1B AND 1BA TELEPHONE ANSWERING SETS

REQUIREMENTS AND ADJUSTMENTS

1.00 GENERAL

1.01 This section contains **REQUIREMENTS** (2.00) and **ADJUSTMENTS** (3.00) for 1B and 1BA telephone answering sets.

1.02 The following components are covered:

- Operating controls
- Message selector and dial assembly
- Message-bail carriage and head
- Flyback switch (S8) and slide bar
- Announcement-bail carriage and head
- Drum torque
- Cam action
- Announcement dictate timing
- Incoming message timing
- Thermal circuit
- Pulleys and belts
- Function switch S1
- Contact springs of switches
- Relays
- Tone generator
- Gears
- Dial cables
- Lamps
- Tubes

1.03 Make only those adjustments given in this section.

1.04 ***Tools, Gauges, and Materials***

Tool	Description
Allen-type wrenches	3/32, 1/16, 1/8, and 5/32 inch
Open-end wrenches	3/8, 5/16, 1/4, 7/32, 13/32, and 1/2 inch
265C	Burnishing tool
374B and C	Burnishing blades
325B	Adjuster
328	Guide adjuster
363	Spring adjuster
415B	Spring adjuster
524A, B, and E	Spring adjusters
70D	Gauge, 50 - 0 - 50 grams
79B	Gauge, 0 - 1000 grams
74D	Thickness gauges
131A	Thickness gauges
376A	Dental mirror
KS-2423	Cloth twill jean
KS-6320	Orange stick
Cleaning brush	Camel or sable hair
KS-16328, L2	Cleaner
KS-14774, L1	Lubrication grease
Trichloroethylene	
4/0 Emery polishing paper	Carborundum Co.

2.00 REQUIREMENTS

OPERATING CONTROLS

2.01 Control knobs and dial shall be properly positioned.

2.02 START and STOP switches shall not be loose on their inserts.

2.03 Knobs of START and STOP switches shall not be loose on their inserts.

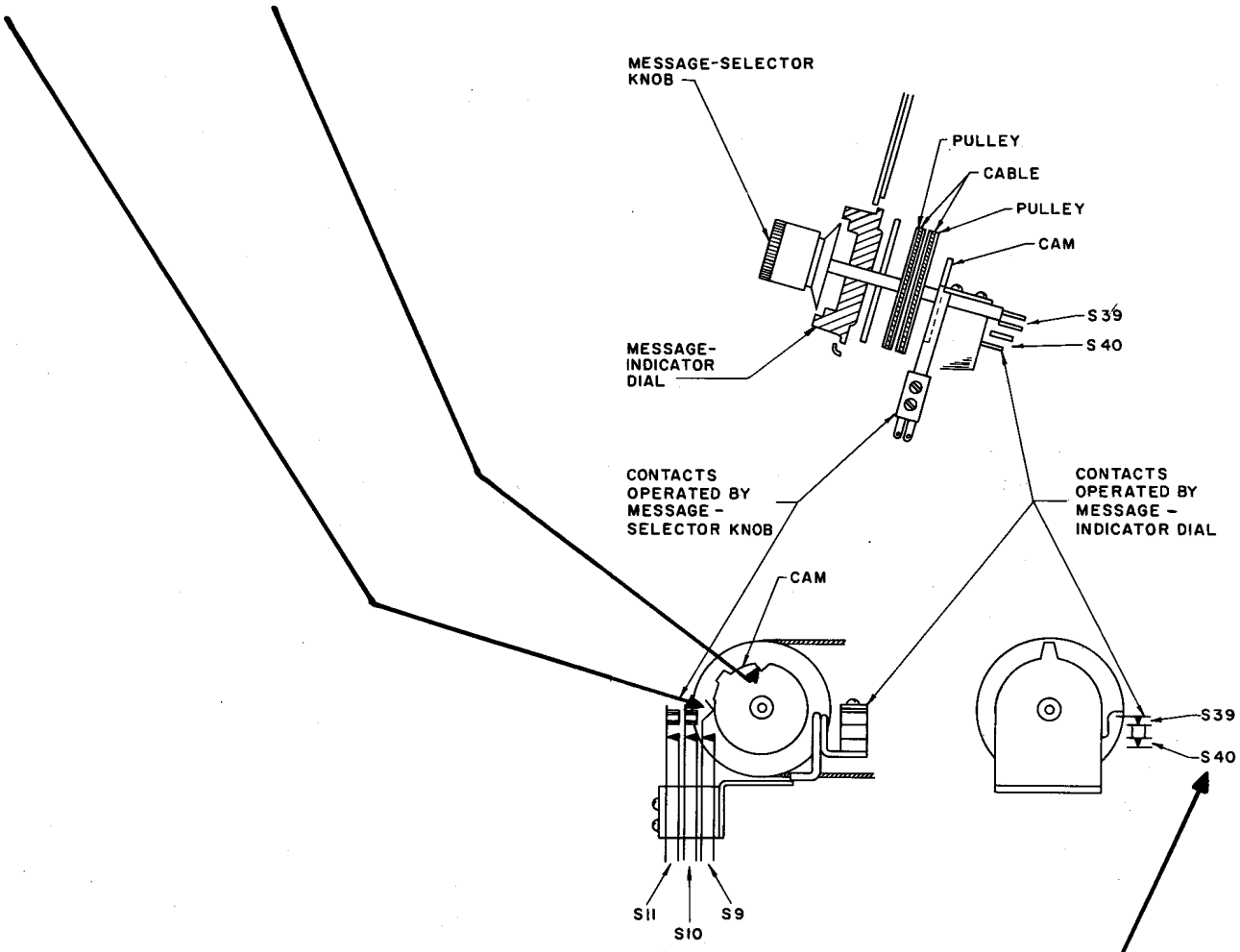
2.04 The message-indicator dial shall properly index in the detent.

2.05 On the 1B telephone answering set, the concentric shaft playback volume control knob shall not move as switch S41 is turned from ANSWER & RECORD to the ANSWER ONLY position and back.

2.06 The message-selector knob shall return positively to its normal position when pushed in and released.

MESSAGE SELECTOR AND DIAL ASSEMBLY

2.07 Push in message knob, turn it completely counterclockwise, and observe that the spring of switch S9 is in the start notch of the indicator dial.



2.08 Turn indicator dial completely counterclockwise and observe that:

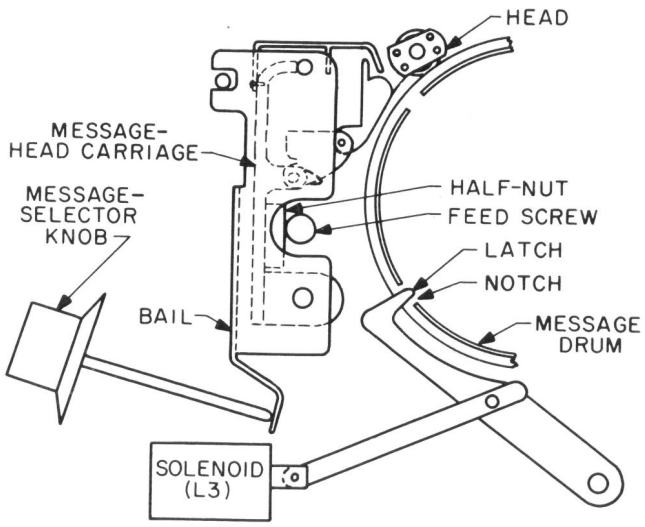
- Controls operate smoothly.
- Dot on panel, zero on dial, and line on knob line up.
- Message-indicator dial indexes in detent.
- Setscrews are tight.

Indicator dial shall be checked for freedom of rotation with cover of answering set on.

2.09 Cam operated by message-selector knob shall operate switches S9, S10, S11 successively.

2.10 Switches S39 and S40 shall operate smoothly.

2.11 The dial shall move with the knob and shall not bind.

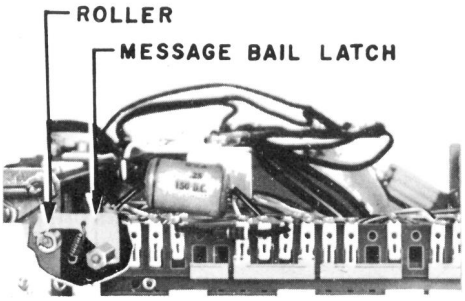


MESSAGE-BAIL CARRIAGE AND HEAD

2.12 Push in selector knob, turn it clockwise and then counterclockwise, and observe that:

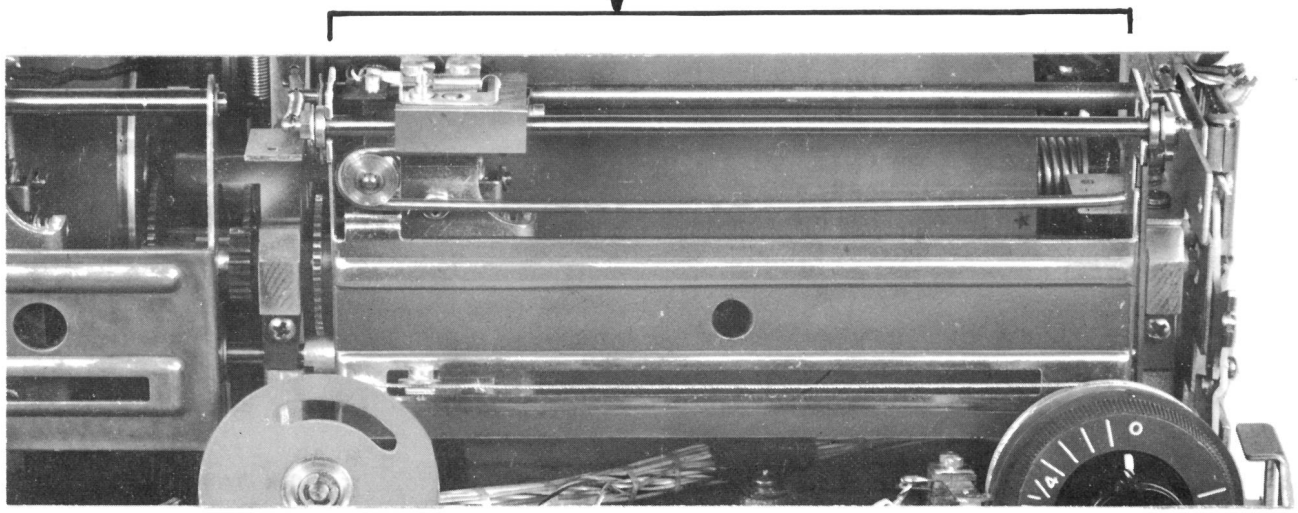
- Half-nut shall not scrape.
- Carriage cable shall not be loose, cause binding, or have broken strands.
- Half-nut shall have no perceptible end play (0.003 inch maximum) when engaging the feed screw at right end and left end. Gauge by feel.

2.13 Feed screw shall have no perceptible end play (0.003 inch maximum). Gauge by eye.

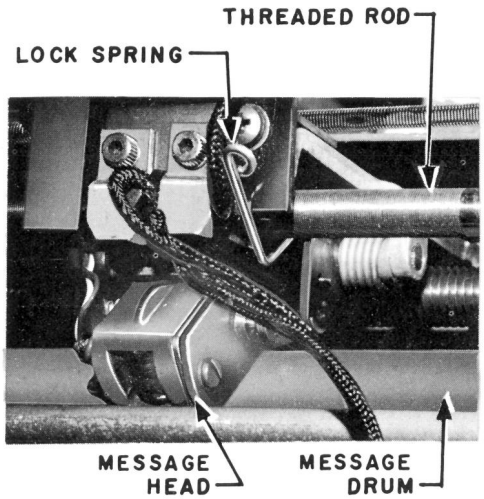


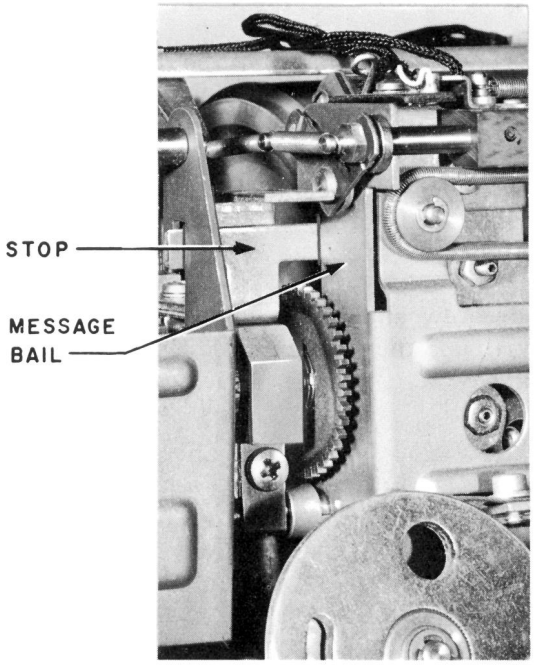
2.14 Message bail return latch shall be properly positioned.

2.15 Message bail shall have no excessive end play (0.010 inch maximum). Gauge by feel.



2.16 The head lock spring shall properly hold and release the head without binding on the threaded rod.



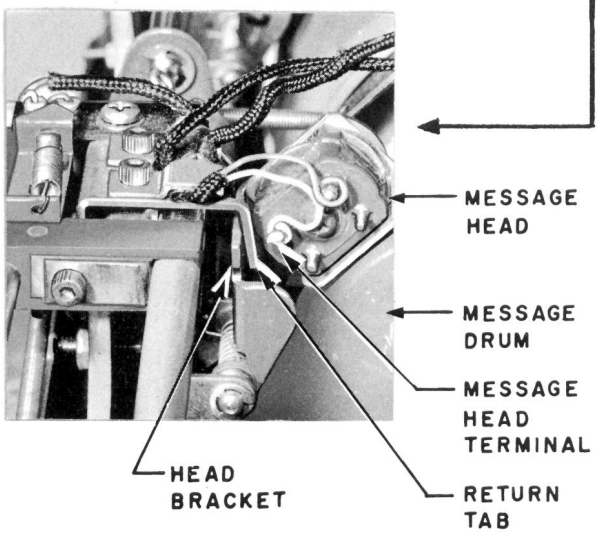


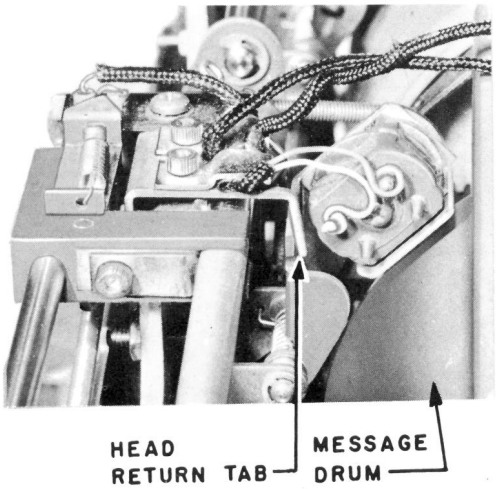
2.17 With the answering set turned to ON and set for MESSAGE PLAYBACK, depress START button and observe that:

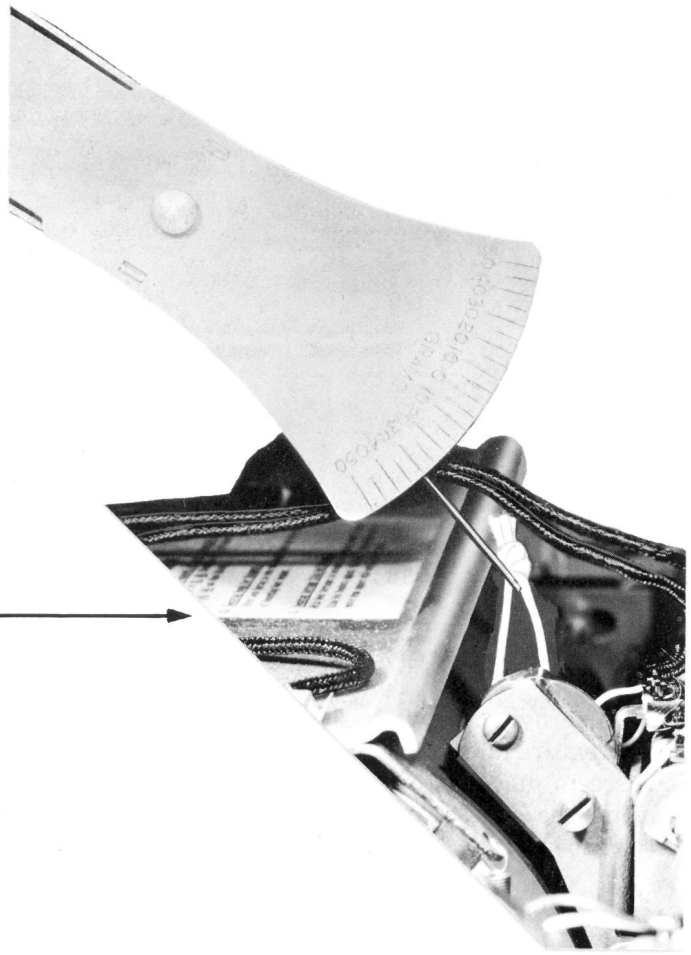
- Message bail hits bail stop.
- Message-head return tab clears head bracket.
- Head return tab does not touch message-head terminal.

Depress STOP button and observe that:

- Head return tab keeps head off drum.



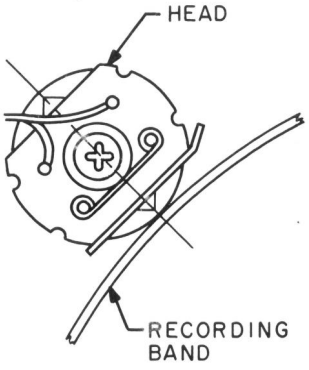




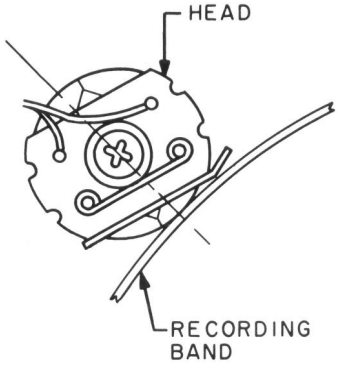
2.18 The head, when lifted off the drum, shall exert a definite pressure of 43 grams maximum and 28 grams minimum. Measure by placing blade of 70D gram gauge through loop of string wrapped around head screw, as shown.

Do not touch gauge blade to head laminations.

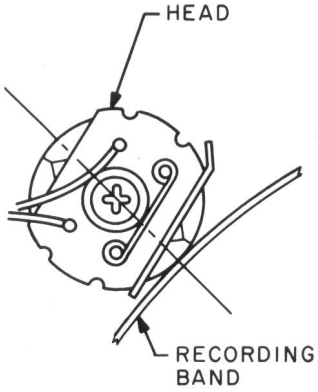
2.19 If the output of the answering set is below normal, check that gap of recording head is tangent to and in contact with surface of recording band.



CORRECT ALIGNMENT

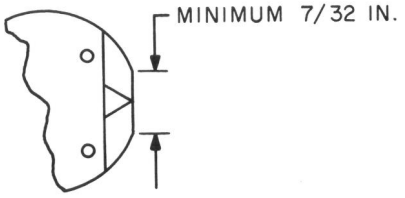


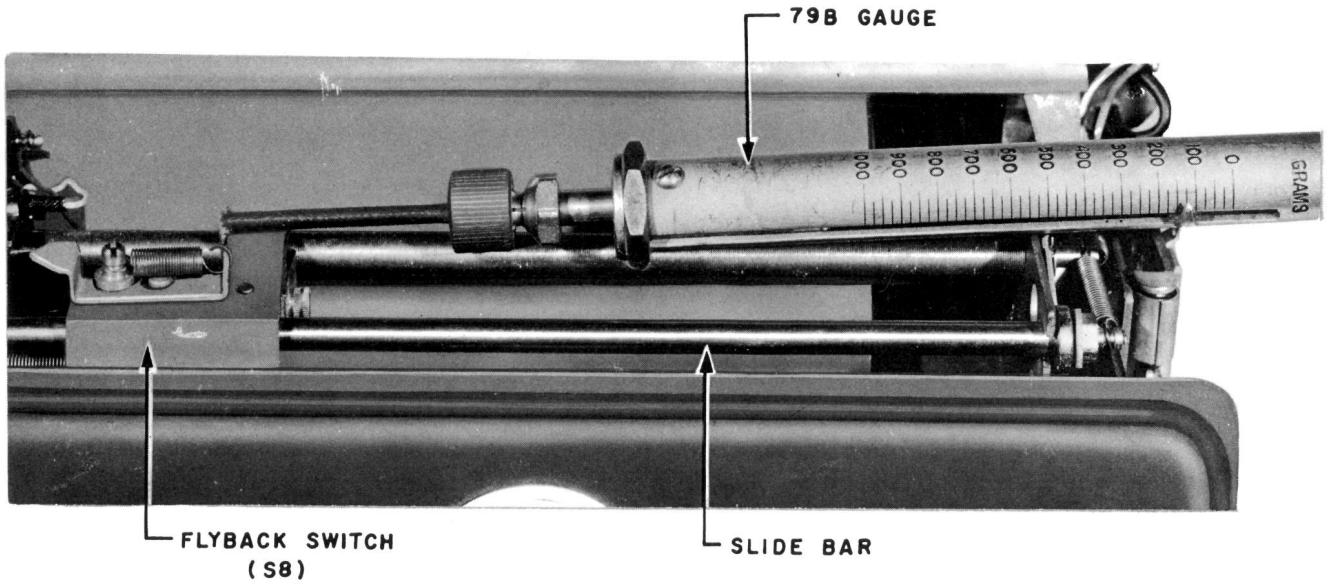
INCORRECT ALIGNMENT



INCORRECT ALIGNMENT

2.20 Check that surface of the head that contacts the drum is minimum 7/32 inch and is free of scars and irregularities which may impair recording.

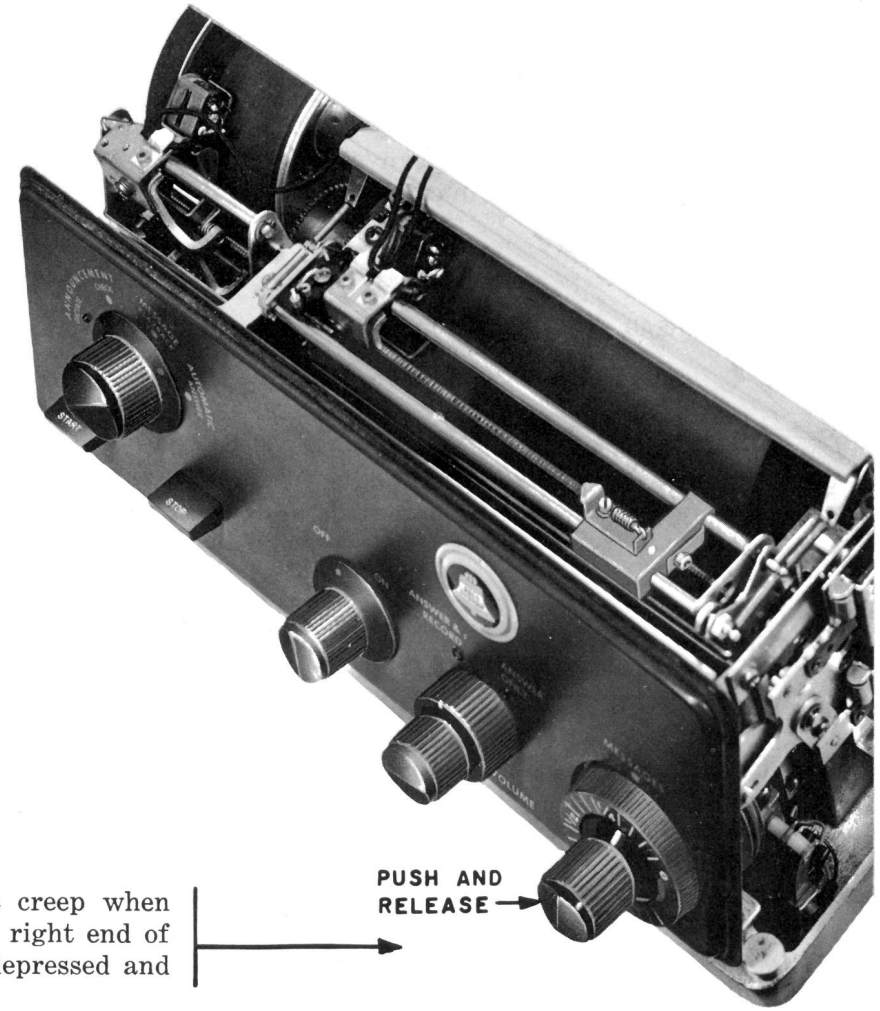




FLYBACK SWITCH (S8) AND SLIDE BAR

2.21 The flyback switch shall not require more than 150 grams of force to move it to the right. If drag on the switch appears excessive, readjust.

Do not push flyback switch to the left.

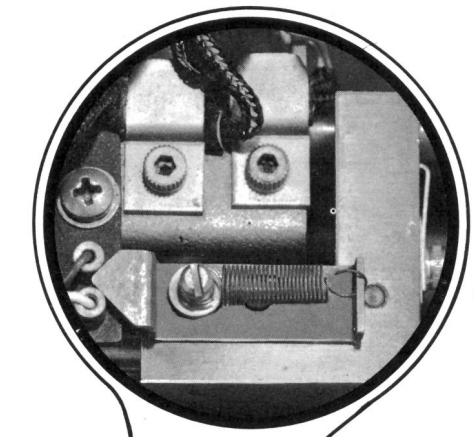


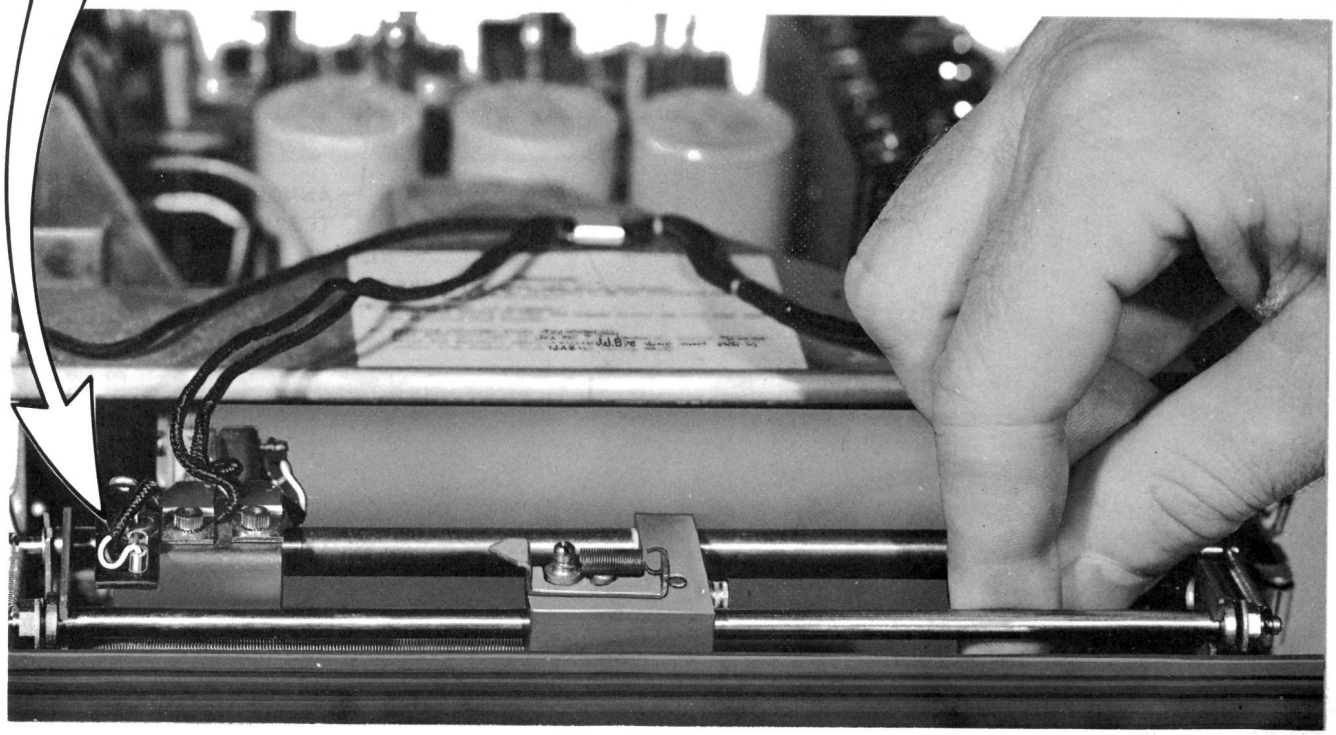
2.22 The flyback switch shall not creep when in a position 1 inch from the right end of its travel as the scanning knob is depressed and released several times.

2.23 Spread the threaded rod and slide bar apart. Observe the action of the flyback switch.

- Flyback switch should return to left.
- It should align itself with switch contacts so it is centered between contact pins.

2.24 Clean slide bar with KS-2423 twill jean cloth or dextilose paper. Tighten nuts on either side of slide bar. Check that wires to flyback switch are not loose and do not interfere with flyback switch action. Check that screw which holds spring is tight.

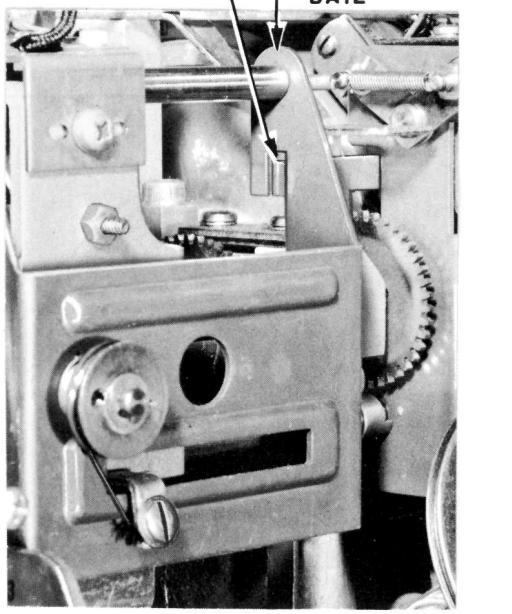




ANNOUNCEMENT-BAIL CARRIAGE AND HEAD

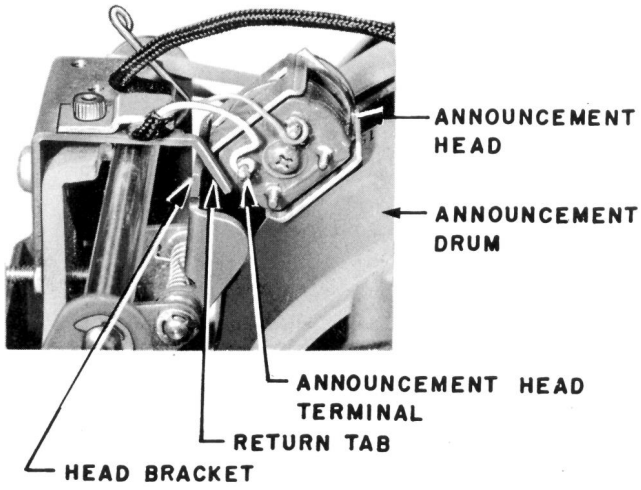
2.25 With the answering set turned to ON and set for ANNOUNCEMENT CHECK, depress START button and observe that:

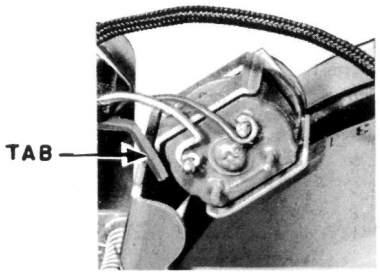
- Announcement bail hits bail stop.



- Head return tab clears head bracket.

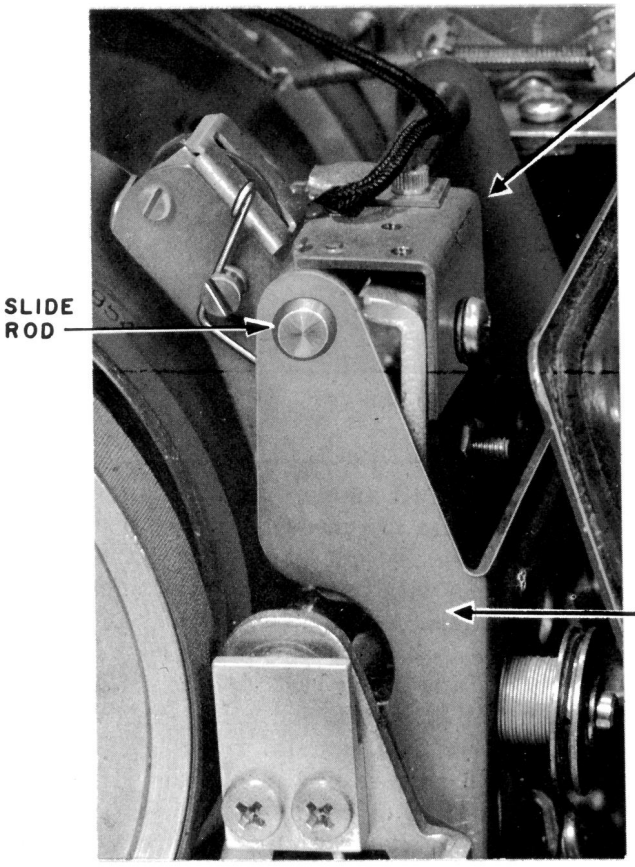
- Head return tab does not touch head terminal.





Depress STOP button and observe that:

- Head return tab keeps head off drum.



2.26 Grasp the announcement bail, move it from side to side, and observe that:

- End play does not exceed 0.010 inch. Gauge by feel.

2.27 The head lock spring shall properly hold and release the head without binding on the upper slide rod. Announcement head shall meet Requirements 2.18 and 2.19.

2.28 Manually push the announcement bail forward and observe that:

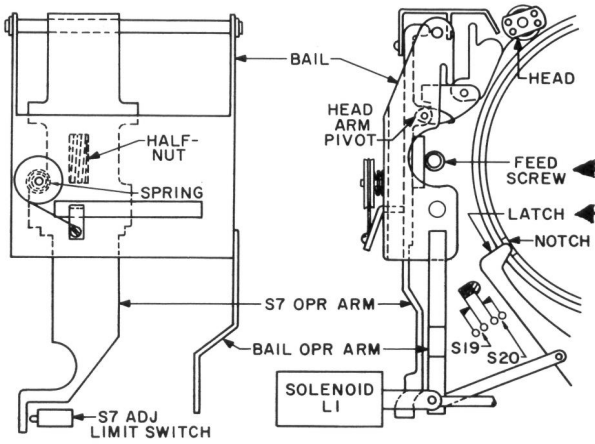
- Half-nut does not have excessive side play (0.003 inch maximum). Gauge by eye.

2.29 Feed screw shall have no perceptible end play (0.003 inch maximum). Gauge by eye.

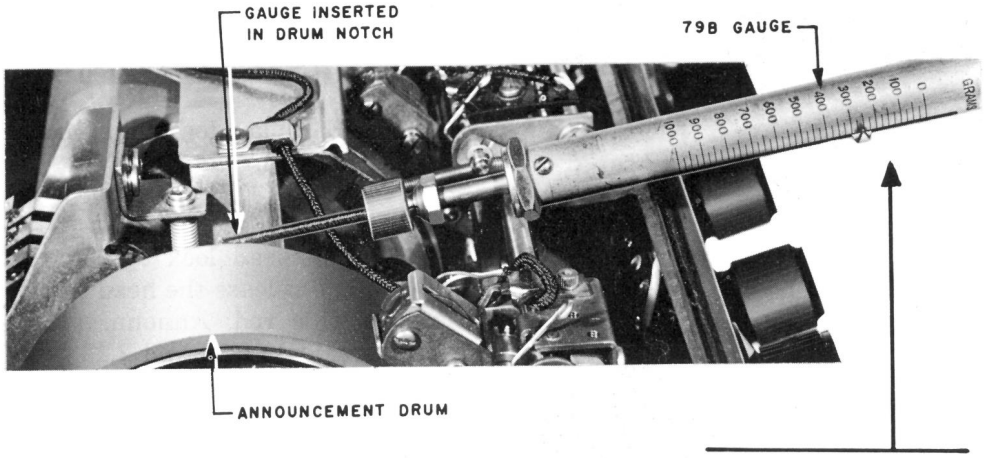
2.30 Manually push announcement bail to right several times, release, and observe that:

- Half-nut does not scrape on feed screw.
- Bail always returns to left without delay.

Do not push the announcement bail any farther to the right than the limit switch S7 will allow.



2.31 Check for full engagement of latch in notch which may become disengaged as a result of tying bail for shipment.



DRUM TORQUE

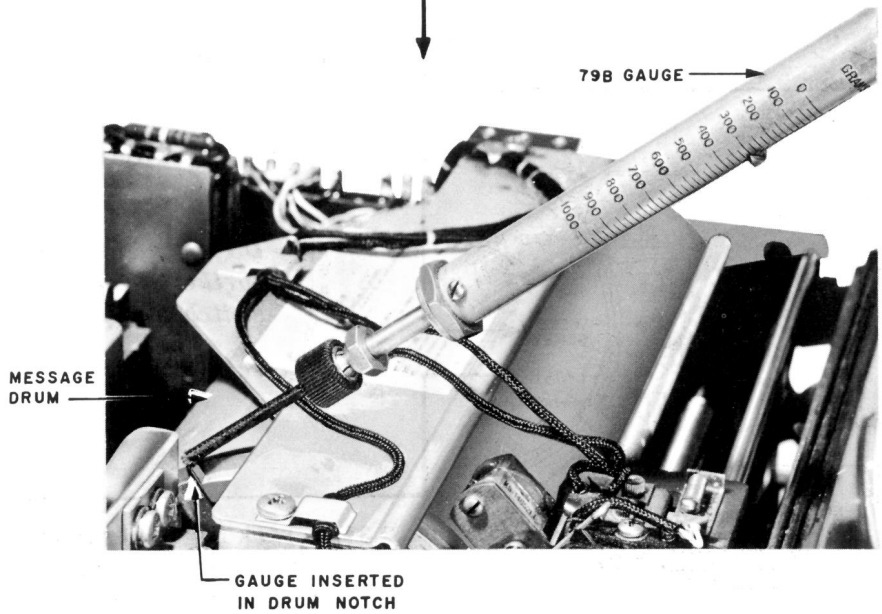
2.32 Operate set to ANNOUNCEMENT CHECK position. Depress the START button. The announcement drum should turn, but message drum should not turn. Message drum latch should hold message drum. Grasp and hold announcement drum. (Do not touch drum surface.) The belts shall not slip.

2.33 The first-stage drive belt shall not rub continuously on the fan hub or tone generator wheel.

2.34 The belts shall not ride more than 0.020 inch beyond edge of large pulleys.

2.35 Insert a 79B gauge in notch on announcement drum and measure torque required to just stall drum. Torque should be between 225 and 325 grams with momentary variations not to exceed 30 grams.

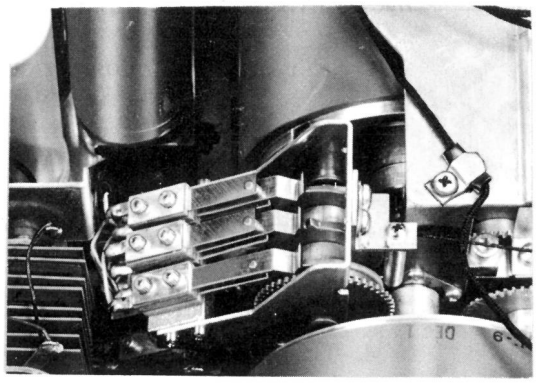
2.36 Index answering set to the MESSAGE PLAYBACK position. Hold the message drum. The belts shall not slip. Insert a 79B gauge in one of the notches of the message drum and measure the torque required to just stall the drum. The belts shall not slip. The torque should be between 225 and 325 grams with momentary variations not to exceed 30 grams. Depress the STOP button.



CAM ACTION

2.37 With the set in the MESSAGE PLAYBACK position, depress the START button and observe:

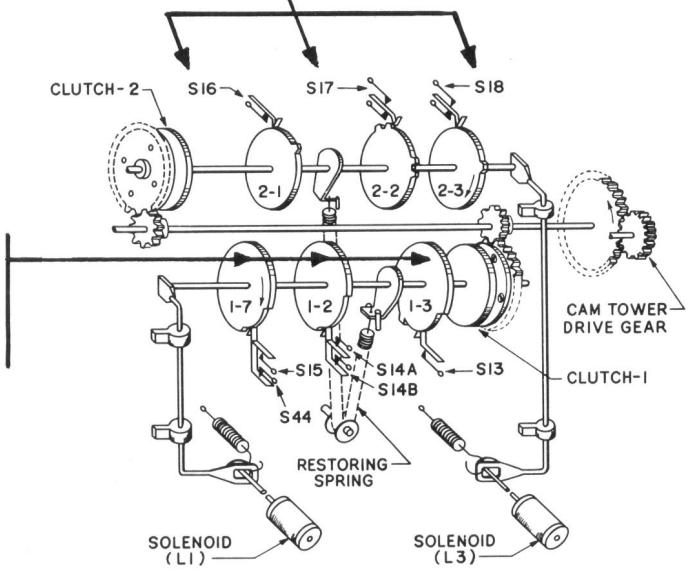
- Action of upper cams. Upper cams should turn without hesitation.



Depress the STOP button and operate the set to ANNOUNCEMENT DICTATE. Depress the START button and observe that:

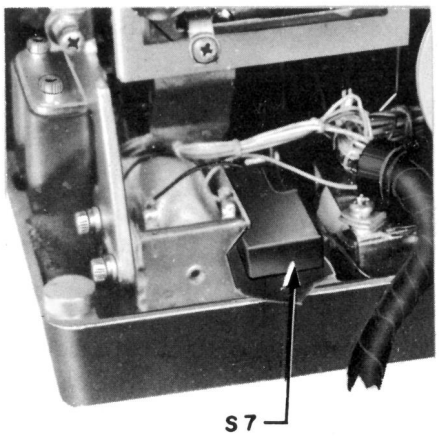
- Dictate lamp lights after erasure takes place.
- Cams rotate without hesitation.

Depress STOP button after about 10 seconds and note that lower cams return to start position without hesitation. Start and stop the set three times at 20-second intervals.



ANNOUNCEMENT DICTATE TIMING

2.38 Depress START button. Observe the time (28 to 32 seconds) that elapses between the lighting of dictate lamp and operation of S7 limit switch. Observe that the dictate lamp flashes before the S7 switch operates. The announcement head shall not run off band.



INCOMING MESSAGE TIMING

2.39 Perform the following steps:

1. Operate set to AUTOMATIC ANSWER.
2. Operate ANSWER & RECORD switch to ANSWER & RECORD.
3. Turn scanning knob completely counterclockwise.
4. Turn indicator dial counterclockwise until ANSWER & RECORD lamp lights.
5. Manually operate *K2* relay, then hold *K7* relay operated.
   - Observe the small drum and note when S7 limit switch operates and large drum begins to turn.
   - Observe the time (28 to 32 seconds) that elapses from time S7 limit switch operates and message drum stops turning.

THERMAL CIRCUIT

2.40 Perform the following steps:

1. Operate set to MESSAGE PLAYBACK.
2. Simultaneously depress START button and manually hold *K6* relay operated.
3. Continue to hold *K6* relay operated until thermal circuit operates to open ac power circuit. Thermal protective circuit should operate as follows:
   - 1B and 1BA sets — between 6 and 40 seconds.
   - 1BA set (circuit breaker CB1) — between 6 and 45 seconds.

PULLEYS AND BELTS

2.41 Remove both belts and clean them on the inside with a cloth moistened with trichloroethylene so that no black discoloration is present. Clean pulleys where belts ride. Reassemble drive belts to their pulleys.

2.42 The first-stage idler pulley tension can be checked as follows:

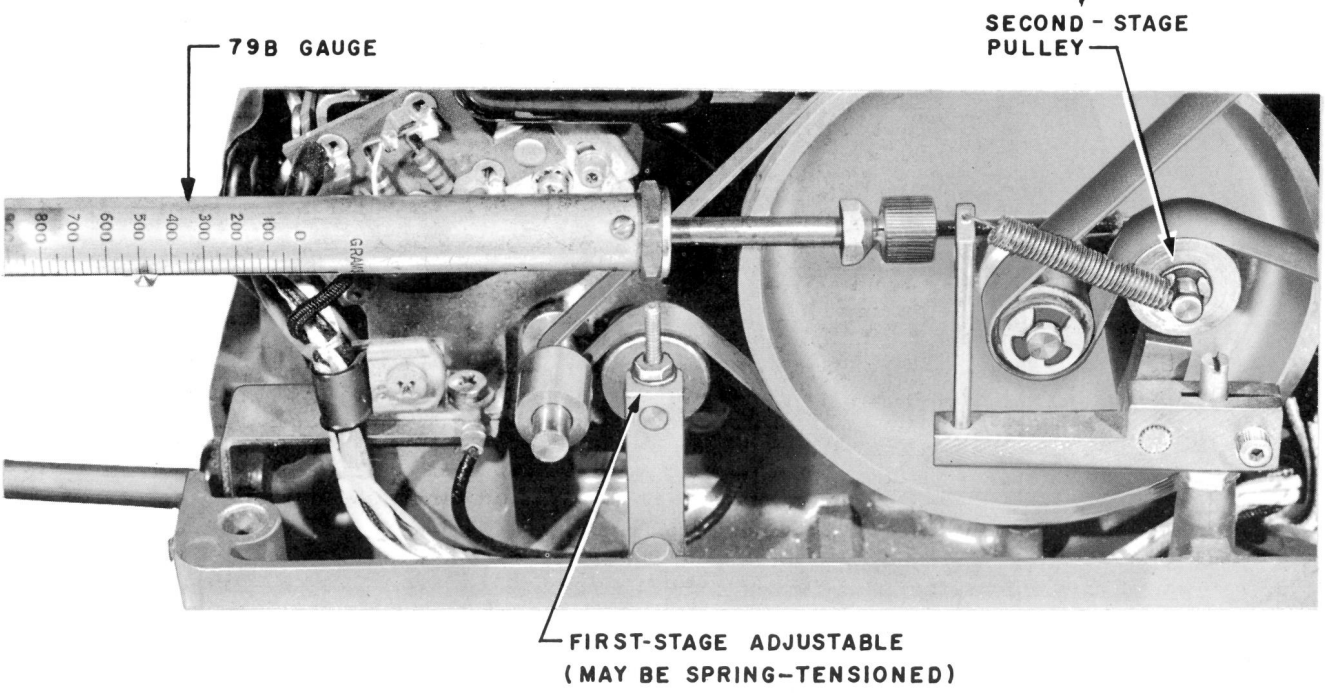
- Insert end of 79B gauge behind shaft of idler pulley and extend gauge until pulley begins to move away from belt.
- Reading on 79B gauge shall be between 200 and 400 grams.

2.43 The second-stage idler pulley tension can be checked as follows:

- Insert end of 79B gauge behind shaft of idler pulley and extend gauge until pulley begins to move away from belt.
- Reading on 79B gauge shall be between 350 and 600 grams.

Measurement is made at the moment visible slippage of the belt on the pulley is observed.

2.44 First-stage drive belt adjustment for unloaded idlers is described in 3.44 in this section.

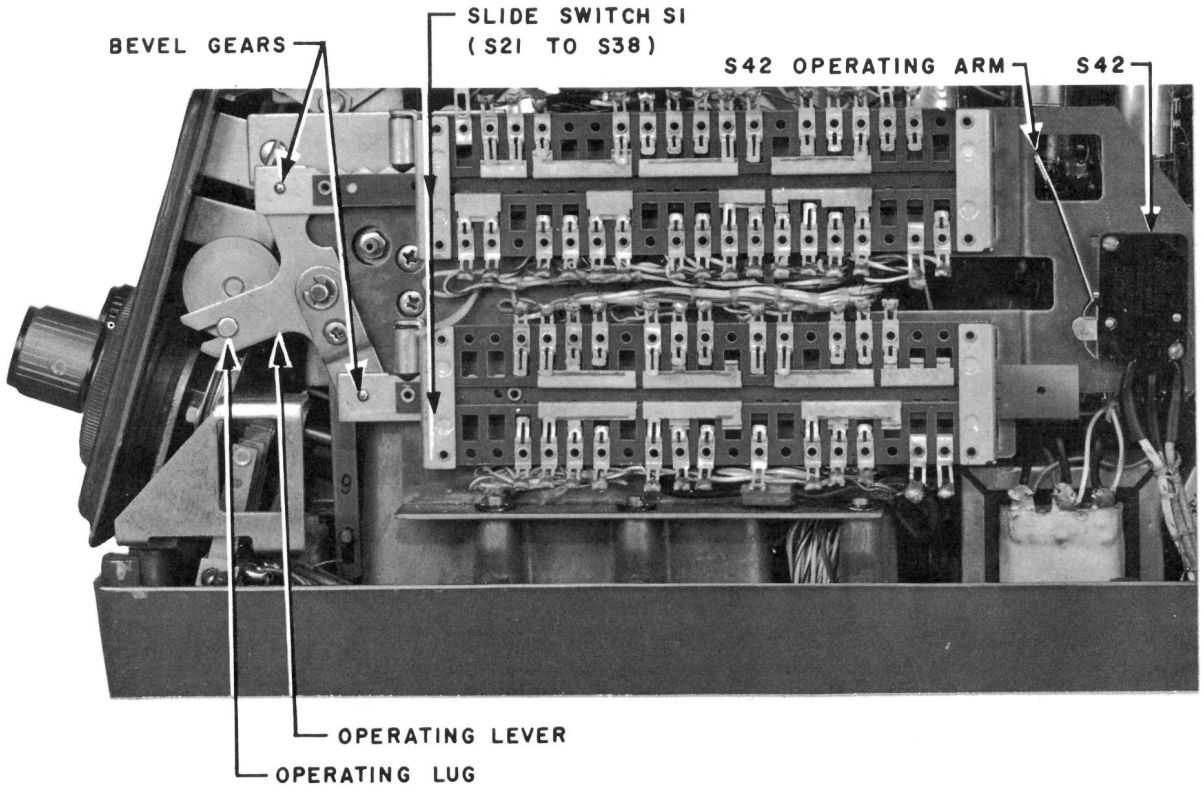


FUNCTION SWITCH S1

2.45 Function switch S1 consists of slide switch S1 and gear details. Operate function-selector knob. Observe that:

- Switch terminals are not bent.
- Switch contacts make properly.
- Bevel gears shall not bind, which may result in poor detent action so that switch contacts are not properly aligned when the function knob is operated.
- The operating lug shall bottom in the slot of switch-operating lever.
- The upper and lower slides shall detent in the same position of the function-selector knob.
- S42 switch shall be operated by upper slide.
- Contact springs have good contact with slides.

Do not clean these contacts.



CONTACT SPRINGS OF SWITCHES

2.46 Check for kinks, flaws, and bends. Check spring pile-ups for looseness. Switch contact springs shall meet the following requirements:

- Contact gap 0.006 inch minimum when open.
- Contact pressure 15 grams minimum when closed.
- Contact follow 0.010 inch minimum.
- Distance between springs not designed to make, or any other metal part, shall be 0.015 inch minimum.
- Point of contact of one contact to fall completely within the area of the opposing contact during period that contacts are made.

1B Sets: ***S39 shall break immediately after S40 when message dial is operated from its extreme counterclockwise position.***

1BA Sets: S40 shall break immediately after S39.

2.47 *Switches S9, S10, and S11* should be closed when the message-selector knob is in the extreme counterclockwise position. Spring of switch S9 shall be in start notch of indicator dial (Requirement 2.07). Rotate message-selector knob to right and note that S9, S10, and S11 open in sequence and that they all have noticeable follow of 0.010 inch minimum. When the selector knob is pushed in and moved clockwise, S9 shall open on the first rise of the cam, S10 shall open after S9 on the first rise of the cam, and S11 shall open on the second rise of the cam.

2.48 *Switches S19 and S20:* When solenoid L1 is operated, the pawl shall open switch S20 and close switch S19. Before the solenoid is operated, the pawl shall be in the notch of the announcement drum, and S19 shall be open, S20 shall be closed.

RELAYS

2.49 Relay contact springs shall meet the following requirements:

- Contact gap 0.005 inch minimum when open.
- Contact pressure 15 grams minimum when closed.
- Contact follow 0.10 inch minimum.
- Contacts shall be aligned so that point of one contact falls wholly within the area of the opposing contacts during the period that the contacts are made.

TONE GENERATOR

2.50 Visually observe that the distance between the tone gear and pole pieces of tone generator is not less than 0.010 inch minimum.

GEARS

2.51 Visually check that all gears are aligned. Gears should mesh so that at least half the width of the gears is engaged.

DIAL CABLES

2.52 The dial cables shall not be so tight as to prevent free movement of the carriage but shall be tight enough to prevent the cable from running off the pulleys.

LAMPS

2.53 Replace K2 lamps with 2T lamps.

TUBES

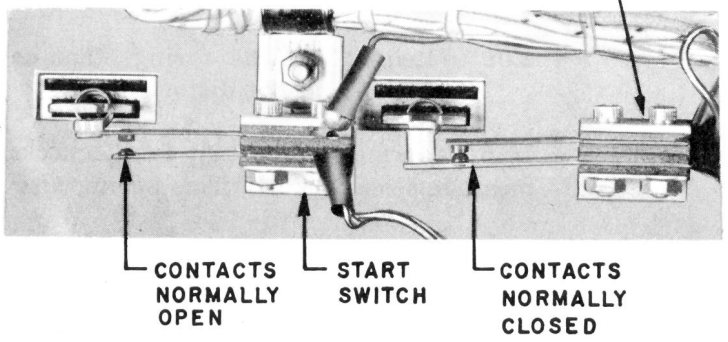
2.54 Whenever testing indicates tubes require replacing, use only known good tubes as replacements, and retest set. A set of known good tubes should be kept on hand for use in locating suspected defective tubes. Defective tubes should be disposed of immediately to prevent possible reuse.

3.00 ADJUSTMENTS

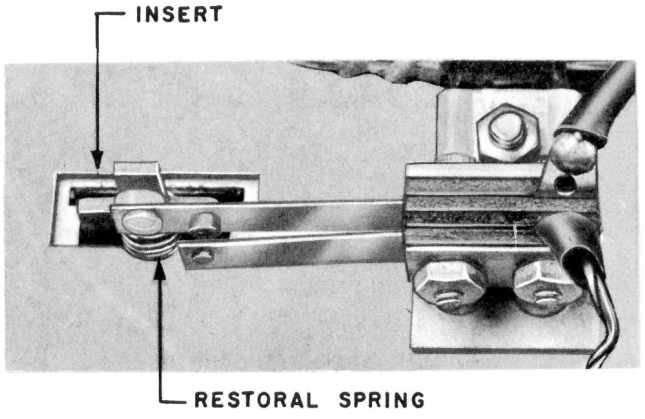
OPERATING CONTROLS

3.01 (Reqt 2.01) With cover fastened to base, the function-selector knob, OFF-ON knob, ANSWER & RECORD—ANSWER ONLY knob, message-indicator dial, and message-selector knob shall all have complete rotational freedom as gauged by eye and feel. If binding is indicated, replace set.

3.02 (Reqt 2.02) The STOP switch must break when STOP button is depressed. If necessary, readjust springs for 0.010 to 0.015 follow. START switch must make when START button is depressed. If necessary, adjust springs to provide 0.015 to 0.030 clearance between contacts when START button is released. Inspect restoral springs and inserts for proper positions. If above requirements cannot be met, replace set.

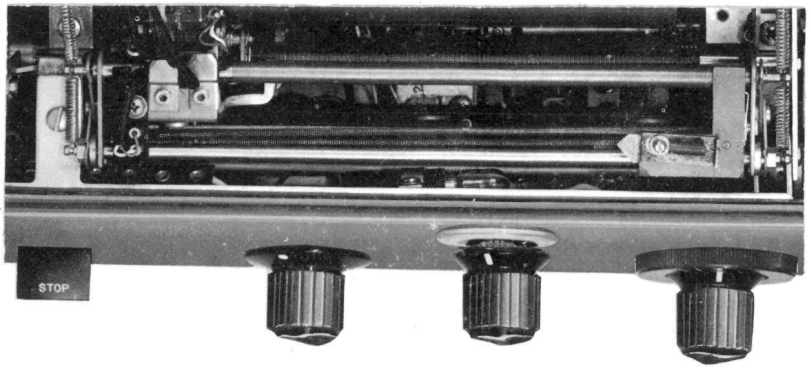


3.03 (Reqt 2.03) When START and STOP buttons are depressed, they shall return promptly to their horizontal positions. Inspect restoral springs and inserts for proper positions. If buttons cannot be positioned properly, replace set.



3.04 (Reqt 2.04) If the message-indicator dial does not properly index in the detent, the pulley cable shall be readjusted as described in 3.52.

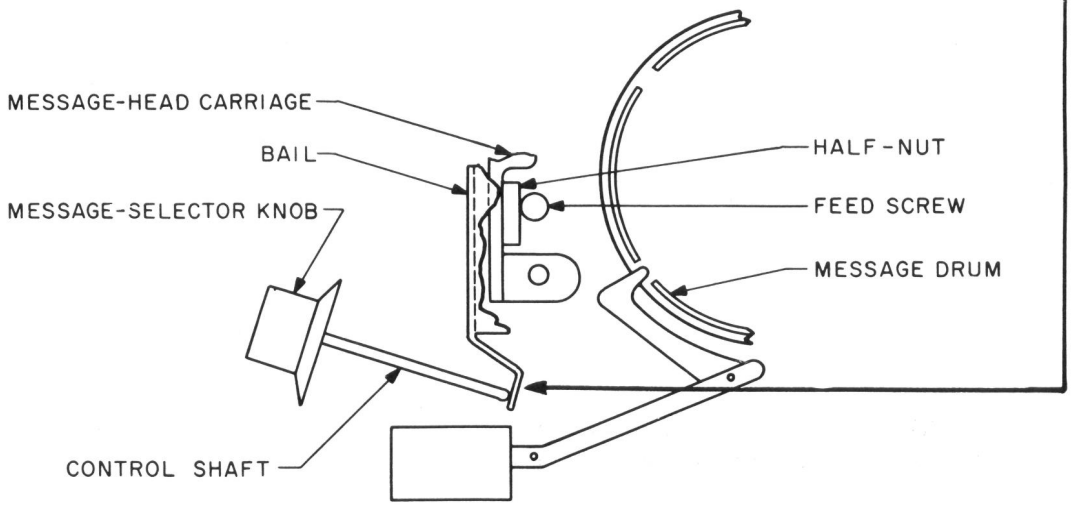
3.05 (Reqt 2.05) Check for binding or bent shaft. If condition cannot be corrected, replace set.



3.06 (Reqt 2.06) The springs that cause the bail to return should be present and not distorted.

If bail springs are not at fault, check the spring washer located under message-selector knob. This spring also controls indicator-dial torque.

The message-bail tail should clear end of carriage-control shaft so that entire length of message drum can be scanned without half-nut scraping feed screw when knob is depressed, and head moves from one end of drum to the other when knob is turned.



MESSAGE SELECTOR AND DIAL ASSEMBLY

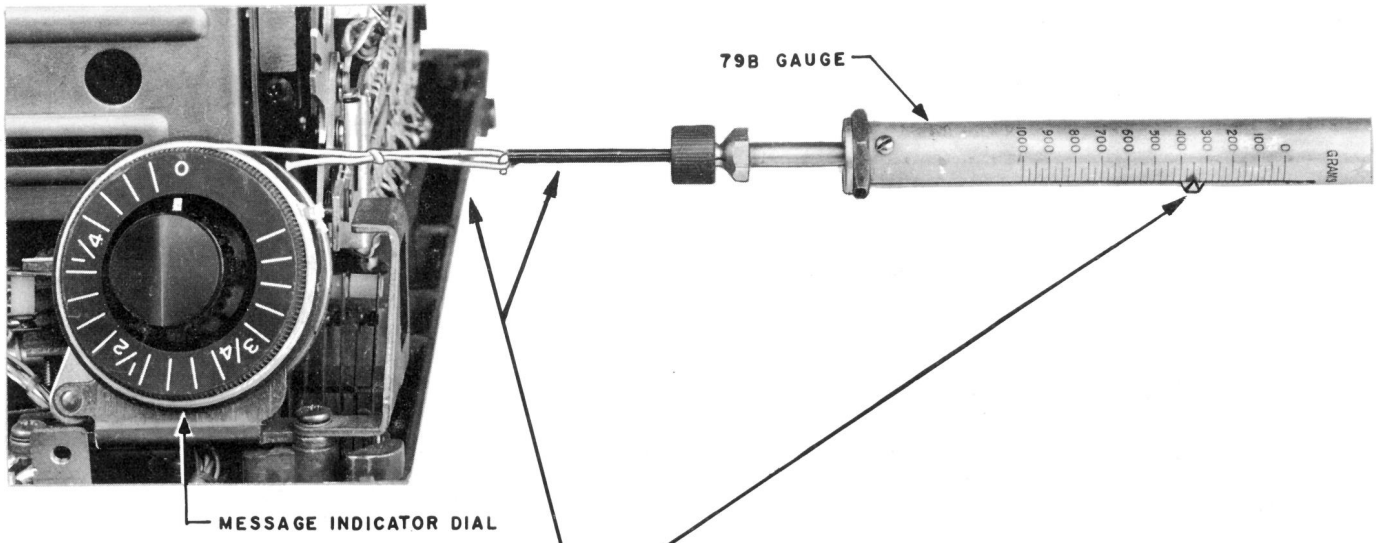
3.07 (Reqt 2.07)

3.08 (Reqt 2.08)

3.09 (Reqt 2.09)

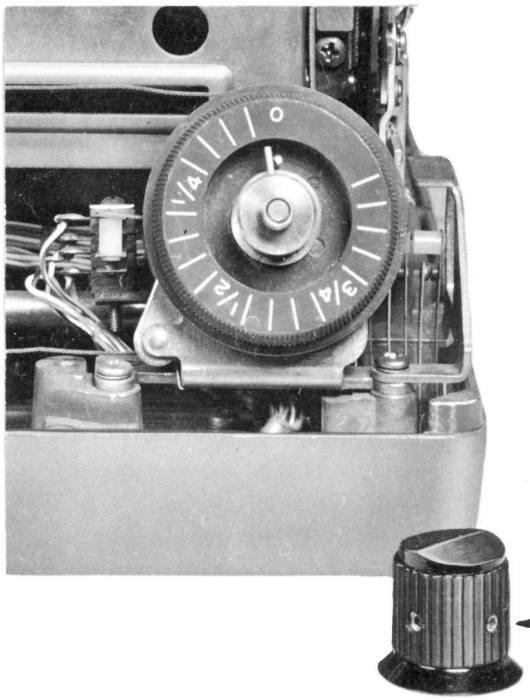
3.10 (Reqt 2.10)

3.11 (Reqt 2.11)



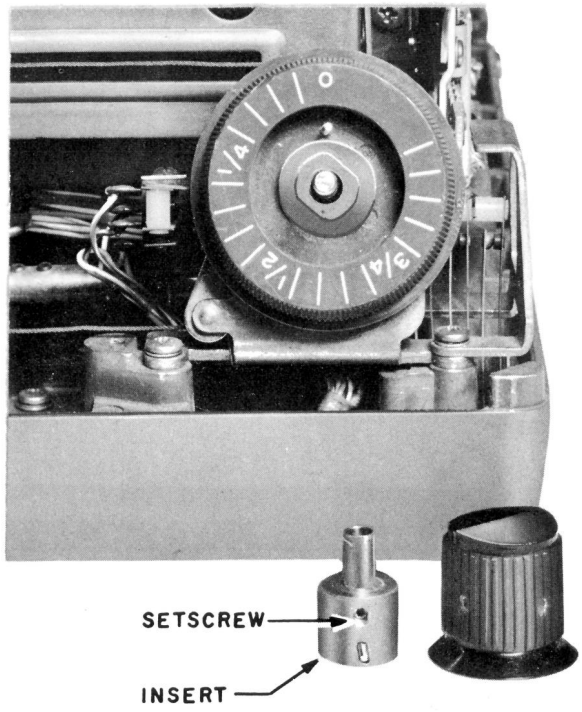
The amount of torque required to rotate the message-indicator dial should be 170 grams minimum and 400 grams maximum.

Tie a piece of cord around dial. Wrap several times. Keep cord taut without allowing message dial to turn. Measure with 79B gauge.

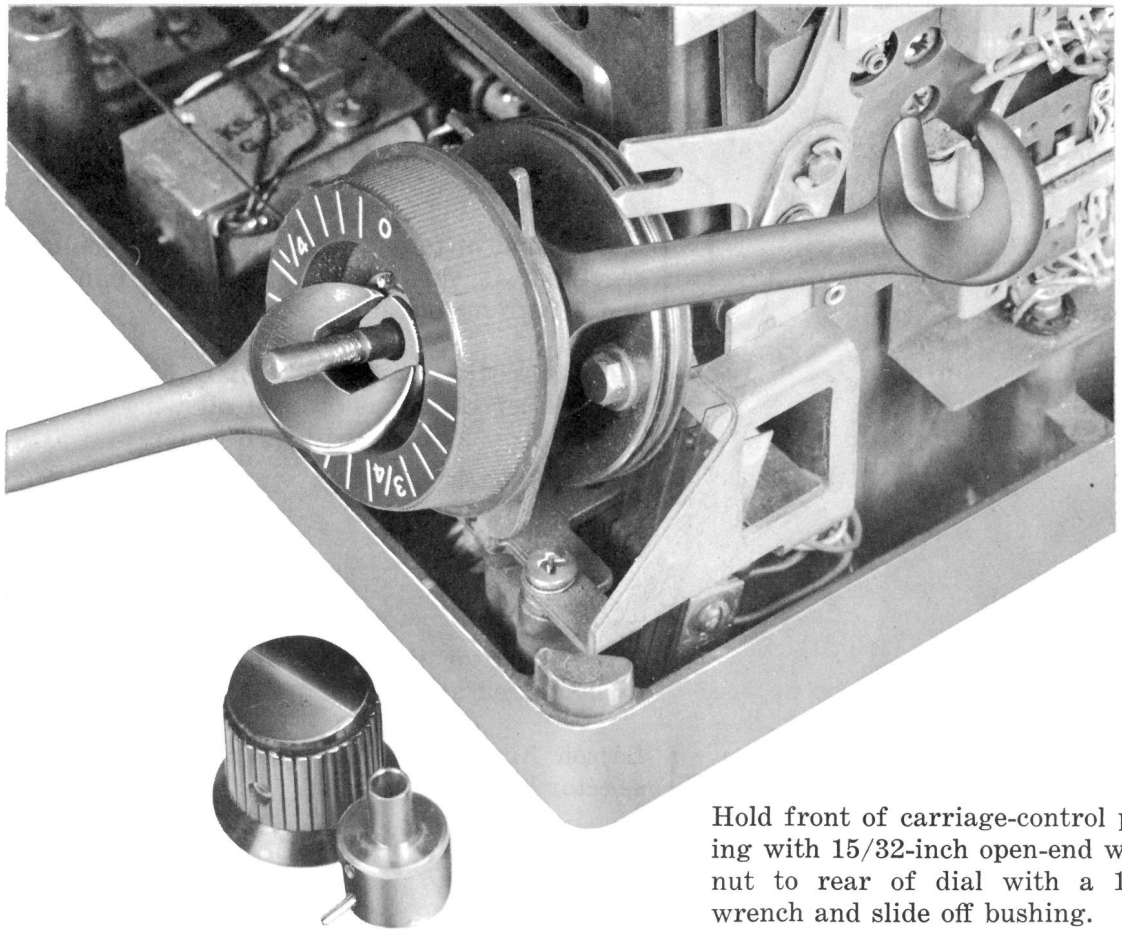


If the indicator dial moves with an unsteady motion, proceed as follows:

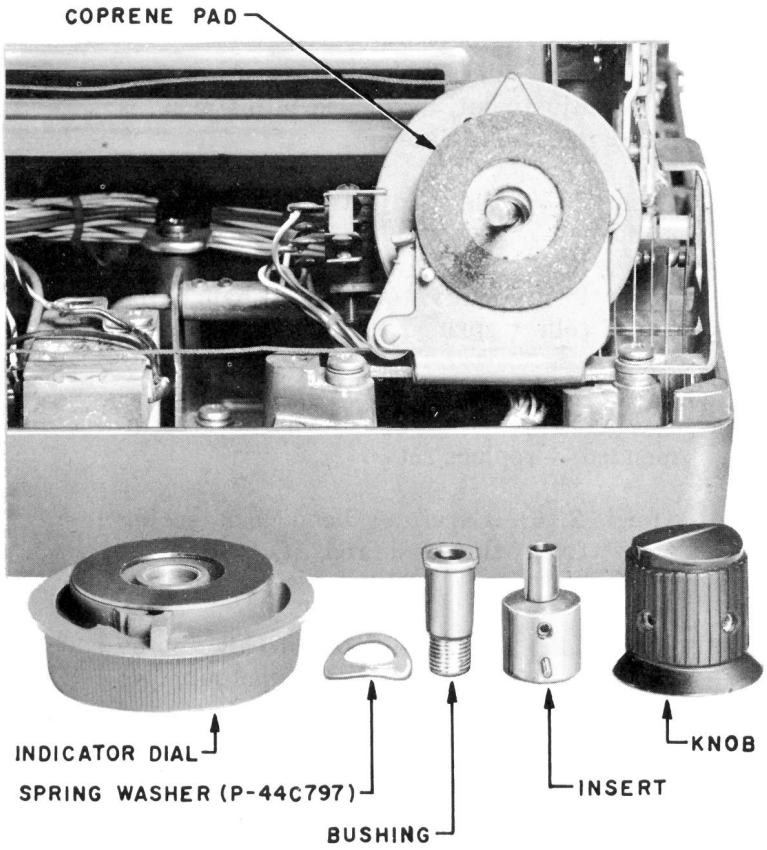
Loosen Allen key socket setscrews on message-selector knob and slide off.



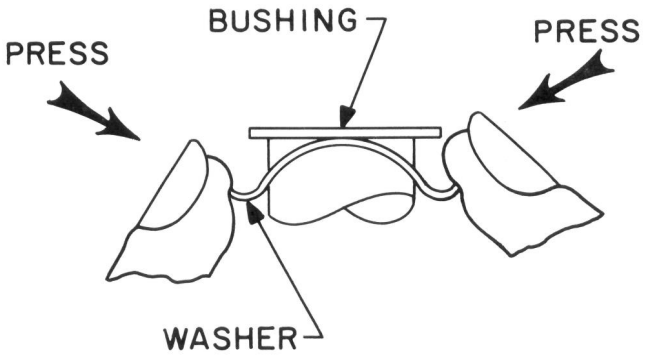
Loosen Allen key socket setscrews on message-selector knob insert and slide off.



Hold front of carriage-control pulley shaft bushing with 15/32-inch open-end wrench; loosen hex nut to rear of dial with a 1/2-inch open-end wrench and slide off bushing.

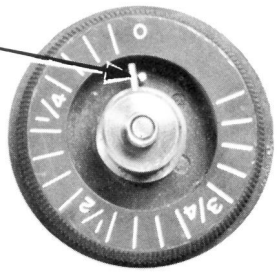


Remove bushing, spring washer, and indicator dial. Apply a light coating of KS-14774, L1 lubrication grease, or equivalent, to face of coprene friction clutch pad.



The spring washer can be bent to increase torque or straightened slightly to decrease torque. The spring washer also restores the message-selector knob positively to its normal position when pushed in and released. If washer appears faulty, replace set.

Reassemble parts, taking care that the pin in dial knob insert is to the left of the dial pin.



Check for proper operation of switches S39 and S40.

Check that the riser of switch S9 is in the start notch of the cam when these switches are operated.

MESSAGE-BAIL CARRIAGE AND HEAD

3.12 (Reqt 2.12) With the exception of carriage cable adjustment, 3.52, field adjustment is not recommended — replace set.

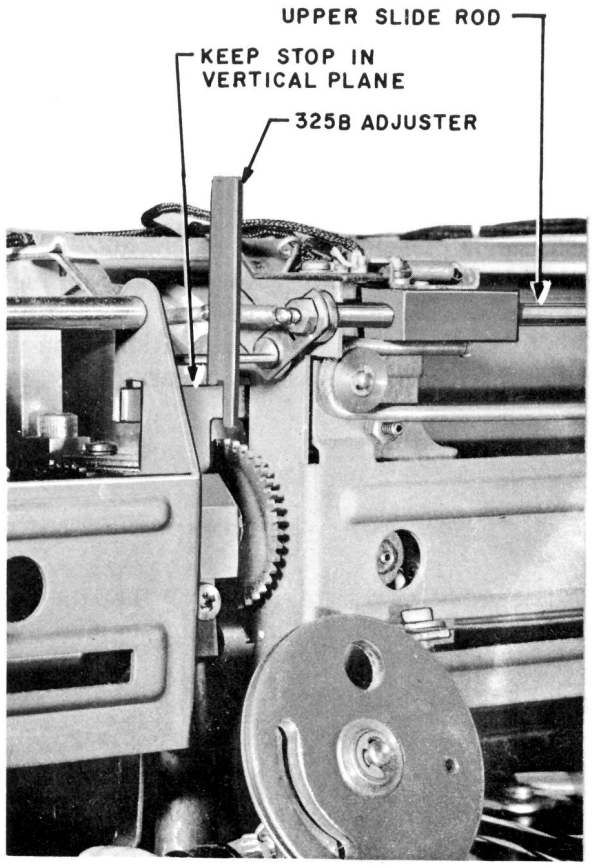
3.13 (Reqt 2.13) Field adjustment not recommended — replace set.

3.14 (Reqt 2.14) Bail return latch shall be on top of roller; spring attached to latch shall not be loose.

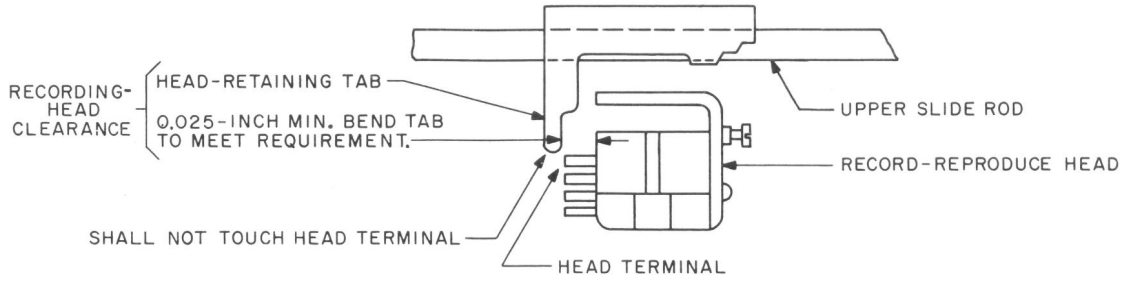
3.15 (Reqt 2.15) Field adjustment not recommended — replace set.

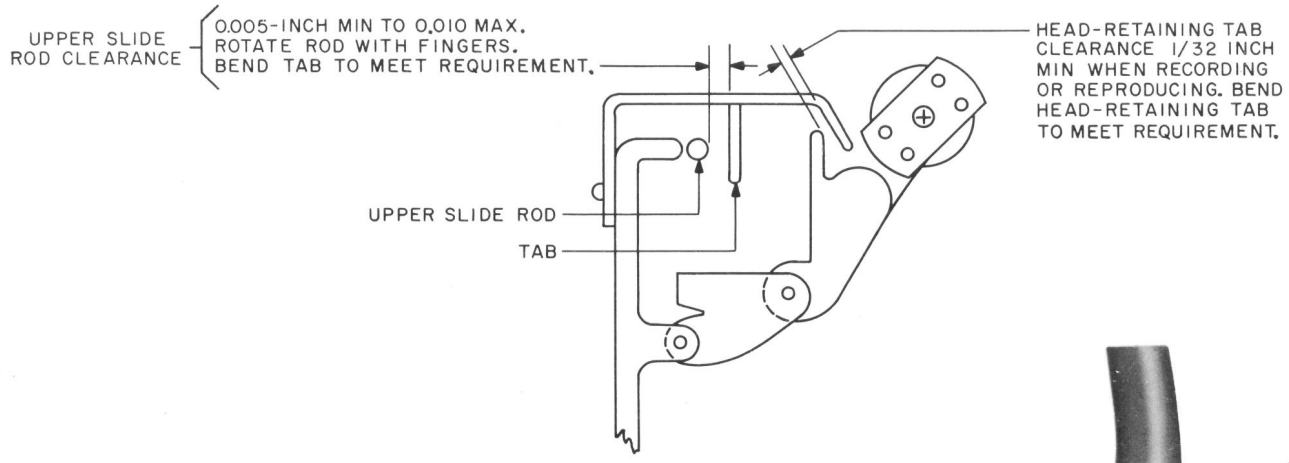
3.16 (Reqt 2.16) Carefully bend lock spring away from threaded rod if binding is present.

3.17 (Reqt 2.17) Adjust position of bail stop by bending, if necessary, the ear that supports the message bail. After adjustment, the upper slide rod shall be parallel with the feed screw to within 0.010 inch. Gauge by eye.

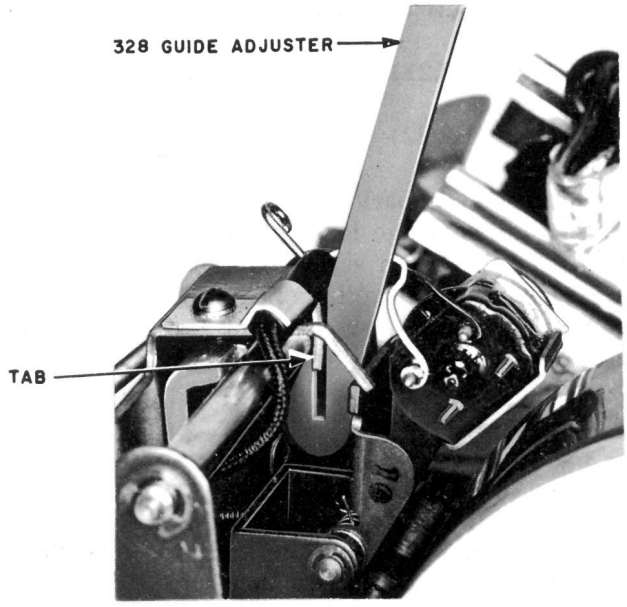


3.17 (Cont)
With message bail against its stop, make adjustments as shown here:

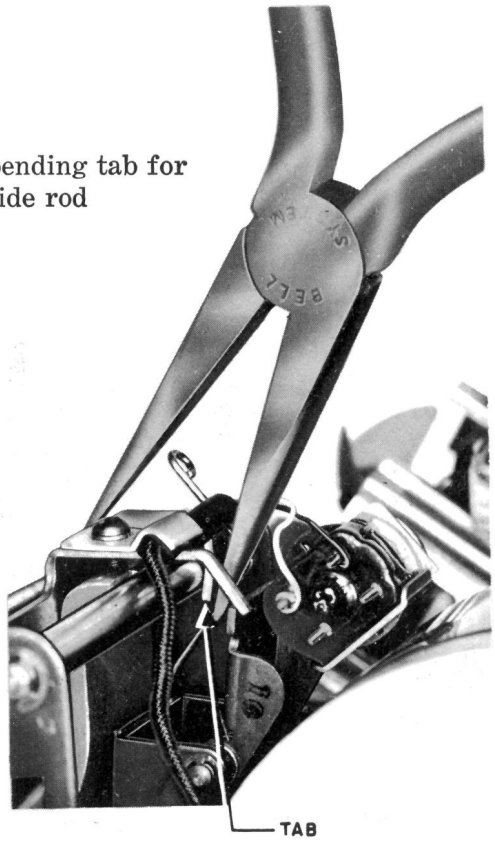




Method of bending tab for maximum slide rod clearance:



Method of bending tab for minimum slide rod clearance:

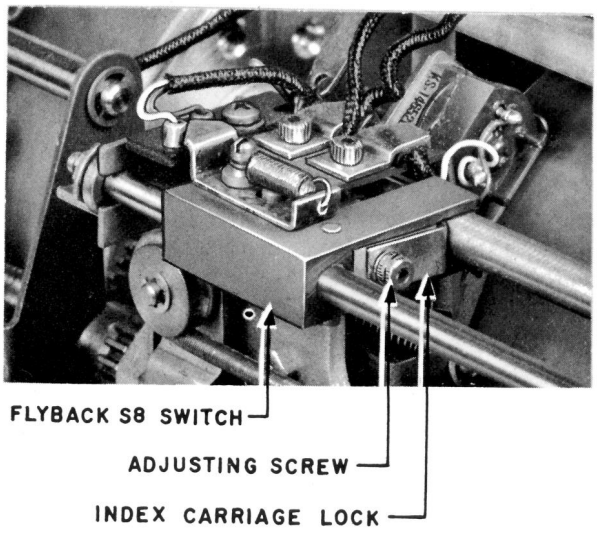


3.18 (Reqt 2.18) Whenever the recording-head pressure on the band is too high (above 43 grams) or too low (below 28 grams), check that head has free movement. Tab on carriage or leads to head may be preventing head from contacting drum. If condition cannot be corrected, replace set.

3.19 (Reqt 2.19) Field adjustment not recommended — replace set.

3.20 (Reqt 2.20) Place a narrow strip of Carborundum No. 4/0 emery polishing paper between head and drum. Apply light pressure to head and pull strip of polishing paper past head until strip is withdrawn so surface of head that ordinarily contacts drum is polished by paper. Repeat this operation ten times.

Re-examine gap area of head, using dental mirror. Lap again if scars and irregularities are still pronounced enough to interfere with recording. If condition does not improve or if face of head is worn to length of 7/32 inch or more, replace set.



FLYBACK SWITCH (S8) AND SLIDE BAR

3.21 (Reqt 2.21)

3.22 (Reqt 2.22)

To adjust S8 flyback switch, loosen screw and move index carriage lock toward rear. If switch creeps, then tighten screw. If tension is greater than 150 grams, move index carriage lock toward front and tighten screw. Recheck for creeping and tension.

3.23 (Reqt 2.23)

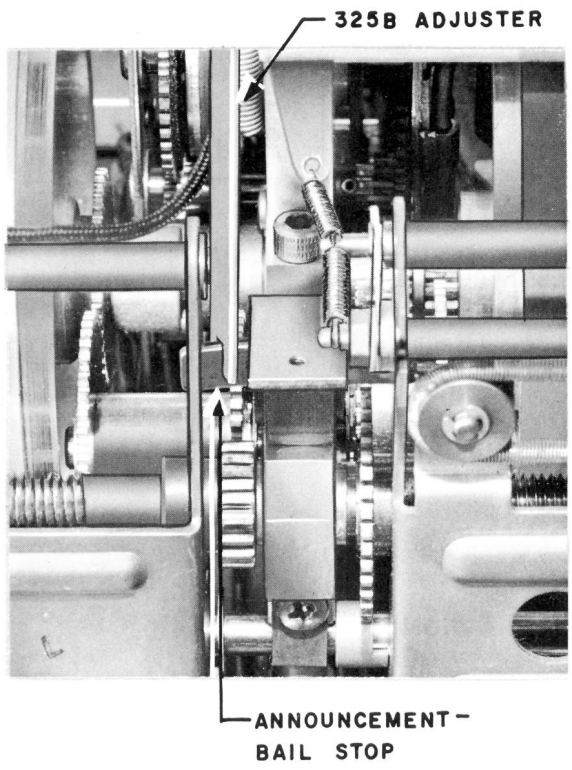
3.24 (Reqt 2.24)

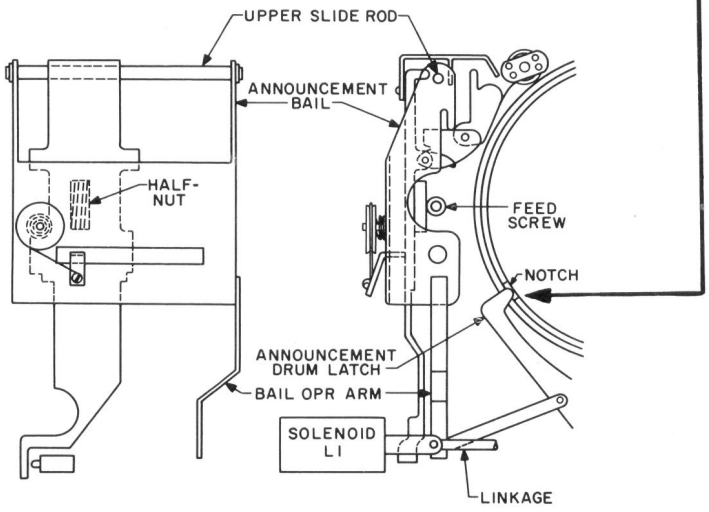
If visual inspection for binding and wire dress does not correct trouble, replace set.

ANNOUNCEMENT-BAIL CARRIAGE AND HEAD

3.25 (Reqt 2.25) With announcement drum latch resting on surface of drum, the linkage must be such that operation of the solenoid will bring the bail into operating position against the bail stop and allow it to fall freely away from stop when the solenoid is de-energized.

Adjust bail stop so that latch is disengaged from notch in drum to start announcement cycle.





Announcement head and upper slide rod adjustments are the same as those for message head in 3.17.

3.26 (Reqt 2.26) Field adjustment not recommended — replace set.

3.27 (Reqt 2.27) Carefully bend lock spring away from threaded rod if binding is present.

3.28 (Reqt 2.28) Field adjustment not recommended — replace set.

3.29 (Reqt 2.29) Field adjustment not recommended — replace set.

3.30 (Reqt 2.30) Field adjustment not recommended — replace set.

3.31 (Reqt 2.31) Reposition latch. Refer to 3.25.

DRUM TORQUE

3.32 (Reqt 2.32)

3.33 (Reqt 2.33)

3.34 (Reqt 2.34)

3.35 (Reqt 2.35)

3.36 (Reqt 2.36)

Field adjustment not recommended — replace set.

CAM ACTION

3.37 (Reqt 2.37) Field adjustment not recommended — replace set.

ANNOUNCEMENT DICTATE TIMING

3.38 (Reqt 2.28) The time between the first make of S13 (cam tower) and the break of the normally made contacts of S7 at the limit of travel of S7 shall be 28 seconds minimum and 32 seconds maximum. If elapsed time is more than 32 seconds, check for clutch or belt slippage. If slippage is not present, reset limit switch stop.

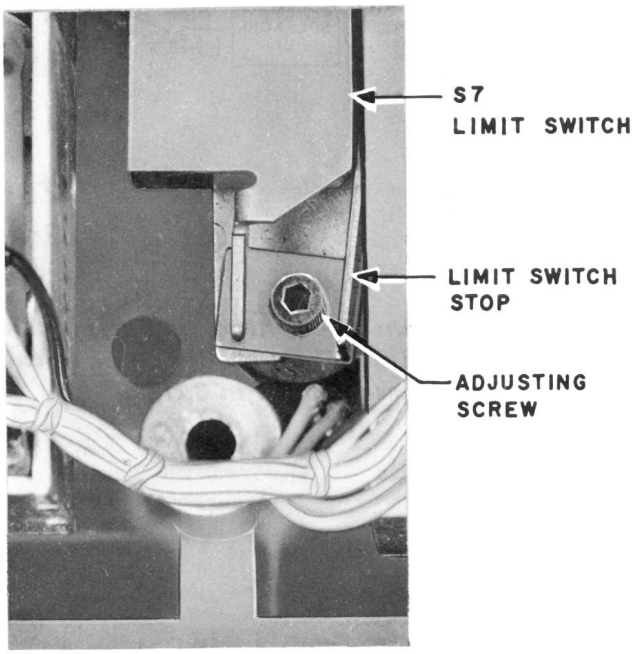
If time is less than 28 seconds, check that limit switch hits stop. If it does, reset the stop.

INCOMING MESSAGE TIMING

3.39 (Reqt 2.39) The time between the make of the normally open contacts of S7 and the break of S16 (of cam 2-1) shall be 2.8 seconds minimum and 32 seconds maximum.

THERMAL CIRCUIT

3.40 (Reqt 2.40) Field adjustment not recommended — replace set.



PULLEYS AND BELTS

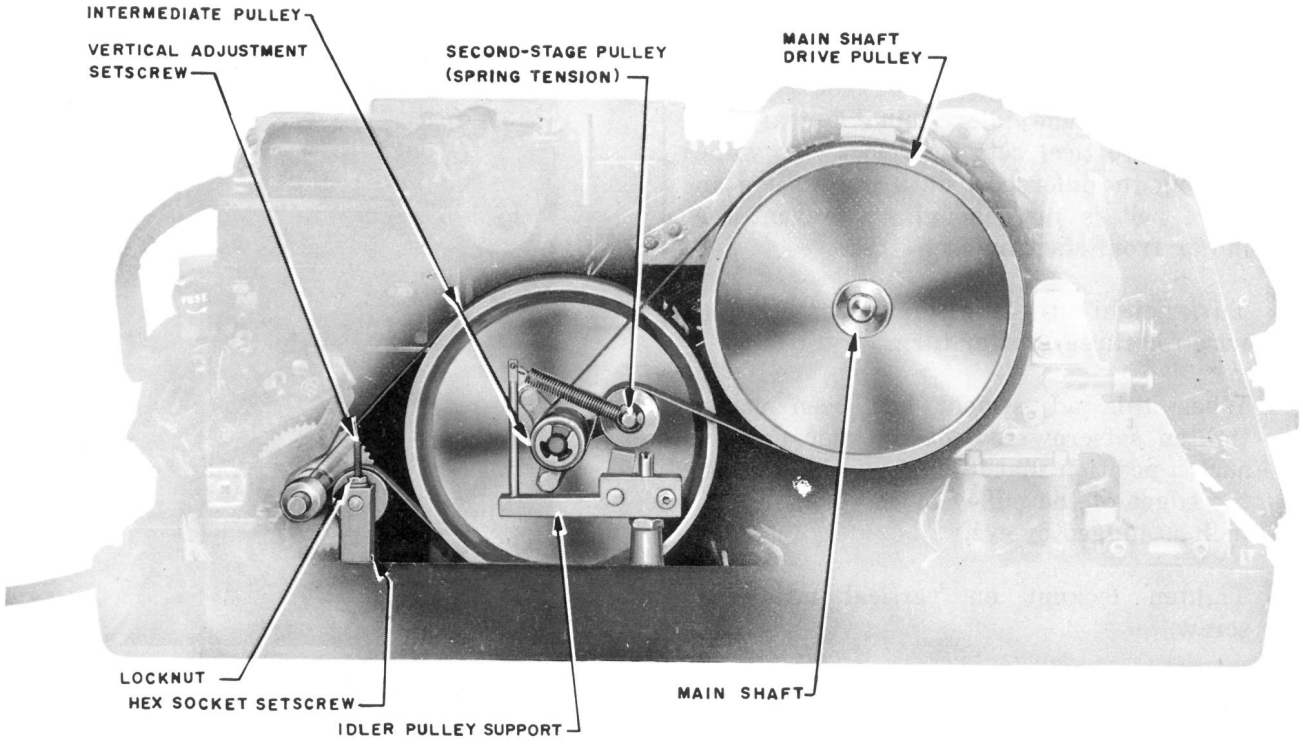
3.41 (Reqt 2.41)

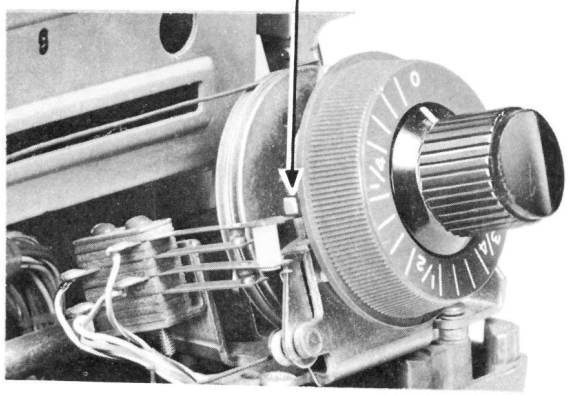
3.42 (Reqt 2.42)

3.43 (Reqt 2.43)

Belt adjustment of spring-loaded idlers. If pressure is out of limits, loosen Allen screw and proceed as follows:

- Move spring assembly upward to increase tension and downward to decrease tension. Remeasure.
- Hold pulley assembly.
- Push START button.
- Turn idler-pulley assembly clockwise or counterclockwise so as to keep the belt riding on the idler pulley. Belt shall not overlap pulley by more than 0.020 inch.
- Do not raise or lower the idler-pulley assembly.
- Tighten idler setscrew in idler-pulley assembly.
- If intermediate pulley squeaks or rattles, check if pulley is touching base. If pulley is clear of base and noise persists, replace set.
- Push STOP button.





3.44 (Reqt 2.44) First-stage drive-belt adjustment for unloaded idlers is as follows:

- Turn function-selector knob to MESSAGE PLAYBACK.
- Turn set on. Depress START button.
- With motor turning, loosen Allen setscrew in side of first-stage idler pulley post while holding post.
- Loosen locknut on vertical setscrew.
- Move first-stage idler pulley upward by turning vertical setscrew clockwise while holding the idler post until the tension on drive belt is just enough to prevent the motor from starting.
- Turn height-adjusting screw counterclockwise for three-quarter turn.
- When this adjustment has been made, tighten setscrew in side of idler post in such a position that it does not ride beyond the edges of the pulley by more than 3/16 inch as judged by eye.
- Tighten locknut on vertical adjusting screw.
- Push STOP button.

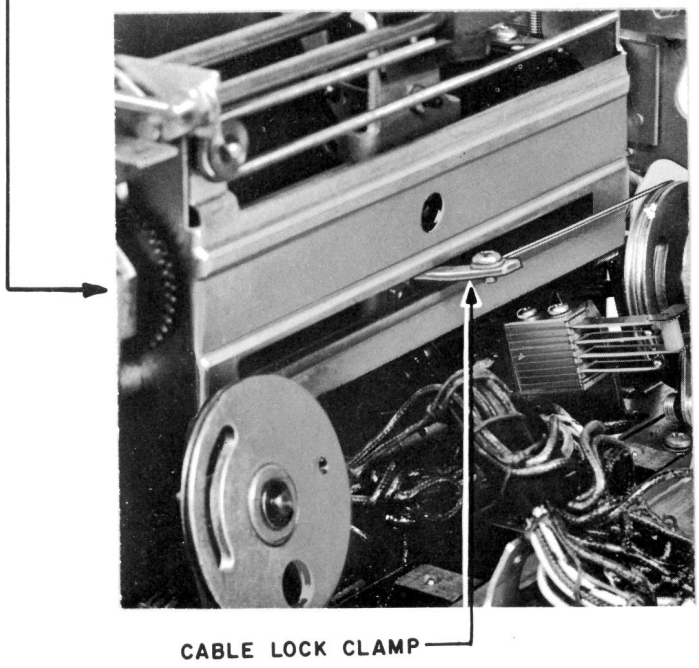
FUNCTION SWITCH S1

3.45 (Reqt 2.45) Field adjustment not recommended — replace set.

CONTACT SPRINGS OF SWITCHES

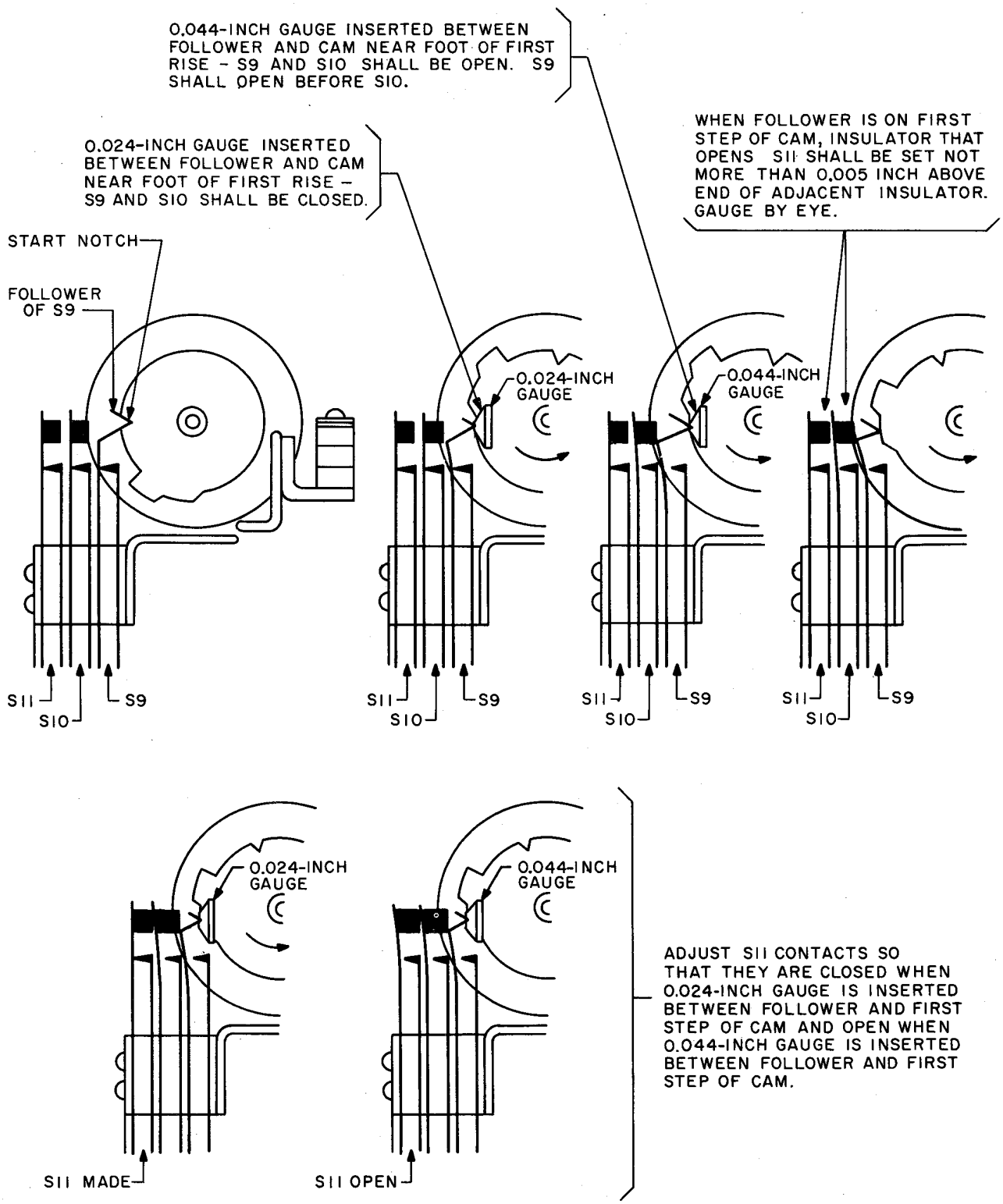
3.46 (Reqt 2.46) On 1B sets that have been modified to prevent erasure of short first message and on 1BA sets, S40 shall break immediately after S39.

If switches S9, S10, and S11 are not operated by the cam, loosen cable lock clamp and position follower spring on second rise of cam.



3.46 (Cont)

Adjust switches S9, S10, and S11 as follows:



3.47 (Reqt 2.47) Switches S9, S10, and S11 shall be adjusted to meet the following requirements:

- With message-indicator knob in counterclockwise position, all three sets of contacts shall be closed with minimum follow of 0.010 inch.
- Follower spring shall be either in contact with or not more than 0.005 inch above cam surface at foot of first rise (gauge by eye).
- First and second set of contacts (counting from follower) shall open in that sequence on first rise of cam.
- Between first and second rises of cam, first and second sets of contacts shall meet requirements of minimum gap, and third set shall meet minimum follow requirements.
- Third set of contacts shall open on second rise of cam.
- Contacts when made shall have a minimum follow at contacts of 0.010 inch and, when open, a minimum gap of 0.006 inch.

3.48 (Reqt 2.48) Field adjustment not recommended — replace set.

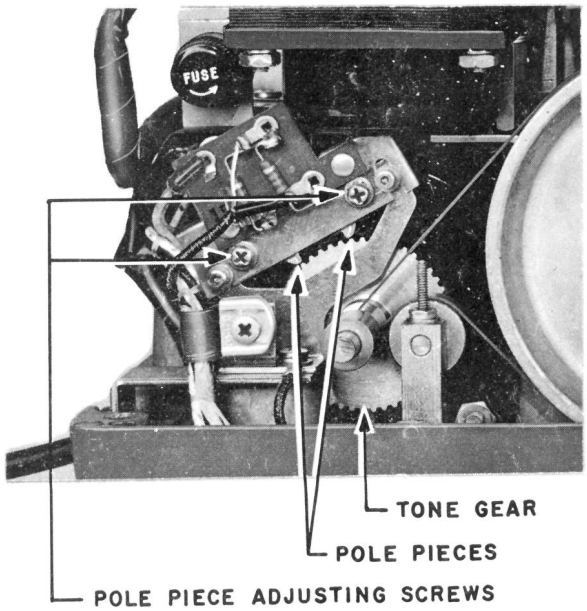
RELAYS

3.49 (Reqt 2.49) Refer to Bell System Plant 022 Series entitled Cleaning and Reconditioning Relay Contacts. Individual relay electrical and mechanical requirements can be found in the circuit requirement tables. The ***K1*** relay (U200) in 1B answering sets shall be adjusted to meet the following requirements:

- Readjust operate current, 12.1 ma.
- Test operate current, 12.8 ma.
- With a 32 gauge inserted between armature and core, **8T** and **9T** shall make and **2T** and **3T** shall not break. No-make requirements on contacts **8T** and **9T** and minimum clearance requirements on springs 8T and 9T are waived.

TONE GENERATOR

3.50 (Reqt 2.50) If changing the tone amplifier tube does not increase the output of the tone generator when it is adjusted to within 0.010 inch of the tone gear, replace set.

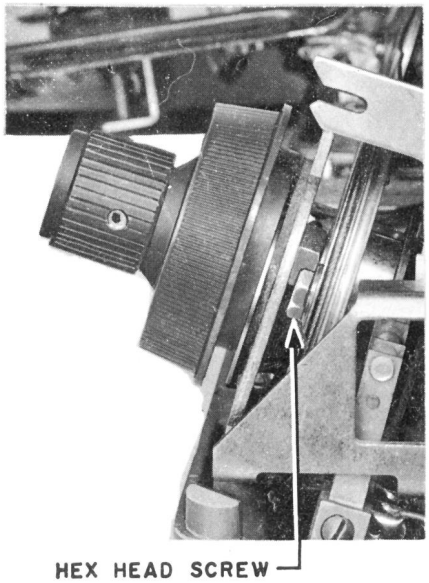


GEARS

3.51 (Reqt 2.51) Field adjustment not recommended — replace set.

DIAL CABLES

3.52 (Reqt 2.52) To tighten a loose cable, loosen hexagon head screw on pulley behind message-indicator dial and turn two pulleys in opposite directions to take up slack in dial cable. Hold pulleys in desired position and tighten hexagon head screw.



LAMPS

3.53 (Reqt 2.53) 1B set — 2T lamps
1BA set — 1847 lamps.

TUBES

3.54 (Reqt 2.54) 1B set — 1BA set.

- V1 — CK512AX amplifier
- V2 — CK512AX amplifier
- V3 — 3V4 amplifier
- V4 — 3V4 AVC amplifier
- V5 — 3V4 bias oscillator
- V6 — 3V4 tone amplifier.