KEYS

499, 523, AND 524 TYPES

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers 499-, 523-, and 524-type keys.

1.02 This section is reissued primarily to amplify the information on lubrication and to add the Nos. 499G, 499H, and 523B keys to the plunger travel requirement. Detailed reasons for reissue will be found at the end of the section.

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 One dip of KS-8496 lubricating compound No. 3 for the purpose of this section is the amount of lubricant retained on the KS-14164 brush after it is dipped into the lubricant to a depth of 3/8 inch and quickly removed without allowing the bristles to touch the side of the container.

1.06 The normal (unoperated) position is that position in which the metal shoulder of the plunger rod assembly rests against the keytop or the upper buffer plates and the normally open contacts are open.

1.07 The operated position is that position in which a plunger is depressed to the bottom of its stroke and the normally open contacts are closed.

2. REQUIREMENTS

*2.01 Cleaning

(a) 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 covered in Part 3 of this section.

2.02 Lubrication

(a) Figs. 1(A) and (C) - Each plunger guide hole in the keytop and lower bearing shall be adequately lubricated with KS-8496 lubricating compound No. 3. When lubrication is necessary, one dip shall be applied.

(b) Fig. 1 (B) - The portions of the plunger rod which pass through the helical restoring springs shall be adequately lubricated with KS-8496 lubricating compound No. 3. When lubrication is necessary, one dip shall be applied near the top and one dip near the bottom of each helical restoring spring.

(c) After turnover it is recommended that the parts listed in requirement (a) be lubricated at intervals of one year and that the part listed in (b) be lubricated at intervals of three years. These intervals may be extended if periodic inspections have indicated that local conditions are such as to insure that the requirements will be met during the extended interval.

2.03 Record of Lubrication: During the period of installation a record shall be kept of the lubrication of the keys and this record shall be turned over to the telephone company with the equipment. If no lubrication has been done, it shall be so stated.

2.04 Plunger Movement: Fig. 2(A) - The plungers shall slide without bind in their bearings, and they shall not be sluggish in returning to normal.

Gauge by eye and by feel.

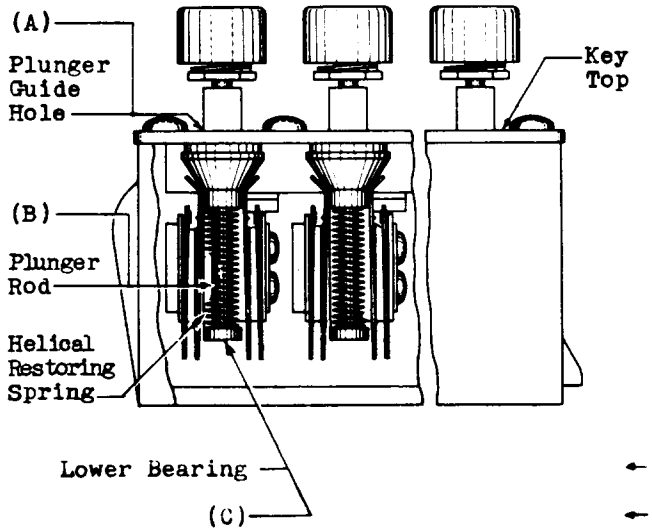

Fig. 1 - Lubrication Points of 499-, 523-, and 524-type Keys

*2.05 Plunger Travel

(a) On Nos. 499A and 499B keys the plunger shall have a travel of at least 1/32 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 1/16 inch.

Gauge by eye.

→ (b) On Nos. 499C, 499D, 499E, 499F, 499G,
→ 499H, 523B, and 524-type keys the plunger shall have a travel of at least 0.050 inch before any of the springs make contact, but both sets of springs shall have made contact by the time the plunger is depressed 0.094 inch.

Use the No. 161A gauge.

(1) To check that this requirement is met depress the key button and insert the 0.050-inch end of the No. 161A gauge between the top of the plunger and the keytop or the buffer plates. Allow the key to restore against the gauge. Move the button from front to rear and from side to side and check that the contacts do not close in any position. Repeat the above operation with the 0.094-inch end of the gauge and check that the contacts remain closed in all positions of the button.

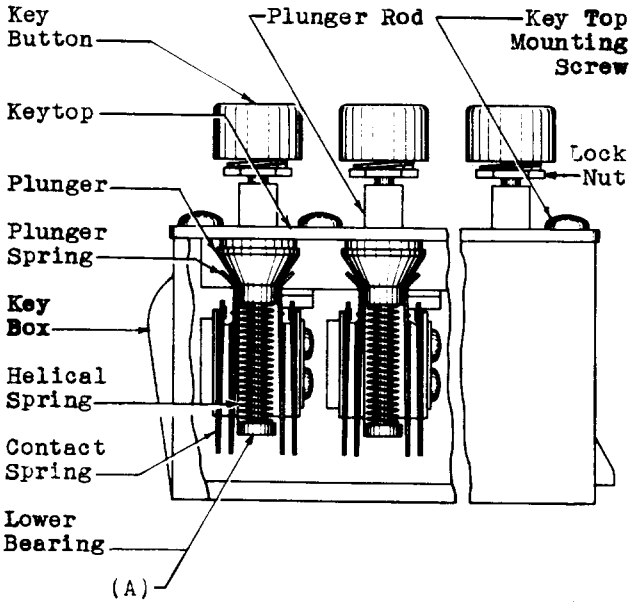

Fig. 2 - 499-type Key - General View

*2.06 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.

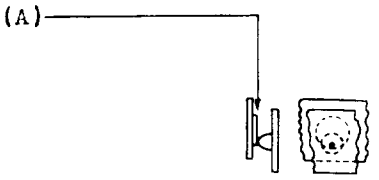

Fig. 3 - Contact Alignment Showing Maximum Permissible Misalignment

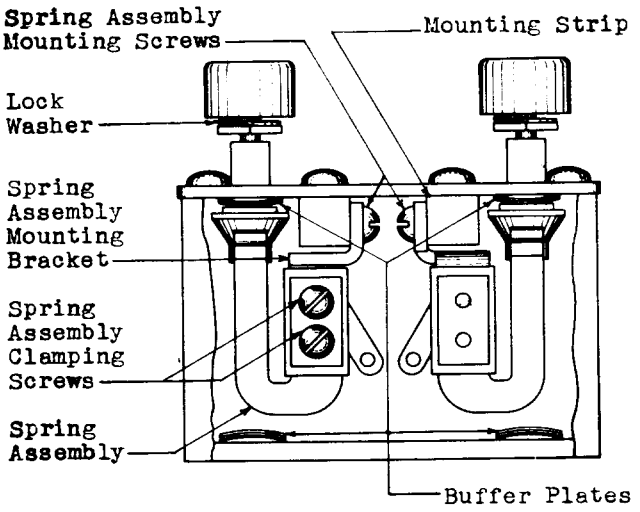

Fig. 4 - 499-type Key - End View

*2.07 Spring Clearance: There shall be a clearance between springs not designed to make contact and between any contact spring and the frame of

Min 0.016 inch

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

*2.08 Contact Separation: There shall be a separation between all open contacts of

Min 0.010 inch

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

*2.09 Contact Pressure: There shall be a pressure between all closed contacts of

Test - Min 30 Grams
Readjust - Min 35 Grams

Use the No. 70D gauge.

*2.10 Contact Follow: There shall be a follow on all contacts of

Min 0.010 inch

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

2.11 Plunger Operate Pressure: The pressure required to depress a plunger to the bottom of its stroke shall be

Test - Max 550 Grams
Readjust - Max 515 Grams

Use the No. 79B gauge.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, and Materials

Tools

Code or Spec No.	Description
209	5/16-in. Hex. Open Single-end Offset Wrench
210	Key Button Pliers (15/32 in.)
211	Key Button Pliers (3/8 in.)
485A	Smooth-jaw Pliers ←
KS-6320	Orange Stick
KS-14164	Brush ←
-	3-in. Cabinet Screwdriver

Gauges

70D	50-0-50-gram Gauge
79B	0-1000-gram Push-Pull Tension Gauge
161A	0.050 to 0.094 Thickness Gauge
KS-6909	Thickness Gauge Nest

Materials

KS-14666 (or replaced D-98063)	Cloth ↰┐
KS-8496	Lubricating Compound No. 3
KS-7860	Petroleum Spirits ↵┘ Toothpicks, Hardwood, (Flat on one end and pointed on the other)

3.002 The design and method of mounting of these keys is such that it may not be possible to check the adjustment or make readjustments unless the key is made accessible.

(a) To make the keys accessible proceed as follows:

(1) On 499-type keys remove the key from the keyshelf and then loosen the screws holding the keytop to the key box using the 3-inch cabinet screwdriver.

(2) On 523-type keys proceed as for the 499-type keys except that it is not necessary to remove the keys from the keyshelf.

(3) On 524-type keys raise the keyshelf.

At the time the key is made accessible inspect the entire key for possible faults and make any adjustments that appear necessary at this time.

3.01 Cleaning (Rq 2.01)

(1) Clean the contacts in accordance with approved procedures. Clean other parts ← in accordance with 3.04 (1), (2), and (3).

3.02 Lubrication (Rq 2.02)

(1) Lubricate the various parts with the KS-8496 lubricating compound No. 3 ap- ← plied with the KS-14164 brush. Distribute ← the compound retained by the brush after each dip as specified.

3.03 Record of Lubrication (Rq 2.03)
No procedure.

3.04 Plunger Movement (Rq 2.04)

(1) If dirt or a gummy substance is observed on the bearing surfaces of the plunger or the plunger rod, clean the plunger rod with a piece of KS-14666 cloth moistened ← with petroleum spirits and wipe off the plunger with a piece of clean, dry, KS-14666← cloth. The KS-6320 orange stick may be used← as an aid in applying the cloth to the bearing surfaces of the plunger and plunger rod.

(2) If the surfaces of the crimps of the plunger springs 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.

(3) If the plunger operates freely yet is sluggish in returning to normal after the plunger and plunger springs have been cleaned in accordance with (1) and (2) above, it is probably due to a weak or defective helical spring; misalignment of the plunger bearings; the plunger rod being bent; or the plunger rod binding on the sides of the frame.

(4) If the plunger rod binds on the sides of the key frame, loosen the keytop mounting screws with the 3-inch cabinet screwdriver and shift the keytop to relieve the bind. Tighten the mounting screws securely.

(5) If the helical spring is weak or defective, replace it. To do this, hold the key button with either the No. 210 or the No. 211 key button pliers, depending on whether or not the key has a large or a small button. Loosen the locknut by turning it away from the button with the No. 209 wrench and remove the button, lockwashers, and locknut. Loosen the screws holding the mounting strip to the keytop with the 3-inch cabinet screwdriver and remove and replace the spring without entirely removing the

mounting strip from the keytop. Exercise care not to allow the other plungers to become displaced.

(6) After the defective or weak spring has been replaced with a new one, reassemble the mounting strip taking care not to distort the springs or damage the plunger rod.

(7) If the plunger bearings are out of alignment, remove all the key buttons and the mounting strip opposite the plunger unit which is to be realigned as covered in (5) above and, with the 3-inch cabinet screwdriver, loosen the screws holding the spring assembly mounting bracket to the mounting strip and shift the bracket as required. Examine the plunger rods at this time, and if any are bent, replace them. After relocating the plunger bearing tighten the screws which hold the spring assembly mounting bracket to the mounting strip and reassemble the mounting strip.

(8) If the plunger springs have little or no tension against the plunger, tension
→ the springs with the No. 485A pliers as shown in Fig. 5. This tension should not be excessive as it will cause undue wear and decrease the life of the key. If it is necessary to tension the plunger springs, check for plunger operate pressure.

(9) After the desired adjustment for plunger operation has been obtained, remount the key buttons so that the tops of the buttons all lie in approximately the same horizontal plane.

3.05 Plunger Travel (Rq 2.05)
3.06 Contact Alignment (Rq 2.06)
3.07 Spring Clearance (Rq 2.07)
3.08 Contact Separation (Rq 2.08)
3.09 Contact Pressure (Rq 2.09)
3.10 Contact Follow (Rq 2.10)

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

(2) Adjust the springs, unless otherwise specified, close to the point where the spring leaves the insulators with the
→ No. 485A pliers applied as shown in Fig. 5.

(3) Plunger Travel: To adjust for the plunger travel adjust the springs toward or away from the plunger as required. If the springs make contact before the plunger is depressed the specified distance, adjust the springs away from the plunger. If the contacts are not made when the plunger is depressed the specified distance and the contact separation is within the specified limits, adjust the springs toward the plunger.

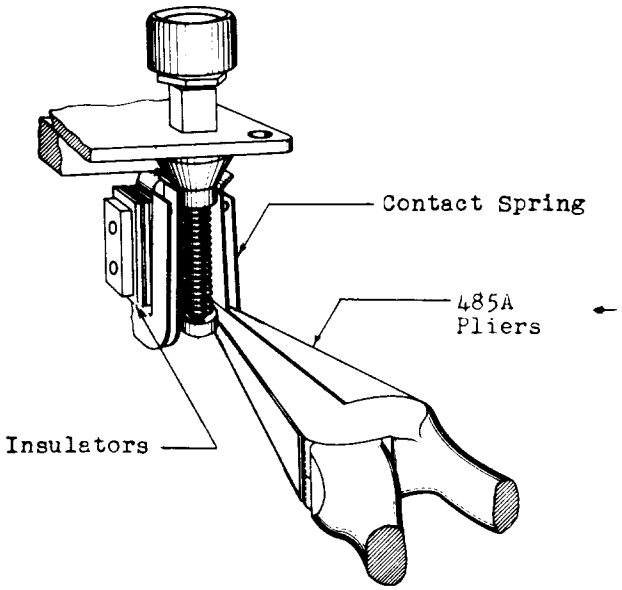

Fig. 5 - Method of Adjusting Contact Springs

(4) If the requirement cannot be met due to side play of the plunger rod in the bearings, replace the buffer springs or the keytop or both.

(5) Contact Alignment: Check the key to see whether or not the springs are out of alignment. If it is necessary to readjust the springs, remove the mounting strip as described in 3.04 (5), remove the spring assembly mounting screws using the 3-inch cabinet screwdriver, and then remove the
→ spring assembly. Loosen the spring assembly
→ clamping screws very slightly with the 3-inch cabinet screwdriver and then set the springs so that they are all in alignment.
→ Tighten the spring assembly clamping screws and reset the assembly on the key mounting strip. When mounted, the springs should be as nearly parallel to each other as can be judged by eye and the contacts should rest wholly within the corresponding discs, preferably as near the center as possible.

(6) Spring Clearance: See that the springs are not kinked. If they are kinked, straighten and adjust them so that there will be the specified clearance between the springs designed never to make contact and between the contact springs and the frame in both the operated and nonoperated positions of the key. Straightening the springs will usually rectify any trouble that may exist because of springs touching each other which are designed to clear at all times.

(7) Contact Separation: The contact separation can be judged visually when the key is made accessible as covered in 3.002. If the separation between either set of contacts is insufficient, adjust the outer

spring away from the inner contact spring using the No. 485A pliers applied as shown ← in Fig. 5.

(8) Contact Pressure: Foreign matter wedged between the contact springs may prevent the springs from making contact when the plungers are depressed. Remove the foreign matter 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 in the manner outlined under (1) and (2).

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

3.11 Plunger Operate Pressure (Rq 2.11)

(1) If a plunger fails to meet the maximum plunger operate pressure requirement, examine the plunger springs to determine whether or not a gummy substance has formed on them. If necessary, take the key apart and clean the plunger and plunger springs as outlined in 3.04 (1) and (2).

(2) If, after cleaning, the key still fails to meet the requirement, it may be necessary to reduce the tension of the plunger springs against the plunger by adjusting the springs away from the plunger with the No. 485A pliers applied as shown in ← Fig. 5.

REASONS FOR REISSUE

1. To amplify the lubrication requirement [2.02(a)].

2. To add the 499G, 499H, and 523B keys to the plunger travel requirement [2.05(b)].

3. To amplify Figs. 1 and 2.

4. To revise the list of tools and materials to bring them up to date (3.001).

5. To revise Fig. 5.