

BELL SYSTEM PRACTICES
Teletypewriter and Manual
Telegraph Station and P.B.X.
Installation and Maintenance

SECTION P35.631
Issue 5, May, 1948
AT&T Co Standard

TRANSMITTER-DISTRIBUTOR NO. 14—STATION TYPE REQUIREMENTS AND PROCEDURES

1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of No. 14 type station teletypewriter transmitter-distributors. Test message transmitter-distributors are covered in a section of the "A" series of the Bell System Practices.

1.02 This section is reissued to remove the information on woven wire brushes and to add or revise the requirements and procedures marked with the arrows.

1.03 The following shall be observed in applying requirements and procedures:

- (a) Use appropriate gauges for dimensional measurements.
- (b) Use the following scales for tension measurements, as the tension values specified are in most cases not absolute values but readings to be obtained on these scales when used in the positions described.

Note: The off-zero no-load readings of the 138-55M and 138-58M scales, when held in certain positions, should be disregarded. These off-zero values are compensated for in the limits specified.

<u>Scale</u>	<u>Tension Range</u>
68B or 70D	20 to 25 grams (for 4.43 only)
138-55M	8 ozs. or less
138-58M	8 ozs. to 32 ozs.

- (c) Before readjusting a part, loosen locking device (clamping screw, lock nut, etc.). Reset locking device after adjustment is completed.

- (d) After readjusting a part, check adjustment of related parts which may have been disturbed.
- (e) Parts dismantled to facilitate checking or readjustment shall be reassembled after operation is completed.
- (f) Springs which are outside tension limits specified and for which no adjustment is provided shall be replaced.
- (g) All contacts shall meet squarely and contact points shall fall wholly within the circumference of the opposing contact except contacts having same diameter, whose centers shall not be out of alignment more than 25 per cent. of their diameter.
- (h) Names of parts as used in this section are in some cases not the same as those used in the parts bulletin. For ordering use only the parts bulletin names.

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1.05 **Variable Features.** The following features have been incorporated in certain new style transmitter-distributors and may be found also on modified old style transmitter-distributors:

83844M Set of Parts for a-c governor spark protection, 20 ohm resistor and contacts (4.07, 4.49, Fig. 18)

84593M Set of Parts for closing a contact during the "stop pulse" (4.56-4.59)

- 106916 Tape Stop Magnet and Feed Lever Set of Parts. Auxiliary magnet to stop tape feed and permit brush arm to rotate. (This includes the 97460M Tape Stop Magnet.) (4.60-4.63)
 - 101389M Set of Parts for chadless tape (4.17, 4.20, 4.21, 4.26, 4.28, 4.31)
 - 10148M Set of Tape-Out Mechanism Parts (4.40-4.43)
 - 102520M Tape Stop Rod (with crook in end) (4.37)
 - 104720M Tape Stop Assembly (delayed start) (4.38, 4.39)
- Stop-start mechanism in which a pivoted stop arm is held latched in the stop position by the armature extension (4.08-4.11)

2. CLEANING

- 2.01 Transmitter-distributors shall be cleaned in accordance with Sections P30.010 and P35.542.

Caution: Cleaning shall be performed only when motor is at rest.

3. LUBRICATION

- 3.01 Transmitter-distributors shall be lubricated in accordance with Sections P35.602 and P35.542.

4. REQUIREMENTS AND PROCEDURES

Caution: Do not rotate distributor main shaft in a counterclockwise direction, viewed from above, as this will mutilate the distributor brushes.

Note: To prevent mutilation, brushes may be lifted from distributor face by removing the brush holder arm assembly from the shaft. When replacing brush holder arm, make certain it is pressed firmly down in place while tightening its mounting screw, then check brush tension.

- 4.01 Motor pinion shall engage main shaft gear with minimum backlash without bind throughout a complete revolution of main shaft gear. Gauge by eye and feel.

(a) To adjust, reposition motor.

- 4.02 Operating cam shall clear the operating lever as in Fig. 1, when operating lever roller is about to rise up on high part of its cam and all play in the lever is taken up in a direction to make this clearance a minimum. When the play in the operating lever is taken up in a direction to make the clearance a maximum, this clearance shall not exceed .040".

(a) To adjust, loosen the main shaft bearing cap screws and raise or lower the main shaft. Tighten the screws.

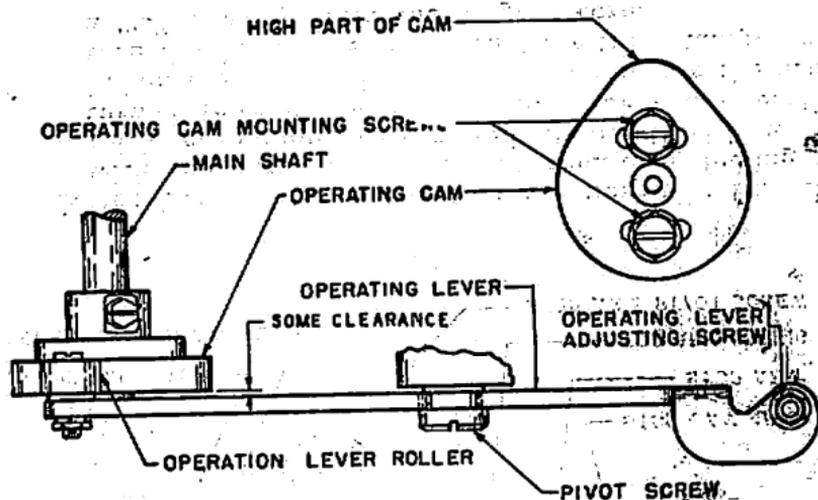
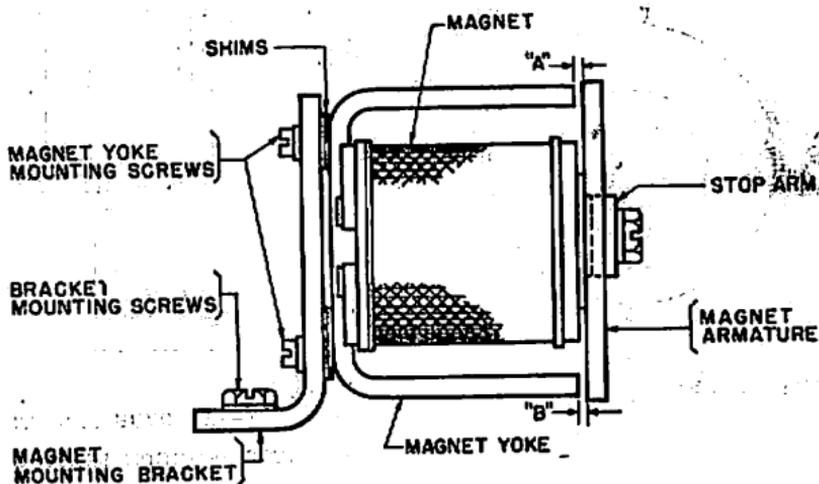


Fig. 1



"A" & "B" TO BE APPROX. EQUAL, .010" MIN., .020" MAX.

Fig. 2

Note: 4.03-4.07 cover requirements for the stopping and starting mechanism in which the stop arm is an extension of the magnet armature—that is of transmitter-distributors other than the 14AP, 14AR and 14AS.

4.03 Stop magnet yoke ends shall clear the armature by approximately the same amount and by Min. .010", Max. .020" when the armature is held in its operated position (against the core, either manually or electrically).

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Note: Requirement 4.03 applies only to units equipped with the new-style single-core universal stop magnet.

- (a) To adjust, use 8896M shims between magnet bracket and top and bottom of yoke. See Fig. 2.

4.04 Stop arm shall clear the stop cam lug by Min. .004", Max. .012" (see Fig. 3) when the magnet armature is held in its operated position.

- (a) To adjust, reposition magnet bracket. When a universal magnet is used make sure magnet yoke ends are parallel to the armature face and do not extend beyond the armature edges.

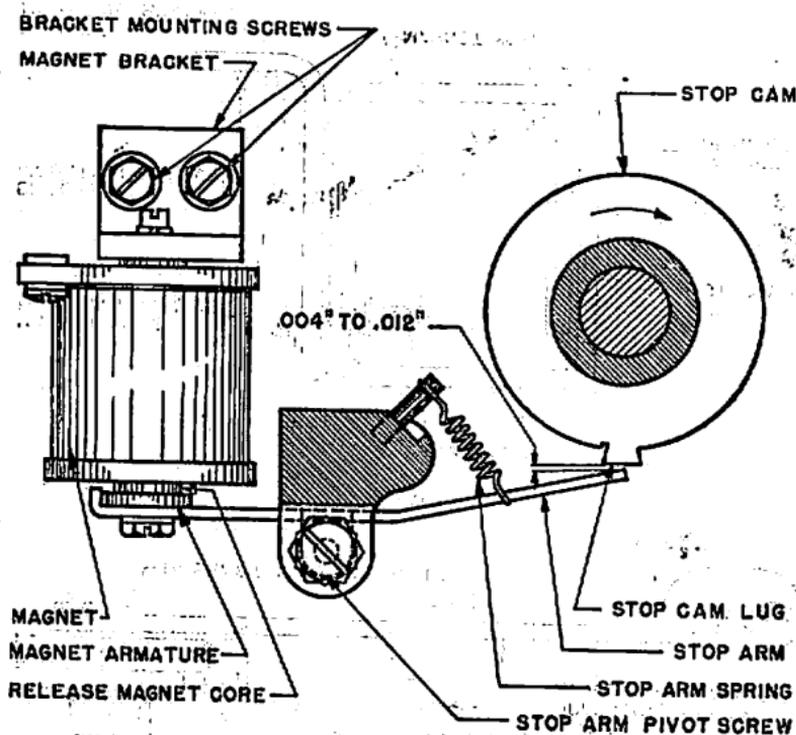


Fig. 3

Note: Transmitter-distributors are normally furnished with the face of the 84115M armature, having the thick chromium plating and stamped with a "C", turned toward the magnet core for d-c operation. When the magnet is to be operated on a-c the armature should be reversed so that the face stamped with a "C" is away from the magnet core.

Note: If magnet hums when energized with a-c, turn bracket slightly to decrease the clearance between the armature and that part of the center pole encircled by the copper slug.

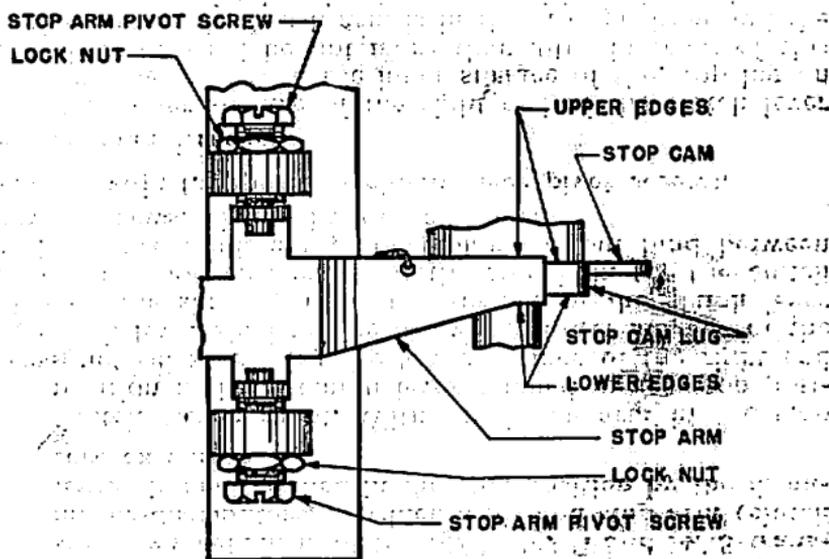


Fig. 4

4.05 Stop arm shall project above upper edge and below lower edge of the stop cam lug, as in Fig. 4 when engaging lug, and have slight vertical play without bind between pivot bearing screws. Gauge by eye and feel.

(a) To adjust, reposition stop arm pivot screws.

4.06 Stop arm spring tension on machines equipped with a-c synchronous motors or d-c motors shall be Min. 5 oz., Max. 7 oz., measured as in Fig. 5(A).

4.07 Stop arm spring tension on units equipped with a-c series motors and with 83844M² set of parts for a-c governor spark protection, including 4703M spring, shall be Min. 1 oz., Max. 1-3/4 oz., measured as in Fig. 5(B).

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PULL TO START ARM MOVING:
 (A) 5 TO 7 OZS. WITH 55669M
 SPRING, (B) 1 TO 1-3/4 OZS.
 WITH 4703M SPRING.

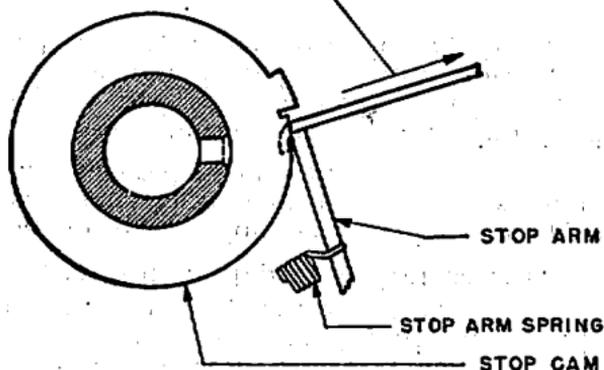


Fig. 5

Note: 4.08-4.11 cover requirements for the stopping and starting mechanism of the 14AP, 14AR and 14AS transmitter-distributors, in which a pivoted stop arm (clutch lever) is held latched in the stop position by the armature extension.

4.08 Clutch Lever Pivot. With the brush arm in the stop position and the clutch lever latched in the stop position (magnet released), (a) the lower surface of the right end of the clutch lever shall not be below the lower surface of the stop lug on the shaft, (b) the top surface of the clutch lever shall clear the bottom surface of the stop hub, (c) the clutch lever shall have minimum vertical play without bind between the pivot screws. Gauge by eye and feel:

(1) To adjust, reposition clutch lever pivot screws.

4.09 Magnet Bracket

(a) The inner surface of the right end of the clutch lever shall be even with the inner surface of the stop lug on the shaft or shall be not more than .010" in front of this surface when the brush arm is in the stop position and the clutch lever is latched in the stop position. Gauge by eye.

(b) There shall be a clearance of Min. .002", Max. .006" between the left surface of the front end of the armature extension and the clutch lever when the magnet armature is held against the cores and the armature extension is in its unlatched position against the clutch lever.

(1) To adjust, remove clutch lever spring, loosen magnet bracket mounting screws and position magnet bracket.

4.10 **Clutch Lever Spring.** It shall require a pull of Min. 12 ozs., Max. 16 ozs., applied perpendicularly to the left end of the clutch lever to start the clutch lever moving forward from its latched position when the clutch lever is not touching the stop lug and the magnet is latched in its unoperated position.

4.11 **Armature Pivot Shaft.** It shall require a horizontal push of Min. $3/4$ oz., Max. $1-1/4$ ozs. applied perpendicularly to the front end of the armature extension to just start the armature moving toward the core when the magnet armature is in its unoperated position and the clutch lever is held to remove pressure from the end of the armature extension.

(1) To adjust, loosen lock nut at lower end of armature pivot shaft and rotate shaft by means of the hexagonal portion of the shaft.

4.12 **Feed pawl spring** shall have a tension of Min. 1 oz., Max. 2 ozs., when the pawl is vertical and in its uppermost position.

(a) To gauge, place main shaft in its stop position, then remove the tape transmitter top plate, taking care not to bend tape pins, and gauge as in Fig. 6.

(b) To adjust, loosen pawl screw and reposition feed pawl spring clockwise to increase tension and counterclockwise to decrease tension. Check to insure that there is clearance between the feed pawl spring and the feed wheel ratchet, when the feed pawl is in its extreme upward position.

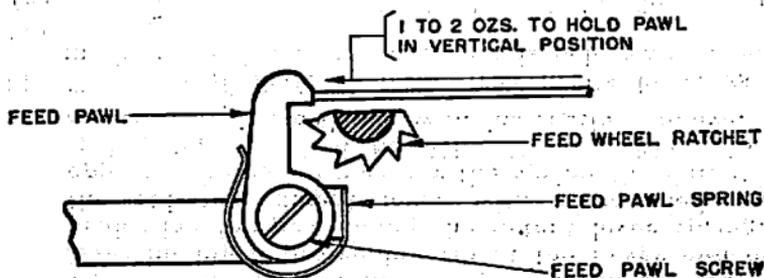


Fig. 6

4.13 **Detent lever spring tension** shall be Min. 12 ozs., Max. 15 ozs., measured as in Fig. 7, when tape transmitter top plate is held upside down in a horizontal plane and detent roller is in hollow between two ratchet teeth.

Note: The above requirement applies to the 300-315 detent lever having a protruding rib at the lower end of the projection for positioning the detent lever spring. For the old-style detent lever with a rounded surface opposite the round boss for the spring the detent lever spring tension shall be Min. 15 ozs., Max. 18 ozs., measured in accordance with instructions above.

4.14 **Feed wheel shaft** shall be free in its bearings with minimum end play when detent is held away from the ratchet.

(a) To adjust, loosen feed wheel shaft bearing mounting screws and position bearings. See Fig. 7.

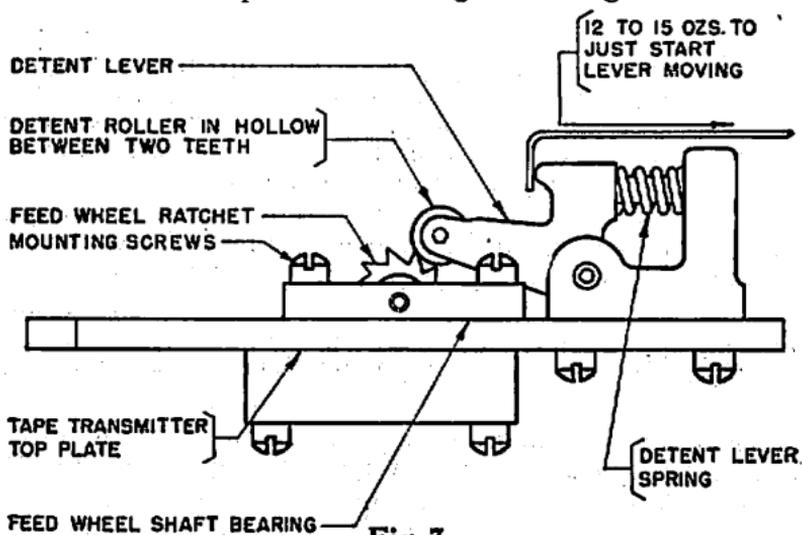


Fig. 7

4.15 With the **retaining lid** held against the front guide rail on the tape guide plate the **retaining lid latch** shall operate fully under its own spring tension. The latch shall not close fully under these conditions when a .003" thickness gauge is placed between the retaining lid and the front guide rail.

(a) To adjust, add or remove 72069M shims between the latch wearing strip and the top plate.

Note: If, when the tape retaining lid is latched, contact between the retaining lid and the front raised portion of the tape guide is made only at one end of the lid, it may have been bent and should either be straightened or replaced.

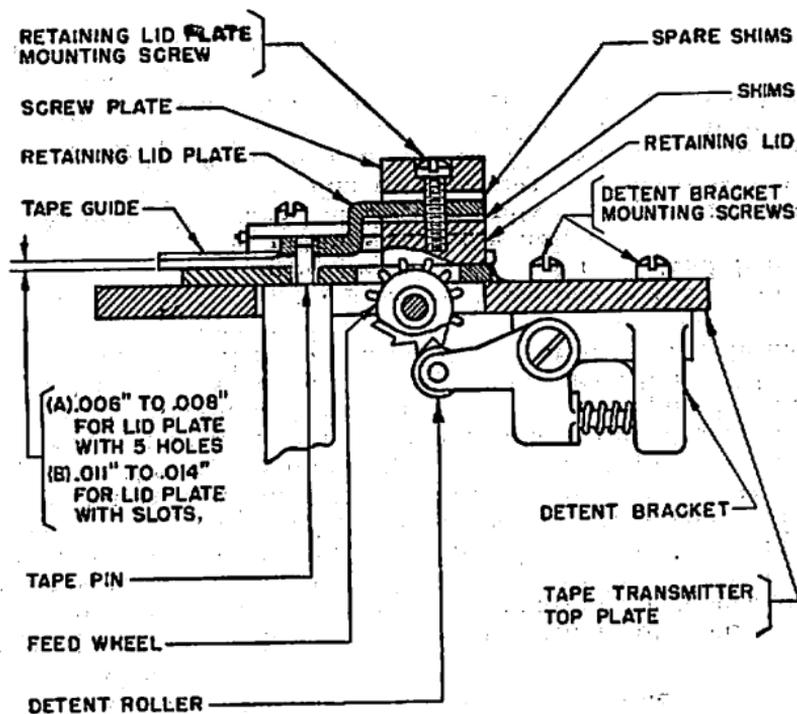


Fig. 8

4.16 **Retaining lid plate** having individual holes to clear tape pins shall clear tape guide by Min. .006", Max. .008", as in Fig. 8(A), when the retaining lid is latched closed and the play taken up in a direction to make this clearance a minimum.

- (a) To adjust, add or remove 72137M shims between the retaining lid and the retaining lid plate.

Note: Spare shims are provided between the retaining lid plate and the screw plate.

4.17 **Retaining lid plate** having slots, either 2 or 5, to clear tape pins shall clear tape guide by Min. .011", Max. .014", as in Fig. 8(B), when the retaining lid is latched closed and the play taken up in a direction to make this clearance a minimum.

- (a) Adjust as in 4.16, using 95953M shims.

(b) When spliced chadless tape is used the retaining lid plate shall clear the tape guide by .014" to .016". Under this condition a check should be made for closure of the spacing contacts with blank tape in the transmitter.

See 4.27.

4.18 Retaining lid latch spring tension shall be Min. 1-1/2 ozs., Max. 7 ozs., measured by pulling at right angles to the top of the formed upper end of the latch with the horizontal latch surface approximately flush with the top of the top plate—not latched.

Note: Reassemble tape transmitter top plate, taking care that feed pawl is in vertical position and, if the transmitter-distributor is equipped with the 101481M set of parts, that the 97447M contact pin is in place.

4.19 Tape guide shall clear the edges of tape, leaving perforations properly centered, by approximately equal amounts, as in Fig. 9, when tape is engaged by feed wheel and operating lever is on high part of its cam. Gauge by eye.

Note: Perforations are properly centered if No. 1 and No. 5 perforations are equally distant from the two edges of the tape.

(a) To adjust, reposition tape guide. If tape binds in guide it is an indication that the tape used does not meet requirements for maximum width.

Note: Before making adjustments 4.20 to 4.32, back-off all contact screws (Fig. 11). These adjustments must be made in the order given, because all are inter-related and a change in one will affect all others. If one adjustment is changed, all others should be checked.

4.20 Feed wheel detent. Tape perforations of tape freshly perforated with "letters" combination and checked for correct spacing with perforation gauge 95960M, shall center over tape pins, as in Fig. 9, when detent roller rests in the hollow between two ratchet teeth, and the right edges of the code perforations shall just clear the edges of the pins when the play in the tape is taken up to the left. Gauge by eye.

Note 1: If tape can be pivoted about pin of feed wheel far enough, without wrinkling, for an edge of a pin to be covered by the edge of a code hole, it is an indication that the tape used does not meet requirements for minimum width.

Note 2: If chadless tape is used, the lids of the set of five perforations over the pins should be folded back so that they do not obstruct the holes.

Note 3: Standard Bell System units use tape with centers of feed holes in line with centers of code holes. However, if advanced feed hole tape is to be accommodated by Bell System transmitter-distributors the adjustments here given should be followed, using advanced feed hole tape.

(a) To adjust, reposition detent bracket.

FEED WHEEL RATCHET

DETENT BRACKET
MOUNTING SCREWS

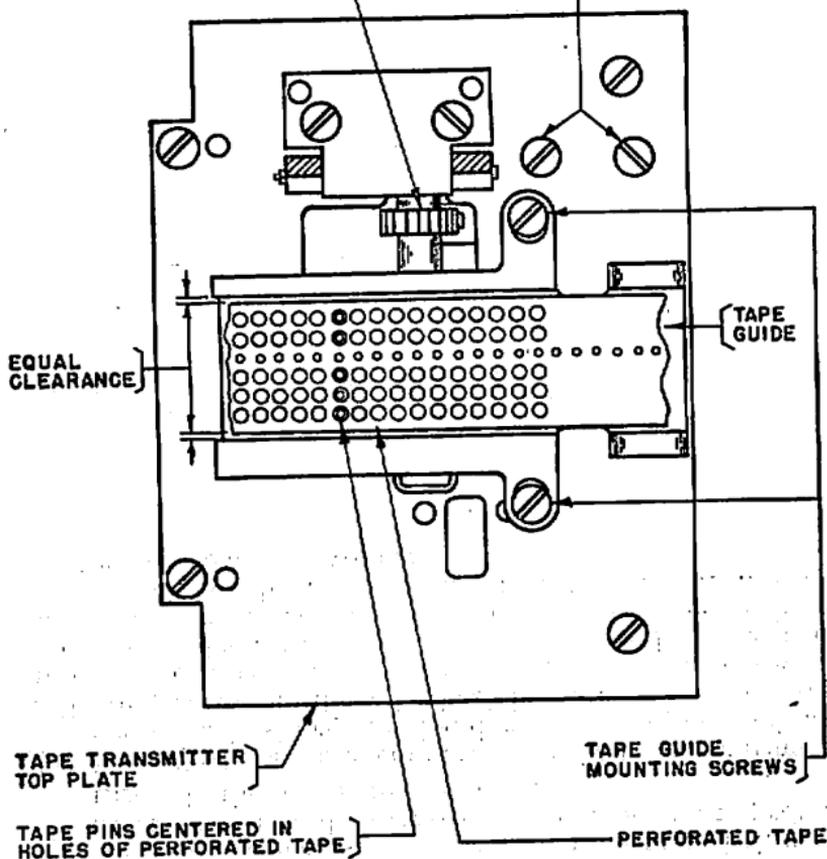


Fig. 9

4.21 Retaining Lid Plate

(a) On units equipped with a plate having individual holes to clear the pins, the edges of the plate shall be parallel to the tape guide and the tape pin holes shall center over the tape pins.

(b) On units equipped with a plate having two slots to clear the five pins, the edges of the lid shall be parallel to the tape guide and the edges of the slots shall clear the hinged lids of chadless tape when the lids are raised by the tape pins and the play in the tape is taken up in a direction to make the clearance a minimum.

(c) On units equipped with a plate having five slots instead of holes, the slots shall center over the tape pins and shall be parallel to the tape guide, and if used with chadless tape the hinged lids with "letters" perforations shall be equi-distant from but shall not touch the edges of the slots, throughout the length of the slots, when all play of the tape is taken up first to the front, then to the rear. Gauge by eye.

(d) To adjust for (a), (b) or (c) reposition retaining lid plate.

4.22 **Feed pawl** shall just engage first tooth above the center of the feed wheel ratchet when the tape pins are flush with the surface of the tape guide on which the tape rests. Gauge by eye and feel.

Note: This is necessary to prevent tape from being torn by being moved forward when tape pins protrude through the holes in the tape.

(a) To adjust, operate contact lever bail by rotating the main shaft slowly by hand and reposition **feed lever adjusting screw** until feed wheel just starts to move when tops of the tape pins are flush with the surface of the tape guide on which the tape rests. See Fig. 10. Check that when the brush arm is in the stop position, the feeding of the wheel has been completed and the detent has been bottomed between two teeth.

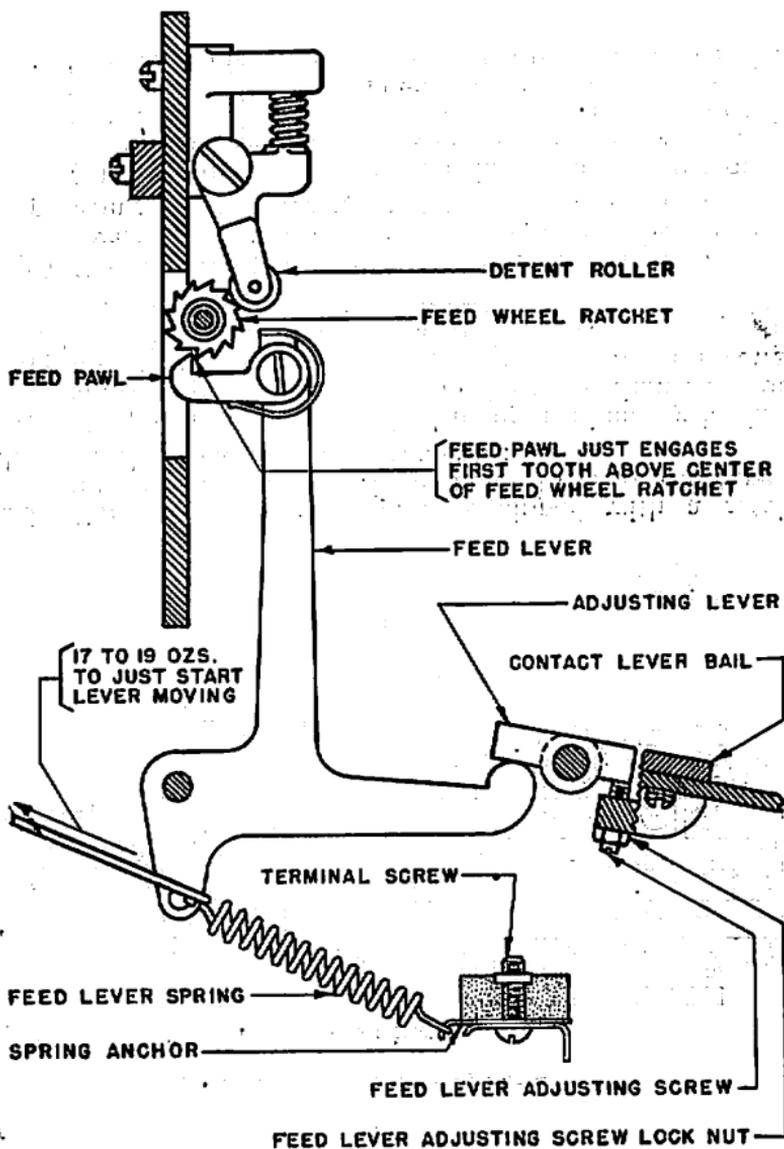


Fig. 10

4.23 Feed pawl face shall clear ratchet teeth face by not more than .010" when operating lever roller is on the high part of its cam.

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- (a) To adjust, reposition operating lever adjusting screw.
See Fig. 12.

4.24 Tape transmitter contacts shall be clean.

- (a) Contacts may be cleaned with the 88993M contact burnisher.

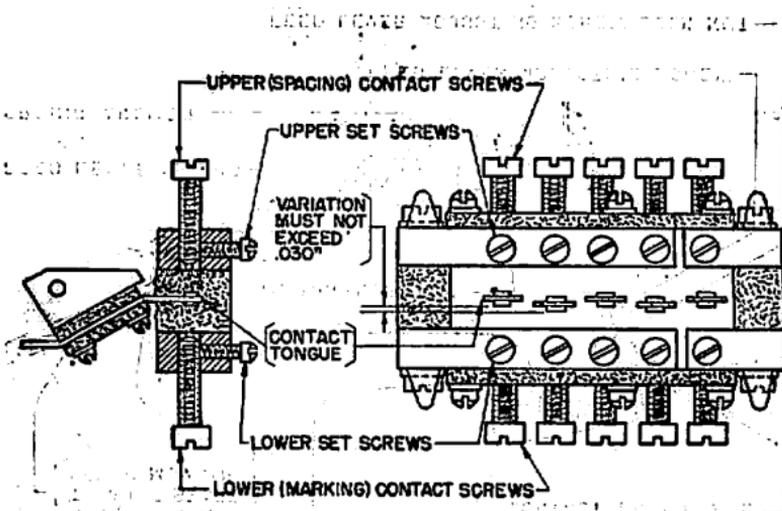


Fig. 11

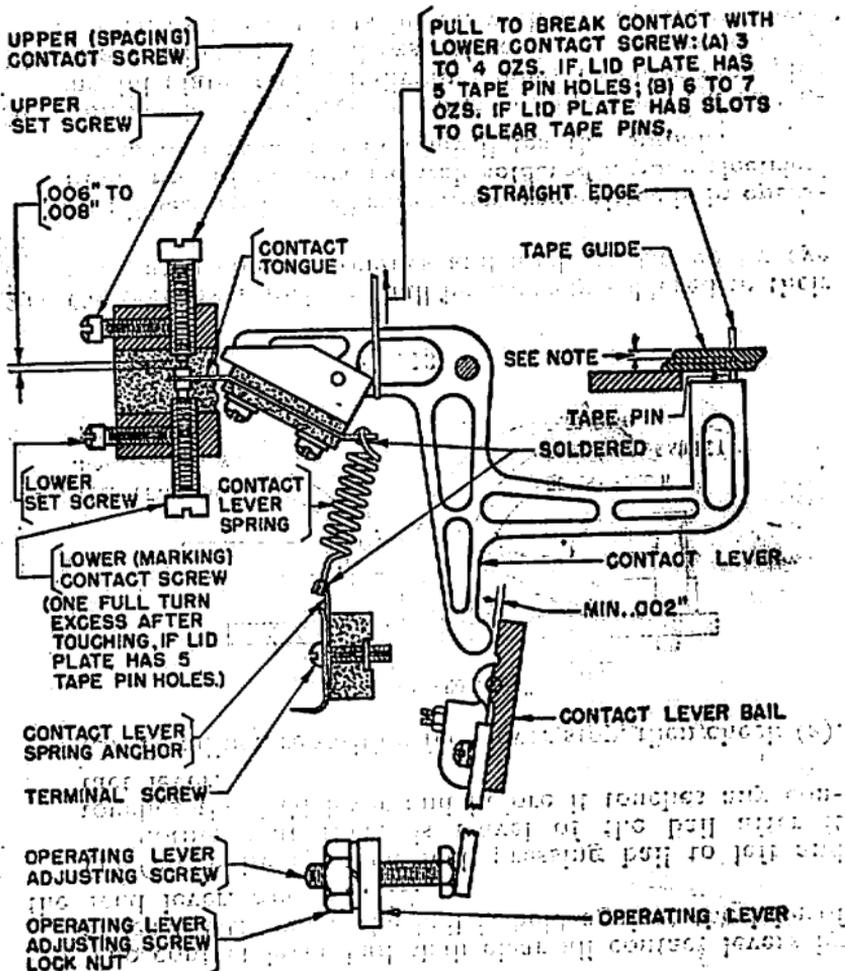
4.25 Contact tongues on units equipped with a retaining lid plate having individual holes to clear the tape pins shall meet the following requirements:

- (a) Contact tongue plane shall be approximately horizontal, and any one tongue shall not be more than $.030''$ out of alignment with any other tongue when contact screws are backed off, as in Fig. 11. Gauge by eye.

(1) To adjust, bend tongues

- (b) Contact tongues shall make contact with the associated lower contact screws with perceptible follow when the operating lever roller is on low part of its cam.

(1) To gauge and adjust, using lamp, buzzer or ohm-meter, reposition lower contact screws until they just touch tongues when operating lever roller is on low part of its cam. Then give contact screws one full turn in a direction to increase the follow. See Fig. 12.



NOTE: .020 TO .025 IF LID PLATE HAS SLOTS TO CLEAR TAPE PINS.

Fig. 12

4.26 Tape pins on units equipped with a retaining lid plate having either 2 or 5 slots to clear tape pins shall be Min. .020", Max. .025" below a straight-edge placed across the top edges of the tape guide channel when the retaining lid is raised and the operating lever roller is on the low part of its cam. See Fig. 12.

(a) To adjust, reposition lower contact screws con-

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4.27 Contact tongues shall clear the associated upper contact screws by Min. .006", Max. .008", as in Fig. 12, when the operating lever roller is on low part of its cam.

(a) To adjust, reposition upper contact screws:

4.28 On units equipped with a feed lever stop proceed as follows:

(a) The lower surface of the tip of the feed pawl shall be approximately .020" below the tip of the second tooth above the center of the feed wheel ratchet when the operating lever is on the low part of the operating cam. See Fig. 13.

(1) Gauge by eye.

(b) The contact lever bail shall clear all contact levers by at least .002" when the bail is held against the lobe of the feed lever. See Fig. 12.

(1) Gauge by eye and feel, pressing bail to left and noting that there is travel of the bail after it touches the feed lever and before it touches any contact lever.

(2) To adjust, reposition feed lever stop, then check (a).

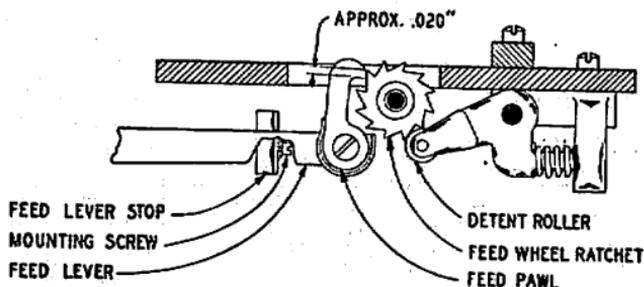


Fig. 13

4.29 Contact lever springs shall be securely soldered to their associated contact tongues and anchors. Gauge by eye and feel.

Note: These springs vibrate when transmitter is in operation, and unless ends are well soldered a poor electrical connection results which mutilates the signals.

4.30 Contact lever springs on units equipped with a retaining lid plate having individual holes to clear tape pins shall have a tension of Min. 3 ozs., Max. 4 ozs. measured as in Fig. 12 at (A), as the contacts break, with the operating lever

roller on the low part of its cam. Gauge contact break with lamp, buzzer or ohmmeter.

(a) To adjust, reposition contact lever spring anchors.

4.31 **Contact lever springs** on units equipped with a retaining lid plate having either 2 or 5 slots to clear tape pins shall have a tension of Min. 6 ozs., Max. 7 ozs., measured as in Fig. 12, at (B), as the contacts break, with the operating lever on the low part of its cam. Gauge contact break with lamp, buzzer or ohmmeter.

(a) Adjust as for 4.30.

4.32 The amount of pull, applied as in Fig. 12, required to break the circuit and the pull required to permit the **tape contacts** just to make, shall not differ by more than $3/4$ oz.

(a) To adjust, remove the **contact lever**, clean lever and guide slot, and if necessary stone down burrs on lever and in guide slot. If bind has not been removed, replace the contact lever by a new one. Check alignment of contact lever spring, and if it is sufficiently out of line to tend to cause the lever to **bind** in its slot resolder the spring, taking care not to damage the spring or the terminal block by the application of too much heat. Replace lever and check adjustments 4.25 to 4.31, incl.

4.33 **Feed lever spring** tension shall be Min. 17 ozs., Max. 19 ozs., measured as in Fig. 10, when the operating lever roller is on low part of its cam.

(a) To adjust, reposition spring anchor.

4.34 **Auto-stop contact springs** shall meet the following requirements when the contact spring post is held clear of the springs. See Fig. 14.

(a) Fiber insulator on right spring shall clear the contact spring bracket by Min. .015", Max. .020".

(b) Contact gap shall be Min. .015", Max. .020".

(1) To adjust (a) bend right spring; to adjust (b), bend left spring.

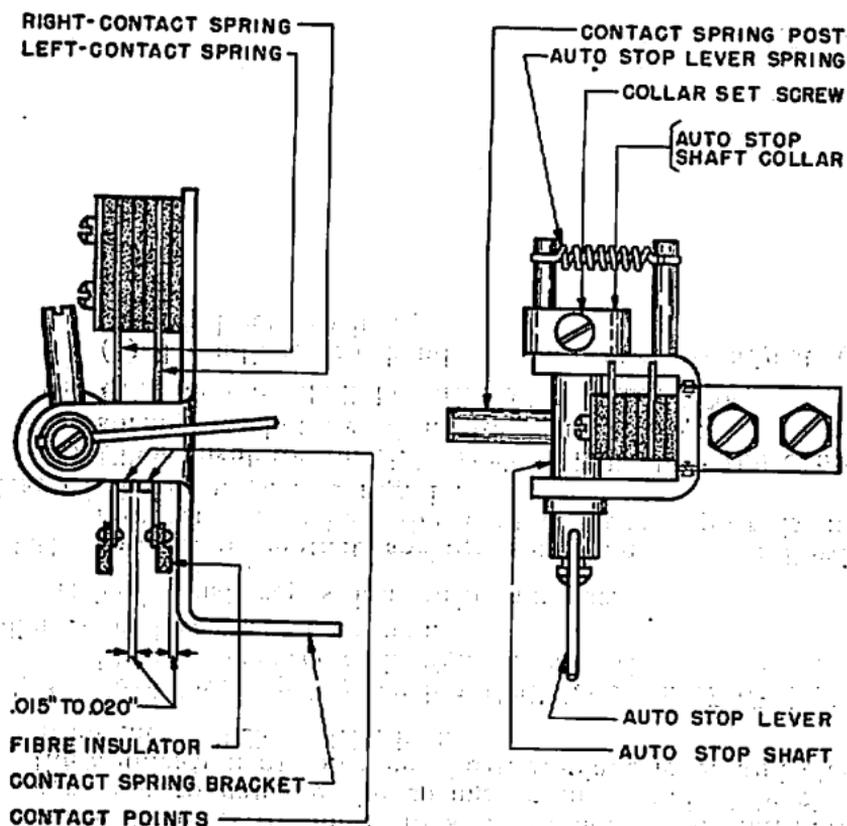


Fig. 14

4.35 **Auto-stop lever spring** on older units equipped with a stop lever as shown in Fig. 14 shall exert a tension of Min. 2-1/2 ozs., Max. 3-1/2 ozs., when extended to an over-all length of approximately 3/4" and shall be in a horizontal position when auto-stop contact spring post is in a horizontal position.

(a) To adjust position, loosen collar set screw, hold auto-stop shaft so that contact spring post is in a horizontal position, and reposition auto-stop shaft collar.

4.36 **Auto-stop lever end**, on units equipped with stop lever of type screwed into a clevis clamp block, shall be approximately 1/2" below the horizontal position when the contacts are held closed by the contact spring post.

(a) To adjust, reposition stop lever by means of the clevis clamp, making sure auto-stop shaft protrudes through clamp approximately 1/16".

4.37 **Auto-stop lever, 102520M Tape Stop Rod**, having the end bent back to form a crook shall be positioned with the crook at an angle of approximately 45° with the horizontal, sloping downward toward the right away from the transmitter-distributor. Gauge by eye.

(a) To adjust, reposition stop lever.

Note: 4.38 and 4.39 apply to units equipped with the 104720 tape stop assembly. (Delayed action)

4.38 When the **tape stop rod** is lowered until the switch just closes, there shall be a clearance between the lower post on the shaft collar and the post on the mounting bracket of Min. .030", Max. .080". Check closing of switch with buzzer, lamp or ohmmeter.

(a) To adjust, with a .055" gauge held between the lower post on the shaft collar and the mounting bracket post, and with the eccentric set screw loosened, move the high part of the eccentric downward against the switch plunger until the switch opens. Then move the eccentric upward until the switch just closes and tighten set screw, taking care that there is no bind between the eccentric and the sides of the bracket.

4.39 The **tape stop rod** shall be approximately horizontal when the end of the rod is raised until the switch just opens. Gauge by eye.

(a) To adjust, position rod on its shaft by means of its clamping screw.

Note: 4.40 to 4.43, inclusive, apply to units equipped with the 101481M set of tape-out mechanism parts.

4.40 On units equipped with end of **tape stop pin** shall clear the shoulder of the tape guide plate by Min. .010", Max. .020", when the side play of the pin is taken up in a direction to make this clearance a minimum. See Fig. 15. On units equipped with a 111627 tape guide plate (having cut-out opposite the tape stop pin) the same limits apply but as measured with a straight-edge laid across the front edge of the guide. The end of the tape stop pin shall enter the hole in the retaining lid without binding when the lid is closed.

(a) To adjust, loosen to friction tight the feed wheel shaft bearing mounting screws and reposition the **stop pin guide**. Note that requirement 4.14 is met before tightening the screws.

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4.41 End of **tape stop pin** shall be within $.005''$ of a straight-edge placed across the top of the tape guide plate. See Fig. 15.

(a) To adjust, bend upper contact spring.

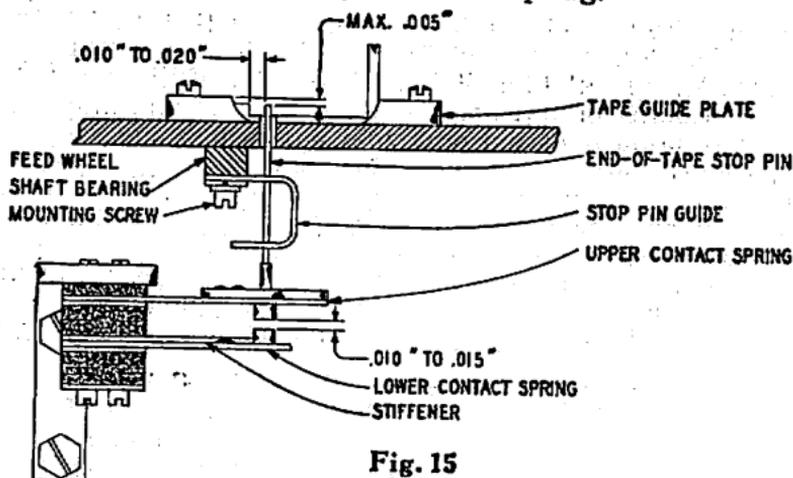


Fig. 15

4.42 **Contact gap** shall be Min. $.010''$, Max. $.015''$, when the lower contact spring is resting against its stiffener.

(a) To adjust, bend the lower contact spring stiffener.

4.43 **Contact Pressure.** It shall require a pressure of Min. 20, Max. 25 grams, applied at the contact point of the lower contact spring, to open the contacts when a piece of tape is in the guide and the tape retaining lid is closed. Use a 68B or 70D gram gauge. Gauge contact break with lamp, buzzer or ohmmeter. On units using spliced chadless tape this pressure may be reduced to Min. 10, Max. 15 grams and a check made for reliable contact closure by six repeat runs on a short length of tape.

(a) To adjust, bend the lower contact spring.

Note: Remove the tape and recheck 4.42.

4.44 **The distributor segments and ring** shall be flat and free from grooves and irregularities. Gauge by eye.

(a) If resurfacing is required proceed as follows:

Note: If the top surfaces of the segments are worn down to within $.015''$ of the top of the disc replace the disc assembly instead of resurfacing.

(1) Remove the brush holder arm assembly and carefully place a clean cloth under the distributor face and between the wires to prevent particles from dropping into the distributor gears and bearings.

(2) If necessary, take out the three 2191M lockwashers while resurfacing the face to avoid striking the heads of the 8539M mounting screws.

(3) If the grooves and raised portions are prominent start the resurfacing with the coarse side of the 101424M tool and rub with a lateral circular motion (not rotation around the center of the disc) bearing substantially and evenly against the segments and ring, and continue with the coarse sanding until the grooves are removed and the segments are even at adjacent ends.

(4) For final dressing use the face of the tool having the fine sandpaper, continuing only until the marks resulting from the coarse sandpaper disappear.

(5) Before removing the cloth brush out the slots between the segments and clean off the commutator disc in accordance with Section P35.542.

(6) Turn the distributor on its side and carefully remove the cloth taking care not to drop particles into the distributor mechanism, and then inspect to see that the bearings and gears are clean.

4.45 Distributor Segment Lacquer: If the ends and sides of the distributor segments and ring are lacquered or enameled, the lacquer or enamel shall provide continuous coating over these surfaces. Gauge by eye.

(a) If the lacquer or enamel has become chipped or burned by arcing, so that repainting is required, proceed as follows:

(1) Remove the brush holder arm and commutator disc but do not disconnect the wires from the segments.

(2) Remove old lacquer or enamel by scraping lightly with a knife blade using care not to mar the metallic surface. (Paint remover or No. 3500 lacquer thinner may be used at locations approved for such use. Do not use it at subscriber's premises.) It is not necessary that all of the old coating be removed, but merely that any loose particles be removed.

(3) Before applying a new coat of lacquer, clean the edges and ends of the segments thoroughly with an approved cleaning fluid and wipe off any residue with a piece of cloth on the end of a blade using care to avoid scarring the segments.

(4) Using the flat end of a toothpick or a small camel's hair brush such as Devoe and Reynolds No. 251 brush (artist's show card No. 2) dipped 1/16 inch into RM646971 lacquer and wiped lightly over the edge of

the container, apply a light but thoroughly covering coat of the lacquer to the ends of each segment, preferably from the underside of the commutator disc making sure that the space between the segments is not bridged with the lacquer.

(5) Proceed with application of lacquer, one slot at a time. Before proceeding to the next slot immediately wipe off with a clean KS-2423 cloth any excess lacquer which may have worked onto the top surface of the segments:

Caution: In wiping off the excess apply the cloth lightly to avoid the removal of lacquer from the top edges of the ends of the segments and avoid spreading any of it on top surfaces.

(6) Next coat the inner and outer sides of segments and the outer edge of the inner ring.

(7) Allow the lacquer to dry for 5 to 10 minutes, then apply a second coat of lacquer. The unit can be placed in service within 15 minutes after the final application.

(8) Western Electric Company's No. 3500 lacquer thinner may be used as a thinner if required. It may be used also on a KS-2423 cloth to wipe off any excess lacquer on the contacting surface of the segments. This thinner, however, should not be used at subscriber's premises.

(9) Replace commutator disc and brush holder arm and restore the unit to normal.

4.46 **Carbon-tipped brushes** shall meet the following requirements:

(a) The brush springs shall not be kinked, twisted, nor bent to a contour appreciably different from that of new brushes; that is, they shall be provided with a bend so that the carbon portion will rest on the face at an angle of approximately 75 degrees. Gauge by eye.

(b) Brush sides shall be at right angles to brush holder. See Fig. 16(A).

(c) The trailing edge of the brushes shall make contact with the segments at a point in line with the line impressed on the commutator disc when the stop cam lug is against the end of the stop arm.

(d) The brushes shall remain within the edges of the rings throughout a complete revolution of the main shaft.

(e) It shall require a pull of Min. 2-1/2 ozs., Max. 3-1/2 ozs., applied as in Fig. 16(B), just to break contact between brush and commutator ring. Gauge contact break with lamp, buzzer or ohmmeter.

(f) With the brushes resting on the commutator with a pressure of 2-1/2 to 3-1/2 ozs., contact shall be made over at least 3/4 of the lower surface of the carbon brush. Gauge by eye, removing the brush holder arm assembly and noting polished area of brush face after running motor for 2 minutes with magnet energized.

(1) To adjust, loosen brush holder clamp screw and loosen clamping screw so that the brush springs are friction tight; any brush having a kink or sharp bend in the spring shall be replaced; position the brush holder and the brush springs to meet requirements (b), (c) and (d); tighten brush spring clamp screw; rotate brush holder to meet requirement (e); tighten brush holder clamp screw; place a flat piece of "0000" sandpaper approximately 1" x 2", sand side up, on the distributor disc and, with the brushes pressing against the face with a pressure of approximately 3-1/2 ozs., rotate the motor by hand back and forth to draw the brushes across the sandpaper two or three times to meet requirement (f). Clean commutator and brushes carefully with a piece of KS-2423 cloth to remove sand and loose carbon dust. Check requirement (e). If requirement (d) cannot be met by adjusting brush holder, loosen face mounting screws and take up play between face and screws in the proper direction. If face cannot be shifted far enough, replace face by a new one.

Caution: To avoid hazard of sharp leading ends of brush springs, after final adjustment these ends shall be bent down and under the brush holders.

Note: Brush should be replaced by the time the carbon tip is worn so that approximately 1/16" of carbon remains.

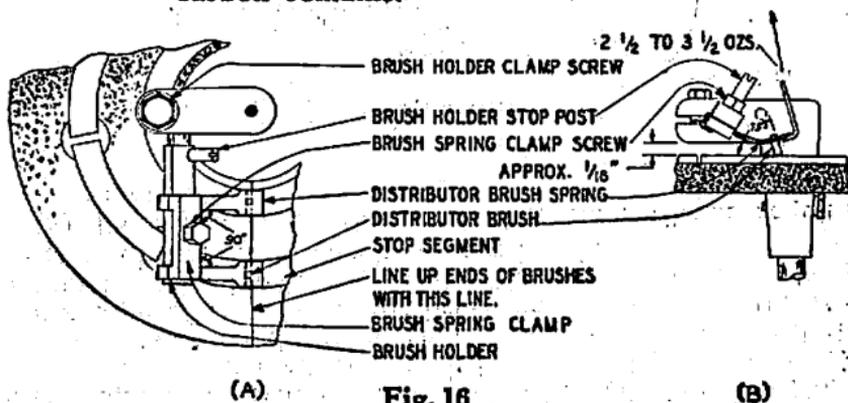


Fig. 16

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4.47 **Operating cam** shall be so positioned that the No. 5 transmitter contact tongue is just leaving lower (marking) contacts when the main shaft has been rotated until the trailing edge of the distributor brush has passed onto the stop segment by Min. $1/32''$, Max. $1/16''$. Gauge by eye, using lamp, buzzer or ohmmeter to check contact break.

(a) To adjust, reposition operating cam. Check requirement 4.23.

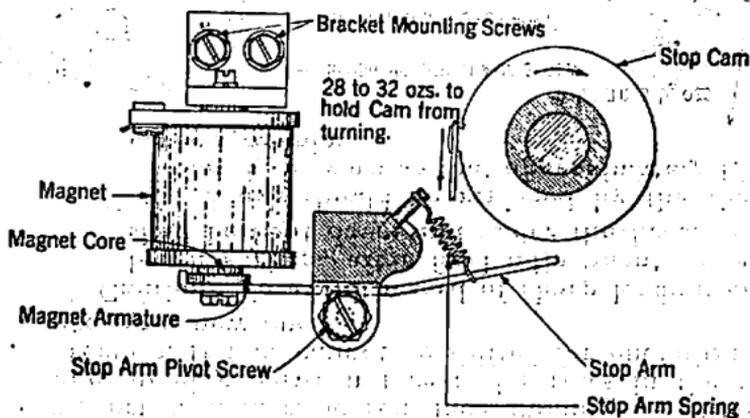


Fig. 17

4.48 **Main Shaft Clutch.** Run the motor for at least 10 minutes, after the clutch has been freshly lubricated and with the magnet armature released—brush stationary. Stop motor and insert orange stick in the cut-out of bakelite insulator below outside edge of slot between segments 1 and 2 of the distributor disc. This acts as a stop to prevent rotation of brush beyond this point as motor is started. Start motor. A pull of 32 ozs. applied to the stop cam lug, as in Fig. 17, with the motor running, shall move the cam in a direction opposite to normal rotation. A pull of 28 ozs. applied under the same conditions shall not move the cam.

Caution: Care should be taken not to pull the stop cam far enough to cause a brush to pass over the slot between segments thus avoiding possible damage to brush.

Note: Before increasing tension, examine felt washers to make sure they are not glazed.

(a) To adjust, turn adjustable clutch disc clockwise, viewed from above, to increase tension, and counterclockwise to decrease tension. Hold friction nut 77012M with the

99772M spanner wrench while tightening and loosening the 77140M lock nut.

Caution: Tighten lock nut securely to prevent change in torque during operation. Do not strip threads. Check requirement after tightening lock nut.

4.49 86960M stop arm contacts of 83844M set of parts on 14D and L transmitter-distributors shall meet the following requirements:

(a) Contact pressure shall be Min. 2 ozs., Max. 2-3/4 ozs., measured at the end of the outside spring. See Fig. 18(A).

(1) To adjust, bend contact springs, making sure the fiber extension of the outside spring is not touching the stop arm; shift contact bracket if necessary to obtain a clearance and then check (b).

(b) Contact gap shall be Min. .015", Max. .020", when stop lever armature is held against magnet cores. See Fig. 18(B).

(1) To adjust, reposition contact bracket. Check requirement (a).

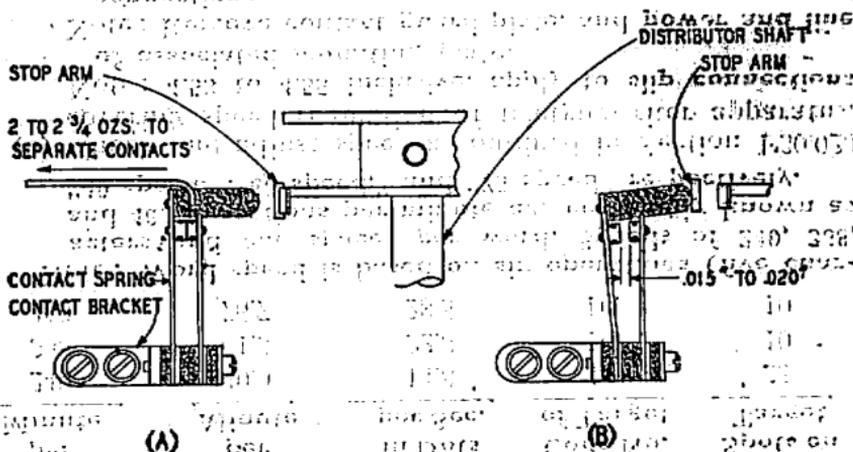


Fig. 18.

4.50 Motor and governor shall conform to requirements of Section P36.640 covering 15 type teletypewriter motor units, except the requirement on motor position and speed which shall be as specified in 4.01 and 4.52 of this section, and except governor speed adjusting bracket requirement, which shall be disregarded.

4.51 **Governor guard** shall clear the upper outside edge of the target by at least .062".

4.52 **Speed.** The speed of the main (sending) shaft shall be 240 revolutions per minute for 40 speed, 368 revolutions per minute for 60 speed, and 460 revolutions per minute for 75 speed. The target information for checking speed of governed motors is as follows:

<u>Operations per Minute</u>	<u>Words per Minute</u>	<u>Line Freq. in Dots per Sec.</u>	<u>Code No. of Target</u>	<u>Black Spots on Target</u>
240	40.0	14.8	1J	23
368	61.3	22.8	1G	10
460	76.7	28.5	1G	10

Note: Word speed is based on six operations (five characters and one space) per word. Speeds of 240, 368, and 460 operations per minute are commonly known as "40 speed," "60 speed," and "75 speed" respectively.

(a) Check and adjust speed as outlined in Section P30.020 covering speed regulation of teletypewriter apparatus.
Note: 4.53 to 4.55 inclusive, apply to slip connections of associated mounting plate.

Note: Remove contact guard plate, and power and line connections.

4.53 With the transmitter-distributor removed, the **slip connection contacts** shall be closed with a pressure of Min. 16 ozs., Max. 32 ozs., measured by pulling upward at the crimp in the upper spring. To gauge contact break, use lamp, buzzer or ohmmeter.

(a) To adjust, bend upper contact springs near the clamped portion.

4.54 With the transmitter-distributor removed, the crimped ends of the extreme right and extreme left **upper contact springs** shall be in a horizontal plane and the crimped ends of the remaining upper springs shall be within 1/64" of this plane and not above it. The plane referred to shall be so located that the transmitter-distributor can be inserted in its proper position. To gauge, place a straight-edge across the two end springs and check that the remaining springs are within 1/64" of the straight edge. Check to see that the associated transmitter-distributor can be firmly seated in place without interference from the springs.

4.55 When the transmitter-distributor is in place, the contact between the **upper and lower contact springs** shall be broken. To gauge, use lamp, buzzer or ohmmeter.

Note: 4.56 to 4.59, inclusive, apply to units equipped with the 84593M set of parts for controlling an external circuit.

4.56 It shall require a pull of minimum 3 ozs., maximum 4 ozs., applied as in Fig. 19(A) to break the auxiliary contacts when the operating lever roller is on the high part of the cam. Gauge contact break with a lamp, buzzer or ohm-meter.

(a) To adjust, bend the long contact spring.

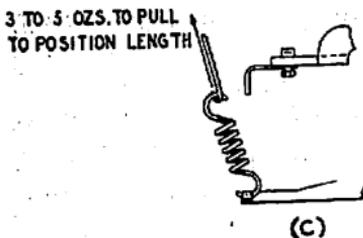
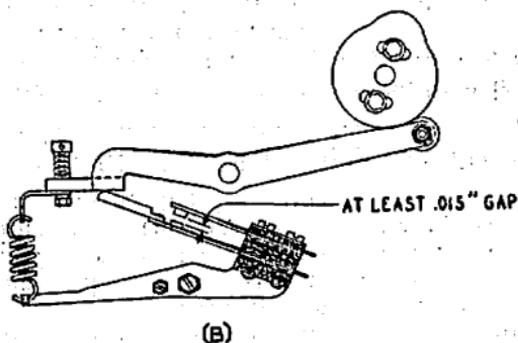
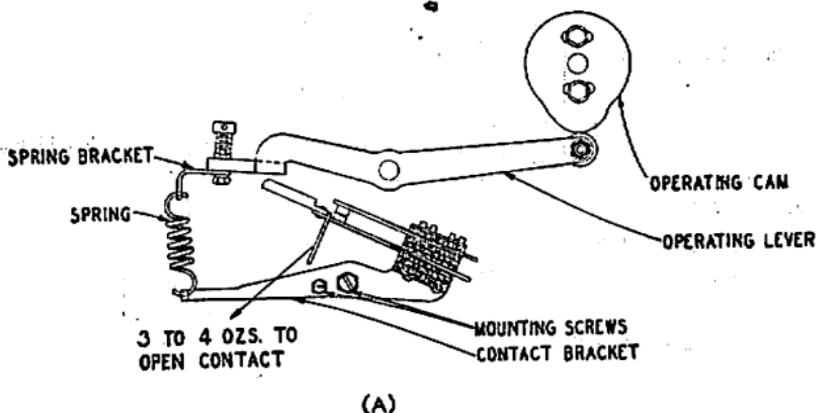


Fig. 19

4.62 **Blocking Plate.** With the magnet energized and with the operating lever roller on the low part of the cam—the feed pawl in its extreme upward position—the clearance between the top edge of the blocking plate and the bottom surface of the feed pawl extension shall be Min. .004", Max. .010", when all play is taken up to make this clearance a minimum. See Fig. 21.

(a) To adjust, position blocking plate.

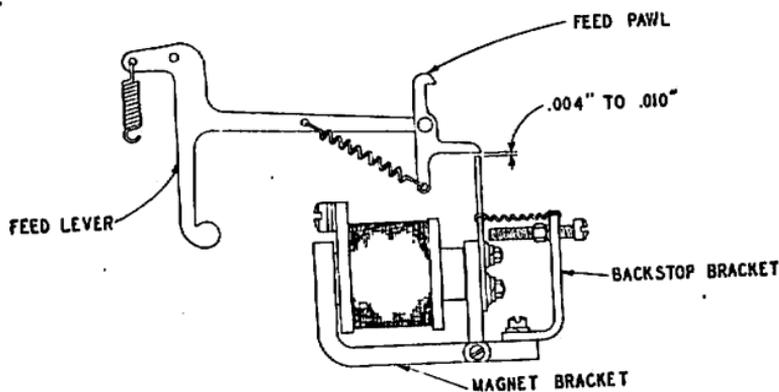


Fig. 21

4.63 **Magnet Bracket Position.** With the armature released there shall be some clearance, not more than .012", at the point of minimum clearance between the end of the feed pawl extension and the side of the blocking plate as the feed lever is moved downward, and no interference between these parts as the feed lever is moved upward after completing a downward stroke. See Fig. 20. To gauge, turn motor by hand and determine points of minimum clearance as the feed lever is lowered and raised.

(a) To adjust, relocate the magnet bracket by means of its mounting screws.