

## KEYS

### 547, 552, 576, 579, 582, 583, 585, 592, 596, 597, 614, 615, 624, 625, 630, 648A, 649A, AND 650 TYPES REQUIREMENTS AND ADJUSTING PROCEDURES

#### 1. GENERAL

- 1.01** This section covers the keys enumerated above.
- 1.02** This section is reissued to:
- Add the 648A- and 649A-type keys.
  - Add illustrations of the 648A-, 649A-, and 650-type keys.
  - Revise 2.10, changing the plunger operate pressure for the 624- and 650-type keys.
  - Revise 3.02 (2) and (3).
- 1.03** Reference shall be made to Section 020-010-711 covering 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 dismantling or dismounting of apparatus or would affect the adjustments 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** *Dagger(†)*: Requirements are marked with both a dagger and an asterisk when 1.04 covering the use of the asterisk does not apply to the 582- and 583-type keys.
- 1.06** *The normal (unoperated) position of a pushbutton-type key* is that position in which the plunger is at the top of the stroke and the normally open contacts are open and the normally closed contacts are closed.
- 1.07** *The operated position of a pushbutton-type key* is that position in which the plunger is depressed to limit of its stroke and the normally open contacts are closed and the normally closed contacts are open.
- 1.08** *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 normally open contacts are open and the normally closed contacts are closed.
- 1.09** *The operated position of a locking rotating plunger-type key* is that position in which the plunger is rotated to the locked position. In this position, the normally closed contacts are open and the normally open contacts are closed. On keys equipped with 2-way throw plungers only, those contacts on the side to which the plunger is rotated are operated.
- 1.10** *The 630-type key assumes the locked and unlocked positions* on alternate operations of the plunger: push to lock, push to unlock.
- 1.11** *The unlocked position of a 630-type key* is that position in which the plunger is at the top of the stroke and the normally open contacts are open and the normally closed contacts are closed.
- 1.12** *The locked position of a 630-type key* is that position where the plunger remains 1/8 inch below its outermost unlocked position after the plunger has been fully depressed and released. See 1.13 or 1.14.
- 1.13** In the locked position of a 630-type key, except the 630R and 630AB keys, all normally open contacts are closed and all normally closed contacts are open.

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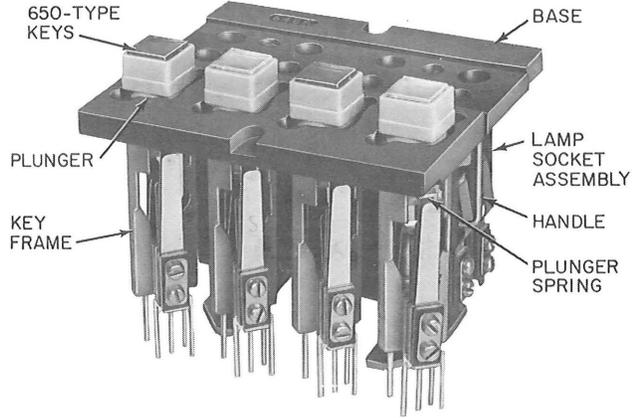
**1.14 630R Key:** In the locked position of a 630R key, the normally open contacts on the spring pile-up with three pairs of contacts are open and the normally open contacts on the single pair are closed. However, when the plunger is fully depressed, the three pairs of contacts are momentarily closed and the single pair remains closed.

**1.15 630AB Key:** One contact is closed in the locked position and the momentary contact is open.

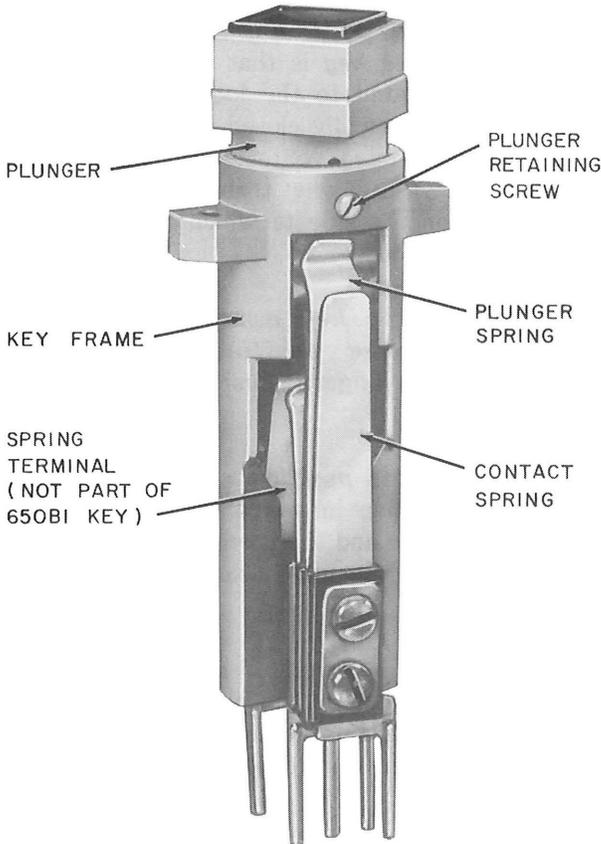
**1.16 The operated position of a 552M key** is that position in which the 2-way throw plunger is rotated from the normal position in a clockwise or counterclockwise direction and the normally open contacts, on the side to which the plunger is rotated, are closed.

**1.17 The 650-type key** (Fig. 1) is the basic component of the 648A- and 649A-type keys (Fig. 2 and 3) which replace the 614A- and 615-type

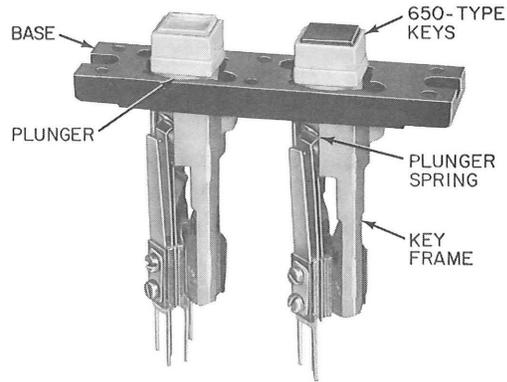
keys, respectively. All requirements and adjustments for the 650-type key apply to the 648A- and 649A-type keys. ◀



▶ Fig. 2—648A-Type Key ◀



▶ Fig. 1—650-Type Key(650A1 Illustrated) ◀



▶ Fig. 3—649A-Type Key ◀

**1.18** One drop of KS-8496 lubricating compound No. 3 for the purpose of this section is the drop of the compound which forms on the end of the nozzle of the 486A oil can.

**1.19** One dip of KS-14774 L2G lubricant, for the purpose of this section, is the amount of lubricant retained on a KS-14208 brush after being dipped into the lubricant to a depth of 1/2 inch and the tip touched lightly against the edge of the container to remove any surplus.

**2. REQUIREMENTS**

**\*2.01 Cleaning**

- (a) Contacts shall be cleaned, when necessary, in accordance with Section 069-386-801.
- (b) Other parts shall be cleaned, when necessary, in accordance with approved procedures.

**2.02 Plunger Movement:**

- (a) **547-, 576-, 579-, 582-, 583-, 614-, 615-, 624-, and 650-Type Keys:** The plunger shall move freely in its bearing and, when released unrestrained from the operated position, shall return to the normal position with a snap.

Gauge by eye and feel.

- (b) **552-, 585-, 592-, 596-, 597-, and 625-Type Keys:** Fig. 14(A) and 16—The plunger rod shall turn freely in the sleeve of the frame. Gauge by eye and feel.

- \*(c) **547-, 552-, 585-, and 625-Type Keys:** It shall not be possible to operate the contacts by any side thrust of the plunger.

Gauge by eye.

- (d) **630-Type Key:** (Fig. 4)—The plunger shall slide without binding and shall not be sluggish in restoring from its depressed position.

Gauge by eye and feel.

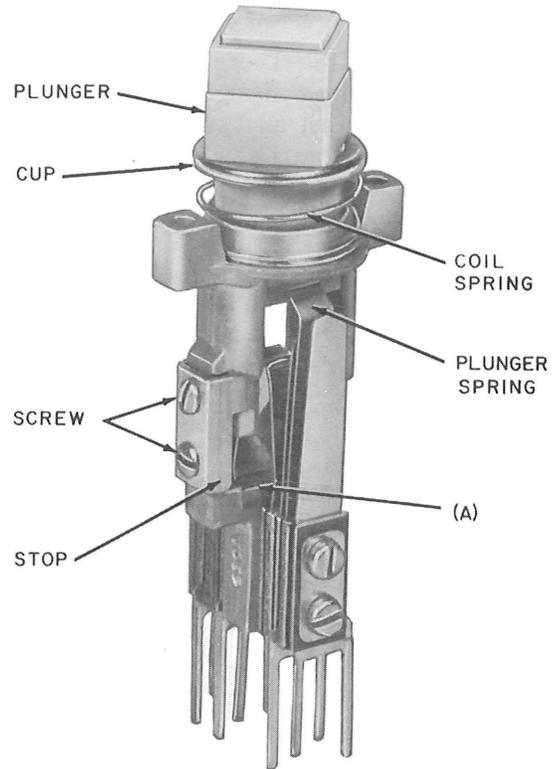
**\*2.03 Contact Alignment:**

- (a) **Point and Disc Contacts:** Fig. 5(A)—The contacts shall line up so the point of contact falls wholly within the boundary of the opposing contact disc at all times during contact.

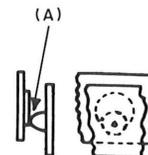
Gauge by eye.

- (b) **Bar-Type Contacts:** Fig. 6(A)—The contacts shall line up so the width of the contact surface of each contact bar falls wholly within the length of its mating bar.

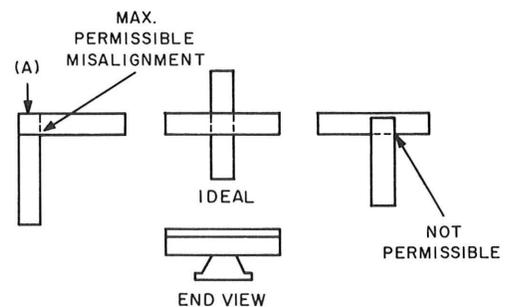
Gauge by eye.



**Fig. 4—630-Type Key**



**Fig. 5—Point And Disc Contact Alignment Showing Maximum Permissible Alignment**



**Fig. 6—Alignment Of Standard Bay-Type Contacts**

†\*2.04 *Spring Clearance:*

(a) Fig. 7(A) and 8—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:

Min 0.015 inch.

Gauge by eye.

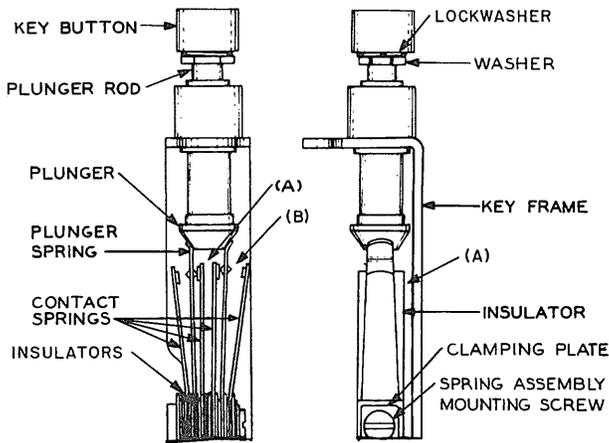


Fig. 7—547-Type Key Equipped With 3-Piece Plunger

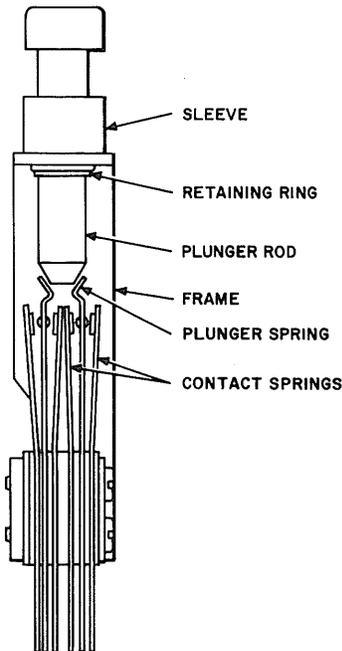


Fig. 8—547-Type Key Equipped With 1-Piece Plunger

(b) Fig. 9—There shall be a clearance between springs designed to make contact when the contacts are closed of:

Min 0.008 inch.

Gauge by eye.

(c) *576-, 579-, 582-, 583-, 614-, and 615-Type Keys:* Fig. 10, 11, 12, and 13—With the plunger in the normal position, there shall be a

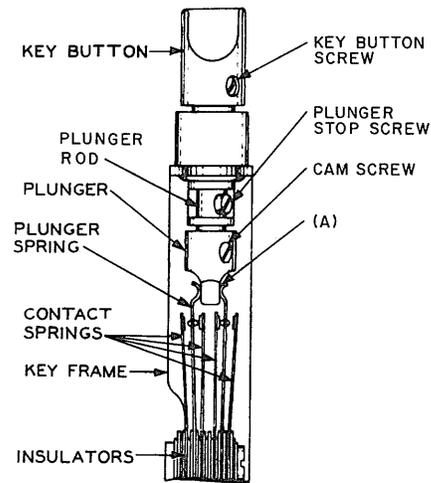


Fig. 9—Typical Of 552- and 558-Type Key Equipped With 3-Piece Plunger

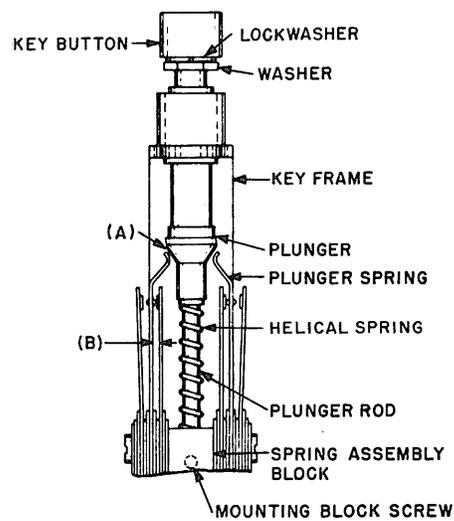
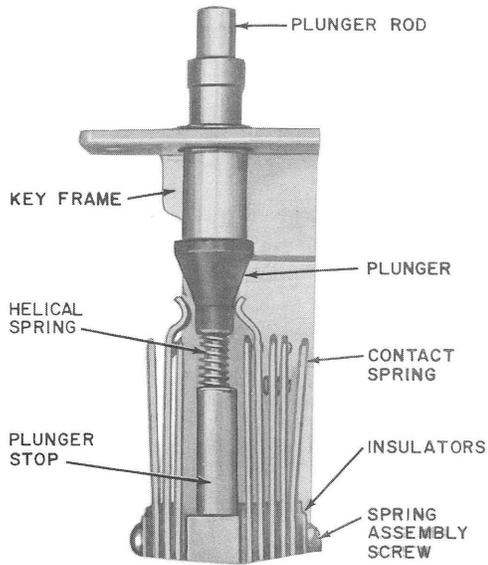
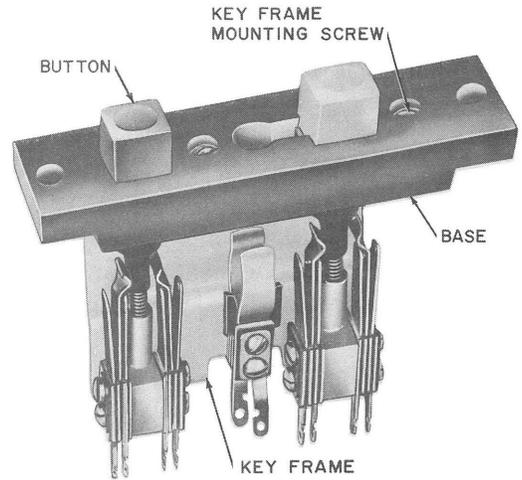


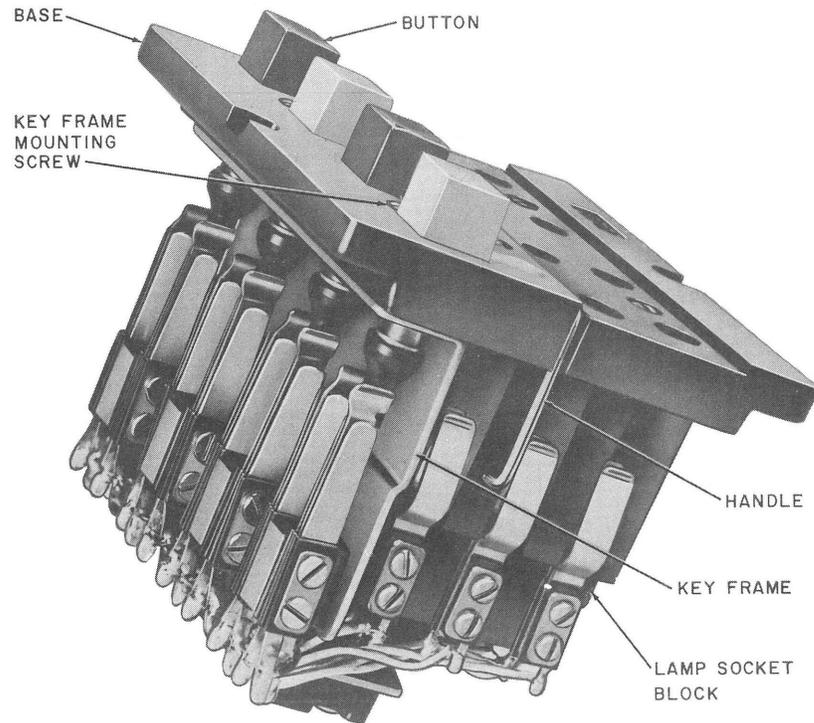
Fig. 10—Typical Of 576- and 579-Type Key



**Fig. 11—Plunger and Spring Assembly—Typical Of 582-, 583-, 614-, and 615-Type Keys**



**Fig. 12—615-Type Key**



**Fig. 13—614-Type Key**

clearance between the plunger spring and the plunger in at least one position of the plunger as the plunger is rotated.

Gauge by eye.

†\*2.05 **Contact Separation:**

(a) Fig. 6(B)—Except as specified below, 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:

Min 0.016 inch.

Gauge by eye.

(b) **552C, 552G, and 592A Keys:** Fig. 14—On make-before-break spring combinations (continuity), there shall be a separation of:

Min 0.010 inch.

Gauge by eye.

(c) **552M Key:** The separation between any pair of contacts normally open shall be:

Min 0.010 inch.

Gauge by eye.

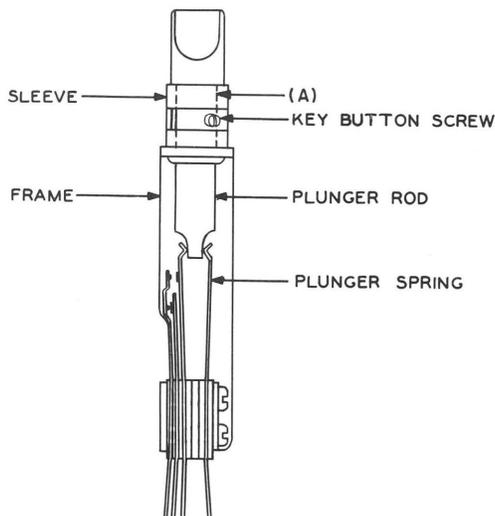


Fig. 14—Typical Of 552-, 585-, 592-, 596-, and 597-Type Keys Equipped With One-Piece Plunger

(d) **624A-, 624B-, 624E-, and 624F Keys:**

Fig. 15—The separation between any pair of contacts normally open shall be:

Min 0.022 inch.

Gauge by eye.

(e) **625-Type Key:** Fig. 16—All normally closed contacts shall have a separation of minimum 0.012 inch when open.

Gauge by eye.

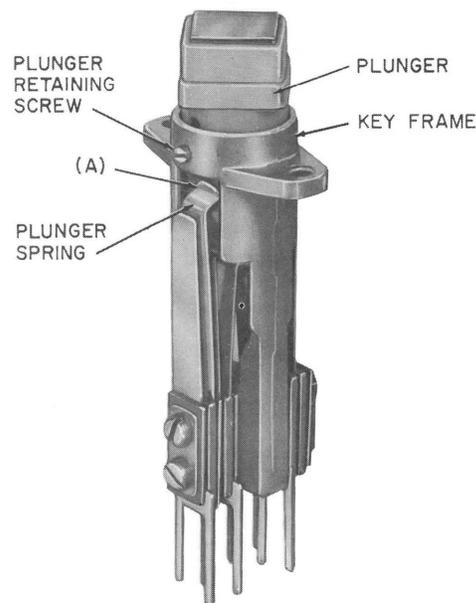


Fig. 15—624-Type Key

†\*2.06 **Contact Pressure:** There shall be a pressure between all closed contacts of:

TYPE OF KEY	TEST	READJUST
624, 630 (except 630R outer momentary contact) and 650	Min 40 grams	Min 50 grams
630R (outer momentary make contact only)	Min 35 grams	Min 40 grams
All others	Min 50 grams	Min 55 grams

↳ Use the 70D or 70J gauge

Use the 70D or 70J gauge.

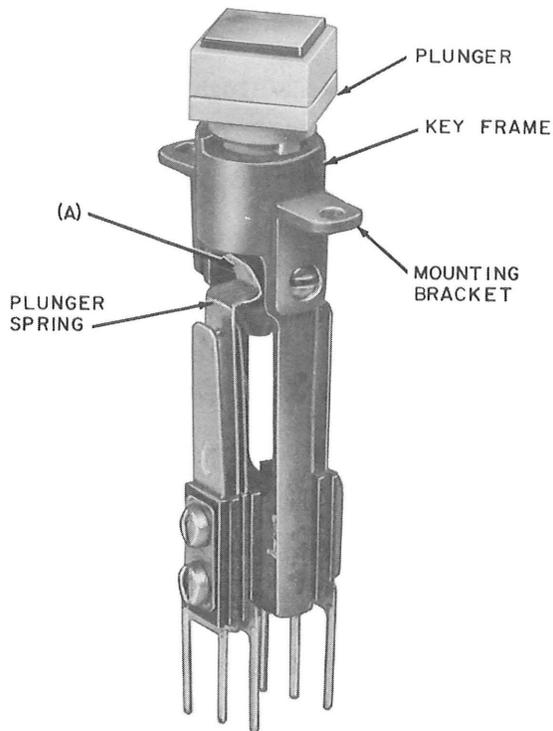


Fig. 16—625-Type Key

†\*2.07 Contact Follow: There shall be a follow on all contacts of:

Min 0.010 inch.

Gauge by eye.

**Note:** On make-before-break combinations where a long, thin spring makes contact with a short, heavy spring, the heavy spring should not be considered as a follow spring.

†\*2.08 **Contact Sequence—547-, 552-, 585-, 592-, 596-, 597-, 624-, 625-, 630-, and 650-Type Keys:**

(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:

Min 0.006 inch.

Gauge by eye.

(b) **Cross Sequence—576-, 582-, 583-, 614-, and 615-Type Keys:** All normally closed contacts operated by the depression of a plunger shall break before any of the normally open contacts make by:

Min 0.006 inch.

Gauge by eye.

(c) **624M—The outermost make contact** on the side opposite the break contact shall make before the break contact breaks.

Gauge by eye.

(d) **Other Contact Sequences:** When specified on the circuit requirement table or circuit drawing.

†\*2.09 **Plunger Spring Pressure:**

(a) **552-, 592-, 597-, and 625-Type Keys:** Fig. 9(A)—Both plunger springs shall rest against the plunger in the unoperated position and it shall not be possible to break this contact between the plunger and the plunger springs by taking up the side thrust or backlash in the plunger.

Gauge by eye.

(b) **585-, 596-, 624-, 630- (except 630R), and 650-Type Keys:** Fig. 8(A) and 11—Both plunger springs shall rest against the plunger in the unoperated position.

Gauge by eye.

(c) **630R Key:** Both plunger springs shall rest against the plunger with a force of:

Max. 40 grams.

Use the 70J gauge.

(d) **552M Key:** The pressure of both plunger springs against the plunger shall be sufficient to restore the plunger from the operated position to the unoperated position.

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**2.10 Plunger Operate Pressure:** The pressure required to depress the plunger to the limit of its stroke shall be:

TYPE OF KEY	MIN GRAMS	MAX GRAMS
547, 576, 579A	650	1350
582, 583	650	1120
579B	—	450
614, 615	—	900
→624, 630, 650	275	800

Use the 79B or 79F gauge

Use the 79B or 79F gauge.

**2.11 Plunger Nonoperate Pressure:**

(a) **579B Key:** A pressure of

Min 190 grams

applied on the plunger shall not cause any contacts to operate.

Use the 79B gauge.

(b) **614- and 615-Type Keys:** A pressure of

Min 440 grams

applied on the plunger shall not cause any contacts to operate.

Use the 79B gauge.

**3. ADJUSTING PROCEDURES**

**3.001 List of Tools, Gauges, and Materials**

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
206	30-Degree Offset Screwdriver
207	60-Degree Offset Screwdriver
209	5/16-Inch Hex Open Single-End Offset Wrench
211	Key-Button Pliers
485A	Smooth-Jaw Pliers
486A	Oil Can

CODE OR SPEC. NO.	DESCRIPTION
KS-3093	Bristle Brush
KS-6320	Orange Stick
R-1005	Jewelers Screwdriver
R-1051	File
R-2959	Allen Socket Screw Wrench
—	P Long-Nose Pliers
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver

**GAUGES**

70D	50-0-50 Gram Gauge
70J	0-150 Gram Gauge
79B	0-1000 Gram Push-Pull Tension Gauge
79F	0-6000 Gram Push-Pull Tension Gauge

**MATERIALS**

1A or 2A	Cushion (or equivalent tubing)
KS-2423 or KS-14666	Cloth
KS-7860	Petroleum Spirits
KS-8496	Lubricating Compound No. 3
KS-14774 L2G	Lubricant
—	Toothpicks — Hardwood, Flat on One End, Pointed at the Other

**3.002** Due to the method of mounting these keys, it may not be practical to perform any of the checks and adjustments unless the key is removed from its mounting. At the time the key is removed, inspect the entire key for possible faults and make any adjustment that may appear necessary. Before mounting the key, remove any dirt as covered in 3.01.

**3.003** To remove the 614A or 648A key when it is mounted in the PBX switchboard cord unit, proceed as follows:

**Note:** Have available a 614A key space which should be inserted in place of the key immediately after the key has been removed. This will close the chain circuit and maintain service at the position.

Remove the screws that secure the keyshelf plate to the keyshelf using the E screwdriver and remove the plate. Remove the two key mounting screws using the C screwdriver and lift the key from the keyshelf using the key handle. Immediately replace it with a 614A key space.

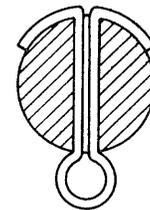
**3.004** To remove the 615-type key or the 649A key when it is mounted in the PBX switchboard cord unit, remove the keyshelf plate as covered in 3.003. Remove the two key mounting screws using the C screwdriver and lift the key from the keyshelf as far as the skimmers will permit. When necessary, unsolder the leads to the cord unit and tag to facilitate reconnecting them.¶

**3.005** To remove and remount a 582- or 583-type key when it is mounted in a PBX switchboard cord unit, proceed as follows:

(1) To remove the 582- or 583-type key, remove the 348A plug from the connector. Loosen the two cowl fasteners at the top and bottom of the cord unit by turning them toward the left (counterclockwise) with the E screwdriver and remove the cord unit. Loosen the plunger block setscrews that secure the plunger block on the push turn rod of the 580A key with the R-2959 wrench. Remove the cotter pin that connects the push turn rod to the 580A key with the long-nose pliers and, while supporting the plunger block, withdraw the push turn rod. Remove the two screws that secure the keyshelf to the cord unit frame with the C screwdriver and remove the push turn rod bushing with the E screwdriver. Lift the keyshelf from the cord unit frame. Tag and unsolder the wires from the terminals of the 582- or 583-type key. Remove the key mounting screws with the C screwdriver.

(2) To remount the 582- or 583-type key, proceed as follows: Mount the key with the key mounting screws using the C screwdriver, connect and solder the leads that were removed. Place the keyshelf on the frame and remount the push turn rod bushing with the E screwdriver. Insert and tighten securely the keyshelf mounting screws with the C screwdriver. Slide the push turn rod through the bushing and through the hold in the plunger block. During this operation, the finger portion of the knob should be in the upward position and the key mechanism of the 580A key should be in the unoperated position

but with the push turn rod pulled out. Insert a new cotter pin as shown in Fig. 17 with the long-nose pliers. The two setscrews in the plunger block should then be tightened securely on the push turn rod with the R-2959 wrench so the position of the plunger block is in accordance with the requirements for plunger block position for the 581A key as covered in Section 032-726-701. Remount the cord unit, tighten the cowl fasteners with the E screwdriver, and insert the 348A plug in the connector.



**Fig. 17—Method Of Clinching Cotter Pin To Clear Wiring**

### **3.01 Cleaning (Reqt 2.01):**

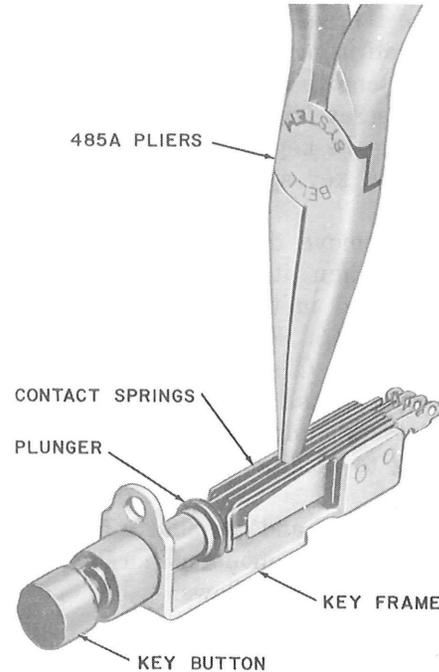
- (1) Brush all loose dust or dirt from the frame using the KS-3093 brush.
- (2) Clean the contacts in accordance with Section 069-386-801.
- (3) Clean other parts as covered in 3.02(2) and (5).

### **3.02 Plunger Movement (Reqt 2.02):**

- (1) **614- and 615-Type Keys:** Cracked, warped, or broken base may cause the button to bind and thus prevent or delay the release of a plunger. In this case, replace the base as covered in Section 032-724-801.
- (2) **547-, 576-, 579-, 582-, 583-, 614-, 615-, 624-, 630-, and 650-Type Keys:** If the plunger operates but fails to return freely to its normal position, inspect the plunger to determine whether it is dirty or requires lubrication. If the plunger is dirty or gummy, wipe it with a clean, dry KS-2423 cloth except the plunger of a 624-, 630-, or 650-type key which should be removed and cleaned as covered in (6) and (7). If lubrication is required, proceed as covered in (a) or (b), depending on the construction of the plunger.

**(a) Keys Equipped with a 3-Piece Plunger:**

Apply one drop of KS-8496 lubricating compound to the operating surface of the plunger using the 486A oil can. After applying the lubricant to the operating surface of the plunger, rotate the plunger so the lubricant is distributed evenly over the surface. Lubricate the plunger rod by applying one drop of the KS-8496 lubricating compound as follows: On the 547-type keys, apply the lubricant to the plunger rod at the top of the brass bushing in the frame below the key button. On the 614- and 615-type keys, apply the lubricant to the plunger rod at the bottom of each brass bushing in the frame, with the plunger rod in a depressed position. After applying the lubricant to the plunger, operate the plunger several times to distribute the lubricant. If the plunger still fails to return to normal, proceed as covered in (3).



**Fig. 18—Method Of Adjusting Plunger Or Contact Springs**

**(b) Keys Equipped With a 1-Piece Plunger:**

Before applying lubricant, remove and clean the plunger as covered in (6) and (7). Then lubricate the plunger using KS-14774 L2G lubricant and the KS-14208 brush as follows: On the 547-, 624-, and 650-type keys, evenly distribute one dip of lubricant over the plunger surfaces that bear against the contact springs and sleeve. On the 630-type key, distribute one dip of lubricant on the point where the catch strikes the frame (point A, Fig. 4). If the plunger still fails to return to normal, proceed as covered in (3).

**(3) 547-, 576-, 579-, 582-, 583-, 614-, 615-, 624-, 630-, and 650-Type Keys:** If the plunger is clean and lubricated in accordance with (2) but fails to return to normal after operation and release, proceed as follows: On the 547-, 624-, and 650-type keys, check the tension of the plunger springs and make adjustment required using the 485A pliers as illustrated in Fig. 18. On the 576-, 579-, 582-, 583-, 614-, 615-, and 630-type keys, check both the plunger springs and the helical spring. Adjust the plunger spring tension as required using the 485A pliers. If the helical spring is broken or damaged, replace it with a new spring as covered in Section 032-724-801.♦

**(4) 576-, 579-, 582-, 583-, 614-, and 615-Type Keys:**

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-inch C screwdriver and shift the block slightly to eliminate the bind. Tighten the screws securely. On the 614-type keys, remove the key frame mounting screws using the 3-inch C screwdriver and position the key frame to clear the base and lamp socket block, being careful not to break the wires; proceed as covered above, then reassemble the key. Make adjustments as required as covered in 3.11.

**(5) All Keys:** If the plunger or plunger rod binds in the bearing, remove and clean the plunger as covered in (6) and (7), respectively.

**(6)** To remove the plunger or plunger rod from a key frame, proceed as follows:

**(a) 547-Type Key Equipped With a 1-Piece Plunger:** Operate the plunger and remove the C-ring with the P long-nose pliers. Remove the plunger.

**(b) 547-Type Keys With a 3-Piece Plunger:**

Remove the spring assembly mounting screw nearest the key button and also slightly loosen the other spring assembly mounting screw using the C screwdriver. Tilt the spring assembly sufficiently to clear the plunger. Hold the washer with the 209 wrench and remove the key button with the fingers. If the key button cannot be removed with the fingers by turning it in a counterclockwise direction, hold the washer with the 209 wrench and, with the 211 pliers equipped with a 1A or 2A cushion or equivalent slid over each jaw, remove the key button by turning it in a counterclockwise direction. Remove the washer and lockwasher. Withdraw the plunger rod from its bearing.

**(c) 576-, 579-, 582-, 583-, 614-, and 615-Type**

**Keys:** Remove the key button of the 576- and 579-type keys. In the case of the 582- and 583-type keys, remove the key button as covered in (b). In the case of the 614-type keys, remove the key frame mounting screws using the C screwdriver, position the key frame to clear the base and lamp socket block, being careful not to break the wires, and remove the buttons. In the case of the 615-type keys, remove the key frame mounting screws using the C screwdriver and remove the key base and buttons. Remove the mounting block screws using the C screwdriver, remove the spring assembly and withdraw the plunger rod and plunger from the bearing.

**(d) 552- and 585-Type Keys Equipped With a 1-Piece Plunger and 592-, 596-, and 597-Type Keys:**

Remove the key button screw with the R-1005 screwdriver and remove the plunger rod from its bearing.

**(e) 552- and 585-Type Keys Equipped With a 3-Piece Plunger:**

Remove the key button screw with the R-1005 screwdriver and remove the key button with the fingers. Remove the plunger stop screw and the cam screw with the R-1005 screwdriver, withdraw the plunger rod from its bearing, and remove the plunger with the fingers.

**(f) 624- and 650-Type Keys:** Remove the plunger retaining screw with the R-1005 screwdriver and withdraw the plunger from the key shell.

**(g) 625-Type Keys:** Grasp the plunger with the fingers and withdraw the plunger from the key frame.

**(h) 630-Type Keys:** Remove the stop mounting screws with the 3-inch C screwdriver and remove the stop. Withdraw the plunger from the key frame and remove the coil spring and cup.

(7) With the plunger removed from the key frame, clean the surfaces of the plunger and plunger rod as required using the KS-2423 cloth which has been slightly moistened with KS-7860 petroleum spirits. On the 624- and 650-type keys, use a KS-6320 orange stick as an aid in applying the cloth to clean the slot in the plunger. On the 630-type keys, rotate the catch on the plunger to clean the surfaces adjacent to the catch. On all keys, after cleaning with petroleum spirits, wipe the plunger and plunger rod as required with a clean, dry KS-2423 cloth. Inspect the plunger and plunger rod for burrs or other irregularities which may cause binding. If bind is due to a bent or roughened plunger rod or plunger, replace it with a new part as covered in Section 032-724-801. Clean the inner surfaces of the bearing with a piece of cloth on the end of a KS-6320 orange stick. Follow this by wiping with a clean, dry cloth. If the surfaces of the crimps of the plunger springs are dirty, clean them with a toothpick which has been dipped in KS-7860 petroleum spirits. Do not use the same toothpick for more than one operation. When the plunger springs are thoroughly dry, lubricate the plunger and plunger rod if specified in (2) and reassemble the key. When inserting a plunger in the frame of a 625-type key, take care to center the plunger in the recess and carefully apply pressure. **Do not tilt the plunger nor force it into position, otherwise the plunger tip may butt against the end of a contact spring and deform the spring.** When inserting the plunger of a 630-type key, **take care that the plunger key with the rotating catch is aligned with the stop side of the key frame to avoid damage to the contact springs and plunger. Readjust as required to meet all requirements.**

**(8) 547-, 552-, 585-, 592-, 596-, and 597-Type Keys:** If the springs can be operated by a

side thrust of the plunger, it is an indication of wear in the bearings. Refer the matter to the supervisor.

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

(1) When making these adjustments, consult the associated circuit drawing and circuit requirement table and give consideration to the maintenance of any requirement for contact sequence which may be specified thereon. In adjusting springs, take care not to kink them. 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 its life.

(2) **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.

(3) **Contact Alignment and Spring Clearance:**

Loosen the spring assembly screws with the C screwdriver or with the 206 and 207 offset screwdrivers, as applicable, and shift the springs as required. Take care not to break or damage the spring assembly insulator when making this adjustment. After the contacts are properly aligned and spring clearance is satisfactory, tighten the spring assembly screws securely. If satisfactory clearance between springs cannot be met by shifting the springs, proceed as covered in (4).

(4) Trouble due to springs touching each other which are designed never to make contact is caused either by springs being kinked, bowed, or by excessive follow. Straighten the springs or reduce the excessive follow as required with the 485A pliers.

(5) **Contact Separation:** If the separation between contacts on these keys is not satisfactory, adjust as required using the 485A pliers. Make adjustments close to the point where the spring leaves the clamping plate and insulator as shown in Fig. 18.

(6) **Contact Pressure, Contact Follow, Contact Sequence, and Plunger Spring 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 KS-7860 petroleum spirits. Do not use the same toothpick for more than one operation. If the pressure requirement is still not met, proceed as follows: To adjust for contact pressure, contact follow, contact sequence, and plunger spring pressure, adjust the springs with the 485A pliers close to the point where the springs leave the clamping plate and insulators as shown in Fig. 18.

3.10 **Plunger Operate Pressure** (Reqt 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 as covered in Section 032-724-801.

(2) If the key fails to meet the maximum plunger operate pressure requirement, examine the plunger and plunger springs to determine whether a gummy substance has formed on them. If necessary, dismantle the key and clean the plunger and plunger springs as covered in 3.02. If after cleaning, the key still fails to meet the requirement, it may be necessary to reduce the tension of the contact or plunger springs with the 485A pliers.

(3) If the key fails to meet the minimum plunger operate pressure requirement, it is an indication that the plunger spring tension is insufficient. In this case, adjust the spring toward the center of the key using the 485A pliers as shown in Fig. 18. Check that requirement 2.04(c) is met.

3.11 **Plunger Nonoperate Pressure** (Reqt 2.11)

(1) If the key fails to meet the requirement, examine the helical spring to determine whether it is broken or distorted in any way. If necessary, replace the helical spring as covered in Section 032-724-801.