

100A REGULATOR EQUIPPED WITH KS-5511 MOTOR — TYPE 892C REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the 100A Regulator, equipped with a KS-5511 motor — type 892C, used in the "K" Carrier Telephone System. 100A Regulators equipped with other types of KS-5511 motors are covered in other sections.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

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 the dismantling or dismantling of apparatus, or would affect the adjustment involved or other adjustments. No check need be

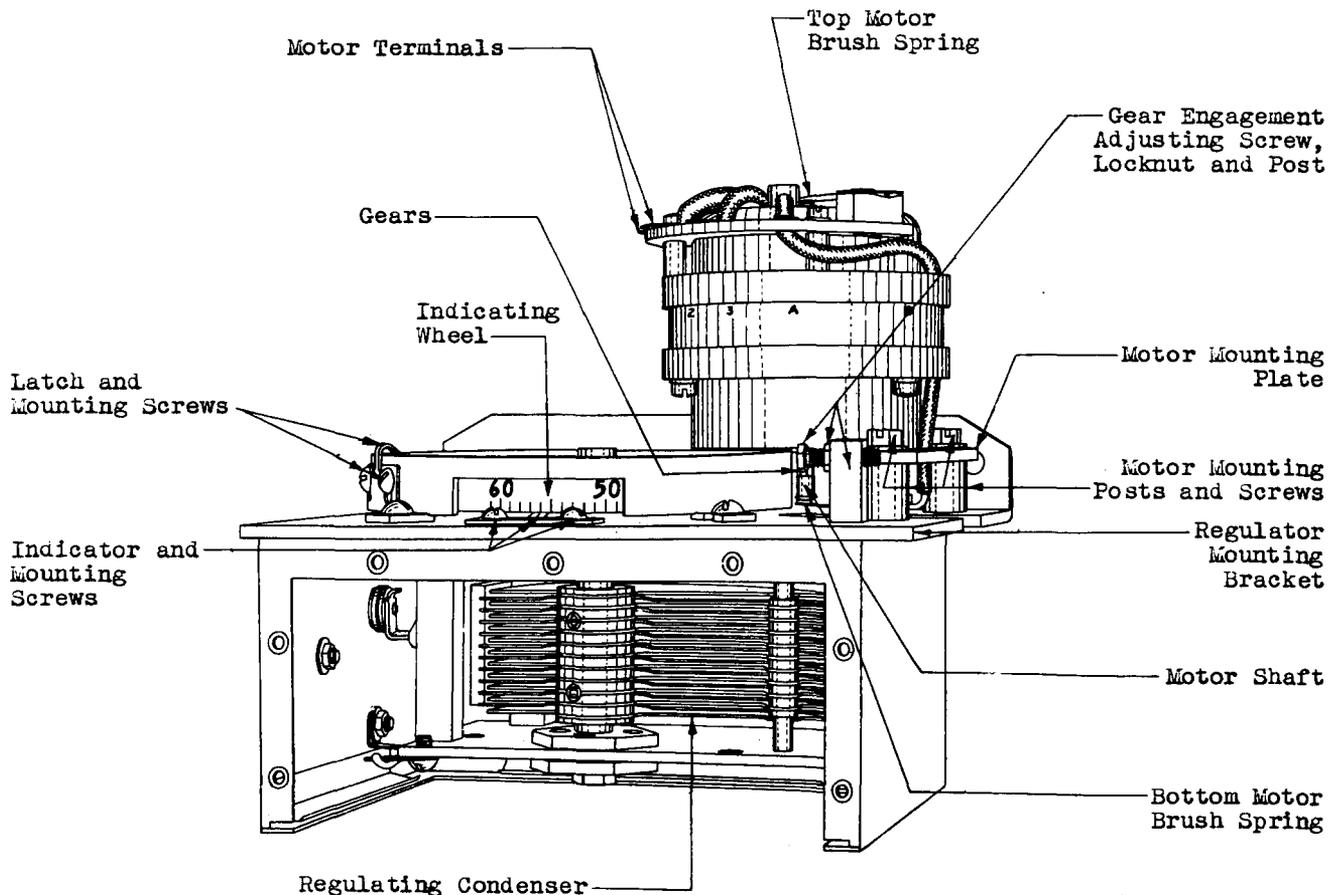


Fig. 1 — 100A Regulator

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 Checking and Readjusting for Requirements: All requirements shall be checked for and readjustments made with the amplifier, of which the 100A regulator is a part, removed from service. The plate and filament battery fuses shall also be removed to prevent damage to the equipment due to short circuits.

1.06 Removing Power from Motor: Remove power from the motor by removing the individual motor strap leads (designated S1, S2, S3 and P±) at the top of the bay.

Caution: To avoid damage to the motor bearings, never turn the indicating wheel manually while the gears are engaged.

2. REQUIREMENTS

2.01 Cleaning: The regulator shall be cleaned, when necessary, in accordance with the procedures contained in this section.

***2.02 Top Motor Brush Spring Pressure:** The pressure of the top brush spring on the motor shaft shall be:

Minimum — 10 grams

Use the 68B gauge. Apply the gauge to the spring near the contact.

2.03 Motor Shaft End Play and Bottom Motor Brush Spring Follow

(a) The end play of the motor shaft shall be:

Minimum — .005"

Gauge by eye.

(b) When the shaft is lifted up, on motors equipped with a flexible bottom motor brush spring, the flexible spring shall follow the shaft for:

Minimum — .005"

Gauge by eye.

To check (a) and (b) apply the KS-6320 orange stick below the hub of the shaft and lift up.

***2.04 Motor Movement:** With the motor removed from its mounting and held so that the shaft is vertical and with the gear end down, the shaft shall turn freely. Gauge by feel.

2.05 Position of Latch: The latch, when not used for locking the indicating wheel in position, shall be moved up as far as possible so as to permit free movement of the indicating wheel. Gauge by eye.

2.06 Condenser Torque: Fig. 2 — With the gears disengaged, the force required at the periphery of the indicating wheel to rotate the condenser shall be as follows: The maximum reading obtained shall be noted since it is required in connection with checking requirement 2.08.

Maximum 10 grams (at time of turnover)

Maximum 30 grams (maintenance only)

Use the 70D or 70H gauge. To check insert a common straight pin twice thru a piece of scotch tape about 1" square. Then stick tape to top of wheel at position 15 so that the head of the pin is within approximately 1/16" of the rim of the wheel but not protruding beyond the rim.

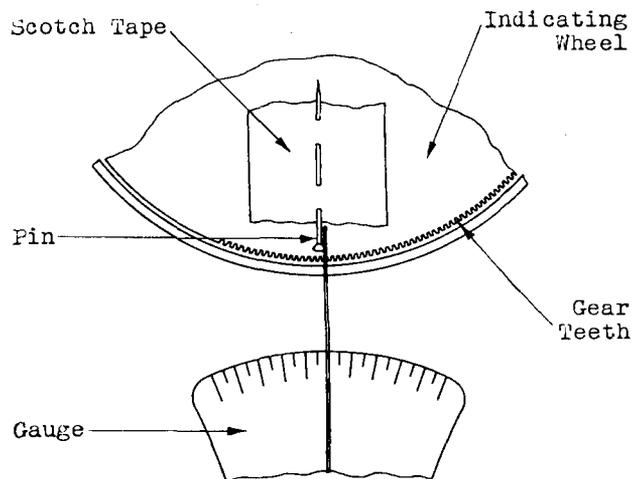


Fig. 2

The pin should be approximately radial with the center of the wheel. Place tang of gauge against pin, immediately back of head,

and hold it so that it rests on top of wheel by its own weight. The reed of the gauge should be in line with the pin. Hold gauge lightly, and measure force required to turn wheel in a slow continuous sweep over the range from 2 to 30 and from 30 back to 2. Note maximum reading of gauge. If in making this check a point is reached where the wheel jumps several divisions, move wheel back within 1 division of point where the jump occurred and continue the measurement to the end of the range. After the check from 2 to 30 and from 30 to 2, relocate pin at position 45 the same as at position 15 and measure from position 30 to 60 and from 60 to 30 the same as above for the lower range of the wheel. After test is completed set wheel in step with master controller and carefully mesh gears. If the gears have not previously been meshed in accordance with 3.08, mesh them in accordance with the 3.08 procedure. If the gears have been previously meshed in accordance with 3.08, mesh the gears as follows. Insert the .018" blade of the 74D gauge between the adjusting screw and the motor mounting plate. With the gauge held flat against the end of the screw, move the mounting plate in until the plate is tight against the gauge. While holding the gauge and plate in position, tighten the front motor plate clamping screw securely. Remove gauge and tighten securely the right rear clamping screw and then the left rear screw. Note that wheel is still in step with master controller within 0.2 division after the gears are meshed.

2.07 Indicating Wheel Setting: The indicating wheel and master controller indicator shall be in step within ± 0.2 division of the indicating wheel, as indicated by the numbers on the wheel and indicator. Gauge by eye.

2.08 Gear Bind and Back Lash

(a) The gears shall not bind and the back lash as indicated in degrees on the 0-360 dial of the KS-5551 test set shall be as specified below:

CONDENSER TURNING FORCE	BACK LASH IN DEGREES
15 grams or less	Maximum 10
Between 15 and 30 grams	Maximum 15

(b) To use the test set, remove the plug from the test set. Then remove the S1, S2 and S3 straps at the top of the bay for the par-

ticular regulator in question. Connect S1, S2 and S3 leads of test set cord to the lower set of S1, S2 and S3 terminals from which straps were removed. Check with a volt-ohmmeter that 48 to 62 volts AC is present on a set of spare P \pm and G terminals and then connect P \pm and G leads of test set cord to these terminals. Mount 510B test lamp rigidly so it illuminates the index and dial of regulator under test. Paste scotch tape over the lower half of the lens of the test lamp so as to leave a vertical slit of not over 1/32" width. This slit shall be approximately radial with the center of the lens. Locate lens about 3 inches from dial so that the index line appears between and parallel to the two edges of the slit. The numerals on the dial may be observed through the upper half of the lens while the lines on the index and the dial should be observed through the slit. Set 0-60 dial of test set in step with regulator under test within 0.2 division. Then insert plug in test set. Check for presence of 48 to 62 volts AC on terminals A and B of the motor under test with a volt-ohmmeter.

(c) Turn knob of test set until 0-60 dial of test set is at 2. Turn knob slowly so that regulator dial moves over the range from 2 to 60 and from 60 to 2 and check for bind of the gears of the regulator under test. Bind will be evidenced by the variation in pressure required to turn the knob and uneven rotation of the dial.

(d) Then starting again at 2, turn the knob slowly until the center of the line for dial position 3 of the regulator under test lines up with the center of the index line. If the dial goes beyond 3, restart again at 2. Note reading on the 0-360 dial of the test set. Continue to turn knob in same direction until regulator is approximately at position 4. Then turn knob back until regulator is again at position 3 the same as above. Do not overshoot. Note reading on 0-360 dial. This reading shall be less than the first reading by a maximum of 10 degrees (where the condenser turning force is 15 grams or less) or a maximum of 15 degrees (where the condenser turning force is between 15 and 30 grams). In cases where this reading (second reading) is in the range immediately below 360 or 0 and the first reading is immediately above 0, add 360 to the reading above 0.

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- (e) Repeat (d) for each succeeding 4 dial divisions after 3, ending at 59.

3. ADJUSTING PROCEDURES

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

CODE NO.	DESCRIPTION
TOOLS	
206	30° Offset Screwdriver
207	90° Offset Screwdriver
474A (2 Req'd)	3/16" and 1/4" Hex. Closed Double End Offset Wrench
510A	Test Lamp
541A	1/4"-12 Point Double End Box Wrench
—	KS-6320 Orange Stick
—	KS-6015 Duckbill Pliers
—	R-8950 Syringe
—	3-1/2" Cabinet Screwdriver
—	4" Regular Screwdriver
—	Typewriter Brush — Toothbrush Type
GAUGES	
68B	70-0-70 Gram Gauge
70D or	50-0-50 Gram Gauge
70H	0-30 Gram Gauge
MATERIALS	
—	KS-6232 Oil
—	D-98063 or KS-2423 Cloth
—	Pipe Cleaners
TEST SETS	
—	KS-5551 Test Set and Associated W5B Cord
—	KS-8295 Volt-ohmmeter

3.002 *General*

- (1) **Removing Motor:** Remove the plate and filament battery fuses for the amplifier of which the motor is a part. Remove the motor

straps (designated S1, S2, S3 and P_{\pm}) at the top of the bay and the amplifier can cover if not previously removed during test. Remove P_{\pm} lead of test set from P_{\pm} terminal, if connected. Remove the leads at the motor. Remove the 311A tube after it has cooled. Remove the cable ring attached to the right cover guide with the 3-1/2" cabinet screwdriver and move the cable out of the way. Remove the three motor mounting screws with the 541A wrench. Lift off the motor and plate. Remove motor from plate.

(2) **Remounting Motor:** Mount the motor on the mounting plate, tightening the screws securely. Place plate in position so that its mounting plate holes line up with the holes in the mounting posts. Check that the plate is seated on the pivot post (left rear post). Insert the three mounting screws and tighten them just sufficiently to permit moving the plate later when engaging the gears. Reconnect the motor leads. Reconnect the P_{\pm} strap at the top of the bay. Adjust for gear bind and back lash as covered in 3.08. Reconnect cable ring and replace the 311A tube. Insert fuses.

(3) **Removing and Remounting Regulating Condenser:** Remove motor as covered above under (1). Then loosen the three screws for the cover for the T, TV and GC condensers with the 206 and 207 offset screwdrivers. Slide back the cover so that the cut out portions are in a position which will permit raising the cover. Disconnect the three leads from the regulating condenser. Remove the mounting screws for the regulating condenser using the 4" regular screwdriver and remove the condenser.

(4) To remount the replacing condenser proceed as covered in (3) going through the operations in the reverse order. Remount motor as covered in (2).

3.01 *Cleaning* (Rq. 2.01)

(1) Do not wipe off the regulating condenser or outside of the motor while the motor is mounted since dust will be disturbed and may get into the motor bearings and cause trouble later. **Cloth referred to in connection with cleaning is cloth per D-98063 or KS-2423.**

(2) To clean the motor proceed as follows.

Remove the plate and filament battery fuses for the amplifier. Remove the amplifier can cover. Remove the 311A tube after it has cooled. Loosen the three motor mounting screws sufficiently to swing the motor out so as to disengage the gears. Then follow (3) to (9).

(3) First remove the motor from its mounting as covered in 3.002(1). Then remove the three motor mounting plate screws with the 3-1/2" cabinet screwdriver. Wipe off the outside of the motor, including contact spring, with a clean cloth. Then remove the two screws which mount the bottom motor brush spring assembly to the motor, using the same screwdriver. Turn back the contact and associated assembly and lift off the block. Then remove the three screws which hold together the two parts of the motor, using the same screwdriver. Carefully separate the two parts of the motor by pulling. If the parts are tightly fitted, it may be impossible to separate them by pulling. In such cases, insert the edge of the blade of a small knife (such as a pocket knife) between the two parts and draw it around the motor, exercising care not to damage the insulation on the wire connected to the bottom motor brush spring. This will separate the parts so they may be pulled apart. **Do not use a prying action with the knife blade since the motor bearings may be damaged.**

(4) Lift off the bottom part of the motor.

Remove the fibre insulator that lies over the end of the stator windings. Lift out the rotor. Brush off lightly any loose particles of varnish that may be on the rotor, shaft bearing surfaces and gear teeth using the type-writer brush (toothbrush type). Then, using the same brush, remove any particles that may be present on the exposed part of the stator windings. Then double and twist a pipe cleaner. Insert the cleaner through the bottom bearing and work it back and forth so as to remove any loose foreign matter that may be present. Insert the orange stick between the top contact spring and the top of the motor so that the spring is raised approximately the same amount as when the motor is in use. Then insert an undoubled pipe cleaner through the top bearing and work it back and forth to remove loose foreign matter. Do not push

cleaner thru too far and change brush spring position. **Take care not to scratch the bearings with the pipe cleaner wire.** Wipe off the inside and outside of the bottom part of the motor with a clean cloth. Then using the R-8950 syringe blow off the bottom part of the motor including the bearing and then cover this part with a clean cloth to keep out dirt that may be present in the air. If a magnifying glass is available, observe that all loose particles are off the bearing.

(5) Wipe off the outside of the motor including contact spring with a clean cloth. Next wrap a piece of clean cloth around one end of the KS-6320 orange stick and then wipe around the inside of the top part of the motor, near the bearing and also where the rotor fits in. Insert the orange stick between the top contact spring and the top of the motor so that the spring is raised approximately the same amount as when the motor is in use. Then blow out the inside of the motor and stator windings with the R-8950 syringe, shaking and turning the motor so as to remove all loose particles. Remove orange stick. Then cover with a clean cloth.

(6) Blow off the rotor with the R-8950 syringe to remove all loose particles. Then put several drops of KS-6232 oil on a clean cloth and spread the oil through the cloth by rubbing the dry part against the oily part. Then wipe the bearing surfaces of the shaft with the oily part of the cloth and follow this by wiping with the dry part of the cloth.

(7) Immediately after (6), insert the rotor with the gear side up. Place fibre insulator on top of stator windings and then slip the bottom part of the motor over the shoulder of the top part so that the holes line up. Insert the three screws that fasten the two parts together and tighten each screw in turn a slight amount at a time until all are tight. Then fasten the bottom spring assembly to the motor, with the notch in the block away from the motor. Tighten the screws securely. After this, fasten the mounting plate to the motor.

(8) Check the tension of the top contact spring.

(9) Wipe off top of regulating condenser with a clean cloth. Then mount motor as covered in 3.002(2).

3.02 Top Motor Brush Spring Pressure
(Rq. 2.02)

(1) Remove motor as covered under 3.002(1) and then adjust tension with the KS-6015 duckbill pliers. Apply the pliers near the base of the spring and then adjust the spring so that it bears on the top contact of the armature with a greater pressure. Adjust spring so that it bears flat against the top contact. If the spring is bowed appreciably or kinked, correct by drawing the pliers along the spring.

(2) Remount motor as covered under 3.002(2).

3.03 Motor Shaft End Play and Bottom Motor Brush Spring Follow (Rq. 2.03)

(1) If there is insufficient end play of the motor shaft, replace the motor.

(2) If the bottom flexible motor brush spring does not follow the shaft the proper amount, remove the motor and replace the bottom spring assembly.

3.04 Motor Movement (Rq. 2.04)

(1) If the motor does not turn freely, clean bearings as covered in 3.01. If this does not correct the trouble, replace the motor.

3.05 Position of Latch (Rq. 2.05)

(1) To position the latch, loosen its two mounting screws with the 3-1/2" cabinet screwdriver and raise the latch to the full extent of its travel. Tighten the screws securely.

3.06 Condenser Torque (Rq. 2.06)

(1) If the torque is excessive, replace the condenser, removing it as covered in 3.002(3). This procedure is for maintenance use only. Transmission tests are required on the amplifier in accordance with other sections of Bell System Practices after the condenser is replaced to insure proper setting of the T condenser of the amplifier.

(2) Check the replacing condenser for maximum 10 grams torque. Remount motor as covered in 3.002(2). Then check 2.07.

3.07 Indicating Wheel Setting (Rq. 2.07)

(1) If the indicating wheel and master controller indicator are not in step within 0.2 division but are not out of step by more than 0.3 division, loosen the two indicator mounting screws with the 3-1/2" cabinet screwdriver. Then shift the indicator until it is centered between the two scribe marks on the top of the condenser mounting bracket. If still out of step more than 0.2 division but not more than 0.3 division, move the indicator until the center of its index mark lines up with the center of the dial mark. If, with the indicator centered between the scribe marks, the setting is out more than 0.3 division, slightly loosen the three motor mounting screws with the 541A wrench just sufficiently to shift the motor assembly to the right so as to disengage the gears. With power on the motor, move the indicating wheel so that the center of the dial mark and the center of the index mark are in line. Then, while holding the dial, remesh the gears as covered in 2.06. If the setting, after meshing, is out more than 0.3 division, unmesh the gears again and move the dial so as to mesh different gear teeth. Then remesh again as covered in 2.06. After a setting is obtained within 0.3 division with the gears meshed, tighten the motor mounting screws securely in the sequence given in 2.06. Then shift indicator so that the center of its index mark lines up with the center of the dial mark. Tighten the indicator mounting screws securely.

3.08 Gear Bind and Back Lash (Rq. 2.08)

(1) Loosen the gear engagement adjusting screw lock nut with the 474A wrench and back off screw until it is barely protruding through the post.

(2) Loosen the three motor mounting plate clamping screws with the 541A wrench just enough to permit the motor and plate to be moved out freely.

(3) Connect the KS-5551 test set to the motor, check for voltage and position lamp, as covered in 2.08(b).

(4) Slide the motor mounting plate to the left so as to mesh the gears. If gear teeth are prevented from meshing due to being in contact at ends, rotate motor slightly with test set until gears mesh. Mesh gears fully

but do not use excessive pressure as this will damage motor shaft. The mounting plate should not touch the adjusting screw.

(5) Using the test set, rotate the regulator motor from 5 to 55 and back again. The purpose of this is to permit the motor to move out so as to accommodate the combined gear and motor pinion eccentricities. Do not go beyond 5 or 55. While holding the mounting plate in this position tighten the front clamping screw first, then right rear and finally left rear clamping screws. Use the 541A wrench and ***tighten screws securely. Do not move plate.***

(6) Now turn in the adjusting screw with the fingers until it touches the plate and then lock the screw in this position with the lock nut. Use one 474A wrench to hold the screw while tightening the lock nut with another 474A wrench.

(7) Then loosen the three motor mounting plate clamping screws with the 541A wrench and push plate to the right. Do not loosen screws more than just sufficient to move plate. Insert the .018" blade of the 74D gauge between the end of the gear engagement adjusting screw and the motor mounting plate. With the gauge held flat against the end of the screw move plate to the left until the plate is tight against the gauge. Then while holding the gauge and plate in position, securely tighten the front plate clamping screw with the 541A wrench. Remove gauge and tighten the right rear and finally the left rear screw.

(8) Check 2.08(c), (d) and (e).

(9) If 2.08(c) is not met after the above adjustment and the condenser torque requirement (2.06) is met, the trouble is probably due to bind in the motor bearings. Clean bearings as covered in 2.01.