

KEYS
545, 575, 591, A28, A34, A36, B22, B23,
B25, B26, E6, G3, G4, AND G5 TYPES
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers 545-, 575-, 591-, A28-, A34-, A36-, B22-, B23-, B25-, B26-, E6-, G3-, G4-, and G5-type keys.

1.02 This section is reissued to:

- Include lubrication instructions.
- Add a new Fig. 1 which illustrates an improved support for the plunger rod assembly used on the 545-, 575-, 591-, A28-, A34-, A36-, B23-, B26-, and G3-type keys.
- Add No. 3 lubricating compound, KS-8496 to List of Materials.

1.03 Reference shall be made to Section 020-010-711 for additional information necessary for the proper application of the requirements listed herein.

***1.04 Asterisk:** 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.

1.05 *The normal (unoperated) position of a plunger* is that position in which the shoulder of the plunger rests against the buffer plates with

the normally open contacts open and the normally closed contacts closed.

1.06 *The operated position of a plunger* is that position in which the plunger is depressed to the limit of its stroke with the normally closed contacts open and the normally open contacts closed.

1.07 ▶ An improved support for the plunger rod assembly is illustrated in Fig. 1. ◀

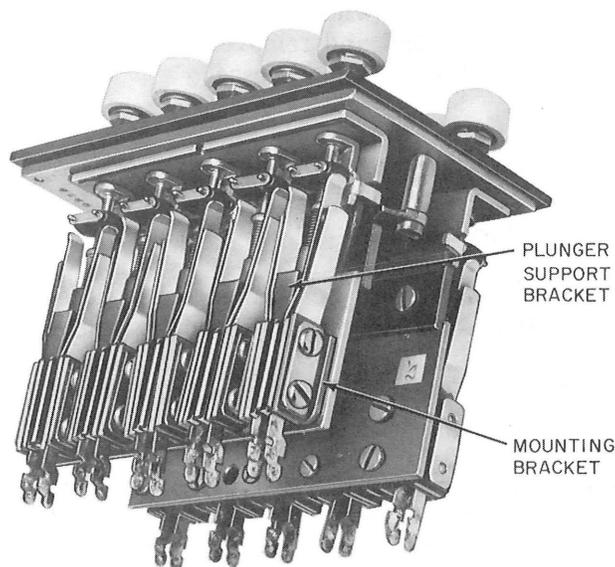


Fig. 1—▶New Plunger Rod Support Assembly◀

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1.08 Keys should be lubricated with a brushful of #3 lubricating compound KS-8496 every 2 years or as needed as follows:

- The plunger guide holes in the spring mounting bracket, where applicable.
- The portion of the plunger rod passing through the helical restoring spring.
- The surfaces of the slots in the frame which act as guides for the lock of the plunger rod assembly.
- The portion of the plunger rod which passes through the guide holes.

The plunger shall be operated a few times to distribute the lubricant.

1.09 For the purposes of this section, a brush full of lubricant is the maximum amount which a camels hair brush (1/2" long by 1/8" in diameter at the point where the bristles are attached) will hold when dipped into #3 lubricating compound KS-8496 and removed without touching the sides of the containing vessel.

2. REQUIREMENTS

*2.01 *Cleaning*

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

2.02 *Plunger Movement:* Fig. 2(A)—The plungers shall move freely in their bearings and shall not be sluggish in restoring to normal when released unrestrained from the operated position.

Gauge by eye and feel.

*2.03 *Plunger Travel:* On all units equipped with make contacts only, the plunger shall have a travel of at least 0.050 inch before either of its associated springs make contact, but both sets of springs shall have made contact by the time the plunger is depressed 3/32 inch.

Gauge by eye.

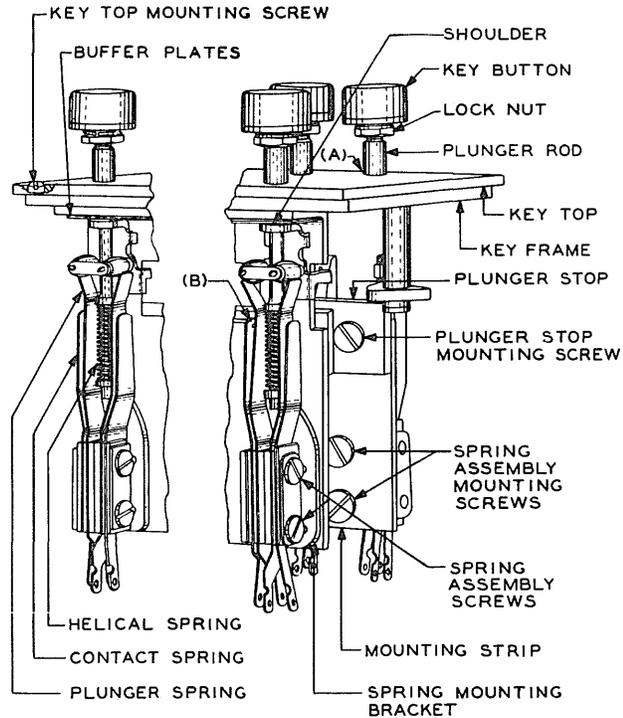


Fig. 2—545-Type Key

Exception: This requirement does not apply to E6A, E6B, and G5A keys, to the front unit of the 575A, A36A, and G3J keys, to the two front units of the 575C and A36C keys, nor to the front and middle units of the G3B key.

*2.04 *Contact Alignment:* Fig. 3(A)—Contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact at all times during contact.

Gauge by eye.



Fig. 3—Illustrating Maximum Permissible Misalignment of Contacts

***2.05 Contact Separation**

- (a) **Fig. 2(B)**—On units equipped with make contacts only, the separation between the normally open contacts shall be

Min 0.010 inch

Gauge by eye.

Exception: This requirement shall not apply to the E6A and E6B keys, to the front unit of the 575A, A36A, and G3J keys, to the two front units of the 575C and A36C keys, nor to the front and middle units of the G3B key.

- (b) **Fig. 4(A)**—On units having spring combinations other than those covered in (a) or (c), on all units of the E6A and E6B, on the front units of the 575A, A36A, G3B, and G3J keys, the two front units of the 575C and A36C keys, and the middle unit of the G3B key, the separation between any pair of contacts operated directly by the plunger spring shall be

Min 0.016 inch

Gauge by eye. Use the KS-6909 gauge as a reference.

- (c) **Fig. 6(A)**—On contacts which function by being acted upon by the making or breaking contact of another spring instead of by a plunger spring, there shall be a contact separation of

Min 0.012 inch

Gauge by eye. Use the KS-6909 gauge as a reference.

***2.06 Spring Clearance**

- (a) **Fig. 4(B) and 7(A)**—There shall be a clearance between springs designed never to make contact and between any contact spring and the frame, whether in the operated or unoperated position of the key, of

Min 0.016 inch

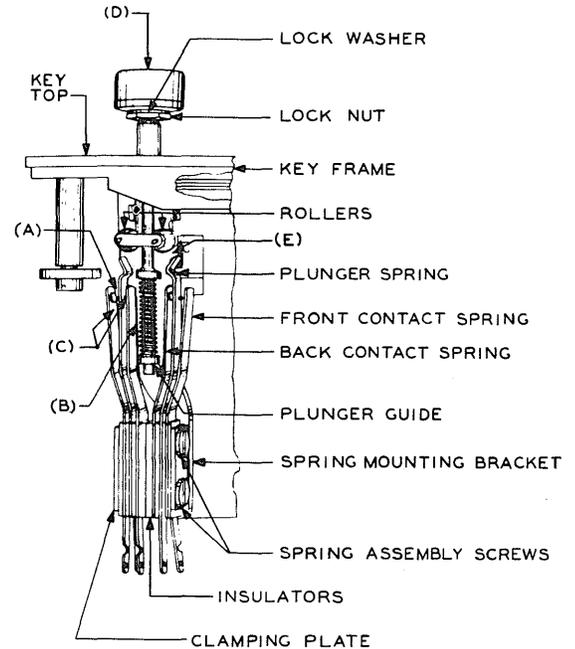


Fig. 4—Contact Separation and Spring Clearance

Gauge by eye. Use the KS-6909 gauge as a reference.

- (b) **Fig. 5(A)**—There shall be a clearance between the springs of spring assemblies in adjacent positions, when two adjacent plungers in the same row are depressed simultaneously, of

Min 0.016 inch

Gauge by eye. Use the KS-6090 gauge as a reference.

- (c) **Fig. 4(E)**—With the plunger in the normal position, there shall be a perceptible clearance between the plunger springs and the rollers.

Gauge by eye.

The requirement is considered met if clearance is observed while rotating the key button slightly to take up the play in the plunger rod.

Exception: This requirement does not apply to keys designated KP.

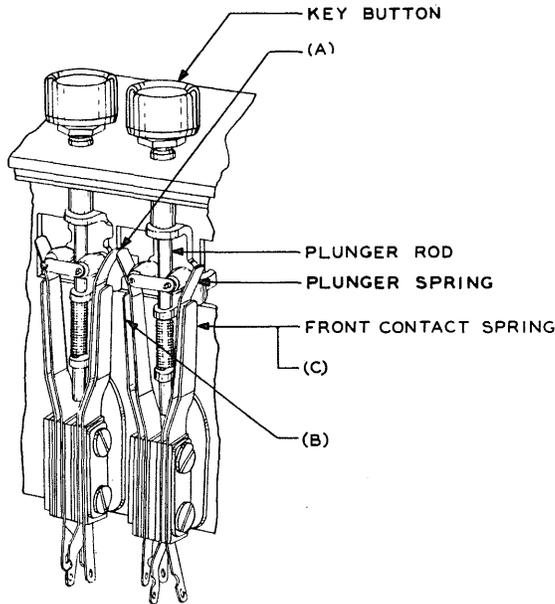


Fig. 5—Spring Clearance—Adjacent Plungers Operated

***2.07 Contact Pressure**

(a) Fig. 5(B)—*On units equipped with make contacts only*, the contact pressure between the normally open contacts, when the plunger is in the operated position, shall be

Test—Min 30 grams

Readjust—Min 35 grams

Use the 68B gauge.

Exception: This requirement shall not apply to the E6A and E5B keys, to the front unit of the 575A, A36A, and G3J keys, to the two front units of the 575C and A36C keys, nor to the front and middle units of the G3B key.

(b) Fig. 4(C)—*On units having spring combinations other than those covered in (a), on all units of the E6A and E6B keys, on the front units of the 575A, A36A, G3B, and G3J keys, the two front units of the 575C and A36C keys, and the middle unit of the G3B key*, the contact pressure between the normally closed contacts and between the contacts closed, when the plunger is in the operated position, shall be

Test—Min 45 grams

Readjust—Min 50 grams

Use the 68B gauge.

***2.08 Contact Follow:** Fig. 5(C)—There shall be a follow after closing any contact of

Min 0.010 inch

Gauge by eye.

***2.09 Contact Sequence**—Fig. 6(B)

(a) **Normal Contact Sequence—Break-Make Combinations:** Unless otherwise specified, the normally closed contacts operated directly by the plunger spring of an individual spring assembly shall break before the normally open contacts of the same assembly directly associated with the plunger spring make, by

Min 0.006 inch

Gauge by eye.

(b) **Other contact sequence requirements** shall be met when specified on the circuit drawing.



Fig. 6—Contact Sequence

2.10 Plunger Operate Pressure—Fig. 4(D)

(a) *On the 545-, 575-, 591-, A36-, B22-, B25-, B26-, G3-, G4-, and G5-type keys (except the front units of 575A, A36A, G3B, and G3J keys, the two front units of the 575C and A36C keys, and the middle unit of the G3B key) and on the rear unit (when equipped) of A28-, A34B-, and B23-type keys*, the pressure required to depress a plunger to the end of its stroke shall be

Test—Max 550 grams

Readjust—Max 525 grams

Use the 79B gauge.

(b) On all combinations other than those covered by (a), the pressure required to depress the plunger to the end of its stroke shall be

Test—Max 1900 grams

Readjust—Max 1850 grams

Use the 79F gauge.

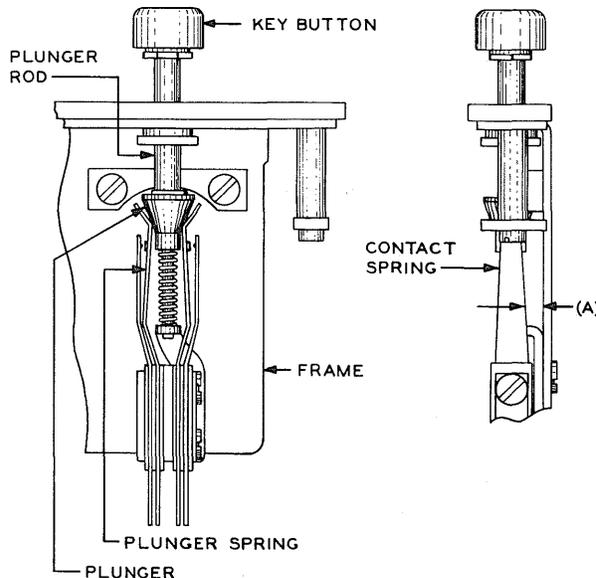


Fig. 7—B25-Type Key

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
206	30-degree Offset Screwdriver
207	90-degree Offset Screwdriver
209	5/16-inch Hex. Open Single-End Offset Wrench
210	Key-button Pliers

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
429A	Key Support
429B	Key Support
485A	Smooth-jaw Pliers
KS-7782	Parallel-jaw Pliers
KS-6320	Orange Stick
KS-6854	Screwdriver
R-1051	Pillar File
—	3-inch C Screwdriver
—	6-1/4-inch Round Needle File, No. 0 Cut
GAUGES	
68B	70-0-70 Gram Gauge
79B	0-1000 Gram Push-Pull Tension Gauge
79F	0-6000 Gram Push-Pull Tension Gauge
KS-6909	Thickness Gauge
MATERIALS	
KS-2423	Cloth
KS-7860	Petroleum Spirits
KS-8496	#3 Lubricating Compound
—	Toothpicks (hardwood, flat at one end and pointed at the other)

3.002 Due to the design and method of mounting these keys, it will not be practical to perform any of the adjustments specified herein unless the key is removed from the keyshelf. At the time the key is removed, inspect the entire key for possible faults and make any adjustments

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that may appear necessary at this time. This will ensure that the key is in proper working order before it is remounted.

3.003 To remove the key from the keyshelf proceed as follows. Raise the keyshelf and loosen the mounting screws with the 3-inch C screwdriver. Raise the key out of the keyshelf as far as is permitted by the skinners. Place a 429A or 429B key support alongside the lugs on each end of the key to support the key while making adjustments.

3.004 When remounting keys equipped with 38-type dust shields, care should be taken to ensure that the flaps lie flat against the keys since crumpled dust shields will interfere with key operation.

*3.01 *Cleaning* (Rq 2.01)

- (1) Clean the contacts in accordance with approved procedures. Clean other parts in accordance with 3.02 (4) and (5), 3.03(8), and 3.10(2).

3.02 *Plunger Movement* (Rq 2.02)

- (1) Cracked, warped, or broken hard-rubber keytops may cause the plunger to bind and thus prevent or delay the release of the plunger. In this case replace the keytop. To do this, remove the key buttons and keytop as covered in (9) and (10).
- (2) Loose or missing screws in the hard-rubber keytop may permit it to move and bind the plunger rods. Replace missing screws and check that all the keytop screws are tight.
- (3) If a plunger rod binds in the keytop hole, loosen the keytop mounting screws with the KS-6854 screwdriver and shift the keytop, if possible, until no bind occurs. If necessary, enlarge the plunger rod hole with the round needle file. In order to gain access to the plunger rod hole at fault, it is necessary to remove the screws which hold the keytop to the key base with the KS-6854 screwdriver and then remove all the key buttons associated with the keytop, as covered in (9).
- (4) If the plunger rod binds in the key frame, it is probably due to dirt. Place a few drops of KS-7860 petroleum spirits in the opening between the plunger rod and the frame. Operate

the plunger rod a few times and then wipe the plunger rod with a clean dry KS-2423 cloth. Repeat this operation until all dirt has been removed.

(5) If the surfaces of the plunger springs which bear on the plunger rollers (or on the plunger of the B25-type keys) are dirty, clean them by means of a toothpick which has been dipped in petroleum spirits. Do not use the same toothpick for more than one operation. Clean the plunger rollers with a clean, dry KS-2423 cloth. The KS-6320 orange stick may be used as an aid in applying the cloth to the surfaces of the plunger rollers.

(6) If the bind is not due to any of the conditions mentioned, see whether the plunger rod is binding in the plunger guide of the spring mounting bracket or whether it is due to the plunger rod being bent.

(7) If the plunger rod binds in the plunger guide of the spring mounting bracket, loosen the spring assembly mounting screws and shift the bracket so as to eliminate the bind. Then tighten the screws securely. In certain cases where the keys are equipped with two rows of plungers, the spring assembly mounting screws may not be accessible and, therefore, it will be necessary to remove the mounting strip in order to remove the screws. To do this, proceed as outlined in (9) and (10). In some cases it may be necessary to bend the plunger guide portion of the spring mounting bracket slightly up or down with the 485A pliers. If this is done, take care not to nick the plunger rod with the pliers.

(8) If the plunger rod operates freely yet is sluggish in restoring to normal after the plunger rollers (or the plunger of the B25-type keys) and plunger springs have been cleaned as outlined above, it is probably due to a weak or defective helical spring or to the plunger rod being bent.

(9) If the plunger rod is bent or the helical spring defective, replace the part with a new one. Place three or four thicknesses of KS-2423 cloth over the button, grip it firmly with the 210 pliers, and while holding the locknut firmly with the 209 wrench, remove the button. Remove the lockwasher and the locknut.

(10) Remove the keytop mounting screws with the KS-6854 screwdriver and lift the keytop from the key. Remove the mounting strip screws with the KS-6854 screwdriver and remove the mounting strip. Then remove the spring assembly mounting screws with the 3-inch C screwdriver. This will permit the removal of the plunger rod from the frame. Take care in this operation not to lose the helical spring. Place the new part in position, taking care that the lugs of the plungers are in their proper position and that the contact springs are mounted so that they line up centrally with the rollers (or with the plunger of the B25-type keys) which operate them.

(11) If the plunger rod still binds, examine the key to determine whether the bind is caused by friction between the plunger rod and the buffer plates. If this is the cause of the trouble, refer the matter to the supervisor.

(12) In resetting a key button, turn down the locknut as far as it will go and set the button so that it will line up with buttons on adjacent keys. Place three or four thicknesses of KS-2423 cloth over the button, grip it firmly with the 210 pliers, and, while holding it firmly, tighten the locknut up against the key button with the 209 wrench.

(13) Do not use any lubricant on any part of the key to facilitate the adjustment.

- 3.03 *Plunger Travel* (Rq 2.03)
- 3.04 *Contact Alignment* (Rq 2.04)
- 3.05 *Contact Separation* (Rq 2.05)
- 3.06 *Spring Clearance* (Rq 2.06)
- 3.07 *Contact Pressure* (Rq 2.07)
- 3.08 *Contact Follow* (Rq 2.08)
- 3.09 *Contact Sequence* (Rq 2.09)

(1) When making these adjustments, consult the associated circuit drawing and give proper consideration to the maintenance of any requirement or contact sequence which may be specified thereon. Do not straighten kinked springs 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. Adjust the springs so that there will be the specified clearance between spring assemblies in adjacent positions, plunger springs and rollers, springs designed never to make contact, and any spring and the frame in both the operated and unoperated position of the key. Trouble caused by contact between springs which are designed never to make contact can usually be rectified by straightening the springs.

(2) When adjusting for these requirements, adjust the springs, unless otherwise specified, close to the point where they leave the clamping plates and insulators (as shown in Fig. 8) using the KS-7782 pliers. In adjusting the springs, exercise care to adjust them in line with their movement so as not to twist them off center.

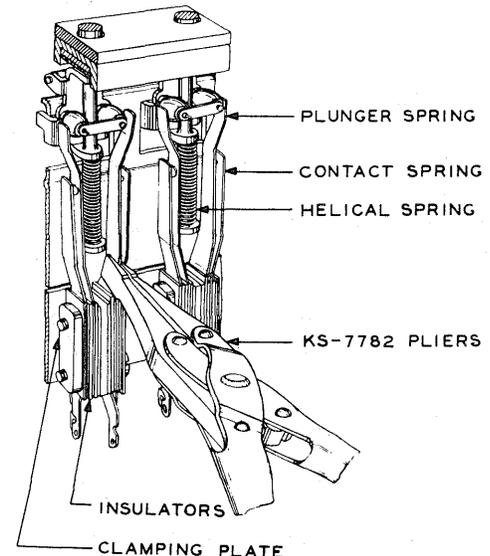


Fig. 8—Method of Adjusting Contact Springs

(3) To check the plunger travel, press down on the plunger and observe whether the requirement is met when the plunger is depressed the specified distance. To adjust the plunger travel on any key, adjust the offset portion of the springs toward or away from the rollers (or the plunger of the B25-type keys), as required, using the KS-7782 pliers applied as shown in Fig. 9. If the springs make contact before the plunger is depressed the specified distance, adjust the springs away from the plunger. If the contacts do not make when the plunger is depressed the specified distance and the contact

separation is within the specified limits, adjust the contact springs toward the plunger.

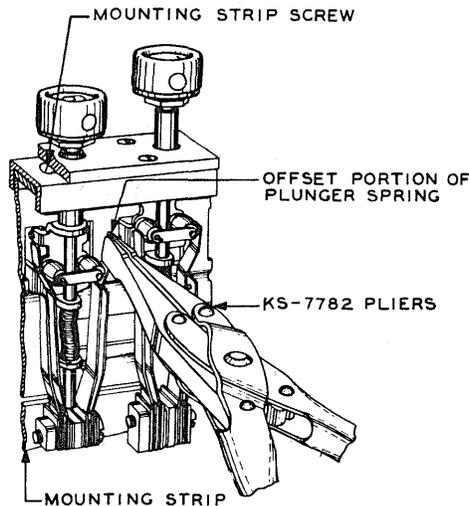


Fig. 9—Method of Adjusting for Plunger Travel

(4) **Contact Alignment:** Check the key to see whether or not the springs are out of alignment. If necessary, loosen the spring assembly screws with the 206 and 207 offset screwdrivers and shift the springs so that they are all in alignment. Tighten the spring assembly screws. When mounted, the springs should be as nearly parallel to each other as can be gauged by eye, and the contacts should rest wholly within the corresponding discs, preferably as near the center as possible.

(5) **Modification of 206 and 207 Offset Screwdrivers for Use on Spring Assembly Screws:** In cases where the screwdriver blades will not fit into the slots in the screwheads, it will be necessary to modify the screwdrivers by filing the blades thinner. With the R-1051 file held flat against one broadside of the blade, take a few strokes with the file and then file the other broadside in the same manner. Continue this operation until the blade is thin enough to fit into the screw slot. Care should be taken to keep the two sides of the blade parallel.

(6) **Spring Clearance:** Failure to meet the specified clearance between the plunger springs in adjacent positions may be caused by the plunger springs not being near enough to their respective plunger rollers. Adjust the plunger springs toward their plungers at the offset portion nearest the rollers with the KS-7782

pliers. Care should be exercised to ensure that the plunger springs do not rest upon the rollers. If this condition arises, adjust the plunger springs away slightly at the offset. Then depress the adjacent plungers and check that the minimum clearance exists between the plunger springs. Also, check that the minimum contact separation is maintained at all times.

(7) **Contact Separation:** If the separation between either set of contacts is insufficient, adjust the outer spring away from the inner contact spring using the KS-7782 pliers applied as shown in Fig. 8.

(8) **Contact Pressure:** Foreign material wedged between the contact springs may prevent the springs from making contact when the plungers are depressed. Remove the foreign material with a toothpick which has been dipped in petroleum spirits. Do not use the same toothpick for more than one operation. If the pressure requirement is still not met, adjust the springs, as required, following the procedure given in (1) and (2).

(9) **Contact Follow:** If the follow requirement cannot be met by adjusting the contact springs as outlined in (1) and (2), the upper part of the spring may be given a slight bend just below the contact disc with the 485A pliers. This bend should not be enough, however, to make a visible kink in the spring.

(10) **Contact Sequence:** To adjust for contact sequence, increase or decrease the contact separation, contact pressure, contact follow, and spring clearance as outlined in (6) through (9).

3.10 Plunger Operate Pressure (Rq 2.10)

(1) If the key fails to meet this requirement, examine the helical spring to determine whether it is broken or distorted in any way, and, if necessary, replace it in the manner described in 3.02(9) and (10).

(2) Examine the plunger springs to determine whether a gummy substance has formed on them. Clean the surface of the spring nearest the rollers (or the plunger of the B25-type keys) with a toothpick that has been dipped in petroleum spirits. Do not use the same toothpick for more than one operation.

(3) If, after cleaning the springs, the key still fails to meet the requirement, determine whether the plunger spring tension is excessive. If it is necessary to reduce the tension, use the KS-7782 pliers to adjust the spring close to the

point where it leaves the clamping plate and insulators.

(4) Do not use any lubricant on the key plunger rod to facilitate adjustment.