

KS-16923 LIST 1 TELEPHONE ANSWERING SET MECHANICAL ADJUSTMENTS AND MAINTENANCE

1. GENERAL

1.01 This section is reissued to:

- (a) Revise format of text.
- (b) Add information on replacement of list 5 recorder.
- (c) Add information on replacement of belts.
- (d) Add information on installation of KS-16923, List 11 recording tape.
- (e) Add information on brake requirements and adjustments.
- (f) Add alignment adjustment of oscillator, amplifier, and voice-control circuits.
- (g) Add information on record and erase heads.
- (h) Add piece part information (Table A).
- (i) Add operational procedures (Flow Chart).

1.02 The KS-16923, List 1 telephone answering set (Fig. 1) has been designed to facilitate maintenance by the use of plug-in assemblies. Replacement of these plug-in assemblies may require

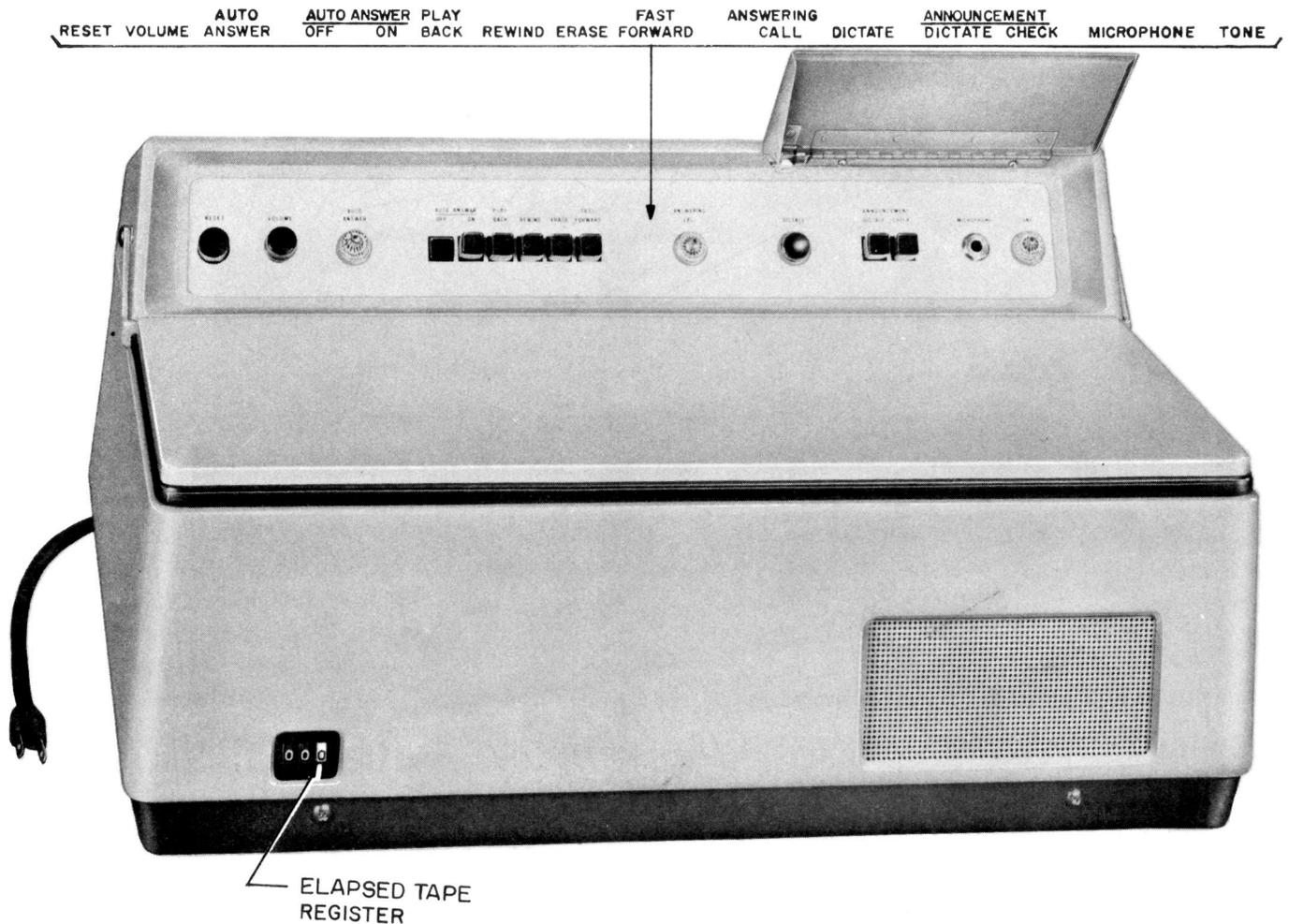


Fig. 1 — KS-16923, List 1 Telephone Answering Set (Showing Controls)

readjustments of various electrical adjustments for alignment of the oscillator, amplifier, and voice control circuits. These procedures are covered in 11.

1.03 It is intended that CD- and SD-95295-01 be used with this section.

THINK *Unless otherwise specified, remove power cord when operating set with cover or outer enclosure removed. Exercise extreme caution when power is not removed since hazardous voltages will be present on exposed terminals.*

1.04 Refer to Flow Chart for probable cause and corrective action of a trouble report. Table A lists maintenance parts.

2. REPLACEMENT OF PLUG-IN UNITS

2.01 KS-16923, List 5 recorder (Fig. 2)

- (1) Insert power cord into ac outlet and rewind list 11 recording tape onto supply reel.
- (2) Remove power cord.
- (3) Remove supply and take up reels.
- (4) Remove list 10 announcement cartridge.
- (5) Remove cover.
 - Remove six screws, two in front and two on each end.

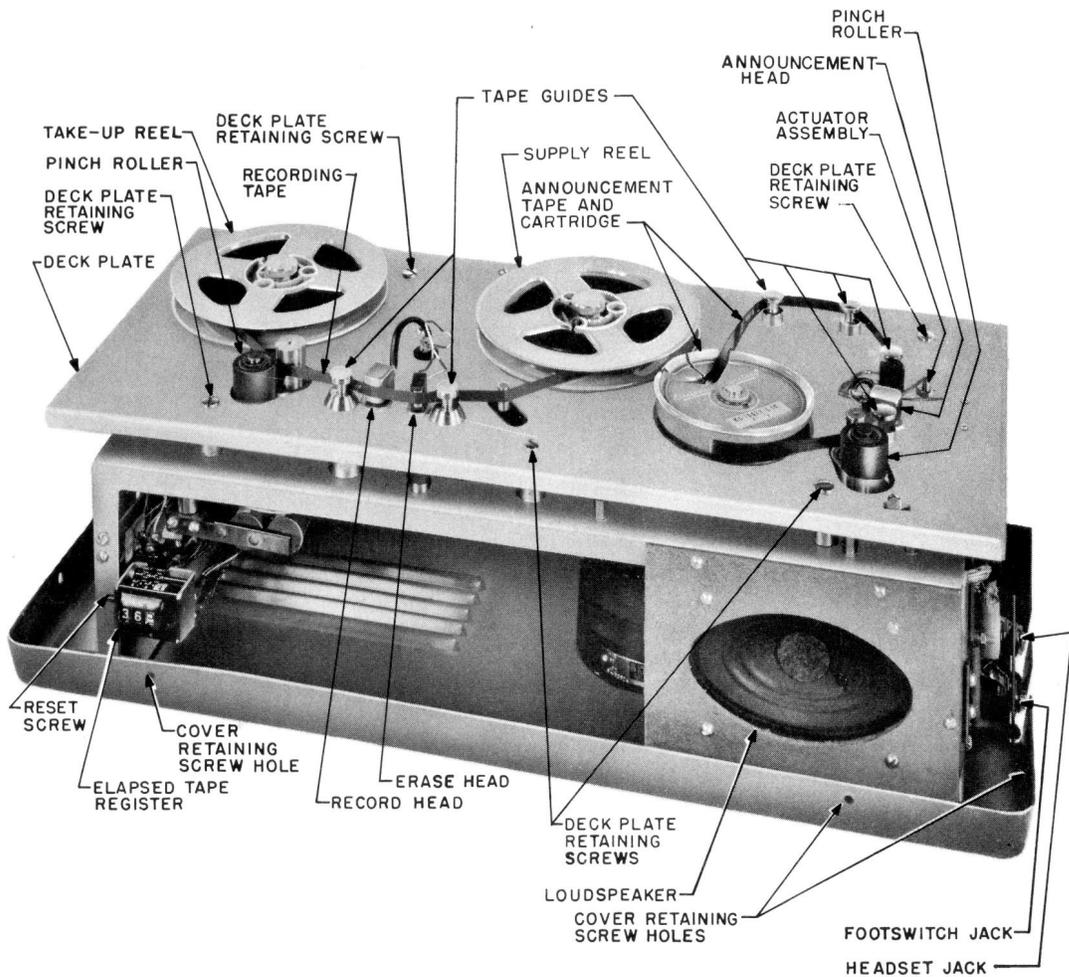


Fig. 2—KS-16923, List 5 Recorder (Assembled to Bottom Pan)

- (6) Remove list 5 recorder.
 - Remove four retaining screws located on bottom of answering set.
 - Lift recorder from bottom pan.
 - Disconnect list 5 recorder connecting plug from its plug-in receptacle.
- (7) Install new list 5 recorder.
 - Insert connecting plug into its plug-in receptacle.
 - Insert recorder onto bottom pan and secure with four retaining screws.
- (8) Install list 10 announcement cartridge. (Refer to 4.)

- (9) Install list 11 recording tape. (Refer to 5.)
- (10) Check alignment of the oscillator, amplifiers, and voice control circuits as described in 11.
- (11) Replace cover.

3. REPLACEMENT OF KS-16923, LIST 4 OSCILLATOR, KS-16923, LIST 3, AND LIST 12 AMPLIFIERS (FIG. 3)



Do not remove or insert printed cards with power on. Failure to observe this precaution may damage electronic circuitry.

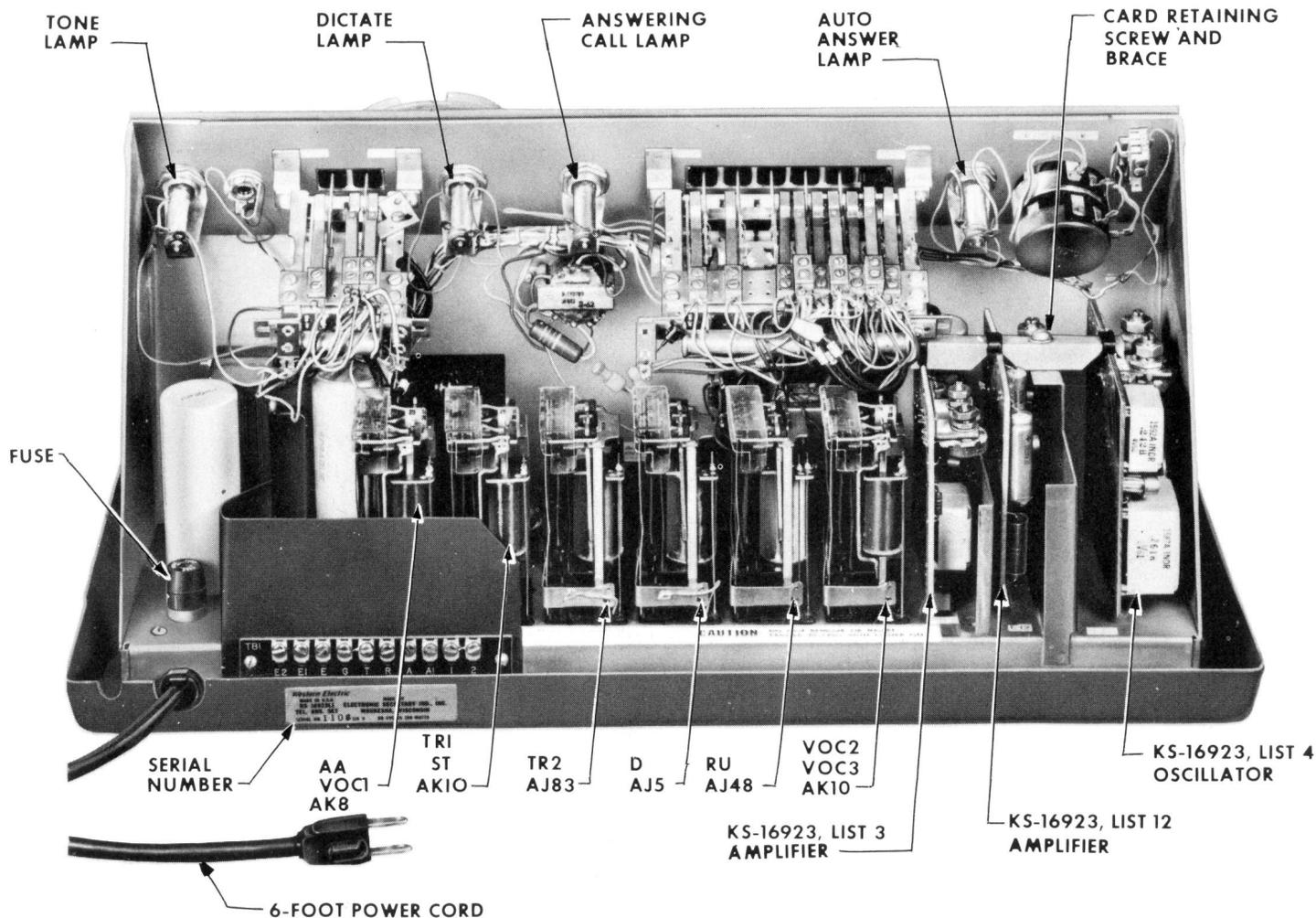


Fig. 3 — KS-16923, List 1 Telephone Answering Set, Rear Panel Removed

3.01 If trouble is encountered in plug-in card, replace card as follows:

- (1) Remove card retaining screw and brace.
- (2) Grasp top of card and pull upward, working card back and forth until card disengages from jack. *Do not move from side to side as this will bend pins on card.*
- (3) Insert new card into jack. Be sure card is firmly seated.
- (4) Replace and tighten card retaining screw and brace.
- (5) Check alignment of oscillator, amplifier, and voice control circuits as described in 11.

4. KS-16923, LIST 10 ANNOUNCEMENT CARTRIDGE (FIG. 4)



Do not install or remove a list 10 announcement cartridge without first disconnecting the power cord from receptacle. This will prevent announcement motor from starting if the actuator of the S101 switch is disturbed or disengaged from the slot in the announcement tape.

4.01 Procedure for installation

- (1) Place announcement cartridge on its hub.
- (2) Pull tape from center of cartridge. *Pull only enough tape to thread properly.*

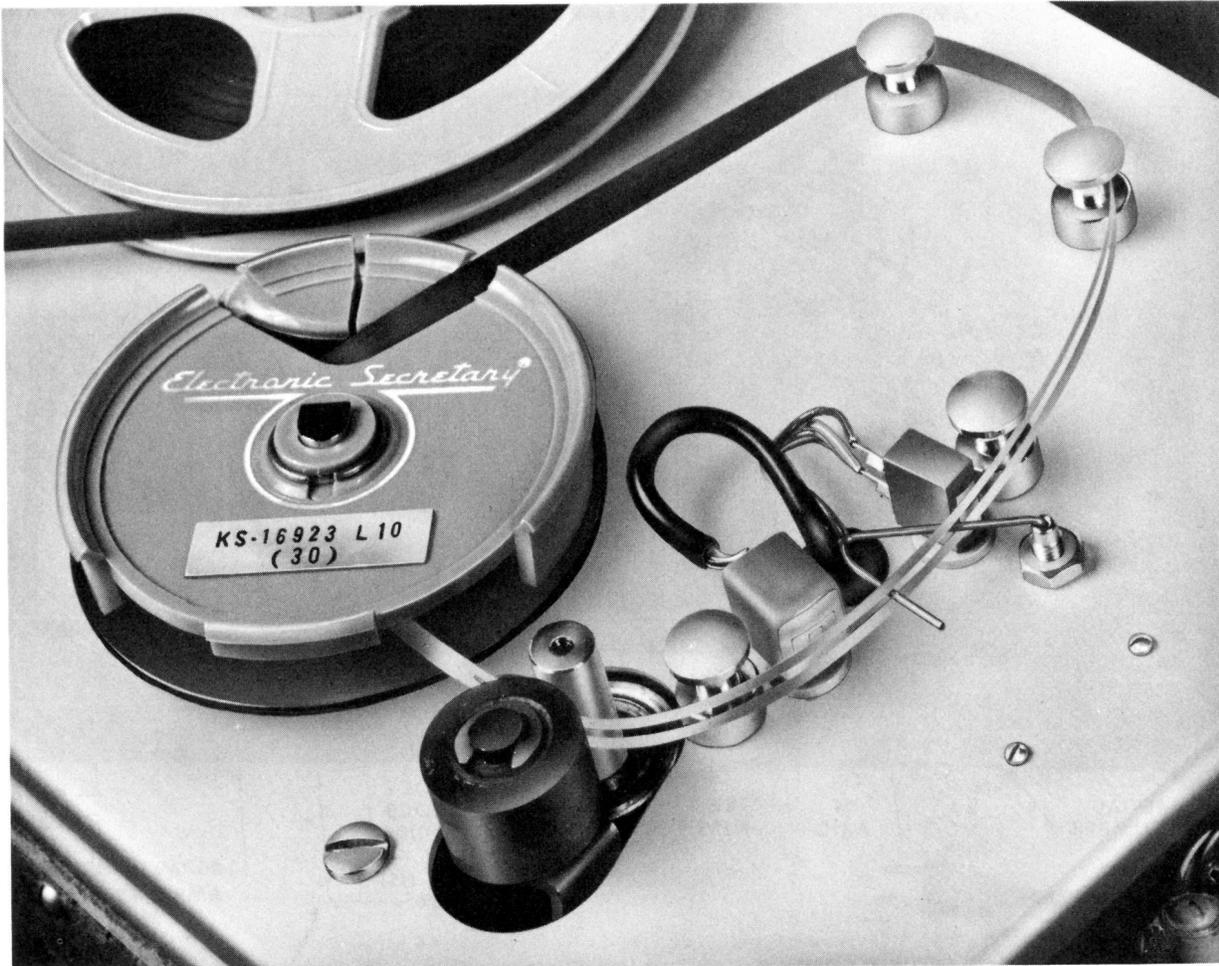


Fig. 4 — KS-16923, List 10 Announcement Cartridge Installed

- (3) Make sure tape rides in groove of guides and that actuator assembly lever rides on top and center of tape.
- (4) Actuator assembly lever shall drop into slot in tape to stop announce motor when the tape is indexed.
- (5) Follow path for tape as shown in Fig. 4.

5. KS-16923, LIST 11 RECORDING TAPE (FIG. 5)

5.01 The following procedures should be employed for installation of the list 11 recording tape on sets with serial numbers less than 8093:

- (1) Run the set (reels removed) in fast forward (FAST FORWARD key and RESET button depressed) to obtain a reading of 645 on the elapsed tape indicator.

- (2) Install the full reel of tape on the take-up hub (left reel hub) and the empty reel on the supply hub.
- (3) Thread the loose tape end from the take-up reel to the supply reel and wind two or three turns onto the supply reel by hand. Follow path of tape shown in Fig. 5.
- (4) Run the set in rewind to obtain a counter reading of 000.

5.02 The following procedures should be employed for installation of list 11 recording tape on sets with serial numbers 8093 and higher:

- (1) Run the set (reels removed) in rewind (REWIND and RESET buttons depressed) to obtain a reading of 970 on the elapsed tape indicator.

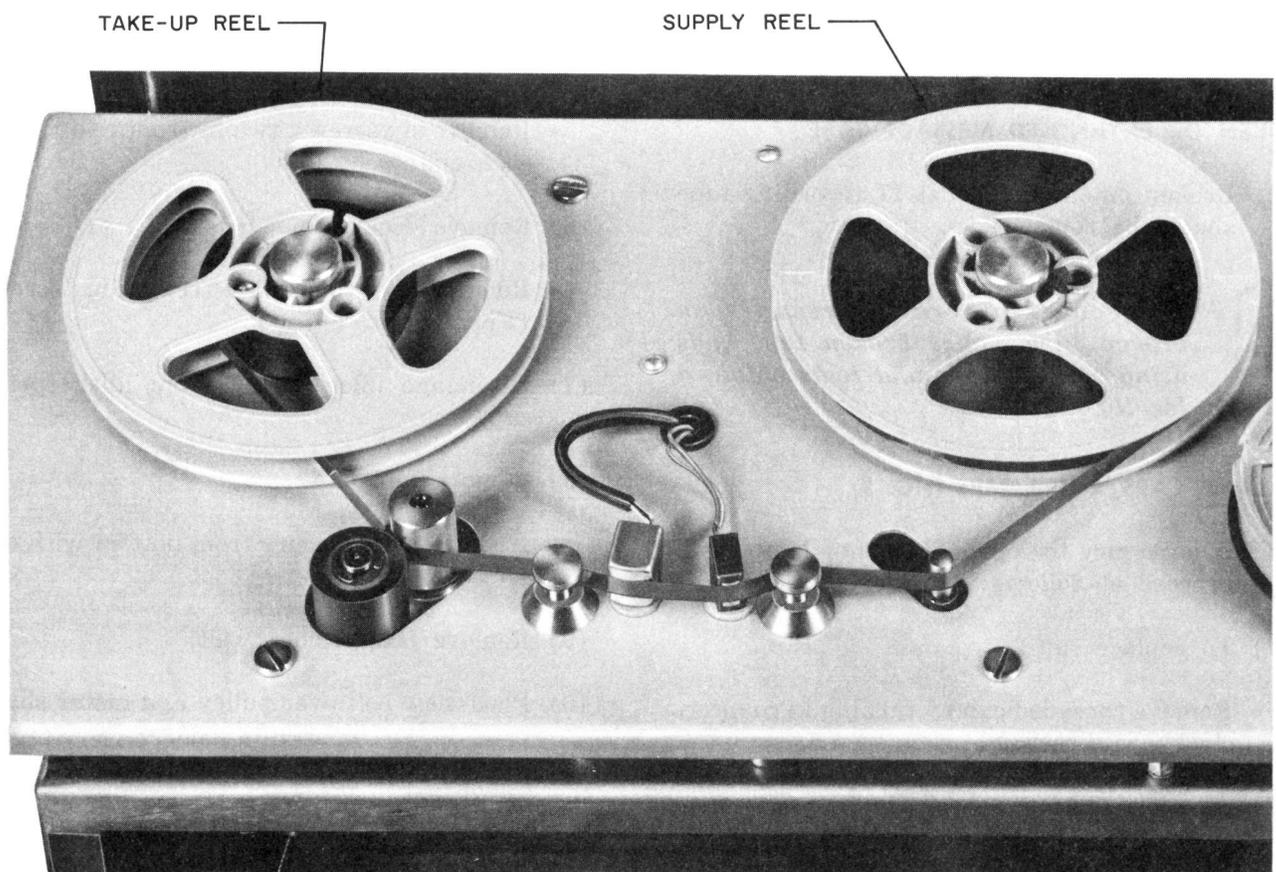


Fig. 5 — KS-16923, List 11 Recording Tape

- (2) Install the full reel of tape onto the supply hub (right reel hub) and the empty reel on take-up hub.
- (3) Thread the loose tape end from the supply reel to the take-up reel and wind two or three turns onto the take-up reel by hand. Follow path of tape shown in Fig. 5.
- (4) Run the set in fast forward to obtain a counter reading of 000.

5.03 These installation procedures should not be interchanged. If the former procedure is employed on new sets, there will not be enough tape remaining on the supply reel after the indicator has passed 600 to ensure 3 minutes of recording time and hence the tape end may pull free from the supply reel before the last message is completed.

5.04 If the latter installation procedure is employed on older sets, the message recording time will be reduced from 1 hour to approximately 52 minutes.

BROKEN OR ENTANGLED MESSAGE TAPE

5.05 Broken or entangled list 11 recording tape should be replaced.



To recover recorded messages on broken tape, splice broken tape ends using splicing tape and tools obtained locally.

6. LAMP CAPS AND LAMPS (FIG. 3)

6.01 If necessary to replace lamps or lamp caps, proceed as follows:

- (1) To replace cap:
 - Remove threaded cap by turning in counter-clockwise direction.
- (2) To replace lamp:
 - With lamp extracting tool, grasp lamp and push down, turn slightly in counterclockwise direction, and lift out.

7. RELAYS (FIG. 3)

7.01 Observe that relay wire springs are not crossed or out of their normal positions. The plastic covers shall be properly installed so as not to interfere with relay operation.

7.02 If relays need adjusting, return set to repair shop.

8. BELT REPLACEMENT (FIG. 6 AND 7)

8.01 *To replace message recorder motor belt:*

- (1) Insert power cord into ac outlet and rewind list 11 recording tape onto supply reel.
 - (2) Remove power cord.
 - (3) Remove supply and take-up reel.
 - (4) Remove list 10 announcement cartridge.
 - (5) Remove cover:
 - Remove six screws, two in front and two on each end.
 - (6) Remove deckplate.
 - Remove five deckplate retaining screws (Fig. 2).
 - (7) Disengage idler spring from idler spring support.
 - (8) Remove hex nut.
 - If shaft turns, secure from bottom with offset screwdriver.
 - (9) Remove faulty motor belt.
 - (10) Place new belt over pulley and motor shaft.
 - (11) To reassemble, reverse procedure.
- 8.02** *To replace announcement capstan (out message) belt (Fig. 6 and 7):*
- (1) Proceed as in 8.01, Steps (1) through (6).

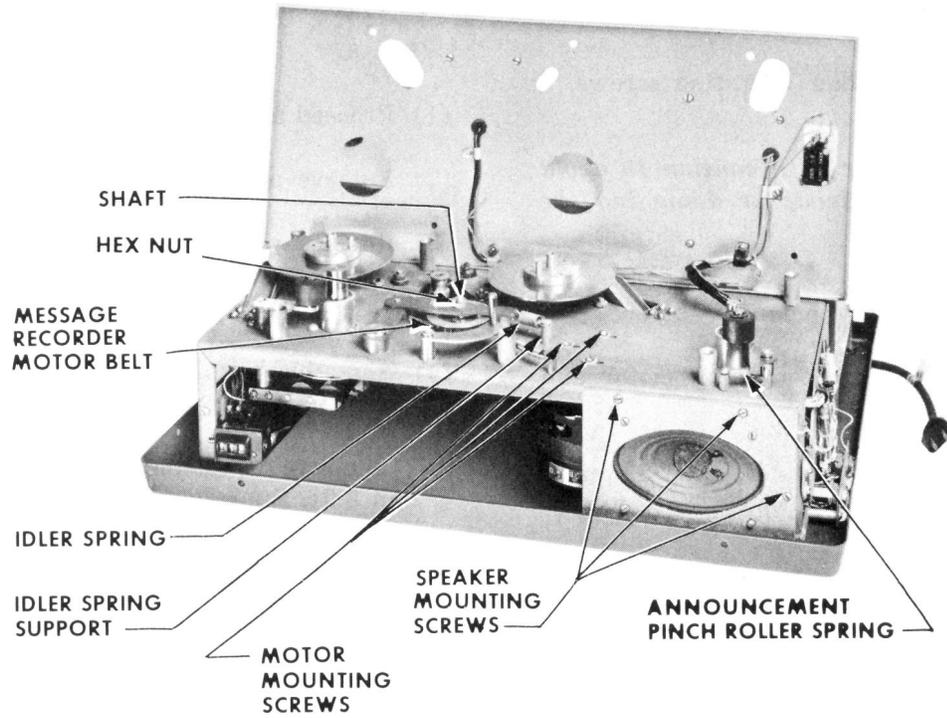


Fig. 6 - KS-16923, List 5 Recorder, Deckplate Raised

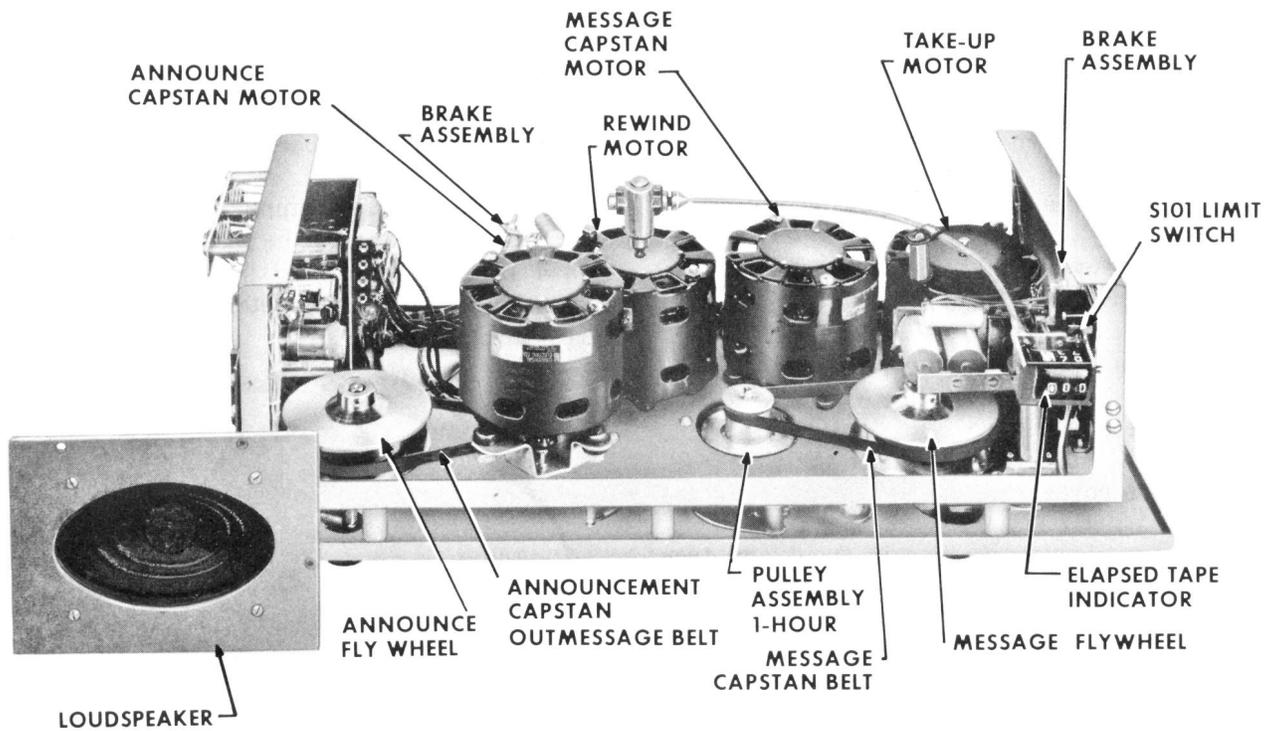


Fig. 7 - KS-16923, List 5 Recorder, Bottom View

(2) Remove speaker.

- Remove three speaker mounting screws.



Handle speaker with caution to avoid breaking wire leads or damaging the paper cone.

(3) Remove three motor mounting screws.

(4) Remove announcement capstan motor and pull to front.

- Be careful not to break wires on motor.

(5) Remove old belt.

(6) Slide new belt over top of and behind motor pulley.

(7) Remount motor, leaving the three motor mounting screws loose.

(8) Push motor forward in its slots to its most forward position and place belt on announcement flywheel.

(9) Pull motor back to place tension on belt and tighten motor mounting screws.

(10) Replace speaker.

- Tighten three speaker mounting screws.

(11) Complete reassembly by reversing procedure in 8.01, Steps (1) through (6).

8.03 *To replace message capstan belt (Fig. 7):*

(1) Remove power cord.

(2) Remove cover.

- Remove six screws, two in front and two on each end.

(3) Remove faulty capstan belt.

(4) Install new capstan belt.

(5) Replace cover.

9. KS-16923, LIST 9 TWO-HOUR CONVERSION KIT (FIG. 8)

(1) Proceed as in 8.01, Steps (1) through (8).

(2) Remove pulley assembly (Fig. 7).

(3) Replace pulley assembly and capstan belt with KS-16923, List 9 two-hour conversion kit.

(4) Assemble belts with shiny sides in contact with their associated pulleys.

(5) Complete reassembly by reversing procedure in 8.01, Steps (1) through (8).

10. BRAKE REQUIREMENTS AND ADJUSTMENTS

10.01 Clearance between brake shoe and brake plate shall be approximately 0.015 inch with brakes energized.

(1) Proceed as in 8.01, Steps (1) through (6).

(2) To check clearance, operate brakes electrically by operating PLAYBACK switch.

(3) Hold reel hub to keep it from turning.

(4) To adjust gap between shoe and disc, loosen assembly mounting screws and tilt coil assembly forward or backward.

10.02 Brake pressure applied by brake arm to brake plate shall be 220 ± 10 grams when 5-3/4 inch diameter reel is used and 170 ± 10 grams when 5-inch diameter reel is used. Reels are shown in Fig. 9.

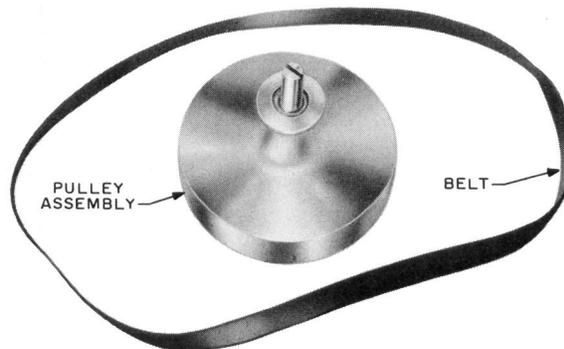
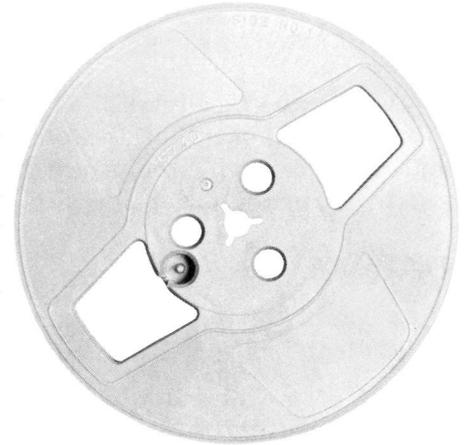


Fig. 8 — KS-16923, List 9 Two-Hour Conversion Kit



5 Inch Reel

Caution: 5-3/4 inch reels are used with earlier model sets with serial number 1101 and lower. Do not use 5-inch reels on these sets unless the list 5 recorder has been modified. Recorders which have been modified may be identified by a red marking RB in 1/8-inch characters, located to the left of the KS-16923, List 1 nameplate at rear of set.



5-3/4 Inch Reel

Fig. 9 — Tape Reels

10.03 To adjust brake pressure, refer to Fig. 10 and proceed as follows:

- (1) With gram gauge, apply pressure on center of brake shoe in a direction parallel to center line of coil assembly. Adjust stud and associated hex nuts to obtain a reading of 220 ± 10 grams (with 5-3/4 inch diameter reel) and 170 ± 10 grams (with 5-inch diameter reel) on

the gram gauge when armature just breaks contact with core piece of coil assembly.

- (2) Adjust by applying or releasing spring tension to brake arm with hex nuts on stud.

10.04 Return answering set to repair shop if brake shoe trouble cannot be corrected with adjustments.

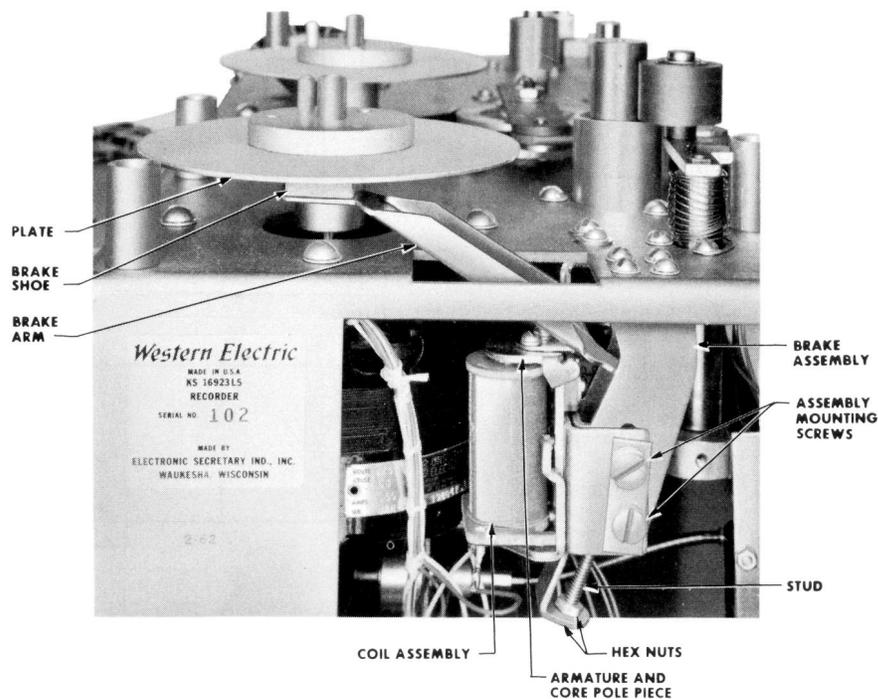


Fig. 10 — KS-16923, List 5 Recorder, End View

11. ALIGNMENT

11.01 The various electrical adjustments required for alignment of the oscillator, amplifier, and voice control circuits are to be made consecutively in the order specified herein.

11.02 Apparatus Required.

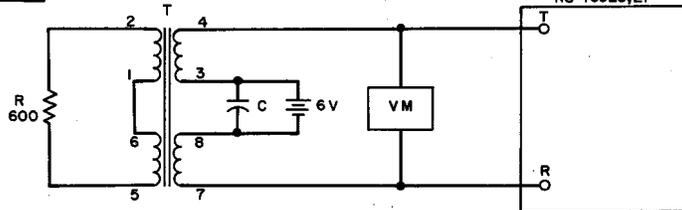
- Oscillator Hewlett-Packard 200CD or equivalent.
- Voltmeter Hewlett-Packard 400D or equivalent.
- Attenuator WECO 5A or equivalent.

- Test circuits A, B, and C (to be fabricated locally).

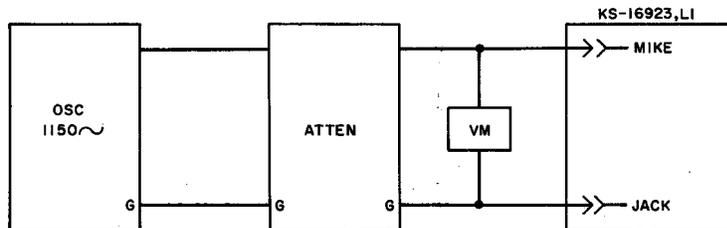
11.03 Preparation

- Use test circuit A (Fig. 11) — Tests 1 through 12.
- Use test circuit B (Fig. 11) — Tests 13 and 14.
- Use test circuit A (Fig. 11) — Tests 15 through 21.
- Use test circuit C (Fig. 11) — Tests 22 through 26.

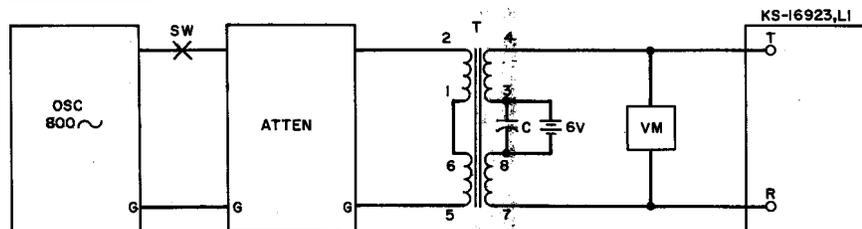
TEST CIRCUIT A



TEST CIRCUIT B



TEST CIRCUIT C



DESIGNATION CODE

| | | | |
|---|-------------------------|-------|------------------------|
| T | WECO 202A OR EQUIVALENT | OSC | HEWLETT PACKARD 200 CD |
| R | 600 OHM WECO 106A | ATTEN | WECO 5A |
| C | 4 UFD WECO 542G | VM | HEWLETT PACKARD 400 D |

Fig. 11 — Test Circuits

11.04 Oscillator — Control Adjustment

| Test | Operation | Requirement |
|------|---|--|
| 1 | Depress AUTO ANSWER ON button. | Relays TR1 and AA shall operate. |
| 2 | Manually operate relay RU. | AUTO ANSWER lamp shall light. Relay RU shall lock up. Announcement tape loop shall start. Relays ST, VOC2, and VOC3 shall operate. ANSWERING CALL lamp shall light. |
| 3 | Block relay VOC3 operated. | |
| 4 | Manually operate and hold relay VOC1. | After approximately 1-1/2 seconds, relay TR1 shall release momentarily. Relays TR2 and D shall operate. Message mechanism shall start. |
| 5 | Release relay VOC1. | After approximately 4 seconds, relay VOC2 shall release. |
| 6 | Observe reading on voltmeter; adjust OSC control (Fig. 12). | Reading on voltmeter shall be 0.045 volt. |
| 7 | Remove block from relay VOC3, and depress AUTO ANSWER OFF button. | Message mechanism shall stop. Announcement mechanism shall stop when indexed. |

11.05 Record-Reproduce Amplifier Gain Adjustment

| Test | Operation | Requirement |
|------|---|--|
| 8 | Depress and hold DICTATE button. | DICTATE lamp shall light. |
| 9 | Immediately after DICTATE lamp lights, release DICTATE button and hold relay VOC2 operated. | 1400-cycle tone shall be recorded on the announcement tape. |
| 10 | As soon as announcement tape stops, release relay VOC2. Block relay TR1 operated. | |
| 11 | Depress AUTO ANSWER ON button. Manually operate relay RU. | Announcement mechanism shall start. Within approximately 2 seconds, ANSWERING CALL lamp shall light. |
| 12 | Observe the reading on the voltmeter. Adjust KS-16923, List 12 amplifier gain control (Fig. 12), if necessary. Remove block from relay TR1. | Average reading on the voltmeter shall be between 0.5 and 0.6 volt. |

Note: If it is necessary to adjust the gain control more than 2 db to give a reading of 0.5 to 0.6 volt, repeat Tests 8 through 12.

11.06 Tone Transfer Adjustment

| Test | Operation | Requirement |
|------|---|---|
| 13 | Connect a 1150-cycle, 0.025-volt signal to the MICROPHONE jack. Depress AUTO ANSWER OFF button. | |
| 14 | Depress and hold the DICTATE button until the DICTATE lamp is extinguished at the end of the loop. | The 1150-cycle tone shall be recorded on the announcement tape. |
| 15 | Depress AUTO ANSWER-ON button. Block relay TR1 operated. Rotate the TONE control (Fig. 12) to its full CCW position. | |
| 16 | Operate relay RU manually. | Announcement mechanism shall run. |
| 17 | Adjust TONE control (Fig. 12) slowly CW until relay VOC1 just operates. | Relay VOC1 shall operate. |
| 18 | Remove block from relay TR1. Remove microphone input. Depress AUTO ANSWER OFF button to release relays VOC2 and VOC3. Allow announcement tape to index and relays RU and ST to release. | |

11.07 Rejection Filter Adjustment

| Test | Operation | Requirement |
|------|---|---|
| 19 | Depress AUTO ANSWER-ON button. Adjust FIL control (Fig. 12) to maximum CW position. Manually operate relay RU. Block relay VOC3 operated. | Announcement mechanism shall start. Relay VOC1 shall operate. Within approximately 1 to 2 seconds, relay TR1 shall release momentarily. Relays TR2 and D shall operate and the message mechanism shall start. Within approximately 4 seconds, relay VOC2 shall release. The 1400-cycle tone shall be audible in the loudspeaker (adjustable by means of VOLUME control on front panel). |
| 20 | Adjust FIL ADJ control (Fig. 12) through the side of the chassis for minimum 1400-cycle output from speaker. Note: This adjustment shall be made with a nonmagnetic screwdriver. | |
| 21 | Adjust FIL control (Fig. 12) for minimum 1400-cycle output from loudspeaker. | The 1400-cycle signal shall be reduced to a level where it cannot be heard in the loudspeaker with the VOLUME control in full CW position. If the 1400 cycles is still distinguishable from the harmonics and background noise, rotate the FIL control (R409) to maximum CW position, and repeat Tests 20 and 21. |

11.08 Voice Control Adjustment

| Test | Operation | Requirement |
|------|--|--|
| 22 | Momentarily operate and release relay VOC1. | Relay VOC2 shall operate. |
| 23 | Block relay VOC2 operated. Remove block from relay VOC3. | |
| 24 | Connect an 800-cycle signal to line test terminals and adjust for voltmeter reading of 0.004 volt. (Provide a means for interrupting this signal at a rate of approximately 1 to 2 pulses per second with approximately equal on and off periods.) | |
| 25 | With this pulsing 800-cycle signal applied, adjust the SPEECH control (Fig. 12), starting from its fully CCW position and slowly turning the control CW until relay VOC1 just operates. | Relay VOC1 shall operate and release at the start of each burst of tone. |
| 26 | Remove the block from relay VOC2. (This completes the electrical alignment.) | |

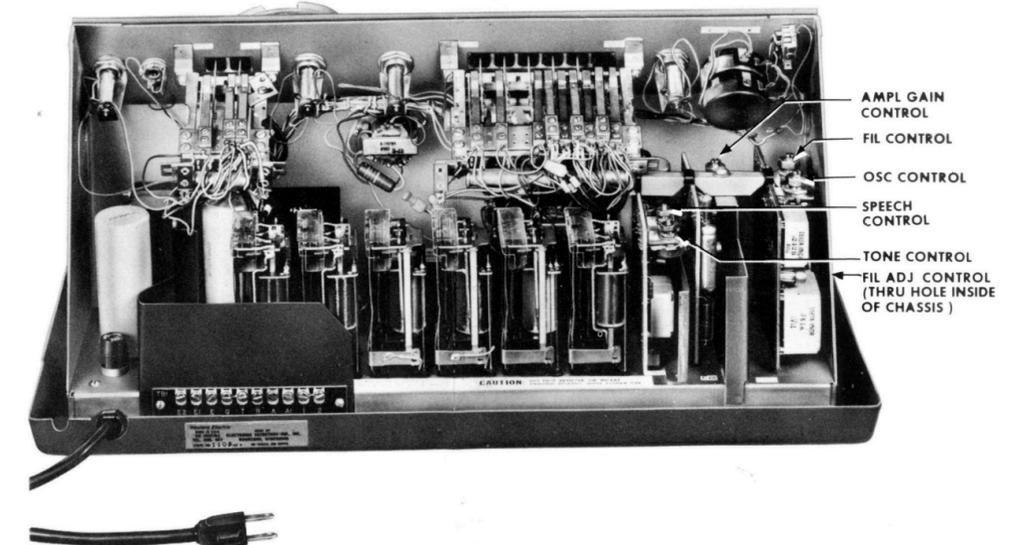


Fig. 12 — KS-16923, List 1 Telephone Answering Set (Rear View)

12. RECORD AND ERASE HEADS (FIG. 2)

12.01 If leads to the record or erase heads are disconnected during maintenance or for replacement, observe that these lead connections are reconnected as follows:

- (a) *Record Head*: Connect black lead of black-white pair, or black-white lead of black white-white pair to terminal identified with a dot of black paint.
- (b) *Erase Head*: Connect orange lead to terminal identified with a dot of orange paint.

13. CLEANING

13.01 The record and erase heads, capstans, and pinch rollers may be cleaned by wiping with a clean KS-2423 cloth, moistened slightly with 1,1,1, trichloroethane (type cleaner) or approved equivalent. Remove all excess cleaner with a dry KS-2423 cloth.

14. ACCESSORIES

14.01 Limit maintenance on foot switch, head set, or backspace unit to correcting loose connections. Replace and return accessories to the distributing house for repairs of any other troubles.

15. CHECK POINTS



Upon completion of any maintenance work, the following steps should be taken to insure answering set is in proper operating condition.

15.01 Insert power cord into ac outlet. Refer to section entitled KS-16923, List 1 Telephone Answering Set, Operation, and check the following:

- (a) Announcement Recording and Erasure
 - Dictate lamp
 - Tone lamp

- (b) Announcement Check
 - With speaker
 - With headset (optional accessory)

- (c) Automatic Answer
 - Automatic answer lamp
 - Ring-up
 - Answering call lamp
 - Announcement monitoring in speaker
 - Transfer beep tone
 - Message monitoring in speaker
 - Talk-down tone
 - Voice control — time-out
 - Disconnect beep tone

- (d) Automatic Answer — Answer Only
 - Ring-up
 - Announcement monitoring in speaker
 - Disconnect at end of announcement loop

- (e) Message Playback
 - With speaker
 - With headset (optional accessory)

- (f) Fast Forward and Rewind of Message Tape

- (g) Erase Messages

- (h) Foot Switch (optional accessory)

- (i) Back Space Unit (optional accessory)

TABLE A

| Part | Part Number* | See Figure | |
|---------------------------------------|-----------------|-----------------------------------|---|
| Actuator Assembly | B-194022 | 2 | |
| Baffle, Speaker | B-194048 | 2 | |
| Belt, Capstan Message (1HR) | B-194039 | 7 | |
| Belt, Capstan Message (2HR) | B-194020 | 8 | |
| Belt, Motor Recorder Message | B-194028 | 6 | |
| Belt, Outmessage Capstan Announcement | B-194045 | 7 | |
| Brake, Assembly† | B-194081-01 | 10 | |
| Brake, Assembly‡ | B-194081-02 | 10 | |
| Cable, Flexible | B-194051 | 7 | |
| Cap | 995 (White) | Dial Light Corp or Equiv | |
| Cap | 993 (Red) | | 1 |
| Cap | 991 (Amber) | | 1 |
| Coil Assembly | B-194082 | 10 | |
| Elapsed Tape Indicator | B-194157 | 1 | |
| Erase Head | B-555930 | 2 | |
| Fuse | AGC, 1 AMP 250V | 3 | |
| Spring Idler | B-194032 | 6 | |
| Lamp | GE #1847 | 3 | |
| Motor, Announce Capstan | B-194043 | 7 | |
| Motor, Message Capstan | B-194040 | 7 | |
| Motor, Rewind | B-194042 | 7 | |
| Motor, Take-Up | B-194041 | 7 | |
| Pulley Assembly (1-Hour) | B-194071 | 7 | |
| Record Head | B-194016 | 2 | |
| Relays | _____ | 3 | |
| Spring Pinch Roller Announcement | B-194057 | 6 | |

* Unless otherwise specified, B numbers referred to are BTL drawing numbers; order parts as follows:

B_____ (Part of KS-16923, List 1 Telephone Answering Set).

† For take-up motor.

‡ For supply motor.

FLOW CHART

Before proceeding with operational procedure make the visual inspection listed below:

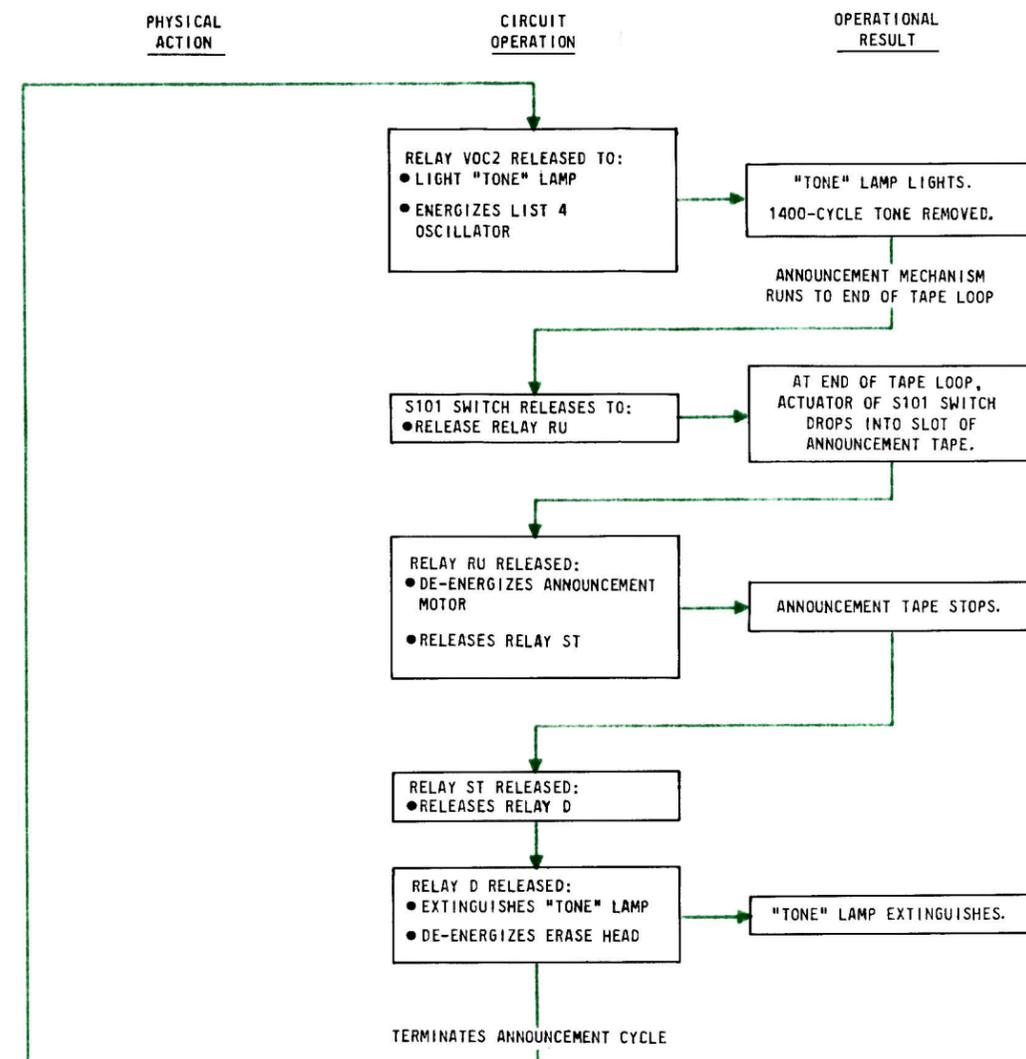
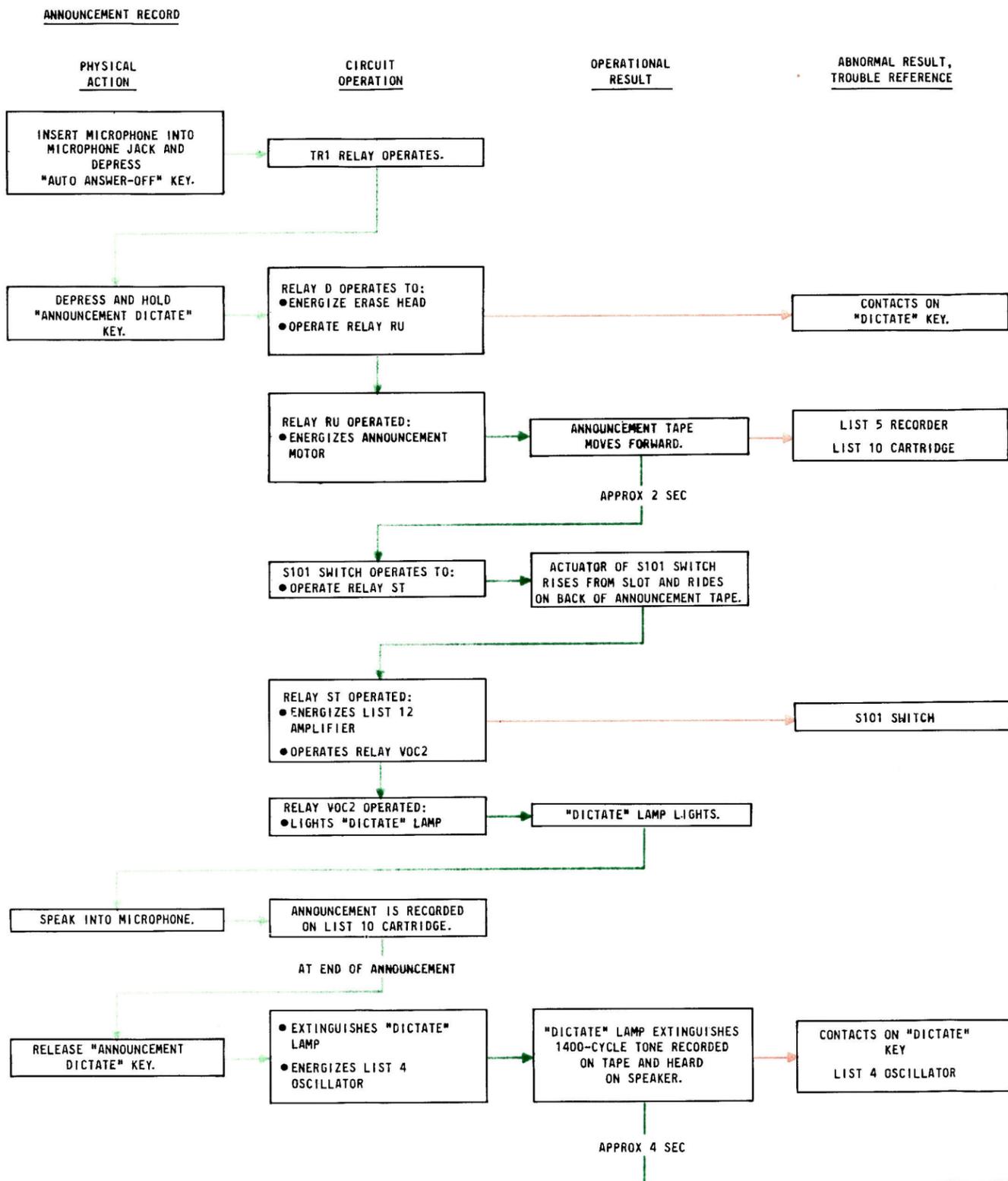
- (1) Power cord properly installed.
- (2) Elapsed tape register reading between 000 and 600.
- (3) Check connections for type of service.
- (4) KS-16923, List 10 cartridge properly installed.
- (5) KS-16923, List 11 recording tape properly installed.
- (6) Fuse not blown.
- (7) Check that plug-in assemblies are properly installed, with plugs firmly in place:
 - KS-16923, List 3 amplifier.
 - KS-16923, List 12 amplifier.
 - KS-16923, List 4 oscillator.
 - KS-16923, List 5 recorder.

OPERATIONAL PROCEDURES



The following tests require operation of the set with cover removed and 48 volts dc and 110 volts ac on exposed terminals. Do not operate switches, tape reels, or other mechanism parts by hand.

If securing of loose connections or replacement of fuse, lamp bulbs, list 3 amplifier, list 12 amplifier, list 4 oscillator, list 10 cartridge, list 11 recording tape, or list 5 recorder does not correct trouble, return set to distributing house.

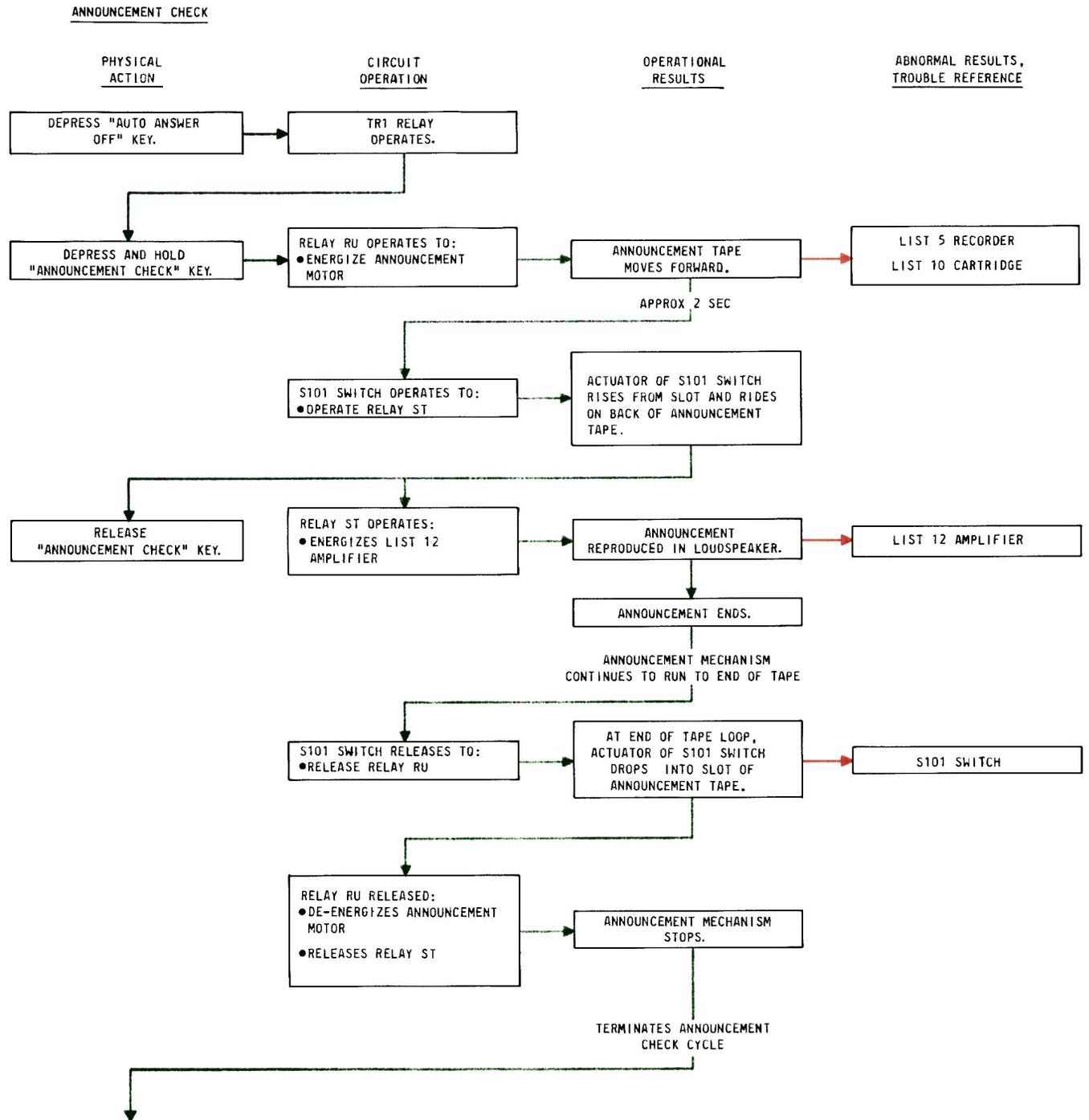


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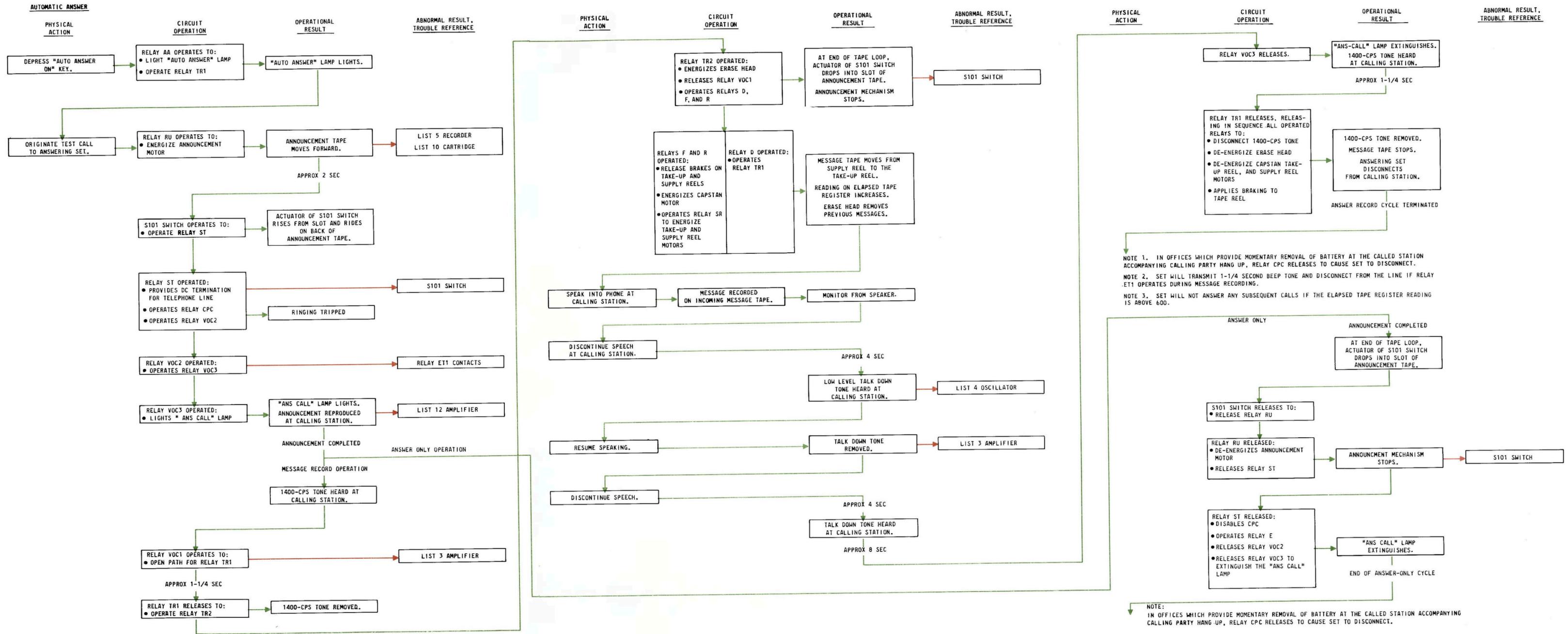
A. IF THE "DICTATE" KEY IS NOT RELEASED BEFORE THE END OF THE ANNOUNCEMENT TAPE, S101 SWITCH RELEASES TO:
 • EXTINGUISH "DICTATE" LAMP
 • DE-ENERGIZES LIST 12 AMPLIFIER
 • DE-ENERGIZES ANNOUNCEMENT MOTOR
 THE ANNOUNCEMENT TAPE STOPS. NO OPERATION OF THE SET WILL THEN BE POSSIBLE UNTIL THE "DICTATE" KEY IS RELEASED. IF THE ANNOUNCEMENT WAS INCOMPLETE, IT MUST BE SHORTENED AND RERECORDED.

B. IF THE "DICTATE" KEY IS RELEASED LESS THAN 4 SECONDS FROM END OF ANNOUNCEMENT TAPE, "TONE" LAMP WILL NOT LIGHT.
 IN ORDER TO INSURE RELIABLE OPERATION IN THE AUTOMATIC ANSWER FUNCTION, THE ANNOUNCEMENT MUST BE SHORTENED AND RERECORDED.

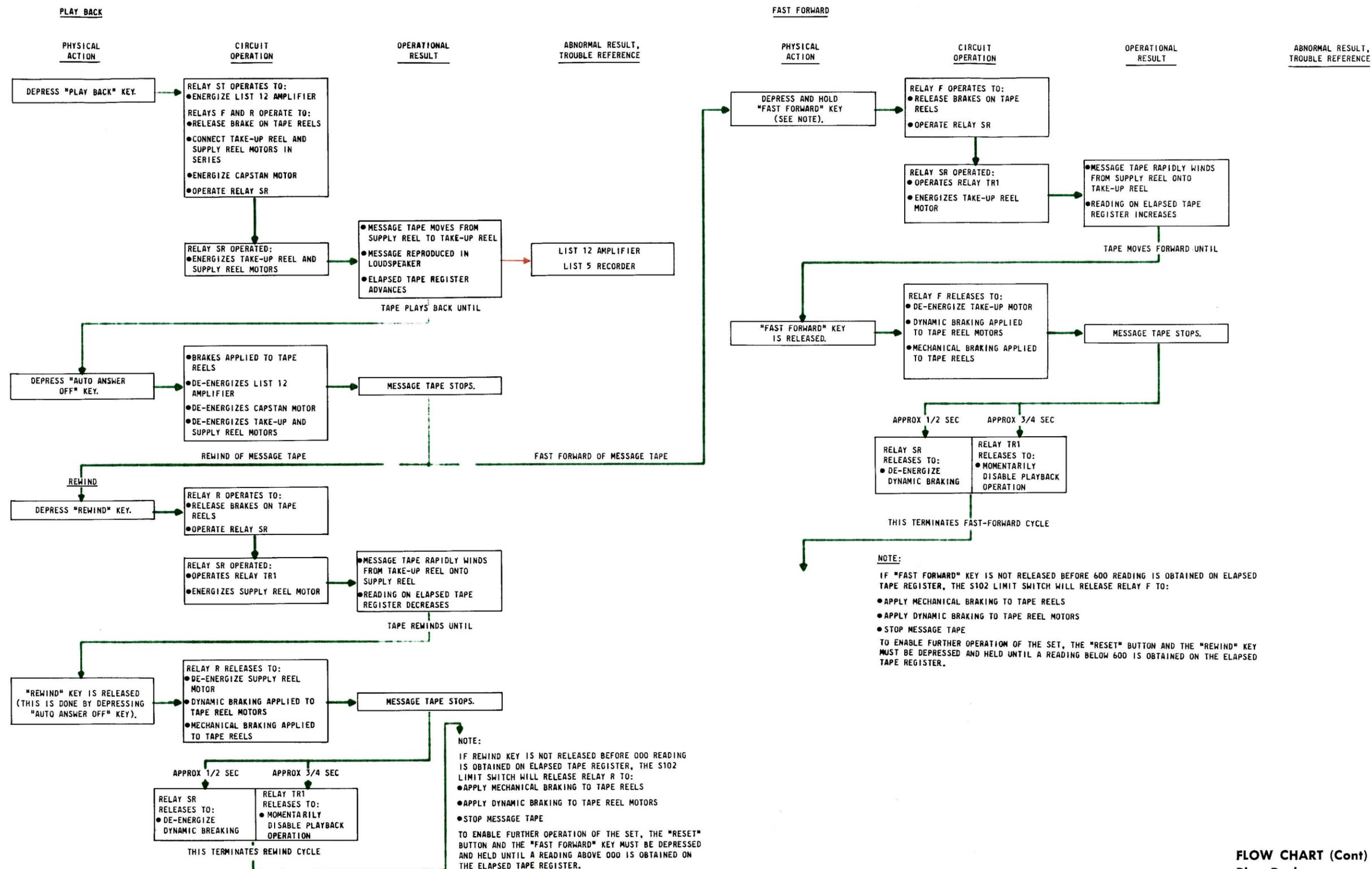
FLOW CHART
Announcement Record



**FLOW CHART (Cont)
Announcement Check**



FLOW CHART (Cont)
Automatic Answer



FLOW CHART (Cont)
Play Back