

## DIALS

### 2, 4, 5, AND 6 TYPES

### REQUIREMENTS AND ADJUSTING PROCEDURES

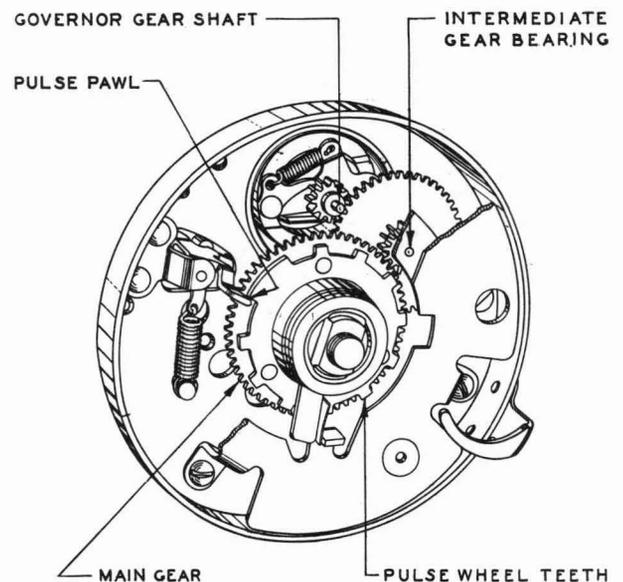
#### 1. GENERAL

- 1.01** This section covers 2-, 4-, 5-, and 6-type dials.
- 1.02** This section is reissued to add requirements, procedures, and figures covering 6-type dials equipped with plastic fingerwheels. Issue 8-D of this section was not given general distribution. 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** *Dial speed* is the rate of interruption of the pulse contacts. The rate of speed is expressed in pulses per second.
- 1.06** *Dial pulse* consists of two parts, a make period and a break period, as defined below.
- 1.07** *Make period* is the period when the pulse contacts are closed.
- 1.08** *Break period* is the period when the pulse contacts are open.
- 1.09** *Per cent break period* is the length of time of the break period compared with the total length of time of the complete pulse.
- 1.10** *Carrying Case for Dials and Target*: In order to protect the contact springs, carry dials in the cartons in which they were shipped. Also, carry the stroboscope target used in testing the dial speed in a similar carton in order to prevent damage to the faces and prongs on the target.

#### 2. REQUIREMENTS

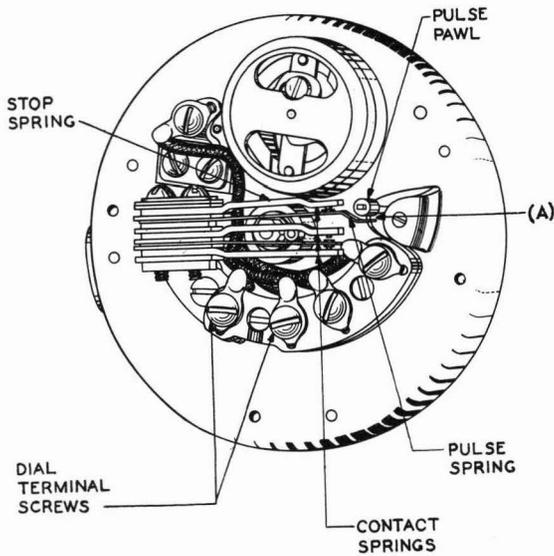
##### 2.01 *Cleaning*

- (a) Contacts shall be cleaned, when necessary, in accordance with Section 022-100-811.
- (b) The number plate shall be cleaned, when necessary, in accordance with approved procedures.

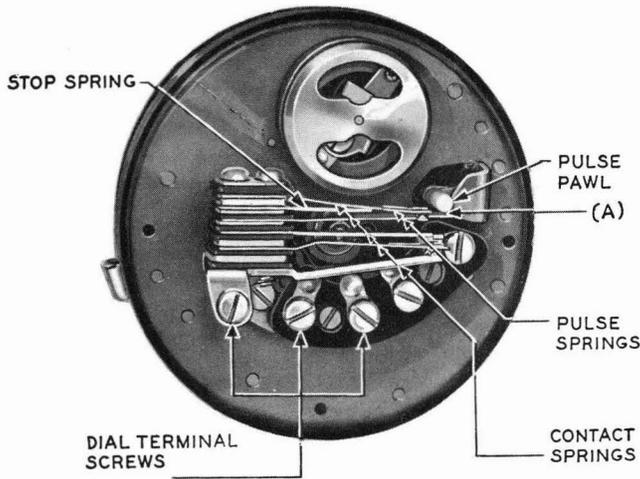


**Fig. 1 — 2-Type Dials and General Construction of 4 Type**

**2.02 Lubrication:** The dials shall not be lubricated. Dials which require lubrication shall be replaced.



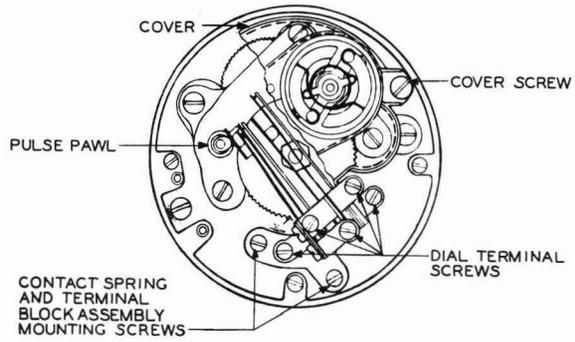
**Fig. 2 - 2- and 4-Type Dials**



**Fig. 3 - 5-Type Dials**

**2.03 Tightness of Cord Tips:** The cord tips shall be clamped tightly by the dial terminal screws and shall not ground on any metal parts or on each other.

Gauge by eye and feel.



**Fig. 4 - 6-Type Dials (No. 6G Dial Illustrated)**

**2.04 Arrangement of Cord Tips and Leads:**

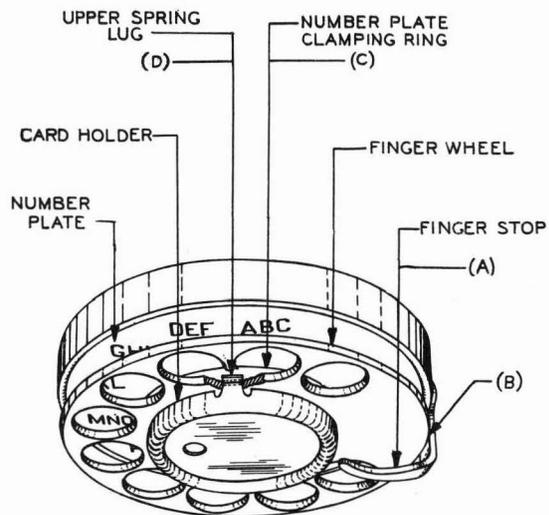
The cord tips and leads shall be arranged so as not to interfere with the working parts of the dial.

Gauge by eye.

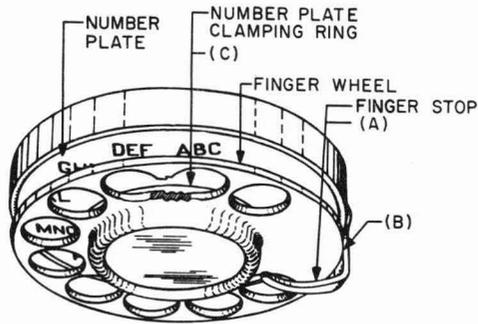
**2.05 Straightness of Contact Springs:** Fig. 2,

3, and 4 - The contact springs shall not be distorted. These springs shall not be readjusted in the field since any readjustment of the pulse springs would be likely to destroy the setting which controls the per cent break.

Gauge by eye.



**Fig. 5 - General External Features of Dials Equipped With Metal Fingerwheel**



**Fig. 6 — General External Features of Dials Equipped With Plastic Fingerwheel**

**2.06 Clearance Between the Fingerwheel and Finger Stop**

(a) Fig. 5(A) — The clearance between the *metal* fingerwheel and the underside of the finger stop at all points when the digit 0 is dialed shall be

Min 0.025 inch

Use the No. 66D gauge.

(b) Fig. 6(A) — The clearance between the *plastic* fingerwheel and the underside of the finger stop at all points when the digit 0 is dialed shall be

Min 0.015 inch

Use the No. 66D gauge.

(c) Fig. 5(B) and 6(B) — The clearance between the periphery of the fingerwheel and the vertical portion of the finger stop at all points when the digit 0 is dialed shall be

Min 0.015 inch

Use the No. 66D gauge.

(d) **Metal Fingerwheel:** The over-all wobble of the fingerwheel in relation to the number plate, measured at the periphery of the fingerwheel when the digit 0 is dialed, shall be

Max 1/16 inch

Gauge by eye.

**2.07 Tightness of Finger Stop:** The finger stop shall be held securely to the dial case.

Gauge by feel.

**\*2.08 Pulse Pawl Adjustment**

(a) **Dials Equipped With Pulse Springs Having Offset at Outer End:** Fig. 2(A) — The pulse pawl shall strike the flat portion of the pulse spring and not the angular offset.

Gauge by eye.

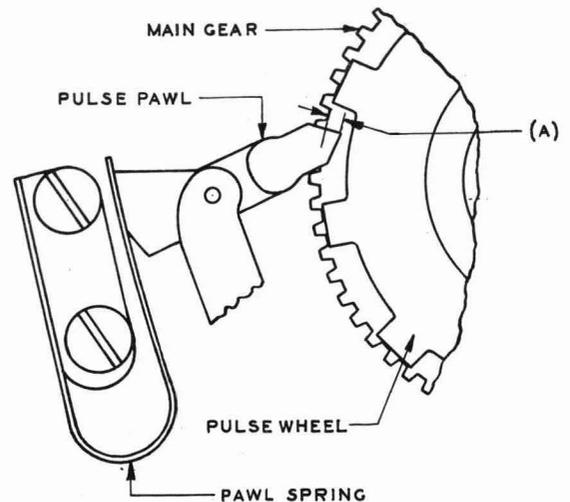
(b) **2- and 4-Type Dials:** Fig. 2(A) — The clearance between the pulse pawl and the pulse spring when the dial is at rest shall be

Min 0.005 inch

Gauge by eye.

(c) **5-Type Dials:** Fig. 3(A) — The pulse spring shall not move as the pulse pawl moves away from the spring.

To check, move the fingerwheel off-normal and observe that the pulse spring does not move.



**Fig. 7 — Molded-Type Pulse Pawl for 5-Type Dials**

(d) **5-Type Dials:** Fig. 7(A) — When the pawl spring rests against the large flat of the pulse pawl during the wind-up of the dial, the engagement of the pulse wheel teeth and the pulse pawl, measured from the tip of the pawl to the outer edge of a tooth, shall be

Min 0.015 inch

Gauge by eye.

The depth of a tooth on the pulse wheel is 0.065 inch, approximately four times the minimum specified pawl engagement.

(e) **6-Type Dials:** Fig. 8(A)—The clearance between the end of the pawl finger and each bifurcation of the pulsing spring, when the dial is at rest and the pawl is pressed against the cam follower to give maximum clearance, shall be

Min 0.005 inch

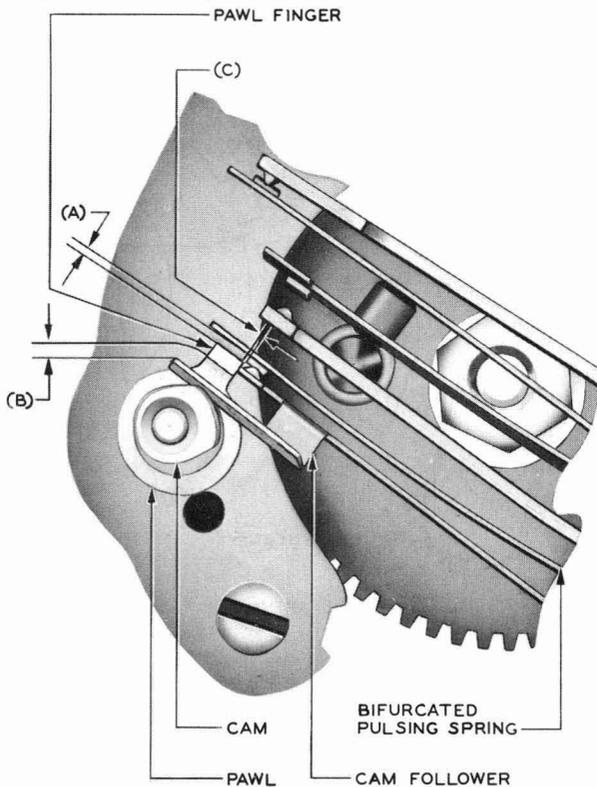
Gauge by eye.

(f) **6-Type Dials:** Fig. 8(B)—The clearance between the pawl finger and the end of the cam follower shall be

Min 0.015 inch

as the pawl finger swings past the end of the cam follower.

Gauge by eye.



**Fig. 8 — 6-Type Dials — Pulse Pawl and Contact Spring Pile-up When Dial Is at Rest (No. 6G Dial Illustrated)**

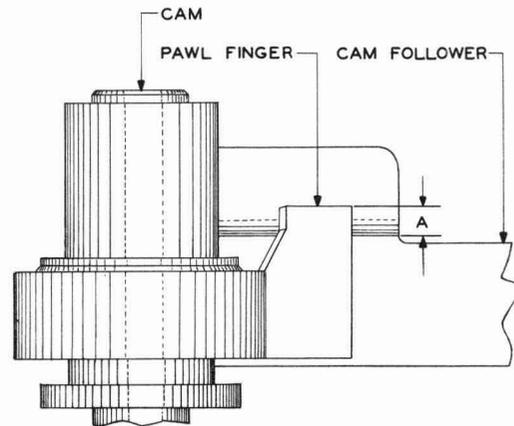
(g) **6-Type Dials:** Fig. 8(C)—There shall be perceptible clearance between the pawl finger and the contacts on the bifurcated pulsing spring.

Gauge by eye.

(h) **6-Type Dials:** Fig. 9(A)—When the dial is fully wound, the overlap between the end of the pawl finger and the cam follower shall be

Min 0.020 inch

Gauge by eye.



**Fig. 9 — 6-Type Dials — Position of Pawl Finger When Dial Is Fully Wound**

**\*2.09 Tightness of Number Plate:** Fig. 5(C) and 6(C) — The number plate shall be held securely by the number plate clamping ring.

Gauge by feel.

**2.10 Mounting of Dial:** Dials shall be held securely to their mountings.

Gauge by feel.

**2.11 Assembly of Card Holder** (Dial Equipped with Metal Fingerwheel)

(a) The card holder assembly shall fit snugly.

Gauge by feel.

(b) Fig. 5(D)—The tip of the upper spring lug on the card holder shall clear the number plate clamping ring at all points during rotation of the dial.

Gauge by eye.

**2.12 Per Cent Break Period of Pulses** (No. 5L and 6E Dials)—(Applies only when used in toll testboards, toll test sets, toll test panels, Lswitchboards associated with intertoll dialing,

and switchboards dialing into tandem networks<sup>†</sup> requiring these values.) The break period of the pulses shall be

**No. 5L Dials**

Min 59.5 per cent  
Max 67.5 per cent

**No. 6E Dials**

Min 61.0 per cent  
Max 67.0 per cent

of the combined make and break periods.

Use the J64722A pulse repeating test set and check in accordance with the methods specified in Section A203.066.

**2.13 Speed**

**Speed Limits**

(a) The speed of the particular dial being tested shall be within the limits specified in Table A when the digit 0 is dialed. Each test shall be repeated at least once so that it can be determined whether successive operations are within the required limits.

**TABLE A**

DIAL CODES	PULSES PER SECOND				REMARKS
	TEST		READJUST		
	MIN	MAX	MIN	MAX	
2F, 4F, 5F, and 5K	16	20	17	19	
D-157233	11.9	12.1	11.9	12.1	
5L	9.5	10.5	9.7	10.3	(before turnover)
	9.5	10.5	9.7	10.3	(after turnover) See note 1
	8.0	11.0	9.5	10.5	(after turnover) See note 2
All other 2, 4, and 5 types	8.0	11.0	9.5	10.5	
6A	8.0	11.0	—		See notes 3 and 4
6E	11.9	12.1	11.9	12.1	
	9.5	10.5	—		
6E	8.0	11.0	—		
6F and 6G	—		—		
All other 6 types	8.0	11.0	—		See note 3

**Note 1:** Applies after turnover when used<sup>†</sup> on toll testboards, toll test sets, toll test panels, switchboards associated with inter-toll dialing, and switchboards dialing into tandem networks requiring these speed limits.

**Note 2:** Applies after turnover when used in other cases than those covered by note 1.

**Note 3:** With the exception of the 11.9- to 12.1-pps limits, no readjust limits are specified for the 6-type dials, and no test or readjust limits are specified for the No. 6F or 6G dial.

**Note 4:** The 9.5- to 10.5-pps value applies when the No. 6E dial is used on switchboards associated with intertoll dialing. The 8.0- to 11.0-pps value applies when the dial is used for other than intertoll dialing. The 11.9- to 12.1-pps value applies when the No. 6E is used with the J64722A pulse repeating test set.

**Methods of Checking Dial Speeds**

(b) **General:** The procedure in checking dial speeds depends upon the dial speed to be checked and upon the dial testing equipment available. Dial speeds may be checked by using a stroboscope (a No. 11A tuning fork associated with the proper target), or by using a dial testing circuit with or without the assistance of a test deskman. If access to a dial testing circuit is available for testing the dial to the proper speed limit, proceed in accordance with (c), (d), and (e). If not, use the stroboscope as covered in (f) to (k), inclusive. Before making any speed test, inspect the dial, make the necessary repairs, and exercise the dial by dialing the digit 0 three times.

(c) **Method of Checking Dials, Using a Dial Testing Circuit — Connection Established Through Test Desk:** Dial the test desk code and advise the test deskman of the type of dial to be tested. When dial tone is heard indicating that the test deskman has connected the line to a dial tester and that the dial tester is ready to receive pulses, dial 0. The test deskman will ask that this be repeated at least once to determine whether successive operations are between the specified limits, and will report the results of his tests. Where the dial tester is arranged to give audible signals which indicate

whether the dial speed is OK, fast, or slow, these audible signals are as follows.

OK — Ringing Induction

Fast — Rapidly Interrupted Dial Tone (0.2 to 0.3 second on, 0.2 to 0.3 second off)

Slow — Slowly Interrupted Dial Tone (0.15 to 0.3 second on, 1.15 to 1.2 seconds off)

If a repeat test is desired, advise the testman who will again prepare the dial tester for testing the dial as before, and when the dial tone is heard, repeat the tests.

(d) **Method of Checking Dials, Using a Dial Testing Circuit — Connection Established Automatically by Dialing Directly Into the Dial Testing Circuit:** Dial the ringer test code and listen for dial tone. Then dial the desired digit as indicated.

<u>PULSES PER SECOND</u>	<u>DIGIT TO BE DIALED</u>
Test — 8 to 11	2
Readjust — 9.5 to 10.5	† 3
Test — 16 to 20 (panel and crossbar only)	4
Readjust — 17 to 19 (panel and crossbar only)	5

† Also dial 3 when checking the test values whenever 9.5 to 10.5 pps are specified.

When the dial tone is heard again, after dialing one of the above digits, dial 0 and listen for the audible signal as defined in (c) to determine whether the dial speed is OK, fast, or slow.

(e) To repeat the test, dial the same digit as given above, and when dial tone is heard, dial 0 as before. Any test may be repeated as many times as necessary, or a change to the associated test or readjust value made as desired by dialing the proper digits, except that if the connection is held too long, the test circuit will be automatically disconnected. If this occurs, replace the receiver on the switch-hook and dial the ringer test code again as in (d).

(f) **Method of Checking Dials, Using a Stroboscope:** The stroboscope consists of the proper target and the No. 11A tuning fork. These targets are used to check the following speed limits.

<u>TARGET</u>	<u>SPEED RANGE</u>
No. 2A	8.0 to 11.0 pps (test) 9.5 to 10.5 pps (readjust)
No. 2B	9.5 to 10.5 pps (test) 9.7 to 10.3 pps (readjust)
No. 2C	11.9 to 12.1 pps (test and readjust)

The disc assemblies of the above targets are interchangeable. Where a target is available, it will therefore be necessary to order only the disc assembly of one of the other targets in order to test the dial to the required speed limits. In replacing the disc, take special care that the pin in the base of the target properly engages the hole in the disc. When necessary to clean the face of the target disc, use a KS-2423 cloth dampened with water. Do not use petroleum spirits for this purpose or rub the surface hard, as this will injure the protective coating or obliterate the markings.

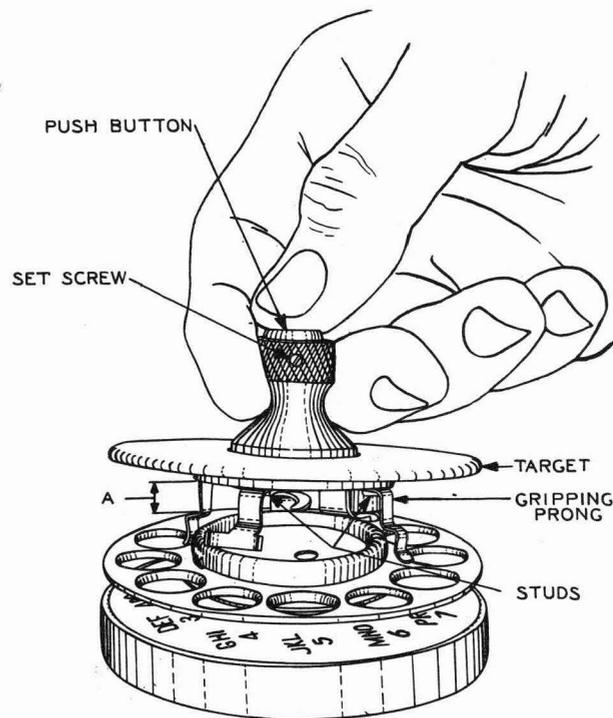


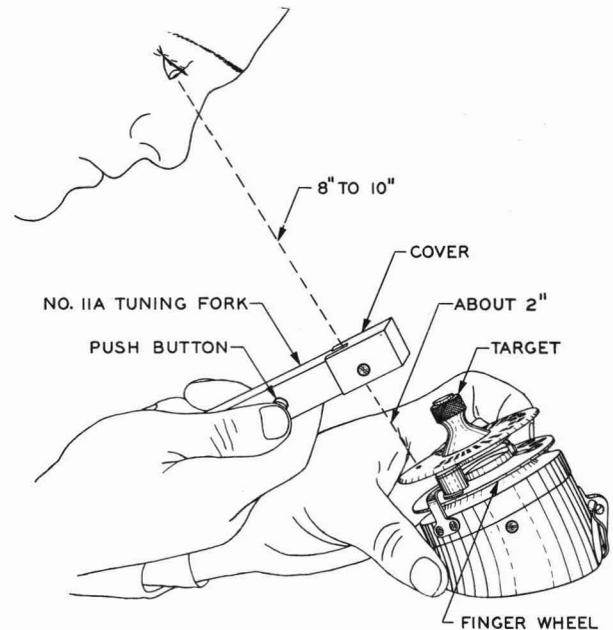
Fig. 10 — Method of Placing Stroboscope Target on Dial

(g) Mount the target on the dial to be tested by grasping the knurled knob between the second and third fingers, and with the thumb, fully depress the pushbutton on the knob to expand the prongs, as shown in Fig. 10, to avoid marring the finish of the dial. Partially insert the notched stud and prong into the 0 hole of the fingerwheel, holding the target at an angle so that the extreme outer edge of the stud first engages the edge of the 0 hole and steadies the target and the remaining three prongs are above holes 1, 4, and 7. While still depressing the pushbutton, carefully press the target into place so that the prongs engage the holes mentioned above. If the pushbutton binds in its bearing seat, remove the setscrew with the R-1005 jewelers screwdriver and remove the button. Clean the bearing seat with a KS-2423 cloth moistened with KS-7860 petroleum spirits. Remount the button and tighten the setscrew securely. If the gripping prongs bind under the studs, clean the bearing surfaces with petroleum spirits applied with a clean toothpick. Do not use the same toothpick for more than one cleaning operation.

(h) In order to insure that the target will not affect the dial speed, observe that:

- (1) There is some clearance throughout the rotation of the dial between the gripping prongs of the target and the number plate and number plate clamping ring.
- (2) There is some clearance between the three prongs of the target and the finger stop.
- (3) There is no rotary play between the target and the fingerwheel.
- (4) The target prongs have sufficient tension to hold the target snugly on the dial. (The target prongs will, in general, have sufficient tension to hold the target on the dial if the portion of the prongs designated A in Fig. 10 is at right angles to the base of the target.)

In case it is necessary to adjust the target for any of these conditions, use the No. 485A pliers and adjust the prongs as required.



**Fig. 11 — Method of Checking Speed of Dials, Using Stroboscope**

(i) Slide the cover of the No. 11A tuning fork to expose the prongs, and grasp the fork in the palm of one hand with the cover projecting beyond the hand and with the pushbutton convenient to the thumb. By means of the knob on the target, wind the dial with the same hand to the stop position. When wound, hold the dial with the other hand by placing the index finger against the edge of the fingerwheel and the thumb well down on the front of the dial mounting. Steady the hand holding the tuning fork on the other hand, as shown in Fig. 11. With the thumb pressing the pushbutton in far enough to partially open the prongs, centrally sight the spot on the target marked "Sight Here." (For the average individual, the tuning fork should be held about 2 inches from the target and 8 or 10 inches from the eye, as indicated in Fig. 11.) Fully press the button and then release the dial by removing the index finger from the edge of the fingerwheel, taking care that no part of the hand is dragging the wheel.

(j) The apparent movement of the rows of division on the target, as viewed through the vibrating fork, indicates whether the dial speed is within, at, or outside the limits appear-

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ing on the target. The apparent movement of the rows of divisions at various speeds has the following significance.

**TABLE B**

APPARENT MOVEMENT OF ROWS OF DIVISIONS	SPEED INDICATION
Rows of divisions rotate in opposite directions (directions indicated by arrows on target).	Dial speed is within limits indicated on target.
Inside row of divisions (labeled "Max") appears to stand still or to rotate in counterclockwise direction (opposite to direction indicated by arrow).	Dial speed is at or above its maximum speed limit.
Outside row of divisions (labeled "Min") appears to stand still or to rotate in a clockwise direction (opposite to direction indicated by arrow).	Dial speed is at or below its minimum speed limit.
<p><b>Note 1:</b> The relative apparent speed of the two rows of divisions with respect to each other is an indication of the proximity of the dial speed to either maximum or minimum limit.</p> <p><b>Note 2:</b> In observing the test limits, one row of divisions may appear blurred if the dial speed is near the limit. In this case, concentrate attention on the other row of divisions. In the case of the readjust limits, however, both rows of divisions must be observed.</p> <p><b>Note 3:</b> Dials in which the governor is set at or near the extreme fast position may give false speed indication due to harmonics. These do not appear, however, until the dial is running at twice normal speeds.</p>	

(k) Keep the cover closed when the No. 11A tuning fork is not in use.

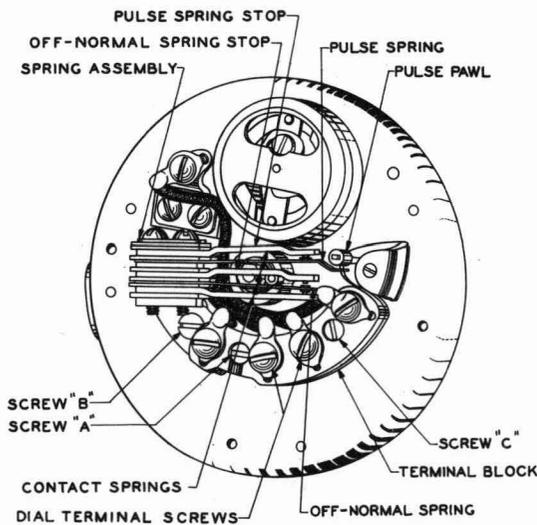
**3. ADJUSTING PROCEDURES**

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

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
260	Dial Governor Holder
311	3/8- and 7/16-inch Hex. Double-end Socket Wrench

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
→363	Spring Adjuster
445A	Dial Card Holder Tool
485A	Smooth-jaw Pliers
KS-6854	3-1/2 Inch Screwdriver
KS-7782	Parallel-jaw Pliers
KS-8400	Dialing Tool
→KS-16750, L1	Releaser
R-1005	Jewelers Screwdriver
→—	3-inch C Screwdriver (or replaced 3-inch cabinet screwdriver)
<b>GAUGES</b>	
2A	Target
→2B	Target (formerly D-157090)
→2C (or replaced D-157234)	Target
11A	Tuning Fork
66D	Thickness Gauge Nest
<b>MATERIALS</b>	
KS-2423	Cloth
KS-7860	Petroleum Spirits
—	Bell System Rubber Eraser (nonabrasive)
—	Toothpicks, Hardwood, Flat at One End and Pointed at the Other
<b>TEST APPARATUS</b>	
→J64722A	Pulse Repeating Test Set
—	Dial Testing Circuit

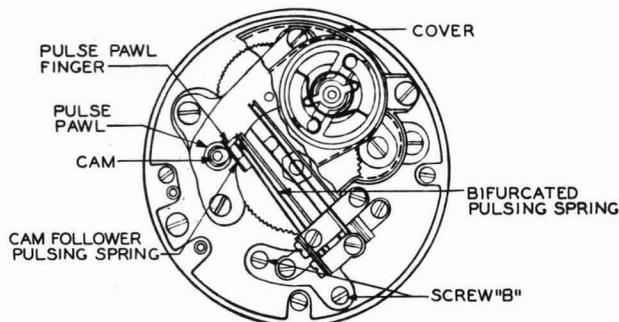
**3.002** In order that the apparatus may function properly, it is important that the speed and per cent break of the pulse contacts be within certain limits. When dials are manufactured or repaired, the per cent break is adjusted to narrow limits. If the per cent break is outside of these limits, the dial is likely to fail to operate the equipment properly even if the speed is within the proper limits.



**Fig. 12 — Spring and Terminal Block Assemblies for Other Than 6-Type Dials**

**3.003 Per Cent Break**

(a) **2-, 4-, and 5-Type Dials:** Fig. 12—The per cent break depends largely on the position of the tip of the pulse spring with respect to the pulse pawl which operates it, and on the tension of the pulse spring. Because of this, always protect the pulse springs and the pulse spring stop (see Fig. 3 and 12) from injury. Any shifting of the spring assembly, due to loosening of B and C screws, shown in Fig. 12, which hold it in place, or the loosening of the spring assembly screws, will also cause a change in the per cent break. *Never attempt to adjust any of the springs of the spring assembly or to loosen B and C screws shown in Fig. 12.*



**Fig. 13 — 6-Type Dials — Spring and Terminal Block Assemblies (No. 6G Dial Illustrated)**

(b) **6-Type Dials:** Fig. 13—The per cent break depends largely on the position of the cam follower pulsing spring with respect to the pulse cam, which operates it and the pulse pawl finger and the bifurcated pulsing spring. Because of this, always protect the pulse cam, pulse pawl, cam follower pulsing spring, and the bifurcated pulsing spring from injury when the protecting cover is removed for any reason. Any shifting of the spring assembly, due to loosening of B screws, shown in Fig. 13, which hold it in place, or the loosening of the spring assembly screws, will also cause a change in the per cent break. *Never attempt to adjust any of the springs of the spring assembly or to loosen B screws shown in Fig. 13.*

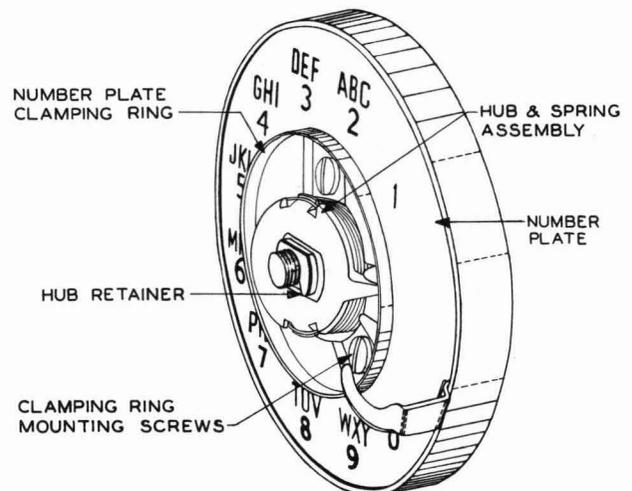
**3.004** If a dial is removed from its mounting and decoded, re-record the dial in accordance with Section 028-310-811.

**3.005** In handling a dial, take care to avoid smearing or otherwise disturbing the grease which is on the bearings.

**3.01 Cleaning (Reqt 2.01)**

**Cleaning Contacts**

(1) Clean the contacts in accordance with Section 022-100-811.



**Fig. 14 — 6-Type Dials With Metal Fingerwheel Removed**

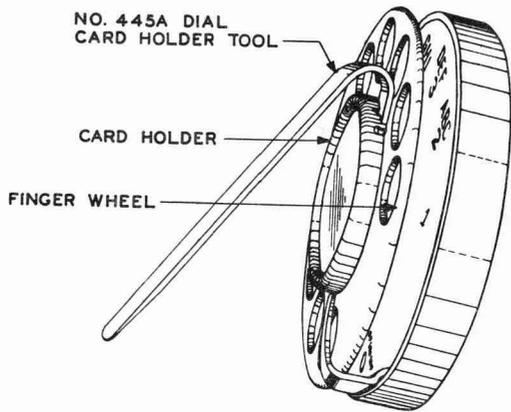


Fig. 15 — Method of Removing Dial Card Holder

**Cleaning Number Plates — 2-, 4-, and 5-Type Dials**

(2) Remove the card holder by inserting the point of the No. 445A dial card holder tool into either of the two slots of the card holder adjacent to the 2 hole of the fingerwheel, forcing the other end of the tool away from the fingerwheel, as shown in Fig. 15.

(3) Remove the fingerwheel clamping nut with the No. 311 wrench and remove the lock-washer, if provided; then remove the fingerwheel. A C screwdriver or the equivalent may be inserted into the slot of the No. 311 wrench to assist in turning the nut.

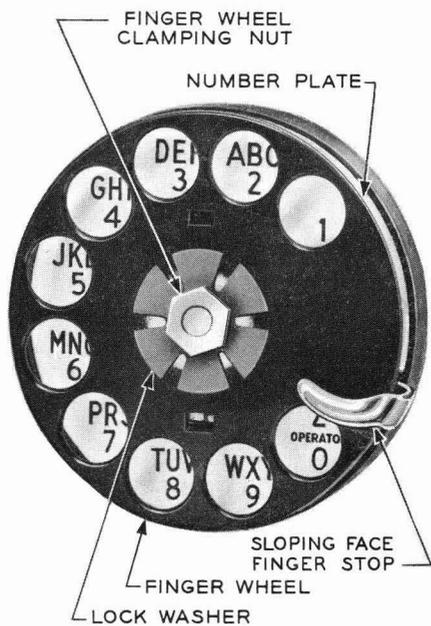


Fig. 16 — Clamping Nut and Lockwasher on Dials Equipped With Metal Fingerwheel

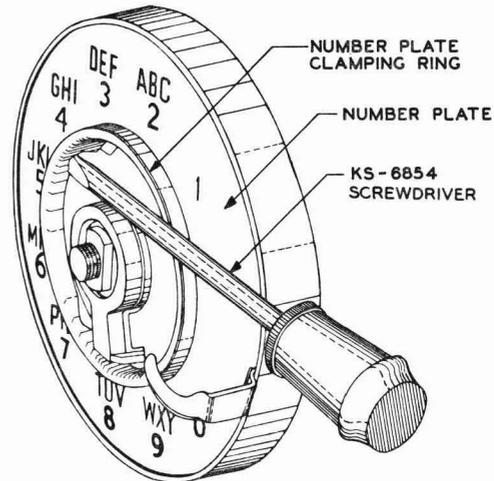


Fig. 17 — Method of Removing the Number Plate Clamping Ring on All Dials Except the 6 Type

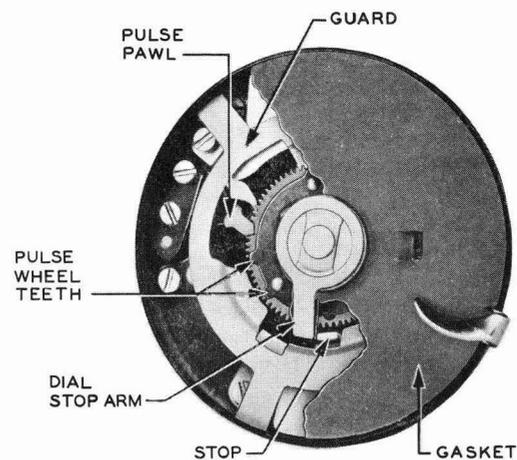


Fig. 18 — Gasket and Guard on 5-Type Dials

(4) Pry off the number plate clamping ring with the KS-6854 screwdriver. To avoid marring the surface of the number plate, apply the screwdriver as shown in Fig. 17. Never apply the end of the screwdriver to the outside of the clamping ring. Remove the number plate, and the gasket and guard, if the latter are provided, as shown in Fig. 18. Do not remove the number plate support.

*Note:* If the gasket is to be used again, take care not to tear it when removing it from the dial.

(5) Clean the number plate with a KS-2423 cloth moistened with KS-7860 petroleum spirits. If the finish on the number plate is marred or scratched, take particular care to avoid removing the characters at the points where the scratches cross the characters. Use the Bell System rubber eraser to remove pencil marks or other foreign matter not removed by the petroleum spirits. Do not immerse the number plate in petroleum spirits.

#### Cleaning Number Plates—6-Type Dials Equipped With Metal Fingerwheel

(6) Remove the card holder by inserting the point of the No. 445A dial card holder tool into either of the two slots of the card holder adjacent to the 2 hole of the fingerwheel, forcing the other end of the tool away from the fingerwheel, as shown in Fig. 15.

(7) Remove the fingerwheel clamping nut with the No. 311 wrench and remove the lockwasher, if provided; then remove the fingerwheel. A C screwdriver or the equivalent may be inserted into the slot of the No. 311 wrench to assist in turning the nut.

**Caution:** *On dials equipped with unfinished brass fingerwheel clamping nuts, take care that the motor spring and hub assembly does not slip or jump out of its proper position. This will not occur when the dial is equipped with a black-finished clamping nut, as the parts are either staked or held in position by a hub retainer. If the motor spring does slip or jump out of its position, replace the dial.*

(8) Remove the number plate clamping ring by removing the three clamping ring mounting screws shown in Fig. 14, using the C screwdriver. Remove the clamping ring and the number plate.

(9) Clean the number plate with a KS-2423 cloth moistened with KS-7860 petroleum spirits. If the finish on the number plate is marred or scratched, take particular care to avoid removing the characters at the points where the scratches cross the characters. Use the Bell System rubber eraser to remove pencil marks or other foreign matter not removed by the petroleum spirits. Do not immerse the number plate in petroleum spirits.

(10) Remount the parts in the reverse order of removal. When the motor spring and hub assembly is not staked, mount a P-12A951 hub retainer on the shaft, as shown in Fig. 14, to secure the hub and spring assembly in place.

#### Cleaning Number Plates—6-Type Dial Equipped With Plastic Fingerwheel

(11) Rotate the fingerwheel in the clockwise direction as far as possible. Then, while holding it in this position, insert the end of the KS-16750, L1 releaser into the small hole in the edge of the raised center portion of the fingerwheel adjacent to the finger stop. Push down on the releaser to disengage the locking tab of the fingerwheel clamp plate. Then continue rotation of the wheel in a clockwise direction to fully disengage the clamp plate. Remove the fingerwheel.

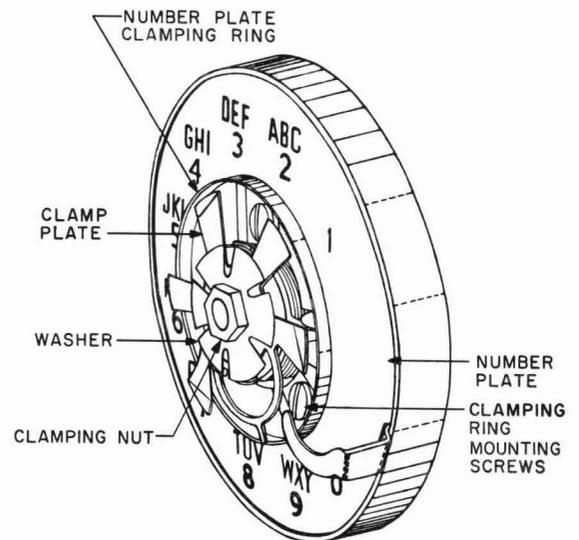


Fig. 19—6-Type Dials With Plastic Fingerwheel Removed

(12) Remove the clamping nut, shown in Fig. 19, with the No. 311 wrench and lift off the washer and clamp plate.

(13) Remove the clamping ring mounting screws with the C screwdriver, and remove the number plate clamping ring and the number plate.

(14) Clean the number plate in accordance with (9).

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Γ (15) Remount the parts in the reverse order of removal and remount the fingerwheel as covered in (16).

(16) With the dial normal, place the fingerwheel on the clamp plate of the dial so that the hole that is normally over the 0 is over the 9. Make sure that the fingerwheel is approximately level, and then rotate it counter-clockwise until a click is heard or the holes are over the proper digits.

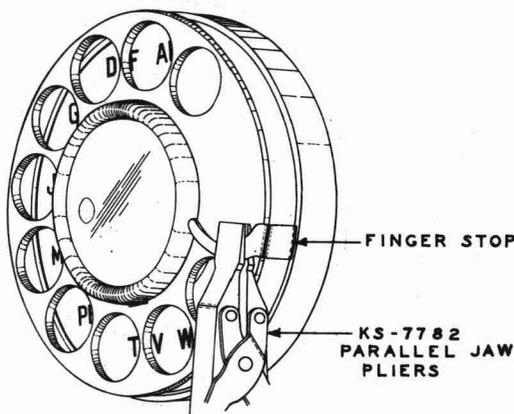
**3.02 Lubrication** (Reqt 2.02)  
(No procedure)

Γ **3.03 Tightness of Cord Tips** (Reqt 2.03)  
**3.04 Arrangement of Cord Tips and Leads** (Reqt 2.04)

- (1) If the cord tips are loose, tighten the dial terminal screws with the C screwdriver.
- (2) If the cord tips and leads interfere with the working parts of the dial, rearrange them as required. If the cord tips touch any metal parts, shift them as required.

**3.05 Straightness of Contact Springs** (Reqt 2.05)

- (1) If the contact springs are distorted, replace the dial with another dial of the same code number or its equivalent.



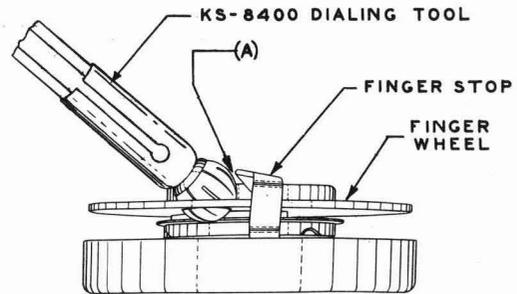
**Fig. 20 – Method of Adjusting Finger Stop**

**3.06 Clearance Between the Fingerwheel and Finger Stop** (Reqt 2.06)

- (1) To correct the clearance between the fingerwheel and the finger stop, adjust the finger stop with the KS-7782 pliers applied as

shown in Fig. 20. If the required clearance cannot be obtained in this manner, replace the finger stop, taking care not to mar the finish of the dial or the surface of the number plate.

- (2) To correct the clearance between the periphery of the fingerwheel and the vertical portion of the finger stop, apply the No. 485A pliers to the finger stop between the fingerwheel and number plate and adjust the finger stop as required. If the required clearance cannot be obtained in this manner, replace the finger stop, taking care not to mar the finish of the dial or the surface of the number plate.



**Fig. 21 – Method of Checking Overlap of Finger Stop and 0 Hole of Fingerwheel on Dials Having Sloping Face Finger Stops**

- (3) When the sloping face finger stop shown in Fig. 21 is replaced, the new finger stop should be located so that with the KS-8400 dialing tool inserted into the 0 hole of the fingerwheel and inclined as shown in Fig. 21 (approximately 45 degrees with the surface of the fingerwheel), there should be a clearance at (A) in Fig. 21, not to exceed 1/32 inch, between the finger stop and the surface of the dialing tool.

- (4) To change the position of the finger stop, remove the card holder, the fingerwheel, the number plate, and the gasket and guard if the latter are provided, as covered in 3.01(2), (3), and (4) for the 2-, 4-, and 5-type dials, 3.01(6), (7), and (8) for the 6-type dials equipped with metal fingerwheels, or 3.01(11), (12), and (13) for the 6-type dials equipped with plastic fingerwheels. Loosen the finger stop mounting screws with the C screwdriver and shift the finger stop as required. Remount these parts and check the clearance. If the

clearance as covered in (3) is still not met, adjust the finger stop with the No. 485A pliers, applying the pliers to the side of the finger stop between the fingerwheel and the number plate. Take care not to mar the finish. Also take care not to bend the finger stop more than is necessary to obtain satisfactory clearance.

(5) If the fingerwheel is bent so that with a straight finger stop the clearance is not within the specified limits, or if the fingerwheel is otherwise damaged, replace the fingerwheel.

### 3.07 *Tightness of Finger Stop* (Reqt 2.07)

(1) If the finger stop is loose, remove the card holder, the fingerwheel, the number plate, and the gasket and guard if the latter are provided, as covered in 3.01(2), (3), and (4) for the 2-, 4-, and 5-type dials, 3.01(6), (7), and (8) for the 6-type dials equipped with metal finger wheels, or 3.01(11), (12), and (13) for the 6-type dials equipped with plastic fingerwheels. Tighten the finger stop mounting screw with the C screwdriver. Remount the parts, and in the case of the sloping face finger stop, check that the clearance as covered in 3.06(3) is met.

### 3.08 *Pulse Pawl Adjustment* (Reqt 2.08)

(1) If the requirement is not met, replace the dial by another one of the same code number or its equivalent. See 3.003.

### 3.09 *Tightness of Number Plate* (Reqt 2.09)

#### 2-, 4-, and 5-Type Dials

(1) Remove the card holder and fingerwheel as covered in 3.01(2) and (3). If the number plate is not held securely, remove the number plate clamping ring as covered in 3.01(4), and adjust the prongs of the number plate clamping ring, as required, with the No. 485A pliers.

#### 6-Type Dials

(2) Remove the card holder and metal fingerwheel as covered in 3.01(6) and (7), or remove the plastic fingerwheel as covered in 3.01(11). If the number plate is not held securely, tighten the clamping ring mounting screws with the C screwdriver.

### 3.10 *Mounting of Dial* (Reqt 2.10)

(1) If the dial is loose on its mounting, tighten the dial mounting screws, or the screws holding the adapters to the mounting, with the C screwdriver.

### 3.11 *Assembly of Card Holder* (Dial Equipped With Metal Fingerwheel) (Reqt 2.11)

(1) If the card holder assembly does not fit snugly, remove it from the dial as covered in 3.01(2). With the No. 485A pliers, adjust the card retainer spring or the lugs on the frame of the card holder or both, as required.

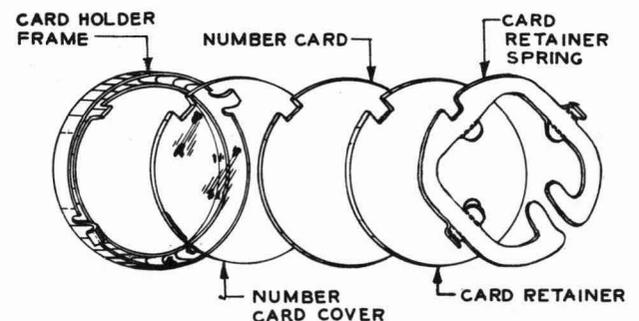


Fig. 22 — Card Holder Assembly (Earlier Type)

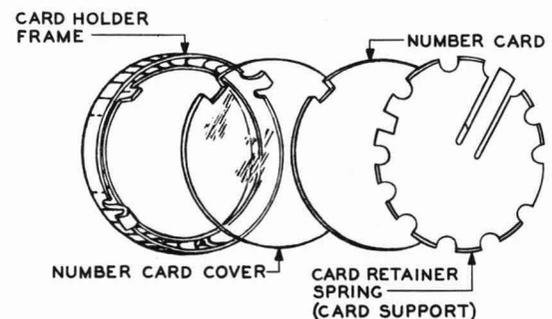


Fig. 23 — Card Holder Assembly (Later Type)

(2) If the tip of the upper spring lug on the card holder does not clear the number plate clamping ring, remove the card holder from the dial and adjust the lug with the No. 485A pliers. If the number plate clamping ring appears to be at fault, substitute a new one. Replace the card holder parts in the order shown in Fig. 22 and 23.

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**Γ3.12 Per Cent Break Period of Pulses (No. 5L and 6E Dials) (Reqt 2.12)**

- (1) If the requirement is not met, replace the dial.

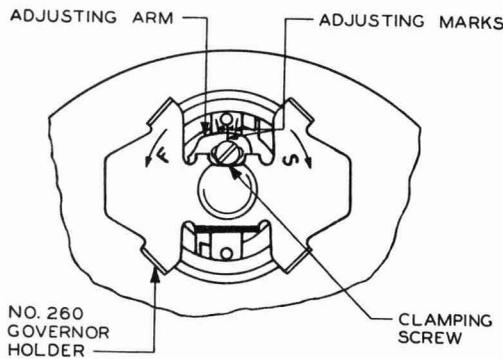
*Note:* Do not attempt to adjust the dial to change the per cent break period. See 3.002 and 3.003.

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**3.13 Speed (Reqt 2.13)**

**2-, 4-, and 5-Type Dials**

- (1) If the dial speed is not within the specified limits, readjust the governor as covered below.



**Fig. 24 — Position of the No. 260 Governor Holder on the 2-, 4-, and 5-Type Dials**

- (2) *To adjust the speed of a dial*, place the No. 260 dial governor holder on the governor as shown in Fig. 24.
- (3) Loosen the clamping screw with the KS-6854 screwdriver only enough to permit movement of the adjusting arm with slight friction.

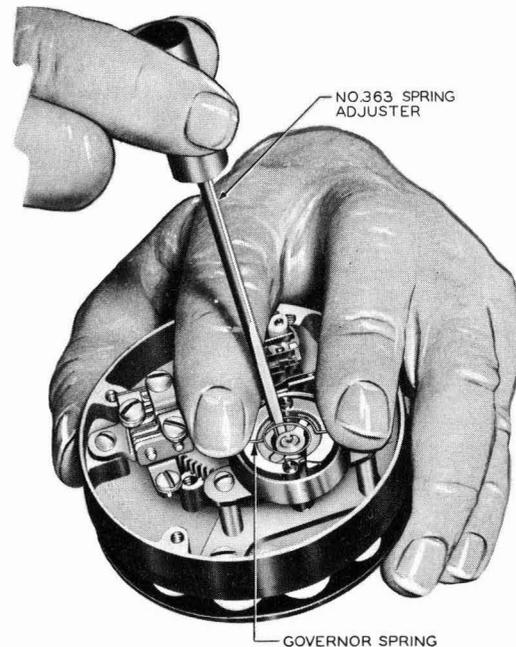
*Note:* In case the tip of the blade of the KS-6854 screwdriver is too thick to engage the slot in the governor clamping screw, select a screwdriver which has a narrower blade, or file the blade down slightly to fit the slot in the screw.

- (4) Move the adjusting arm toward F to increase the speed, or toward S to reduce the speed, gauging the amount of movement by the adjusting marks, when provided.

- (5) Tighten the clamping screw and remove the governor holder.
- (6) Recheck the speed of the dial.
- (7) If it is impossible to readjust the dial to meet the specified limits, or if, after readjusting, the dial does not operate satisfactorily, replace the dial with another dial of the same code number or its equivalent.
- (8) Do not bend or adjust any of the contact springs, since any shifting of the spring assembly will also cause a change in the per cent break as outlined in 3.003.

**Γ No. 6E Dial Used in Central Office**

- (9) To adjust the No. 6E dial to meet the speed requirement of 11.9 min, 12.1 max pps, proceed as follows.
- (10) Remove the mounting screws fastening the dial mechanism cover, using the C screwdriver. Remove the cover.



**Fig. 25 — No. 363 Spring Adjuster**

- (11) With the dial at rest, place the middle and index fingers over the ends of the governor spring, as shown in Fig. 25. This is to prevent

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the governor spring from becoming dislodged<sup>†</sup> while adjusting the governor spring. Insert the slot of the No. 363 spring adjuster in the upper loop of the governor spring midway between the weights, as shown in Fig. 25, and adjust as required. To increase the dial speed, twist the spring adjuster in a clockwise direction; to decrease the dial speed, twist the spring adjuster in a counterclockwise direction. Take care, when doing this, not to overbend the spring. If additional adjustment is required, bend the lower loop of the governor spring by twisting the spring adjuster counterclockwise to increase the dial speed, and clockwise to decrease it. ↵

#### **All Other 6-Type Dials**

(No procedure)

#### **REASONS FOR REISSUE**

1. To add 6-type dials equipped with plastic fingerwheels, and to make reference to these where necessary.
2. To add Fig. 6.
3. To add requirement for clearance between plastic fingerwheel and finger stop [2.06(b)].
4. To revise list of tools (3.001).
5. To add procedures covering cleaning number plates of 6-type dials equipped with plastic fingerwheels [3.01 (11) through (16)].
6. To add Fig. 19.
7. To add throughout the section information which applies to dials used in central offices.
8. To add Fig. 25.