3-TYPE COUNTER
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the 3-type counters used initially to indicate the end of the initial interval of an operator assisted call.

1.02 This section is reissued to revise the information covering lubrication, to add requirements and procedures covering position of stationary contact spring, and to revise the requirements for stepping armature restoring spring force and operate time. Detailed reasons for reissue will be found at the end of the section.

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 ***Asterisk (*):*** Requirements are marked with an asterisk when to check for them would necessitate 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 ***Phi (ϕ):*** Requirements are marked with a phi when they are not required to be checked before turnover.

1.06 ***Make-Busy Information:*** Before checking or adjusting for any requirement on the counter, make the associated circuit busy in accordance with approved methods. If necessary, disconnect the leads and remove the counter from its mounting to facilitate checking the requirements or making adjustments.

1.07 ***Operate***

(a) ***Stepping Coil:*** Fig. 1 — The stepping coil is considered to operate if, when current is connected to the windings, the armature moves sufficiently towards the core to rotate the bottom cam [Fig. 1(A)] approximately 18 degrees from its initial or reset position. The most severe test usually occurs with pulse 1 and pulse 21, 41, 61, 81, or 101, depending on the individual codes. A pulse is defined as a single application of current to the winding.

(b) ***Reset Coil:*** Fig. 2 — The reset coil is considered to operate if, when current is connected to the windings, the armature moves sufficiently towards the core to cause the reset finger to rest firmly against the depression in the reset cams. The most severe reset test usually occurs after pulse 90, 91, 110, and 111.

1.08 ***Release***

(a) ***Stepping Coil:*** Fig. 1 — The stepping coil is considered to release if, when current is disconnected from the coil, the armature moves from the frontstop or core to the backstop.

(b) ***Reset Coil:*** Fig. 2 — The reset coil is considered to release if, when current is disconnected from the coil, the armature moves from the frontstop or core toward its backstop. It is not necessary for the armature to rest against the backstop.

1.09 An operate card and associated contacts are considered to be in the unoperated position when the tip of the operate card is off the cam lobe, the break contacts are closed, and the make contacts are open. The card and contacts are considered to be in the operated position when the tip of the card rests against the projected portion of the cam lobe, the break contacts are open, and the make contacts are closed.

1.10 One drop of KS-6232 light mineral oil for the purpose of this section is obtained when the adjustable stop collar of the KS-14796 oiler is set for the discharge of this quantity from the nozzle when the plunger is depressed and released once.

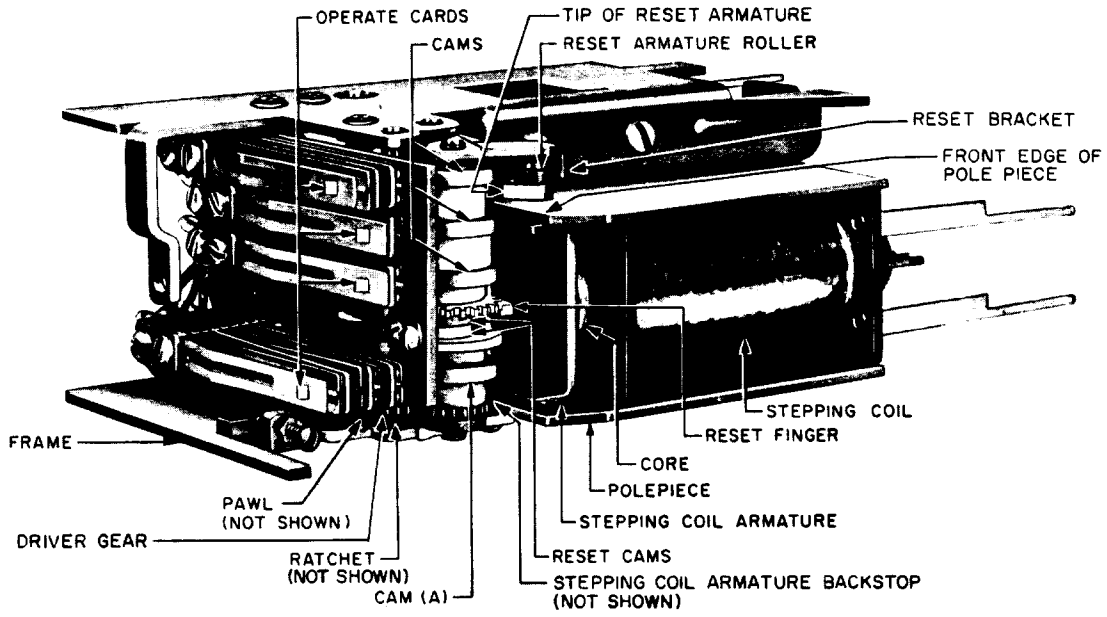

Fig. 1 – 3-Type Counter — Right Side View (cover removed)

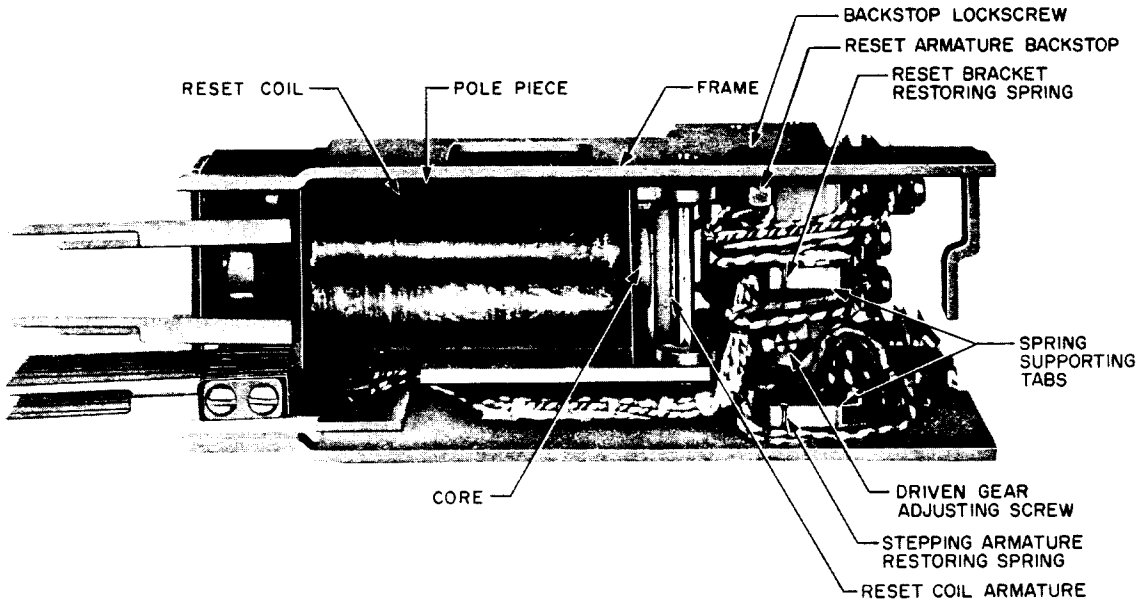

Fig. 2 – 3-Type Counter — Left Side View (cover removed)

2. REQUIREMENTS

2.01 ***Lubrication***

(a) The following parts shall be adequately lubricated with KS-6232 light mineral oil. When lubrication is necessary the oil shall be applied as follows.

(1) ***Ratchet:*** One drop to the upper part of the ratchet.

(2) ***Driver Gear:*** One drop to the upper side of the driver gear adjacent to the shaft which may be seen through the clearance slot of the pinion guide bracket when the reset armature is operated.

(3) ***Shafts:*** One drop to the upper part of each shaft where the shaft enters each bushing, the frame, and the pole-piece.

(4) ***Reset Armature Roller:*** One drop to the reset armature roller.

(5) ***Pawl Bearing:*** One drop to the upper side of the pawl.

(b) ***Lubrication Interval:*** The counter shall be lubricated every 2 years. The interval may be extended if periodic inspections have indicated that conditions are such as to insure that the parts will be adequately lubricated during the extended interval.

2.02 ***Record of Lubrication:*** During the period of installation, a record shall be kept by date of the lubrication of the counter and this record shall be turned over to the telephone company with the equipment. If no lubrication has been done, the record shall so state.

2.03 ***Mounting of Counter:*** The counter shall be fastened securely to its mounting.

Gauge by feel.

ϕ2.04** ***Clearance Between Tip of Operate Card and Cam: Fig. 3(A)

(a) There shall be perceptible clearance between the tip of each operate card and its associated cam after the reset armature is operated and released. [See 1.07(b) and 1.08(b).]

Gauge by eye.

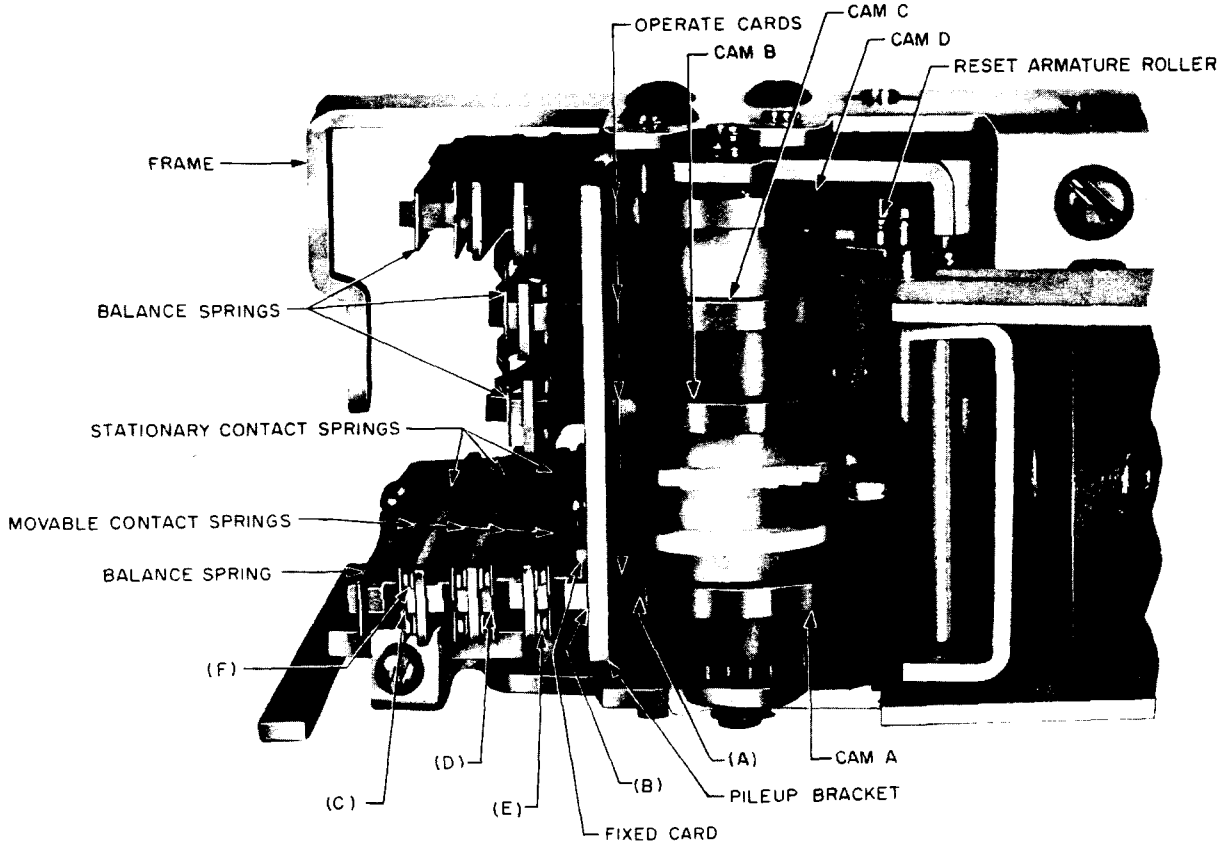

Fig. 3 – Partial Right Side View of 3-Type Counter (cover removed)

(b) The position of each operate card with respect to the associated cam shall be as shown in Table A when the number of pulses to the stepping coil is as specified in the table.

Gauge by eye.

*ϕ2.05 ***Clearance Between Shoulder of Operate Card and Pile-Up Bracket:*** Fig. 3 (B) — With the operate card in the operated position (1.09), the clearance between the shoulder on each card and the pile-up bracket shall be

Min 0.025 inch

Max 0.032 inch

Use the KS-6909 thickness gauge nest.

*ϕ2.06 ***Clearance Between Movable Break Contact Spring and Mating Surface of Operate Card:*** Fig. 3(C) — With the operate card in the unoperated position (1.09), there shall be perceptible clearance between a movable break contact spring and the mating surface of the operate card.

Gauge by eye.

*ϕ2.07 ***Clearance Between Movable Make Contact Spring and Mating Surface of Operate Card:*** Fig. 3(D) — With the operate card in the operated position (1.09), there shall be perceptible clearance between a movable make contact spring and the mating surface of the operate card.

Gauge by eye.

*ϕ2.08 ***Clearance Between Movable and Stationary Make Contacts:*** Fig. 3(E) — With the operate card in the unoperated position (1.09), the clearance between a movable and stationary make contact shall be

Min 0.010 inch

Max 0.020 inch

Use the KS-6909 thickness gauge nest.

*ϕ2.09 ***Clearance Between Movable and Stationary Break Contact:*** Fig. 3(F) — With the operate card in the operated position (1.09),

TABLE A

Cam	A	B			C			D		
DURATION OF INITIAL INTERVAL IN MINUTES BASED ON A PULSE EVERY 3 SECONDS		1	2	3	2	3	4	3	4	5
NUMBER OF PULSES AFTER RESETTING CAMS	"X" denotes tip of operate card resting against cam. "O" denotes perceptible clearance between tip of operate card and cam.									
0	O	O	O	O	O	O	O	O	O	O
1	X	O	O	O	O	O	O	X	X	X
2 through 6	X	O	O	O	O	O	O	O	O	O
7 through 20	O	O	O	O	O	O	O	O	O	O
21 through 26	X	X	O	O	O	O	O	O	O	O
27 through 40	O	X	O	O	O	O	O	O	O	O
41 through 46	X	O	X	O	X	O	O	O	O	O
47 through 60	O	O	X	O	X	O	O	O	O	O
61 through 66	X	O	O	X	O	X	O	X	O	O
67 through 80	O	O	O	X	O	X	O	X	O	O
81 through 86	X	O	O	O	O	O	X	O	X	O
87 through 100	O	O	O	O	O	O	X	O	X	O
101 through 106	X	O	O	O	O	O	O	O	O	X
107 through 120	O	O	O	O	O	O	O	O	O	X
121 through 126	X	O	O	O	O	O	O	O	O	O
127	O	O	O	O	O	O	O	O	O	O

the clearance between a movable and stationary break contact shall be

Min 0.007 inch

Use the KS-6909 thickness gauge nest.

ϕ2.10 ***Position of Stationary Contact Spring:*** Fig. 3

(a) With the operate card in the unoperated position (1.09), the stationary contact spring shall rest against the mating surface of the fixed card.

Gauge by eye.

(b) With the operate card in the operate position (1.09), the stationary contact spring shall rest against the mating surface of the fixed card.

Gauge by eye.

ϕ2.11** ***Pressure of Balance Spring: Fig. 3 and 4— The pressure of a balance spring against the operate card shall be

Min 10 grams

Max 20 grams

Use the 70H gauge with the adjustable stop removed.

To check the requirement, position the reed of the gauge against the balance spring as shown in Fig. 4. Then gradually exert pressure against the spring with the reed and observe the indication of the gauge as the spring just begins to move.

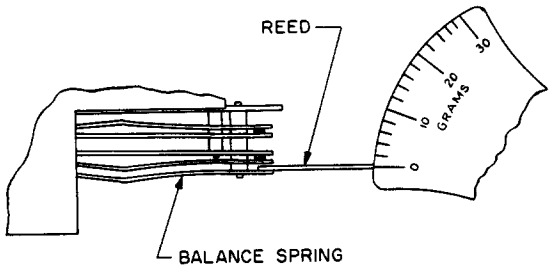

Fig. 4 – 70H Gauge Positioned to Check Pressure of Balance Spring

ϕ2.12** ***Freedom of Movement of Armatures: Fig. 1 and 2 — The stepping coil and reset coil armatures shall be free to operate and release with slight manual pressure as well as electrically. (See 1.07 and 1.08.)

Gauge by eye or feel.

ϕ2.13** ***Clearance Between Armature and Pole Piece: Fig. 1 and 2 — There shall be perceptible clearance between each armature and pole piece when the armature is in its electrically operated position.

Gauge by eye and feel.

ϕ2.14** ***Clearance Between Reset Armature Roller and Lobe of Cam D: Fig. 3 — The reset armature roller shall clear the lobe of cam D when the reset armature is in the released position [1.08(b).]

Gauge by eye.

To check the requirement, manually rotate cam D so that the lobe of the cam is nearest the roller and observe whether the roller clears the lobe.

ϕ2.15** ***Stepping Armature Restoring Spring Force: Fig. 5 — With the stepping armature in the unoperated position, the force required at the pawl screw to move the armature off the backstop shall be

Min 25 grams

Max 85 grams

Use the 70J gauge.

To check the requirement, apply the gauge to the head of the pawl screw as follows. With the counter viewed as shown in Fig. 5, position the gauge with the reed perpendicular to the frame and the tip of the reed against the lower edge of the head of the pawl screw so as to obtain an indication on the gauge when upward pressure is exerted on the head. Then exert upward pressure on the head with the gauge and observe the indication on the gauge as the screw just starts to move.

ϕ2.16** ***Reset Bracket Restoring Spring Force: Fig. 1 — With the reset armature in the unoperated position and all cards off the cams, the force required at the tip of the reset armature to move the reset bracket shall be

Min 120 grams

Max 165 grams

Use the 70J gauge.

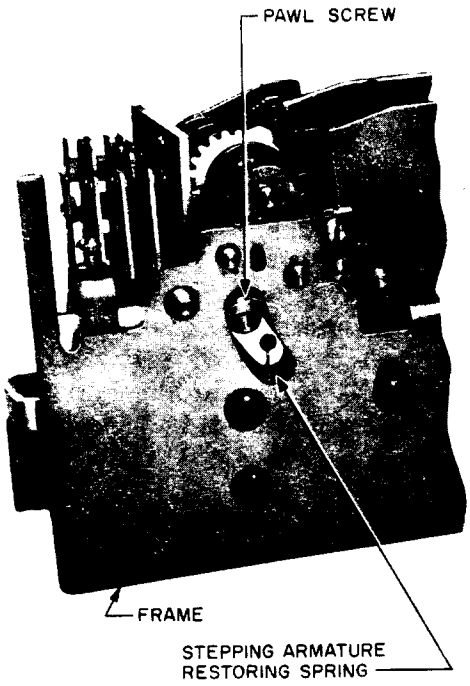

Fig. 5 – Partial Bottom View of 3-Type Counter (cover removed)

To check the requirement, apply the gauge to the tip of the reset armature as follows. Referring to Fig. 2, position the gauge with the reed parallel to the front edge of the pole piece and the tip of the reed against the tip of the reset armature so as to obtain an indication on the gauge when pressure toward the reset bracket is exerted on the tip of the armature. Exert pressure on the tip of the armature with the gauge and observe the indication on the gauge as the reset bracket just starts to move.

*ϕ2.17 ***Operate Voltage:*** The stepping coil and reset coil shall operate (1.07) when 45 volts dc is applied across the terminals of the coil.

Use 35-type test set.

To check this requirement, use a 35-type test set having a voltmeter. If a test set with voltmeter is not available, use the external voltmeter in conjunction with the test set. If test set preparation is not specified on the circuit requirement table, disconnect the counter from the circuit and furnish battery and ground through the test set with B/G/V preparation as covered in Section 100-101-101.

*ϕ2.18 ***Operate Time:*** The operate time for the stepping coil and reset coil when 45 volts dc is applied across the coil terminals shall be:

		TIME (max)
→	Stepping Coil	27.5 milliseconds
→	Reset Coil	150 milliseconds

This requirement shall be considered met if the stepping coil and reset coil operate in step with the associated circuit and the cams are positioned in accordance with Table A.

3. ADJUSTING PROCEDURES

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

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
415B	Spring Adjuster
532B	Spring Adjuster
KS-6320	Orange Stick
→KS-14796	Oiler
R-2958	5/64-Inch Allen Wrench
—	4-Inch E Screwdriver
GAUGES	
70H	0-30 Gram Gauge
70J	0-150 Gram Gauge
KS-6909	Thickness Gauge Nest
MATERIALS	
→KS-6232	Light Mineral Oil
—	0.004- by 3/16- by 4-Inch Steel Strip
TEST APPARATUS	
35-Type	Test Set
—	Voltmeter, DC, Weston Model 931 With 300/150/75/30 Volt Ranges or Equivalent (if 35-type test set having voltmeter is not available) (see reqt 2.17)

3.01 *Lubrication* (Reqt 2.01)

→ (1) Apply the KS-6232 light mineral oil to the
→ various parts using the KS-14796 oiler. After applying the oil, operate the stepping armature and reset armature several times with the KS-6320 orange stick to work in the oil.

(2) To lubricate the driver gear operate the reset armature and apply oil as covered in 2.01(a)(2).

3.02 ***Record of Lubrication*** (Reqt 2.02)
(no procedure)

3.03 ***Mounting of Counter*** (Reqt 2.03)

(1) If the requirement is not met, securely tighten the mounting screws using the 4-inch E screwdriver.

3.04 ***Clearance Between Tip of Operate Card and Cam*** (Reqt 2.04)

(1) If the requirement is not met, check requirement 2.05. If the requirement cannot be met, replace the counter.

3.05 ***Clearance Between Shoulder of Operate Card and Pile-Up Bracket*** (Reqt 2.05)
3.06 ***Clearance Between Movable Break Contact Spring and Mating Surface of Operate Card*** (Reqt 2.06)
3.07 ***Clearance Between Movable Make Contact Spring and Mating Surface of Operate Card*** (Reqt 2.07)
3.08 ***Clearance Between Movable and Stationary Make Contacts*** (Reqt 2.08)
3.09 ***Clearance Between Movable and Stationary Break Contacts*** (Reqt 2.09)
3.10 ***Position of Stationary Contact Spring*** (Reqt 2.10)

(1) If any one of the requirements is not met, replace the counter.

3.11 ***Pressure of Balance Spring*** (Reqt 2.11)

(1) If the requirement is not met, adjust the balance spring using the 415B spring adjuster as follows. Position either end of the spring adjuster on the balance spring just to the right of the bend so that the full width of the spring is engaged by the slot in the end of the adjuster. Then, to increase the pressure, bend the spring towards the operate card. To decrease the pressure, bend the spring away from the operate card. Take care to avoid excessively bending the spring. After adjustment, make sure that the balance spring properly engages the operate card and recheck the requirement.

3.12 ***Freedom of Movement of Armatures*** (Reqt 2.12)

(1) If an armature binds, work the 0.004 inch steel strip into and out of each gap between the armature and pole piece several times to clean out any accumulated dirt. Then, lubricate the armature shaft bushings in accordance with 2.01(a)(3). If the requirement cannot be met, replace the counter.

3.13 ***Clearance Between Armature and Pole Piece*** (Reqt 2.13)

(1) If the requirement is not met, check requirement 2.12. If requirement 2.12 cannot be met, replace the counter.

3.14 ***Clearance Between Reset Armature Roller and Lobe of Cam D*** (Reqt 2.14)

(1) If the reset armature roller does not clear the lobe of the cam, adjust the reset armature backstop as follows. Referring to Fig. 2, loosen the backstop lockscrew using the R-2958 Allen wrench. With the counter viewed as shown in Fig. 2, move the backstop slightly towards the left and securely tighten the screw. Then recheck the requirement.

3.15 ***Stepping Armature Restoring Spring Force*** (Reqt 2.15)
3.16 ***Reset Bracket Restoring Spring Force*** (Reqt 2.16)

(1) If either requirement is not met, refer to Fig. 2 and bend the spring supporting tab associated with the spring to be adjusted as follows. Apply the 532B spring adjuster to the tab and bend the tab outward from the counter to increase the spring tension or inward to decrease the tension. Take care to avoid excessively bending the tab. Recheck the requirement.

3.17 ***Operate Voltage*** (Reqt 2.17)
3.18 ***Operate Time*** (Reqt 2.18)

(1) If either requirement is not met, check requirement 2.12. Then recheck the requirement. If the requirement is still not met, replace the counter.

REASONS FOR REISSUE

1. To omit information covering definition of one drop of grease (1.09 of previous issue).
2. To add information covering definition of one drop of KS-6232 light mineral oil (1.10).
3. To revise requirements and procedures covering lubrication (2.01 and 3.01).
4. To add requirements and procedures covering position of stationary contact spring (2.10 and 3.10).
5. To revise the requirement for stepping armature restoring spring force (2.15).
6. To revise the requirement for reset bracket restoring spring force (2.16).
7. To revise the requirement for operate time (2.18).
8. To revise the list of tools, gauges, materials, and test apparatus (3.001).