

MOTORS AND MOTOR UNITS
 REQUIREMENTS AND ADJUSTMENTS

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL	1	Motor positioning	18
		Motor shield	19
2. REQUIREMENTS AND ADJUSTMENTS — OTHER THAN 28, 35, AND 37 TYPE MOTOR UNITS	2	Standard and Heavy Duty Synchronous Motor Units	
Common Requirement	2	Centrifugal switch	22
Governors		Motor adjusting stud	21
Adjusting-wheel friction washer (single-speed governor)	8	Motor positioning	21
Center-contacting-type Governors	9	Series Governed Motor Units	
Edge-contacting-type Governors	14	Governor brush spring	24
Governor contacts	7	Governor contact	23
Speed-adjusting-lever stop plate	8	Governor contact backstop	23
Governed Motors		Motor positioning	23
Cleaning brush and brush holder	6	Motor speed	24
Commutator	6	Series Governed Variable Speed Motor Units	
Motor bearings	7	Brake shoe slide	25
Motor brush	5	Governor spur gear train	26, 27
Motor-brush spring	5	Speed control linkage bearing plate	25
Refacing motor brush	6	Plastic Type Axial Fan for Models 28 and 35 Teletypewriter Sets	
Synchronous Motors		Cable clamp interference	28
Three-brush starting switch on G. E. motor	3		
Three-brush starting switch (Old-style on H. C. motor)	4	1. GENERAL	
3. REQUIREMENTS AND ADJUSTMENTS — 28, 35, AND 37 TYPE MOTOR UNITS	18	1.01 This section contains the requirements and adjustments for motors and motor units used with various teletypewriters and associated apparatus. This section and the section covering general teletypewriter requirements and adjustments provide the information necessary for maintenance of motors and motor units. It is reissued to change the title and to include the requirements and adjustments for the 14, 15, 19, and 20 type motor units, variable speed	
Miniaturized Synchronous Motor Units			
Air ducts	20		
Capacitor position	20		
Motor gear	18		

series governed motor units, centrifugal switch, and plastic type axial fan. Since this a general revision, marginal arrows used to indicate changes and additions have been omitted.

1.02 Also included in this section are the requirements and adjusting procedures for the maintenance of motors, motor units, and governors used with 28, 35, and 37 teletypewriter apparatus.

1.03 Routine maintenance of a motor unit is ordinarily confined to wiping oil, grease, and dust from its exterior portions. If it becomes necessary to dismantle the motor unit, consideration should be given to substituting a new motor, since motor repair and maintenance can be done more efficiently in a repair shop than on the subscriber's premises.

1.04 The figures in this section show the adjusting tolerances, positions of moving parts, and spring tensions. For requirements and procedures for adjusting the relationship between the motor pinion and the gear, refer to the particular section for the type of apparatus involved.

CAUTION: THE ELECTRIC POWER SHALL BE DISCONNECTED BEFORE THE APPARATUS IS REMOVED FROM ITS PROTECTIVE HOUSING. WHERE OPERATION OF THE APPARATUS AFTER ITS REMOVAL FROM THE HOUSING IS REQUIRED, POWER SHALL BE APPLIED WITH APPROPRIATE PRECAUTIONARY MEASURES TAKEN TO PREVENT ACCIDENT.

1.05 The cleaning materials specified in this section are those listed in the section covering the general requirements for cleaning teletypewriter apparatus.

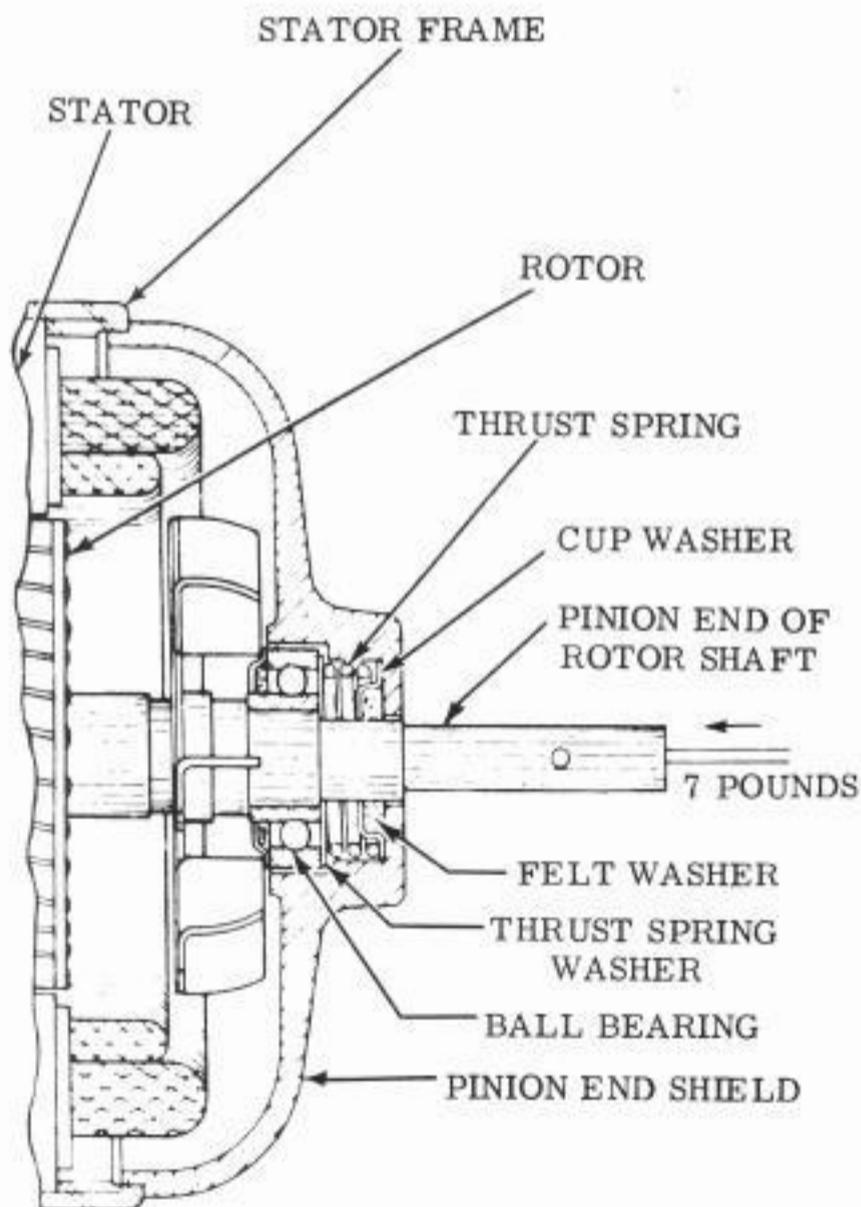


Figure 1 - Rotor Thrust Spring Tension

2. REQUIREMENTS AND ADJUSTMENTS — OTHER THAN 28, 35, AND 37 TYPE MOTOR UNITS

2.01 Common Requirement - Rotor Thrust-spring Tension: It shall require at least 7 pounds to push the shaft endwise. Upon releasing the tension, the shaft should return to its normal position. (See Figure 1.)

Note: All General Electric motors have thrust springs, but some Holtzer-Cabot motors do not.

(a) To gauge, remove the motor from the teletypewriter and place the push end of the 15 pound scale against the switch end of

the rotor shaft and apply the pressure in line with the shaft.

(b) If springs do not meet this requirement, remove the pinion end shield and clean the bearing housing. If necessary, replace the spring. Reassemble the end shield.

2.02 Synchronous Motors:

Note: These requirements need not be checked unless there is reason to believe the starting switch is causing trouble or the motor is disassembled for other reasons.

(a) Three-brush Starting Switch on G.E. Motor (See Figure 2): To disassemble,

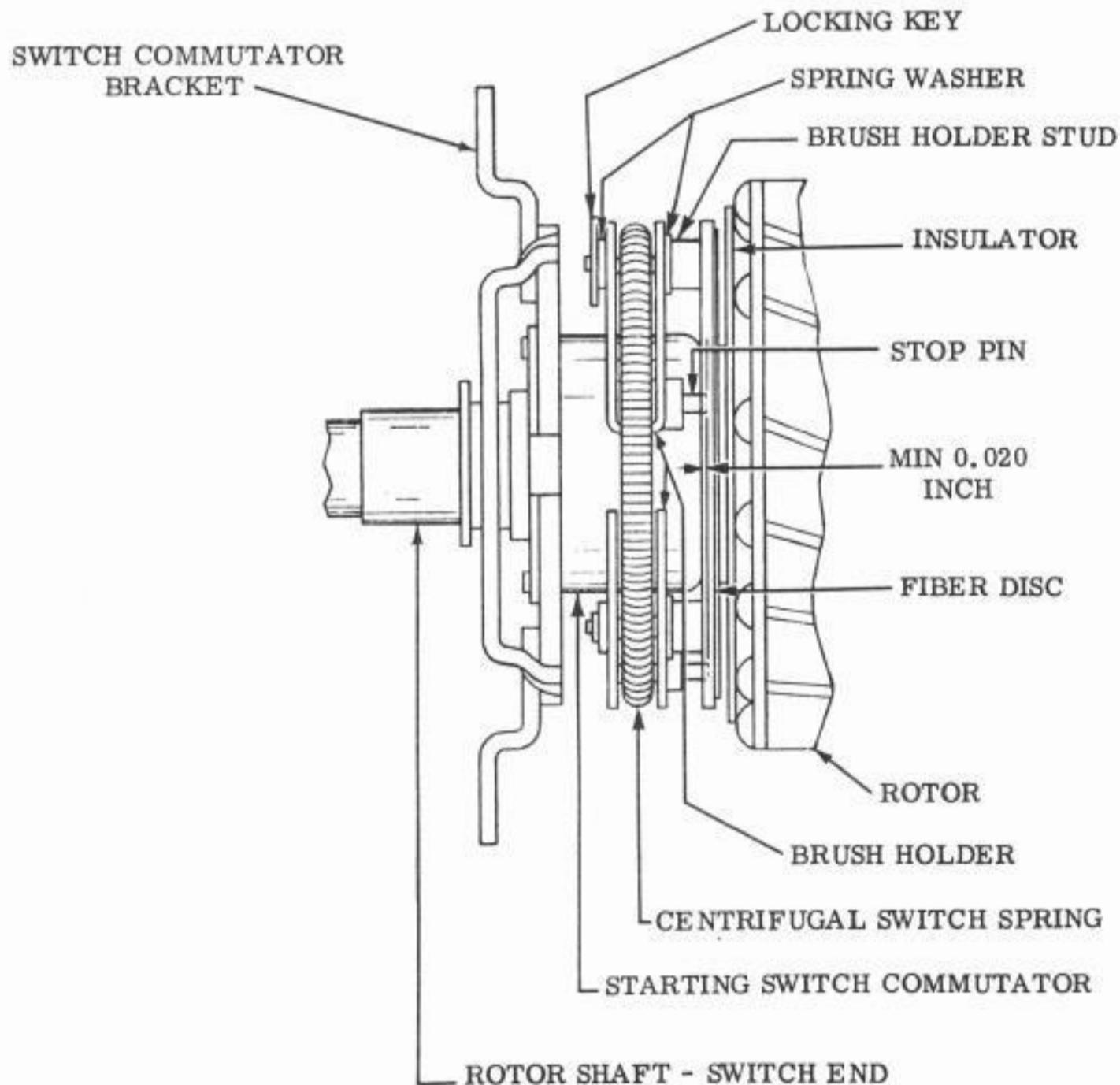


Figure 2 - Three-brush Starting Switch on G.E. Motor

detach motor from its associated apparatus, and remove pinion, motor fan (if provided), and the end shield on the starting-switch end of the motor. Pull out the rotor until the starting switch is easily accessible. Unhook and remove the centrifugal-switch spring.

- (1) Brush holders shall be mounted by their center mounting holes with their spring washers and locking keys securely in place, and shall be free from bind.
- (2) Brush-holder stop pins shall be safely within the elongated holes of the fiber disc on which the brush holders are mounted (minimum 0.020 inch), when all the play has been taken up to reduce the engagement to a minimum. Gauge by eye.
- (3) Centrifugal-switch Spring Tension: It shall require minimum 1-3/4 ounce, maximum 2 ounces for 50 hertz motors, minimum 2 ounces, maximum 2-1/2 ounces for 60 hertz motors to extend the spring to a length of 5 inches.
- (4) The fiber mounting disc shall be securely fastened to the metal sleeve that secures the assembly to the rotor shaft. Loosening of the fiber disc on the metal sleeve may cause failure of the brushes to disengage from the commutator.
- (5) The starting-switch commutator shall be free from excessive burns or pits and its wires securely soldered in place and in good condition.

To Adjust: If the commutator is burned or pitted, remove the rotor bearing, unsolder the wires attached to the commutator, and slip the commutator from the rotor shaft. Wrap a piece of 400A Aloxite around the commutator and rotate back and forth until the burned spots or pits are removed. If the burns or pits are too deep, discard the commutator. Before reassembling, make sure that the gaps between the segments of the commutator are free from metal particles and dirt.

- (6) To reassemble, replace the centrifugal-switch spring, making certain that the spring eyes are fully engaged with each other. Slide the end shield on the rotor shaft and fasten the switch commutator to the end shield, tightening the screws alter-

nately, a little at a time, until both are tight. Fasten the end shield to the motor frame tightening the screws in the same manner as above.

- (b) Three-brush Starting Switch (Old-style) on H.C. Motor (See Figure 3): To disassemble, detach motor from its associated apparatus, and remove pinion and motor fan (if provided). Remove the starting-switch split-ring screws, the end-shield screws, the bearing retainer screws, and the end shield. Remove the bearing-retainer screws from the pinion end shield of the motor and pull out the rotor until the starting-switch is easily accessible.

- (1) Brush-arm Spring Tension: It shall require minimum 5 ounces, maximum 8 ounces, to just pull the brush arm against its stop when the brushes are resting on the commutator (split ring) and the rotor is held so that the spring being checked is in a horizontal position. Repeat check for each brush-arm spring.
- (2) Brush arms shall be free and without bind, the retaining washers in place, and the end of the brush-arm mounting post safely riveted to secure the retaining washer. If retaining washers are missing or the mounting post is not safely flattened, do not attempt to flatten the mounting post but replace the assembly.
- (3) The starting-switch split ring shall be free from excessive pits or burns, the gap between its segments minimum 1/32 inch and the mica insulator on its inner surface securely glued and intact. If the split ring is burned or pitted, remove the rotor bearing, unsolder the wires attached to the split ring, and slip the split ring from the rotor shaft. Wrap a piece of 400A Aloxite around the split ring and rotate back and forth until the burned spots or pits are removed. If burns or pits are too deep, the mica insulator is loose or mutilated, or the gap between the segments is less than 1/32 inch, replace the commutator. Place the split ring on the rotor shaft and reassemble the rotor bearing.
- (4) Starting-switch brush-assembly mounting screws shall be tight and their fiber insulators free of breaks or cracks. Broken or cracked insulators shall be replaced.

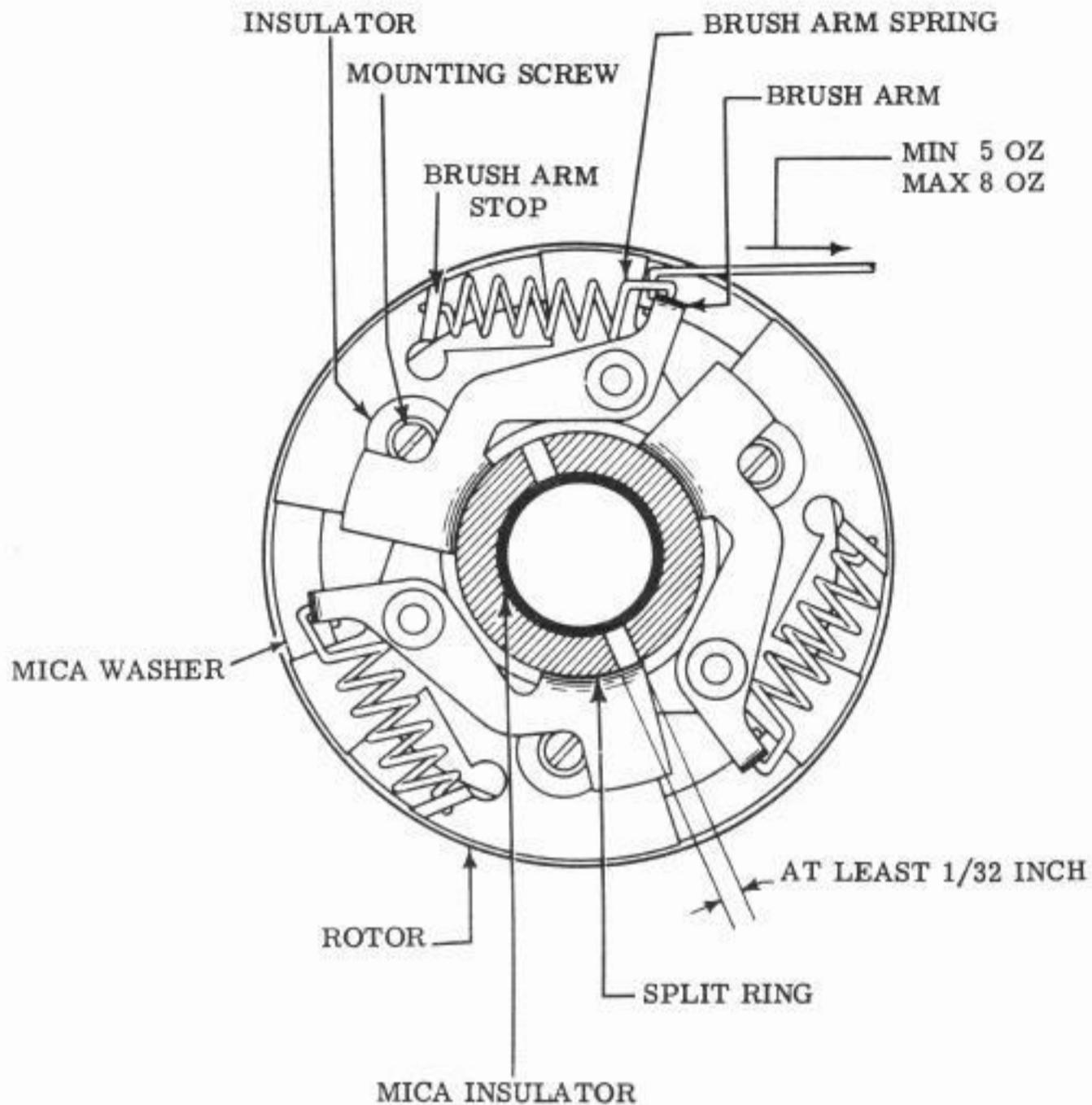


Figure 3 - Old-style Starting Switch on H.C. Motor

Note: The above old-style three-brush starting switch on the Holtzer-Cabot motor has been replaced by a starting switch which works by centrifugal action but employs no brushes. The installation of this newer style switch is covered in 5770S.

2.03 Governed Motors:

(a) Motor-brush Spring: Remove brush spring cap. It shall require minimum 5 ounces, maximum 8 ounces to press the motor-brush

spring to its normal position (about 1/8 inch inside the outer edge of the insulator on the brush holder). Springs not meeting this requirement shall be replaced. Avoid the tendency to keep brush spring tension low, because it results in grooving of the collector, copper picking, and loss in brush life.

(b) Motor Brush (See Figure 4): Remove the brush assembly (brush and brush spring) from its holder, noting its position and the side from which it was removed, and mark

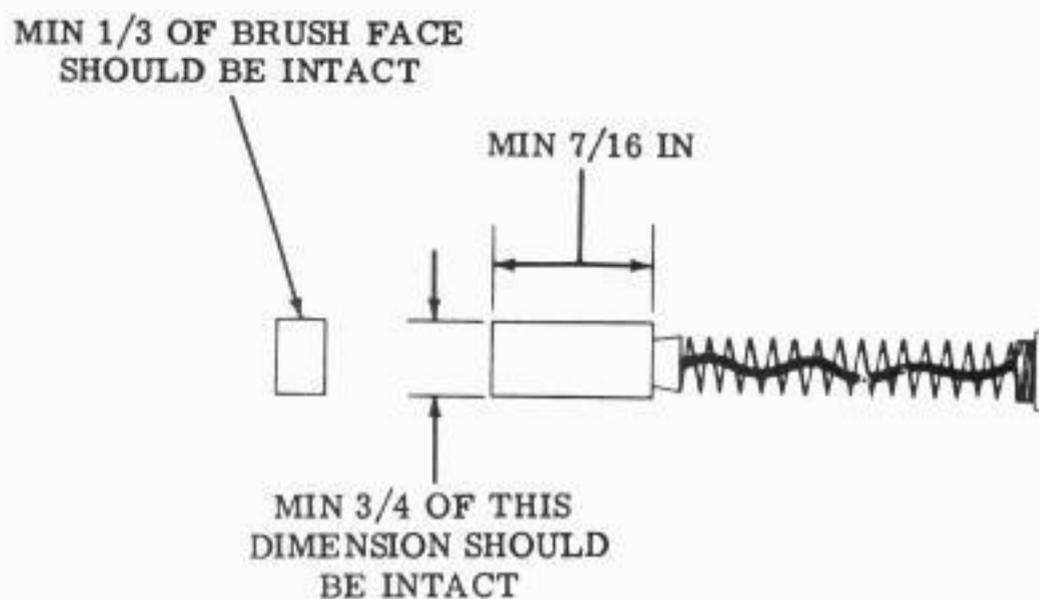


Figure 4 - Motor Brush

the brush so that it may be reassembled in the same position. Where the brush has a number stamped on the carbon, this may be used as a guide in putting the brush back in place.

- (1) There shall be minimum 7/16 inch of brush material remaining, and the contact surface of the brush bearing on the commutator shall constitute minimum 1/3 of the brush face, and extend minimum 3/4 of the long dimension.
- (2) There shall be no copper pickings imbedded in the face of the brush.
- (3) Note that the stranded wire inside the brush spring is intact and free from kinks which may prevent the spring from extending properly and that the wire is securely fastened to the brush and the contact disc.

(c) **Cleaning Brush and Brush Holder:** The brush shall be wiped with a clean KS-2423 cloth dampened with KS-19578, List 1 trichloroethane. The brush holder shall be wiped out with a KS-2423 cloth dampened with KS-19578, List 1 trichloroethane and wrapped around an orange stick.

CAUTION: USE KS-19578, LIST 1 TRICHLOROETHANE ONLY IN A WELL-VENTILATED AREA. AVOID PROLONGED OR REPEATED BREATHING OF VAPOR. AVOID PROLONGED OR REPEATED CONTACT WITH THE SKIN. USE IN SMALL QUANTITIES ONLY. DO NOT TAKE INTERNALLY.

(d) **Refacing Motor Brush:** Where it is necessary to reface a brush, the following method shall be used: Wrap a piece of 400A Aloxite around a section of the commutator under the brush holder, with the abrasive side toward the brush. Place the brush in its proper position in the holder and put back the spring cap. Turn the armature and Aloxite back and forth by hand until the brush face has the proper curvature. The last turn shall be in the normal direction of rotation. Remove the brush and bevel the edges slightly with the Aloxite. Extreme care shall be taken to remove all traces of grit and carbon from the commutator slots and adjacent windings after the above operation. Insert the brush in its holder with the identified side up. Note that the brush slides freely, but not too loosely, in the holder.

(e) **Commutator:** A smooth, even, bronze-colored or chocolate-brown glaze is a desirable condition, and the commutator shall not be disturbed unless there is excessive sparking at the brushes under load, or unless it is noted that the commutator is grooved due to wear in excess of 0.010 inch deep, as gauged by eye. Do not attempt to remove any grooves or pits from the commutator.

- (1) **Sparking:** Not all sparking under load may be of a destructive nature. To determine whether damage is being done,

examine the commutator closely. If in doubt as to whether any marks on the commutator are caused by destructive copper etching, or are merely flecks (a carbon deposit often found on the leaving edges of the bars), rub the commutator with a pencil eraser. If the marks are erased the bar is only flecked and it may be assumed that the sparking is not destructive.

(2) **Cleaning Commutator:** If small pits or streaks still remain on the leaving edges of the bars, the sparking is probably caused by destructive copper etching. In this case, remove the brushes and clean the commutator with a KS-2423 cloth dampened with KS-19578, List 1 trichloroethane, turning the shaft by hand.

(3) **Resurfacing Commutator:** If sparking is still excessive after the commutator has been cleaned, remove the armature. With a piece of 400A Aloxite paper wrapped lightly around the commutator, the armature shall be rotated in one direction only. No attempt shall be made to remove grooves or pits. If the commutator is pitted or grooved in excess of 0.010 inch, it should be sent to a repair shop equipped to turn down the commutator on a lathe. Clean out all particles that remain in the gaps between the commutator segments.

(f) **Motor Bearings:** Examine the motor bearings. If necessary, clean and repack the bearings in accordance with the instructions outlined in the section covering the general requirements for the lubrication of teletype-writer apparatus.

(g) **Reassemble the motor.** Avoid touching the commutator with the hands or fingers as grease and perspiration may cause burned spots or poor contacts.

2.04 Governors:

(a) **Governor Contacts:** These requirements are common to single-speed and two-speed governors. They need not be checked unless there is evidence that the contacts are causing trouble or unless the governor is disassembled for other reasons.

(1) **Contact Surface:** A uniform surface over the greater portion of the contact face is a desirable condition. Where the

contact surfaces are deeply pitted or have buildups, no attempt shall be made to remove pits or buildups, but the contacts shall be replaced. See Figures 5, 7, and 16(A).

(2) **Contact-spring Block:** With the speed-adjusting spring removed, there shall be at least 0.010-inch clearance between the contact-spring block clamp and the inner rim of the governor shell. Gauge by eye.

To Adjust: Position the contact-spring block by means of its mounting screws. On governors having peripheral or edge-contacting slip rings, note that this gap is free of dirt and metal particles which may tend to short-circuit the rings and the governor contacts. See Figures 7 and 16(B).

(3) **Governor Contact Clearance:** With the speed-adjusting (retractile) spring removed, there shall be a gap of minimum 0.015 inch, maximum 0.040 inch between the governor contacts.

To Adjust: Bend the governor contact spring. See Figures 5, 7, and 16(A).

(4) **Governor Contact Alignment:** With the speed-adjusting (retractile) spring in place, governor contacts shall be in line and meet squarely so that the maximum contact surface is provided. Gauge by using a 0.002-inch gauge (or smaller, if available) on all sides of the contacts. If the contacts are adjusted correctly, the gauge shall not enter between the contacts on any side.

To Adjust: Adjust the speed-adjusting spring until the contacts just make, or to the minimum tension allowed by the adjusting wheel and its screw. Line up the edges of the contacts by loosening the screw in the contact-spring clamp and reposition the contact spring so that the edge of its contact coincides with the edge of the fixed contact. In order to align the contacts so that their faces are parallel from front to back, twist the contact-spring hinge with a pair of long-nose pliers by applying pressure to the contact spring near the contact. In order to align the contacts so that their faces are parallel side to side, one of the two options given as follows shall be used.

Option 1: Where the governor shell is provided with elongated holes for the fixed-

contact-block mounting screws, loosen the screws and move the block up or down as shown in Figure 5 until the contact faces are parallel. Tighten the mounting screws.

Option 2: Where the governor shell does not have elongated holes for the fixed-contact-block mounting screws, loosen the screws and move the block from side to side as shown in Figure 5 until the contact faces are parallel. Tighten the mounting screws. If the contact faces cannot be made parallel by either of the two options given above, remove the contact spring and check with the TP95960 tape gauge used as a straightedge as shown in Figure 6. When necessary, bend the contact spring at the first bend from the contact. (See Figures 5, 6, 7, and 16.)

(b) Adjusting-wheel Friction Washer (Single-speed Governor): It shall require minimum 16 ounces, maximum 24 ounces to start the adjusting wheel moving.

To Gauge: Rotate the adjusting wheel to a point where the governor-contact pressure is minimum 13 ounces, maximum 14 ounces

when the pull end of the 32-ounce scale is hooked over the contact spring at the contact and pulled parallel to the speed-adjusting spring and the contacts just opened. Insert a common pin radially into the leather rim of the adjusting wheel and hook the pull-end of the 32-ounce scale over the pin at the leather and pull at a tangent to the circumference of the adjusting wheel.

To Adjust: Remove the friction washer and bend the large projections. (See Figure 7.)

(c) Speed-adjusting-lever Stop Plate: On all governed motors equipped with speed-adjusting lever TP7661, there shall be from minimum 0.006-inch, maximum 0.050-inch clearance between the adjusting lever wearing strip and the governor, when the speed-adjusting lever is held against the stop plate.

To Adjust: Position the adjusting lever stop plate by means of its elongated mounting holes. (See Figure 9.)

CAUTION: DO NOT ATTEMPT TO CHECK THE ABOVE REQUIREMENT OR MAKE THE ABOVE ADJUSTMENT WITH THE MOTOR RUNNING.

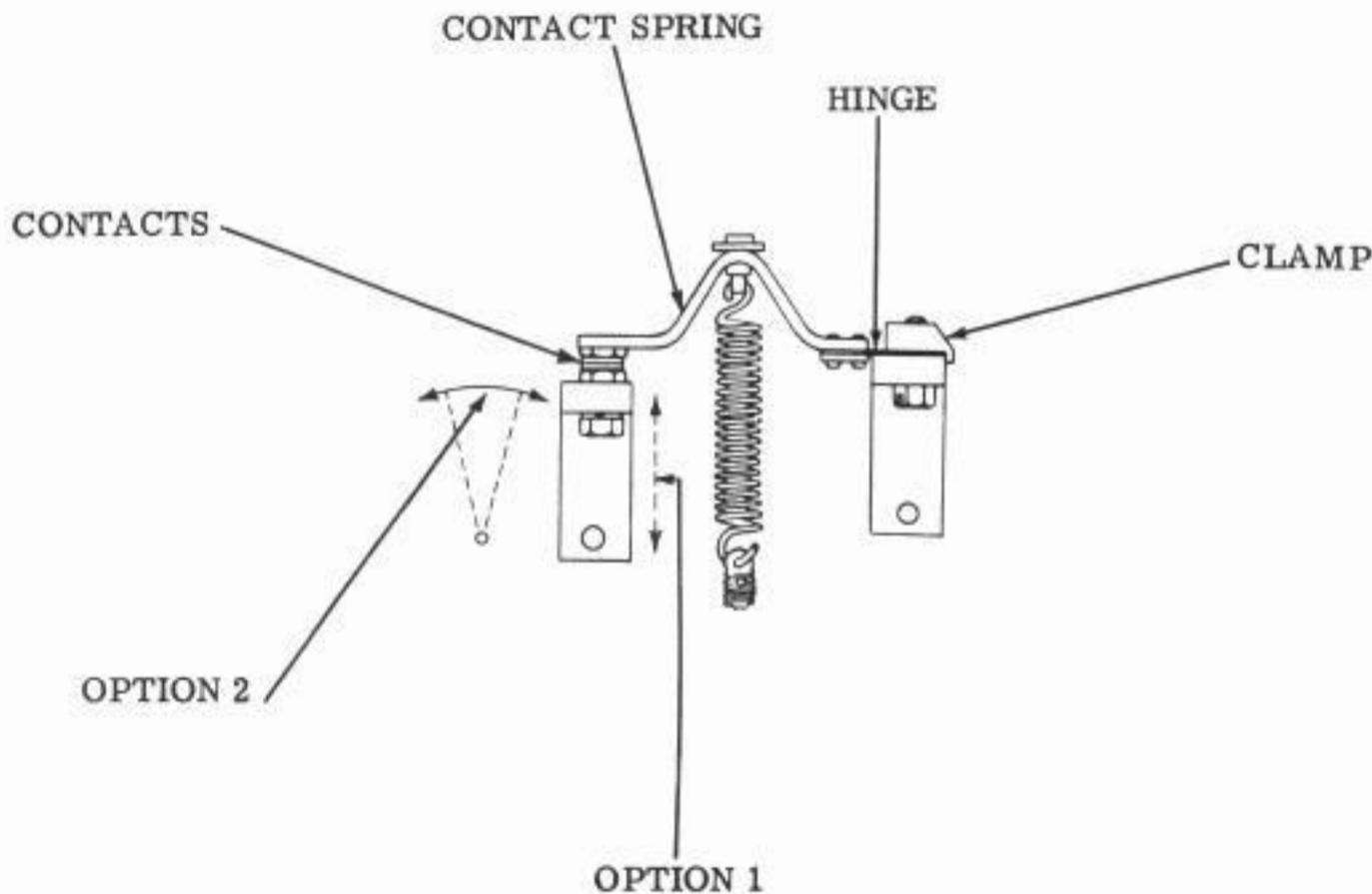


Figure 5 - Governor Contacts

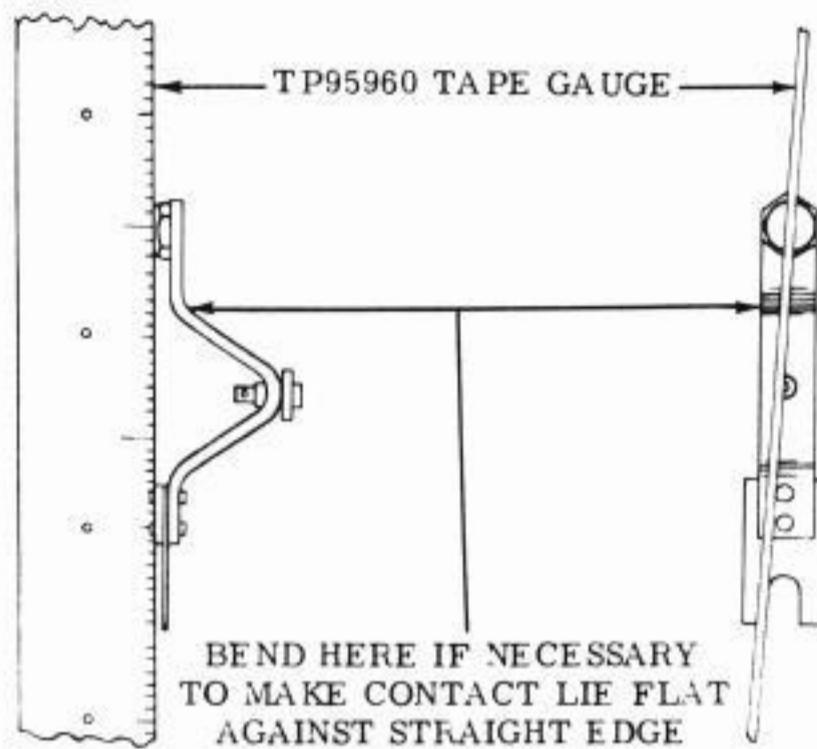


Figure 6 - Tape Gauge

(d) Center-contacting-type Governors

(1) **Contact Springs:** The distance from the inner surface of the governor cover to the highest point on the contact springs shall be minimum $25/32$ inch, maximum $27/32$ inch.

To Adjust: Bend the springs. (See Figure 8.)

(2) **Inner-disc Contact Spring:** With the TP135678 socket wrench placed over the nut which holds the contact springs in place, the distance from the outer surface of the wrench to a point where the TP95960 tape gauge, used as a ruler, touches the curved surface of the inner-disc contact spring shall be minimum $17/32$ inch, maximum $19/32$ inch.

To Gauge: Place the end of the TP95960 tape gauge against the outer surface of the wrench so that the edge of the $1/32$ -inch

scale is resting against the curved surface of the inner-disc contact spring.

To Adjust: Bend the spring. Recheck (1). (See Figure 8.)

(3) **Outer-disc Contact Spring:** With the socket wrench in position as in (2), the distance from the outer surface of the wrench to a point where the tape gauge touches the curved surface of the outer-disc contact spring shall be minimum $7/16$ inch, maximum $1/2$ inch. To gauge, place the end of the TP95960 tape gauge against the outer surface of the wrench so that the edge of the $1/32$ -inch scale is resting against the curved surface of the outer-disc contact spring.

To Adjust: Bend the spring. Recheck (1). (See Figure 8.)

(4) **Governor-brush-spring-plate Bracket:** The inner surface of the bracket shall

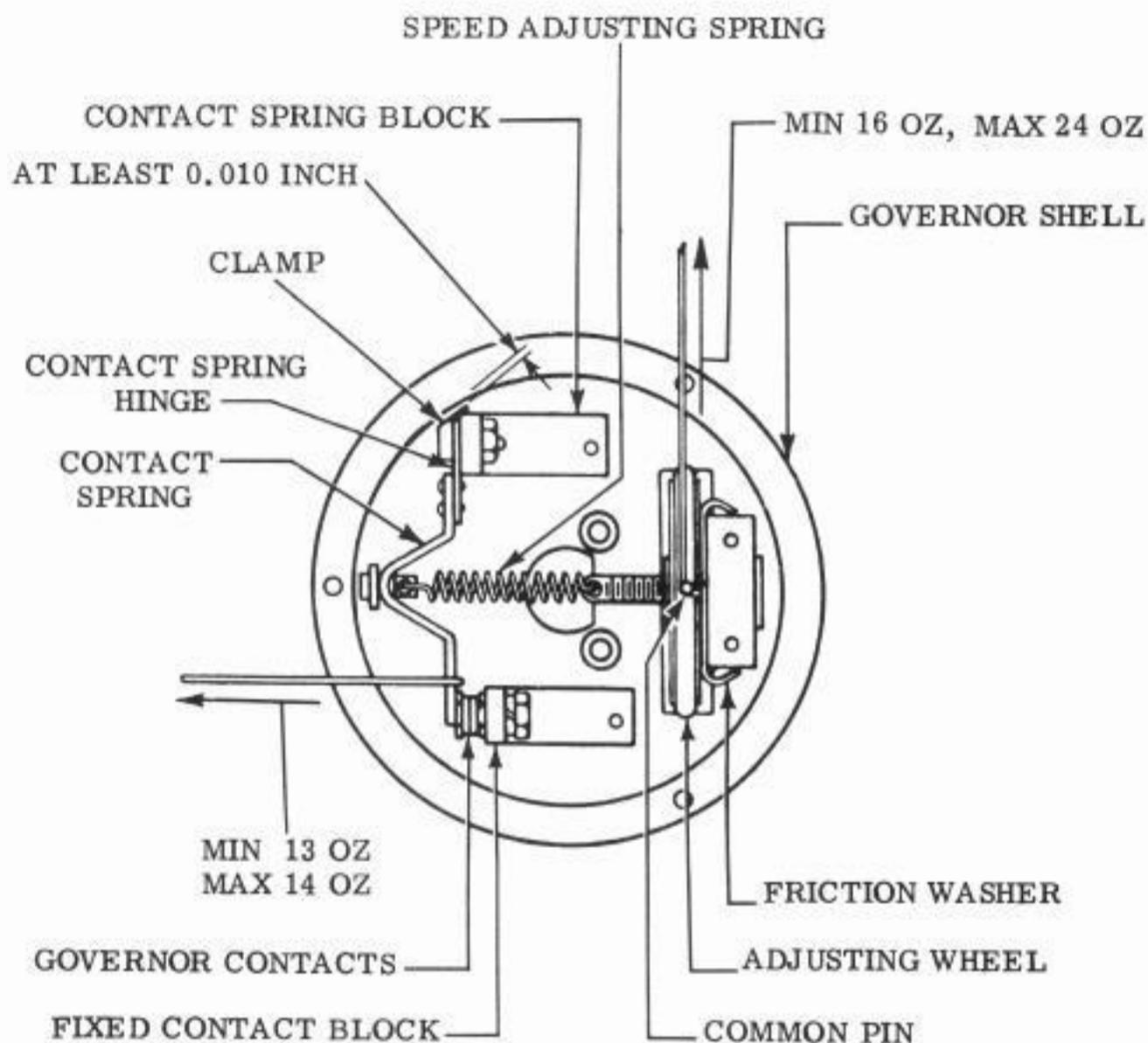


Figure 7 - Center Contact Governor Assembly

be parallel to the governor cover. Gauge by eye.

To Adjust: Loosen the brush-spring-plate mounting screws and reposition the bracket. Tighten the screws. (See Figure 9.)

(5) Contact Discs: A smooth, even, bronze-colored glaze is a desirable condition for the contact surfaces of the discs and they shall not be disturbed unless there is excessive sparking under the

brushes. Gauge by eye. When it is necessary to clean the discs, a KS-2423 cloth, wrapped around an orange stick and moistened with KS-19578, List 1 trichloroethane, shall be held on each disc while the motor is being rotated by hand and the brushes have been removed. If the discs are pitted or burned, a piece of 400A Aloxite wrapped around an orange stick shall be held against each disc while the motor is being rotated by hand. Badly grooved discs shall be replaced. (See Figure 8.)

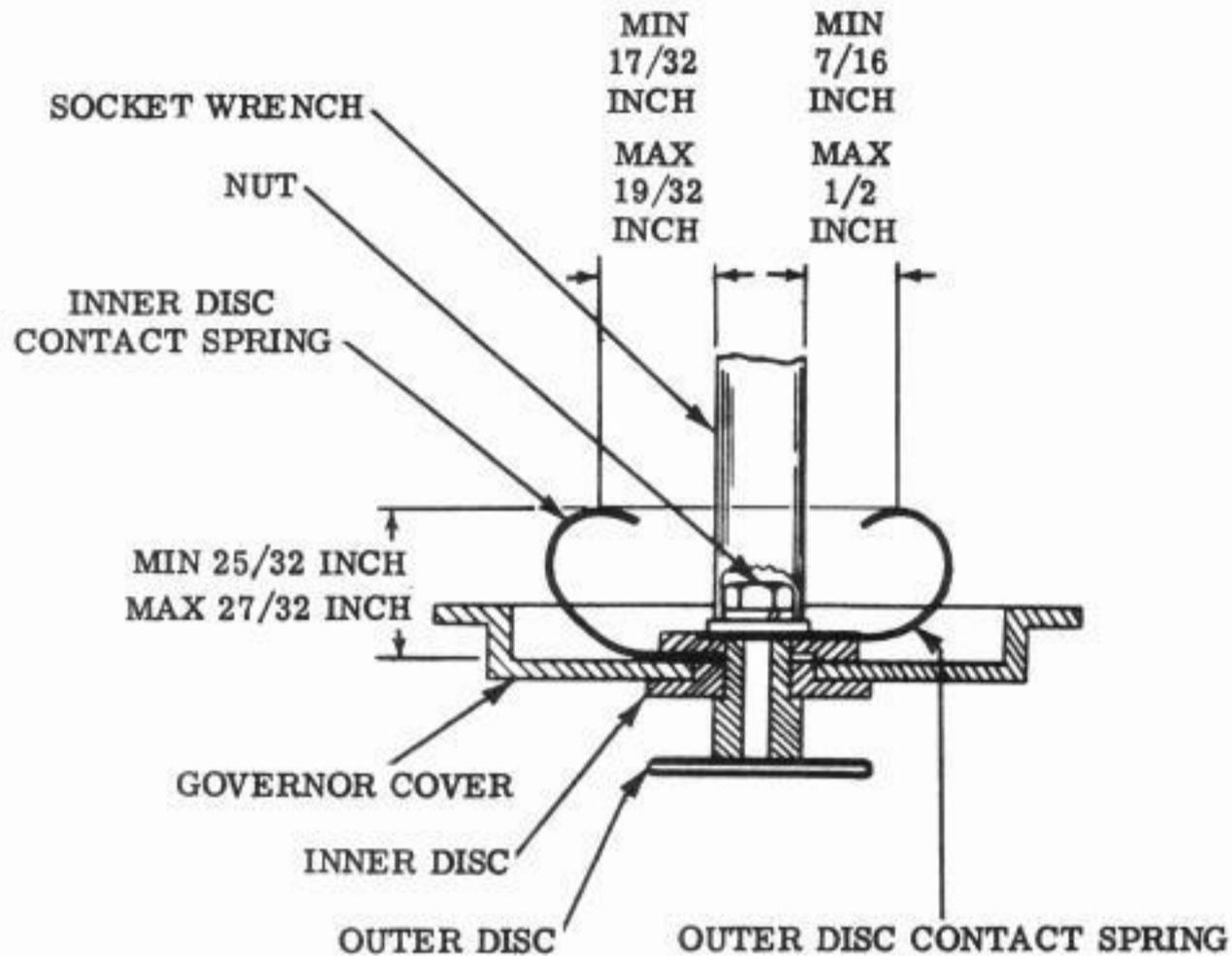


Figure 8 - Governor Cover Contact Spring Disc Assembly

(6) Governor brushes shall lie flat against their discs and there shall be minimum $3/32$ inch of the brush material remaining. Gauge by eye.

To Adjust: Level off the brush by passing a piece of 400A Aloxite between the brush and the disc. If there is less than $3/32$ inch of the brush remaining, replace the brush. (See Figure 10.)

(7) Inner-disc Brush-spring Tension: It shall require minimum $4-1/2$ ounces, maximum $5-1/2$ ounces to start the brush moving away from its disc.

To gauge: Hook the pull end of the 8-ounce scale over the brush spring at the brush and pull horizontally away from the motor.

To Adjust: Remove and bend the brush spring. Reassemble the spring and recheck (6). (See Figure 9.)

(8) Outer-disc Brush-spring Tension: It shall require minimum $4-1/2$ ounces, maximum $5-1/2$ ounces to start the brush moving away from its disc.

To Gauge: Apply the push end of the 8-ounce scale to the brush spring at the brush and push horizontally toward the motor.

To Adjust: Remove and bend the brush spring. Reassemble the spring and recheck (6). (See Figure 9.)

(9) Governor-brush Alignment: The outer edge of the brushes shall be within $3/64$ inch of the outer edge of the discs throughout one revolution of the governor; and a line established by the center of the outer disc and the center of one of the brushes shall pass through some portion of the other brush.

To Gauge: Remove the governor-adjusting bracket.

To Adjust: Reposition the brush spring by means of its mounting slot. Reassemble the governor-adjusting bracket. (See Figure 11.)

(10) Governor-adjusting Bracket: There shall be a clearance of minimum 0.020 inch, maximum 0.060 inch between the

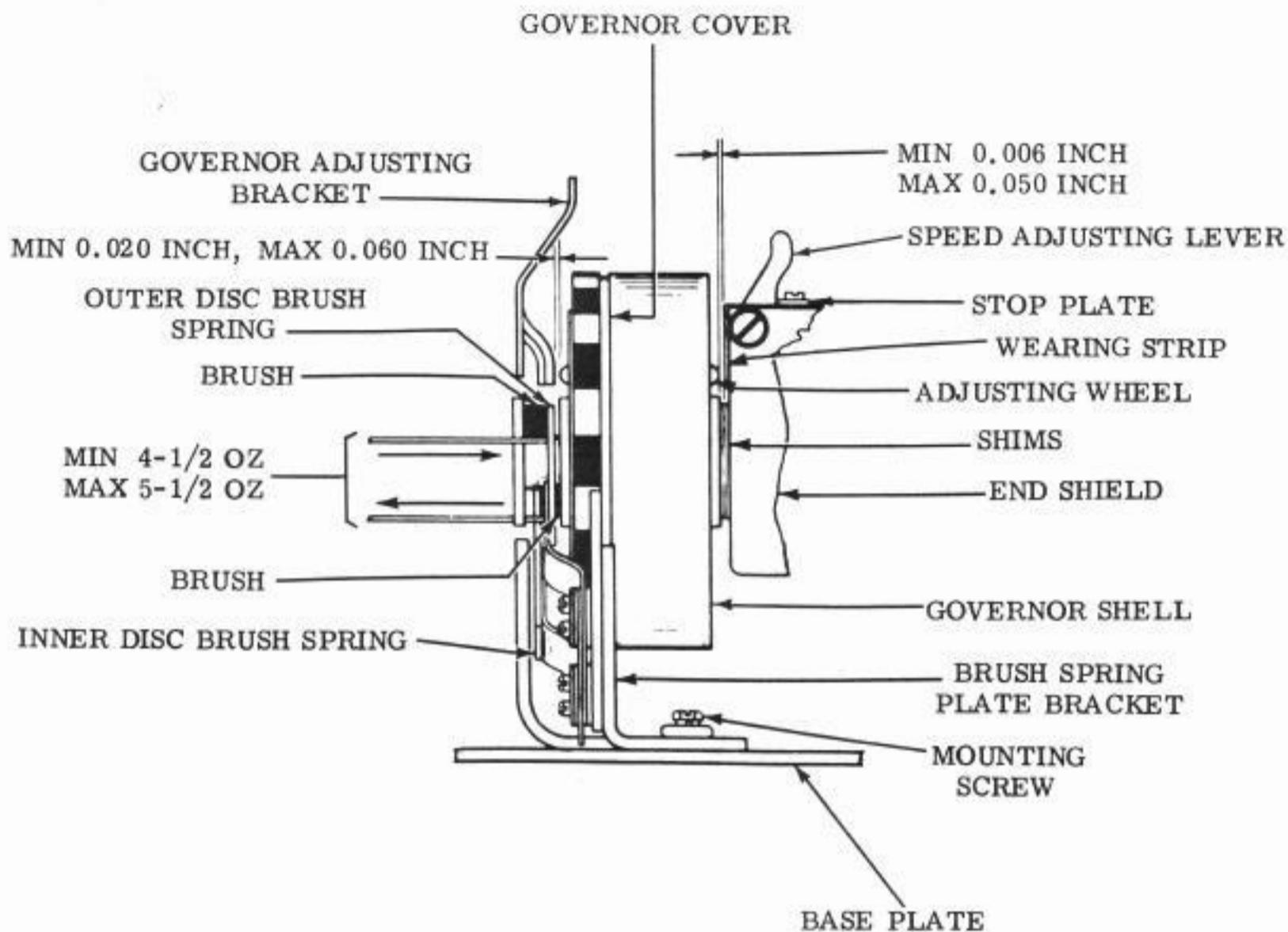


Figure 9 - Governor Brush Spring Plate Bracket Assembly

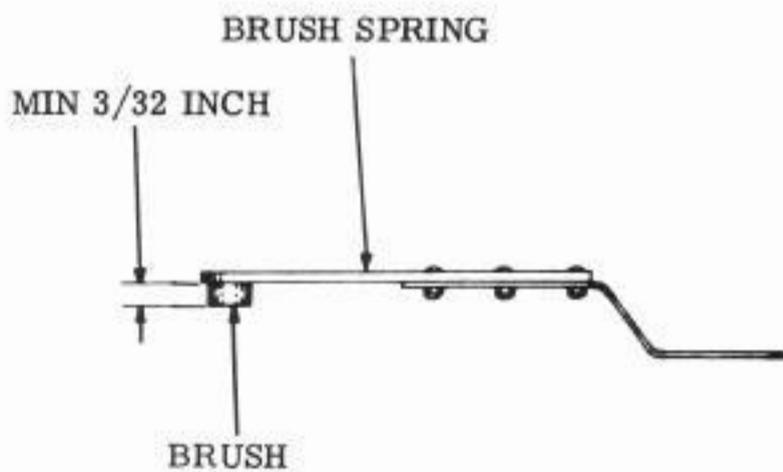


Figure 10 - Brush Spring Assembly

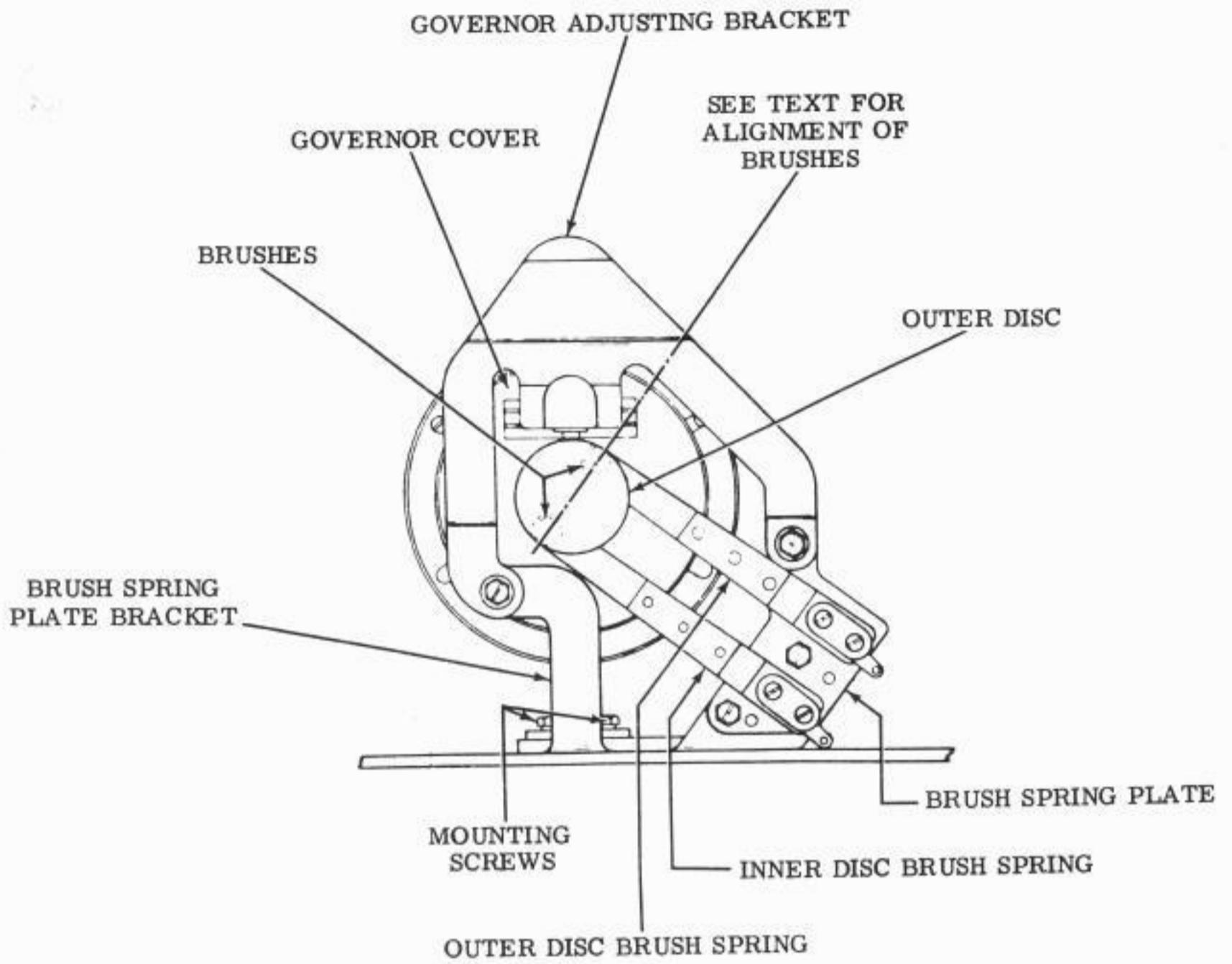


Figure 11 - Governor Adjusting Bracket Assembly

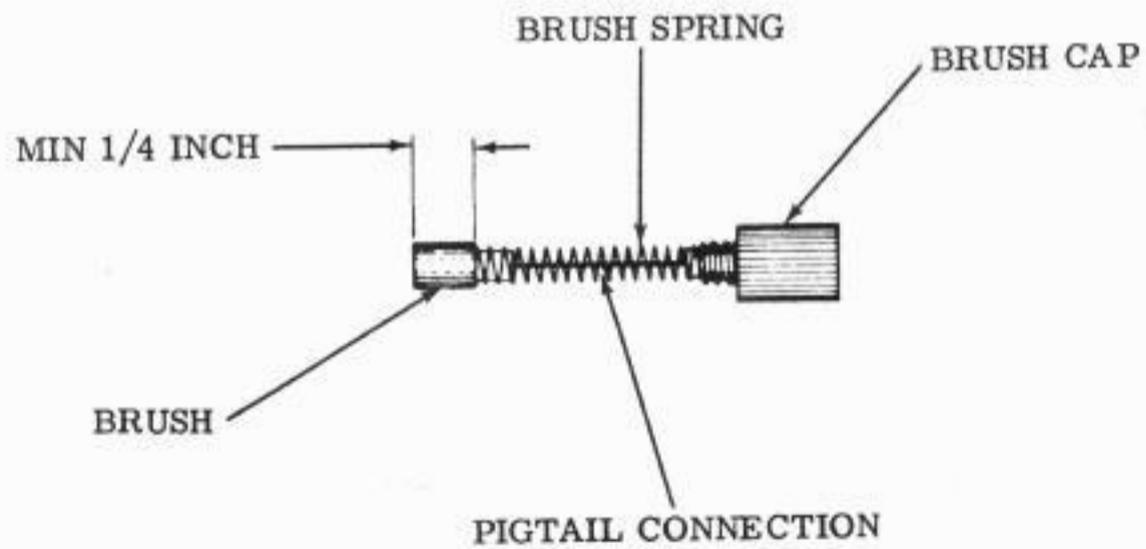


Figure 12 - Governor Brush

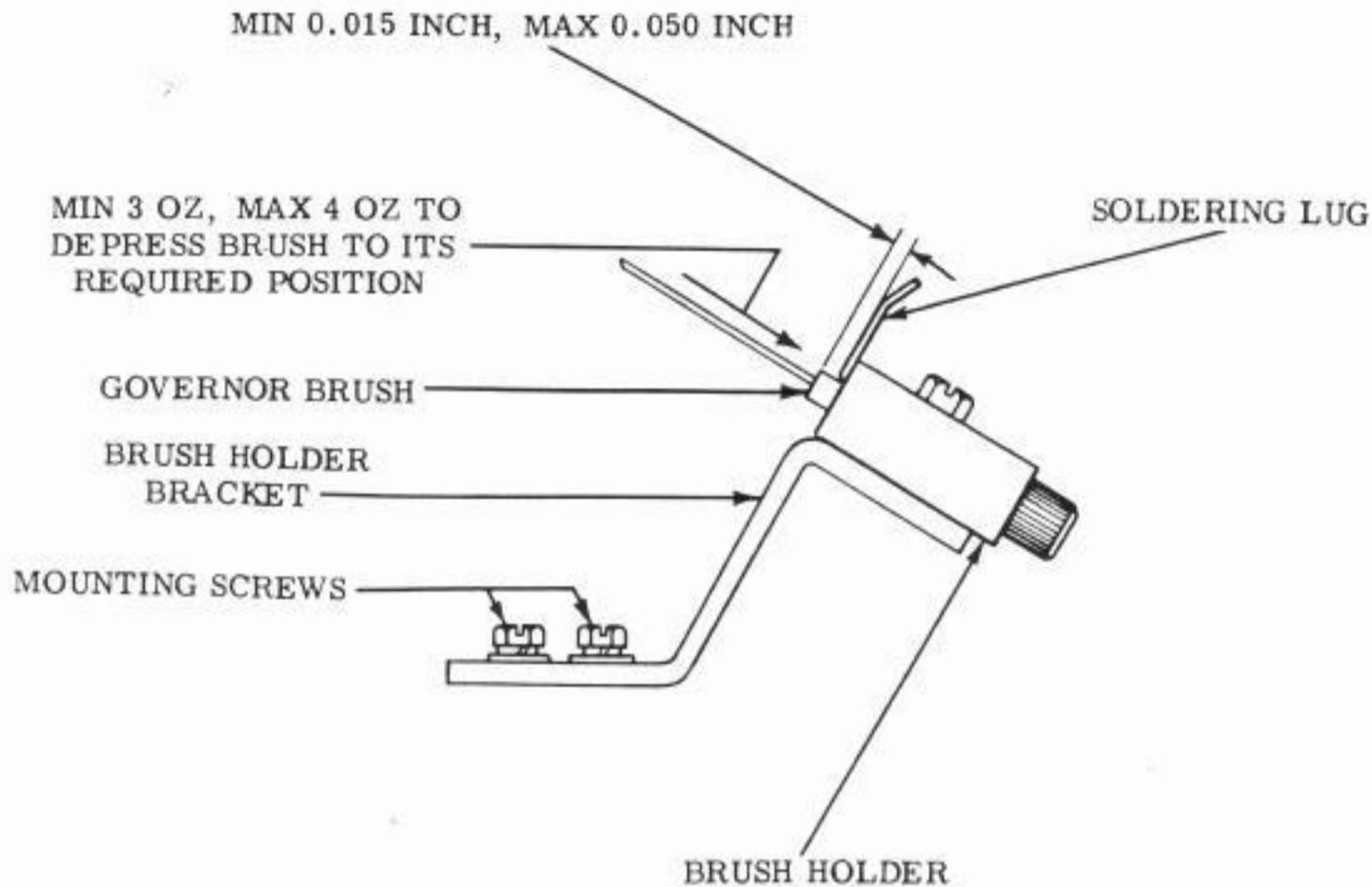


Figure 13 - Governor Brush Bracket Assembly

adjusting wheel and the governor-adjusting bracket. This requirement shall be ignored if the bulge near the center of the adjusting bracket is omitted in manufacture.

To Gauge: Rotate the governor until the adjusting wheel is opposite the adjusting surface of the governor-adjusting bracket.

To Adjust: Bend the governor-adjusting bracket. (See Figure 9.)

(e) Edge-contacting-type Governors: The following brush requirements are also applicable to the TP138598 auxiliary brush holder assembly (specification 3125S and 5332S).

(1) Governor Brushes: There shall be minimum 1/4 inch of the brush material remaining on each brush, the braided wire pigtail connection inside the brush spring shall be free from kinks which may prevent the spring from extending properly, and the wire shall be securely fastened to the brush and the brass insert of the brush cap. Gauge by eye. If the brush has less

than 1/4 inch of its material remaining or if the spring is mutilated, replace the brush. (See Figure 12.)

(2) Alignment of Governor Brushes: The governor brushes shall ride approximately in the center of the governor rings. Check for a full revolution.

To Adjust: Reposition bracket by means of its mounting screws. (See Figure 14.)

(3) Governor-brush Spring Tension: It shall require minimum 3 ounces, maximum 4 ounces to hold the brush in its normal position (within minimum 0.015 inch, maximum 0.050 inch of the brush holder).

To Gauge: Remove the brush holder from the brush holder bracket, remove the brushes from the holder, and clean each brush with a KS-2423 cloth moistened with KS-19578, List 1 trichloroethane. Clean out the holes in the holder into which the brushes are placed and reinsert the brushes, making sure that the brushes move freely in the holder. Using the push end of the 8-ounce

scale, depress that portion of the brush which extends beyond the holder until the end of the brush is within minimum 0.015 inch, maximum 0.050 inch of the holder. Where springs do not meet the requirement, replace the governor-brush-spring assembly. Reassemble the brush holder. (See Figure 13.)

(4) Brush Holder: There shall be minimum 0.015-inch, maximum 0.050-inch clearance between the brush holder and the rings through one complete revolution of the governor.

To Adjust: Loosen the brush-holder mounting screws and reposition the brush holder. Tighten the mounting screws. (See Figure 14.)

(5) Two-speed Governor-adjusting-wheel Detent-spring Pressure: The detent spring shall rest on the adjusting wheel; (1) in all positions of the adjusting wheel,

(2) at the point of minimum pressure with a minimum 2-ounce, maximum 4-ounce pressure.

To Gauge the Pressure: With the detent spring resting between the notches on the adjusting wheel, hook the 8-ounce scale to the spring near the adjusting wheel as shown by (A) in Figure 15. With the scale in a horizontal position, pull at right angles to the spring. To determine the minimum pressure point, the check shall be made at three points approximately equally spaced around the periphery with the wheel in its final revolution at each end of its travel.

To Adjust: Loosen the clamping screw and lock-nut and shift the detent spring as required. Moving the spring higher up on the rim of the wheel increases the tension and shifting the spring lower on the wheel decreases the tension. If satisfactory pressure cannot be obtained in this way, remove the clamping screw and locknut and bend

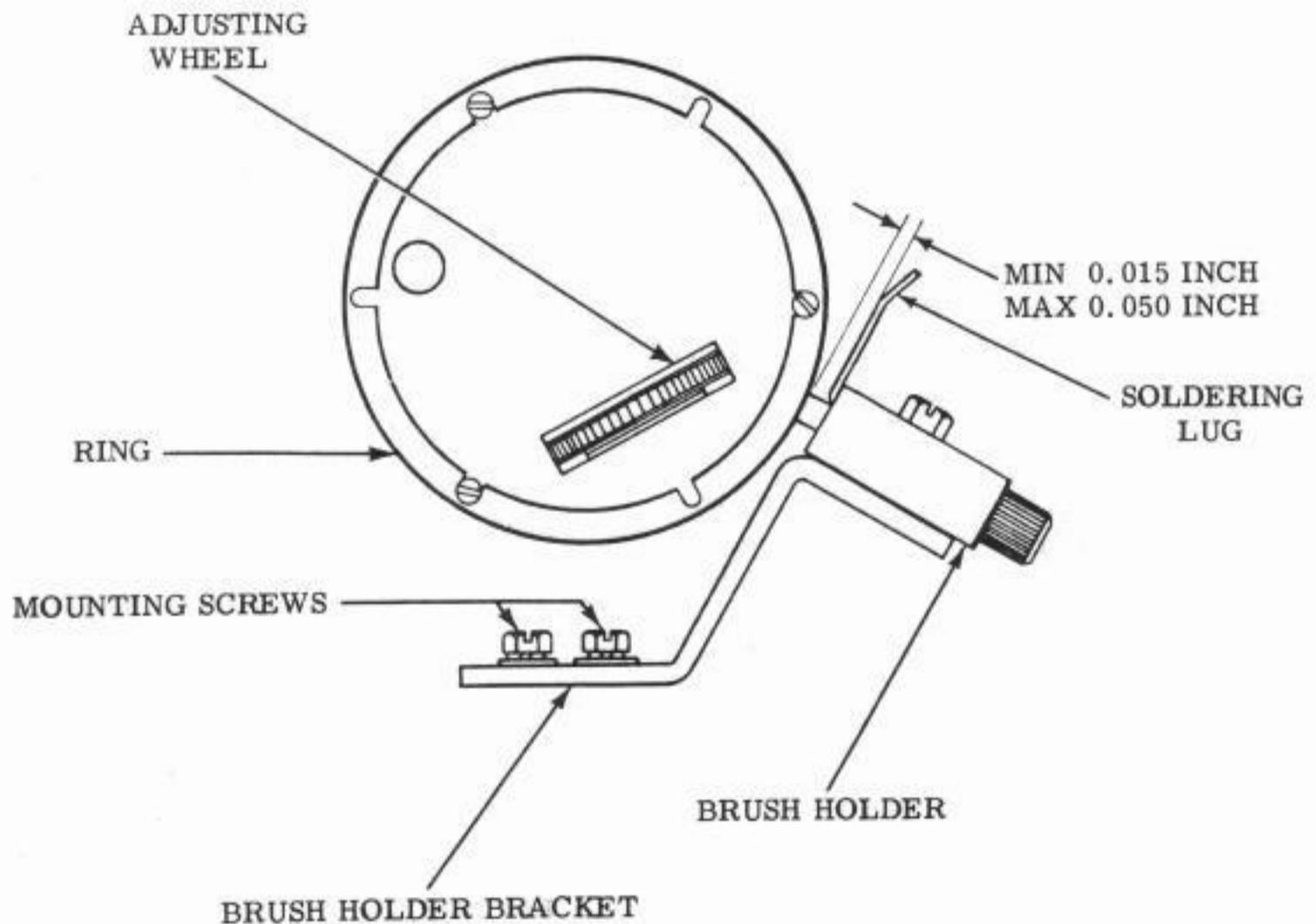


Figure 14 - Governor Adjusting Wheel

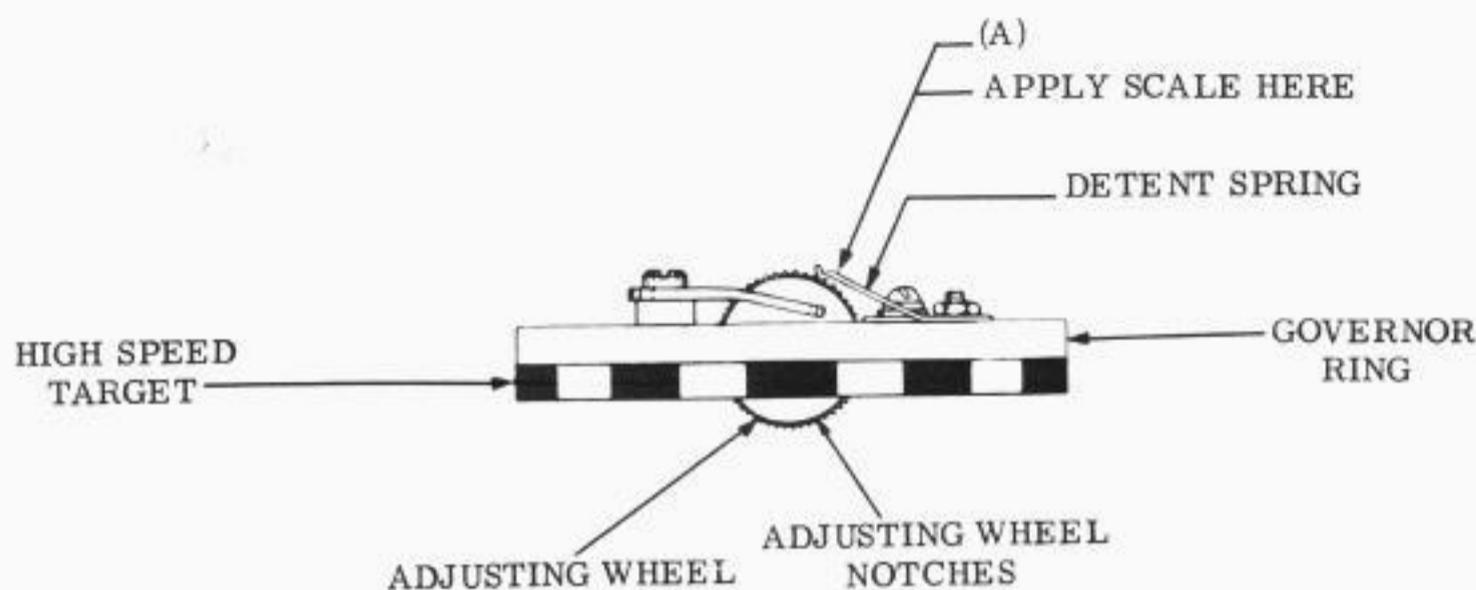


Figure 15 - Half of Two-speed, Edge-contacting Governor

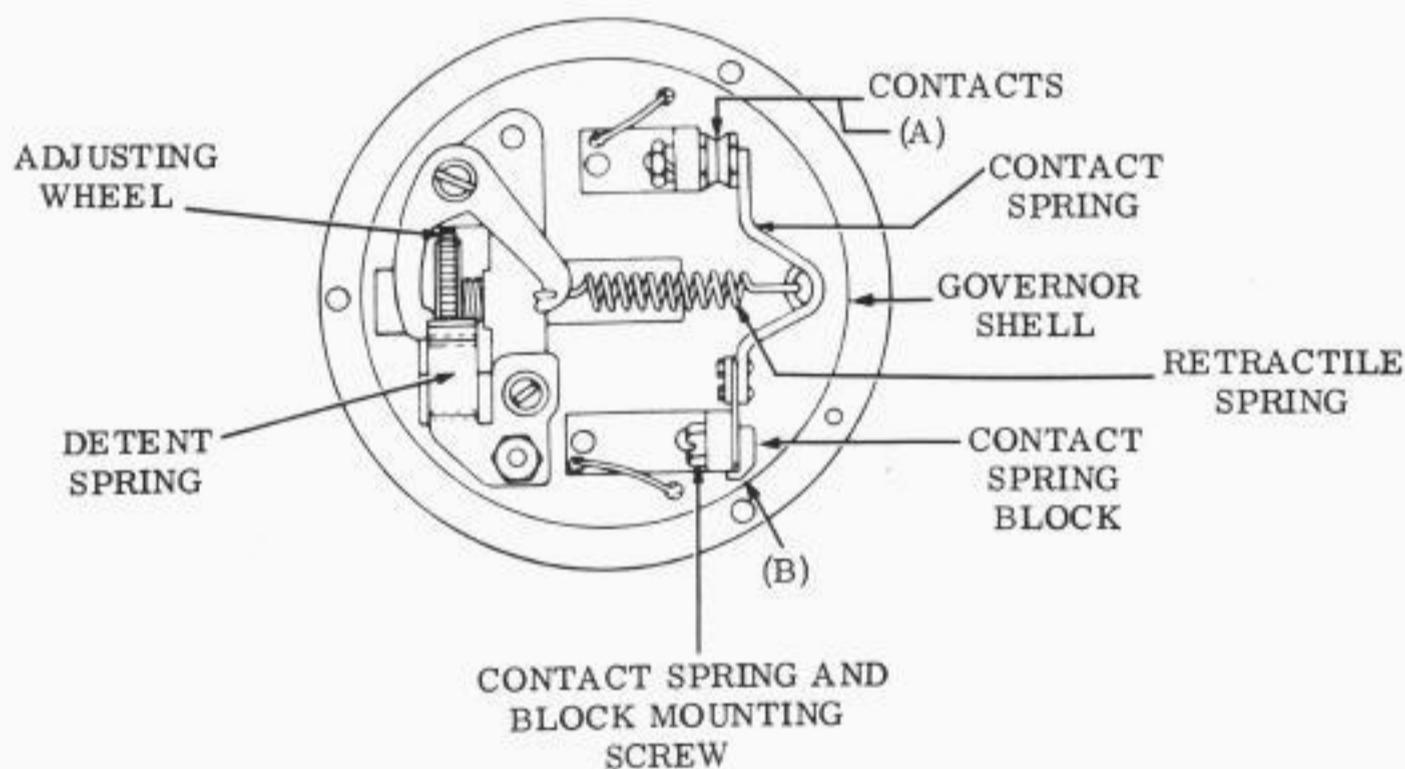


Figure 16 - Two-speed Edge-contacting Governor-Interior View of Half of Governor

the detent spring as required. Position the spring on the wheel and tighten the screw and nut. (See Figure 15.)

(6) Governor Rings: A smooth, even, bronze-colored glaze is a desirable condition for the contact surface of the rings and they shall not be disturbed unless there is excessive sparking under the brushes. Gauge by eye. When it is necessary to clean the rings, a KS-2423 cloth moistened with KS-19578, List 1 trichloroethane shall be

held against the rings while the motor is in motion. To remove burned spots from the rings, a piece of 400A Aloxite held lightly against the rings while the motor is in motion, along with a KS-2423 cloth to immediately wipe off the cuttings and sand, may be used. (See Figure 15.)

(7) Governor-brush contact surface shall be curved to fit the contour of the rings. Gauge by eye. To resurface the brushes, hold a piece of 400A Aloxite around the

outer shell of the governor between the brushes and the shell and rotate the governor back and forth by hand. The last rotation shall be in the normal direction of travel. (See Figure 14.)

(8) Adjusting Governor Speed: With the motor at rest, turn the adjusting wheel (Figure 7 or 16) as indicated by the letters S and F to decrease or increase the speed respectively. On two-speed governors, the

outer adjusting wheel is for adjusting the high speed, and the inner adjusting wheel is for adjusting the low speed. As the inner adjusting wheel is not very accessible, a screwdriver or other slender object should be used to engage it. Tuning fork TP103628 (87.5 V.P.S.) is recommended for setting the speeds, as explained in the section covering the speed regulation of teletypewriter apparatus. (See Figures 7 and 16.)

3. REQUIREMENTS AND ADJUSTMENTS — 28, 35, and 37 TYPE MOTOR UNITS

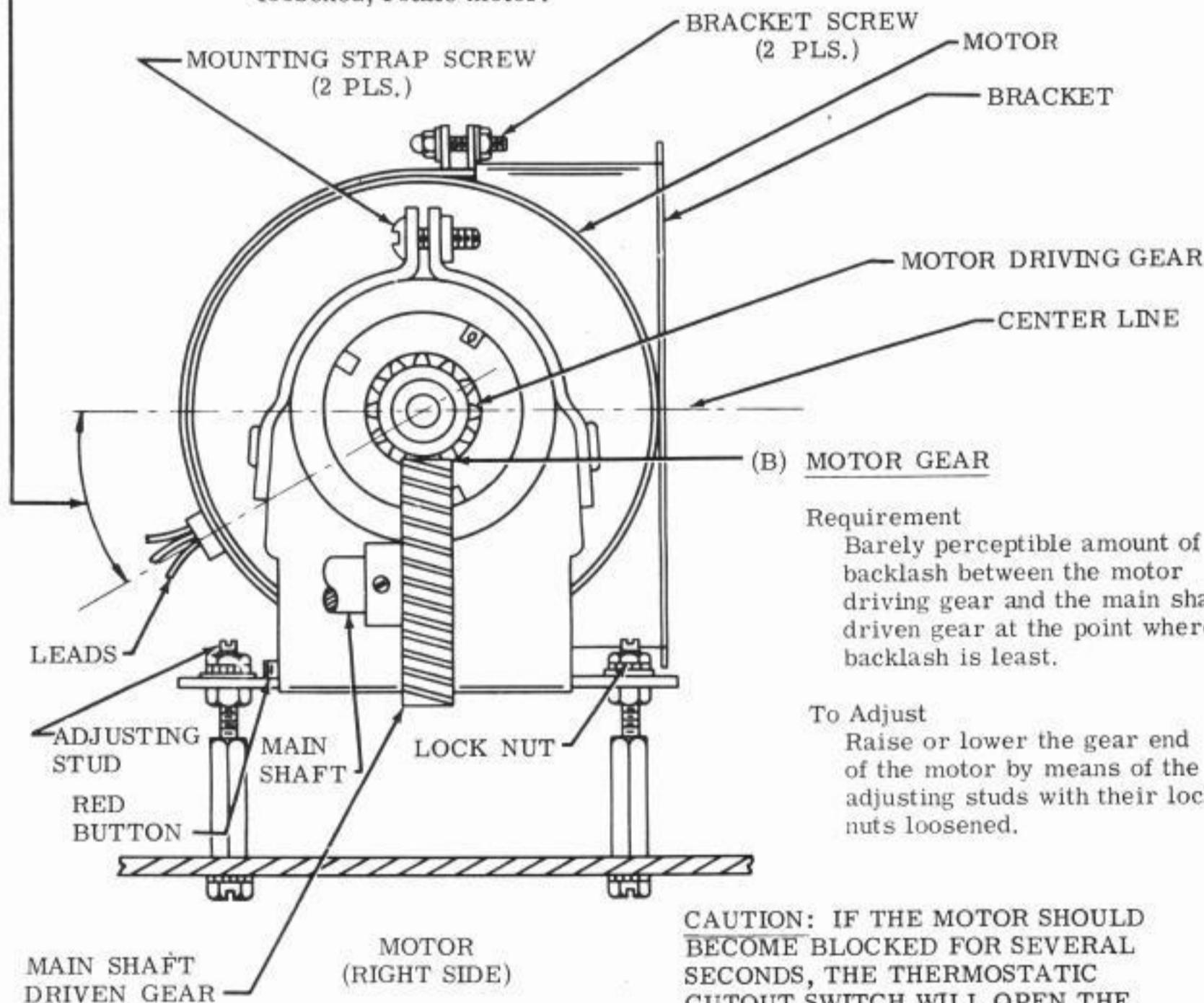
3.01 Miniaturized Synchronous Motor Units

(A) MOTOR POSITIONING

Requirement
Position motor so that leads are approx 30° from center line with oil holes up.

Note: If necessary, position bracket with bracket screws loosened.

To Adjust
With mounting strap screws loosened, rotate motor.



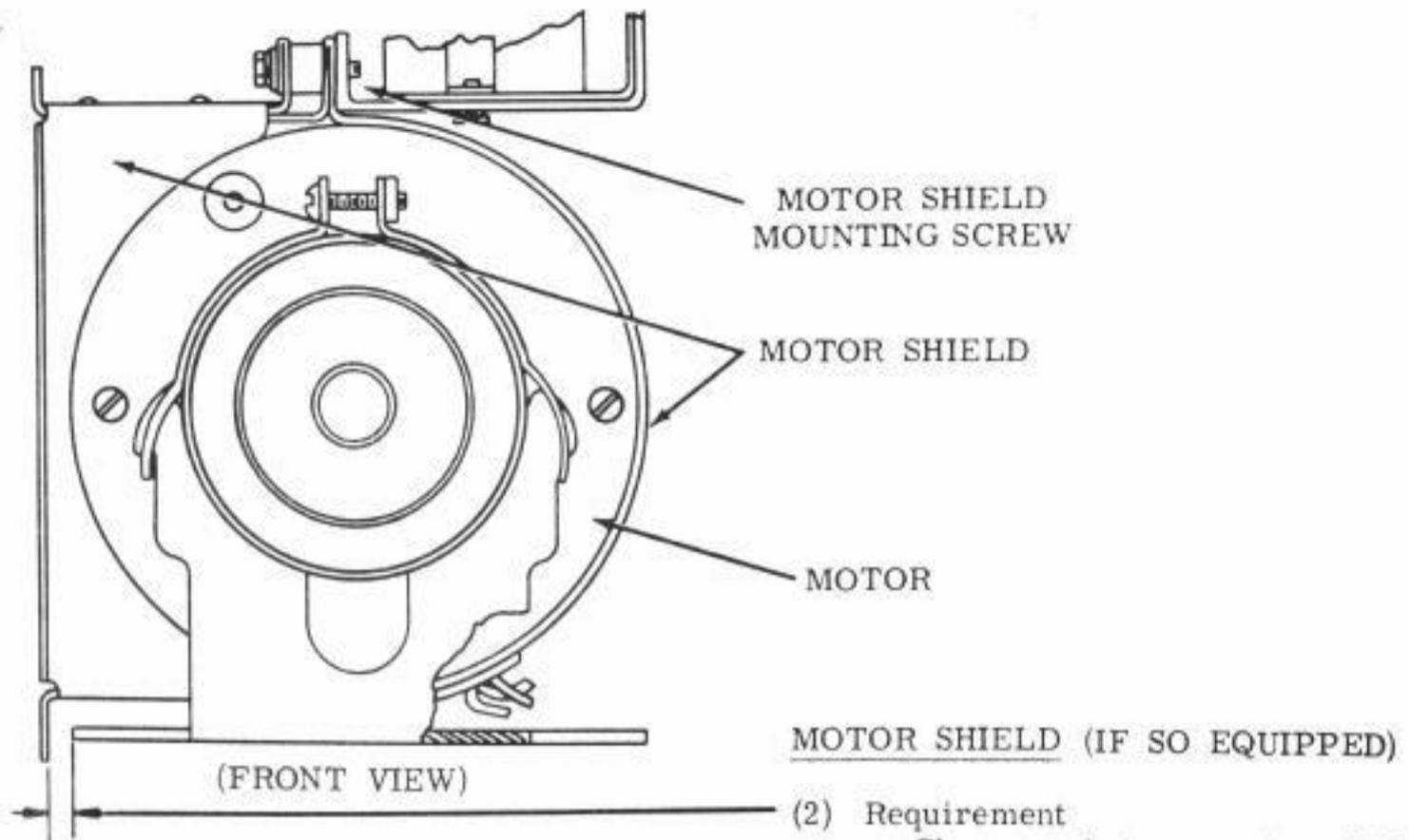
(B) MOTOR GEAR

Requirement
Barely perceptible amount of backlash between the motor driving gear and the main shaft driven gear at the point where backlash is least.

To Adjust
Raise or lower the gear end of the motor by means of the adjusting studs with their lock nuts loosened.

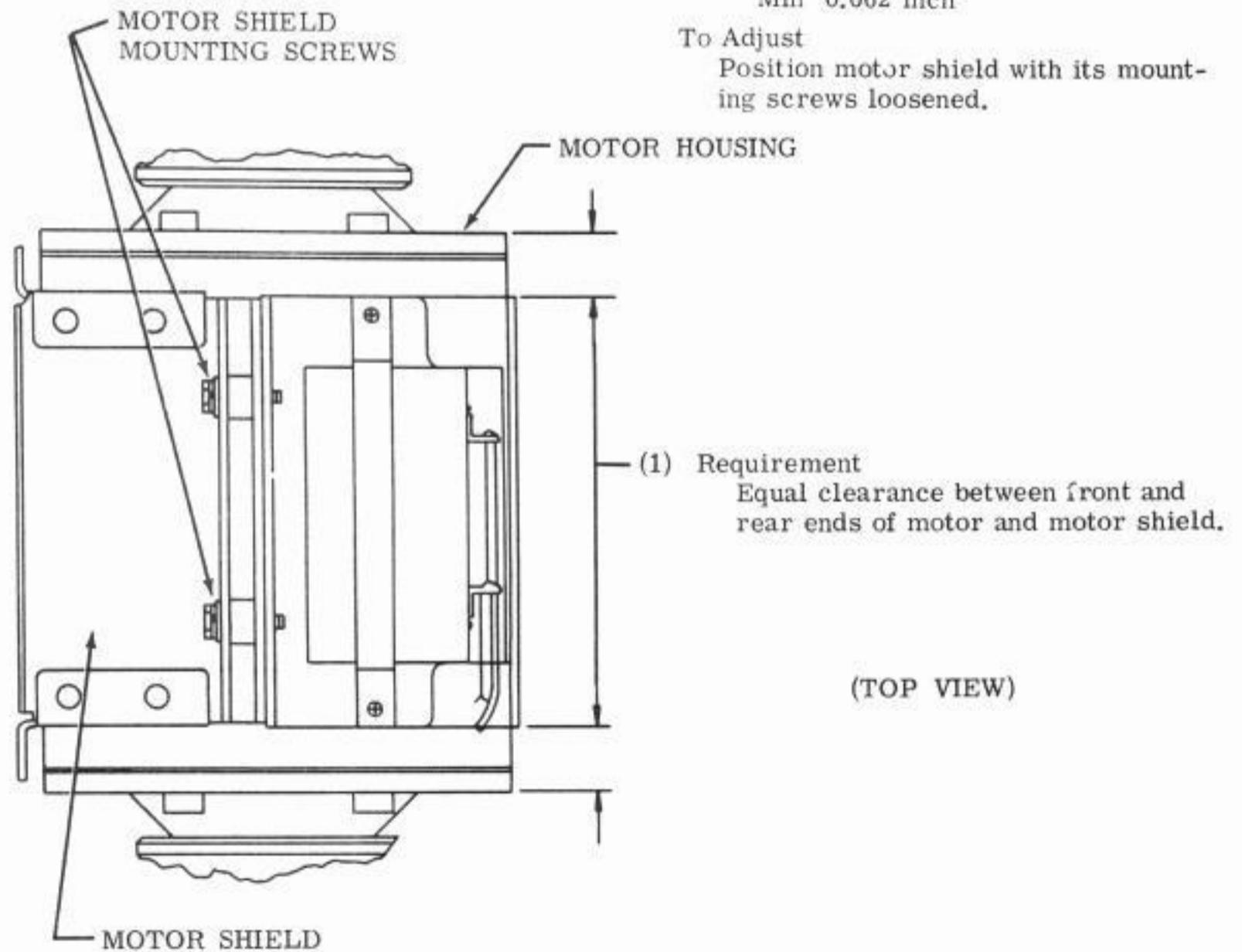
CAUTION: IF THE MOTOR SHOULD BECOME BLOCKED FOR SEVERAL SECONDS, THE THERMOSTATIC CUTOFF SWITCH WILL OPEN THE CIRCUIT. SHOULD THIS HAPPEN, ALLOW MOTOR TO COOL AT LEAST 5 MINUTES BEFORE MANUALLY RESETTING THE SWITCH BY DEPRESSING THE RED BUTTON. AVOID REPEATED RESETTING.

3.02 Miniaturized Synchronous Motor Units (continued)

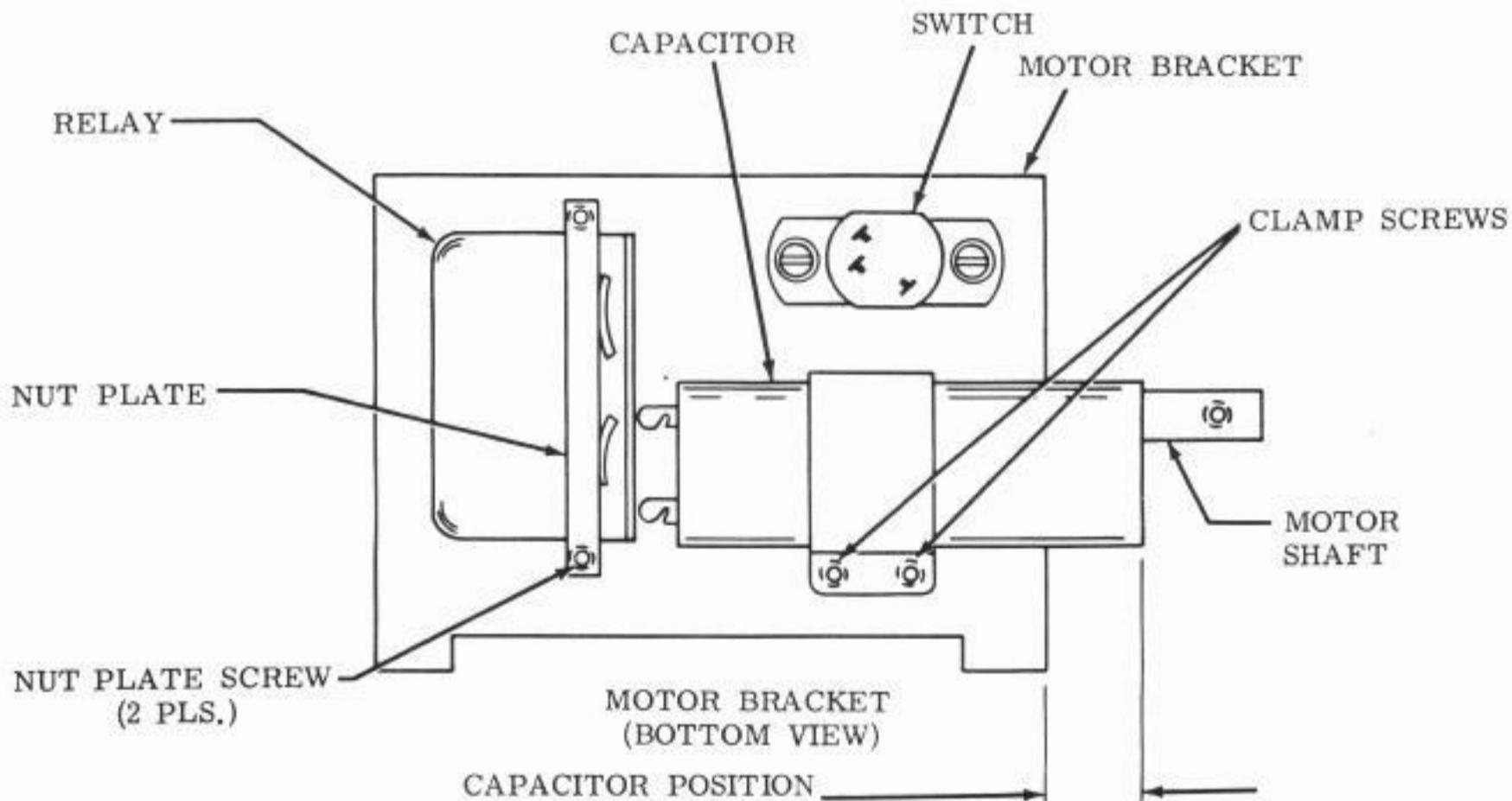
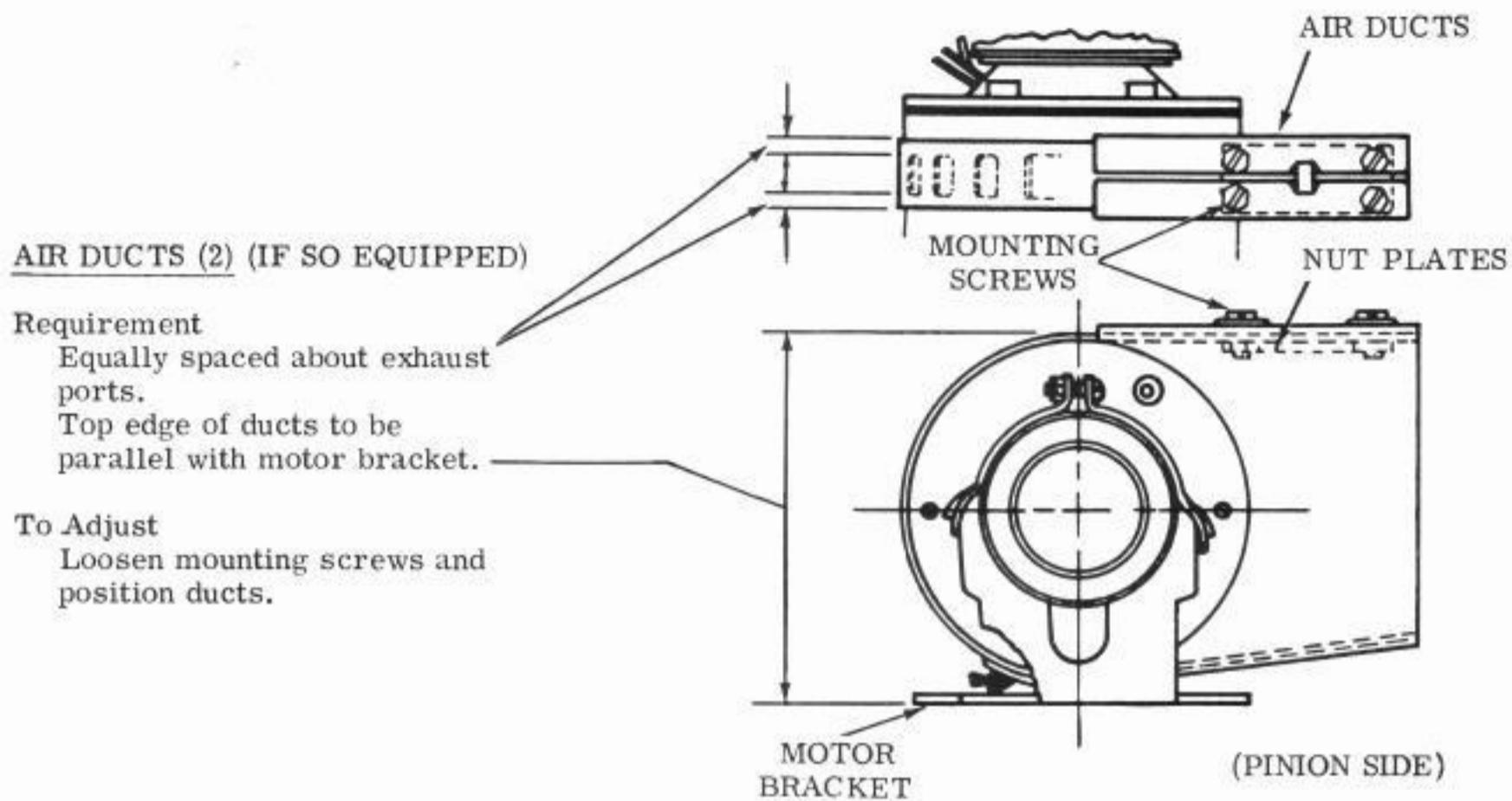


(2) Requirement
 Clearance between motor shield and motor mounting bracket should be Min 0.062 inch

To Adjust
 Position motor shield with its mounting screws loosened.



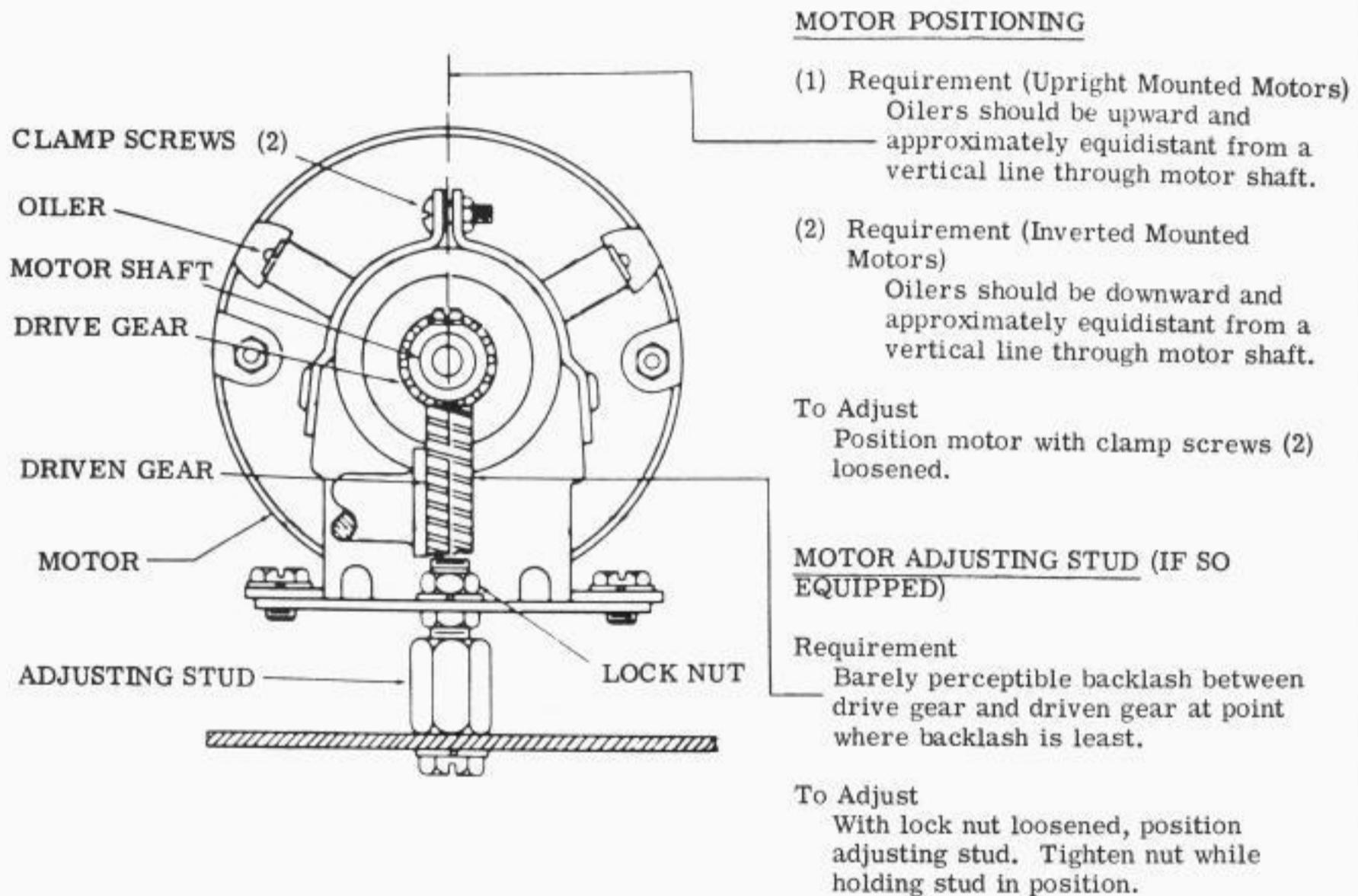
3.03 Miniaturized Synchronous Motor Units (continued)



Requirement
Max 1/2 inch between motor bracket and end of capacitor.

To Adjust
Position relay and capacitor with motor removed from motor bracket and nut plate and clamp screws loosened.

3.04 Standard and Heavy Duty Synchronous Motor Units



CAUTION: IF MOTOR BECOMES BLOCKED FOR SEVERAL SECONDS, THERMOSTATIC CUTOFF SWITCH (ON UNITS SO EQUIPPED) WILL BREAK CIRCUIT. SHOULD THIS HAPPEN, ALLOW MOTOR TO COOL AT LEAST 5 MINUTES BEFORE DEPRESSING RED RESET BUTTON. AVOID REPEATED RESETTING.

3.05 Standard and Heavy Duty Synchronous Motor Units (continued)

CENTRIFUGAL SWITCH

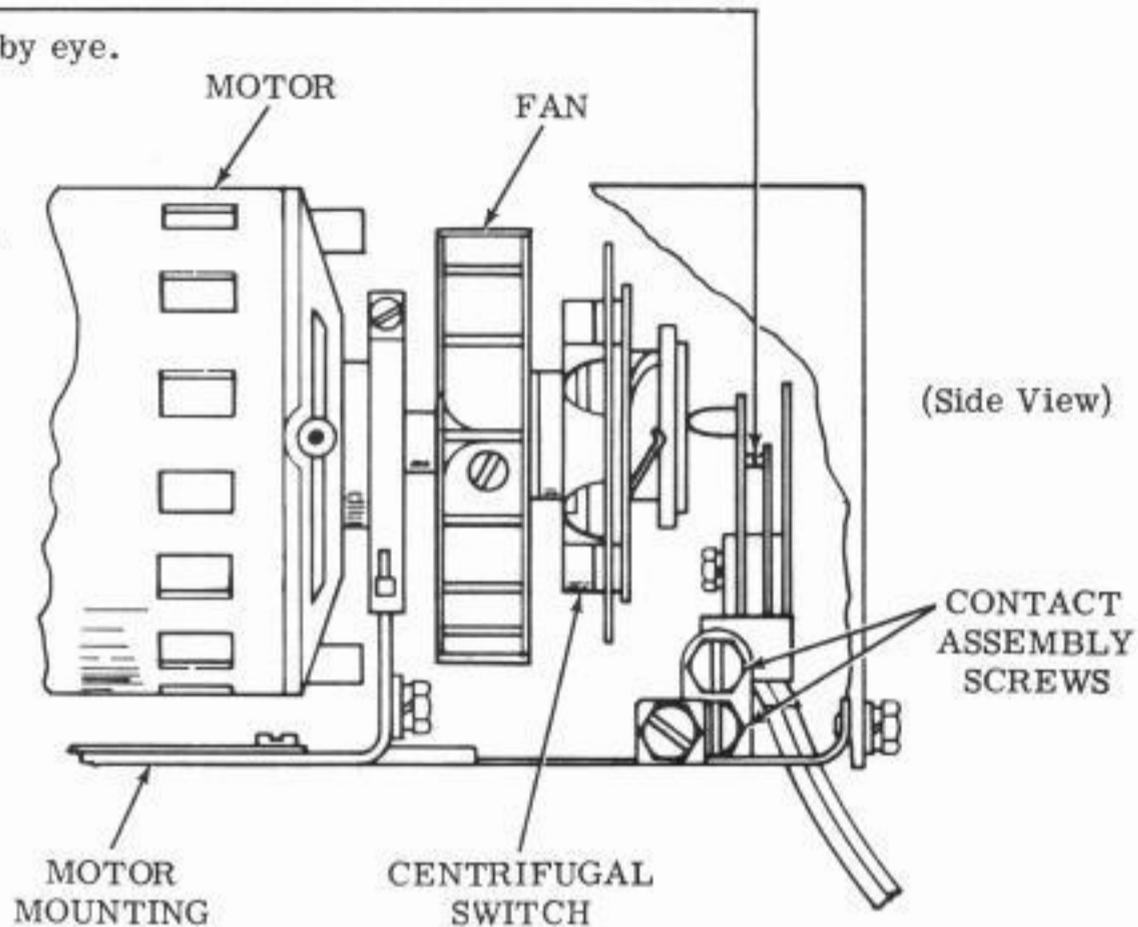
(1) Requirement

With motor stopped (centrifugal switch extends toward contacts) and contact assembly closed there should be

Min 0.020 inch
of overtravel as gauged by eye.

To Adjust

With contact assembly screws friction tight, adjust contact assembly to meet requirements. Tighten screws.



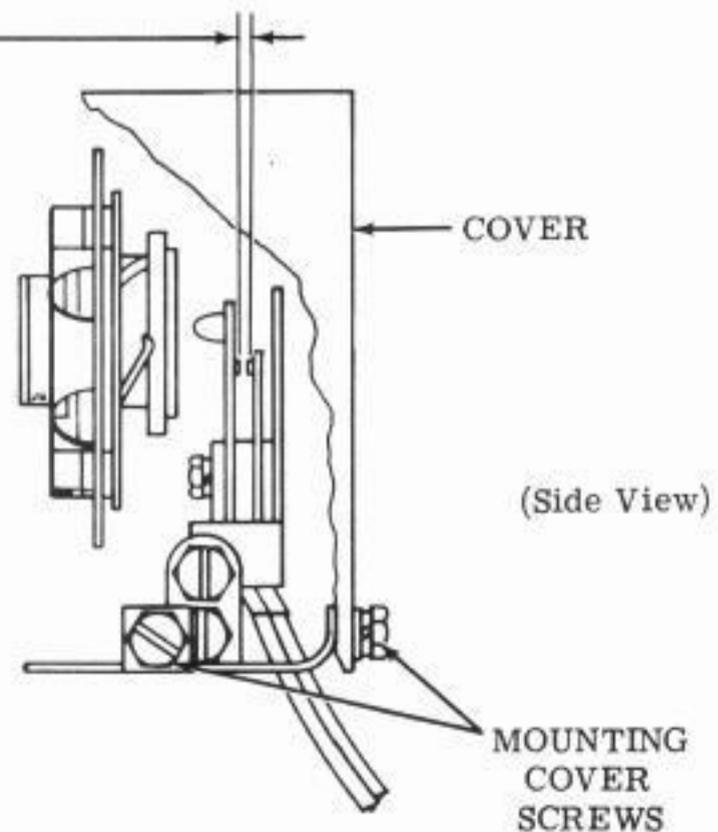
(2) Requirement

With motor running (centrifugal switch toward motor) there should be

Min 0.015 inch---Max 0.025 inch
clearance between contacts.

To Adjust

With motor stopped and contact assembly screws friction tight, adjust contact assembly to meet requirement (1). Tighten screws. If requirement (2) is not met, refine requirement (1).



(3) Requirement

Clearance between centrifugal switch assembly and metal cover should be
Min 0.050 inch.

To Adjust

With mounting cover screws friction tight, lower cover until interference is felt; then raise cover to meet requirement. Tighten screws.

3.06 Series Governed Motor Units

MOTOR POSITIONING (NOT ILLUSTRATED)

Requirement

Motor should be centrally positioned in its rubber mounts so as to provide at least 0.020 clearance between the motor housing and the cradle at the governor end. The cable should also clear the grommet in the screen by at least 0.030 inch.

(A) GOVERNOR CONTACT BACKSTOP

Requirement

Clearance between the movable contact arm and its eccentric backstop.

Min 0.020 inch---Max 0.040 inch

To Adjust

Rotate the eccentric backstop with clamping screw loosened.

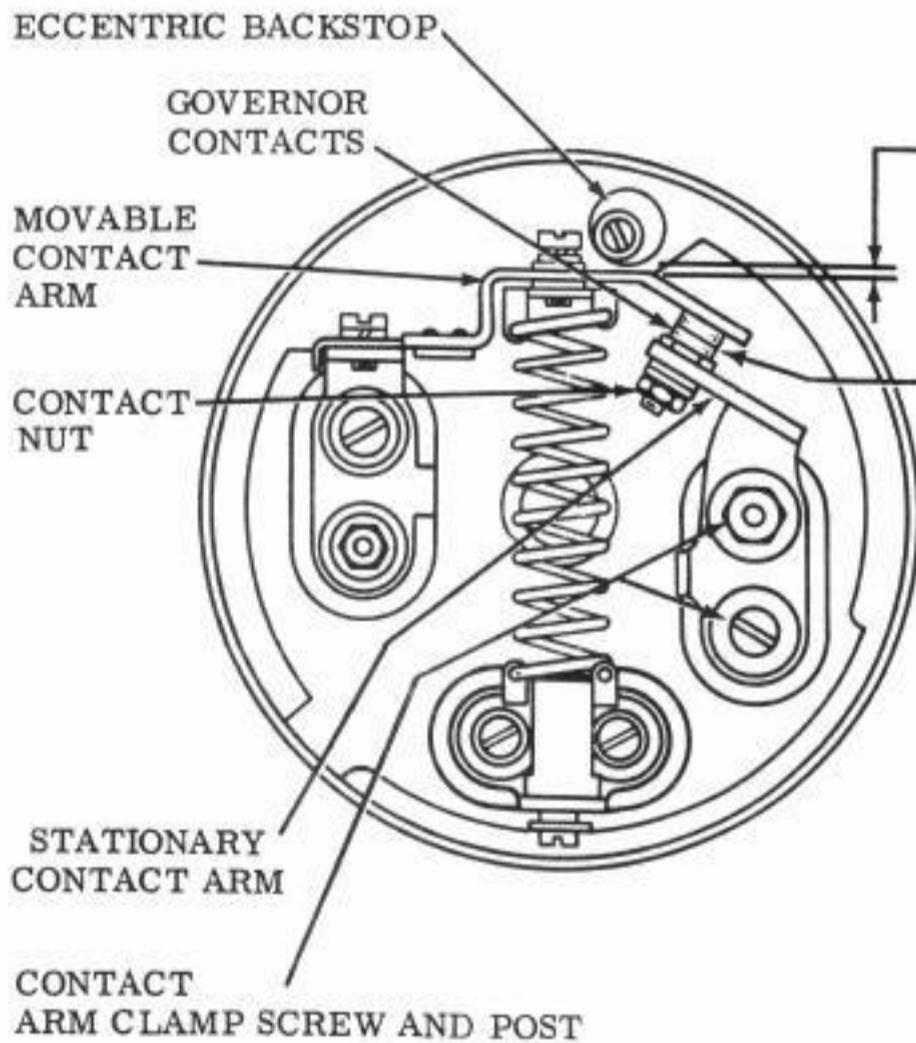
(B) GOVERNOR CONTACT

Requirement

The contacts should meet squarely and not overlap more than 0.010 inch.

To Adjust

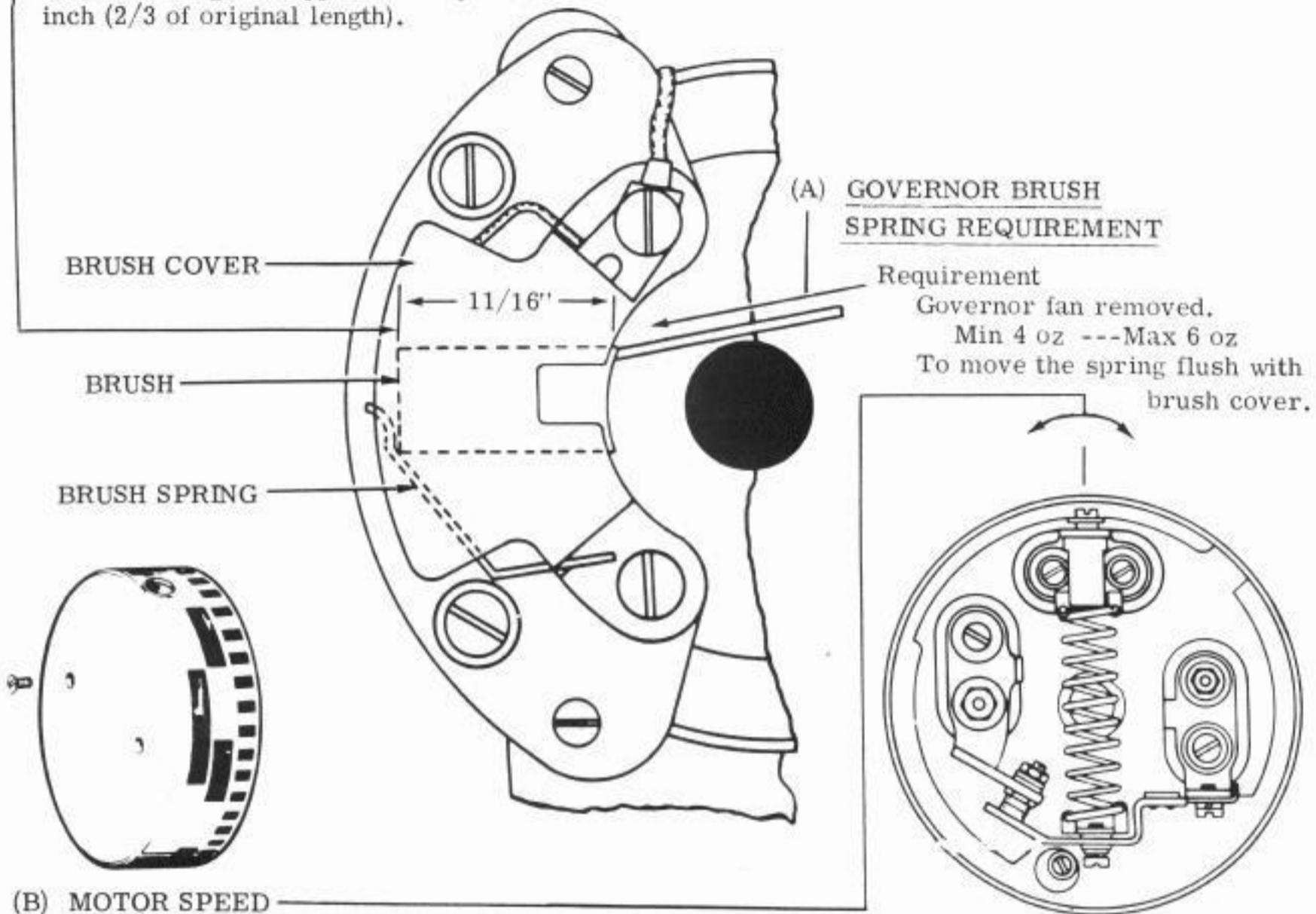
Position the stationary contact and contact arm with the clamp screw and post loosened.



CAUTION: EXCESSIVE PRESSURE AGAINST GOVERNOR COVER ASSEMBLY DURING REMOVAL MAY DAMAGE SCREENED WINDOW.

3.07 Series Governed Motor Units (continued)

Note: Replace governor brushes that have worn to a length of approximately 15/32 inch (2/3 of original length).



Requirement

With target illuminated and viewed through the vibrating shutters of a 120 vps tuning fork the spots on the 4-spot target should appear stationary while rotating. With target illuminated and viewed through the vibrating shutters of an 87.6 vps tuning fork the spots on the 6-spot target should appear stationary while rotating and with speed slightly increased the spots on the 35 spot target should appear stationary.

To Adjust

Stop the motor and turn the adjusting screw as indicated on governor cover. For units with screened governor covers, stop the motor, remove the TP152035 plug from cover. Turn adjusting screw as indicated on periphery of target.

Note: It is possible to adjust the motor at some multiple of the correct speed. To check motor speed when used with a page printer, return typebox carriage to left margin, set up any character in selector and manually trip typebox clutch trip lever. Printing should occur as follows:

WPM	PRINTED CHARACTERS	REQUIRED TIME
60	70	10 seconds
75	44	5 seconds
100	57	5 seconds

3.08 Series Governed Variable Speed Motor Units

BRAKE SHOE SLIDE

(1) Requirement

Clearance between engaging surface of respective disc and associated shoe should be
Min $3/32$ inch---Max $1/8$ inch

To Adjust

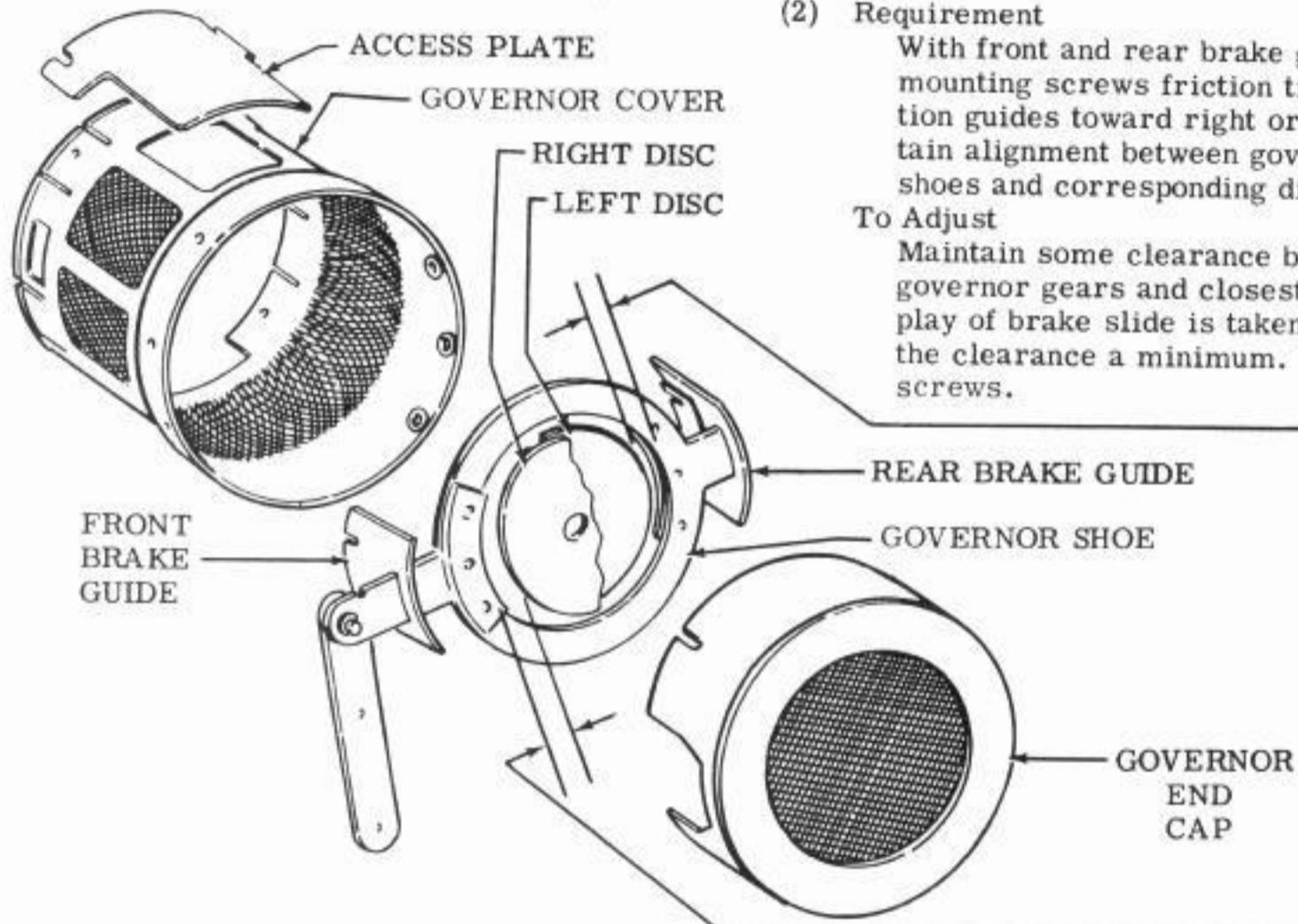
With bearing plate mounting screws friction tight, position the plate toward front or rear to centrally locate shoe assembly.

(2) Requirement

With front and rear brake guide mounting screws friction tight, position guides toward right or left to obtain alignment between governor shoes and corresponding discs.

To Adjust

Maintain some clearance between governor gears and closest shoe when play of brake slide is taken up to make the clearance a minimum. Tighten screws.

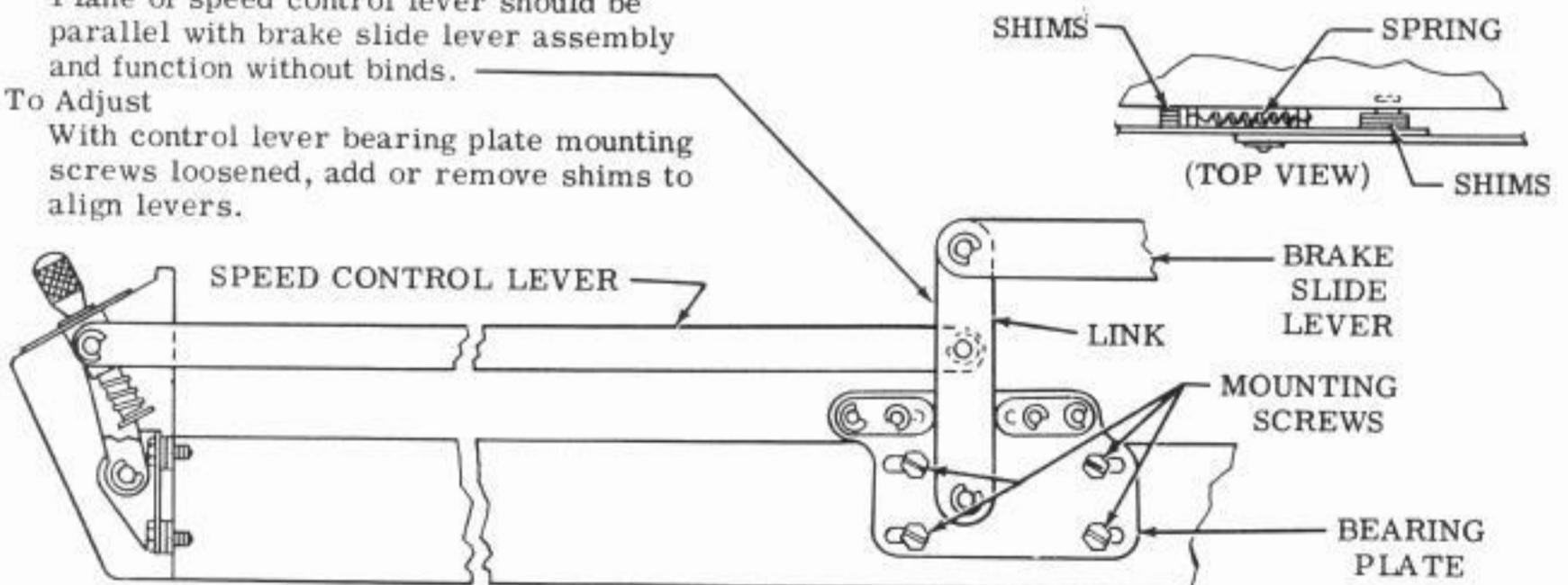
SPEED CONTROL LINKAGE BEARING PLATE (PART OF BASE)

Requirement

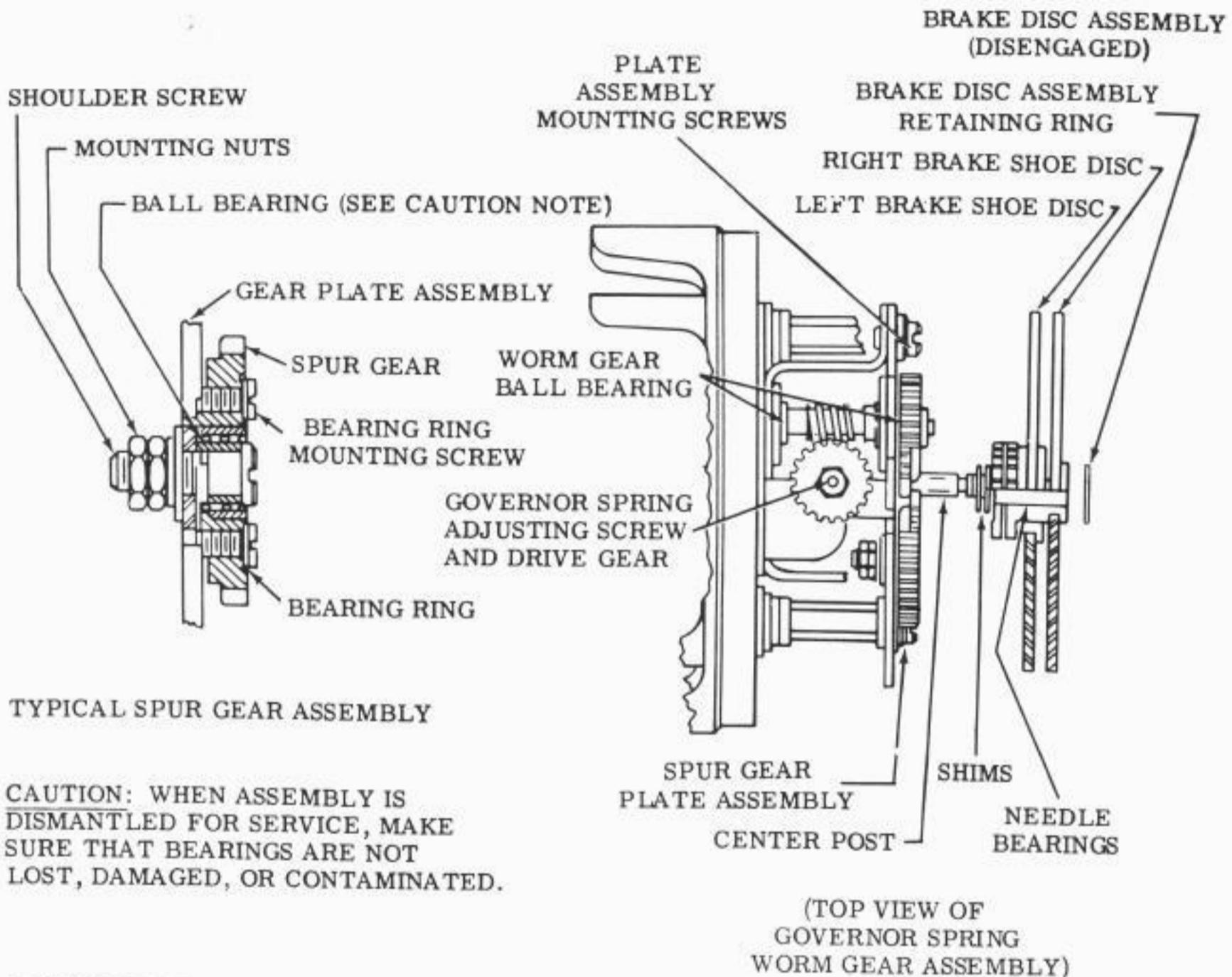
Plane of speed control lever should be parallel with brake slide lever assembly and function without binds.

To Adjust

With control lever bearing plate mounting screws loosened, add or remove shims to align levers.



3.09 Series Governed Variable Speed Motor Units (continued)



CAUTION: WHEN ASSEMBLY IS DISMANTLED FOR SERVICE, MAKE SURE THAT BEARINGS ARE NOT LOST, DAMAGED, OR CONTAMINATED.

GOVERNOR SPUR GEAR TRAIN

(1) Requirement

Backlash between the six mating spur gears should be barely perceptible. Do not mistake side play of gear mounting for backlash.

Preliminary Procedure

Remove brake disc assembly with its retaining ring removed from center post of gear plate. Remove spur gear plate assembly hardware from the four posts and remove the assembly. Note the location of fibre washers, etc. Remove bearing screw locknuts from spur gears B and C; then remove each gear, post, and bearing intact (see 3.10).

CAUTION: MAKE SURE BALL BEARINGS ARE NOT DAMAGED, LOST, OR CONTAMINATED.

Loosen locknuts on spur gear D.

To Adjust

Position bearing screw of spur gear on gear plate to provide perceptible backlash for spur gears A and D.

(2) Requirement

With brake disc assembly replaced in the spur gear plate assembly, backlash between spur gear D and mating gear in brake disc assembly should be barely perceptible.

To Adjust

Refine position of spur gear D mounting screw (Requirement (1) above).

3.10 Series Governed Variable Speed Motor Units (continued)

GOVERNOR SPUR GEAR TRAIN (continued)

(3) Requirement

With brake disc assembly removed and spur gear B replaced in gear plate assembly, backlash between spur gear A and spur gear B should be barely perceptible.

To Adjust

Refine position of spur gear B mounting screw.

(4) Requirement

Replace spur gear C in plate assembly. Backlash between spur gears B and C should be barely perceptible.

To Adjust

Refine position of spur gear C mounting screw.

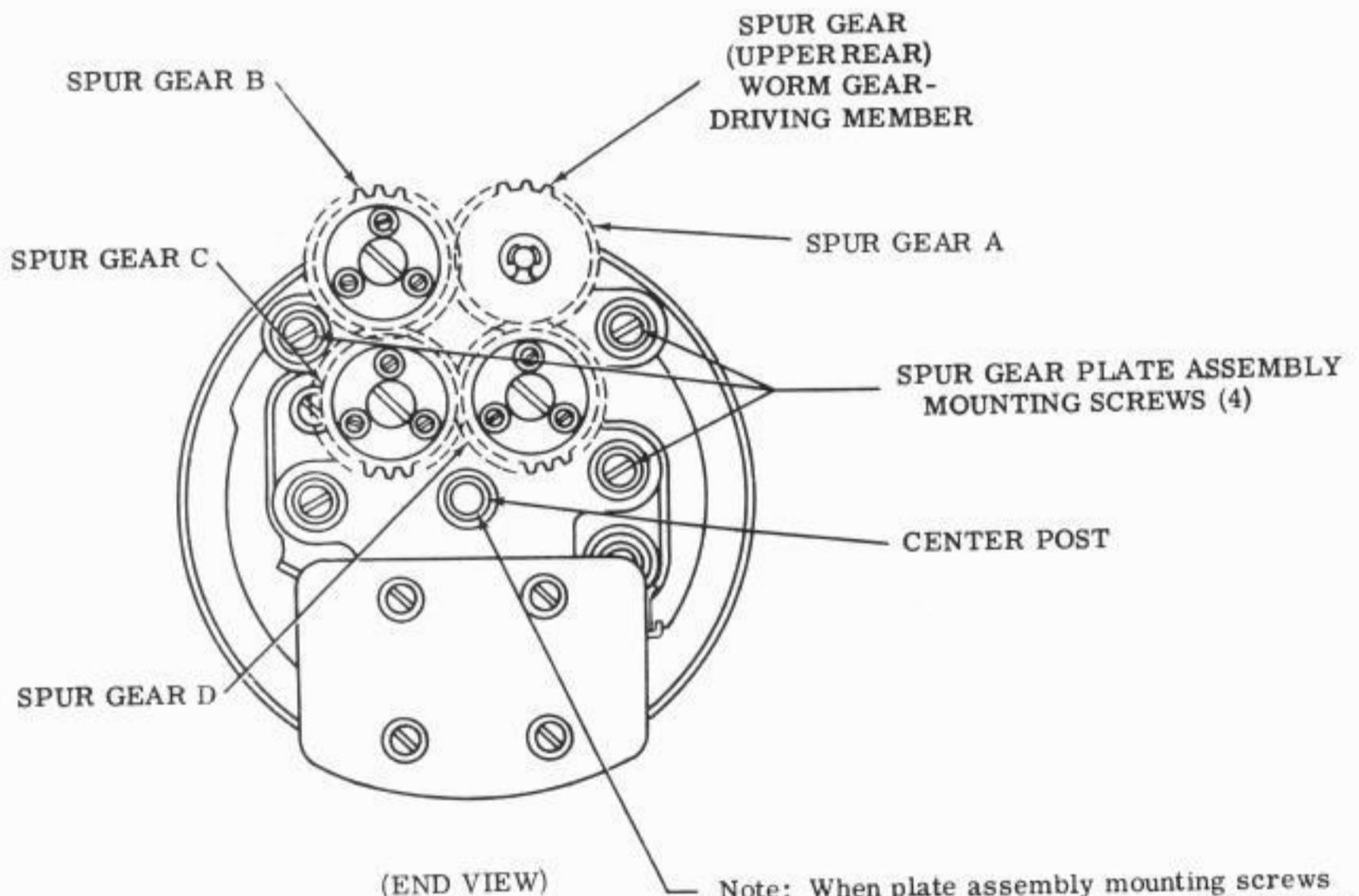
(5) Requirement

Replace brake disc assembly. Backlash between spur gear C and its mating gear on disc assembly should be barely perceptible.

To Adjust

Refine requirements (4) and (5).

(6) Remove the brake disc assembly and replace spur gear assembly.



Note: When plate assembly mounting screws are replaced make sure center post is aligned with axis of motor shaft to avoid wobble.

3.11 Plastic Type Axial Fan for 28 and 35 Teletypewriter Sets

CABLE CLAMP INTERFERENCE

Requirement

When installing a plastic type axial fan or a motor with a plastic type axial fan, there may be interference between the fan and cable clamp on the typing unit.

To Adjust

Remove the cable clamp and tie cable up under the connector bracket and flat against the side plate to prevent possible interference with the plastic type axial fan.

