

## 2A TELEPHONE ANSWERING SET MAINTENANCE

### 1.00 INTRODUCTION

1.01 This section provides maintenance and supply information, circuits, trouble charts, and lubrication information for the 2A telephone answering set.

### 2.00 GENERAL

2.01 The associated telephone set should be maintained in the standard manner as covered in the related Plant Series Practices.

2.02 In the event of a customer's power failure, the 2A telephone answering set will not operate. If the set is turned on, there will be an audible signal in the answering set to signify an incoming call. Normal telephone service will not be affected.

2.03 Cover removal procedure is covered in the section entitled 2A Telephone Answering Set, Installation.

2.04 A final check on the complete operating sequence of the 2A telephone answering set should be made on every maintenance visit.

2.05 If the set fails to perform satisfactorily and maintenance procedures included in this section do not remedy the fault, the set should be replaced. In cases where the set is replaced, refer to the section entitled Packaging and Handling of Disconnected 2-Type Telephone Answering Sets.

- The power supply voltage (115-volt 60-cycle ac) is on contact 2B of the K5 relay and 75 volts dc is on several relay contacts and windings. Keep hands away from blades while working in set.

2.06 The KS-16328, List 1 cleaner has been found to acidify with age and is therefore undesirable for use on telephone answering sets and should no longer be used. A new KS-16328, List 2 cleaner-lubricant is now available. It contains a silicone lubricant. No additional lubrication need be applied before cleaning.

### 3.00 AMPLIFIER

3.01 A plug-in printed circuit amplifier is used in all models of the 2A telephone answering set.

- On early type sets the amplifier will be similar to that shown in Fig. 1 but will not have a code number stamped on the card. (See Fig. 7 for circuit schematic.)

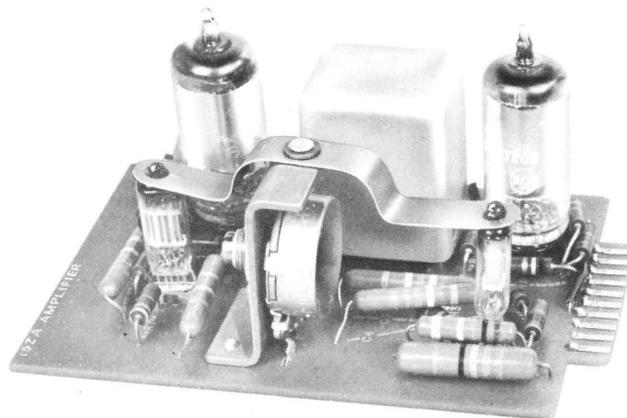


Fig. 1 — 152A Amplifier, Early Type

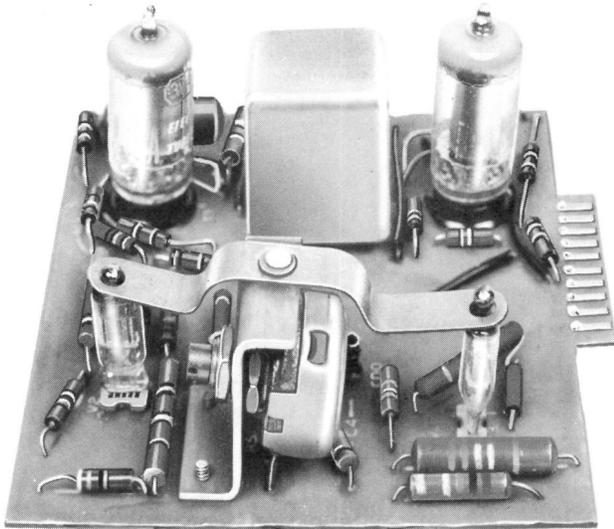


Fig. 2 — 152A Amplifier, Later Type

- On standard sets initial production will be equipped with the type amplifier shown in Fig. 1. The card will be stamped as shown. (See Fig. 8 for circuit schematic.) Later production sets will be equipped with the type amplifier shown in Fig. 2. The center of the card will be stamped 152A AMPLIFIER. (See Fig. 9 for circuit schematic.)

**Note:** The amplifiers in the standard sets described above are interchangeable. Amplifiers for early type and standard sets are not interchangeable.

**3.02** The amplifier may be removed from the chassis for testing, repair, or replacement as follows:

1. **Turn power off** before the amplifier is removed or replaced.

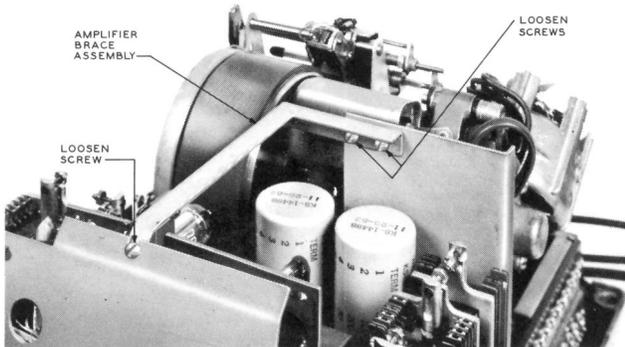


Fig. 3 — Amplifier Brace Assembly, Standard Sets

2. For standard and early type sets, loosen the screws shown in Fig. 3 and remove the amplifier brace assembly.
3. Grasp the amplifier as shown in Fig. 4 and rock gently from side to side while exerting an upward pull.

**Note:** Care must be exercised while placing or removing the amplifier to avoid damaging the metal contacts on its plug end. To avoid damage to the jack (J4), do not rock the amplifier from front to back.

**3.03** The amplifier uses two CK512AX and two 3V4 electron tubes. If tests indicate the trouble is in the amplifier, replace individual tubes until the defective tube is located. The condition of the tubes cannot be determined by visual examination. The **power must be turned off** before a tube is removed or replaced.

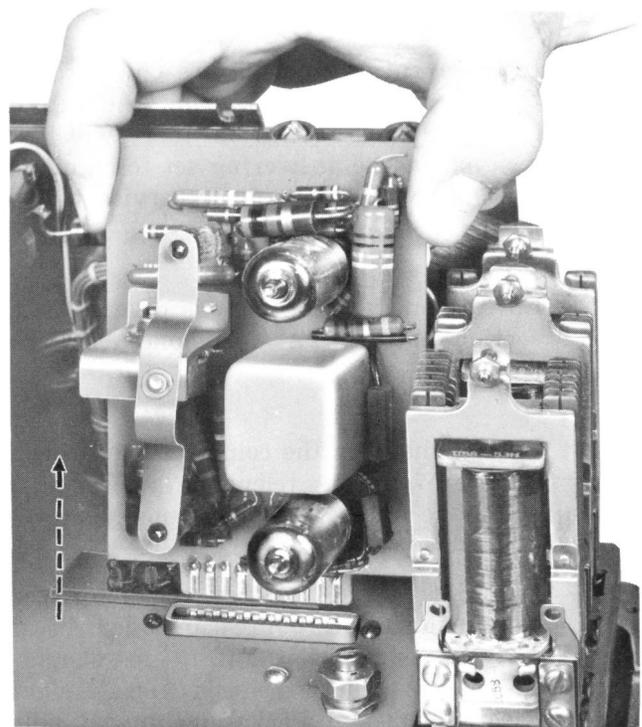


Fig. 4 — Amplifier Removal

**3.04** When removing the CK512AX electron tubes, proceed as follows:

1. Grasp both ends of the spring tube retainer, lift the ends until they clear the tips of the tubes, then rotate the spring until it will not touch the tubes when released.
2. Grasp the CK512AX tube to be removed and withdraw it gently from the socket.
3. Before placing new CK512AX tubes, the length of the leads shall be checked. The length of the leads should be 0.200 to 0.230 inch (approximately 7/32 inch). Cut the leads to meet these requirements.

**Note:** Be certain that the two CK512AX tubes are inserted in the sockets so that the red mark on the tube base coincides with the molded dot on the socket.

**3.05** If replacing the electron tube does not clear the trouble in the amplifier, the amplifier should be replaced.

#### **4.00 MAGNETIC BAND, LAMPS, FLASHER, AND FUSE**

**Note 1:** Do not try to rotate the announcement drum or flywheel by hand because of danger of stripping the gears.

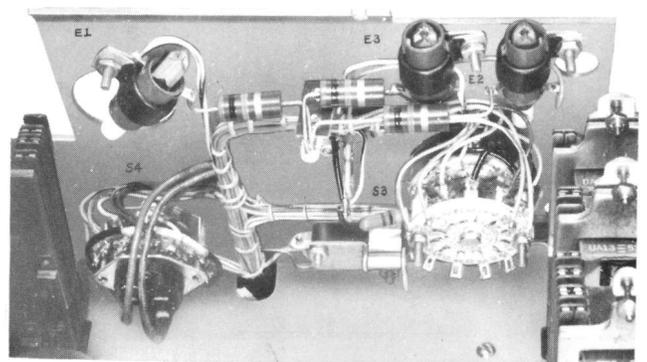
**Note 2:** Avoid touching the magnetic recording band or allowing dirt or other foreign material to fall on it. If loose matter is observed on the band, wipe off lightly with a clean KS-2423 twill jean or other approved lint-free cloth.

**4.01** If volume level is low or if distortion is experienced, the record head and magnetic band should be cleaned with KS-16328, List 2 cleaner-lubricant.

- This cleaner-lubricant is flammable to a small degree (about the same as rubbing alcohol) and is susceptible to freezing. All precautions should be taken to prevent exposure to sparks, flame, and freezing temperatures.
- Remove dirt from the band by wiping lightly with a clean, dry KS-2423 cloth. Remove dirt from the record head with a toothpick or orange stick and then wipe lightly with a clean, dry KS-2423 cloth.

- Shake the container of KS-16328, List 2 cleaner-lubricant thoroughly before use, as the components have a tendency to separate. Apply a small quantity to a clean, dry KS-2423 cloth and wipe on to the recording bands while they are rotating. Wipe the cleaner-lubricant and the emulsified dirt from the drums with a clean, dry KS-2423 cloth. The cleaned drum should be dry and have a polished appearance. Repeat the process if necessary. The cleaner contains adequate lubricant; therefore, it is not necessary to perform a separate lubrication operation. Also, use solution on cloth to clean heads. Dry the recording heads thoroughly. Avoid letting the cleaner-lubricant come in contact with metal parts.

**4.02** The lamps used for the ON-OFF (E1), DICTATE (E2), and READY (E3) lights in early type sets are removed by grasping the base of the lamp and pulling upward out of the lamp socket (see Fig. 5). The 1847 lamps used for the ON-OFF (E1, when provided), DICTATE (E2), and READY (E3) lights in standard sets are removed by pressing the lamp into the socket, turning counterclockwise until free, and withdrawing. To place a lamp, press the lamp into the socket; turn clockwise until secure. It may be necessary to loosen the clamp in order to remove the lamp. After placing a new lamp, tighten the clamp securely. (See Fig. 5.)

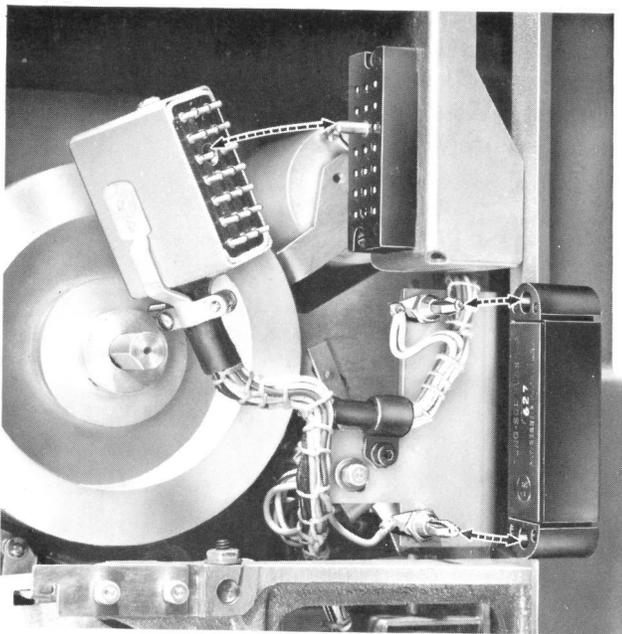


**Fig. 5 — 2A Telephone Answering Set, Back of Front Panel Showing Lamps, OFF-ON and Function Switches**

**4.03** When replacing lamps in early type sets, use K2 lamps. When placing K2 lamps, enough of the white plastic band should be removed so that the light will be directed at the panel. They must be placed carefully so that the metal sides of the lamps are against the metal spring contacts of the lamp sockets.

**4.04** If the No. 627 Tungsol thermal flasher becomes defective, remove it by grasping firmly and pulling straight away from the side of the answering set (see Fig. 6).

**4.05** The F1 fuse is mounted in an HKP fuse holder located in the center of the TS1 terminal strip. For fuse inspection or replacement, turn top of fuse holder counterclockwise and withdraw. See Fig. 6 in section entitled 2A Telephone Answering Set, Installation.



**Fig. 6** — 2A Telephone Answering Set Showing Tungsol Thermal Flasher No. 627 Removed, 10A Recorder Plug, and Power and Control Unit Jack (J1)

**5.00 INVERTER**

**5.01** In areas where only dc power supply is available, a KS-15662 inverter is used to furnish power. For information, see section entitled KS-15662 DC-AC Inverter for Use with Telephone Answering Sets.

**5.02** If the inverter introduces noise in the circuit, a ground in accordance with sections covering protector and signaling grounds should be connected to terminal 10 on terminal strip TS1 in the answering set as follows:

Individual Line Bridged Ringing	Connect terminal 10 on TS1 to GRD on connecting block.*
2-Party Selective	Strap 10 and G on TS1.
4-Party Selective (-) Party on Tip or Ring	Connect terminal 10 on TS1 to GRD in 531C subscriber set.*
4-Party Selective (+) Party on Tip or Ring	Strap 10 and R on TS1.

\* Use D4AN mounting cord or equivalent.

**6.00 SPARE PARTS**

The following list contains all the spare parts that are required for field substitution.

**Amplifier**—For use with 2A telephone answering set with the letter A preceding the serial number. This amplifier has no code number and must be used only with the first 50 sets.

**Amplifier, 152A**—This applies to the coded amplifiers previously described. They can be used interchangeably.

**Bracket Assembly, LP-13A979**—This bracket is used to fasten station cords in standard sets and is mounted under 10A recorder mounting screw.

**Bracket Assembly, LP-17A760**—This bracket is used to fasten station cords and to block

unused entrance hole in standard sets. It is mounted under TS1 terminal mounting screws.

**Button, LP-19B954**—STOP button.

**Button, LP-19B955**—START button.

**Button, LP-14A142**—OPERATE button.

**Cleaner-Lubricant, KS-16328, List 2** (2-ounce or 1-quart bottle)—Cleaner and lubricant for magnetic bands and recording heads.

**Cover Assembly, LP-19B953**—Cover for 2A telephone answering set. Specify whether to be used for sets with the letter *A* preceding the serial number, or sets without the letter *A* preceding the serial number.

**Flasher, KS-16294, L1**—Flasher control for DICTATE light of all sets equipped with medallion light sockets except where letter *A* precedes serial number.

**Flasher, Tungsol, No. 627**—Flasher control for DICTATE light on all other sets.

**Fuse, AGC, 1 amp 250 volt**—F1 power supply fuse.

**Holder, Fuse, HKP**—Power supply fuse holder.

**Indicator Assembly, P-18A704** — DICTATE indicator (red). For standard 2A telephone answering sets.

**Indicator Assembly, P-18A705** — AUTOMATIC ANSWER indicator (amber). For standard 2A telephone answering sets equipped with medallion light socket.

**Lamp, K2**—For E1, E2, and E3 lights in early type sets

**LAMP, 1847**—For E1 (when provided), E2, and E3 lights in standard sets

**Knob, Control, KS-14941**—OFF-ON switch knob

**Knob, Control, KS-14942**—Function switch knob

**Tube, Electron, CK512AX**

**Tube, Electron, 3V4**—Used in all type amplifiers

## 7.00 DRAWINGS

**7.01** The following drawings apply to the 2A telephone answering set:

LA-777054 — 10A Recorder—Wiring Diagram and Schematic

LA-777066 — 152A Amplifier—Schematic

LA-830078 — 2A Telephone Answering Set—Wiring Diagram

LA-830081 — 2A Telephone Answering Set—Schematic

These drawings may be obtained on order from the Western Electric Company.

**7.02** See Fig. 10, 11, and 12 for schematics.

## 8.00 TROUBLES

A list of troubles and possible causes is given as an aid in locating and clearing troubles in the 2A telephone answering set.

Trouble	Possible Causes
Medallion lamp does not light ( <i>ON-OFF</i> switch at <i>ON</i> , and function selector switch has no effect).	Power not connected. Fuse F1 blown. S4 ( <i>ON-OFF</i> ) switch defective. Defective T1 transformer (power transformer). Defective PG1 plug.
Medallion lamp does not light (set functions normally).	Defective E1 lamp (Medallion). Improperly adjusted relay K8. Shorted or open 4-volt ac secondary of T1 transformer (power transformer).

Trouble	Possible Causes
Failure to start cycle in <i>DICTATE</i> or <i>CHECK</i> with <i>OPERATE</i> button depressed.	Defective <i>X1</i> or <i>X2</i> rectifier. Open or shorted 48- or 75-volt secondary of <i>T1</i> transformer (power transformer). <i>K2</i> relay fails to operate or hold. Defective <i>S2</i> ( <i>OPERATE</i> ) switch. <i>K2</i> relay fails to operate or hold. <i>K8</i> relay fails to operate or hold.
<i>DICTATE</i> lamp does not light.	Defective <i>E2</i> lamp. Relay <i>K6</i> fails to operate or fails to close circuit. Recording drum does not rotate. Open contacts in <i>S1</i> (function selector) switch (terminals 5 and 8 on wafer D).
<i>DICTATE</i> lamp does not flash.	Open <i>R25</i> varistor. Defective <i>S5</i> flasher switch. Improper adjustment of <i>S5</i> flasher switch.
Motor fails to operate.	Relay <i>K5</i> fails to operate or hold. Relay <i>K5</i> improperly adjusted. Defective motor starting capacitor. Defective motor.
Recording drum does not rotate.	<i>L1</i> solenoid fails to operate. Motor fails to operate. Improper drum clutch pressure. Defective motor coupling.
Relay <i>K2</i> fails to operate or hold.	Defective <i>X5</i> varistor. Defective contacts on external relay. Relay <i>K5</i> fails to operate or hold. <i>R14</i> or <i>R15</i> resistor open. Defective relay <i>K2</i> . Failure of +48 or +75 volt dc supply.
Relay <i>K4</i> fails to operate or hold.	Relay <i>K2</i> fails to operate or hold. Failure of +48 volt dc supply. Improper adjustment of relay <i>K2</i> . Defective contacts on <i>S1</i> switch (1 and 4). Defective relay <i>K4</i> .
Relay <i>K5</i> fails to operate.	Relay <i>K2</i> fails to operate or hold. Improper adjustment of relay <i>K2</i> . Failure of +48 volt dc supply. Defective <i>K5</i> relay.
Relay <i>K6</i> fails to operate or hold.	Relay <i>K2</i> fails to operate. Improper adjustment of relay <i>K2</i> . Failure of +48 volt dc supply. Failure of recording drum to rotate. Improper adjustment of drum pulsing switch. Improper adjustment of timing switch or associated operating rod spring pressure. Defective relay <i>K6</i> . Improper adjustment of relay <i>K6</i> . Defective contacts on <i>S1</i> switch (1 and 4).

Trouble	Possible Causes
Relay <i>K5</i> fails to hold during indexing.	Improper adjustment of drum index switch ( <i>S3</i> in recorder).
Relay <i>K8</i> fails to operate.	Limit switch fails to operate. Defective relay <i>K8</i> . Defective contacts on <i>S1</i> switch.
L1 solenoid fails to operate.	Relay <i>K2</i> fails to operate. Relay <i>K2</i> improperly adjusted. Defective L1 solenoid. Bind in bail or latch linkage.
L2 solenoid fails to operate.	Relay <i>K4</i> fails to operate. Relay <i>K4</i> improperly adjusted. Defective L2 solenoid. L2 solenoid adjusted with plunger too far out in nonenergized condition.
Failure to erase previous announcement.	Relay <i>K4</i> fails to operate. Improperly adjusted relay <i>K4</i> or <i>K6</i> . Shorted <i>C3-2</i> capacitor. Defective or improperly adjusted erase coil.
Announcement not recorded.	Relay <i>K4</i> improperly adjusted. Defective recording head. Defective amplifier. Motor fails to operate. Relay <i>K6</i> fails to operate. Head lock spring not lowered.
Ready lamp does not light. Function switch in <i>AUTOMATIC ANSWER.</i>	Defective lamp. Defective <i>S1</i> switch.
No announcement played back in <i>AUTOMATIC ANSWER.</i>	Announcement not recorded. Shorted resistor across terminals R and T of terminal strip TS1 or TS1A. Defective <i>T2</i> transformer. Improperly adjusted or defective relay <i>K6</i> . Defective timing or drum pulsing switch.
Weak volume.	Dirty contact surface on recording head. Improperly adjusted recording head. Defective amplifier. Shorted <i>C10</i> capacitor. Defective recording head.
Announcement not clear.	Weak clutch causing slipping drum. Dirty head. Defective motor. Binding bearings.

Trouble	Possible Causes
Distortion in announcement.	Defective magnetic band. Bay oscillator not operating. Improperly positioned recording head. Defective $V_4$ tube, $C7$ or $C10$ capacitor in amplifier. Open or shorted $C11$ capacitor. Improperly adjusted erase coil. Recording head magnetized. Open $R_4$ resistor. Background noise when dictating. Poor connection between telephone set and answering set. Poor telephone transmitter. Half nut does not track properly. AC hum in filter capacitor.
Noise in announcements.	Defective $V_4$ tube in amplifier. Faulty contact of tubes, plugs, relays, or switches (buzzing). Defective or improperly adjusted erase coil. Mechanical vibration of magnetic head.
Limit switch fails to operate at end of message.	Drum fails to rotate. Defective limit switch clamp. Defective limit switch.
Repeats end of message only.	External relay is held operated. Limit switch set to operate exactly at drum index point.
Double tracking. (Simultaneous reproduction of adjacent tracks.)	Improper engagement of half nut with feed screw. Excessive play between half nut and feed screw.
Drum does not index.	Improper adjustment of drum index switch.
Excessive dead time at end of announcement.	Limit switch slipping. Message too short. <b>OPERATE</b> switch not released at end of announcement.
Head fails to fly back at end of cycle.	Limit switch failure. Half nut and feed screw do not disengage. Mechanical interference with bail or head carriage motion.
Echo.	Improper erasure. Improper erase coil adjustment.
Variable speech levels and drop-outs.	Mistracking. Head contact with drum not uniform.

## 9.00 LUBRICATION

9.01 It is recommended that the parts listed be lubricated annually. This interval may be extended if periodic inspections have indicated that the requirements will be met during the extended interval.

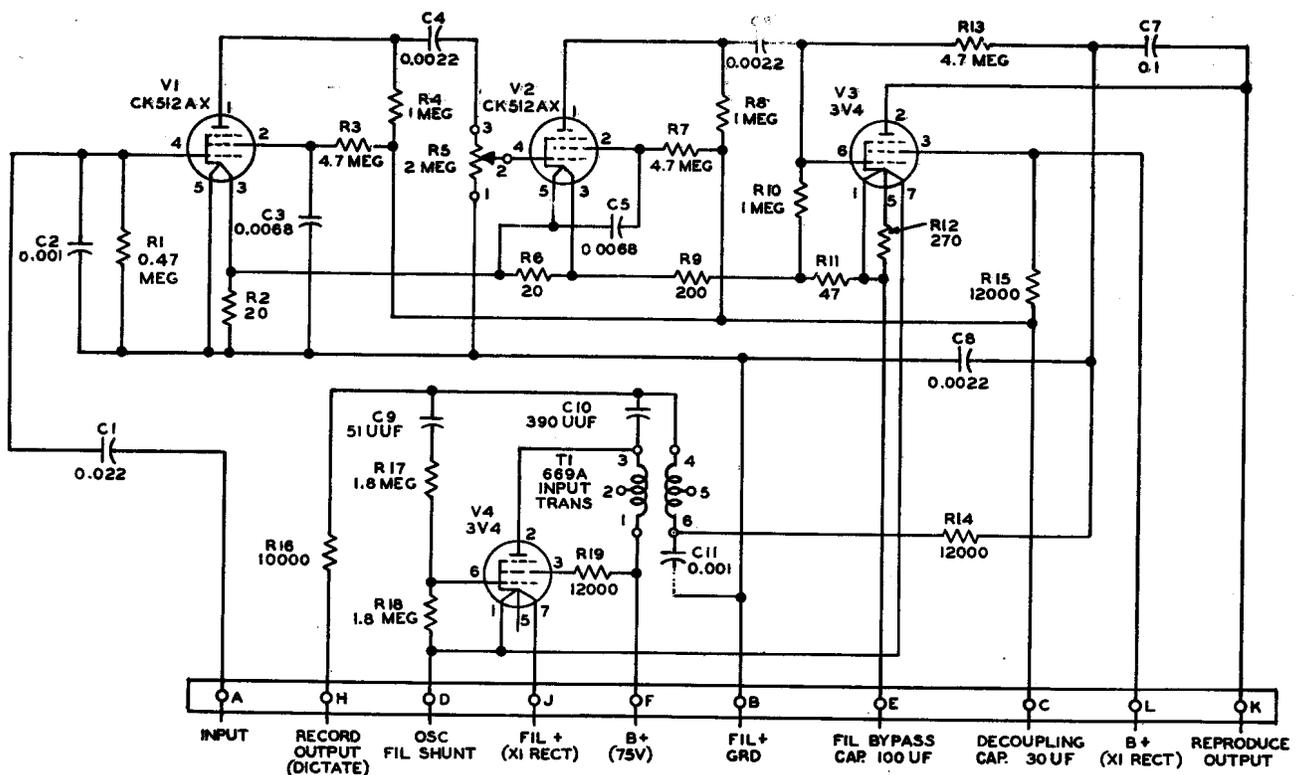
9.02 Use KS-16326, List 1 oil to put a film on the following parts:

- The tooth surfaces of all gears.
- The threads of the feed screw.

9.03 Use caution when lubricating so that no oil gets in relay contacts, drum, or announcement head.

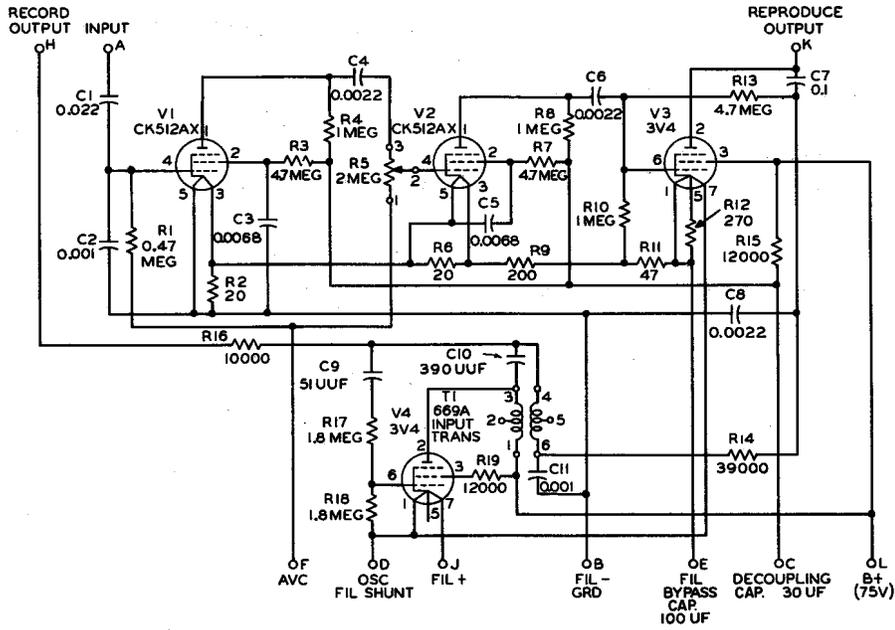
## 10.00 SUPPRESSION OF RADIO STATION INTERFERENCE

If customer hears radio programs on announcement messages, the trouble might be eliminated by the installation of a 1542A inductor in accordance with the section entitled Radio Signal Suppression in Telephone Sets (see Fig. 11).



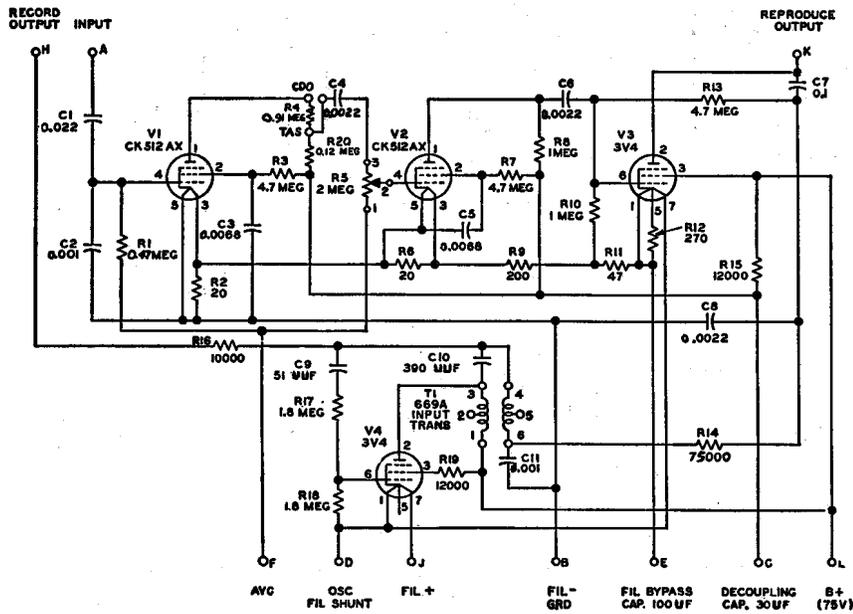
Note: Unless otherwise specified, resistor values are ohms and capacitor values are microfarads.

Fig. 7 — Schematic of Amplifier Used with Early Type Sets



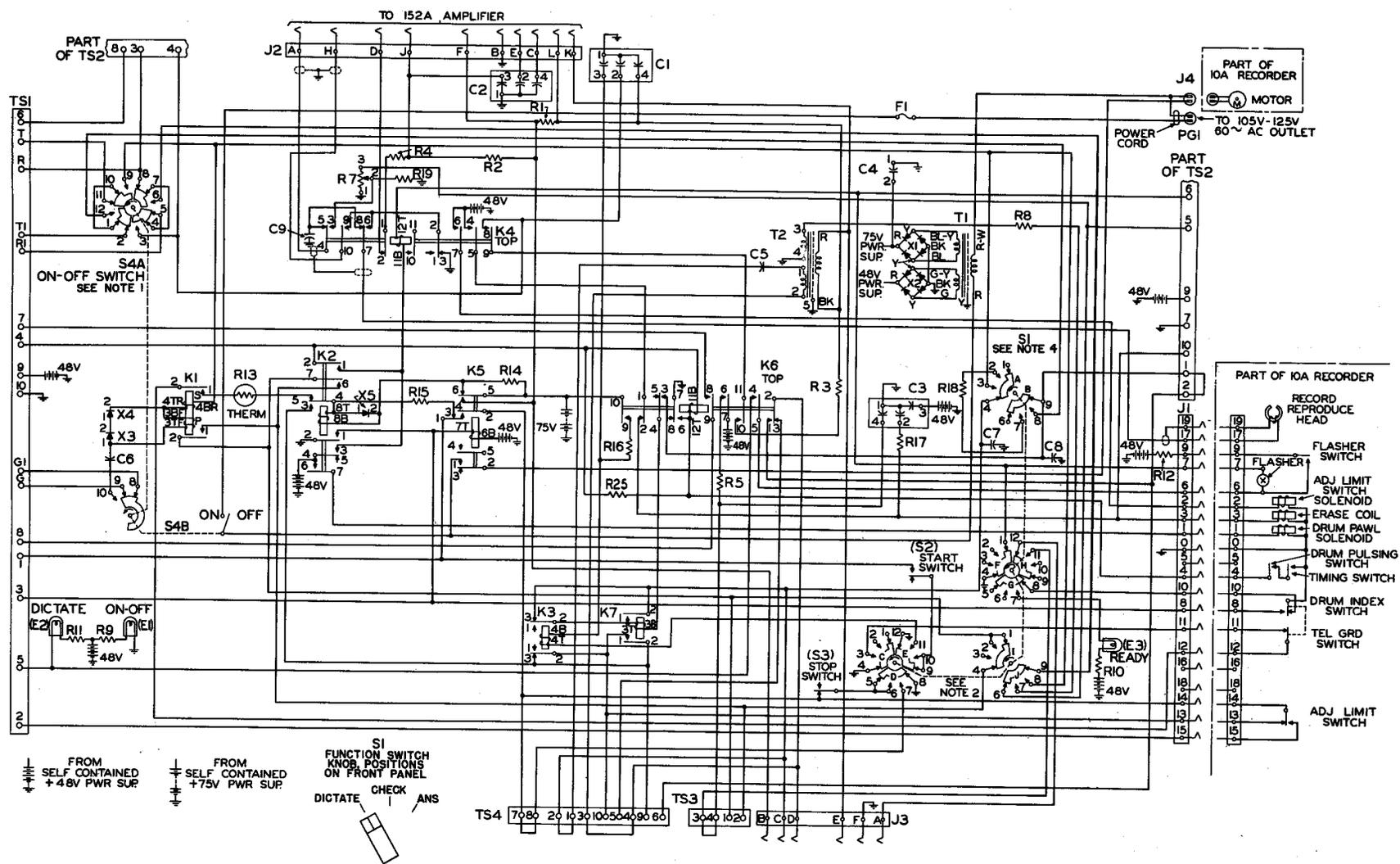
Note: Unless otherwise specified, resistor values are ohms and capacitor values are microfarads.

Fig. 8 — Schematic of 152A Amplifier Shown in Fig. 1, Standard Sets



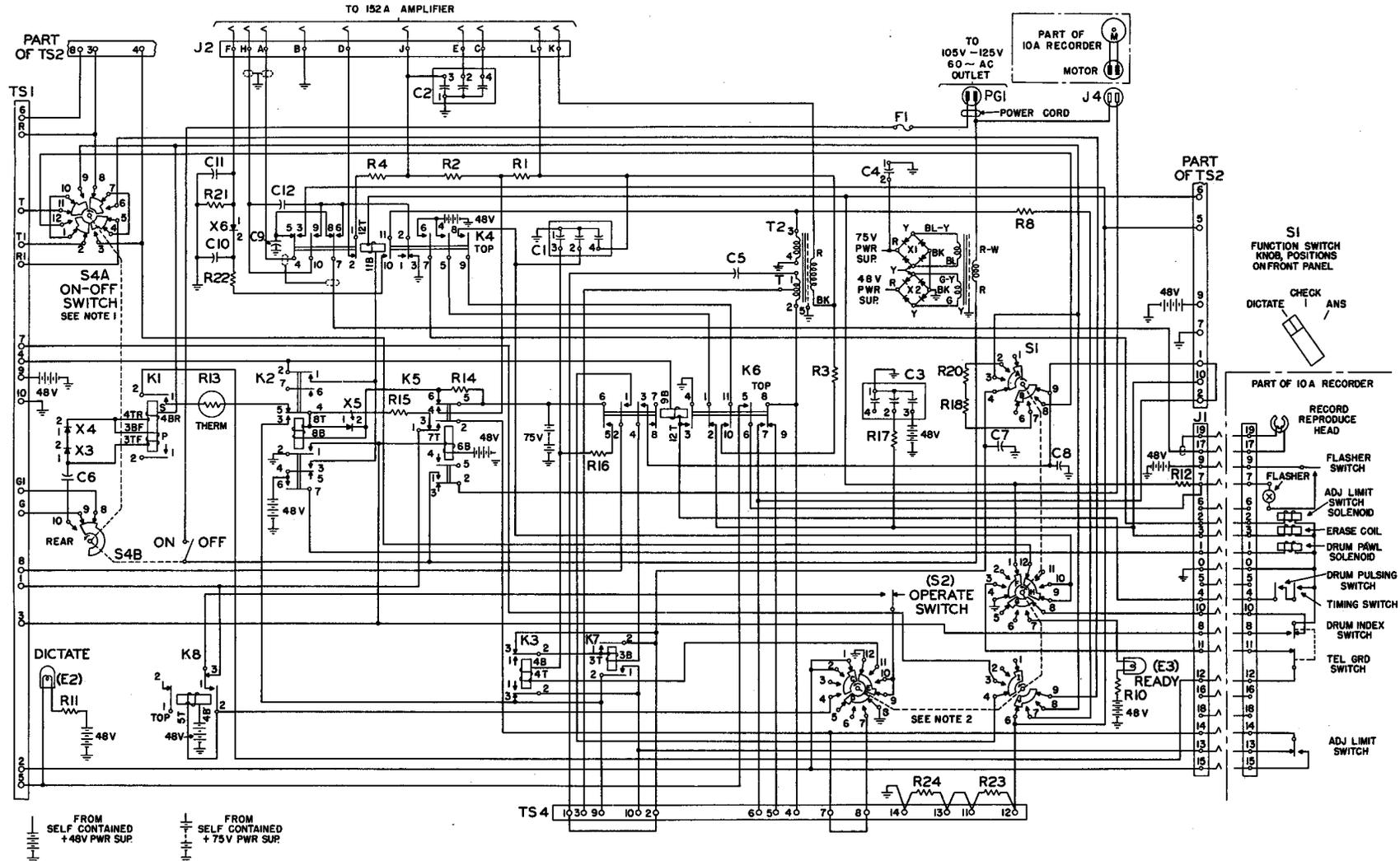
Note: Unless otherwise specified, resistor values are ohms and capacitor values are microfarads.

Fig. 9 — Schematic of 152A Amplifier Shown in Fig. 2, Standard Sets



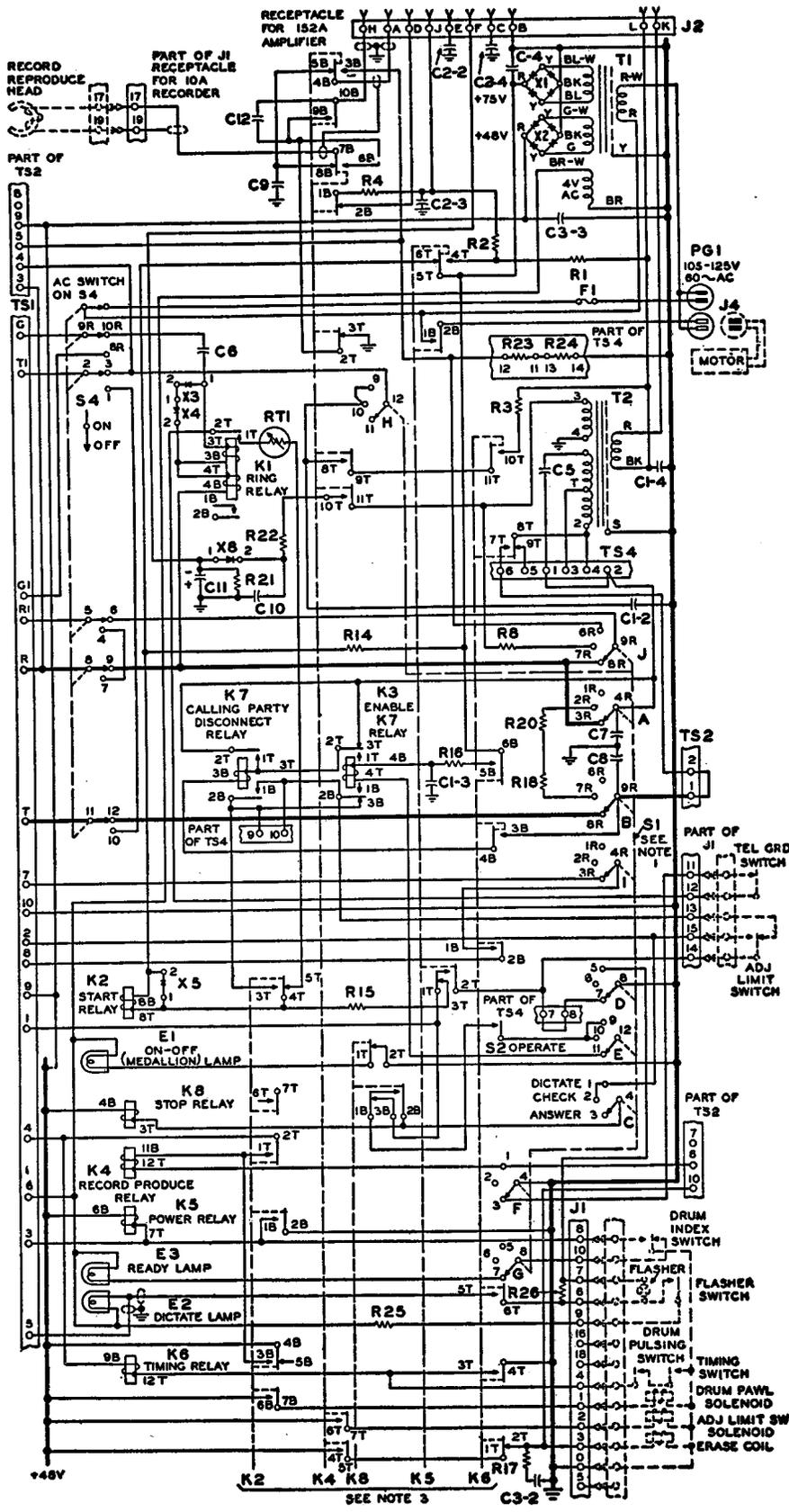
- Note 1: S4 shown in OFF position.
- Note 2: S1 shown in ANNOUNCEMENT DICTATE position.
- Note 3: TS2, TS3, and TS4 strapping shown is for AUTOMATIC ANSWER.
- Note 4: Sections A, B, C, D, and E of S1 are on wafer closest to front panel. Sections F, G, H, I, and J are on wafer farthest from front panel.

Fig. 10-2A Telephone Answering Set Schematic With Letter A Preceding Serial Number



- Note 1:** S4 shown in OFF position.
- Note 2:** S1 shown in ANNOUNCEMENT DICTATE position.
- Note 3:** TS2, TS3, and TS4 strapping shown is for AUTOMATIC ANSWER.
- Note 4:** Sections A, B, C, D, and E of S1 are on wafer closest to front panel. Sections F, G, H, I, and J are on wafer farthest from front panel.

**Fig. 11 — Standard 2A Telephone Answering Set Without Medallion Light Socket**



**Note 1:** Sections A, B, C, D, and E of S1 are on wafer closest to front panel. Sections F, G, H, I, and J are on wafer farthest from front panel.

**Note 2:** Circuit elements shown by dotted lines are part of 10A recorder.

**Note 3:** Relay contacts joined by dotted lines are on the same relay and are operated by the relay indicated. Relay contacts are shown for nonoperate condition of relays.

**Note 4:** Straps shown on TS2 and TS4 must be made for answer only service.

**Note 5:** Capacitors C1, C2, and C3 consist of three 100-volt sections,

- Term. 1 — Common
- Term. 2 — 100UF
- Term. 3 — 200UF
- Term. 4 — 30UF

Fig. 12 — Standard 2A Telephone Answering Set With Medallion Light Socket