table and give proper consideration to the maintenance of any requirement for contact sequence which may be specified thereon. Unless otherwise specified, adjust the springs close to the point where they leave the clamping plates and insulators, using the duck-bill pliers. In adjusting the springs take care not to kink them. Kinked springs should not be straightened unless the kink interferes with the proper adjustment of the key. Removing kinks tends to weaken the spring and shorten the life of the key.

M-2 Contact Alignment At the time the other spring adjustments are being made, see that the contact points lie wholly within the periphery of the corresponding discs. If necessary, loosen the spring assembly screws with the Nos. 206 and 207 offset screw-drivers and shift the springs until each contact point lies wholly within the corresponding contact disc preferably as near the center as possible. Then tighten the screws securely. When mounted, the springs should be as nearly parallel to the mounting strip as can be judged by eye. If the assembly screws cannot be loosened with the key mounted on the frame, loosen and remove the mounting block screws with the 3-1/2" cabinet screw-driver and remove the spring assembly. Then loosen the assembly screws and shift the springs as required. After aligning the springs, securely tighten the assembly screws and then remount the

spring assembly on the key frame taking care that the plunger is satisfactorily located in the plunger well and that the plunger spring does not bind.

M-3 Spring Clearance Trouble due to springs touching each other which are designed never to make contact is caused either by springs being kinked or bowed by excessive follow. Straighten the springs or reduce the excessive follow as required with the duck-bill pliers.

M-4 Contact Pressure Foreign matter wedged between the contact springs may prevent springs from making contact when the plunger is operated. Remove the foreign matter with a toothpick which has been dipped in petroleum spirits.

M-5 Contact Follow If a follow requirement cannot be met by adjusting the springs close to the point where they leave the clamping plates and insulators, the upper part of the spring just below the contact disc may be given a slight bend toward the moving spring with the duck-bill pliers. This bend should not be enough however, to make a visible kink in the spring.

M-6 Normal and Other Contact Sequences When adjusting for contact sequence increase or decrease the contact gap, contact pressure or contact follow as outlined in paragraph M-1.

- 3.11 PLUNGER OPERATE PRESSURE (Rq.2.11)
- 3.12 PLUNGER NON-OPERATE PRESSURE (Rq.2.12)

M-1 If a plunger is stiff and fails to meet the plunger operate pressure requirement examine the plunger springs to determine whether a gummy substance has formed on them. Clean the surface of the plunger springs when they require cleaning with a toothpick which has been dipped in petroleum spirits. Do not use the same toothpick for two operations. Wipe the plunger with clean dry KS-2423 cloth.

M-2 If, after the petroleum spirits has dried off, the key still fails to meet the requirement it may be necessary to reduce the tension of the contact or plunger springs towards the minimum limit. A gauge for measuring the pressure specified in the test and readjust requirements covered by requirement 2.11 is being developed. Until this gauge is available it will be satisfactory to estimate the pressure by "feel".

M-3 No lubricant should be used on the key plunger to facilitate this adjustment.

## 3.11-3.12 (Continued)

M-4 When readjusting a plunger spring see that the relationship of the plunger springs to the plunger is correct. The test to determine whether the plunger springs clear the plunger in any one normal position should be made by revolving the plunger and noting that in at least one position of the plunger the specified clearance between the plunger and plunger spring exists.

M-5 If the non-locking plunger fails to meet the plunger non-operate pressure requirement, examine the helical spring to determine whether it is broken or distorted in any way. If necessary, replace the helical spring as described in procedure 3.02, M-8 and M-9.

ROTATING PLUNGER TYPE KEY3.13 CLEANING (Rq.2.13)

M-1 Clean the contacts in accordance with the section covering cleaning procedures for cleaning key contacts. Clean other parts in accordance with procedures 3.14, M-3 and 3.18. M-7.

3.14 PLUNGER MOVEMENT (Rq.2.14)

M-1 If a plunger binds in the key top slot, remove the key top and ream out the slot.

M-2 Loose or missing screws in the key top may cause the key top to move and thereby cause the plunger to bind. In this case, replace the missing screws and tighten all screws with the No. 35 screw-driver.

M-3 Examine the key to determine whether or not failure to operate is due to dirt or a gummy substance forming between the inside of the key shell and the plunger or on the surface of the plunger spring which rests against the plunger. To determine whether or not this condition exists, remove the key from the keyshelf, using the 3-1/2" cabinet screw-driver to loosen the screws holding the key to the keyshelf. If it is necessary to clean the plunger and plunger springs, remove the plunger from the key shell. To do this remove the plunger retaining screw with the KS-2348 screw-driver and remove the plunger. When the plunger has been removed, wipe it with a clean dry KS-2423 cloth, removing all the gummy substance.

Clean the inside of the key shell and the surface of the plunger springs which rest against the plunger by means of a toothpick which has been dipped in petroleum spirits. Do not use the same toothpick for more than one operation. When the plunger springs are thoroughly dry, place the plunger back in the key shell without the plunger retaining screw. This is done so that a preliminary test may be made. With the key plunger in this position, rotate the plunger a number of times to determine whether or not it operates freely.

M-4 If the plunger operates freely but is sluggish in restoring to normal after the plunger, key shell and plunger springs have been cleaned in accordance with paragraph M-3 it is probably due to the plunger springs not being properly adjusted. Failure of the plunger springs to rest against the plunger when in the normal position, or from unequal pressure of the plunger springs may cause this trouble. Since it is not possible to adjust the plunger springs while mounted in the key shell, it will be necessary to remove the spring assembly. This is done by removing the spring assembly mounting screws with the No. 35 screw-driver and then removing the spring assembly taking care not to lose the insulators. Do not loosen the spring assembly screw. When the spring assembly has been removed from the key shell examine the plunger springs to determine whether the opposite springs are bent at approximately the same angle. If the requirement is not met after the opposite plunger springs have been adjusted so that they are approximately equal, tension the plunger springs slightly by bending the two springs approximately equal amounts towards each other. At this time make any readjustments that may be necessary to meet requirements 2.15 to 2.22 inclusive. Replace the spring assembly in the key shell and fasten it securely. Recheck for proper plunger movement.

M-5 If any contacts of the key are operated when a side thrust is applied to the plunger, it may be due to a worn or defective plunger. Whenever necessary to replace a plunger, remove it in accordance with the method outlined in paragraph M-3.

M-6 If the plunger is neither defective nor worn, the trouble is due to the key failing to meet the contact separation, contact follow, or contact pressure requirements and should be

## 3.14 (Continued)

adjusted in accordance with procedures 3.15 to 3.22 inclusive.

- 3.15 CONTACT ALIGNMENT (Rq.2.15)
- 3.16 SPRING CLEARANCE (Rq.2.16)
- 3.17 CONTACT SEPARATION (Rq.2.17)
- 3.18 CONTACT PRESSURE (Rq.2.18)
- 3.19 FLEXIBLE CONTACT SPRING POSITION (Rq.2.19)
- 3.20 PLUNGER SPRING POSITION (Rq.2.20)
- 3.21 CONTACT FOLLOW (Rq.2.21)
- 3.22 CONTACT SEQUENCE (Rq.2.22)

M-1 In making these adjustments consult the associated circuit drawing and circuit requirement table, and give proper consideration to the maintenance of any requirement for contact sequence which may be specified thereon.

M-2 Adjust the springs unless otherwise specified, near the point where the spring leaves the spring assembly clamping block or insulators with the duck-bill pliers, applied as shown in Fig. 10.

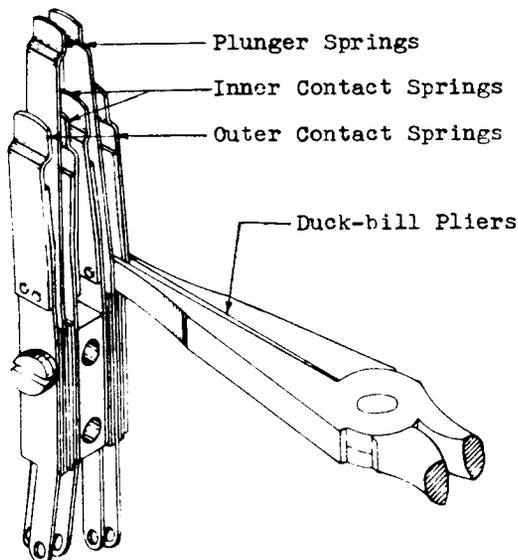


Fig. 10 - Method of Adjusting Contact Springs

In adjusting the springs take care not to kink them. Kinked springs should not be straightened unless the kink inter-

feres with the proper adjustment of the key. Removing kinks tends to weaken the spring and shorten the life of the key.

M-3 Contact Alignment Check the key to determine whether or not the springs are out of alignment. If necessary to readjust the springs, remove the spring assembly mounting screws using the No. 35 screw-driver and then remove the spring assembly. Loosen the spring assembly screw very slightly with the 3-1/2" cabinet screw-driver and shift the springs so that they are all in alignment. Tighten the spring assembly screw and replace the spring assembly in the key shell. Take care not to lose the insulators. When mounted, the sides of the spring shall be approximately equidistant from the sides of the opening in the key shell and the contacts should rest wholly within the corresponding contact discs and as near the center as possible.

M-4 Spring Clearance Trouble due to springs touching each other which are designed never to make contact is caused either by springs being kinked or bowed or by excessive follow. Straighten the springs or reduce the excessive follow as required with the duck-bill pliers.

M-5 Contact Separation The separation of the outside contacts can be gauged visually without removing the spring unit from the key shell, but in order to view the separation for inner contacts of any key it is necessary to remove the spring assembly from the shell and also the plunger as previously described in procedure 3.14, M-3. Holding the spring assembly at the base, place the plunger between the plunger springs in such a position that the center of the plunger will be approximately in line with the center of the key base as indicated in Fig. 12. This will approximate the actual condition when the key is assembled. Turn the plunger to its operated position and note whether or not the specified contact separation is met.

M-6 If the separation between either the inside or outside contacts is insufficient, remove the plunger from the plunger springs and adjust the contact springs very slightly away from or toward the center of the key as required, using the duck-bill pliers applied as shown in Fig. 10. Repeat the above test until the proper contact separation has been obtained. Do not reassemble the

## 3.15-3.22 (Continued)

key until the following tests have been made with the plunger between the springs as described in paragraph M-5 in order to approximate actual conditions.

M-7 Contact Pressure Foreign matter wedged between contact springs may prevent springs making contact when the plunger is in the operated position. Remove the foreign matter with a toothpick which has been dipped in petroleum spirits. If the contact pressure requirement is still not met, readjust the springs as required as outlined in paragraph M-2.

M-8 Flexible Contact Spring Position If the flexible contact spring does not rest against its stop spring as specified, insert a piece of No. 20 bare copper wire between the two springs close to the point where they are riveted together. Then place the duck-bill pliers over both the stop spring and the flexible contact spring close to the wire as shown in Fig. 11 and pinch the two springs together with the pliers. It will be satisfactory to have a slight kink in the feather spring near the rivets which may be introduced in making this adjustment.

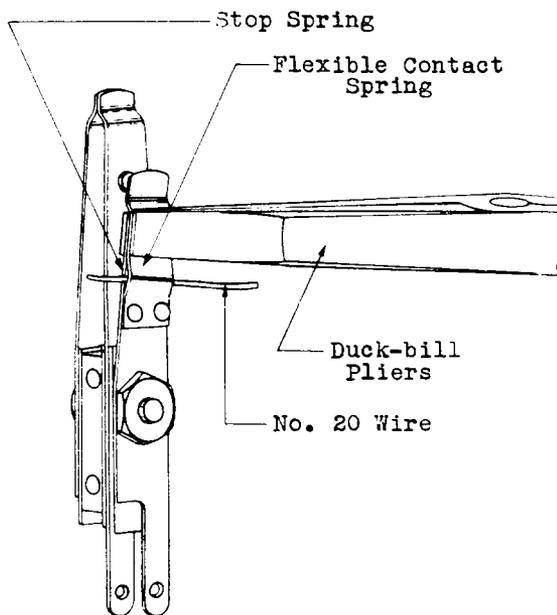


Fig. 11 - Method of Adjusting for Flexible Contact Spring Position

M-9 Plunger Spring Position With the plunger in position in the key shell, turn it slightly, noting that its springs move with the slightest twisting motion. If it is possible to twist the plunger without moving the springs, it is an indication that the plunger springs do not rest against the plunger. Remove the spring assembly by loosening the spring mounting screws with No. 35 screw-driver. Examine the springs to determine whether or not they are bent approximately the same. Bend each of the plunger springs with the duckbill pliers until they have approximately the same profile. Then while holding the spring assembly place the plunger between the two plunger springs noting that the springs lie against the plunger for their full width. When holding the plunger and spring unit in this position note that the center of the plunger is approximately in line with the center of the key base as indicated in Fig. 12. This will approximate the actual condition when the key is totally assembled.

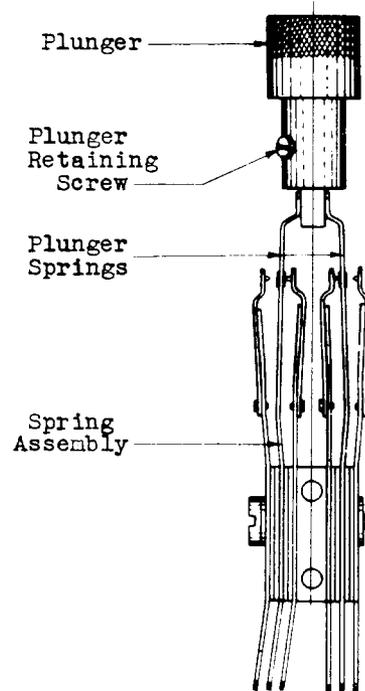


Fig. 12 - Method of Checking for Contact Separation, Contact Follow and Contact Sequence

3.15-3.22 (Continued)

M-10 Contact Follow When readjusting for proper contact follow, adjust the stationary contact spring as described in paragraph M-2 exercising care that the minimum contact separation is maintained. If a satisfactory contact follow cannot be obtained by this method, it will be permissible to adjust the spring close to the contact disc with the No. 363 spring adjuster as indicated in Fig. 13. This bend should not be sufficiently great to make a visible kink in the spring.

M-11 Contact Sequence To adjust for contact sequence, increase or decrease the contact separation, contact pressure, contact follow and spring clearances as required following the methods outlined above.

M-12 After all of the above requirements have been met, reassemble the key.

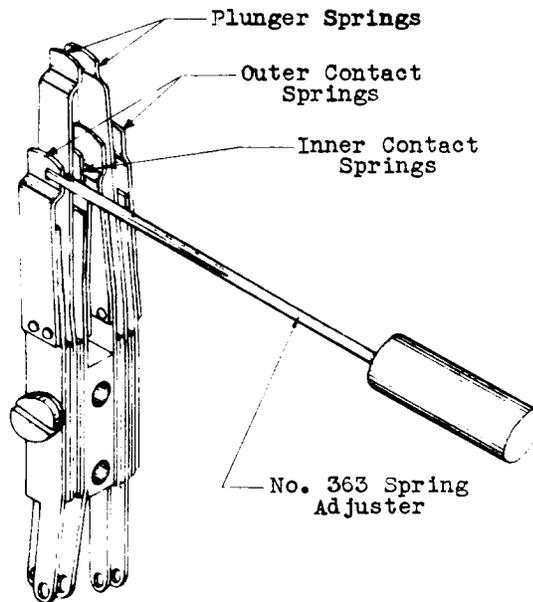


Fig. 13 - Method of Adjusting for Contact Follow