

NO. 7 DIAL

Used With

**STROMBERG-CARLSON
500 SERIES TELEPHONES**

Maintenance Instructions

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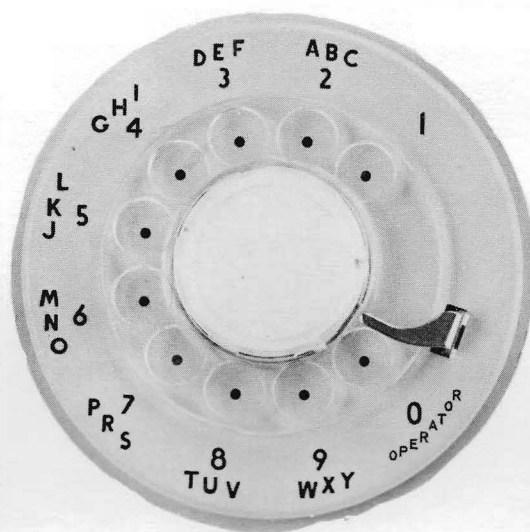
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TABLE OF CONTENTS

	<u>Paragraph</u>	<u>Page</u>
General	1	1
Technical Specifications	2	1
Description of Major Parts and Subassemblies	3	1
Operation	4	5
Maintenance	5	5
Lubrication	6	6
Checks and Adjustments	7	6
Spring Tension and Pawl Measurements	8	8
Disassembly and Assembly	9	8

LIST OF ILLUSTRATIONS

	<u>Figure</u>	<u>Page</u>
No. 7 Dial, Parts Breakdown (Front View)	1	2
No. 7 Dial, Parts Breakdown (Rear View)	2	3
General Arrangement of No. 7 Dial Mechanism	3	4
Cam Alignment	4	7
Method of Releasing Fingerwheel	5	10
Fingerwheel (Rear View) and Card	6	10



No. 7 Dial Used With S-C 500 Series Telephones.

1. GENERAL

The No. 7 Dial is used with the various types of S-C 500 telephones. The number plate is furnished to match the color of the housing with either white or black lettering for proper contrast. A clear plastic, closed-face fingerwheel is supplied with the No. 7 Dial.

2. TECHNICAL SPECIFICATIONS

Pulse speed	10 ± 0.5 pps
Percent break	62 ± 2 percent
Shunt delay	.010 second, minimum

a. Pulse speed is the rate at which interruptions (pulses) of the current flow are made as a result of breaking the pulsing spring contacts.

b. Percent break is the percentage of time that contacts are open during one pulse interval; a pulse interval being that time between the start of one break to the start of the next break.

c. Shunt delay is the time lapse between the making of the pulsing contacts, after the last pulse (break) of a dialed number, and the breaking of the shunt contacts when the dial returns to normal. Shunt contacts are closed, as the dial is moved off normal, to remove the receiver from the circuit so that pulsing is not heard during dialing.

3. DESCRIPTION OF MAJOR PARTS AND SUBASSEMBLIES

The No. 7 Dial consists of the following major parts and subassemblies plus assorted hardware necessary for assembling. These are illustrated in figures 1, 2, and 3. A list of replaceable parts is included on page 11.

a. Frame.

The frame is a zinc-base die casting. The frame is provided with two threaded holes for screw-mounting the complete

dial assembly to the set. It provides the basic casting upon which the other parts and subassemblies are grouped or mounted to form the complete No. 7 Dial.

b. Number Plate.

The number plate is screw-mounted on the forward side of the frame. Positioning holes and studs are provided.

c. Contact Spring Block Assembly.

This assembly normally consists of one pair of shunt springs and one pair of pulsing springs. These are built-up and spaced with plastic to form a complete assembly and then are fastened to the frame with two screws. An extra set of contact springs can be added for special applications.

d. Gear Train and Governor Assembly.

This assembly consists of the governor assembly, governor case, governor pinion gear, friction clutch, intermediate gear and pinion gear, cam pinion gear, cam, pawl, and miscellaneous parts for assembly. It is driven by the main gear which is a part of the main shaft and gear subassembly.

e. Fingerwheel Clamp Plate.

The clamp-plate fits over the ridged shoulder of the hub of the main shaft with its turned edges down and with its narrow, rounded retaining finger pointed between 9 and 0 on the number plate. A star washer is placed over the clamp plate and the plate and washer are retained by a hex nut tightened on the threaded end of the main shaft.

f. Fingerwheel.

The fingerwheel is a closed-face, clear plastic, slightly rounded type.

g. Finger Stop.

The finger stop is a metallic part which projects through the number plate and is bent to project over the fingerwheel.

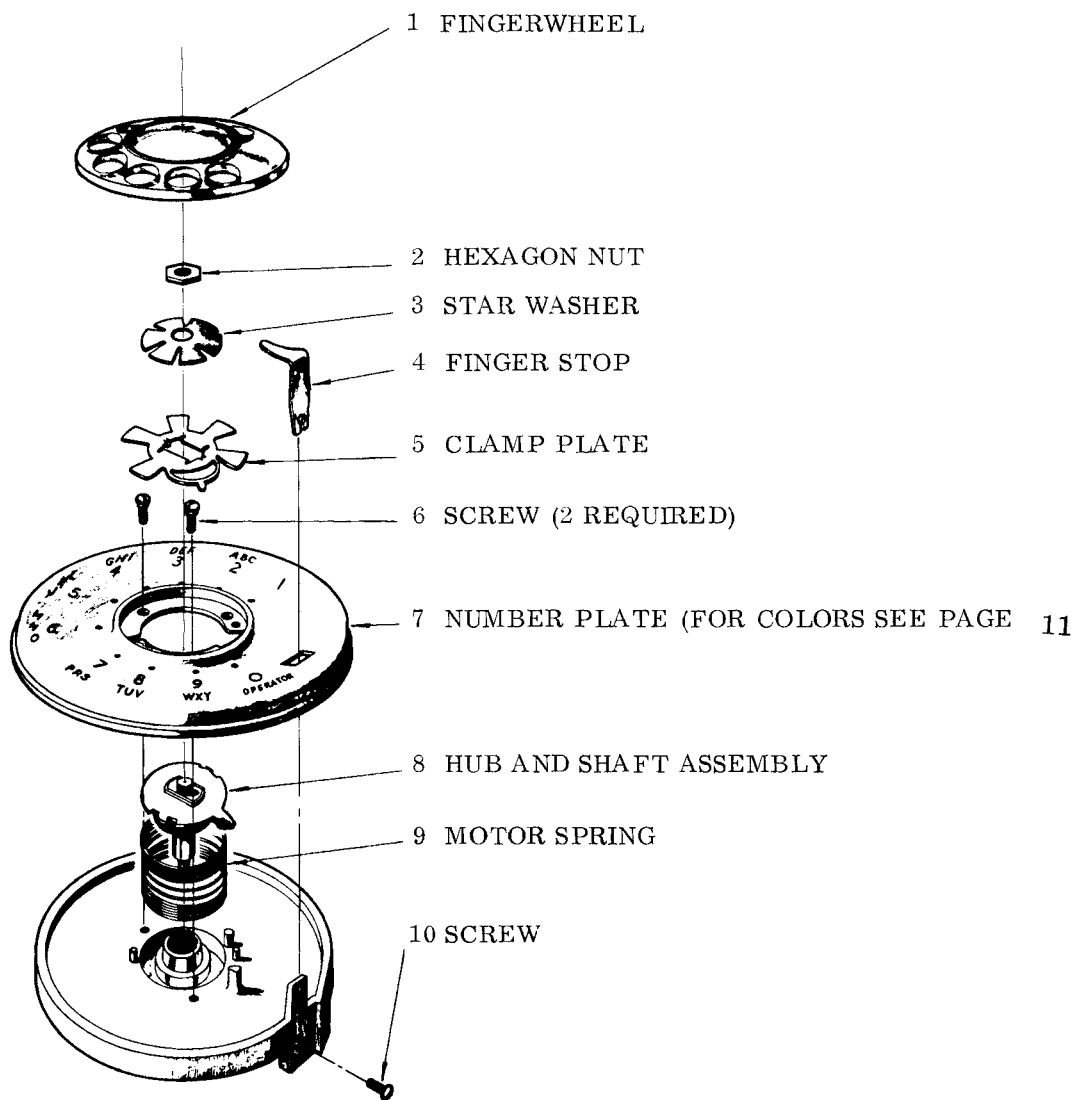


Figure 1. No. 7 Dial, Parts Breakdown (Front View).

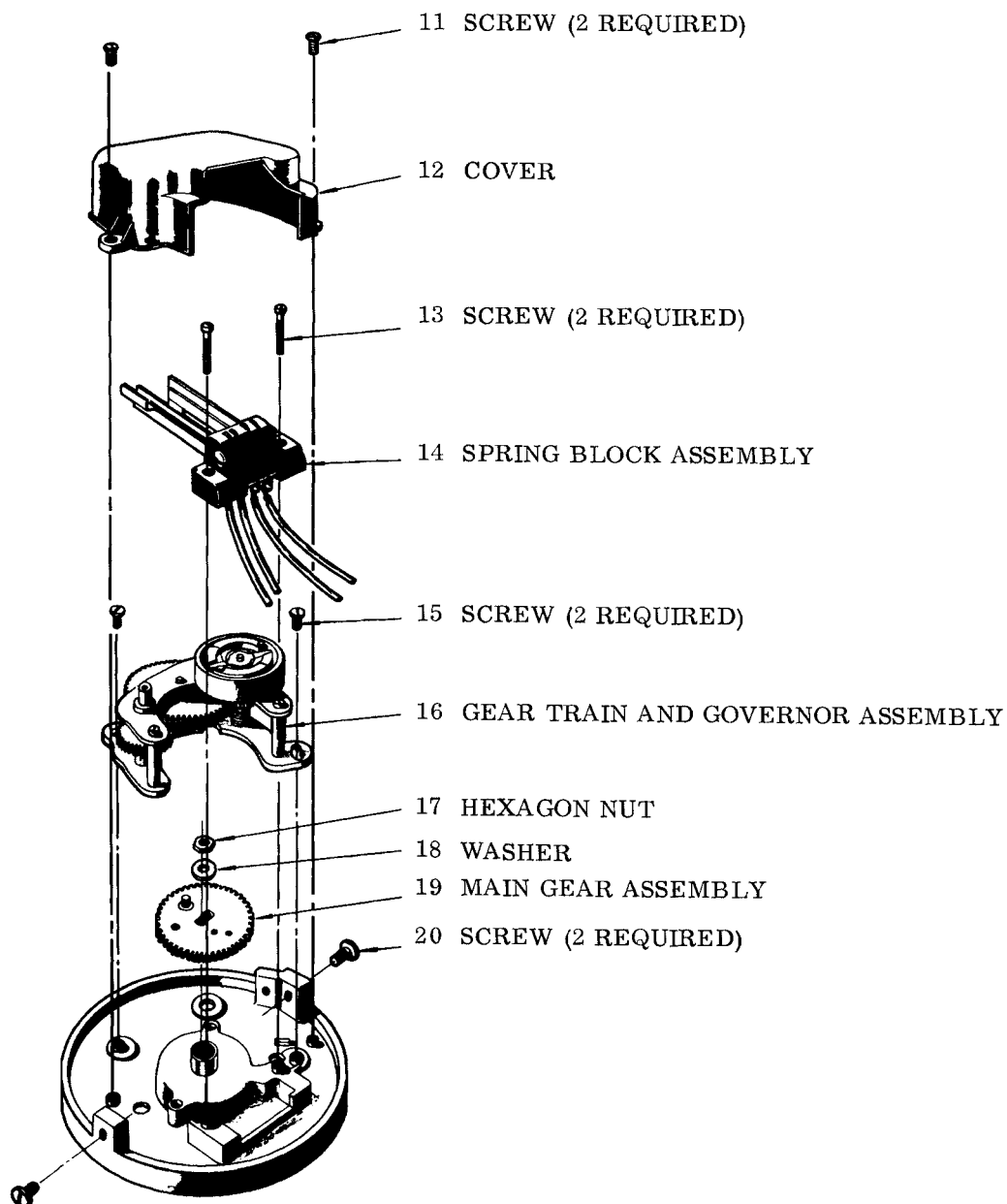


Figure 2. No. 7 Dial, Parts Breakdown (Rear View).

NOTE: For Part Numbers
See Page 8.

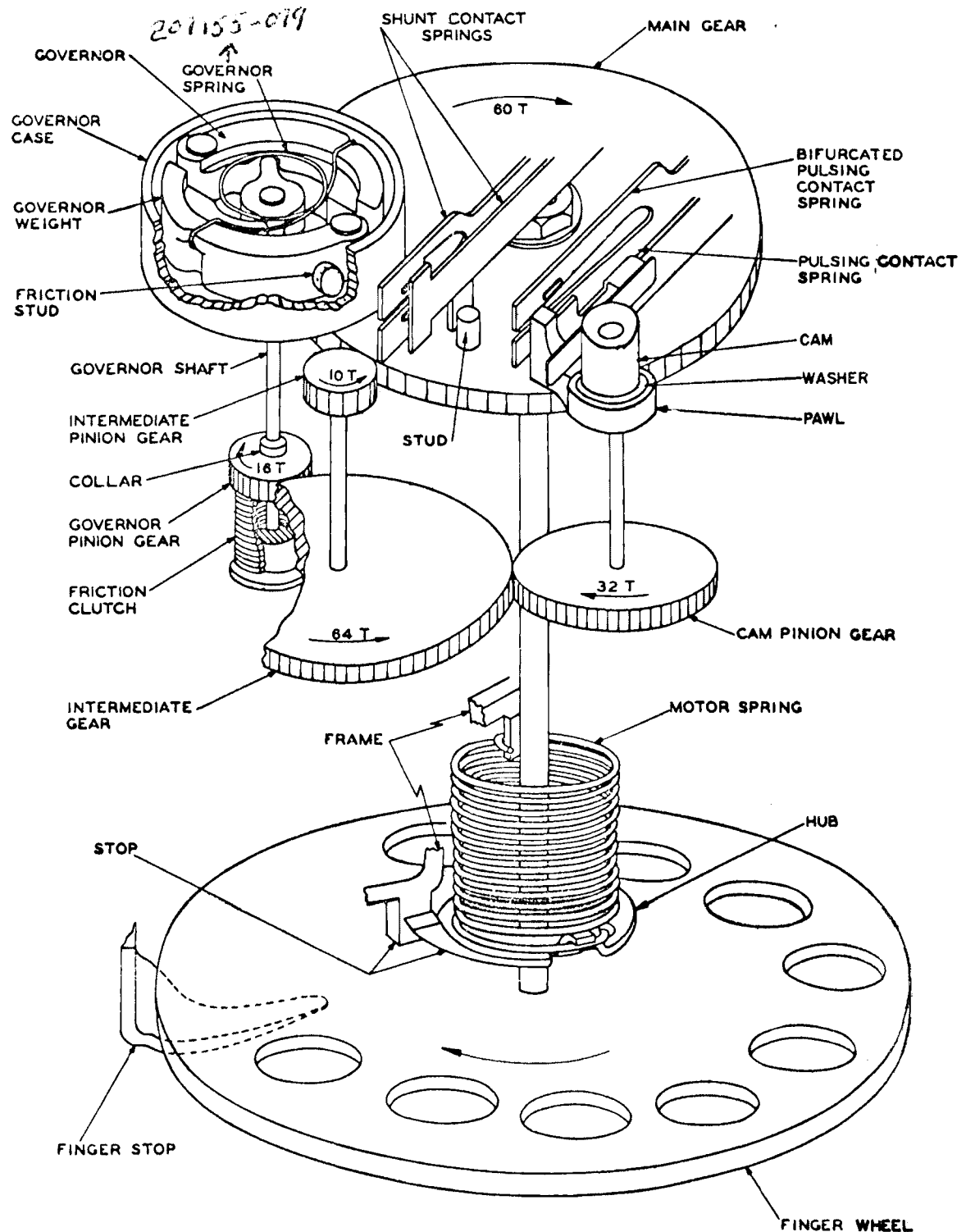


Figure 3. General Arrangement of No. 7 Dial Mechanism.

4. OPERATION

When the fingerwheel is rotated, the motor-spring is tensioned and the shunt springs are closed, short circuiting the telephone receiver. This prevents dial pulse noise from being heard in the receiver.

When the fingerwheel is released, the motor spring provides torque to rotate the main shaft and main gear. The main gear, driving the intermediate gear through the intermediate pinion, causes the cam pinion and governor pinion to rotate.

Rotation of the cam pinion causes the pawl to rotate until the pawl rests against the end of the bifurcated pulsing spring holding it in position; while the cam causes the cam follower pulsing spring to move back and forth opening and closing the pulsing contacts.

The rotation of the governor pinion causes the governor to rotate through the one-way spring clutch. As the weights rotate, they open out through centrifugal action, aided by the drive bar, until the friction studs come into contact with the governor case wall.

Through combined action of the friction studs, the governor spring, and the driving force (produced by the dial motor spring), the governor speed is held constant. This controls the speed at which the dial mechanism runs down and, in turn, controls the pulsing speed of the dial.

Immediately before rundown is complete (the pulsing mechanism completed its last pulse), the stud or studs on the main gear come against the tabs on the movable shunt spring or springs and open the shunt contacts, restoring the receiver circuit or other circuit which may be connected to the shunt springs. On completion of rundown, the dial mechanism is stopped by a tab on the main shaft hub which comes in contact with a lug cast in the dial frame.

5. MAINTENANCE

a. Dials Assembled to Sets.

The following procedures are recommended for No. 7 Dials that have already been assembled in a set.

(1) Check appearance for scratches, rust, or other discrepancies. Replace other components, if discrepancy warrants, as determined by company policy.

(2) Check the ring (gasket) assembly for discoloration or other damage. Replace as warranted.

(3) Check that dust cover is present and secure. If dust cover is cracked, but cracks are not open, it is not necessary to replace it.

(4) Check for excessive looseness or movement of number plate. Slight movement is not objectionable. Tighten number plate mounting screws, if required. Fingerwheel removal is explained in paragraph 9e.

(5) Check that fingerstop is tight and does not overlap 0 hole of fingerwheel by more than 3/64 inch with the dial in normal position and has not less than .020 clearance from fingerwheel during rotation. Tighten finger stop mounting screw, if necessary, or replace fingerstop if distorted.

(6) Check that fingerwheel does not wobble excessively during rotation. Deviation of more than 1/16 inch, as measured at the periphery of the wheel during rotation, should be cause for further investigation as to the cause and possible corrective action (tighten clamp plate retaining nut, replace fingerwheel, etc.).

(7) Replace station number cards as required.

(8) Check that cardholder window in fingerwheel is free from scratches, stains, or cracks. Replace fingerwheel, if number cards are not clearly visible.

(9) Remove fingerwheel (par. 9e) and check that clamp plate and star washer are secured in place by the hex nut. Correct as necessary. Replace fingerwheel.

b. Dials Removed from Sets.

In addition to the procedures in a above, the following are also recommended.

(1) If dust cover is removed, clean interior parts of dial. Stabilized trichlorethylene is recommended.

CAUTION: CLEANING FLUID MUST NOT CONTACT RUBBER, NYLON, OR PLASTIC PARTS, OR THE MAIN SHAFT BEARING. ADEQUATE VENTILATION MUST BE PROVIDED.

(2) Check all components visually for defects, such as cracked, bent, or loose parts. Check for stripped threads, binding gears or associated defects. Replace complete dial assembly or affected parts, when applicable. If gears bind, it is sometimes possible to obtain satisfactory operation by loosening the gear train assembly mounting screw in the slotted hole, repositioning the assembly, and retightening the screw. If this is not successful, replace the complete gear train assembly (par. 9). It is not considered practical to replace any parts in this assembly due to the difficulty in obtaining correct alignment.

(3) Check that the governor tension spring is present and not distorted. Replace with new spring, if required, and check that pulse rate is $10 \pm .05$ pps. If not, adjust spring tension by widening or narrowing spring loop. Narrowing the loop increases the tension and the speed. Check also that the friction studs or clutch do not bind on forward dialing. With the weights extended fully, the studs should be of sufficient length to provide a minimum clearance of .010 inch between the weight and the case. Clearance should be measured after cleaning and lubrication have been accomplished.

6. LUBRICATION

CAUTION: KEEP LUBRICANT FROM TOP OF TOP PLATE AND INSIDE SURFACES OF GOVERNOR CASE.

If a dial has not been lubricated within five years from the date of manufacture, it is recommended that it be lubricated. It is also recommended that the date of lubrication be stamped on the frame.

Lubricate with KS 14774 List 2 Lubricant.

a. All gear teeth (light coating of lubricant).

b. Intermediate shaft bearings (one drop).

c. Pulse shaft bearings (one drop).

d. Main gear shaft (not shown) between main gear and bearing (one drop). (If main gear shaft is replaced, the new shaft shall be lightly coated with lubricant.)

e. Governor shaft bearings.

Note. The presence of oil on the contacts shall not be considered objectionable, provided that the amount is not sufficient to form a sustained meniscus between the contacts when they are slowly opened to a separation of .010 inch.

7. CHECKS AND ADJUSTMENTS

a. Dial Speed.

(1) The dial must meet the following speed requirements within five attempts. The dial should be in an associated set in its normal position. The average of nine complete pulses is the basis for calculation.

(a) Not less than 9.0 pps.

(b) Not more than 10.5 pps.

(2) If the requirements for dial speed cannot be met, remove dial from set and dust cover from dial. Check that the pawl is in position against the end of the pulsing spring during rundown, and that the bifurcated contact spring is seen to move away from the pawl tip when the cam is at its maximum position. Also check that contacts are open when the cam is at its minimum position. If contacts are not being opened and closed properly, refer to paragraph 8 for spring tension adjustment of the cam follower spring assembly. After adjustment, again check dial speed.

(3) If the checks in (2) above establish that the pulsing speed discrepancy is not caused by the contacts of the cam follower pulsing spring assembly, make a visual check of the dial. Check for:

(a) Dirt -- clean and lubricate per paragraph 6.

(b) Binding gears -- adjust position of gear train assembly. Loosen

screw at slotted hole and re-tighten when adjustment is complete.

(c) Broken governor spring -- replace spring and adjust span of loop for correct dial speed. Narrowing the span increases loop tension and dial speed.

(d) Governor spring for binding on parts -- adjust clearance of loop section of spring to .015 inch minimum.

(e) Governor weights for less than .010 inch clearance from case when extended -- replace gear train assembly. Cam must be aligned as shown in figure 4 and, with dial in normal position, pawl must be free to rotate. If necessary, adjust governor spring as in (c) above.

Note. A broken or improperly tensioned motor spring could also cause improper dial speed or dial stalling. Procedures for replacing the motor spring are contained in paragraph 9. In addition, improper tension on contact springs could affect dial speed. Procedures for checking tension are contained in paragraph 8.

b. Dial Stalling.

Dials must not stall when the first digit (1) is dialed and the fingerwheel is returned slowly to normal at one-third normal speed and under a restraining torque of 30 gram-inches.

c. Dial Noise.

Dials must return from the fully-wound (dial 0) position to normal without producing audible, high-pitched squeals. Replace dial, if this condition is found.

d. Shunt Contacts.

(1) Shunt contacts must remain open until the fingerwheel has been moved approximately 1/16 inch from normal as measured at the periphery of the fingerwheel. The contacts must be closed when the digit "1" is dialed and must remain closed until after the last pulse is completed during rundown of the dial.

(2) If the requirements in (1) are not met, adjust spring assembly for not less than .010 inch separation of the contacts, and, when closed, the springs must be adjusted for 30 ± 7 grams force between contacts.

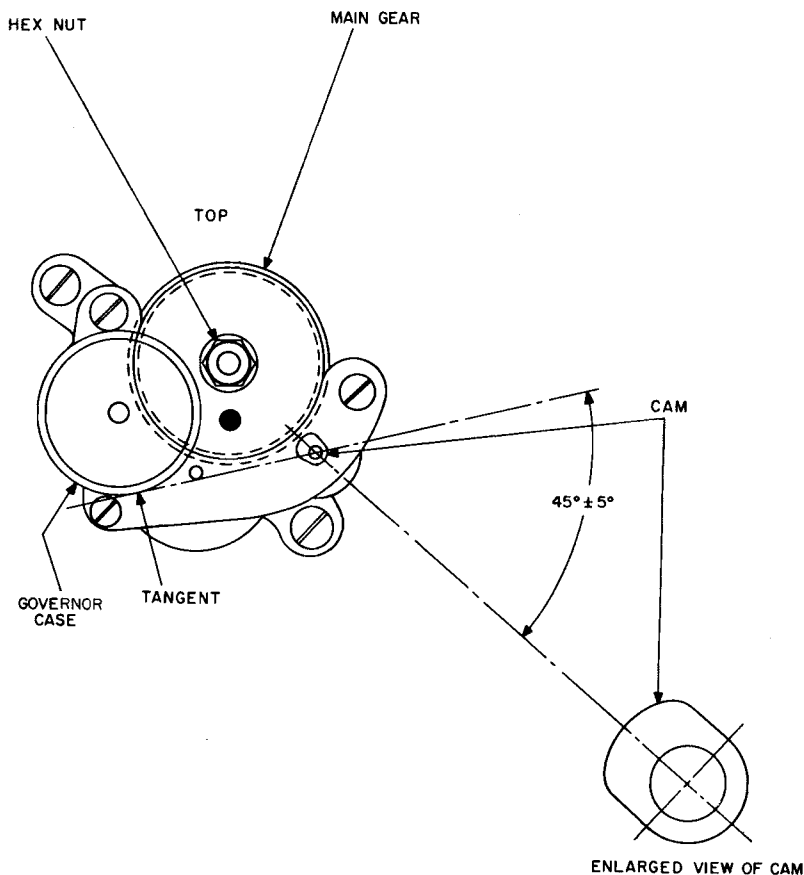


Figure 4.
Cam Alignment.

8. SPRING TENSION AND PAWL MEASUREMENTS

Springs must be checked and adjusted as described below. It is recommended that the complete spring block assembly be replaced when springs have a missing contact, are bent, broken, or otherwise distorted. When the assembly is replaced, dial speed and percent break are affected and should be checked and adjusted as required.

a. Cam Follower Springs.

(1) The contact force between the pulsing contacts, when the cam follower spring is on the low point of the cam, is 30 ± 7 grams. Both tangs of the bifurcated spring must be engaged, simultaneously when making this measurement. Adjust spring tension as necessary.

(2) The contact force between the cam follower spring and the low point of the cam, when the pawl is in its restraining position, must be 12 ± 7 grams.

b. Shunt Spring.

Requirements and adjustments are described in paragraph 7d.

c. Pawl.

The dynamic force required to restrain the pawl during rundown must not be less than $1/2$ gram or more than 5 grams as measured at the corner of the flat surface of the pawl tip during not less than one revolution of the cam shaft at a rate of approximately one revolution per second.

9. DISASSEMBLY AND ASSEMBLY

Pertinent checks and adjustments must be made when a part is changed.

a. Dust Cover.

Remove two mounting screws and cover. Reverse procedure to assemble.

b. Gear Train and Governor Assembly.

(1) Remove two mounting screws. Slide assembly from under main gear and lift. Be careful not to damage cam follower pulsing spring assembly. This subassembly should be replaced in its entirety, except for the governor spring.

(2) To replace the assembly, reverse above procedure. Cam must be positioned so that maximum point of cam lobe would be on an imaginary line drawn from the center of the cam shaft to the rear edge of the threaded portion of the main shaft (approximately the 10 o'clock position). Check that, on last pulse, cam lobe causes closing of cam follower pulsing spring contacts before stud on main gear causes shunt spring contacts to open. If not, cam positioning must be readjusted. Check for smoothest dial operation by adjusting position of assembly at slotted hole end. Tighten screws when best position is located. Refer to figure 4.

c. Spring Block Assembly.

Remove two mounting screws and assembly. Reverse procedure to replace. Make certain that springs are positioned correctly to prevent bending or distortion.

d. Fingerstop.

Loosen fingerstop mounting screw until fingerstop can be removed by pulling away from dial face. To replace, insert slotted end of fingerstop through number plate and beneath mounting screw with stop over fingerwheel. The "0" hole in the fingerwheel can be overlapped by no more than $3/64$ inch in the unoperated position of the dial. Position fingerstop so that clearance between it and fingerwheel is not less than .020 inch during any part of rotation. If necessary, fingerstop may be bent not more than 10° to achieve proper clearance (fig. 5).

e. Fingerwheel (Finger Plate).

(1) To remove fingerwheel, rotate clockwise as far as possible, maintaining moderate pressure in the clockwise direction. Insert end of straightened paper clip or suitable tool in release hole of fingerwheel. Press down to release locking finger of clamp plate. Fingerwheel will come off and dial will return to normal (fig. 5).

(2) To replace fingerwheel, with dial in normal position, slide fingerwheel under fingerstop and center on clamp plate flanges with number 10 hole over number 9 position on number plate. Maintain light pressure on fingerwheel and turn clockwise until finger of clamp plate snaps into place.

Note. When fingerwheel replacement is necessary, order closed-face type as indicated in List of Replaceable parts (page 11).

f. Clamp Plate.

(1) To remove clamp plate, remove fingerwheel (e above). Then remove hex nut, star washer, and clamp plate from main shaft and gear assembly.

(2) To replace clamp plate, place clamp plate over ridged portion (rectangular) of main shaft and gear assembly hub with turned edges inward and with finger pointed between 9 and 0 in number plate. Replace star washer with convex side outward and tighten hex nut.

g. Number Plate.

(1) Remove fingerstop, fingerwheel, and clamp plate (d, e, and f above). Remove two mounting screws for number plate and lift off plate.

(2) To replace, align number plate by means of fingerstop stud and studs on hub. Replace two mounting screws.

h. Main Shaft and Gear Assembly.

(1) Remove all other parts (a through g above). Remove hex nut and washer from main shaft at rear of frame. Remove main gear from shaft. If shaft and spring do not drop out pull on shaft hub at front, or lightly tap end of shaft at rear (use care not to damage threading) and avoid having assembly drop to a hard surface. Remove spring from hub tabs and by disengaging tang from hole in hub.

(2) To assemble, place tang of spring in hole in hub. Place the first coil of the spring over the tabs on the hub (it is not objectionable if the first two turns or coils are placed over the tabs).

Note. If a new shaft is being used, coat lightly with lubricant (par. 6).

(3) Partially insert shaft and spring into frame shaft bearing and frame well, respectively. Be sure that the tang on the opposite end of the spring is inserted into the

receptacle which is located in the frame well. Ensure that tang on opposite end of spring is inserted in receptacle for it in the well. Turn hub clockwise until projection on jub has passed stud on frame twice, then insert shaft fully. Projection on hub must rotate back against frame stud due to spring torque. Hold shaft in place, put main gear on shaft. Make certain that gear is seated properly, place washer and hex nut on end of shaft and tighten nut. Check that shaft rotates freely and returns to normal without stalling. Assemble parts removed in (1) above in reverse order. Lubricate as prescribed in paragraph 6 and perform checks and adjustments as prescribed in paragraph 7.

i. Station Number Card Replacement.

(1) Remove fingerwheel from the dial as shown in paragraph e.

(2) Turn fingerwheel up-side-down with the number 1 hole and 0 hole at the bottom.

(3) Locate the diamond indexing lug located to the left of center line of hole number 5.

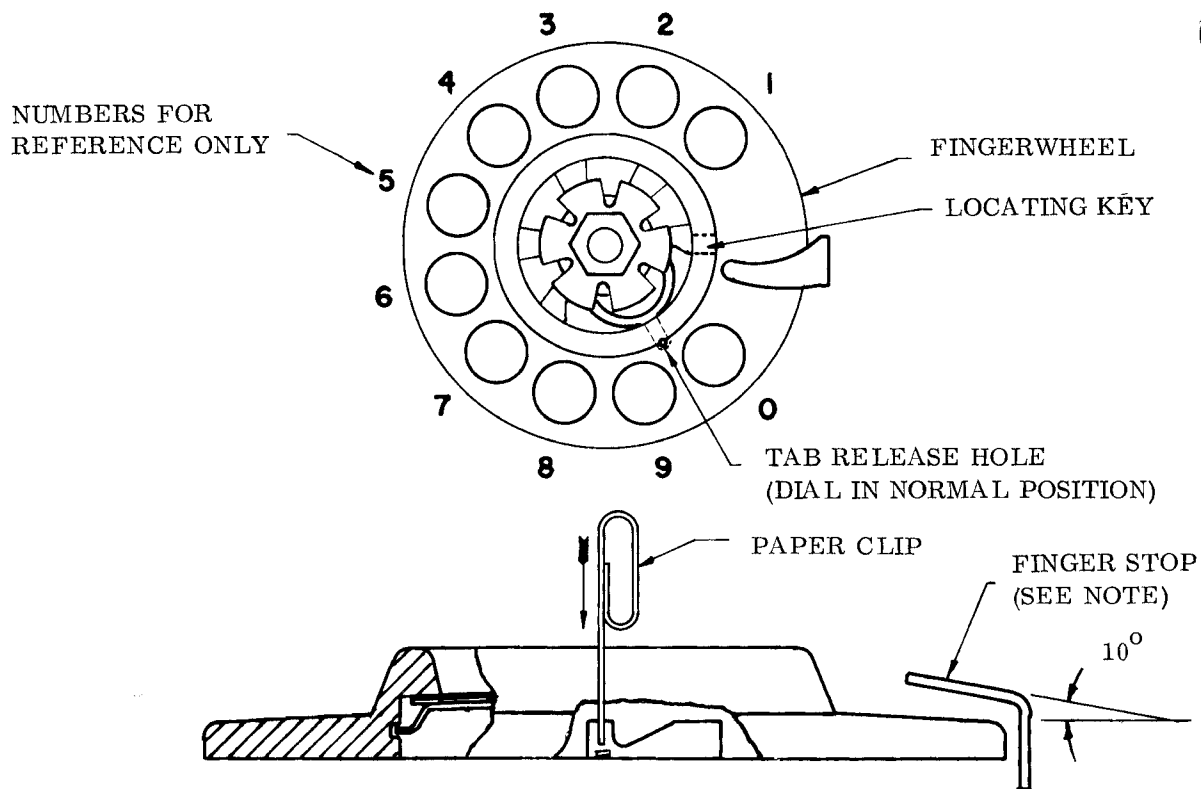
(4) Break out the V-notch in the number card. Do not break out the square notch.

(5) Insert the number card into the fingerwheel with the printed station number face down and the V-notch on the card in line with the diamond indexing lug on the fingerwheel.

(6) Replace fingerwheel on dial as described in paragraph e.

Note. If printed number is not aligned, fingerwheel may have the diamond indexing lug in the wrong location. Remove fingerwheel from the dial. Remove the number card from the fingerwheel and reinsert the number card with the V-notch slightly to the left of the number 5 hole center line.

(7) Order replacement number cards in strips of 4 using order number 300001-481.



Note. When replacing flat fingerwheel with curved top fingerwheel, bend finger stop approximately 10° as shown, or replace with bent up finger stop, part no. 207155-119.

Figure 5. Method of Releasing Fingerwheel.

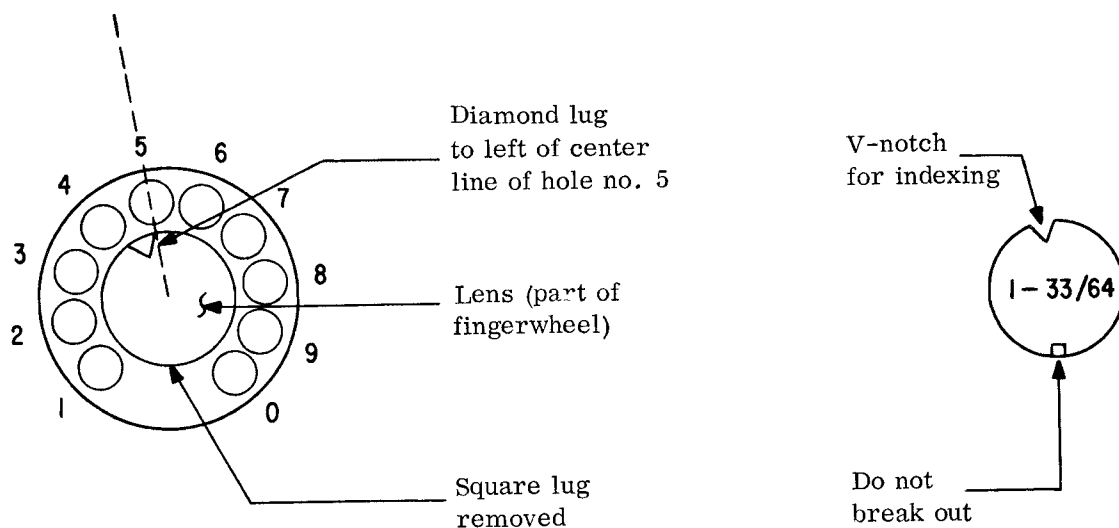


Figure 6. Fingerwheel (Rear View) and Card.

REPLACEMENT PARTS LIST

FIGURES 1 AND 2

<u>Item</u>	<u>Part Number</u>	<u>Description</u>
1	207155-019	#8 Fingerwheel (clear plastic)
1	207155-239	Black Metal Fingerwheel
2	207155-059	Fingerwheel Nut
3	207155-069	Star Washer (Fingerwheel)
4	207155-119	Finger Stop
5	207155-039	Clamp Plate
6	207155-089	Screw (For Mtg. No. Plate)
7	303943-406	Number Plate (Ivory)
7	303943-407	Number Plate (Red)
7	303943-408	Number Plate (Yellow)
7	303943-409	Number Plate (Black)
7	303943-410	Number Plate (White)
7	303943-411	Number Plate (Blue)
7	303943-412	Number Plate (Pink)
7	303943-414	Number Plate (Beige)
7	303943-415	Number Plate (Turquoise)
7	303943-422	Number Plate (Green)
7	303943-423	Number Plate (Gray)
8	207155-149	Hub and Shaft Assem.
9	207155-159	Motor Spring
10	207155-129	Screw for Finger Stop
11	207155-169	Screw (Dust Cover - 2 required)
12	207155-049	Dust Cover
13	207155-179	Screw (Spring Assem. - 2 required)
14	207155-189	Spring Block Assem.
15	207155-199	Screw (Gear Train)
16	207155-099	Gear Train and Governor Assem. for Dial Mechanism
17	207155-209	Hex Nut
18	207155-219	Washer
19	207155-109	Main Gear Assembly
20	207155-229	Screw (Dial Mtg.) (2 required)
21	207155-079	Governor Spring
22	207155-139	Protector (Card)
23	207155-249	Card Holder Group (Protector Retaining Disk, Retaining Ring)

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