

## KEYS

### 237- AND 243-TYPE

### REQUIREMENTS AND ADJUSTING PROCEDURES

#### 1. GENERAL

- 1.01 This section covers 237 and 243 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 is that position in which the top of the metallic portion of the plunger rod assembly rests flat against the key frame, with the normally open contacts open and the normally closed contacts closed.
- 1.07 The operated position of a locking plunger is that position in which, with the magnet energized, the armature rests flat against the magnet pole pieces with the normally open contacts closed and the normally closed contacts open.
- 1.08 The operated position of a non-locking plunger is that position in which the plunger is depressed to the limit of its stroke with the normally open contacts closed and the normally closed contacts open.

#### 2. REQUIREMENTS

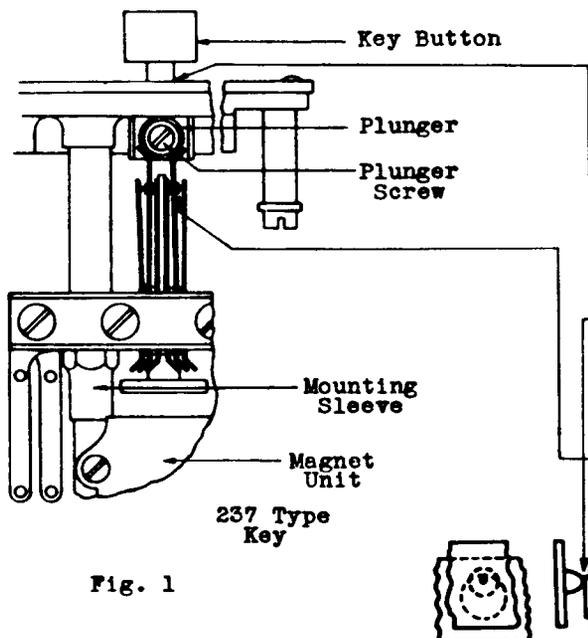


Fig. 1

##### 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 plungers shall work freely through their bearings and when released unrestrained shall return to their normal positions with a snap. Gauge by feel.

##### \*2.03 Contact Alignment (Non-locking Keys Only)

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

##### \*2.04 Contact Separation

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.



Fig. 2

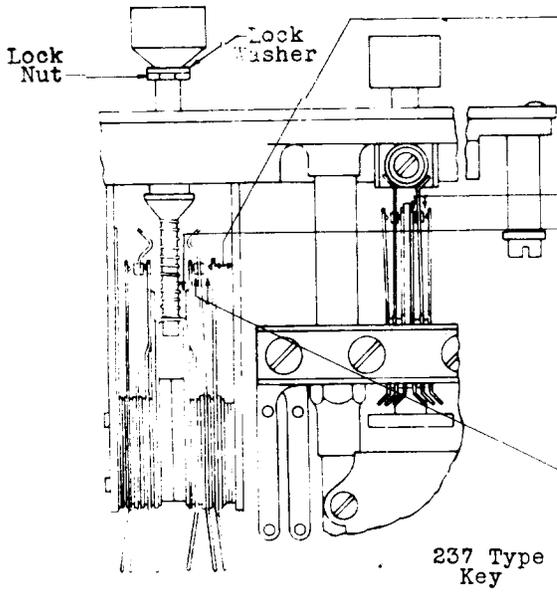


Fig. 3

**\*2.05 Spring Clearance**

(a) On non-locking keys 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.

(b) On non-locking keys there shall be a clearance between any contact or stop spring and the helical spring of

Test - Min. .015"  
Readjust - Min. .020"

Gauge by eye.

**\*2.06 Contact Pressure**

(a) On locking keys there shall be a pressure between normally closed contacts of

Test - Min. 210 grams  
Readjust - Min. 225 grams

Use the No. 62-B gauge.

(b) On locking keys there shall be a pressure between normally open contacts when closed of

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

Use the No. 68-B gauge.

(c) On non-locking keys there shall be a pressure between all closed contacts of

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

Use the No. 68-B gauge.

**\*2.07 Contact Follow** There shall be a follow on all contacts, except the normally closed contacts of locking keys, of

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

Gauge by eye.

**\*2.08 Contact Sequence**

(a) Normal Contact Sequence 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 assembly directly associated with the plunger spring make, by

Test - Min. .005"  
Readjust - Min. .006"

Gauge by eye.

(b) Cross Sequence - Break-Make Combinations on Ringing and Coin Control Spring Assemblies Unless otherwise specified, all normally closed contacts operated by the depression of a plunger shall break before any of the normally open contacts make by

Test - Min. .005"  
Readjust - Min. .006"

Gauge by eye.

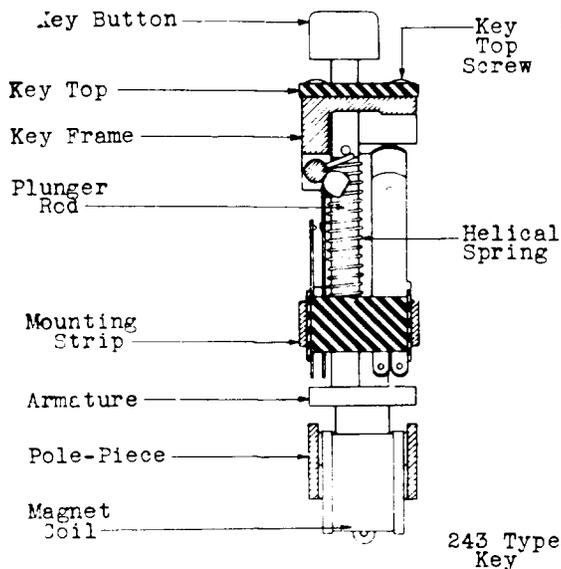


Fig. 4

\*2.08 (Continued)

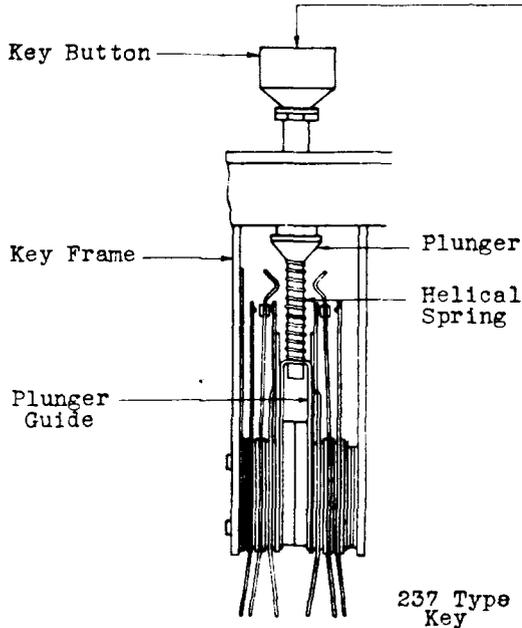


Fig. 5

(c) Special Sequence - Coin Control Spring Assemblies Unless otherwise specified, the normally closed contact toward the front of the key shall break before the normally closed contact toward the rear of the key breaks by  
Test - Min. .002"  
Readjust - Min. .003"  
 Gauge by eye.

(d) Other Contact Sequence When specified on the circuit requirement table or circuit drawing.

2.09 Plunger Operate Pressure (Non-Locking Keys Only) The pressure required to depress the plunger to the limit of its stroke shall be  
Test - Max. 2265 grams  
Readjust - Max. 2040 grams  
 Gauge by feel.

2.10 Plunger Non-Operate Pressure (Non-Locking Keys Only) A pressure of  
Test - 790 grams  
Readjust - 905 grams  
 applied on the plunger shall not cause any contacts to operate. Use the No. 79-B gauge.

2.11 Electrical Requirements

Key	Minimum Locking Current		Release on Open Circuit After Soak Current
	Test	Readj.	
237-A	.066 Amp.	.0625 Amp.	.125 Amp.
237-B	.042 Amp.	.040 Amp.	.080 Amp.
237-CU	.071 Amp.	.067 Amp.	.134 Amp.
237-DU	.071 Amp.	.067 Amp.	.125 Amp.
237-EU	.049 Amp.	.046 Amp.	.080 Amp.
237-HU	.066 Amp.	.0625 Amp.	.125 Amp.
243-A	.042 Amp.	.040 Amp.	.080 Amp.
243-B	.066 Amp.	.0625 Amp.	.125 Amp.

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

<u>Code No.</u>	<u>Description</u>
35	Screw-driver 3-1/2"
48	Wrench 7/32" and 1/4" Hex. Socket Double-End and Screw-Driver
209	Wrench 5/16" Hex. Open-End Offset
211	Pliers 3/8"
KS-6015	Duck-bill Pliers
-	Jewelers' Screw-Driver
-	Bell System Cabinet Screw-Driver 3-1/2" per A. T. and T. Co. drawing 46-X-40

**GAUGES**

62-B (or the replaced 62)	0-700 Gram Gauge
68-B (or the replaced 58)	70-0-70 Gram Gauge
79-B	0-1000 Gram Push-Pull Tension Gauge

**TEST APPARATUS**

35-C	Test Set
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**MATERIALS**

KS-2423	Cloth
KS-6232	Oil
KS-7860	Petroleum Spirits
-	Toothpicks, Hard Wood, Flat at One End and Pointed at the Other

**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 procedures 3.02, M-8 to M-10 and M-14, 3.06, M-4 and 3.09, M-2.

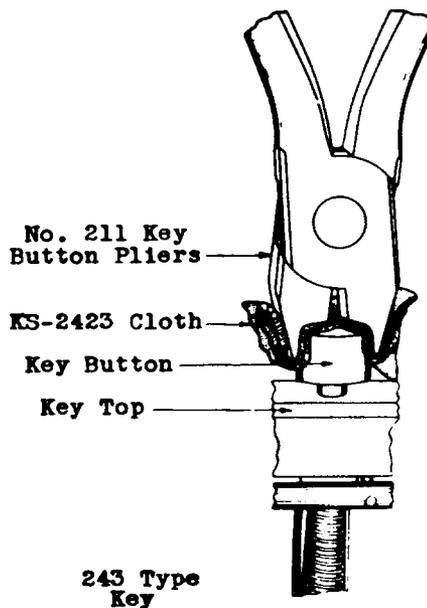
**3.02 PLUNGER MOVEMENT (Rq.2.02)**

**M-1** Cracked, warped or broken hard rubber key tops may cause the

plunger to bind and thus prevent or delay the release of a plunger. In this case the key top should be replaced. To remove the key top it will first be necessary to remove the key buttons.

**M-2** When removing the key button from keys equipped with lock nuts, loosen the lock nut by turning it away from the button with the No. 209 wrench. Place three or four thicknesses of KS-2423 cloth over the button, grip it firmly with the No. 211 key button pliers as required and then while holding the lock nut with the No. 209 wrench, remove the button.

**M-3** Remove the key buttons from keys not equipped with lock nuts, with the No. 211 key button pliers, placing three or four thicknesses of KS-2423 cloth over the button as shown in Fig. 6.



**Fig. 6 - Method of Removing Key Button from Key not Equipped with Lock Nuts**

**M-4** 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-5** 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

## 3.02 (Continued)

all loose screws with the No. 35 screw-driver.

**M-6** In the case of non-locking keys, 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 raise the keyshelf, 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-7** If the plunger rod binds in the key top slot, loosen the key top mounting screws with the No. 35 screw-driver and shift the key top if possible until no bind occurs. If necessary remove the key top as described in M-2 to M-4 and ream out the plunger slot.

**M-8** A bind may be due to a dirty plunger or to a roughened, bent or dirty plunger rod. If a locking plunger is dirty remove the key as follows. Where the keyshelf is equipped with retaining strips, remove the retaining strip screws with the 3-1/2" cabinet screw-driver and remove both retaining strips. Then remove the mounting screws and raise the key out of the keyshelf. Remove the plunger screw, remove the plunger and wipe it thoroughly with a clean dry KS-2423 cloth. At the same time it is advisable to see whether the plunger is worn. Replace any plunger which shows flat spots.

**M-9** Whenever it is necessary to remove the plunger rod or helical spring on a locking key take the key apart in the following manner. Remove the nuts holding the magnet unit to the key frame with the No. 48 combination wrench and screw-driver and remove the entire unit together with the two mounting sleeves. Then while holding the key in a position similar to the normally mounted position, remove the key buttons as outlined in M-2 and M-3 and remove the key frame. Remove the armature screw with the jewelers' screw-driver and remove the armature. The plunger rod can now be taken out from the spring mounting strip. Examine the rod closely and if it is found to be burred or bent replace it with a new one. If the bind is due merely to a dirty plunger rod, clean it and its

slots thoroughly with petroleum spirits applied with a toothpick. It is advisable while the key is apart to clean all the plunger rods and also the surfaces of the plunger springs on which the plungers move. Clean the springs with a toothpick which has been dipped in petroleum spirits. Do not use the same toothpick for more than one operation. Exercise care to keep the petroleum spirits from coming in contact with the hard rubber plungers.

**M-10** Whenever it is necessary to remove the locking plunger from a key arranged to mount in universal type mountings, proceed in the following manner. Raise the keyshelf, remove the mounting screws with the 3-1/2" cabinet screw-driver and then raise the key above the keyshelf if possible without unsoldering any form wires. Remove the plunger screw, remove the plunger and wipe it thoroughly with a clean dry KS-2423 cloth. Then proceed to take the key apart and clean it as outlined in M-9.

**M-11** If the bind on a non-locking key is not due to the above condition, see whether the plunger rod is binding in the plunger guide of the spring assembly mounting block. If the plunger rod binds in the plunger guide of the spring assembly mounting block, remove the key buttons as outlined in M-2 and M-3, remove the key top screws with the No. 35 screw-driver and remove the key top. Then remove the key unit mounting screws with the No. 35 screw-driver and remove the unit. Loosen the spring assembly mounting screws with the 3-1/2" cabinet screw-driver and shift the block very slightly so as to eliminate the bind. Retighten the spring assembly screws securely.

**M-12** In determining the cause for bind on a non-locking key, check for a bent plunger rod by revolving it and watching for side motion of the rubber plunger. At the same time it is advisable to see whether the rubber plunger is worn. Whenever necessary to take the key apart remove the key from its mounting as outlined in M-11.

**M-13** If necessary to remove the helical spring or plunger rod, remove the spring assembly screws. Remove the spring assembly, the plunger rod and the helical spring.

**M-14** If the bind is merely due to a dirty plunger rod clean it and the plunger slot thoroughly with

## 3.02 (Continued)

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-15 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-16 In resetting the key buttons on non-locking keys, turn down the lock nut as far as it will go and set the button so that it will line up with the buttons on adjacent keys. Place three or four thicknesses of KS-2423 cloth over the button. Grip it firmly with the No. 211 key button pliers and then while holding it firmly, tighten the lock nut up against the key button.

- 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)
- 3.07 CONTACT FOLLOW (Rq.2.07)
- 3.08 CONTACT SEQUENCE (Rq.2.08)

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

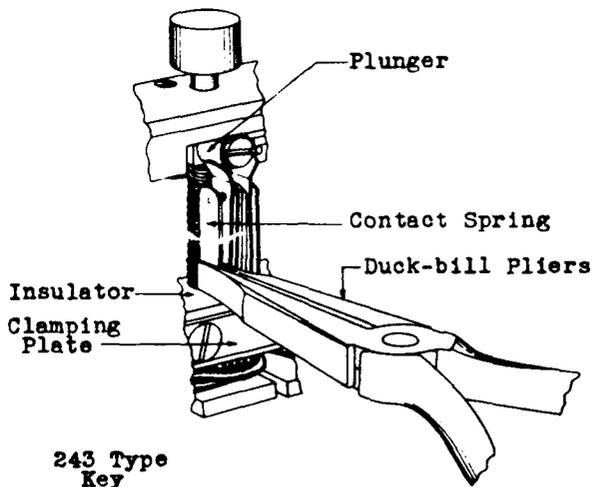


Fig. 7 - Method of Adjusting for Contact Separation, Spring Clearance, Contact Pressure, Contact Follow and Contact Sequence

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 as shown in Fig. 7. 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 on non-locking keys, see that the contact points lie wholly within the periphery of the corresponding discs. If necessary, remove the keys as outlined in procedure 3.02, M-11 and loosen the spring assembly screws with the 3-1/2" cabinet screw-driver. 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. Reassemble the key.

M-3 Contact Separation and Spring Clearance Failure to meet the specified clearance between the inner contact springs and the helical spring may be due to excessive plunger spring tension. Adjust the plunger springs with the duck-bill pliers so as to decrease the contact separation between the plunger spring and the normally open contact. Then adjust the inner contact springs away from the helical spring sufficiently to meet the contact pressure requirement. See that the minimum contact separation is maintained at all times.

M-4 Contact Pressure Foreign matter wedged between the contact springs may prevent the 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 Contact Sequence When adjusting for contact sequence increase or decrease the contact separation, contact pressure, contact follow and spring clearance as required as outlined in M-1.

3.09 PLUNGER OPERATE PRESSURE (Rq.2.09)  
 3.10 PLUNGER NON-OPERATE PRESSURE (Rq.2.10)

M-1 If a plunger is stiff and fails to meet the plunger operate requirement first examine the helical spring to determine whether it is broken or distorted in any way and if necessary replace it taking the key apart as outlined in procedure 3.02, M-11 and M-13.

M-2 Next examine the plunger springs to determine whether a gummy substance has formed on them. Clean the surface of the plunger springs with a toothpick which has been dipped in petroleum spirits. Do not use the same toothpick for more than one operation. Wipe the hard rubber plunger with a clean dry KS-2423 cloth.

M-3 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 2.09 is being developed. Until this gauge is available it will be satisfactory to estimate the pressure by "feel".

M-4 No lubricant should be used on the key plunger to facilitate this adjustment.

M-5 If a 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 outlined in procedure 3.02, M-11 and M-13.

3.11 ELECTRICAL REQUIREMENTS (Rq.2.11)

M-1 Connect the test set leads directly to the magnet terminals and depress the plunger rod to its operate position. With the plunger in this position apply the specified soak current. When the key has been satisfactorily soaked (approximately 5 seconds) remove the mechanical force from the plunger button and release the soak key. The plunger should now release and restore to the normal position. If the plunger fails to release examine the helical spring to determine whether or not it is broken or distorted. If necessary replace the helical spring taking the key apart as outlined in procedure 3.02, M-2, M-3, M-8 to M-10.

M-2 If the trouble is not due to the helical spring increase the tension of the contact and plunger springs using the duck-bill pliers.

M-3 After applying the soak and release (open circuit) requirements depress the plunger rod to its operated position and apply the locking current values. Under this condition when the external mechanical force holding the plunger rod down is removed the plunger rod should remain in the operated position. Failure to meet this condition is due to the tension of the contact and plunger springs being excessive. Decrease the tension very slightly using the duck-bill pliers and recheck the key applying the soak, release (open circuit) and locking value.