

## KEYS 478-TYPE REQUIREMENTS AND ADJUSTING PROCEDURES

### 1. General

- 1.01 This section covers 478 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 Normal (Unoperated) Position of a plunger button is that position in which the plunger button is moved to the extreme front position and all the normally open contacts are open.
- 1.07 The Operated Position is that position in which the plunger button is moved to the position marked 1, 2, 3, or 4 on the key top as required and the corresponding open contacts are closed. As the plunger button is moved from the normal to the operated position the contacts in each position are operated successively and remain closed until the plunger button is moved to the normal position when the contacts are opened in the reverse order.

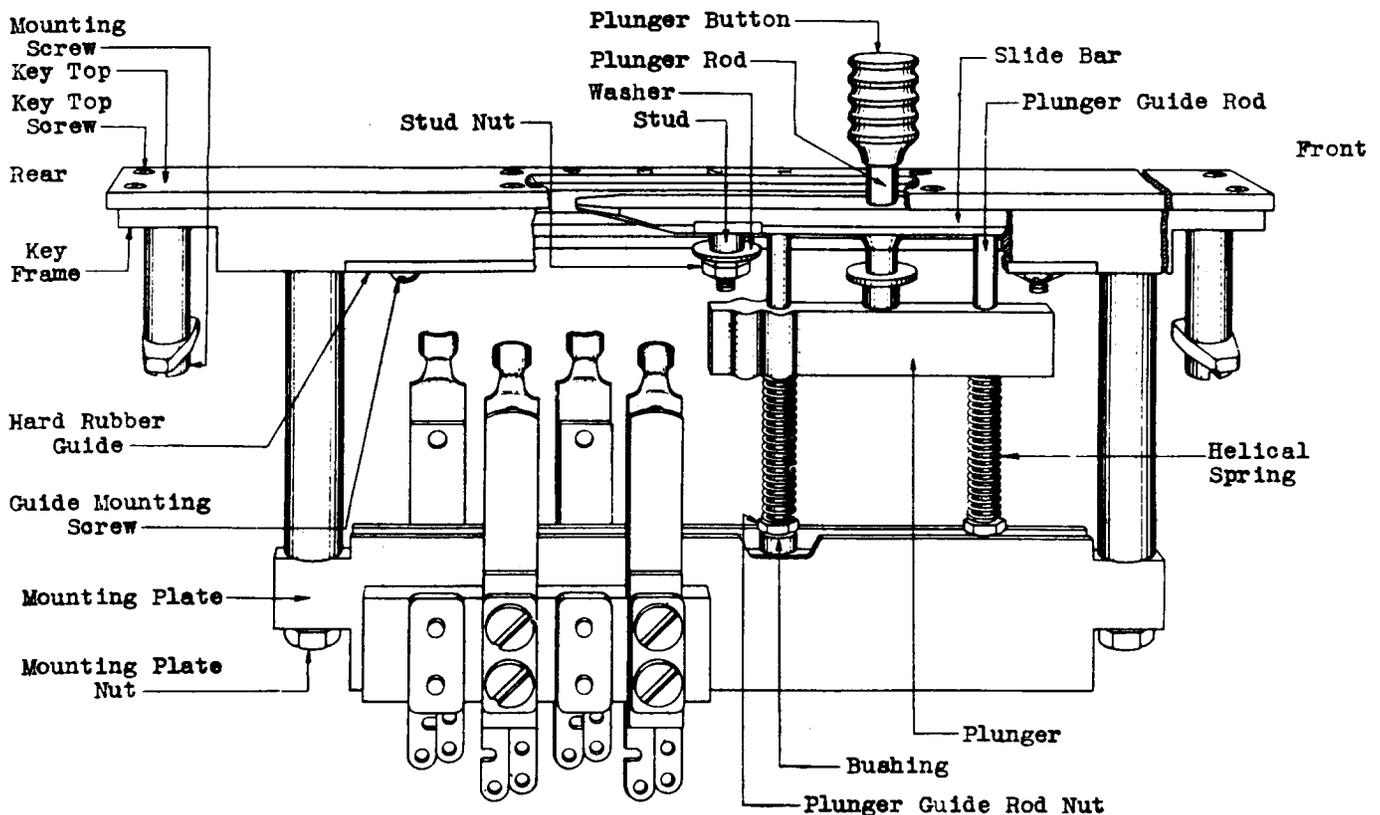
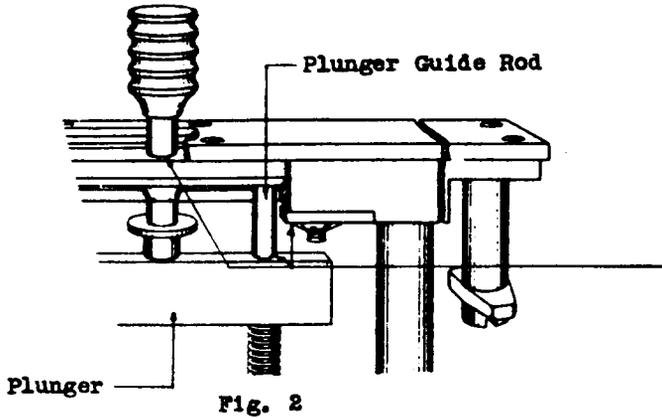


Fig. 1

2. REQUIREMENTS



2.01 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

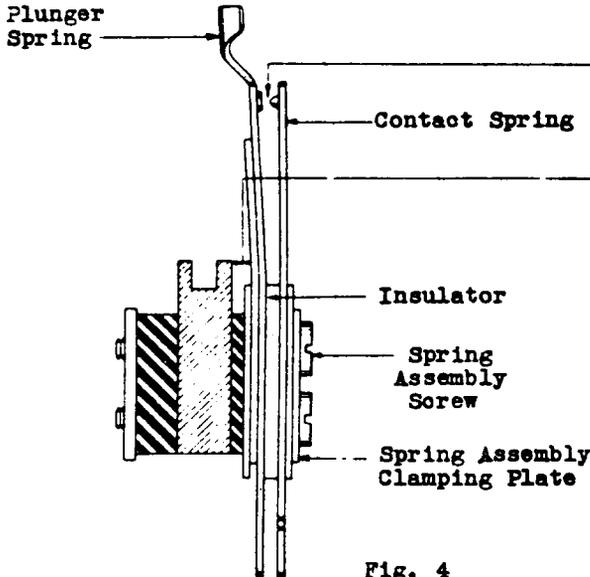
The plunger shall slide freely on the plunger guide rods and the plunger assembly shall slide without binding on the key frame or the mounting plate. Gauge by feel.



\*2.03 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.

Fig. 3



\*2.04 Contact Separation

There shall be a separation between all open contacts of:  
Test - Min. .008"  
Readjust - Min. .010"  
 Gauge by eye.

\*2.05 Spring Clearance

There shall be a clearance between springs which are 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.

\*2.06 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.

Fig. 4

**3. ADJUSTING PROCEDURES****TOOLS**

<u>Code No.</u>	<u>Description</u>
35	Screw-driver - 3-1/2"
43	Wrench - 3/16" and 1/4" Hex. Open Double-End Flat
105	Spring Adjuster
371	Spring Adjuster
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 re- placed 68)	70-0-70 Gram Gauge
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**MATERIALS**

KS-2423	Cloth
-	Toothpicks - Flat on One End and Pointed on the Other
KS-7860	Petroleum Spirits

**3.01 CLEANING (Rq.2.01)**

M-1 Clean the contacts in accordance with the section covering cleaning procedures for key contacts. Clean other parts in accordance with procedure 3.02, M-9 and procedures 3.04 and 3.06, M-4.

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

M-1 Cracked, warped, or broken hard rubber key tops may cause the slide bar to bind and thus prevent or delay the plunger operation as it is being moved from the normal to the operated position. If necessary replace the key top as follows:

M-2 Where the keyshelf is equipped with retaining strips, loosen and remove the retaining strip screws with the 3-1/2" cabinet screw-driver. Then

remove the mounting screws, raise the key out of the keyshelf, and proceed as outlined in M-4.

M-3 Where the key is arranged to mount in a universal type mounting, raise the keyshelf, remove the mounting screws with the 3-1/2" cabinet screw-driver and raise the key above the keyshelf if possible without unsoldering any form wires.

M-4 Now depress the plunger and grasp the plunger rod firmly just above the plunger, with the long nose pliers and remove the plunger button by turning it in a counter-clockwise direction. Remove the key top screws with the No. 35 screw-driver and remove the key top. If the key top is not readily removable, push it up from the bottom with the screw-driver.

M-5 Examine the contact and plunger springs and note if the pressure exerted on both sides of the plunger is approximately equal and not excessive. If necessary correct the tension of these springs in accordance with procedure 3.06.

M-6 A worn or scratched hard rubber guide is an indication that the washer binds on the guide. Correct for this condition by increasing the clearance between the washers and the hard rubber guide. To do this loosen and position the stud nuts with the larger end of the No. 43 wrench. Do not tighten the stud nuts to such an extent that the washer will bind on the hard rubber guide. If difficulty is experienced in preventing the washer from binding on the guide when the stud nuts are tightened, insert the flat end of the toothpick between the washer and the guide before tightening the stud nuts and after tightening the nuts remove the toothpick. This will allow an appreciable clearance between the washer and the guide.

M-7 Cracked, warped or broken hard rubber guides may cause the washers to bind and thus prevent or delay the smooth operation of the plunger as it is being moved from the normal to the operated position. In this case replace the hard rubber guide as follows:

M-8 Remove the mounting plate nuts with No. 43 wrench and remove the mounting plate exercising care not to lose the hard rubber bushings. Hold the plunger rod firmly just above the plunger with the long nose pliers and remove the

## 3.02 (Continued)

key button by turning it in a counter-clockwise direction. Remove the plunger guide rod nuts with the wrench, remove the helical springs, slide the plunger off the plunger guide rods and remove the plunger rod. Then remove the stud nuts with the wrench and remove the studs and washers. Now remove the guide mounting screws with the No. 35 screw-driver and remove the guide. Examine the helical spring and if it is broken or distorted replace it with a new one.

M-9 At this time clean each of the parts thoroughly. Therefore, also remove the key top screws with the No. 35 screw-driver, remove the key top and the slide bar. Clean the key frame, plunger rod and plunger guide rods thoroughly with petroleum spirits. Wipe off the plunger, slide bar and hard rubber guide with a clean KS-2423 dry cloth. When all parts are dry assemble them exercising care to place the washer so that its rounded portion is toward the hard rubber guide.

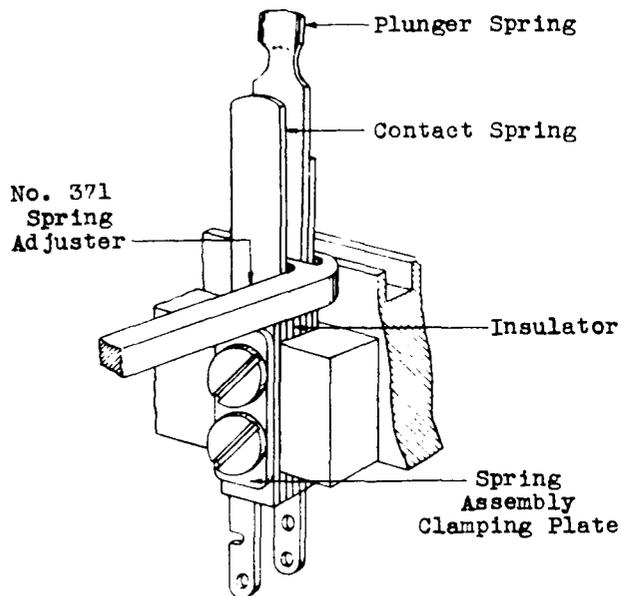


Fig. 5 - Method of Adjusting for Contact Separation, Spring Clearance and Contact Pressure

- 3.03 CONTACT ALIGNMENT (Rq.2.03)
- 3.04 CONTACT SEPARATION (Rq.2.04)
- 3.05 SPRING CLEARANCE (Rq.2.05)
- 3.06 CONTACT PRESSURE (Rq.2.06)

M-1 Unless otherwise specified adjust the springs close to the point where the spring leaves the spring assembly clamping plate and insulators. Adjust the plunger springs with the No. 371 spring adjuster applied as shown in Fig. 5 and the contact spring with the No. 105 spring adjuster. 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 a 3-1/2" cabinet screw-driver on that side of the key where the springs are out of alignment, and shift the springs until each contact lies wholly within the corresponding contact disc preferably as near the center as possible. Then tighten the screws securely.

M-3 Spring Clearance Trouble due to springs touching the frame is due to springs being kinked or bowed by excessive follow. Straighten the springs with the duckbill pliers or reduce the excessive follow using the No. 371 spring adjuster.

M-4 Contact Separation and 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. Do not use the same toothpick for more than one operation.

M-5 When adjusting contact springs take care to adjust the springs in line with their movements and not twist the contacts off center.