

BELL SYSTEM PRACTICES
Teletypewriter Stations

SECTION P33.001
Issue 3, December, 1956
AT&T Co Standard

**MULTIPLE TRANSMITTER
UNITS AND BASES
REQUIREMENTS AND PROCEDURES**

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1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of multiple transmitters.

1.02 This section is reissued to bring the requirements and adjusting procedures up to date, to change the title, to add Part 4—REFERENCE TO BELL SYSTEM PRACTICES, and to omit the information and change of title contained in Addendum, Issue 1. Marginal arrows are used to show changes. Minor editorial revisions have been made throughout the section.

Note: The information formerly in Addendum, Issue 1 has been transferred to BSP Section P33.002 entitled MULTIPLE TRANSMITTER — UNITS AND BASES — CODING.

1.03 Unless otherwise specified, the adjustments in this section apply to 60-, 75-, and 100-speed units.

2. LUBRICATION

2.01 Avoid excessive lubrication; especially avoid getting lubricant on magnet pole faces and armature, on sending contacts and assembly, and on base plate.

2.02 Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient. Use oil for lubrication at all of the places listed in the following, except where the use of grease is specified.

(a) Individual multiple transmitter distributor units.

(1) Selector-cam-assembly shaft—two oil-cups.

(2) Clutch—sliding member.

(3) Cam lubricators—saturate felt with oil.

(4) Clutch-throwout lever—bearings.

(5) Contact-lever pivoting shaft.

(6) Gear—(grease).

(7) Selector-lever pivoting shaft and guiding comb—oil sparingly.

(8) Feed-pawl-lever roller—bearing.

(9) Feed pawl—bearing.

(10) Feed-pawl ratchet.

(11) Feed-roll—bearings—two.

(12) Feed-wheel detent—bearing.

(13) Feed-wheel-detent roller—bearing and points of contact with feed pawl and release bar.

- (14) Tape-out contact lever—guide slot in spring bar.
 - (15) Tape-out lever latch—bearing and point of contact with tape-out contact lever.
 - (16) Release bar—bearing and guide—stud (grease). ←
 - (17) Letters-operating lever—bearing.
- (b) Parts on base.
- (1) Gears—apply film of grease.
 - (2) Main shaft — bearings — three holes in bearing mounting blocks.
 - (3) Main-shaft driving-gear—bearing oil-hole.
- (c) Motor.
- (1) Motor pinion—light film of grease.
 - (2) Motor-bearing oiler—two.
 - (3) Motor-speed lever—pilot screw.
- (d) Helical springs.
- (1) Oil both loops of all helical springs.

3. REQUIREMENTS AND PROCEDURES

Transmitting Units (3.01 to 3.43)

3.01 **Transmitting-cam cylinder** should have some endplay, not over .002", as indicated in Fig. 1. **Fig. 1**

(a) To adjust, add or remove shims between the transmitting-cam cylinder and the side-frame bearing. Further refine this adjustment by positioning the clutch-driving member on the transmitting shaft.

3.02 **Clutch Spring:** As indicated in Fig. 1, it should require Min 12 oz, Max 15 oz to separate the clutch teeth, with the scale hooked over the clutch driven-member projection and pulling in line with the shaft. **Fig. 1**

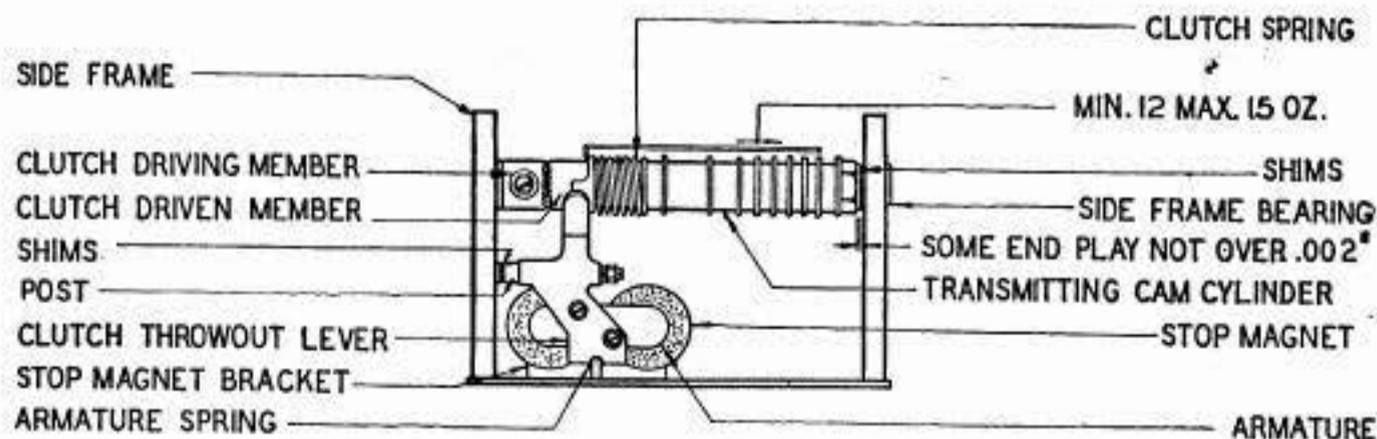
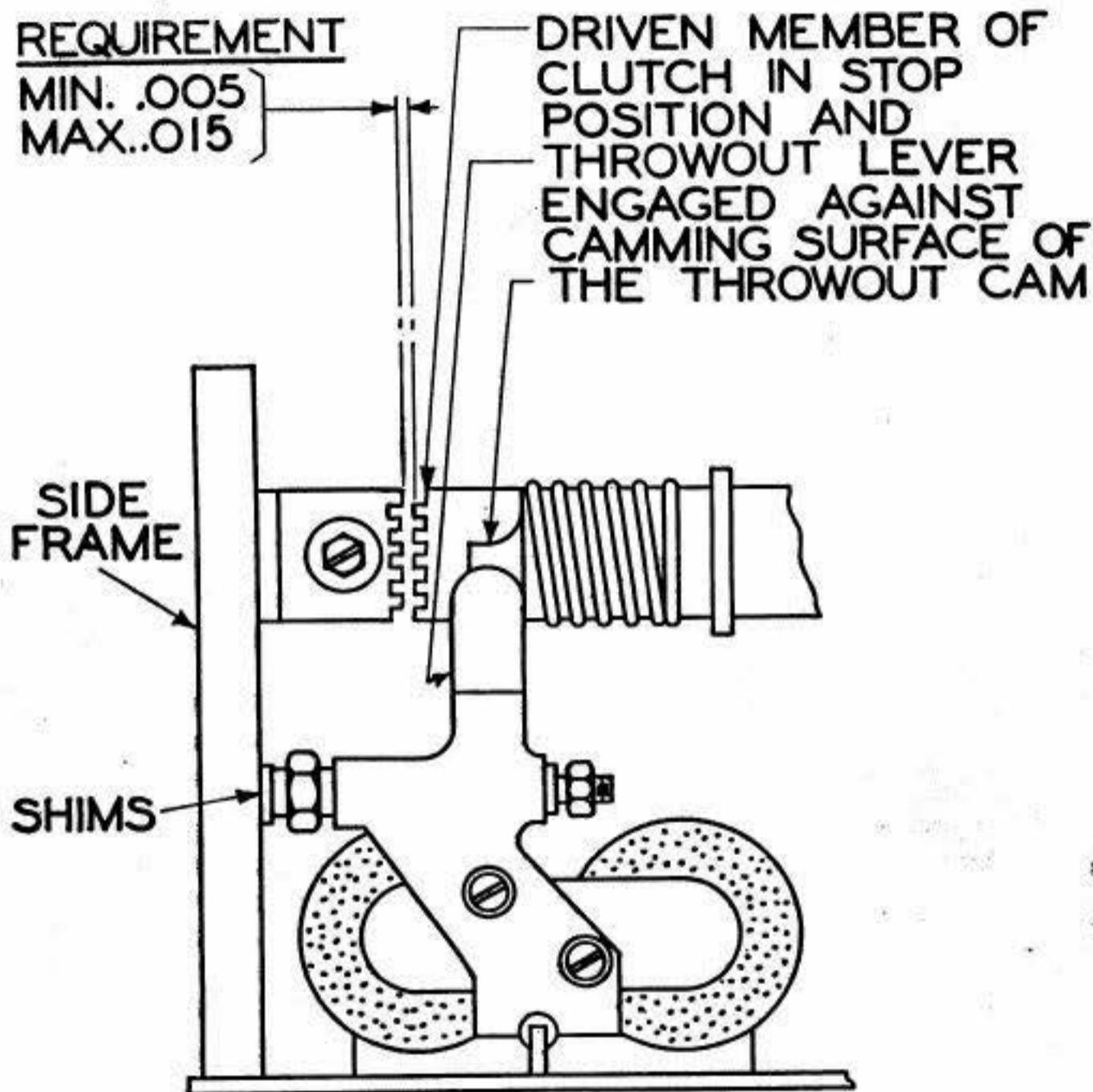


Fig. 1

3.03 **Clutch Teeth:** There should be Min .005", Max .015" ← clearance as indicated in Fig. 2 between the clutch teeth ← when the clutch is fully disengaged. **Fig. 2**

(a) To adjust, position clutch-throwout lever by adding or removing shims between the shoulder on the throwout-lever post and the side frame.



ADJUST THROWOUT LEVER BY MEANS OF SHIMS BETWEEN SIDE FRAME AND THROWOUT LEVER.

Fig. 2

3.04 **Stop-magnet Bracket:** With the armature held against the magnet cores there should be some clearance, not over .004", between the clutch-throwout lever and the high part of the cam on the clutch driven-member. See **Fig. 1** for location of parts. **Fig. 1**

(a) To adjust, loosen the stop-magnet-bracket mounting screws and position the bracket using a WE Co 541A tool.

3.05 Armature Spring: For 60- and 75-speed transmitters, using the TP2836 spring, it should require Min 2 oz, Max 3-1/2 oz to extend it to position length with the armature in its unoperated position. For 60-, 75-, and 100-speed transmitters, using the TP111342 spring, it should require Min 3-1/2 oz, Max 4-1/2 oz to extend it to position length with the armature in its unoperated position. **Fig. 1**

Note: It will be necessary to supply .100-ampere dc for satisfactory operation of the start magnet.

3.06 Cam-cylinder Detent-lever-spring Tension: On MFD units, with the transmitting cam-sleeve in the stop position and the detent-lever roller resting on the low part of its cam, it should require 6 to 8 oz to start the detent lever moving when pulling on an 8-oz scale hooked at a right angle to the detent lever just above the spring hole.

3.07 Transmitting-contact Spring (Long)—Preliminary Adjustment: (Final Adjustment 3.09). With its contact lever on the high part of its cam, it should require Min 7 oz, Max 7-1/2 oz to just start the contact-spring moving away from its contact-lever when the push end of the scale is applied to the long contact-spring just above the contact-point. Fig. 3 shows the parts together with the requirement for the final adjustment (3.09). **Fig. 3**



Fig. 3

(a) Before making adjustments rotate the cam-sleeve until the contact lever associated with the contact spring is on the low part of its cam.

(b) To adjust by increasing the contact-spring pressure, back off the associated contact stop screw (if provided), insert a TP72003 contact-spring bender, with its projection downward, from the right-hand side between the contact bracket and the stiffener of the long contact-spring and turn the spring bender in a clockwise direction to bend the long contact-spring and its stiffener.

(c) To adjust by decreasing the contact-spring pressure, insert the TP72003 contact-spring bender, with its projection upward, from the right-hand side between the long and short contact-springs and turn it clockwise to bend the long contact-spring and stiffener.

3.08 **Transmitting-contact Gap:** Measure the contact gap with the contact lever on the high part of its cam.

	<u>Operating Speed (WPM)</u>	<u>Gap on Contacts 1 to 5</u>	<u>Gap on Start-Stop Contact</u> ↗
Distortion test set available for checking signals	60, 75, 100	.017" to .025"	.015" to .025"
Distortion test set not available	60, 75	.017" to .023"	.017" to .023"
	100	.020" to .025"	.020" to .025" ↘

The short contact springs should rest against their stop screws with a pressure of at least 4 oz measured by applying the push end of the scale to the end of the short contact springs.

(a) To adjust, bend the short contact springs and position the backstop adjusting screws to meet all the requirements of this paragraph.

3.09 **Transmitting-contact Spring (Long)—Final Adjustment:** (Preliminary Adjustment 3.07). With any contact lever on the low part of its cam, it should require a pressure of Min 5 oz, Max 5-1/2 oz, as indicated in Fig. 3 to open the associated contact when the push end of the scale is applied to the longer contact spring just above the contact point. **Fig. 3**

(a) If necessary, refine the contact pressure by rebending the longer contact spring as described in 3.07 to meet this final requirement. Recheck the transmitting-contact gap adjustment.

3.10 **Comb-shaft Retainer**

Note: Both shaft retainers are made so that the distance ← from the hole for the comb shaft is closer to the eccentric slot on one side than on the other. Before making the following adjustment, check to see that both retain- ← ers are installed so that the sides on which this distance is the shortest are toward the front of the unit.

The comb shaft should be clamped ← by both retainers so that it ← rests at the bottom of the shaft slot. See Fig. 4 for location of parts. **Fig. 4**

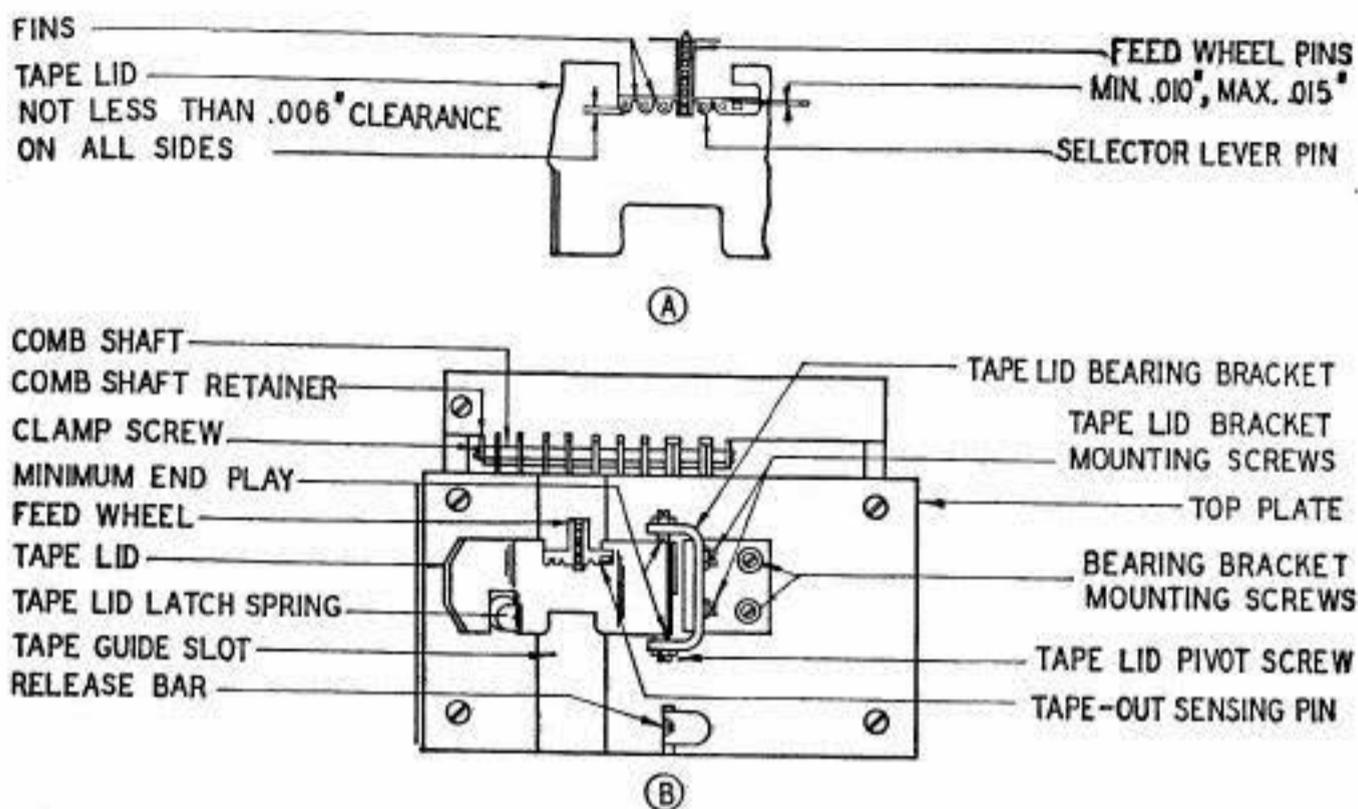


Fig. 4

(a) To adjust, loosen the retainer clamp-screw on each end of the comb and position each retainer in such direction that the eccentric slot in the retainer takes up the clearance between the shaft and the bottom of the shaft slot.

3.11 Tape-lid Pivot-screws: The tape-lid should be located centrally with respect to the tape-lid-bearing bracket and should be free to pivot, without binding, with a minimum amount of endplay at the bearings. **Fig. 4(B)**

(a) To adjust, position the tape lid by means of the pivot screw.

3.12 Tape Lid—Vertical Adjustment: The tape lid should rest flat along both edges of the tape-guide slot in the top plate. **Fig. 4(B)**

(a) To adjust, loosen the two tape-lid bracket mounting screws and position the tape lid.

Caution: In making the above adjustments, make sure that the lowest section of the tape lid is within the tape-guide slot of the top plate.

3.13 Tape Lid—Horizontal Adjustment: The feed-wheel pins should line up centrally between the fins of the feed-wheel pin slot in the tape lid. With the selector-lever pins in the upper position, there should be at least .006" clearance, as indicated in Fig. 4(A), between the selector-lever pins (tape-out sensing pin included) and any part of the tape lid. The selector-

lever pins should be inside their slots. On units other than those equipped with TP135561 tape lids, the pins should be Min .010", Max .015", as indicated in Fig. 4(A), from the end of the tape-lid fins. **Fig. 4(A)**

(a) To adjust, loosen the tape-lid bearing bracket mounting screws and position the tape lid. **Fig. 4(B)**

3.14 Tape-out Contact-lever Latch: With the tape-out operating lever resting firmly on and in the approximate center of the low part of its cam and with the tape-out contact lever against its stop, there should be Min .010", Max .020" clearance, as indicated in Fig. 5(A), between the latching surface of the tape-out contact-lever latch and the tape-out contact lever. **Fig. 5(A)**

(a) To adjust, loosen the tape-out contact-lever-latch mounting-screw nut and position the mounting screw in the elongated hole of the bracket. Tighten the nut.

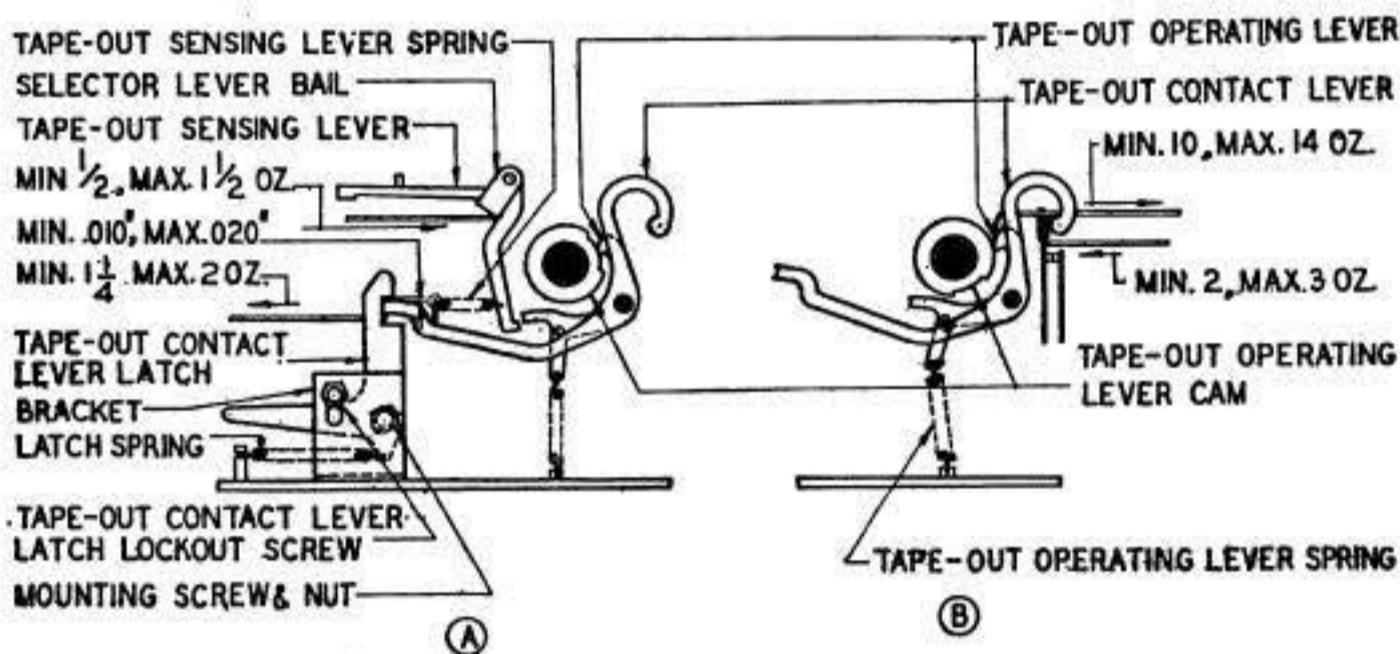


Fig. 5

3.15 Tape-out Contact-lever-latch Spring: With a TP82725 latch spring (49 turns) installed, it should require Min 1-1/4 oz, Max 2 oz, as indicated in Fig. 5(A) to just start the contact-lever latch moving when the tape-out operating lever is resting on the low part of its cam.

(a) To gauge, hook the scale through the bottom of the notch in the tape-out contact-lever latch and pull in the direction of travel. **Fig. 5(A)**

3.16 Tape-out Contact Adjustments for Units Equipped with Backstop Screws.

Note: On units equipped with LTRS-sensing mechanism, move the tape-out contact-lever-latch lockout screw to the UP position and tighten the nut.

Preliminary Adjustments

(a) **Gap Adjustment:** With the transmitting-cam cylinder in its stop position (clutch teeth disengaged), the tape-out contact lever in its latched position, and the adjusting screw backed up all the way, there should be a gap of Min .035", Max .040" between the contact points.

(1) To adjust, bend the short contact spring.

(b) **Tension Adjustment:** With the transmitting-cam cylinder in its stop position (clutch teeth disengaged), and the tape-out contact lever in its latched position, apply the push end of a scale to the long contact spring just above the contact and push at right angles to the spring. It should require a pressure of Min 4-1/4 oz to just move the contact spring away from its contact lever.

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

Final Adjustments

(c) **Gap Adjustment:** With the transmitting-cam cylinder in its stop position and the tape-out contact lever in its latched position, there should be a Min .020", Max .025" clearance between the contact points.

Note: Make sure the friction between the contact lever and the tape-out operating lever does not interfere with the proper closure of the contacts.

(1) To adjust, regulate the backstop screw.

(d) **Tension Adjustment (Short Contact Spring):** It should require a pressure of Min 4 oz, Max 8 oz to just move the short contact spring away from its backstop screw when a scale is applied at right angles to the end of the short contact spring.

(1) To adjust, bend the short contact spring.

(e) **Tension Adjustment (Long Contact Spring):** With the transmitting-cam cylinder in its stop position (clutch teeth disengaged), with the tape-out contact lever in its unlatched position, and with clearance between the long contact spring and its contact lever (the contact lever may have to be moved manually to overcome friction* between it and the tape-out operating lever), it should require a pressure of Min 2 oz, Max 3 oz, as indicated in Fig. 5(B), to just open the contacts when the push end of a scale is applied to the long contact spring just above the contact point.

Fig. 5(B)

*Make sure the friction between the contact lever and the tape-out operating lever does not interfere with the proper closure of the contacts.

(1) To adjust, bend the long contact spring. Recheck contact gap adjustment.

3.17 **Tape-out Contact Adjustments for Units Without Backstop Screws**

(a) **Gap Adjustment:** With the transmitting-cam cylinder in its stop position (clutch teeth disengaged) and the tape-out contact lever in its latched position, there should be a gap of Min .020", Max .025" between the contact points. For location of parts see **Fig. 5(B)**

(1) To adjust, bend the short contact spring.

(b) **Tension Adjustment (Long Contact Spring):** With the transmitting-cam cylinder in its stop position (clutch teeth disengaged), with the tape-out contact lever in its unlatched position, and with clearance between the long contact spring and its contact lever (the contact lever may have to be moved manually to overcome friction* between it and the tape-out operating lever), it should require a pressure of Min 2 oz, Max 3 oz, as indicated in **Fig. 5(B)**, to just open the contacts when the push end of a scale is applied to the long contact spring just above the contact point. **Fig. 5(B)**

*Make sure the friction between the contact lever and the tape-out operating lever does not interfere with the proper closure of the contacts.

(1) To adjust, bend the long contact spring. Recheck contact gap adjustment.

3.18 **Tape-out Contact-lever Upstop:** With the transmitting cam in its stop position and the tape-out contact lever unlatched and resting against the upstop, there should be Min .005", Max .015" clearance between the tape-out contact lever and the contact insulator.

(a) To adjust, position the upstop by loosening the clamp screw and rotating the upstop on the shoulder screw to meet the above requirement. Retighten the clamp screw.

3.19 **Tape-out operating-lever spring** should require a pull of Min 10 oz, Max 14 oz, as indicated in **Fig. 5(B)**, to start the lever moving away from the cam with the end of the scale hooked over the top of the tape-out operating lever with the transmitting-cam cylinder in its stop position (clutch teeth disengaged) and with the tape-out operating lever resting on the high part of its cam. **Fig. 5(B)**

3.20 **Release-bar contact** requirements are as follows:

(a) With the release bar fully depressed, there should be a gap of Min .020", Max .025", as indicated in **Fig. 6(A)**, between the contact on the heavy, short contact spring and the contact of the long contact spring. **Fig. 6(A)**

(1) To adjust, bend the heavy, short contact spring.

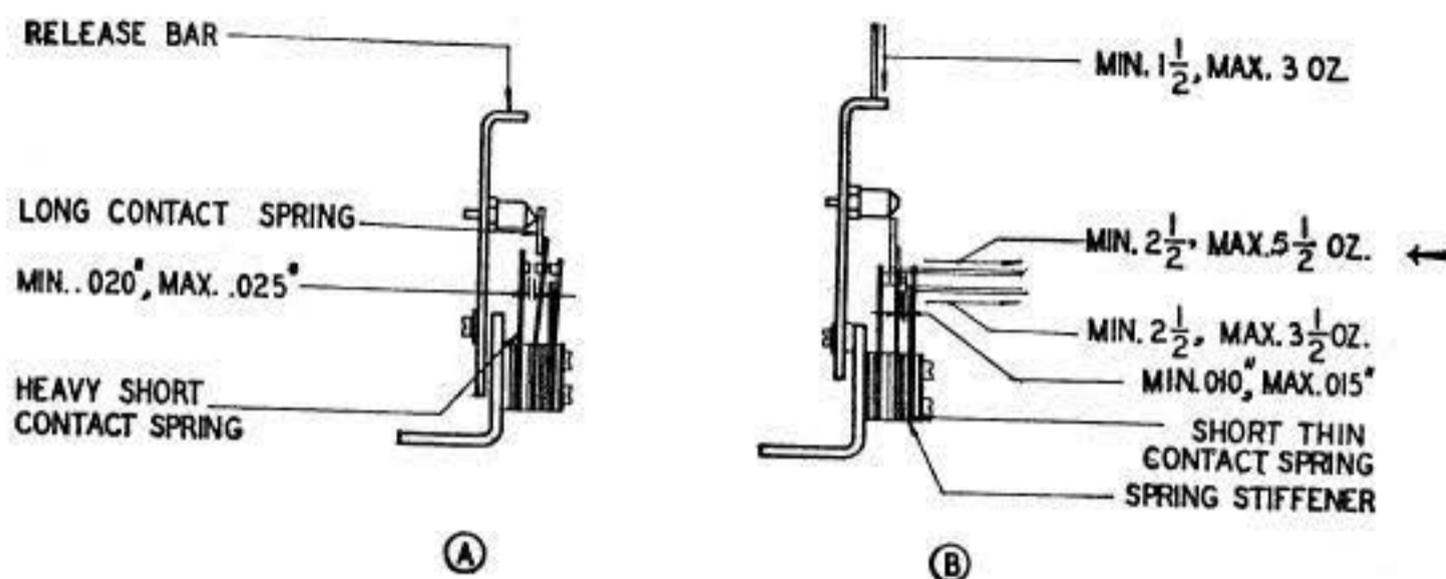


Fig. 6

- (b) With the release bar in the unoperated position (up), it should require a tension of Min 2-1/2 oz, Max 5-1/2 oz, as indicated in Fig. 6(B), to open the contact when the scale is hooked over the long contact spring just above the contact point and pulled horizontally. **Fig. 6(B)**
- (1) To adjust, bend the long contact spring. Recheck (a).
- (c) With the release bar unoperated, there should be a gap of Min .010", Max .015", as indicated in Fig. 6(B), between the contact of the short, thin contact spring and the contact of the long contact spring. **Fig. 6(B)**
- (1) To adjust, bend the short, thin contact-spring stiffener.
- (d) It should require Min 2-1/2 oz, Max 3-1/2 oz to just start the spring moving away from the spring stiffener with the scale hooked over the short, thin contact spring at the contact point.
- (1) To adjust, bend the short, thin contact spring.
- (e) With the feed-wheel detent roller resting in the hollow between two ratchet teeth and with the release-bar stud just touching the detent-lever extension there should be some clearance between the contacts of the long spring and those of the heavy, short spring.
- (1) To adjust, bend the heavy, short contact spring.
- (f) With the release bar in the unoperated position (up), the release-bar stud must clear the top of the insulator of the contact swinger by at least .010". If necessary, remake the release-bar contact adjustment to meet this requirement.

3.21 **Release-bar spring** should require Min 1-1/2 oz, Max 3 oz to start the bar moving, with the push end of the scale applied to the top of the release bar and pushing vertically downward. **Fig. 6(B)**

3.22 **Selector-lever Comb:** There should be a clearance of Min .002", Max .012" as indicated in Fig 7(A), between the lower ends of the selector levers and the horizontal extensions of the contact levers, with the transmitting-cam cylinder in its stop position. **Fig. 7(A)**

(a) To adjust, add or remove shims under the selector-lever comb on each of the side frames. **Figs. 1, 7(B)**

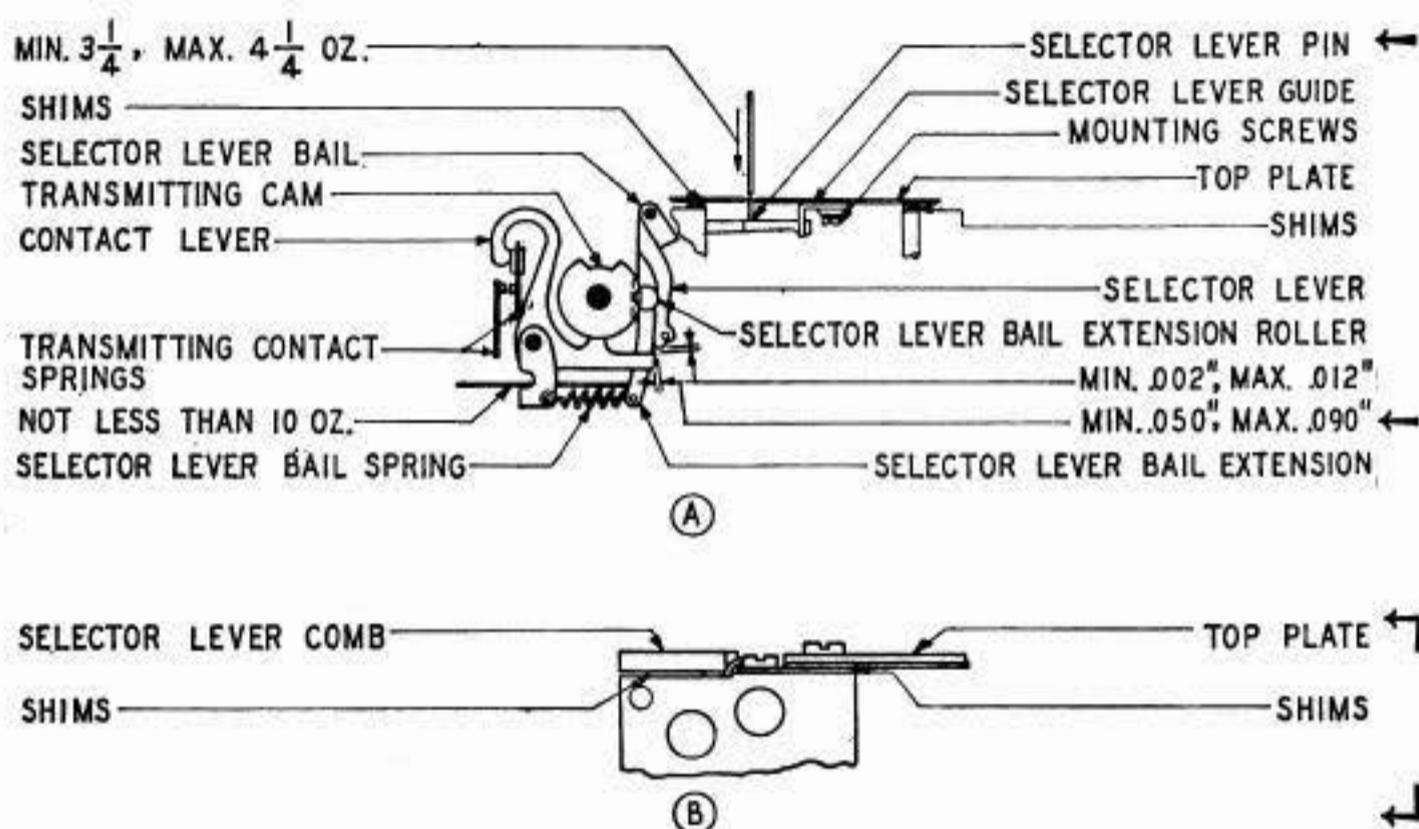


Fig. 7

Note: For the following adjustments,

- (a) Unhook the release-bar spring from the release bar.
- (b) Remove tape-lid-latch spring.
- (c) Remove the four screws which hold the top plate.
- (d) Noting the number, remove shims from under each corner of the top plate when old-style top plate is used.
- (e) Move the release bar out of the way and slide the top plate forward off the unit. Do not bend the tape-out sensing levers.

3.23 Tape-out Sensing Lever

(a) The top of the sensing pin should be flush, within .005", with the top of the adjacent selector-lever pin.

(1) To adjust, bend the horizontal leg of the tape-out sensing lever, using a TP116799 bending tool. Avoid damaging the pin with the bending tool. **Fig. 8**

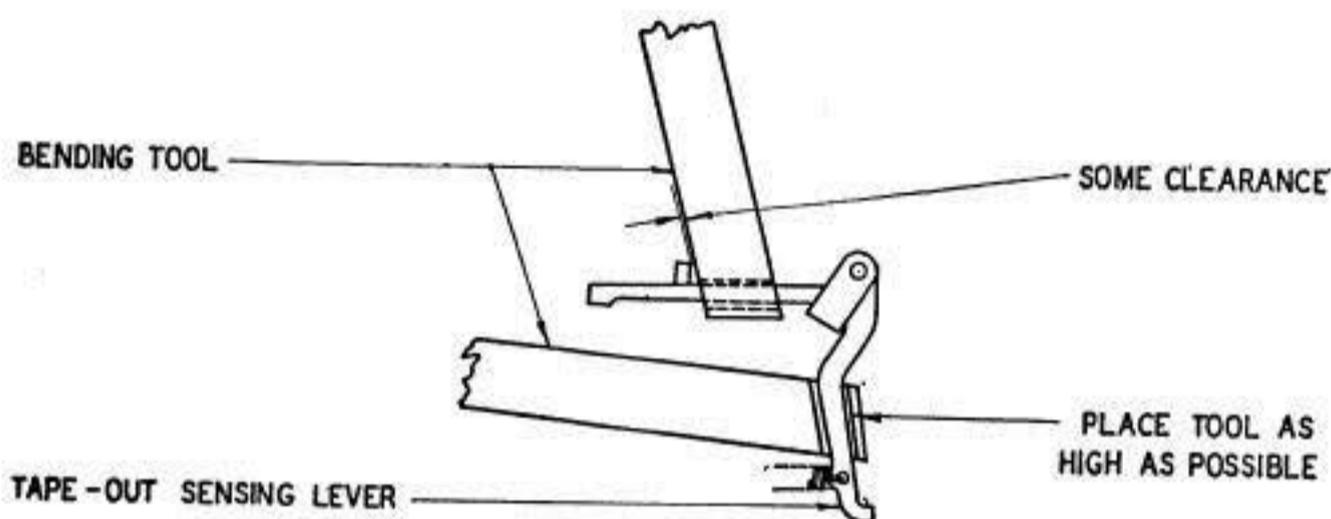


Fig. 8

(b) With the transmitting-cam sleeve in its stop position there should be Min .015", Max .030" clearance, as indicated in Fig. 10, between the vertical leg of the sensing lever and the tape-out operating lever. **Fig. 10** ←

(1) To adjust, place the bending tool on the lever as shown in Fig. 9 and bend the vertical leg of the sensing lever. **Figs. 9, 10**

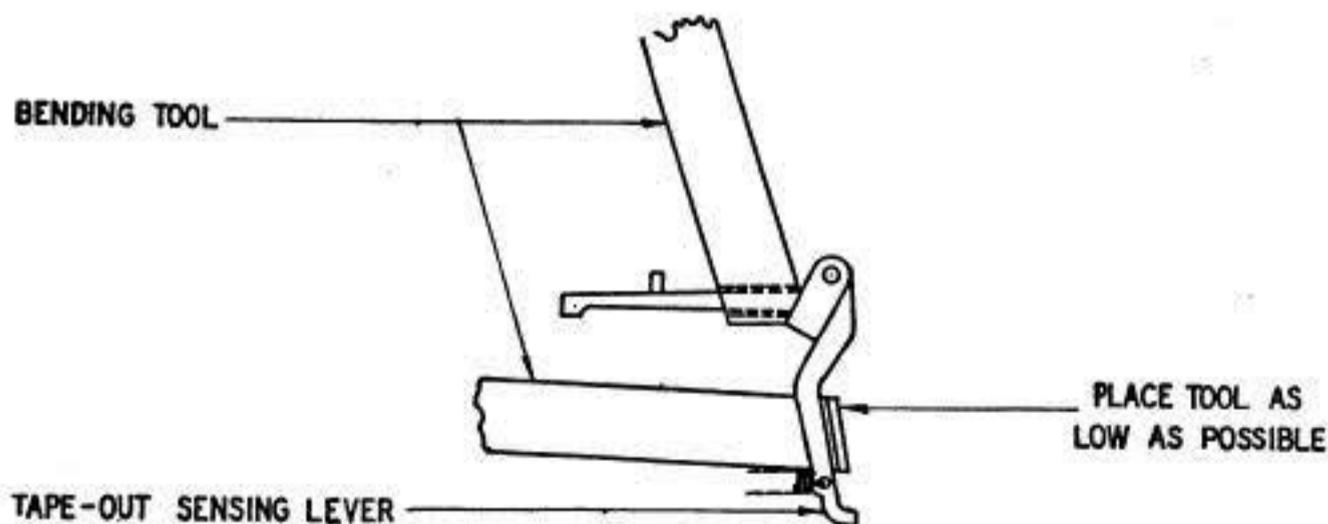


Fig. 9

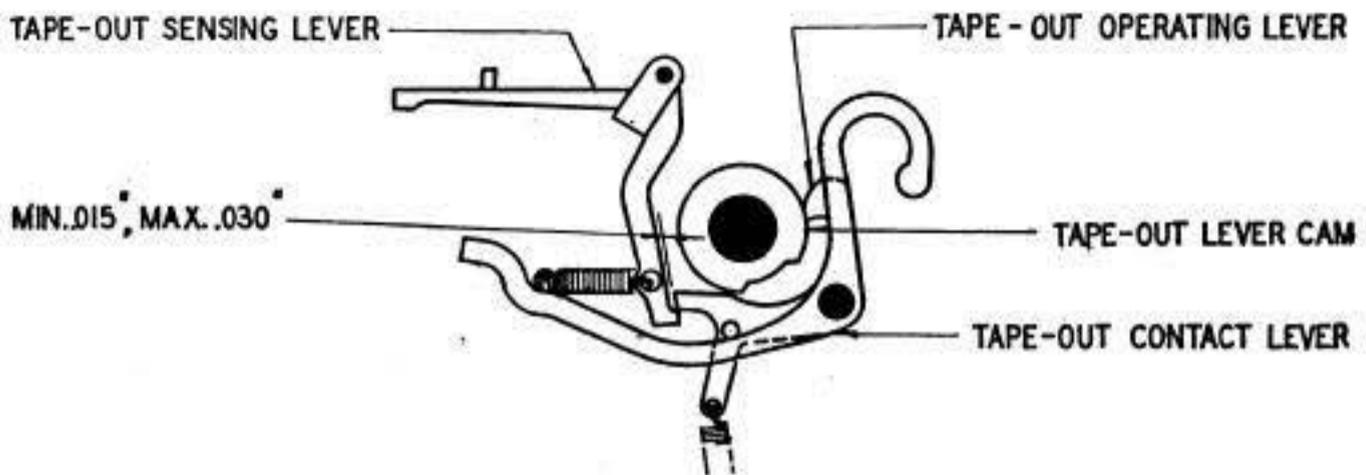


Fig. 10

Note: Where reruns of tape are desired, work toward the minimum limit of .015" in (b) and the maximum limit of .090" in 3.25.

3.24 The feed wheel should meet the following requirements:

(a) The feed pins on the tape-feed wheel should extend Min .035", Max .045" above the top surface of the channel in the top plate.

(1) To adjust, insert shims between the feed-wheel brackets and the bottom surface of the top plate.

(b) The mounting screws shall engage the top plate with the maximum number of threads without protruding through the surface.

(1) To adjust, insert unused shims between the brackets and the clamp plates.

(c) Position the tape-feed wheel so that when a piece of perforated tape having perforations properly centered, is engaged by the feed wheel, there will be an equal amount of clearance between the sides of the tape-guide slot in the top plate and the edges of the perforated tape. Adjust the feed wheel by means of the pilot screws. When adjusted, there should be some endplay, not more than .002". Recheck adjustment (a). See Figs. 4 and 11 for location of parts.

Figs. 4, 11

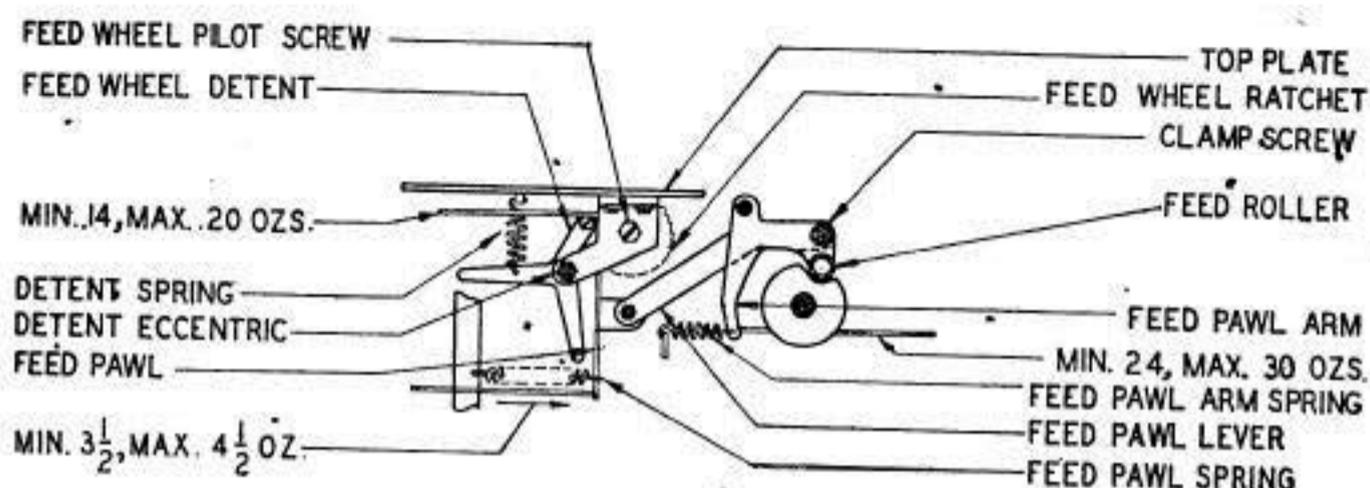


Fig. 11

Note: If necessary, the accessibility of the right pilot screw may be improved by removing the hexagonal post on which the transmitter filter is mounted, and rotating the post and filter to the right.

Note: Replace top-plate assembly by reversing the procedure outlined for disassembling it, then check the following adjustments:

1. Top Plate (3.25)
2. Selector-lever Bail (3.27)
3. Feed-pawl Lever (3.34)
4. Tape-lid-latch Spring (3.38)

3.25 Top Plate: The lower ends of the five selector levers should overlap their contact levers by Min .050", Max .090", as indicated in Fig. 7, with the selector-lever pins just flush with the top surface of the tape-guide slot in the top plate.

Fig. 7

(a) **Top Plate Without Captive Shims**

(1) To adjust, rotate the transmitting-cam cylinder until the selector-lever pins are flush with the top surface of the tape-guide slot and shim the top plate at its four corners to obtain the proper overlap, using as a reference the No. 5 selector-lever pin, then checking the other pins by eye while rotating successive contact levers out of the way in order to view the amount of overlap.

(2) Before tightening the mounting screws, position the top plate so that the selector-lever pins are aligned approximately on the center line of the slotted hole in the top plate, and so that the clearance is at least .006" between the pins (tape-out pin included) and the edges of the slotted hole.

(b) Top Plate With Captive Shims

(1) To adjust, rotate the transmitting-cam cylinder until the selector-lever pins are flush with the top surface of the tape-guide slot. Loosen the four top-plate mounting screws and the locknuts on the two front posts. Rotate the upper adjustable sections of the posts clockwise until there is approximately $1/16$ " clearance between the top plate and the post. Shim the top plate at the two rear corners to meet the requirements above, and tighten the rear mounting screws. Rotate the upper adjustable sections of the two front posts until they just touch the top plate, and lock in place by means of the locknut. Tighten the front mounting screws. At the time the top plate is being adjusted in this way, position it so that the selector-lever pins are aligned approximately on the center line of the slotted hole in the top plate, and so that the clearance is at least $.006$ " between the pins (tape-out pin included) and the edges of the slotted hole.

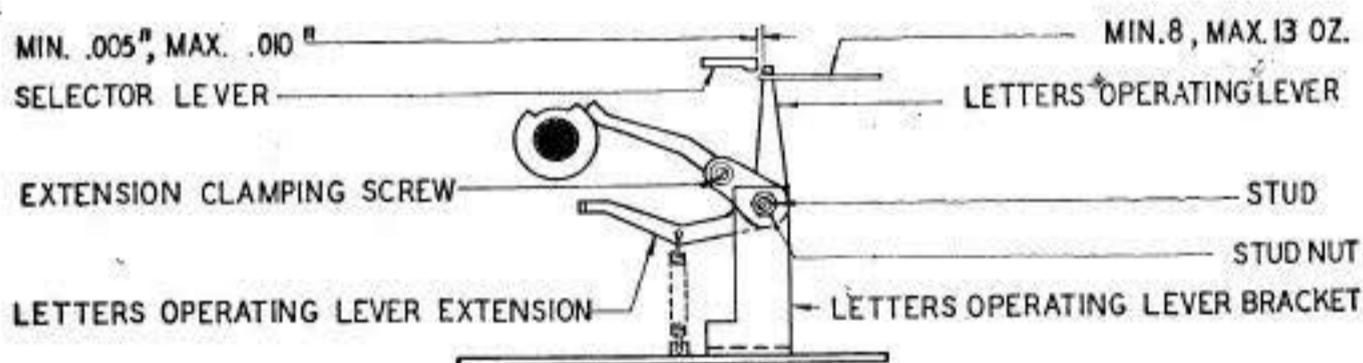


Fig. 12

3.26 **Tape Deflector:** For transmitters using the TP129656 tape-deflector assembly:

(a) The tang of the tape deflector should be centrally located in the rear of the feed-wheel slot in the top plate. The deflector should not prevent the feed wheel from rotating freely.

(1) To adjust, loosen the mounting screws and position the deflector bracket by means of its enlarged mounting holes. Tighten the mounting screws.

(b) The spring should hold the deflector firmly in position for deflecting tape and also allow it to swing out of the way when not in use.

- (1) To adjust the position of the spring, loosen its mounting screw and position the spring by use of the enlarged mounting hole. Tighten the mounting screw.
- (2) To adjust the tension, bend the spring.

3.27 Selector-lever Bail:

Note: Before making the following adjustment on units having a mechanism for momentarily opening the tape-out contact on LTRS combinations, move the LTRS-operating lever toward the front of the transmitter by means of its mounting stud and the slotted hole in the bracket. This is done so that the vertical projection of the LTRS-operating lever will not interfere with the free movement of the selector levers.

Fig. 12

With the selector cam-sleeve in its stop position (clutch fully disengaged) and the selector-lever-bail-extension roller resting on the low part of its cam, the highest selector-lever pins should not project above the top surface of the tape-guide slot in the top plate and should be below the top surface by Min .010", Max .015". See Fig. 7 for location of parts. **Fig. 7**

- (a) To adjust, insert a screwdriver through a hole in the side frame, loosen the selector-lever-bail clamping screw and position the selector-lever bail with relation to its extension.

3.28 Selector-lever-bail Spring: With a TP119904 selector-lever-bail spring (18 turns) installed, it should require Min 10 oz to start the selector-lever bail moving when the transmitting-cam cylinder is in its stop position and the selector-lever-bail extension roller is resting on the low part of its cam.

- (a) To gauge, apply the push end of the scale to the selector-lever-bail extension just above the selector-lever-bail spring and push in line with the spring. **Fig. 7**

3.29 Selector-lever Spring: With a TP78533 selector-lever spring (17 turns) installed, it should require Min 3-1/4 oz, Max 4-1/4 oz, as indicated in Fig. 7(A), to push the selector-lever pin downward from its uppermost position until the top of the pin is flush with the upper surface of the tape-guide slot in the top plate.

- (a) To gauge, apply the push end of the scale to the top surface of the selector-lever pin and push downward.

Fig. 7

3.30 Tape-out sensing-lever spring should require Min 1/2 oz, Max 1-1/2 oz, as indicated in Fig. 5(A), to start the tape-out sensing lever moving, with the tape-out sensing

pin it its uppermost position, and the push end of the scale applied horizontally at the bend of the tape-out sensing lever just below the selector-lever bail. **Fig. 5**

3.31 Feed-wheel Detent: Select a piece of tape (regular or chadless) with a series of LTRS perforations checked for ten holes to the inch. With the detent roller resting in an indent between two teeth of the feed-wheel ratchet, rotate the cam-sleeve until the tape pins are flush with the bottom of the tape. Engage the feed perforations of the tape with the feed wheel so that the LTRS perforations are directly over the tape pins. When the play of the tape on the feed wheel is taken up in the direction of rotation of the feed wheel, the tape-sensing pin with the minimum clearance in its code hole should just clear the trailing edge of its code hole. See Fig. 11 for location of parts. **Fig. 11**

(a) To adjust, hold the feed pawl away from the ratchet, and position the detent eccentric keeping the high part of the eccentric toward the rear of the unit.

3.32 Selector-lever Guide: When a piece of tape, perforated with the LTRS combination and properly centered (having No. 1 and No. 5 code holes equidistant from the edges), is placed in the transmitter and the cam-sleeve rotated until the selector-lever pins are in their uppermost position, the pins should be approximately in line with the center line through each hole in the perforated tape. **Fig. 7**

(a) To adjust, loosen the mounting screws of the selector-lever guide and position the guide. See Fig. 7 for location of parts.

3.33 Feed-wheel-detent spring should require Min 14 oz, Max 20 oz, as indicated in Fig. 11, to start the detent moving with the feed pawl held away from the feed-wheel ratchet, and the scale hooked over the head of the detent-roller screw, pulling parallel to the top plate. **Fig. 11**

3.34 Feed-pawl Lever: With the transmitting-cam cylinder in the stop position, there should be some clearance, Max .010", between the feed pawl and the face of the feed-wheel tooth which has the least amount of clearance.

(a) To gauge, bring each tooth into position and check throughout a complete revolution of the feed wheel before making any adjustment. (See Fig. 11 for location of parts.) **Fig. 11**

(1) To adjust, loosen the clamp screw and position the feed-pawl lever with respect to the feed-pawl arm.

Caution: Hold the feed pawl while loosening or tightening the clamp screw to avoid spreading the slot of the comb.

Note: If any difficulty is found in making the adjustment of 3.34, recheck the requirement of 3.31 with respect to the high part of the eccentric.

3.35 **Feed-pawl-arm spring** should require Min 24 oz, Max 30 oz, as indicated in Fig. 11, to start the feed-pawl arm moving with the transmitting-cam cylinder in the stop position, with the feed roller resting on the low part of its cam, with the feed-pawl spring unhooked from the feed pawl and with the scale hooked over the feed-pawl arm in line with the spring hole and pulled at right angles to the feed-pawl arm. **Fig. 11**

3.36 **Feed-pawl-spring tension**, to start the feed pawl moving away from the ratchet wheel with the transmitting-cam cylinder in the stop position (the scale applied at right angles to the lower part of the feed pawl near the spring hole) should be:

<u>Word Speed</u>	<u>Spring</u>	<u>Tension</u>	
		<u>Minimum</u>	<u>Maximum</u>
60 or 75	TP55090 (60 turns)	1/2 oz	2 oz ←
100	TP76379 (40 turns)	3-1/2 oz	4-1/2 oz ←

Note: If the stiffer spring (TP76379) is found on machines operating at 60 or 75 speed, it is recommended that it be replaced by the lighter spring to avoid tape-feed troubles.

3.37 **Tape-lid-latch spring** should be adjusted vertically so that the tape-lid latches firmly. **Fig. 13**

(a) To adjust, loosen the tape-lid-latch-spring mounting screws and position the spring up or down.

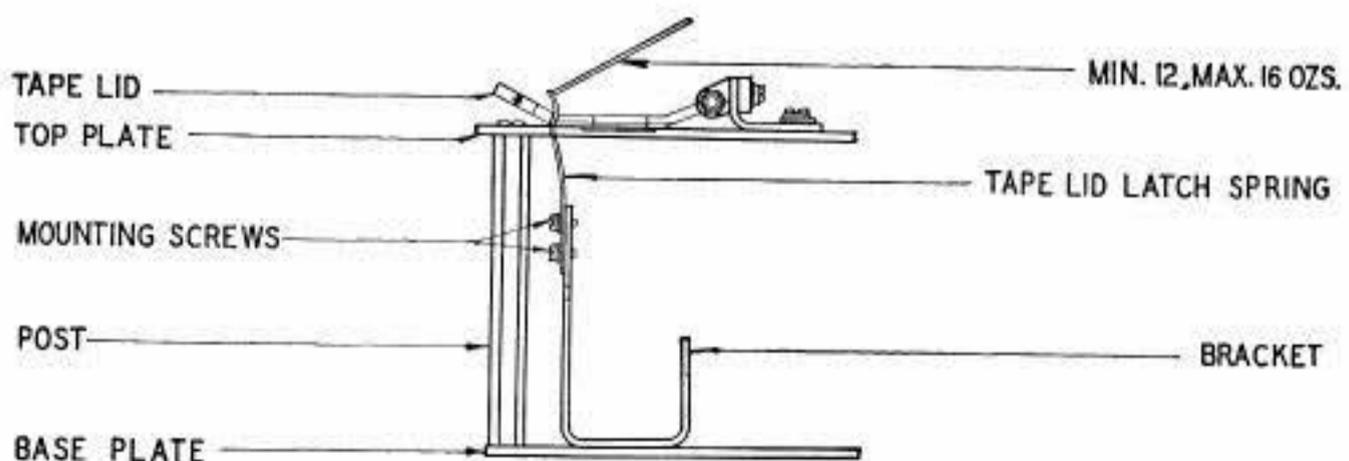


Fig. 13

3.38 **Tape-lid-latch spring** should require Min 12 oz, Max 16 oz, as indicated in Fig. 13, to just start deflecting the spring with the tape-lid latched and the scale applied at right angles to the uppermost bent section of the latch spring and pushing downward. **Fig. 13**

(a) To adjust, curve the spring approximately midway between its upper mounting hole and the top plate.

3.39 **LTRS-operating lever** is used to control tape in numbering-type multiple-transmitter units. With the LTRS-operating lever riding on the high parts of its cam, rotate the cam sleeve until the bottom edges of the ends of the horizontal members of the selector levers are in line with the bottom edge of the horizontal section of the LTRS-operating-lever vertical extension, there should be Min .005", Max .010", as indicated in Fig. 12, clearance between the end of the selector lever providing the minimum clearance and the operating-lever vertical extension. **Fig. 12**

(a) To adjust, loosen the LTRS-operating-lever-stud nut and position the stud in the bracket.

3.40 **LTRS-operating-lever Vertical Extension:** Rotate the transmitting-cam cylinder until all selector-lever pins are in their selected (uppermost) position and the LTRS-operating-lever horizontal extension is on the low part of its cam. Under this condition there should be Min .020", Max .040" clearance, as indicated in Fig. 14, between the underside of the horizontal members of the selector lever and the top surface of the LTRS-operating-lever vertical extension. **Fig. 14**

(a) To adjust, loosen the two vertical-extension mounting screws and position the extension vertically. Tighten the mounting screws. Recheck 3.39

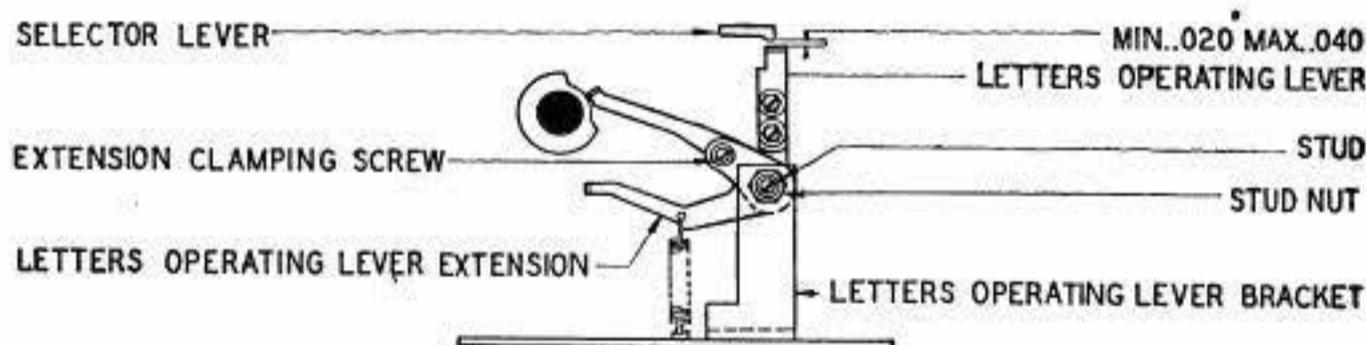


Fig. 14

Note: An old unit having a tape-out sensing lever which is not cut off at the selector-lever guide should be checked to be sure that there is at least .010" clearance between the LTRS-operating-lever vertical extension and the tape-out sensing lever when a piece of tape perforated with the LTRS combination is placed in the unit and the cam cylinder is positioned as in 3.40.

3.41 LTRS-operating-lever Horizontal Extension: Move the tape-out contact-lever-latch lockout screw upward so that it is ineffective. Set up the LTRS combination and rotate the cam-sleeve manually until the LTRS-operating lever (Fig. 14) is resting on the low part of its cam. With the LTRS-operating lever in this position, there should be Min .010", Max .020" clearance between the latching surface of the tape-out contact-lever latch and the tape-out contact lever. **Figs. 14, 5(A)**←

(a) To adjust, loosen the horizontal extension clamping screw and position the LTRS-operating-lever horizontal extension with respect to the tape-out contact lever. **Fig. 14**←

Note: After completing the above adjustment make the tape-out contact-lever latch ineffective by positioning the lockout screw downward so as to provide a clearance of at least .010" between the end of the tape-out contact lever and the tape-out contact-lever latch.

3.42 LTRS-operating-lever horizontal extension spring should require Min 8 oz, Max 13 oz, as indicated in←
Fig. 12, to start the operating lever moving with the lever resting on the high part of its cam, with the scale hooked over the vertical arm of the LTRS-operating lever as close as possible to the selector lever and pulling at right angles to the LTRS-operating lever. **Fig. 12**

3.43 Release-bar latch should meet the following requirements:

(a) With the release bar fully depressed, there should be some clearance, not more than .010", between the release-bar latch and the latching edge of the release bar.

(1) To adjust, bend the release-bar latch.

(b) When the release bar is latched and the release-bar slot is fully engaging the release-bar latch, there should be some clearance, not more than .010", between the slot in the release bar and the top plate.

(1) To adjust, loosen the release-bar-latch mounting screw and position the latch in its mounting holes.

Multiple-transmitter Base (3.44 to 3.49)

Note: These adjustments should be made with the motor unit removed from the base casting. To remove the motor unit, disconnect the three wires from the motor unit at the terminal block, and on governed motors also remove the governor adjusting bracket. Remove the four screws which mount the two motor plates to the base casting, and remove the motor unit by lowering it through the base casting.

3.44 **Main-shaft Bearings:** The main shaft should turn freely in its bearings. Check throughout one complete revolution of the main shaft. Fig. 15

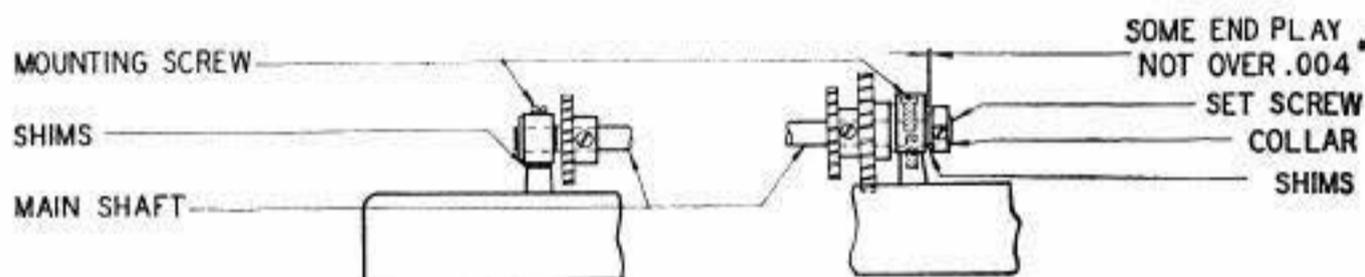


Fig. 15

(a) To adjust, loosen the mounting screws of the two main-shaft bearings. Align the bearings so that the shaft turns freely. If necessary, add or remove shims between either bearing and its base on the base casting.

3.45 **Main-shaft Endplay:** The main shaft should have some endplay, not over .004\". Fig. 15

(a) To adjust, loosen the two collar set screws and position the collar on the main shaft.

3.46 **Motor Alignment:** The axis of the pinion shaft should lie in the midplane of the main-shaft gear.

(a) To adjust, loosen the four motor mounting screws and position the motor on its mounting plates.

3.47 **Motor-gear Backlash:** There should be a barely perceptible amount of backlash between the motor pinion and the motor gear. This backlash should be checked throughout one complete revolution of the motor gear.

(a) To adjust, loosen the four mounting screws which clamp the two motor plates to the base casting, and add or remove shims between the motor plates and their bosses on the base casting.

3.48 **Gear Guard:** There should be some clearance, not more than $1/32''$, between the gear guard and the motor gear at the closest point, throughout one complete revolution of the motor gear.

- (a) To adjust, loosen the gear-guard mounting screws and position the gear guard.

3.49 **Transmitter-unit Position:** Each unit should be positioned on the base so as to provide a barely perceptible amount of backlash, without binding between the driven gear on the unit and the driving gear on the main shaft. This backlash should be checked throughout one complete revolution of the gear.

- (a) To adjust, loosen the three mounting screws and position the unit.

4. REFERENCE TO BELL SYSTEM PRACTICES

4.01 The following BSPs contain information used in conjunction with Section P33.001:

<u>Title</u>	<u>Section No.</u>
Orientation and Distortion Tests	P30.002
Cleaning—General Requirements	P30.010
Lubrication—General Requirements	P30.011
Requirements and Procedures— General Requirements	P30.012
Motor Units and Governors— Requirements and Procedures	P32.004
Coding	P33.002