

## ELECTRIC CLOCKS

### 1 TYPE

### REQUIREMENTS AND ADJUSTING PROCEDURES

#### 1. GENERAL

1.01 This section covers 1 type electric clocks.

1.02 This section is reissued to incorporate material from the addendum in its proper location.

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 dismantling 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 *Operate* means that when current is applied to the winding, the armature moves toward the core until the armature adjusting screw touches the front stop and the operating pawl advances the fractional minute wheel to the next position.

1.07 *Non-Operate* means that when current is applied to the winding, the armature does not move away from the armature backstop rod.

1.08 *One drop of oil* for the purpose of this section is the amount of oil that may be released from a piece of No. 22 bare tinned copper wire after it has been dipped into KS-6232 oil to a depth of 1/2" and slowly removed.

#### 2. REQUIREMENTS

##### 2.01 *Cleaning*

(a) The bearings and contact surfaces shall be thoroughly cleaned with KS-7860 petroleum spirits at least once a year.

(b) After cleaning, allow the clock to dry and then relubricate in accordance with requirement 2.02.

##### 2.02 *Lubrication*

(a) The electric clock shall be adequately lubricated with KS-6232 oil. When lubrication is necessary, one drop of oil shall be applied to each of the following points:

Bearing at each end of all shafts—Fig. 1(A)

Teeth of each pinion — Fig. 1(B)

Bearing surface of each pinion — Fig. 1(C)

(b) After turnover, it is recommended that the above mentioned parts be lubricated at intervals of one year. This interval may be extended if periodic inspections have indicated that local conditions are such as to insure that requirement (a) will be met during the extended interval.

2.03 *Record of Lubrication:* During the period of installation a record shall be kept, by date, of the lubrication of the electric clock 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.

2.04 *Mounting:* The bracket shall be held securely by the mounting screws and the clock shall be held tightly in the bracket by the mounting nut. Gauge by feel.

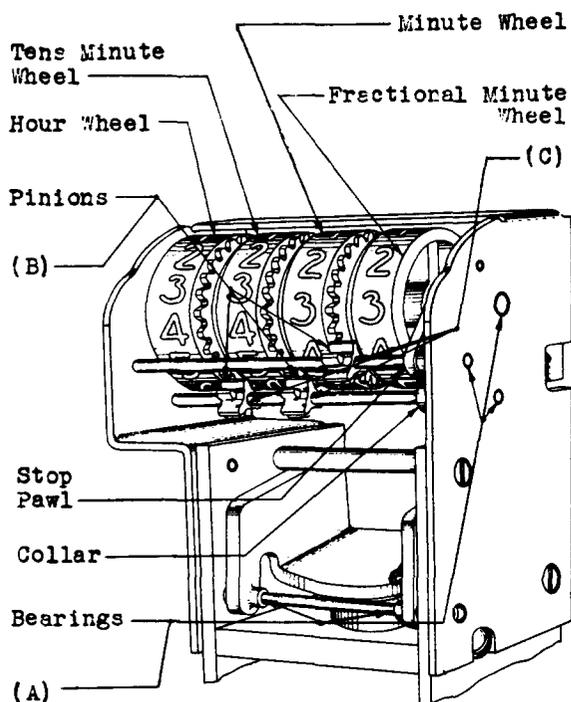


Fig. 1

**2.05 Armature Air-gap:** Fig. 2(A) — With the armature in its operated position, the clearance between the end of the core and the under side of the armature shall be:

Min. .010"

Use the No. 74-D gauge.

**2.06 Tightness of Lock Nut:** Fig. 2(B) — The armature adjusting screw locknut shall be sufficiently tight to hold the screw in any adjusted position.

**2.07 Back Lash:** Fig. 2(C) — The fractional minute wheel shall have a noticeable forward and backward movement or "back lash." The back lash shall not be sufficient to allow the top of any figure to lie above the top edge of the cap window or the bottom of any figure to lie below the bottom edge of the cap window when viewed from a position which the operator would normally occupy.

**Note:** This requirement shall be noted when the electric clock is electrically operated and shall be met on each tooth on the ratchet wheel.

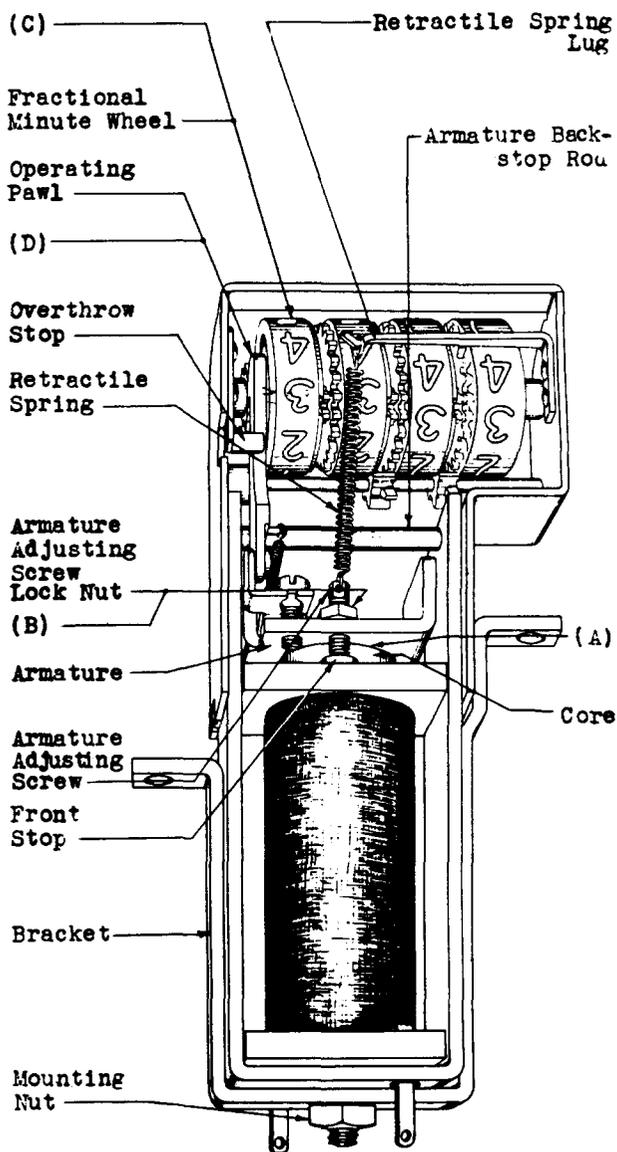


Fig. 2

**2.08 Freedom of Operation of Operating Pawl:**

Fig. 2(D) — The operating pawl shall not bind on its bearing or against the side of the fractional minute wheel. If the pawl touches the fractional minute wheel, due to side play in the pawl, but can be made to stand away from the wheel it shall not be considered as binding against the wheel.

**Note:** This requirement shall be noted when the electric clock is electrically operated and shall be met on each tooth on the ratchet wheel.

**2.09 Position of Stop Pawl:** Fig. 3(A) — The stop pawl shall drop into its normal position behind each tooth of the ratchet wheel.

*Note:* This requirement shall be noted when the electric clock is electrically operated.

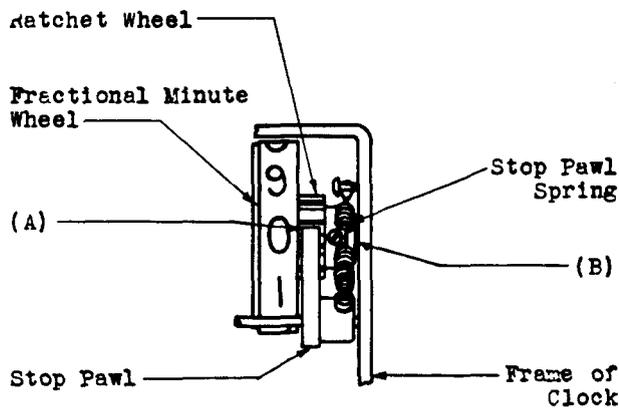


Fig. 3

**2.10 End Play:** Fig. 3(B) — The end play between the fractional minute wheel hub and the frame shall be

- Min 0.003 In.
- Max 0.008 In.

Use the No. 74D Gauge.

**2.11 Pawl Clearance:** Fig. 4(A) — There shall be a slight clearance between the operating pawl and the overthrow stop. This requirement shall be considered as having been satisfactorily met if, with the clock electrically operated, the operating pawl may be moved slightly from side to side without binding on the overthrow stop. The clearance shall not be sufficient to permit overcount.

*Note:* This requirement shall be noted when the electric clock is electrically operated and shall be met on each tooth on the ratchet wheel.

**2.12 Position of Retractable Spring:** The retractile spring shall not touch the cap or the number wheels.

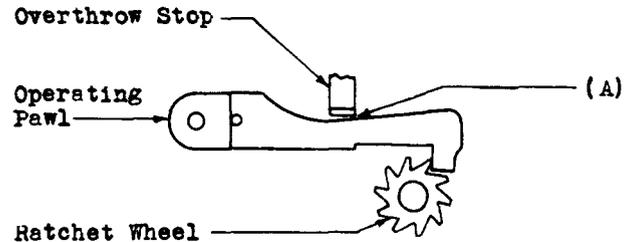


Fig. 4

**2.13 Location of Tip of Retractable Spring Lug:** Fig. 5(A)

(a) At the time of turnover to the Telephone Company there shall be a clearance between the tip of the retractile spring lug and the inside face of the top frame cross piece of:

- Min 1/8 In.
- Max 3/8 In.

The lug shall be approximately straight except for the bend made at the tip for holding the spring. Gauge by eye.

(b) After turnover it will be satisfactory, in readjusting, to bend the retractile spring lug to the outside face of the top frame cross piece.

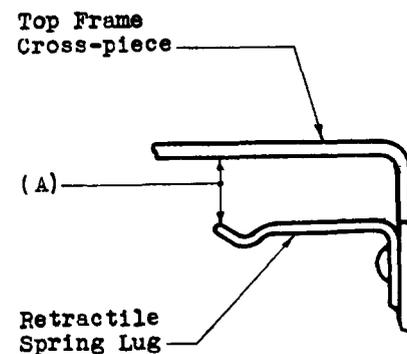


Fig. 5

**2.14 Electrical Requirements****(a) Nos. 1A and 1B Electric Clocks**

	OPERATE	NON-OPERATE
No. 1A (Test	0.036 Amp	0.019 Amp
(Readj	0.028 Amp	0.020 Amp
No. 1B (Test	0.025 Amp	0.013 Amp
(Readj	0.0195 Amp	0.0138 Amp

(b) *The No. 1-C electric clock*, when mounted with the centerline of its core at an angle of 30° forward from the vertical, shall operate and non-operate on any tooth of the ratchet wheel on the current values specified in the circuit requirements table.

**2.15 Cover Tightness:** The cap shall be tight but easily removable with the fingers.

**3. ADJUSTING PROCEDURES****3.001 List of Tools, Gauges, Materials and Test Apparatus**

CODE NO.	DESCRIPTION
<b>TOOLS</b>	
74	Wrench — 5/32" and 7/32" Hex. Open Double-end Flat
417-A	Wrench — 1/4" and 3/8" Hex. Open Double-end Flat
—	Jeweler's Screwdriver
—	Tweezers
—	Bell System Cabinet Screwdriver — 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
KS-14164	No. 4 Artists' Show Card Brush
<b>GAUGES</b>	
74-D	Thickness Gauge Nest

CODE NO.	DESCRIPTION
<b>MATERIALS</b>	
KS-2423	Cloth
KS-6232	Oil
KS-7860	Petroleum Spirits
—	No. 20 Bare Tinned Copper Wire
—	No. 22 Bare Tinned Copper Wire
—	Spare Main Shaft
<b>TEST APPARATUS</b>	
35-C	Test Set

**3.002 Removing and Remounting Electric Clock** — In making the adjustments specified herein, it may be necessary to remove the electric clock from its mounting. To do this unsolder the leads, if necessary. Then remove the mounting nut with the No. 417-A wrench. Remount the clock, taking care that requirement 2.04 (Mounting) is met. Resolder the leads to the clock terminals if they have been removed, and make an inspection of the wiring.

**3.01 Cleaning****3.02 Lubrication**

M-1 To clean the clock remove the cover and, with the No. 4 Artists' show card brush dipped into KS-7860 petroleum spirits, thoroughly clean all of the bearings and contact surfaces. Take the necessary precautions to prevent the petroleum spirits from splattering on adjacent equipment.

M-2 After this general cleaning, replace the main shaft with the spare main shaft, which has been thoroughly cleaned with KS-7860 petroleum spirits and which has been lubricated with a drop of KS-6232 oil. Do this by loosening the main shaft set screw (see Fig. 6) with the jeweler's screwdriver and push out the main shaft by means of the spare main shaft. See that both ends of the spare main shaft are inside the outer surfaces of the clock frame so that when the clock cover is in place, it will not bear against the ends of the main shaft. Then tighten the main shaft set screw.

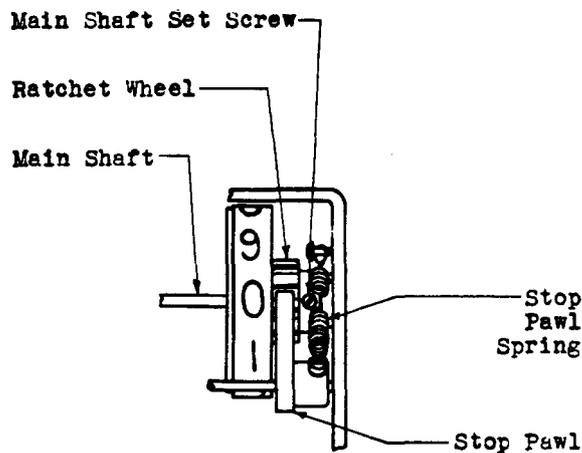


Fig. 6 - Illustrating Parts of Electric Clock

M-3 In case these methods are not sufficient to clean the clock satisfactorily, it will be necessary to remove the number wheels and shafts and thoroughly clean the wearing surfaces with KS-7860 petroleum spirits.

M-4 In performing this operation, place the clock on a table or bench so that the pinions, collars and washers will not be lost when they drop out.

M-5 To take the clock apart, loosen the main shaft set screw and the two pinion shaft collar set screws with the jeweler's screwdriver. Push out the main shaft with the spare main shaft and the pinion shafts with a piece of No. 20 bare tinned copper wire. This operation will free all the number wheels, washers, collars and pinions.

M-6 Clean the number wheels with a KS-2423 cloth and clean the collars, shafts (including the spare main shaft), washers and pinions by washing them in a small container of KS-7860 petroleum spirits.

M-7 With the No. 4 Artists' show card brush dipped into petroleum spirits, thoroughly clean all the bearings including the number wheel bearings, armature and operating pawl and the ratchet wheel. Take care not to let the petroleum spirits get on the painted surfaces of the number wheels.

M-8 Lubricate both main shafts with KS-6232 oil, spreading a drop of oil over the entire surface of each shaft and insert one of the main shafts through the bearing next to the ratchet wheel. Slide the fractional minute and the minute wheels on this main shaft, lifting the operating pawl to permit the fractional minute wheel to fit up against the hub of the bearing. Insert the other main shaft through the opposite bearing and place the washers on it so that they will fit up against the hub of the bearing and slide the hour wheel on and up close to the washers. See that neither main shaft protrudes beyond the minute wheel and hour wheel respectively. Now put the tens minute wheel in place with the tweezers. Push one of the main shafts through the hub in the tens minute wheel and into place, taking care not to allow the washers to drop out and push out the other main shaft. With the main shaft in place, tighten the main shaft set screw. See that the number wheels turn freely on the shaft.

M-9 Hold the stop pawl in place and slide a pinion shaft through the adjacent bearing and through the collar of the stop pawl. Turn the minute and fractional minute wheels so that the center of any two numbers on the wheels are in horizontal alignment. Hold the larger pinion so as to properly engage the cogs on these two wheels and slide the pinion shaft through to the opposite bearing. See that the shaft does not protrude beyond the outside surfaces of the clock frame and then tighten the set screw in the stop pawl collar. With the aid of the tweezers, hook one end of the stop pawl spring on the set screw in the collar and the other end on the lug on the inside surface of the clock frame.

M-10 Bend a piece of straight No. 20 bare tinned copper wire at a point about 1/4" from the end, to an angle of approximately 60°. Slide the other pinion shaft collar on the bent portion of the wire and hold it in place adjacent to its pinion shaft bearing beneath the ratchet wheel. Slide the pinion shaft through the adjacent bearing and through the collar. Turn the tens minute wheel so that any two numbers on the two minute wheels are in approximate horizontal alignment when viewed from the top of the clock. With the tweezers, hold one of the pinions so as to properly en-

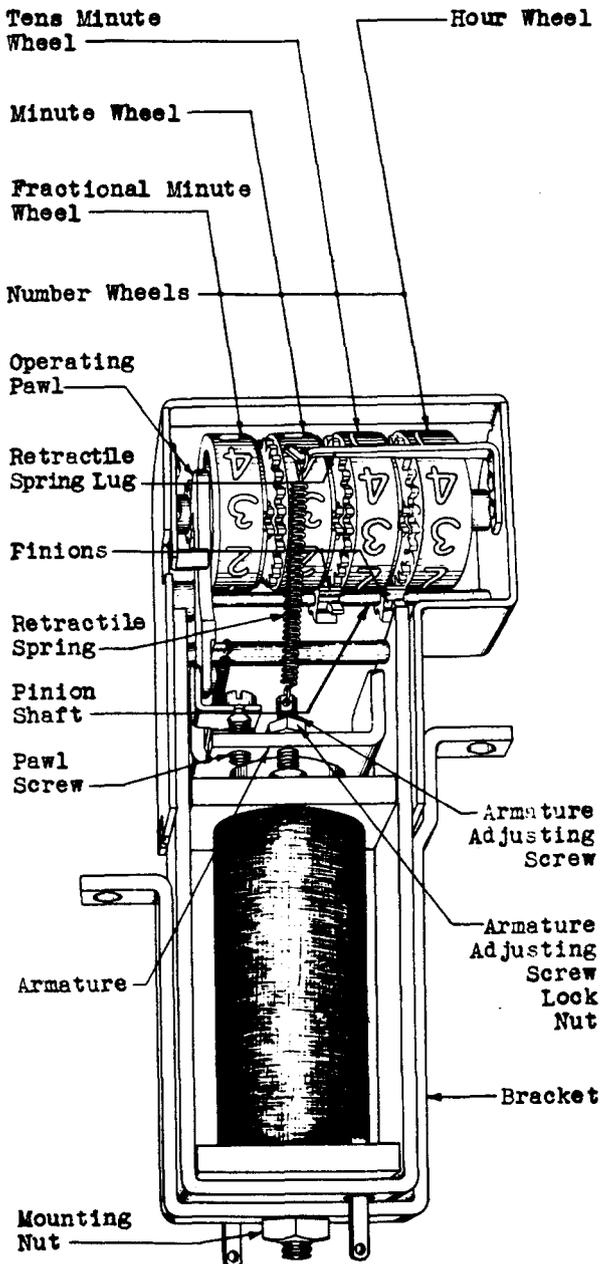


Fig. 7 - Illustrating Parts of Electric Clock

gage the cogs on the two minute wheels and slide the shaft through the pinion. Turn the hour wheel so that any two numbers on the hour and tens minute wheels are in horizontal alignment. With the tweezers, hold the remaining pinion so as to properly engage the cogs of the hour and adjacent tens minute wheels and slide the shaft through the pinion and through the bearing. See that the shaft does

not protrude beyond the outside surfaces of the frame of the clock and then tighten the set screw in the collar.

M-11 With the clock cover in place, note whether or not the numbers appearing through the window are in alignment with respect to the window. If the fractional minute wheel does not align properly, remove the cover and operate the armature manually a few times. Replace the cover and again check for alignment. If it does not line up properly now it is due to incorrect adjustment of the clock, which will be corrected later when the clock is readjusted as covered in procedures 3.04 to 3.14 inclusive in accordance with M-13 below. If any of the remaining wheels are out of alignment, the pinion on the right of the wheel at fault is not in proper engagement with the cogs on the wheels. To correct this, loosen the collar set screw which holds the particular pinion shaft in place and slide out the pinion shaft until the pinion disengages the misaligned wheel. Then turn the wheel (either backwards or forwards) so that the pinion will engage the next cog and secure the shaft as covered in M-9 and M-10 above.

M-12 Lubricate the bearings, pinions and pinion shafts with KS-6232 oil applied with a piece of No. 22 bare tinned copper wire.

M-13 Check requirements 2.04 to 2.14 inclusive and make readjustments as required.

**3.03 Record of Lubrication** (Rq. 2.03) (No procedure).

**3.04 Mounting** (Rq. 2.04)

M-1 If the bracket is not mounted securely, tighten the mounting screws with the 3-1/2" cabinet screw-driver, taking care not to tighten the screws so that they will pull out of the wood. Also check the tightness of the mounting nut and, if necessary, tighten the mounting nut with the No. 417-A wrench.

**3.05 Armature Air-Gap** (Rq. 2.05)

**3.06 Tightness of Lock Nut** (Rq. 2.06)

M-1 To readjust the armature air-gap, remove the clock from its mounting as covered in 3.002. Remove the retractile spring

from the retractile spring lug and then remove the other end of the spring from the armature adjusting screw with the tweezers. Loosen the armature adjusting screw lock-nut with the No. 74 wrench, and move the armature adjusting screw with the long-nose pliers until the required gap is obtained.

M-2 Tighten the armature adjusting screw lock-nut and again check the armature air-gap. Replace the retractile spring. Also check requirements 2.07 (Back Lash), 2.11 (Pawl Clearance) and 2.14 (Electrical Requirements).

M-3 Remount the clock as covered in 3.002.

- 3.07 *Back Lash* (Rq. 2.07)
- 3.08 *Freedom of Operation of Operating Pawl* (Rq. 2.08)
- 3.09 *Position of Stop Pawl* (Rq. 2.09)
- 3.10 *End Play* (Rq. 2.10)

M-1 Replace the electric clock if it fails to meet requirements 2.07 to 2.10 inclusive.

### 3.11 *Pawl Clearance* (Rq. 2.11)

M-1 If the operating pawl binds on the overthrow stop, correct the fault by backing out the pawl screw with the 3-1/2" cabinet screw-driver until the pawl does not bind. In adjusting the pawl screw, note that the pawl is still capable of advancing the fractional minute wheel to the next position when the electric clock is operated.

M-2 Check the clearance between the operating pawl and the overthrow stop to determine whether it is enough to cause the electric clock to over-count. To do this hold the armature operated and attempt to turn the fractional minute number wheel. If the clearance is too great the wheel will turn. It may be possible to correct this by decreasing the armature air-gap if it is not near the minimum specified limit.

M-3 If the pawl clearance requirement cannot be met by the above adjustments proceed as follows: To provide a clearance be-

tween the overthrow stop and the operating pawl, pry the stop upward using the 3-1/2" cabinet screw-driver. To decrease the clearance between the over-throw stop and the pawl, force the stop downward applying the pressure at the free end of the stop.

### 3.12 *Position of Retractable Spring* (Rq. 2.12)

M-1 If the retractile spring touches the cover or the number wheels, and it appears to be due to a defective spring remove the clock from its mounting as covered in 3.002 and replace the retractile spring.

M-2 If the retractile spring seems satisfactory, adjust the retractile spring lug slightly as required. To move the lug out, insert the 3-1/2" cabinet screw-driver between the lug and the top frame cross-piece and pry the lug up. If the lug is out too far, press it back with the finger.

M-3 After the above operation check requirement 2.14 (Electrical Requirements).

### 3.13 *Location of Tip of Retractable Spring Lug* (Rq. 2.13)

### 3.14 *Electrical Requirements* (Rq. 2.14)

M-1 To meet these requirements, adjust the retractile spring lug with the long nose pliers so as to increase or decrease the retractile spring tension. Exercise care in adjusting the lug not to break it.

M-2 Should the retractile spring be so weak that to meet the non-operate requirement it is necessary to adjust the retractile spring lug to such an extent that its tip extends beyond the outer face of the top frame cross-piece, remove the clock from its mounting as covered in 3.002 and replace the retractile spring.

### 3.15 *Cover Tightness* (Rq. 2.15)

M-1 Adjust the cover as required with the fingers until it fits properly.