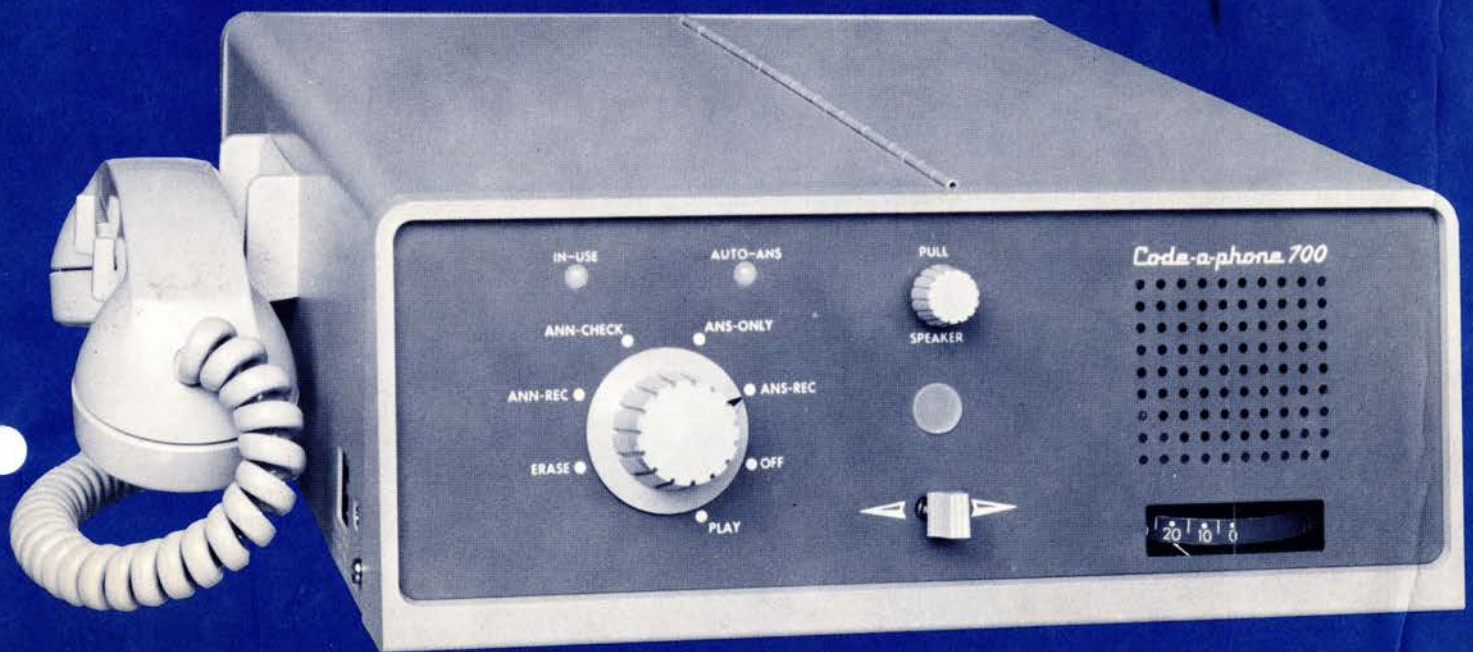


Code-a-phone®



MODEL 700 SERVICE MANUAL

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FORD INDUSTRIES INC.

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SECTION I

DESCRIPTION

GENERAL

The Code-a-phone Model 700 is an automatic telephone answering machine which will answer a telephone line, transmit a pre-recorded announcement, and record a message dictated by the calling party.

The Model 700 will answer the telephone line with an announcement of up to three minutes in length, and record a total of two hours of incoming messages.

A Voice Control circuit allows incoming messages to be of any length that the caller desires, up to the two-hour maximum. If the caller is silent for four seconds, a low "talk-down" tone warns him that the Code-a-phone will disconnect unless he resumes his message within another eight seconds. A separate circuit, the Calling Party Control, will disconnect the Model 700 whenever the caller hangs up. (This feature will operate only where the local telephone Central Office provides a calling party control disconnect signal.) If desired, incoming calls may be "monitored" through the internal speaker.

Announcements are recorded onto the Model 700 through the attached telephone-type handset. Recorded messages may be played back through the handset, internal speaker, or optional Earphone. An accessory Footswitch and Backspace Unit provide for convenient transcription of the messages.

Two separate plug-in tape decks provide the recording facilities. The "A" Deck contains the transmitted announcement, and incorporates a variable cycle feature to set the announcement length each time it is recorded. The "B" Deck records two hours of incoming messages onto a removable Tape Cartridge.

From the maintenance standpoint, the Model 700's "modular construction" is an important feature. The "A" Deck, "B" Deck, Amplifier, Voice Control, Tape Cartridge, power transistors, indicator lamps, relays, and A.C. Power Cable are all plug-in units, easily replaced to facilitate trouble-shooting and repair.

SPECIFICATIONS

GENERAL

WEIGHT 31 pounds (shipping weight 36 pounds)
DIMENSIONS 11-1/2" wide
 4-3/4" high
 14" deep
STANDARD EQUIPMENT Handset
 Tape Cartridge
 A.C. Power Cable

ACCESSORIES AVAILABLE Extra Tape Cartridges
 Earphone
 Footswitch
 Backspace Unit

ELECTRICAL

POWER REQUIREMENTS 105-130 volts, 60 cycle A.C. only
 75 watts (maximum)
 6 watts (standby)

AMBIENT TEMPERATURE
OPERATING RANGE 0° F. to 120° F.
RECORDING CAPACITY "A" Deck — 3 minutes
 "B" Deck — 2 hours, on removable Tape Cartridge.
TAPE SPEED "A" Deck — 1-5/8 ips
 "B" Deck — 15/16 ips
FREQUENCY RESPONSE 300-3000 cps
HARMONIC DISTORTION Less than 3%
WOW AND FLUTTER Less than 1%
SIGNAL TO NOISE RATIO Better than 35 DB

TELEPHONE LINE

IMPEDANCE 33,000 Ω @ 20 cps
 600 Ω @ 300-3000 cps
RING-UP REQUIREMENTS Minimum 50 volts RMS @ 20 cps only
CALLING PARTY CONTROL
D.C. REQUIREMENT Minimum 20 milliamperes D.C. through telephone line at
 all times during the automatic answering cycle.
ANNOUNCEMENT LEVEL -3 DBM (0.55 volts) average
INCOMING MESSAGE LEVEL -45 DBM to +10 DBM (0.0045 volts to 2.5 volts). Auto-
 matic Volume Control compresses 55 DB of level vari-
 ation into 15 DB.
VOICE CONTROL SENSITIVITY ... Voice Control will time out if speech falls below -45 DBM
 (0.0045 volts).
VOICE CONTROL TIME-OUT Talk-down tone will be transmitted to calling party 4 seconds
 after speech stops. If speech does not reappear after an
 additional 8 seconds, the Model 700 will disconnect.
TALK-DOWN TONE 1400 cps ($\pm 2\%$), -26 DBM (0.04 volts)
TRANSFER AND DISCONNECT
"BEEP" TONES 1-second, 1400 cps ($\pm 2\%$), -5 DBM (0.44 volts)

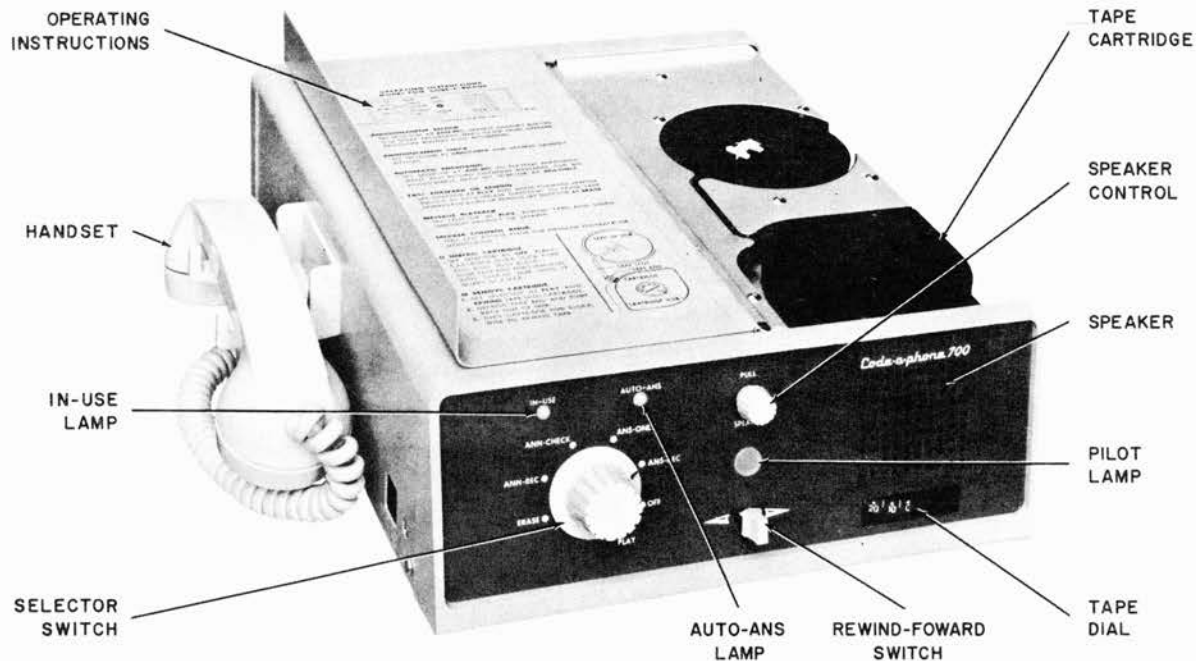


FIGURE 1 MODEL 700 FRONT VIEW

SECTION II OPERATING INSTRUCTIONS

TO RECORD AN ANNOUNCEMENT

1. Rotate Selector Switch to ANN-REC.
2. Depress and hold switch on Handset.
3. When In-Use Lamp comes on (in about two seconds), dictate announcement into Handset.
4. Release Handset switch after completing announcement. This will automatically set the announcement length and rewind the tape.

TO CHECK THE ANNOUNCEMENT

1. Rotate Selector Switch to ANN-CHECK.
2. Depress and hold switch on Handset. The announcement will play back through the Handset.
3. If desired, pull out on Speaker Control to play announcement also through Speaker.

AUTOMATIC ANSWER ONLY

1. Rotate Selector Switch to ANS-ONLY. Auto-Ans Lamp will light to indicate that the machine is ready to answer the telephone.
2. The Model 700 will answer incoming calls, play the recorded announcement, and disconnect.

AUTOMATIC ANSWER AND RECORD

1. Rotate Selector Switch to ANS-REC. Auto-Ans Lamp will light.
2. The Model 700 will answer incoming calls, play the recorded announcement, and transmit a "beep" tone. The calling party may then dictate his message onto the Tape Cartridge. The Model 700 will disconnect when the caller hangs up, or 12 seconds after he stops talking.
3. If desired, pull out on Speaker Control to monitor the incoming calls as they are being recorded.

TO PLAY BACK THE MESSAGES

1. Rotate Selector Switch to PLAY.
2. Depress and hold switch on Handset. The messages will play back through the Handset.
3. If desired, pull out on Speaker Control to play the messages through the Speaker.
4. Operate Rewind-Forward Switch to scan the tape fast in either direction.

TO ERASE THE MESSAGES

1. Rotate Selector Switch to ERASE.
2. Operate Rewind-Forward Switch to erase the Tape Cartridge quickly. (In addition, all old messages are automatically erased as new ones are recorded.)

SECTION III INSTALLATION

LOCATION

Place the Model 700 on a desk, table, or shelf that will securely support its weight (31 pounds). Be sure that the machine is within eight feet of a 117 volt A.C. power outlet.

Bear in mind that the Code-a-phone will require more frequent maintenance if operated in an environment of extreme heat, cold, or dust conditions.

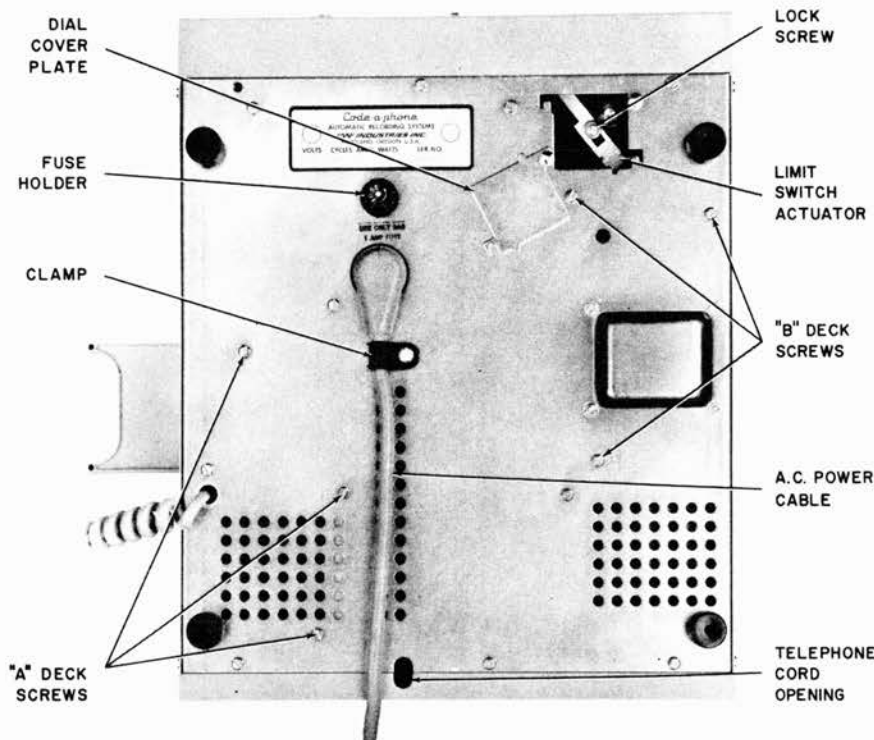


FIGURE 2 MODEL 700 BOTTOM VIEW

CONNECTIONS

1. Loosen one screw and remove Terminal Cover Plate (fig. 11).
2. Locate the telephone connecting cord that enters the Model 700 through the Telephone Cord Opening (fig. 2). The cord should be anchored with a metal clamp and the Clamp Screw (fig. 11). The Model 700 is supplied with a 5-conductor cord, Ford part number 30-01-320.
3. Connect the cord to the telephone line as follows:
 - a. Connect as shown in Fig. 3-A for use with a single telephone set. The telephone set may be connected for single party (metallic ringing) service, for two-party (grounded ringing) service, or to a private exchange line.
 - b. Connect as shown in Fig. 3-B to answer a PBX or PABX trunk.
 - c. Connect as shown in Fig. 3-C to answer one particular line of 1A1 or 1A2 key telephone system.
 - d. The connection shown in Fig. 3-D allows a subscriber with a key telephone set to select the line to be answered. The Model 700 will be connected to the line associated with whichever button is depressed on the key telephone. The Model 700 may be connected in this manner to a 500-series key telephone set.
 - e. Connect as shown in Fig. 3-E for use with any Automatic Electric key telephone set. In this case, the push-buttons on the telephone set will select the line to be answered by the Model 700.
 - f. For special applications phone audio leads ("talking pair") across terminals "R" and "T", and connect the ringing leads across terminals "R" and "G". If the audio and ringing leads are the same cable pair, strap terminal "T" to terminal "C".

If 20 cps ringing voltage is not available, the Model 700 automatic answer cycle may be started by momentarily shorting together terminals "1" and "2". The momentary "shorting pulse" may be as short

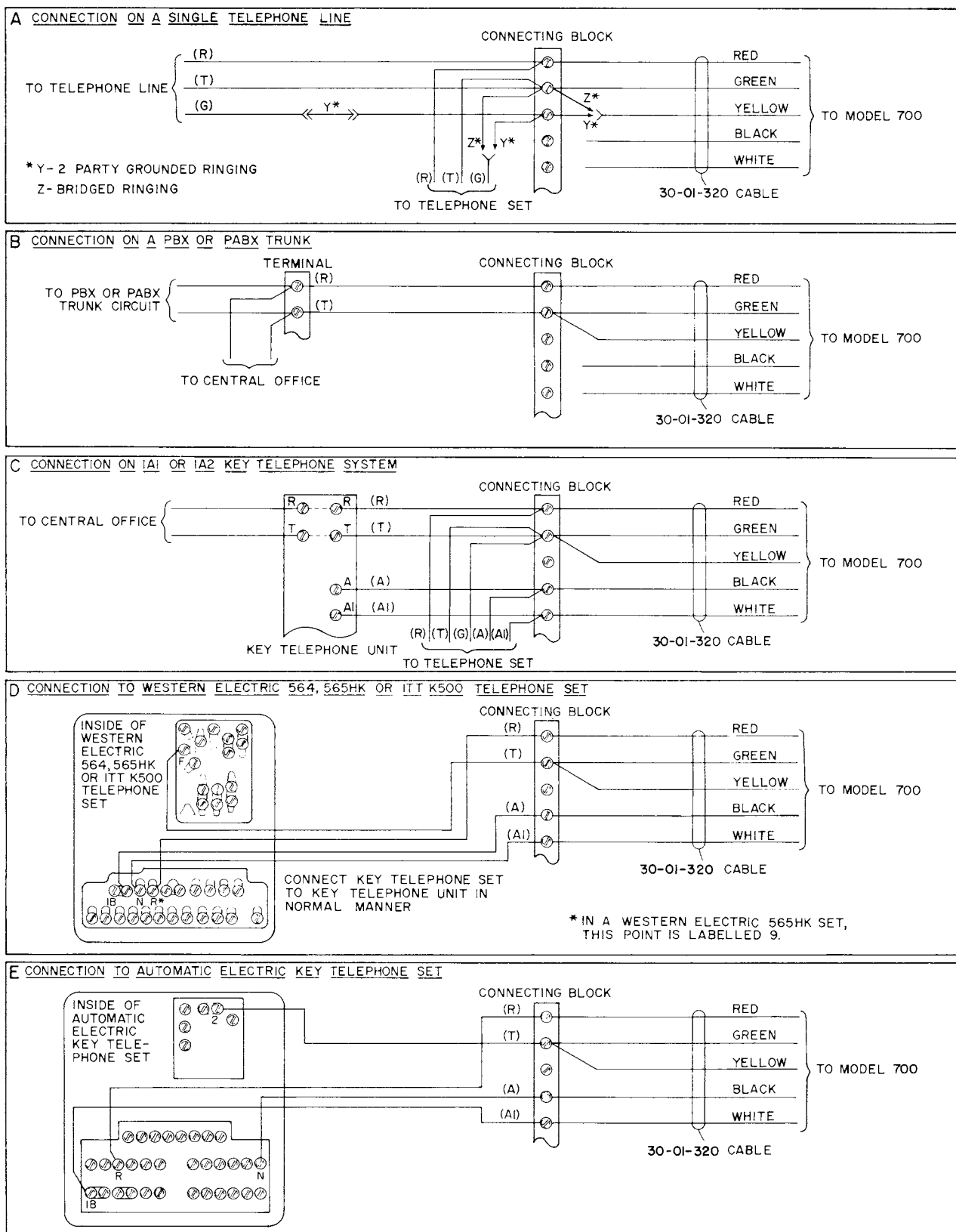


FIGURE 3 CONNECTION TO TELEPHONE LINE

as 0.1 second, and must be removed within a few seconds after the machine starts.

The Model 700 requires a minimum of 20 milliamperes of D.C. battery current through terminals "R" and "T" at all times during the automatic answer cycle. If the telephone line does not provide this battery current, disable the Model 700 Calling Party Control circuit as described on page 10.

4. Replace Terminal Cover Plate.
5. Insert A.C. Power Cable into Model 700 and secure with Clamp as shown in fig. 2.
6. Connect the A.C. Power Cable to a 117 volt, 60 cycle A.C. power outlet.
7. Proceed with the INSTALLATION CHECK-OUT, page 10.

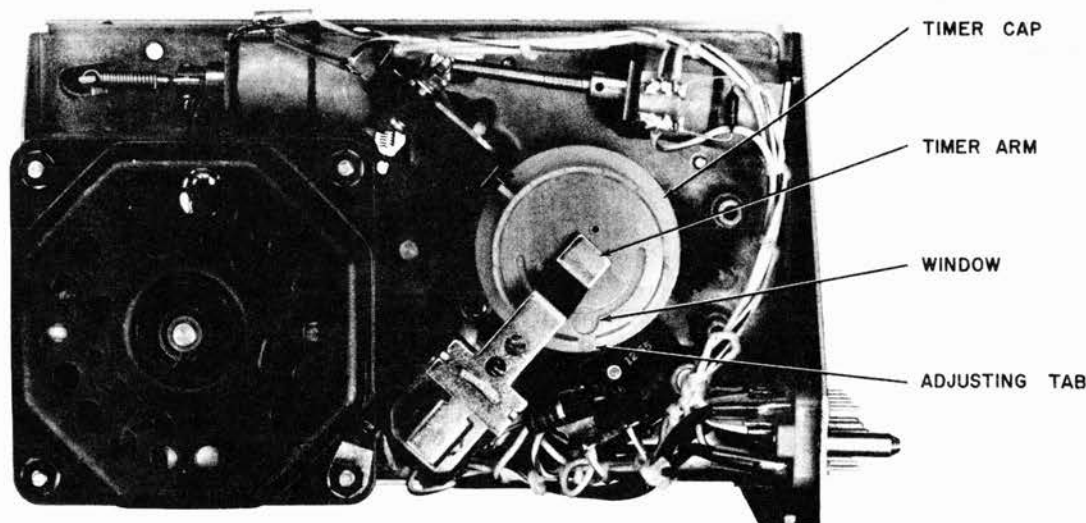


FIGURE 8 ADJUSTMENT FOR ANNOUNCEMENT MAXIMUM LENGTH

OPTIONS

1. ANNOUNCEMENT MAXIMUM LENGTH:

The outgoing announcement length is automatically set each time it is recorded onto the "A" Deck (fig. 10), up to a maximum of 3 minutes. This 3-minute maximum may be reduced as follows:

- a. Disconnect Model 700 from A.C. power.
- b. Remove machine Cover and Amplifier (page 12).
- c. Momentarily lift Timer Arm (fig. 8) away from the "A" Deck. An internal spring will cause the Timer Cap to rotate to the "zero time" position.
- d. Hold Timer Cap and carefully lift Adjusting Tab. Rotate Adjusting Tab until the desired maximum announcement length (in seconds) shows in the small Window (fig. 8).

Adjustment for the maximum announcement length may be made in 15-second increments from 15 to 90 seconds, and in 30-

second increments from 90 seconds to 180 seconds (3 minutes).

2. MESSAGE MAXIMUM LENGTH:

A maximum of two hours of telephone messages may be recorded onto the Tape Cartridge (fig. 1). This maximum may be reduced to one hour as follows:

- a. Connect Model 700 to A.C. power.
- b. Rotate Selector Switch to PLAY (fig. 1).
- c. Push Rewind-Forward Switch to the left to rewind the tape to the beginning.
- d. Disconnect Model 700 from A.C. power.
- e. Loosen 2 screws and remove Dial Cover Plate (fig. 2).
- f. Loosen Lock Screw and slide Limit Switch Actuator to the "1 hr." notch. See fig. 2.
- g. Tighten Lock Screw and replace Dial Cover Plate.

Section III Installation

3. VOICE CONTROL AND CALLING PARTY CONTROL DISABLING:

- a. The Model 700 provides two methods for releasing the telephone line at the end of each automatic answer cycle:

(1) The Voice Control monitors speech on the telephone line and disconnects:

- (a) After 12 seconds of silence on the line.
- (b) After 12 seconds of steady tone (such as dial tone) on the line.

(2) The Calling Party Control circuit monitors the battery current through the telephone line and disconnects immediately whenever:

- (a) The battery current reverses direction.
- (b) The battery current drops below 20 milliamperes for a period of 10 milliseconds or longer.

Local conditions may require that either the Voice Control or Calling Party Control be disabled. Never disable both circuits in the same machine.

- b. To disable the Voice Control circuit, solder a strap between the Blue Dot terminals (fig. 9).

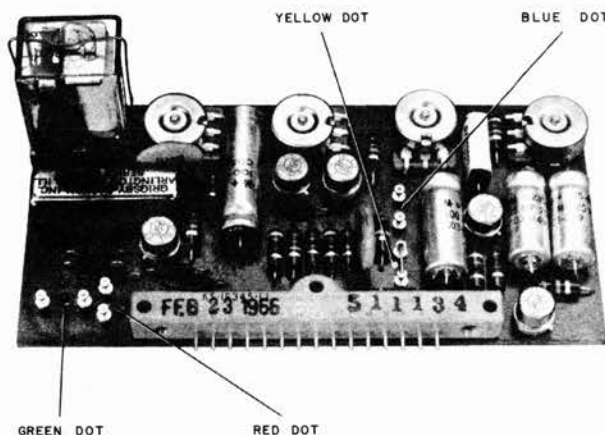


FIGURE 9 VOICE CONTROL STRAPPING OPTIONS

- c. To disable the Calling Party Control circuit, solder one strap between the Red Dot terminals, and another strap between the Green Dot terminals (fig. 9).

4. TALK-DOWN TONE DISABLING:

The talk-down tone warns the calling party 8 seconds before the Voice Control disconnects. To disable the talk-down tone, remove the strap that is soldered between the Yellow Dot terminals (fig. 9).

INSTALLATION CHECK-OUT

Check out the Model 700 and its installation as follows:

1. Referring to the OPERATING INSTRUCTIONS on page 5, record a test announcement. Verify that the Pilot Lamp and In-Use Lamp work properly (fig. 1).
2. CHECK the announcement through the Handset, and through the Speaker.
3. Rotate the Selector Switch to ANS-ONLY. Verify that the Auto-Ans Lamp is working.
4. Call the Model 700 from another telephone. Listen to the test announcement.
5. Rotate the Selector Switch to ANS-REC.
6. Call the Model 700 from another telephone. Listen to the test announcement and "transfer beep" tone, then dictate a test message. Be silent for 4 seconds (until the talk down tone starts). Start talking again during the next 8 seconds. The talk down tone should stop. Be silent again, and allow the Voice Control to disconnect the Model 700. A loud "disconnect beep" tone should be heard.
7. Call the Model 700 again. This time, dictate a short test message and hang up. The Calling Party Control should disconnect the machine immediately. (The Calling Party Control feature will not work with every telephone Central Office.)
8. Rotate the Selector Switch to PLAY and rewind the tape.
9. Pull out on the Speaker Control and listen to the test messages.
10. If playback accessories are being used, test them now. (See pages 48 and 49.)
11. Rotate the Selector Switch to ERASE and rewind the tape.
12. Pull out on the Speaker Control again to verify that the messages have been erased.
13. Rotate the Selector Switch to ANN-REC. Erase the test announcement by covering the Handset mouthpiece while holding the Handset switch depressed.

The Model 700 is now ready for operation. At this time, instruct the subscriber on the use of his new Code-a-phone.

SECTION IV

MAINTENANCE

PREVENTIVE MAINTENANCE

The Model 700 was engineered to operate for long periods of time without requiring maintenance attention. Machine parts have been carefully selected for their ability to resist wear and aging, and all components operate at far below their design ratings. Extensive field experience indicates that mechanical wear and component deterioration are not problems under normal use.

However, as in all tape recorders, a slow building up of recording tape oxide on the "A" and "B" Deck mechanisms will gradually reduce the audio quality of the recordings.

Under normal conditions, the oxide residue should

be cleaned from the tape decks every one thousand hours of machine operation. This will occur approximately each three years of normal use. Very heavy use, or severe environments of heat, cold, or dust-laden air will shorten the interval for which preventive maintenance is required.

To maintain a Model 700 in top working condition, carry out the following steps each one thousand hours of machine operation:

1. Clean the tape heads in the "A" Deck (page 17) and "B" Deck (page 18).
2. Perform the machine CHECK-OUT, page 23.

REPAIR PROCEDURE

Always follow these four steps when servicing an "out of order" Model 700:

1. LOCATE THE TROUBLE:

The quickest way to locate a trouble is to substitute, one by one, the plug-in components. The "A" Deck, "B" Deck, Amplifier, Voice Control, relays, power transistors, lamps, A.C. Power Cable, and Tape Cartridge may all be easily substituted with known good components.

If this method fails, study the CIRCUIT DESCRIPTION, starting on page 24. Compare the actions of the malfunctioning machine with the correct operating sequences. This procedure should soon reveal the faulty component or adjustment.

Troubles in the electronic circuits can be located by employing normal trouble-shooting techniques, such as signal tracing and measuring voltages at critical points. The correct voltages are marked on the MODEL 700 SCHEMATIC, page 51.

2. REPAIR:

Often the best way to repair a Model 700 is to simply replace the faulty plug-in component. This allows the machine to be returned to

service with a minimum of delay. The faulty component may then be repaired, tested, and returned to the spare parts stock at a later time.

Parts that are replaced in a Model 700 must be of Telephone Grade quality or better. The Code-a-phone factory is the only sure source of quality repair parts. See page 32 for information on ordering parts.

3. ADJUST:

If electronic components are replaced in the course of repair, the circuit characteristics are likely to change. Re-adjust the affected controls in the Amplifier and Voice Control (page 21) to restore the factory settings.

If the solenoids are replaced in either tape deck, re-adjust the plungers as described on page 17 ("A" Deck) or 18 ("B" Deck).

If the tape heads are replaced in the "B" Deck, re-align the Record Head as described on page 18.

4. TEST:

Always test all functions of a Model 700 after repairs are made. Follow the CHECK-OUT procedure on page 23.

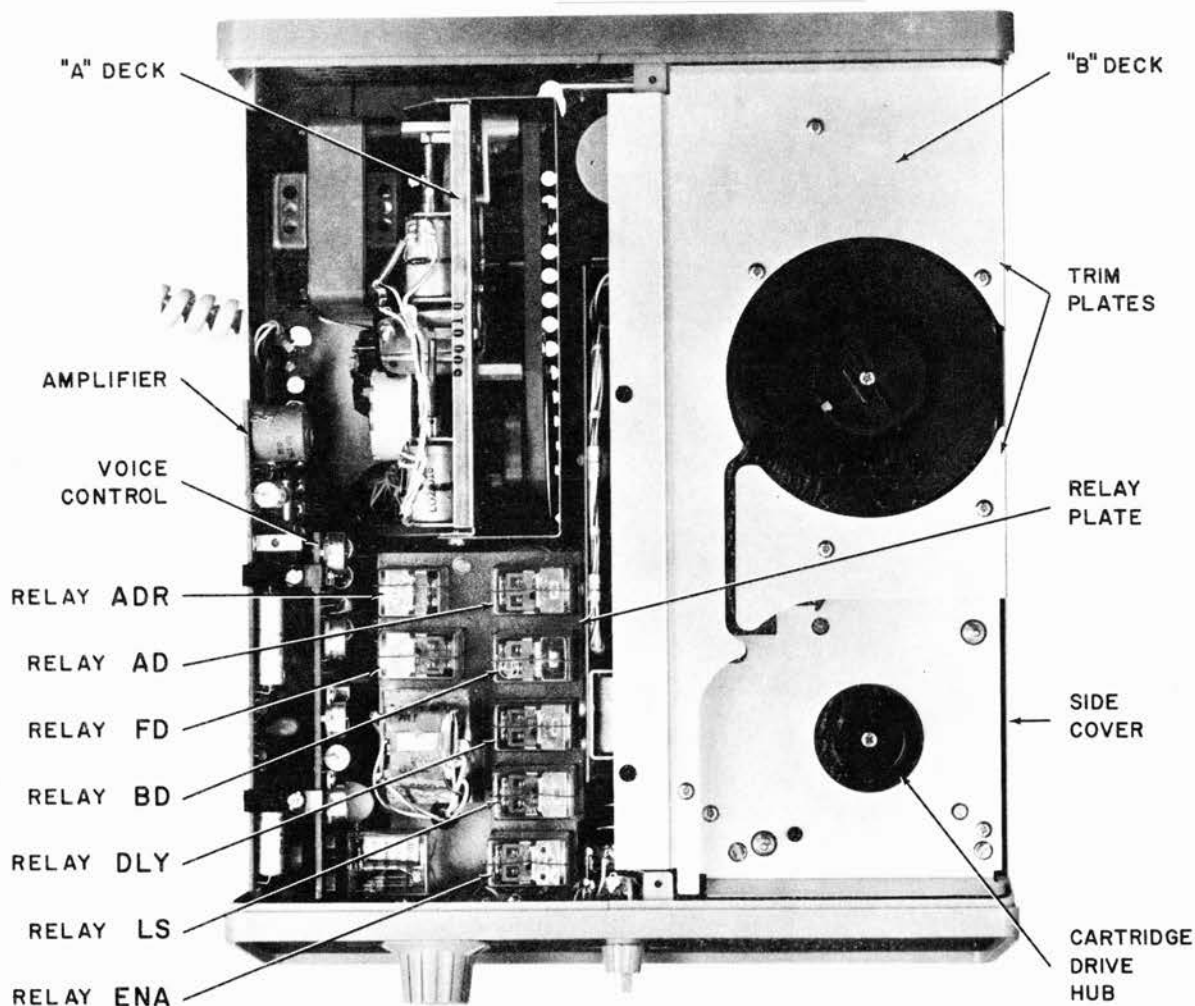


FIGURE 10 MODEL 700 TOP VIEW, COVER AND TAPE CARTRIDGE REMOVED

MACHINE DISASSEMBLY

1. COVER:
 - a. Open Cover door as shown in fig. 1.
 - b. Remove 4 screws (2 on top, 2 on the side).
 - c. Lift off Cover.
2. RELAYS (fig. 10):
 - a. Remove Cover (above).
 - b. Release hold-down clip and unplug desired relay.
3. AMPLIFIER AND VOICE CONTROL (fig. 10):
 - a. Remove Cover (above).
 - b. Loosen screws and rotate 2 Circuit Board Retainers 1/4 turn (fig. 12).
- c. Unplug Amplifier or Voice Control.
4. "A" DECK (fig. 10):
 - a. Disconnect Model 700 from A.C. power.
 - b. Remove Cover (above).
 - c. Remove 3 "A" Deck Screws (marked "L2") from bottom of machine (fig. 2).
 - d. Carefully unplug and lift out "A" Deck.
5. "B" DECK (fig. 10):
 - a. Disconnect Model 700 from A.C. power.
 - b. Remove Cover (above).
 - c. Remove 4 screws and Side Cover (fig. 10).
 - d. Remove 3 "B" Deck Screws (marked "L3") from bottom of machine (fig. 2).

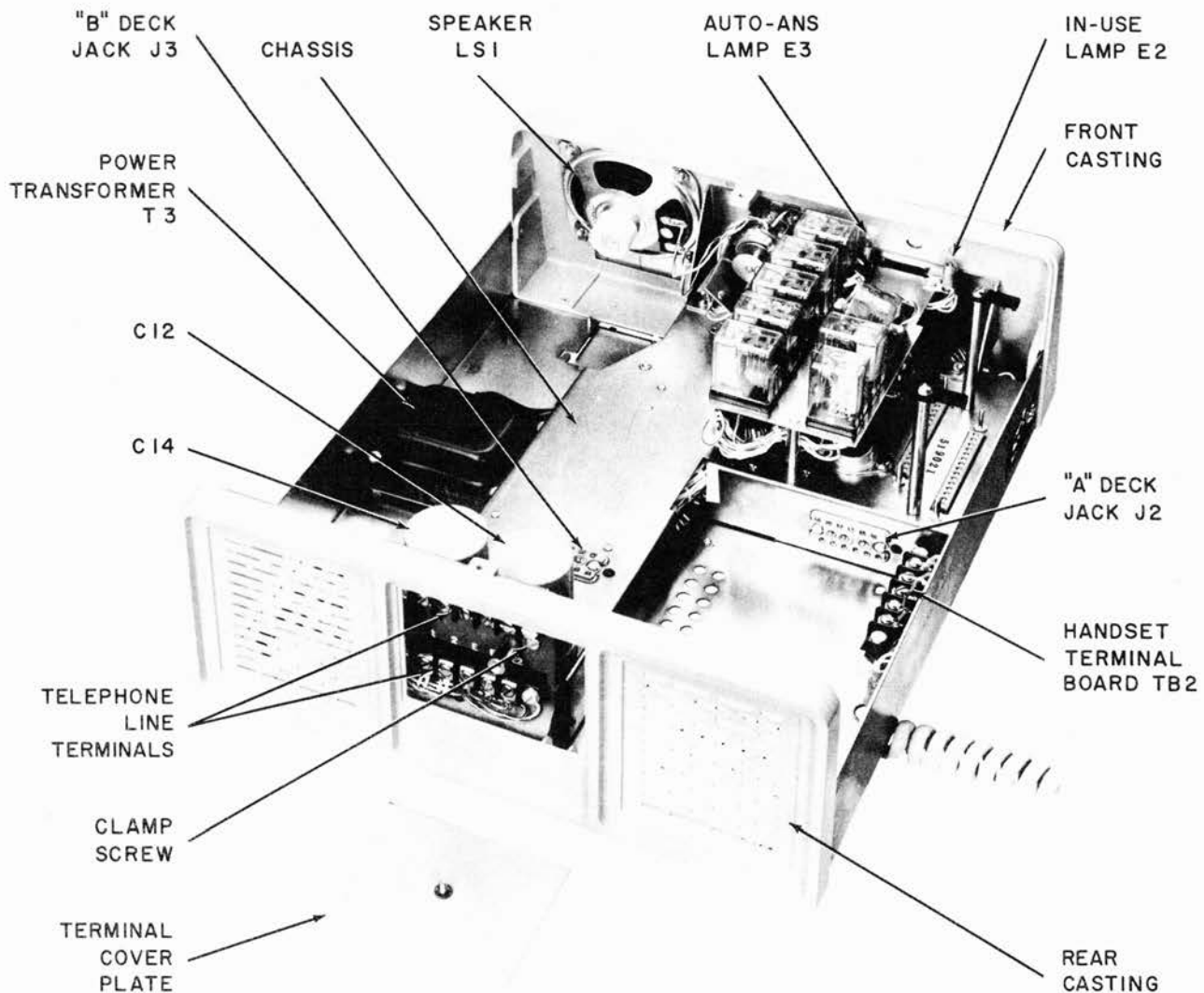


FIGURE 11 MODEL 700 TOP VIEW, TAPE DECKS, AMPLIFIER, AND VOICE CONTROL REMOVED

- e. Carefully unplug and lift out "B" Deck. Do not lift or pry on Trim Plates (fig. 10).
6. AUDIO POWER TRANSISTOR Q1 (fig. 12):
 - a. Remove "A" Deck (page 12).
 - b. Remove "B" Deck (page 12).
 - c. Remove Amplifier and Voice Control (page 12).
 - d. Remove one small (#4-40 x 1/4") screw and carefully swing Relay Plate out of the way as shown in fig. 12.
 - e. Remove 2 screws and unplug Audio Power Transistor Q1.
 - f. When replacing, make sure that mica insulator is between transistor and chassis.

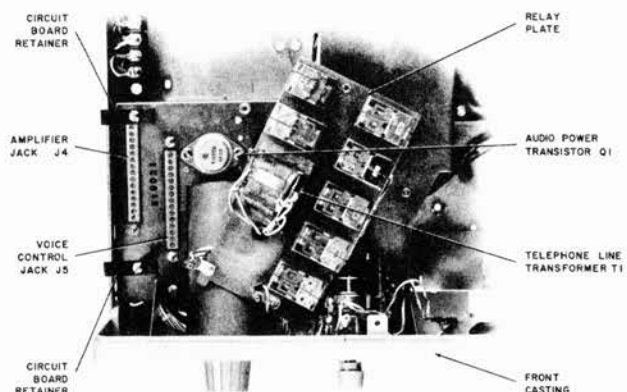


FIGURE 12 LOCATION OF AUDIO POWER TRANSISTOR Q1

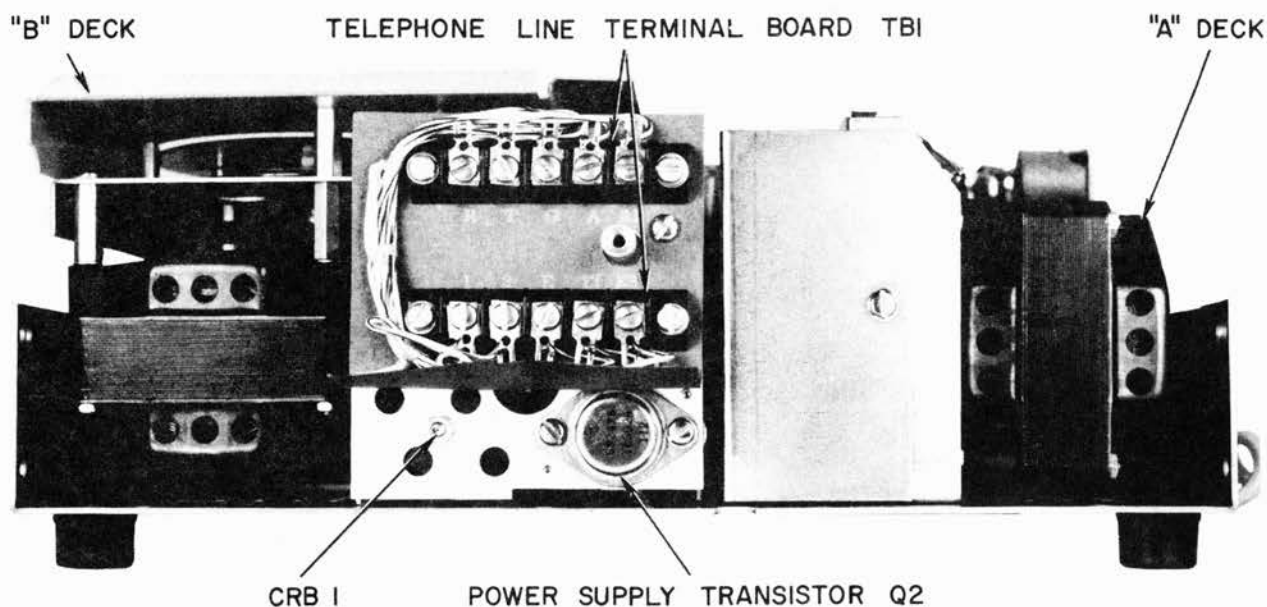


FIGURE 13 MODEL 700 REAR VIEW, COVER AND REAR CASTING REMOVED

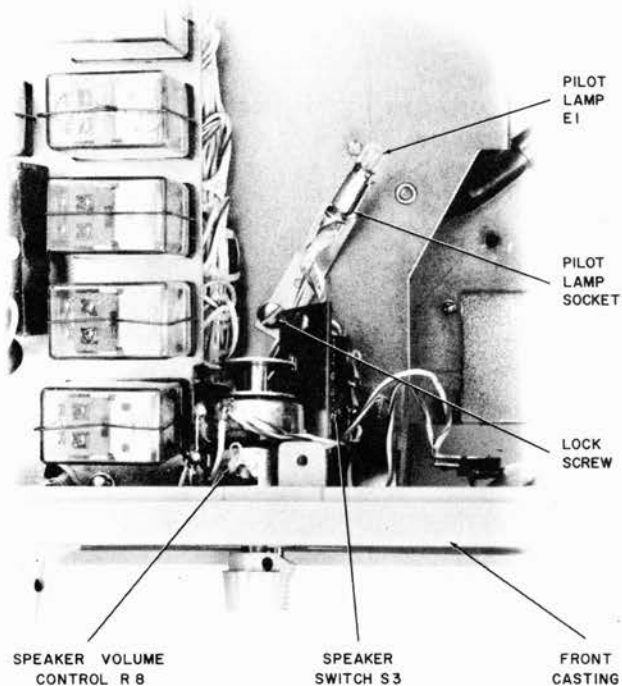


FIGURE 14 PILOT LAMP REPLACEMENT

7. POWER SUPPLY TRANSISTOR Q2 (fig. 13):

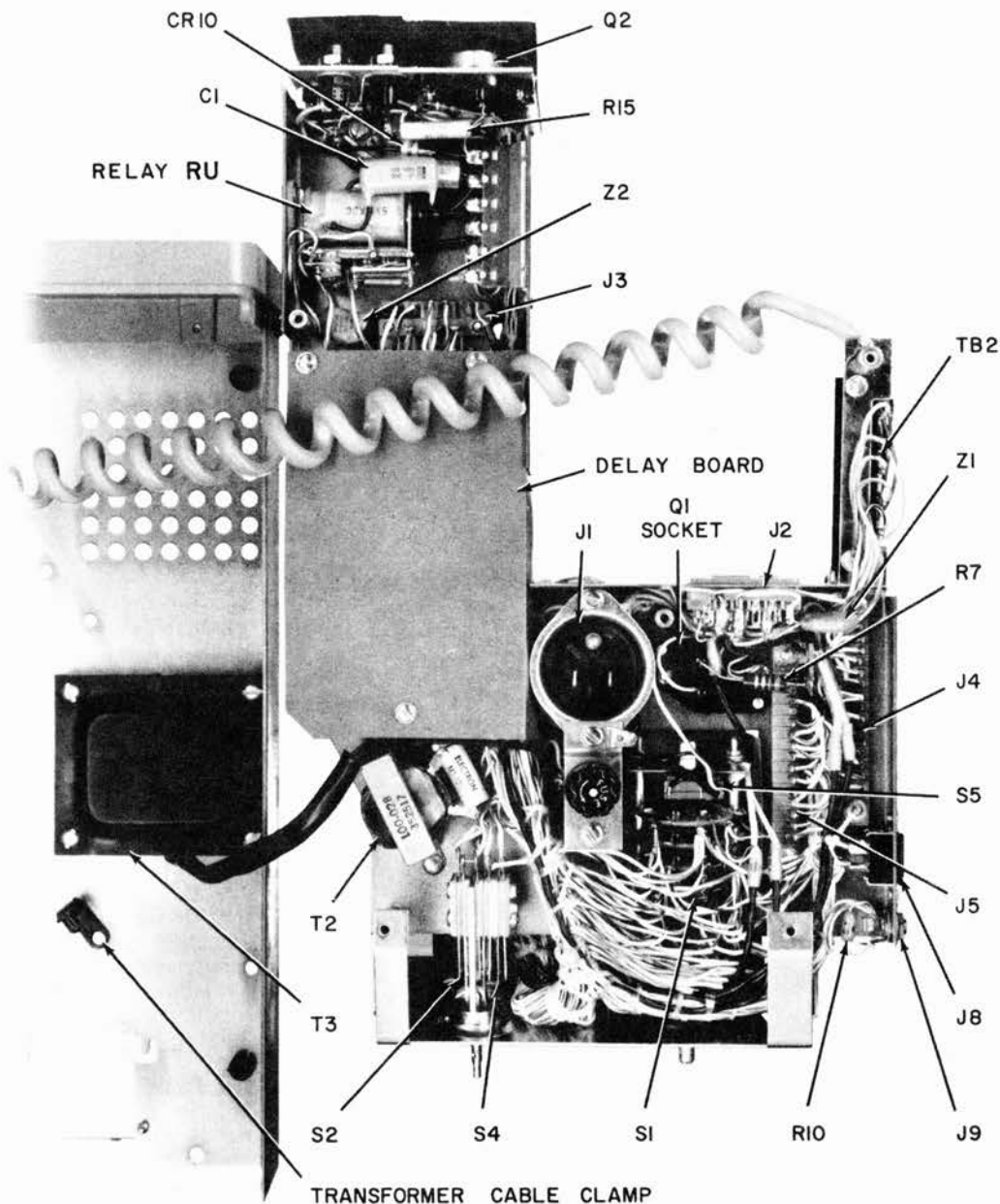
- a. Remove Cover (page 12).
- b. Remove 4 screws and Side Cover (fig. 10).
- c. Loosen one screw and remove Terminal Cover Plate (fig. 11).
- d. Remove 5 screws and Rear Casting (fig. 11). The Model 700 should appear as shown in fig. 13.
- e. Remove 2 screws and unplug Power Supply Transistor Q2.
- f. When replacing, make sure that mica insulator is between transistor and chassis.

8. IN-USE AND AUTO-ANS LAMPS (fig. 11):

- a. Remove Cover (page 12).
- b. Pull out clip on desired socket and remove lamp.

9. PILOT LAMP (fig. 1):

- a. Remove "B" Deck (page 12).
- b. Loosen Lock Screw and slide out Pilot Lamp Socket as shown in fig. 14.
- c. Pull out clip on socket and remove Pilot Lamp.



TRANSFORMER CABLE CLAMP
FIGURE 15 CHASSIS REMOVED FROM BOTTOM PAN

10. CHASSIS (fig. 11):

- a. Loosen Clamp and unplug A.C. Power Cable (fig. 2).
- b. Remove all telephone connecting cords.
- c. Remove Amplifier and Voice Control (page 12).
- d. Remove "A" Deck and "B" Deck (page 12).
- e. Loosen one screw and remove Terminal Cover Plate (fig. 11).
- f. Unsolder two speaker leads at Speaker (fig. 11).
- g. Remove one screw and Rewind-Forward Switch knob (fig. 1).
- h. Loosen set screws and remove Selector Switch knob and Speaker Control knob (fig. 1).
- i. Remove 4 screws and Front Casting (fig. 11).
- j. Release Transformer Cable Clamp (fig. 15) by pressing hard from the bottom.
- k. Remove 5 screws from bottom that secure Chassis. While feeding Handset cord through hole in Bottom Pan, carefully lay chassis as shown in fig. 15.

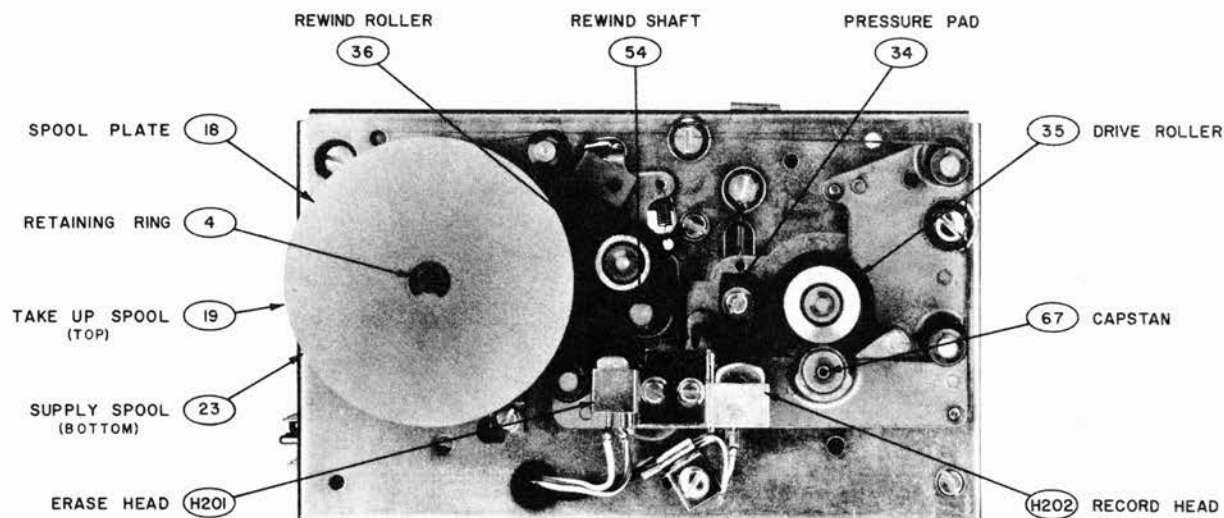


FIGURE 16 "A" DECK FRONT VIEW, COVER REMOVED

"A" DECK MAINTENANCE

1. RECORDING TAPE:

a. Removal:

- (1) Remove "A" Deck from machine (page 12).
- (2) Remove 3 screws and "A" Deck Cover. The "A" Deck mechanism will be visible as in fig. 16.
- (3) Remove Retaining Ring and Spool Plate (fig. 16).
- (4) Rotate spools clockwise to wind tape onto Supply Spool until end of tape is visible.
- (5) Disconnect tape from Take Up Spool and carefully allow Take Up Spool to rotate until clock spring inside is relaxed.

- (6) Carefully remove Take Up Spool and Take Up Clock Spring together (item 19 on fig. 25). Leave clock spring inside spool.

- (7) Remove Mylar washer.

- (8) Remove Supply Spool with recording tape.

b. Replacement:

- (1) Wind 35 feet or 64 turns of 3M Brand No. 591 recording tape onto Supply Spool. Connect end of tape to spool in the manner shown in fig. 17, but wind the tape counterclockwise, with the oxide (dull) side facing outwards.

A Recording Tape Assembly, consisting of a Supply Spool wound with the proper amount of tape, is available as Code-a-phone part number 30-00-010.

- (2) Make sure that the small roller on the Timer Gear is midway between Rewind Limit Switch and Counter Gear (fig. 18).
- (3) Replace Supply Spool, making sure that it meshes with its drive pin. Leave approximately 2 feet of tape free.
- (4) Thread tape as shown in fig. 17. Do not secure free end of tape yet.
- (5) Replace Mylar washer.
- (6) Replace Take Up Spool, making sure that end of clock spring hooks onto pin on Supply Spool.
- (7) Hold Supply Spool and wind Take Up Spool clockwise to wind up clock spring. Rotate Take Up Spool until

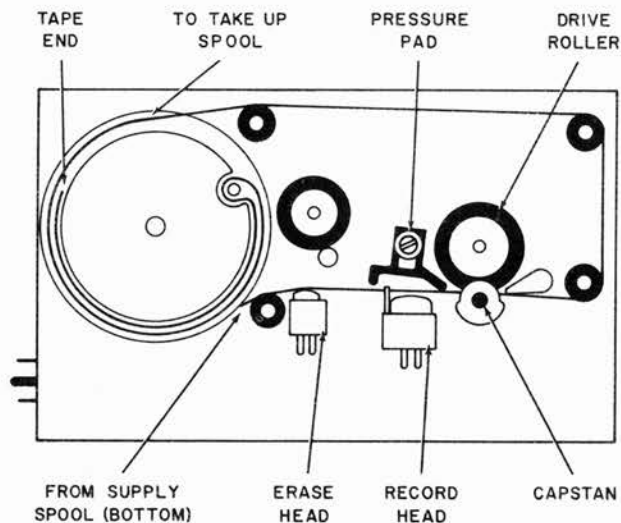


FIGURE 17 "A" DECK TAPE PATH

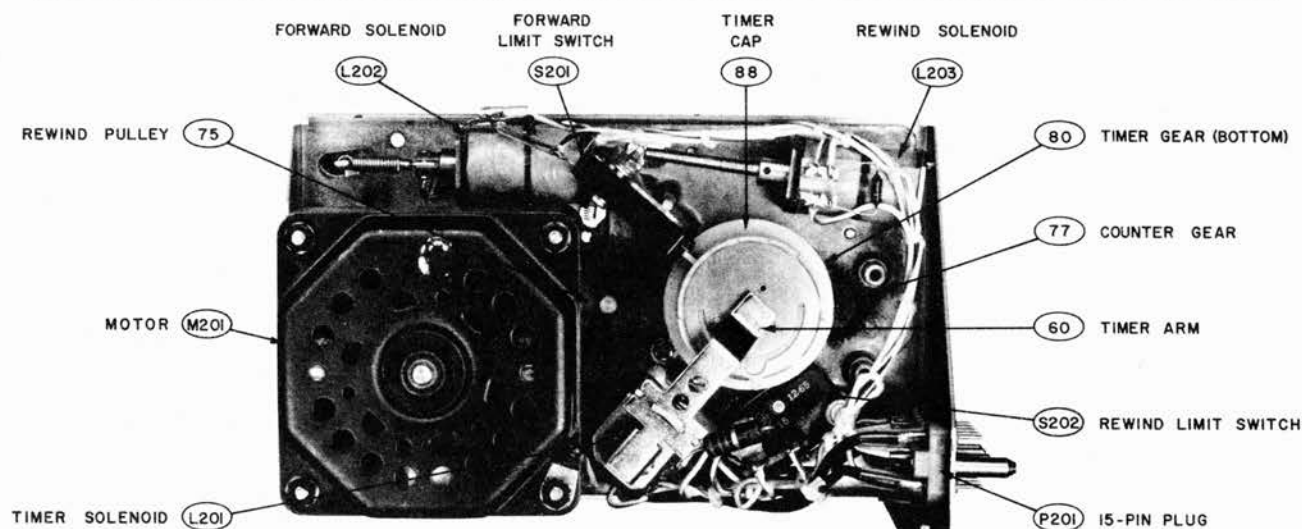


FIGURE 18 "A" DECK REAR VIEW

definite resistance is felt (25 to 30 turns), then unwind 10 turns.

- (8) Connect free end of tape as shown in fig. 17.
- (9) Rotate spools counterclockwise to wind tape 10 turns onto Take Up Spool.
- (10) Replace Spool Plate and Retaining Ring (fig. 16).
- (11) Replace "A" Deck Cover with three #6-32 x 5/32" screws and lock washers.

2. CLEANING:

- a. Parts of the "A" Deck that come into contact with the recording tape will accumulate oxide particles from the tape. This residue must be removed occasionally to prevent loss of recording quality. See PREVENTIVE MAINTENANCE, page 11, for the recommended cleaning intervals.

Remove the oxide accumulation as follows:

- (1) Remove "A" Deck (page 12).
- (2) Remove 3 screws and "A" Deck Cover.
- (3) With swab moistened in alcohol, clean Erase Head, Record Head, Pressure Pad, Drive Roller and Capstan (fig. 16).

- b. After very long use, an oil residue may accumulate on the belts and pulleys. A severe case will introduce slippage in the drive train, causing an objectionable "wow" in the recorded messages.

Clean the drive surfaces as follows:

- (1) Remove "A" Deck (page 12).
- (2) Remove 3 screws and "A" Deck Cover.
- (3) Remove 4 nuts and Motor (fig. 18).

- (4) Remove both drive belts.

- (5) With cloth moistened in alcohol, clean flywheel, motor pulley, both drive belts, and Rewind Pulley (fig. 18).

- (6) Replace both drive belts.

- (7) Replace Motor, securing with 4 #6 nuts and lock washers.

- (8) Rap Motor laminations sharply with soft faced mallet to align motor bearings.

3. ADJUSTMENTS:

- a. Pressure Pad (fig. 16):

- (1) Depress Forward Solenoid plunger by hand (fig. 18).
- (2) Loosen clamp screw and adjust Pressure Pad so that the recording tape wraps lightly around face of Record Head (fig. 16).

- b. Forward Solenoid (fig. 18):

- (1) Depress solenoid plunger only with sharp instrument.
- (2) Plunger should travel 1/32" before bottoming after Drive Roller contacts Capstan (fig. 16).

To increase travel, screw plunger into link spring. To decrease travel, hold tail of link spring with pliers and screw plunger out.

- c. Rewind Solenoid (fig. 18):

- (1) Depress solenoid plunger by hand.
- (2) Plunger should travel 1/16" to 1/8" before bottoming after Rewind Roller contacts Supply Spool (fig. 16).

To increase travel, hold link spring with fingers and screw plunger into it. To decrease travel, hold tail of link spring with pliers and screw plunger out.

d. Timer Solenoid (fig. 18):

- (1) Depress solenoid plunger only with sharp instrument. (Depressing the Timer Arm itself will result in an inaccurate adjustment.)
- (2) Bend timer arm so that Timer Cap lifts 1/32" away from Timer Gear (fig. 18).

"B" DECK MAINTENANCE

1. CLEANING:

- a. Parts of the "B" Deck that come into contact with the recording tape will accumulate oxide particles from the tape. This residue must be removed occasionally to prevent loss of recording quality. See PREVENTIVE MAINTENANCE, page 11, for the recommended cleaning intervals.

Remove the oxide accumulation as follows:

- (1) Remove Tape Cartridge (fig. 1).
- (2) Remove machine Cover (page 12).
- (3) Remove 6 Phillips head screws and Trim Plates (fig. 10).
- (4) With swab moistened in alcohol, clean Record Head, Erase Head, Drive Roller, and Capstan (fig. 19). Do not clean the Pressure Pad.

- b. After very long use, an oil residue may accumulate on the belts, flywheel, pressure rollers, or drums. A severe case will introduce slippage in the drive train, causing sluggish rewind and fast forward action, or "wow" in the recorded messages.

Clean the drive surfaces as follows:

- (1) Remove the "B" Deck (page 12).
- (2) With cloth moistened in alcohol, clean the Drive Belts, Flywheel, Motor Pulley, Rewind Roller, Fast Forward Roller, Supply Drum, and Take Up Drum (figs. 19 and 21).

2. ADJUSTMENTS:

- a. Record Head azimuth and Pressure Pad:

These adjustments must be made whenever the Record Head (fig. 19) is replaced.

- (1) Install a Tape Cartridge with a message recorded on a "B" Deck whose Record Head retains the factory adjustment.

4. LUBRICATION:

The "A" Deck will not require lubrication for the service life of the Model 700. The rotating shafts operate in Delrin sleeves or pre-lubricated sealed ball and needle bearings. The Motor contains porous bearings and large oil reservoirs that are charged at the factory. The recording tape is impregnated with a dry Silicone lubricant as part of the manufacturing process. Lubricating the "A" Deck in the field will not increase bearing life, but will increase the hazard of getting oil on belts, pulleys, rollers, capstan, flywheel, and recording tape. These parts must operate free from oil.

- (2) Play back the message from this Tape Cartridge and carefully adjust the two small screws on the head mount for maximum loudness.

- (3) Loosen clamp screw and rotate pressure pad mount to adjust the Pressure Pad (fig. 19) for maximum loudness.

b. Drive Solenoid (fig. 19):

- (1) Depress solenoid plunger only with sharp instrument.
- (2) Plunger should travel 1/32" before bottoming after Drive Roller contacts Capstan (fig. 19).

To increase travel, hold link spring in front of spade bolt with pliers and screw plunger into it. To decrease travel, hold tail of link spring with pliers and screw plunger out.

c. Rewind Solenoid (fig. 20) and Fast Forward Solenoid (fig. 21):

- (1) Depress solenoid plunger only with sharp instrument.
- (2) Plunger should travel 1/32" before bottoming after roller contacts mating surfaces.

To increase travel, screw plunger into link spring. To decrease travel, hold tail of link spring with pliers and screw plunger out.

d. Brake Solenoid (fig. 20):

- (1) Depress solenoid plunger only with sharp instrument.
- (2) Brake should lift 1/32" from surfaces of Supply Drum and Take Up Drum (fig. 21).

To increase clearance, hold tail of link spring in front of spade bolt with pliers and screw plunger into it. To decrease clearance, hold tail of link spring with pliers and screw plunger out.

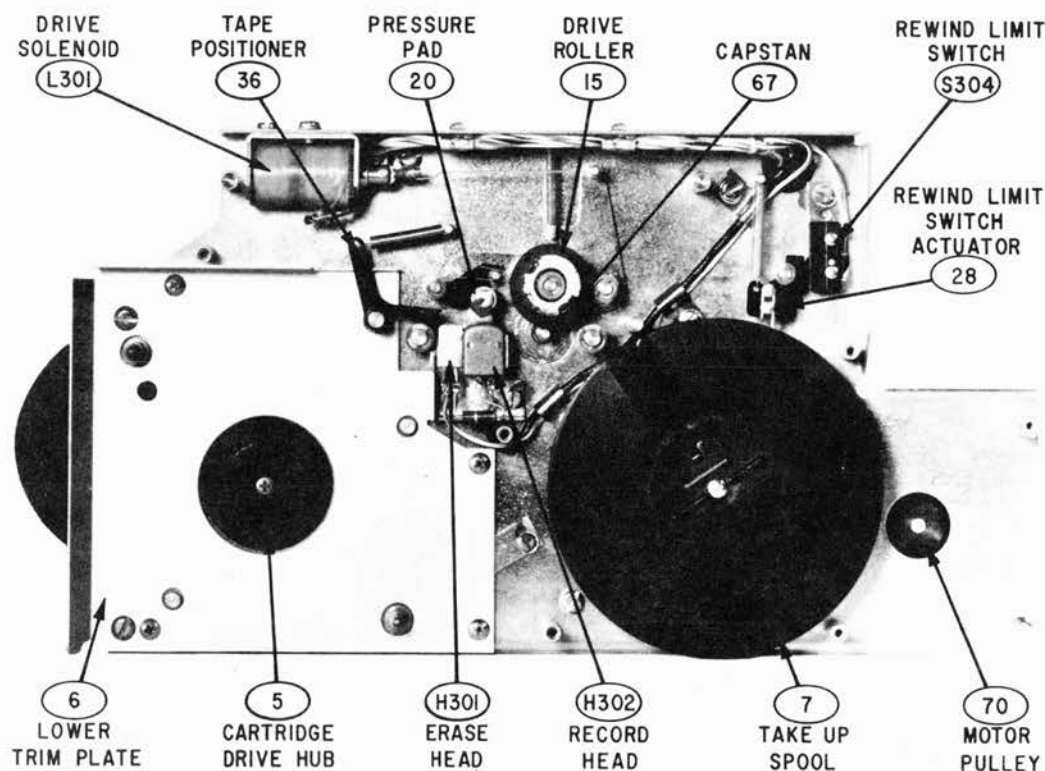


FIGURE 19 "B" DECK TOP VIEW, TRIM PLATES REMOVED

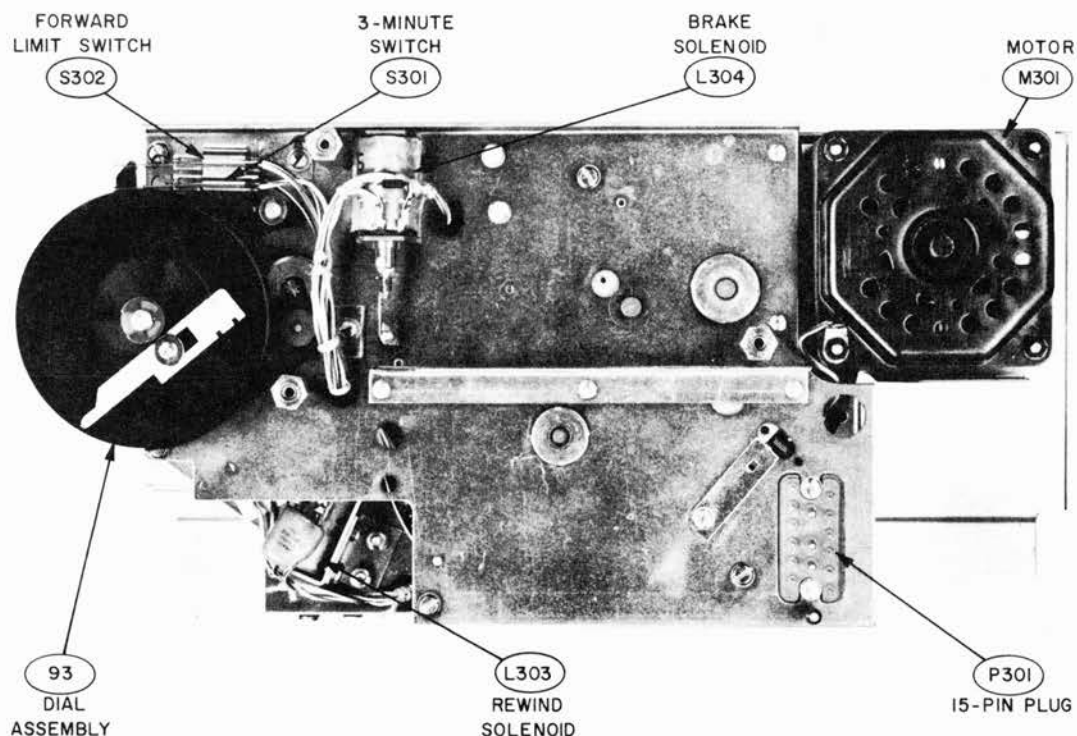


FIGURE 20 "B" DECK BOTTOM VIEW

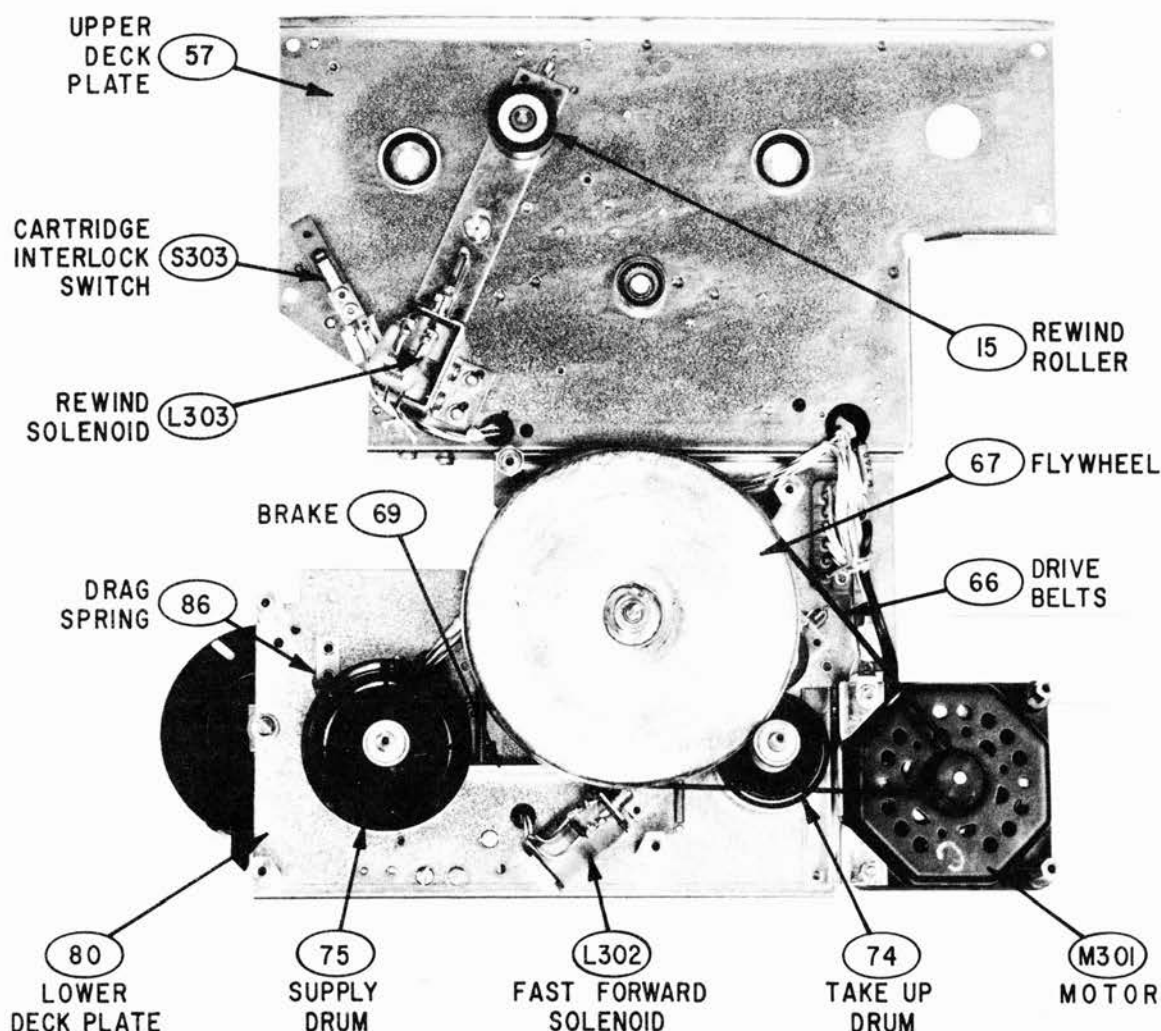


FIGURE 21 "B" DECK DISASSEMBLED

3. LUBRICATION:

The "B" Deck will not require lubrication for the service life of the Model 700. The rotating shafts operate in pre-lubricated ball bearings or Delrin sleeve bearings. The Motor contains porous bearings and large oil reservoirs that are charged at the factory. Lubrication in the field will not improve the operation, but will increase the hazard of getting oil on belts, pulleys, drums, and recording tape. These parts must operate free from oil.

4. DISASSEMBLY:

- a. Remove Tape Cartridge (fig. 1).
- b. Remove "B" Deck from machine (page 12).
- c. Remove 6 Phillips head screws and both Trim Plates (fig. 10).
- d. Slip Tape Positioner (fig. 19) off its shaft. Remove 4 Phillips head screws and Lower

Trim Plate. Replace Tape Positioner.

- e. Remove Phillips head screw and Cartridge Drive Hub (fig. 19).
- f. Remove Phillips head screw and Take Up Spool. Hold Rewind Limit Switch Actuator (fig. 19) out while removing spool.
- g. Remove the 6 largest (#6-32 x 1/4") screws and one hexagonal post from the Upper Deck Plate.
- h. Carefully separate Upper and Lower Deck Plates and lay as shown in fig. 21. The Flywheel, Take Up Drum, and Supply Drum should remain with the Lower Deck Plate. Be careful not to lose the Mylar washers on each end of the supply and take up shafts.
- i. If required, remove 3 Drive Belts and lift out Flywheel and Take Up Drum together. The Supply Drum may be removed separately. Again, be careful not to lose the Mylar washers.

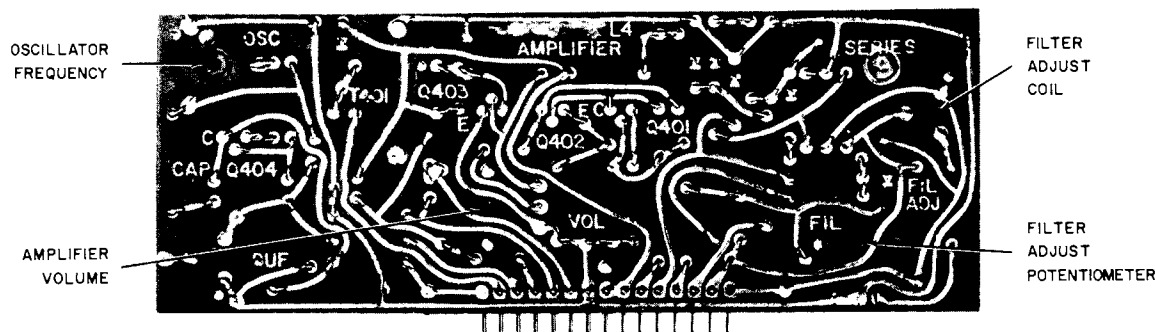


FIGURE 22 AMPLIFIER ADJUSTMENTS
ELECTRONIC ADJUSTMENTS

The methods described here are suitable for performing occasional electronic adjustments to the Model 700. These procedures require a minimum of equipment, and no special test fixtures are necessary. If a large amount of repair work is anticipated, appreciable time can be saved by using a special Test Circuit. A schematic of this Test Circuit is available from Code-a-phone upon request, drawing number 90-00-448.

1. PREPARATION:

- a. Equipment required:
 - (1) A.C. Vacuum Tube Volt Meter (AC VTVM). Must be able to read audio levels down to 0.003 volts RMS.
 - (2) Audio Signal Generator. Must have sine wave output at frequencies from 800 cps to 1400 cps, and at output levels from 0.003 volts to 0.04 volts RMS. (An external series resistor may be used to reduce output to the required levels.)
 - (3) Shielded test leads. (Code-a-phone Test Leads #X00-106 and #X00-114 are recommended.)
 - (4) 600 Ω resistor.
 - (5) Two telephone-type handsets (required only for adjusting Oscillator frequency).
- b. Set-up:
 - (1) Remove Model 700 Cover (page 12).
 - (2) Remove Terminal Cover Plate (fig. 11).
 - (3) Connect the 600 Ω resistor across Telephone Line Terminals "R" and "T".
 - (4) Temporarily disable the Calling Party Control circuit (page 10).
 - (5) Unscrew the microphone cap and remove the microphone from the Handset (fig. 1). This will prevent room noise from affecting the measurements.
 - (6) Connect Model 700 to 117 volt A.C. outlet.

2. AMPLIFIER GAIN:

- a. Temporarily remove the Amplifier. Connect Signal Generator output across the front two terminals on the Handset Terminal Board (fig. 11). Be sure that Signal Generator ground connects to the front terminal (marked "C" (common) on the outside of Bottom Pan). Replace Amplifier.
- b. Connect AC VTVM to Signal Generator to monitor the signal level.
- c. Set Signal Generator for an output of 0.04 volts (as read on the AC VTVM) at 1000 cps.
- d. Rotate Selector Switch to ANN-REC. Depress and hold Handset switch.
- e. When In-Use Lamp comes on (in about 2 seconds), re-adjust the Signal Generator output to exactly 0.04 volts. The "A" Deck will record the 1000 cps tone.
- f. Release Handset switch after about 15 seconds. The "A" Deck will stop and re-wind.
- g. Disconnect AC VTVM from Signal Generator and connect AC VTVM to Telephone Line Terminals "R" and "T" (across 600 Ω resistor mounted earlier).
- h. Rotate Selector Switch to ANS-ONLY.
- i. Momentarily short together Telephone Line Terminals "1" and "2", to start the Model 700 automatic answer cycle. Remove the short as soon as the machine starts.
- j. Adjust the AMPLIFIER VOLUME control (fig. 22) for a reading of 0.5 to 0.6 volts on the AC VTVM.

If the setting has to be changed by more than 0.1 volts, return to step (d) and repeat the adjustment procedure. This is necessary because the AMPLIFIER VOLUME control adjusts both the recording and playback levels.
- k. If it is necessary to change the setting of the AMPLIFIER VOLUME control, re-adjust the Voice Control sensitivity as described on page 22.

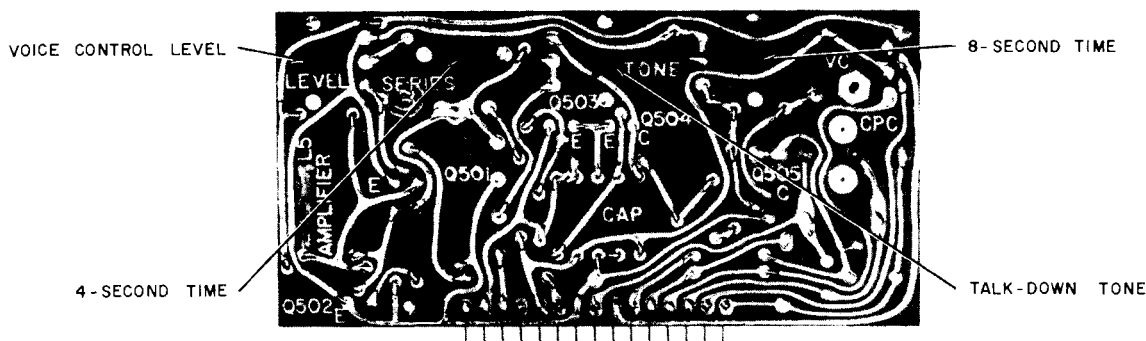


FIGURE 23 VOICE CONTROL ADJUSTMENTS

3. OSCILLATOR FREQUENCY:

- Remove the 600 Ω resistor from Telephone Line Terminals "R" and "T".
- Connect the receiver leads of a telephone-type handset across Telephone Line Terminals "R" and "T".
- Connect a second handset receiver to the Signal Generator output.
- Set the Signal Generator for an output of 0.04 volts at exactly 1400 cps.
- Rotate Selector Switch to ANS-REC.
- Push Speaker Control in.
- Momentarily short together Telephone Line Terminals "1" and "2" to start the Model 700 automatic answer cycle. Remove the short as soon as the machine starts.
- When the talk-down tone comes on (4 seconds after the "B" Deck starts), hold the two handset receivers close together and listen to the two tones.

The two tones will "beat" against each other if their frequencies are nearly the same. This "beat" tone can be heard as distinct pulsations in the volume of the two tones. The closer together the two frequencies are, the slower the "beat" tone. For example, a "beat" tone that pulsates twice each second indicates that the frequencies are 2 cps apart.

- Use a non-ferrous tuning stick to rotate the OSCILLATOR FREQUENCY control (fig. 22) until the slowest beat tone is heard. (It may be necessary to dissolve the red Glyptal sealant with alcohol.)

If it is necessary to change the setting of the OSCILLATOR FREQUENCY control, re-adjust the Filter Trap (below). This is important.

4. FILTER TRAP TUNING:

- Connect the ground terminal of AC VTVM to Model 700 chassis ground.
- Connect the other AC VTVM terminal to the white-green-black wire on Speaker Volume Control R8 (fig. 14).
- Rotate Selector Switch to ANS-REC.
- Momentarily short together Telephone Line Terminals "1" and "2" to start the Model

700 automatic answer cycle. Remove the short as soon as the machine starts.

- When the talk-down tone comes on (4 seconds after the "B" Deck starts), adjust the FILTER ADJUST COIL and FILTER ADJUST POTENTIOMETER together for a minimum reading on the AC VTVM. See fig. 22. Be sure to use a non-ferrous tuning stick to adjust the FILTER ADJUST COIL.

Repeat steps "d" and "e" until the absolute minimum reading is achieved on the AC VTVM.

5. VOICE CONTROL SENSITIVITY:

- Connect Signal Generator and AC VTVM to Telephone Line Terminals "R" and "T" (across 600 Ω resistor mounted earlier).
- Set Signal Generator for an output of 0.005 volts at 800 cps.
- Rotate Selector Switch to ANS-REC.
- Pull out on Speaker Control and rotate full clockwise.
- Momentarily short together Telephone Line Terminals "1" and "2" to start the Model 700 automatic answer cycle. Remove the short as soon as the machine starts.
- As soon as the "B" Deck (fig. 10) starts recording, re-set the Signal Generator output to exactly 0.005 volts.
- Remove one of the test leads from the Signal Generator to stop the 800 cps tone. The Model 700 will transmit its talk-down tone after 4 seconds of silence. Restore the connection from the Signal Generator, and pulse the 800 cps tone on and off at about 1-second intervals. This action should stop the talk-down tone being transmitted by the Model 700.

If the talk-down tone does not stop, increase the sensitivity of the Voice Control by rotating VOICE CONTROL LEVEL control (fig. 23) counterclockwise (as viewed from the conductor side of the circuit board).

- Re-adjust the Signal Generator output to exactly 0.003 volts when connected to the Model 700. (Be sure to read the Signal Generator output in the 4-second interval before the talk-down tone comes on.)
- Immediately start pulsing the tone on and

off at about one-second intervals. This time, the Model 700 should transmit the talk-down tone and disconnect.

If the 0.003 volt pulsed 800 cps tone causes the machine to continue to run, decrease the sensitivity of the Voice Control by rotating VOICE CONTROL LEVEL control clockwise.

Repeat steps "f" through "i" until the Model 700 continues to run with the 0.005 volt tone, but "times out" with 0.003 volt tone.

6. VOICE CONTROL TIMES:

- a. Rotate Selector Switch to ANS-REC.
- b. Pull out on Speaker Control and rotate full clockwise.
- c. Momentarily short together Telephone Line Terminals "1" and "2" to start the Model 700 automatic answer cycle. Remove the short as soon as the machine starts.
- d. Measure the time interval between the loud "transfer beep" tone and the start of the

talk-down tone. Adjust the 4-SECOND TIME control (fig. 23) for an interval of 4 seconds.

- e. Measure the time interval between the start of the talk-down tone and the loud "disconnect beep" tone. Adjust the 8-SECOND TIME control (fig. 23) for an interval of 8 seconds.

7. TALK-DOWN TONE LEVEL:

- a. Connect AC VTVM to Telephone Line Terminals "R" and "T" (across 600Ω resistor mounted earlier):
- b. Rotate Selector Switch to ANS-REC.
- c. Momentarily short together Telephone Line Terminals "1" and "2" to start the Model 700 automatic answer cycle. Remove the short as soon as the machine starts.
- d. The talk-down tone will be transmitted 4 seconds after the "B" Deck starts. Adjust TALK-DOWN TONE control (fig. 23) for a reading on the AC VTVM of 0.04 volts.

CHECK-OUT

Always perform the following check-out after any repair work is done on a Model 700.

1. Connect Model 700 to a telephone line (page 6), and to a 117 volt A.C. power source.
2. Rotate Selector Switch (fig. 1) to PLAY. The Pilot Lamp should light.
3. Push Rewind-Forward Switch to the left to rewind the tape to the beginning.
4. Look at the Tape Dial (fig. 1). If the "0" is not centered behind the red line, remove the Tape Cartridge and rotate the Cartridge Drive Hub (fig. 10) to bring it into alignment.
5. Rotate Selector Switch to ANN-REC. The Pilot Lamp should light.
6. Depress Handset switch. The In-Use Lamp should light in about 2 seconds.
7. Dictate a test announcement into the Handset, then release Handset switch.
8. Rotate Selector Switch to ANN-CHECK.
9. Depress Handset switch and listen to the test announcement.
10. Rotate Selector Switch to ANS-ONLY. The Auto-Ans Lamp should light.

11. Call the Model 700 from another telephone and listen to the test announcement.
12. Rotate Selector Switch to ANS-REC.
13. Again, call the Model 700 from another telephone. The machine should transmit the test announcement, then a "transfer beep" tone. Dictate a test message, then be silent. After 4 seconds of silence, the machine should transmit its talk-down tone. Eight seconds later (if silence is maintained), the machine should transmit a "disconnect beep" tone and disconnect from the telephone line.
14. Return to the Model 700 and rotate Selector Switch to PLAY.
15. Rewind the tape with Rewind-Forward switch.
16. Pull out on the Speaker Control. Listen to the test message.
17. When the message has completed playing back, rotate Selector Switch to ERASE.
18. Rewind the tape again.
19. Rotate Selector Switch back to PLAY.
20. Pull out on the Speaker Control. Verify that the message has been erased.

SECTION V

CIRCUIT DESCRIPTION

OPERATING SEQUENCES

1. ANNOUNCEMENT RECORD:

This function is enabled by rotating Selector Switch S1 to ANN-REC position.

Switch S1 in ANN-REC (position #7):

- a. Lights pilot lamp E1.
- b. Connects handset microphone to Automatic Volume Control (AVC) input (J4-B) through transformer T1.
- c. Connects "A" Deck Record head H202 to recording output of Amplifier (J4-L).

The announcement record cycle is initiated by depressing and holding the handset switch.

Handset switch depressed:

- a. Operates timer solenoid L201, which releases timer cap from timer gear (fig. 18).
- b. Applies 28 volts dc to "A" Deck erase head H201.
- c. Operates relay ENA.

Relay ENA operated:

- a. Applies 117 volts ac to motor M201, causing the capstan to rotate.
- b. Operates forward solenoid L202, which pulls drive roller into contact with tape and capstan (fig. 16).
- c. Operates relay AD, which provides an alternate path for holding forward solenoid L202 operated.

The tape winds from the supply spool, past erase head H201 and record head H202, and onto the take up spool (fig. 17). The supply and take up spools are mechanically coupled through a clock spring to maintain proper tension on the tape. After approximately 2 seconds, a lobe on the timer gear releases rewind limit switch S202 (fig. 18), which operates relay ADR.

Relay ADR operated:

- a. Lights in-use lamp E2.
- b. Connects +18 volts dc to Amplifier (at J4-H).
- c. Provides dc bias current to the carbon microphone in the handset.

The announcement dictated into the handset is adjusted by the AVC, amplified by transistors Q401, Q402, Q403, and Q1, and is recorded onto the tape by record head H202. (See page 30 for circuit analysis of AVC and Amplifier.) The previous message is erased progressively as the tape passes over erase head H201.

The announcement record cycle is terminated by releasing the handset switch.

Handset switch released:

- a. Removes dc voltage from erase head H201.
- b. Releases timer solenoid L201 to lock timer cap to timer gear. Thus, the tape will stop at this point during the announcement check and automatic answer cycles.
- c. Releases relay ENA.

Relay ENA released:

- a. Releases forward solenoid L202, stopping the tape.
- b. Releases relay AD.

Relay AD released:

- a. Extinguishes in-use lamp E2.
- b. Removes dc voltage from Amplifier and handset microphone.
- c. Operates rewind solenoid L203, which pulls rewind roller into contact with supply spool, rewinding the tape. When the tape has been completely rewound, a lobe on the timer gear operates rewind limit switch S202 (fig. 18).

Switch S202 operated:

- a. Releases rewind solenoid L203, stopping the tape.
- b. Releases relay ADR, which removes ac power from motor M201.

This completes the normal announcement record cycle. If the handset switch is held depressed for longer than the maximum preset announcement length (page 9), a pin on the timer gear presses against a tab on the timer cap (items 80 and 88, fig. 25). This causes the timer cap to open forward limit switch S201, which releases relay AD.

Relay AD released:

- a. Releases forward solenoid L202, stopping the tape.
- b. Removes dc power from Amplifier and handset microphone.
- c. Extinguishes in-use lamp E2 to indicate the end of recording.

The cycle will continue after the handset switch is released.

Handset switch released:

- a. Releases timer solenoid L301, which sets the announcement length.

- b. Removes dc voltage from erase head H201.
- c. Releases relay ENA, which operates rewind solenoid L203, rewinding the tape. When the tape has been completely rewound, rewind limit switch S202 operates.

Switch S202 operated:

- a. Releases rewind solenoid L203, stopping the tape.
- b. Releases relay ADR, which removes ac power from motor M201.

2. ANNOUNCEMENT CHECK:

This function is enabled by rotating Selector Switch S1 to ANN-CHECK position.

Switch S1 in ANN-CHECK (position #8):

- a. Lights pilot lamp E1.
- b. Connects handset receiver to transformer T1.

The announcement check cycle is initiated by depressing and holding the handset switch, which operates relay ENA.

Relay ENA operated:

- a. Applies 117 volts ac to "A" Deck motor M201, causing the capstan to rotate.
- b. Operates forward solenoid L202, which pulls drive roller into contact with tape and capstan, causing the tape to drive forward.
- c. Operates relay AD, which provides an alternate path for holding forward solenoid L202 operated.
- d. Operates relay DLY.

Relay DLY operated:

- a. Connects record head H202 to Amplifier input (J4-F).
- b. Connects Amplifier output (J4-M) to transformer T1.

The recording tape winds from the supply spool, past record head H202, and onto the take up spool (fig. 16). After approximately 2 seconds, a roller on the timer gear releases rewind limit switch S202 (fig. 18), which operates relay ADR.

Relay ADR operated:

- a. Lights in-use lamp E2.
- b. Supplies 18 volts dc to Amplifier (at J4-H).

The announcement is detected by record head H202, amplified by transistors Q401, Q402, Q403, and Q1, and is reproduced in the handset receiver. (See page 30 for circuit analysis of Amplifier.) If desired, the Speaker Control may be pulled out to operate speaker switch S3, which connects the Amplifier output to Speaker LS1.

At the end of the announcement, the variable limit switch actuator on the timer cap (set during the announcement record cycle) opens forward limit switch S201, which releases relay AD.

Relay AD released:

- a. Extinguishes in-use lamp E2.
- b. Removes dc power from Amplifier.
- c. Releases relay DLY, which disconnects record head H202 from Amplifier input.
- d. Releases forward solenoid L202, stopping the tape.
- e. Operates rewind solenoid L203, which rewinds the tape. When the tape has been completely rewound, a lobe on the timer gear operates rewind limit switch S202 (fig. 18).

Switch S202 operated:

- a. Releases rewind solenoid L203, stopping the tape.
- b. Releases relay ADR, which removes ac power from motor M201.

If the handset switch has been released, this completes the announcement check cycle.

3. AUTOMATIC ANSWER ONLY:

This function is enabled by rotating Selector Switch S1 to ANS-ONLY position.

Switch S1 in ANS-ONLY (position #1):

- a. Lights pilot lamp E1.
- b. Lights auto-ans lamp E3.
- c. Connects relay RU to telephone line.

The automatic answer cycle is initiated by the appearance of 20 cps ringing voltage across telephone line terminals "R" and "G". The ringing current passes through relay RU, resistor R1, and capacitor C1, causing relay RU to "chatter" rapidly. During the intervals that relay RU is operated, dc current flows through resistor R18 to charge capacitor C9. During the intervals that relay RU is released, capacitor C9 discharges through relay ENA. The charge and discharge time constants are such that relay ENA will operate after several cycles of 20 cps ringing voltage have been received. This ensures that momentary transient voltages on the line (such as dial tap caused by dialing an extension telephone) will not ring up the machine.

Relay ENA operated:

- a. Applies 117 volts ac to "A" Deck motor M201, causing the capstan to rotate.
- b. Operates forward solenoid L202, which pulls pressure roller into contact with tape and capstan (fig. 16).
- c. Operates relay AD, which provides an alternate path for holding forward solenoid L202 operated.
- d. Operates relay DLY.

Relay DLY operated:

- a. Connects record head H202 to Amplifier input (J4-F).
- b. Connects Amplifier output (J4-M) to transformer T1.

The tape winds from the supply spool, past record head H202, and onto the take up spool (fig. 17). After approximately 2 seconds, a

lobe on the timer gear releases rewind limit switch S202 (fig. 18).

Switch S202 released:

- a. Removes dc power from relay ENA. (Relay ENA releases after a one-second delay caused by capacitor C9.)
- b. Operates relay ADR, which lights in-use lamp E2, and supplies +18 volts dc to Amplifier (at J4-H).
- c. Operates relay LS.

Relay LS operated:

- a. Extinguishes auto-ans lamp E3.
- b. Provides alternate path for holding relay AD and forward solenoid L202 operated after relay ENA releases (above).
- c. Disconnects relay RU from telephone line.
- d. Short terminals "A" and "A1" to indicate to external circuits that the telephone line is seized.
- e. Connects telephone line terminals "T" and "R" to transformer T1 and relay CPC (through J5-C and J5-J). This provides a dc termination across the telephone line to trip the ringing circuits in the telephone Central Office. Battery current through the telephone line operates relay CPC, which maintains a path to hold relay LS operated (through J5-E and J5-A).

Diodes CR503 and CR504 shunt dc battery current around relay CPC in excess of that required for operating the relay, and provide a short circuit around the relay coil for the speech that will be transmitted to the telephone line.

The announcement is detected by record head H202, amplified by transistors Q401, Q402, Q403, and Q1, and transmitted to the telephone line through transformer T1 and terminals "T" and "R". (See page 30 for circuit analysis of Amplifier.)

At the end of the announcement, a tab on the timer cap opens forward limit switch S201 (fig. 18), which releases relay AD.

Relay AD released:

- a. Releases forward solenoid L202, stopping the tape.
- b. Extinguishes in-use lamp E2.
- c. Removes dc power from Amplifier.
- d. Operates rewind solenoid L203, which starts the tape rewinding.
- e. Removes dc power from relay DLY, which releases after a one-second delay caused by capacitor C8 and resistor R11.

Relay DLY released:

- a. Disconnects record head H202 from Amplifier input.
- b. Disconnects Amplifier output from transformer T1 and telephone line.
- c. Releases relay LS.

Relay LS released:

- a. Disconnects transformer T1 and relay CPC from terminals "T" and "R" to release the telephone line.
- b. Removes short from terminals "A" and "A1".
- c. Connects relay RU to telephone line to prepare for the next answering cycle.
- d. Lights auto-ans lamp E3.

The tape continues to rewind until a lobe on the timer gear operates rewind limit switch S202.

Switch S202 operated:

- a. Releases rewind solenoid L203, stopping the tape.
- b. Releases relay ADR, which removes ac power from motor M201.

This completes the normal answer only cycle. Certain telephone Central Offices provide a momentary break (or reversal of direction) in the dc battery current through the telephone line if the calling party hangs up before the announcement is completed. When this occurs, relay CPC releases to release relay LS.

Relay LS released:

- a. Disconnects transformer T1 and relay CPC from telephone line terminals "T" and "R".
- b. Removes short from terminals "A" and "A1".
- c. Connects relay RU to telephone line.
- d. Removes dc power from relay DLY, which releases after a one-second delay caused by capacitor C8 and resistor R11. Relay DLY released disconnects record head H202 from Amplifier input and disconnects Amplifier output from transformer T1.
- e. Releases forward solenoid L202, stopping the tape.
- f. Lights auto-ans lamp E3.
- g. Releases relay AD.

Relay AD released:

- a. Removes dc power from Amplifier.
- b. Extinguishes in-use lamp E2.
- c. Operates rewind solenoid L203, rewinding the tape. The tape continues to rewind until a lobe on the timer gear operates rewind limit switch S202.

Switch S202 operated:

- a. Releases rewind solenoid L203, stopping the tape.
- b. Releases relay ADR, which removes ac power from motor M201.

4. AUTOMATIC ANSWER AND RECORD:

This function is enabled by:

- a. "B" Deck cartridge interlock switch S303 operated (indicates that Tape Cartridge is properly installed.)
- b. "B" Deck 3-minute switch S301 not operated (indicates that more than 3 minutes of recording time remains in Tape Cartridge).

- c. "A" Deck rewind limit switch S202 operated (indicates that "A" Deck is rewound to start position).
- d. Selector Switch S1 rotated to ANS-REC (position #2).

The operating sequence in the answer and record function is exactly the same as that described under AUTOMATIC ANSWER ONLY (page 25), up to the point that "A" Deck forward limit switch S201 opens to release relay AD (on page 26). The operating sequence then continues as follows:

Relay AD released:

- a. Releases forward solenoid L202, stopping the "A" Deck tape.
- b. Operates rewind solenoid L203, which rewinds the "A" Deck tape. When the tape has been completely rewound, rewind limit switch S202 operates to release rewind solenoid L203 (stopping the tape) and to release relay ADR. Relay ADR released removes ac power from "A" Deck motor M201.
- c. Removes dc power from relay DLY, which releases after a one-second delay caused by capacitor C8 and resistor R11. (See below for actions resulting from relay DLY releasing.)
- d. Operates relay VC (through J5-M), which operates relay BD (through J5-H and J5-B).

Relay BD operated:

- a. Supplies +18 volts dc to Oscillator (through J5-E, J5-D, and J4-S), which transmits "transfer beep" tone. (Relay DLY releases after one second to terminate the tone, below.)
- b. Applies 18 volts dc to "B" Deck erase head H301.
- c. Applies 117 volts ac to "B" Deck motor M301, causing the capstan to rotate.
- d. Operates brake solenoid L304 to release brake, permitting take up and supply drums to rotate (fig. 20).
- e. Operates drive solenoid L301 to pull drive roller into contact with tape and capstan (fig. 19).

The tape winds from the Tape Cartridge, past erase head H301 and record head H302, and onto the take up spool (fig. 19). Tension is maintained on the tape by a belt-driven slip clutch on the take up drum and a drag spring on the supply drum (fig. 21).

Relay DLY released:

- a. Terminates "transfer beep" tone.
- b. Disconnects "A" Deck record head from Amplifier input.
- c. Disconnects Amplifier output from transformer T1 and telephone line.
- d. Connects transformer T1 to Filter Trap input (J4-A).
- e. Connects Automatic Volume Control (AVC) output (J4-E) to Amplifier input (J4-F).

The message from the telephone line is directed through the Filter Trap and AVC, amplified by transistors Q401, Q402, Q403, and Q1, and recorded onto the "B" Deck tape by record head H302. (See page 30 for circuit analysis of AVC and Amplifier.) Previous messages are erased progressively as the tape passes over erase head H301.

While the message is being recorded, a portion of the speech signal is sent to the input of the Voice Control (J5-L). The Voice Control maintains power to hold relay VC operated so long as speech remains on the telephone line. If speech is absent for a period of 4 seconds, the Voice Control causes the Oscillator to transmit a low-level "talk-down" tone to the telephone line (through J4-P and transformer T1). At the same time, the Filter Trap is activated to prohibit the "talk-down" tone from being recorded onto the tape. If speech resumes during the next 8 seconds, the Oscillator and Filter Trap are de-activated, and the machine continues to record messages until the next 4-second silence. If the silence continues (for a total of 12 seconds), the Voice Control releases relay VC. (See pages 30 and 31 for circuit analysis of Voice Control, Oscillator, and Filter Trap.)

Relay VC released:

- a. Applies +18 volts dc to Oscillator (through J5-D and J4-S), causing it to start transmitting the "disconnect beep" tone.
- b. Removes dc power from relay BD, which releases after a one-second delay caused by capacitor C11 and resistor R14.

Relay BD released:

- a. Removes dc power from Oscillator to terminate "disconnect beep" tone.
- b. Releases drive solenoid L301 and brake solenoid L304, stopping the "B" Deck tape.
- c. Removes dc power from Amplifier.
- d. Removes dc power from erase head H301.
- e. Removes ac power from motor M301.
- f. Extinguishes in-use lamp E2.
- g. Releases relay LS.

Relay LS released:

- a. Disconnects transformer T1 and relay CPC from terminals "T" and "R" to release the telephone line.
- b. Removes short from terminals "A" and "A1".
- c. Connects relay RU to telephone line to prepare for the next answering cycle.
- d. Lights auto-ans lamp E3.

This completes the normal answer and record cycle. Certain telephone Central Offices provide a momentary break (or reversal of direction) in the dc battery current through the telephone line if the calling party hangs up while he is dictating a message. The momentary loss of battery current causes relay CPC to release, which releases relay LS.

Relay LS released:

- a. Disconnects transformer T1 and relay CPC from telephone line.
- b. Removes short from terminals "A" and "A1".
- c. Lights auto-ans lamp E3.
- d. Releases relay VC, which releases relay BD.

Relay BD released:

- a. Releases drive solenoid L301 and brake solenoid L304, stopping the tape.
- b. Removes dc power from Amplifier.
- c. Removes ac power from motor M301.
- d. Extinguishes in-use lamp E2.

The Model 700 is then ready to answer another call.

In the event that the "B" Deck tape nears the end of its 2-hour limit while recording a message, an actuator on the dial operates 3-minute switch S301 (fig. 20), which operates relay FD.

Relay FD operated:

- a. Shorts together telephone line terminals "E" and "E1".
- b. Removes dc power from relay RU contacts to prevent subsequent answering.

The set continues to record the incoming message. If the Voice Control or Calling Party Control circuits do not disconnect the Model 700 within the next 3 minutes, the same actuator on the dial operates forward limit switch S302, which releases relay VC. Machine operation then continues as described under "Relay VC released:", page 27, except that auto-ans lamp E3 remains extinguished. The "B" Deck must be rewound in the PLAY or ERASE positions before the Model 700 will answer further calls.

5. MESSAGE PLAYBACK:

This function is enabled by rotating Selector Switch S1 to PLAY position.

Switch S1 in PLAY (position #4):

- a. Lights pilot lamp E1.
- b. Connects handset receiver to transformer T1.
- c. Operates relay BD.
- d. Operates relay DLY.

Relay BD operated:

- a. Lights in-use lamp E2.
- b. Connects +18 volts dc to Amplifier (at J4-H).
- c. Applies 117 volts ac to motor M301, causing the "B" Deck capstan to rotate.

Relay DLY operated:

- a. Connects "B" Deck record head H302 to Amplifier input (J4-F).
- b. Connects Amplifier output (J4-M) to handset receiver through transformer T1.

The message playback function is initiated by depressing and holding the handset switch, or by pulling out on the Speaker Control, which operates speaker switch S3.

Switch S3 or handset switch operated:

- a. Operates brake solenoid L304 to release brake, permitting take up and supply drums to rotate (fig. 20).
- b. Operates drive solenoid L301 to pull pressure roller into contact with tape and capstan (fig. 19).

The tape winds from the Tape Cartridge, past record head H302, and onto the take up spool (fig. 19). Tension is maintained on the tape by a belt-driven slip clutch on the take up drum and a drag spring on the supply drum (fig. 21).

The messages are detected by record head H302, amplified by transistors Q401, Q402, Q403, and Q1, and coupled through transformer T1 to the handset receiver. (See page 30 for circuit analysis of Amplifier.)

If speaker switch S3 has been operated, the messages are reproduced through speaker LS1. The Speaker Control may be rotated to vary the setting of L-pad R8, which adjusts the playback volume through the speaker.

Message playback continues until:

- a. The handset switch is released.
- b. The Speaker Control is pushed in to release switch S3.
- c. Forward limit switch S302 is actuated at the end of the 2-hour capacity of the Tape Cartridge.

In any of these cases, drive solenoid L301 and brake solenoid L304 release, stopping the tape.

6. MESSAGE ERASE:

This function is enabled by rotating Selector Switch S1 to ERASE position.

Switch S1 in ERASE (position #6):

- a. Lights pilot lamp E1.
- b. Operates relay BD.

Relay BD operated:

- a. Lights in-use lamp E2.
- b. Applies 117 volts ac to motor M301, causing the "B" Deck capstan to rotate.
- c. Connects +18 volts dc to erase head H301.

The message erase function is initiated by operating the "B" Deck in either the REWIND or FAST FORWARD position (below). In either case, the tape is pulled past erase head H301, which erases the messages.

7. REWIND and FAST FORWARD:

This function is enabled by rotating Selector Switch S1 to either PLAY or ERASE position.

Switch S1 in PLAY (position #4) or ERASE (position #6):

- a. Lights pilot lamp E1.
- b. Operates relay BD.

Relay BD operated:

- a. Lights in-use lamp E2.
- b. Applies 117 volts ac to motor M301, causing the "B" Deck flywheel to rotate.

The rewind function is initiated by pushing Rewind-Forward Switch to the left, which operates rewind switch S2.

Switch S2 operated:

- a. Operates relay FD, which releases drive solenoid L301 and brake solenoid L304, stopping the tape (if message playback was in process).
- b. Operates brake solenoid L304 to release the brake, allowing the take up and supply drums to rotate (fig. 20).
- c. Operates rewind solenoid L303, which jams the rewind roller between the flywheel and supply drum (fig. 20), causing the tape to rewind back into the Tape Cartridge.

The tape continues to rewind until rewind switch S2 is released.

Rewind switch S2 released:

- a. Releases rewind solenoid L303 and brake solenoid L304, stopping the tape.
- b. Removes dc power from relay FD, which releases after a 1/4-second delay (caused by capacitor C15 and resistor R17).

Relay FD released restores the current path to drive solenoid L301 and brake solenoid L304. Message playback then resumes if the hand-set switch or speaker switch has been operated. (The 1/4-second delay allows the fast-moving tape to stop before the pressure roller clamps the tape against the capstan.)

If rewind switch S2 is held operated until the tape is completely rewound into the Tape Cartridge, the rewind limit switch actuator will drop into a slot in the take up spool, operating rewind limit switch S304 (fig. 19). Switch S304 operated releases rewind solenoid

L303 and brake solenoid L304, stopping the tape.

The fast forward function is initiated by pushing and holding the Rewind-Fast Forward Switch to the right, which operates fast forward switch S4.

Switch S4 operated:

- a. Operates relay FD, which releases drive solenoid L301 and brake solenoid L304, stopping the tape (if message playback was in process).
- b. Operates brake solenoid L304 to release the brake, allowing the take up and supply drums to rotate (fig. 20).
- c. Operates fast forward solenoid L302, which jams the fast forward roller between the flywheel and take up drum (fig. 21), causing the tape to travel fast forward.

The tape continues to travel forward until fast forward switch S4 is released.

Switch S4 released:

- a. Releases fast forward solenoid L302 and brake solenoid L304, stopping the tape.
- b. Removes dc power from relay FD, which releases after a 1/4-second delay (caused by capacitor C15 and resistor R17).

Relay FD released restores the current path to drive solenoid L301 and brake solenoid L304, allowing message playback to resume.

If fast forward switch S4 is held operated until the end of the 2-hour capacity of the Tape Cartridge, forward limit switch S302 opens.

Switch S302 opened:

- a. Releases fast forward solenoid L302 and brake solenoid L304, stopping the tape.
- b. Breaks current path to drive solenoid L301 and brake solenoid L304, which prevents forward travel of the tape.

Rewind switch S2 must now be operated to rewind the tape, which closes forward limit switch S302.

CIRCUIT ANALYSIS

1. POWER SUPPLY:

The power supply provides voltage sources for operation of the Model 700. These are:

- a. 117 volts ac for operation of "A" Deck and "B" Deck motors.
- b. 28 volts dc for operation of relays and solenoids.
- c. Regulated 18 volts dc for operation of Amplifier, Voice Control, Oscillator, lamps, and erase heads.

The 28-volt dc supply is obtained at the output of a bridge rectifier CRB1. Capacitor C12 provides the only filtering for this supply. The 18-volt dc regulated supply is provided by the regulating circuit involving transistor Q2. Zener diode CR10 serves as an 18-volt base reference for biasing transistor Q2. This transistor is connected as an emitter follower to provide a voltage regulated output across filter capacitor C14. A saturating base current is supplied to transistor Q2 through resistor R16. Capacitor C13 provides additional filtering for the base reference voltage.

2. AUTOMATIC VOLUME CONTROL:

The audio input to the amplifier is routed through the Automatic Volume Control (AVC) during all recording functions. The AVC samples the Amplifier output to adjust a variable attenuator at the Amplifier input.

During the ANN-REC or ANS-REC functions, a portion of the Amplifier output is fed back through J4-C. The audio signal is coupled through capacitor C411, rectified by diodes CR403 and CR404, and appears as a dc voltage across capacitor C408. When the voltage across capacitor C408 exceeds approximately 1.6 volts dc, diodes CR401 and CR402 start to conduct to discharge the capacitor. A characteristic of diodes CR401 and CR402 is that as they conduct more current, their resistances decrease.

Thus, resistor R413 and diode CR401 form a variable voltage divider, whose ratio depends on the dc voltage across capacitor C408. In turn, this dc voltage is proportional to the output level of the Amplifier. Similarly, resistor R414 and diode CR402 form another variable voltage divider, placed in cascade with the first divider.

The audio signal to be recorded is coupled through J4-B, voltage divider resistors R410 and R409, and is coupled into the AVC circuit through capacitor C407. The signal continues through the two cascaded variable voltage dividers and out through J4-E. Relay DLY switches the adjusted signal to the Amplifier input (J4-F) during the recording functions.

It takes approximately 50 milliseconds for a loud audio signal to charge capacitor C408 to 1.6 volts dc through resistor R416. This is the "attack time" of the AVC. The "release time" is determined by the discharge time constant of capacitor C408 and bleeder resistor R415, and is approximately 2 seconds.

3. AMPLIFIER:

The Amplifier consists of silicon NPN transistors Q401, Q402, Q403, and germanium PNP transistor Q1. During all playback modes, audio from the record heads is connected to the Amplifier input, and the amplified output is sent to the handset, speaker, or telephone line. During the announcement record mode, audio is directed through the AVC, then to the Amplifier input. The amplified output is mixed with dc bias current and sent to the "A" Deck record head. When recording from the telephone line, the audio is routed through the Filter Trap, AVC, and Amplifier, then mixed with dc bias current and sent to the "B" Deck record head.

Audio is coupled through J4-F and capacitor C409 to the base of 1st preamplifier Q401. Resistors R417 and R418 bias the base of this transistor, and emitter resistor R420 aids in temperature stability. Resistor R419 is the

collector load for this preamplifier stage, which is directly coupled to 2nd preamplifier Q402. Resistor R419 and transistor Q401 bias the base of this transistor. Emitter resistor R421 aids in temperature stability, and bypass capacitor C415 limits the low frequency response to approximately 300 cps. The collector load is provided by resistor R425. Resistor R418 provides a dc negative feedback path to improve the overall stability of the two preamplifier stages. Resistor R424 and capacitor C410 decouple the two preamplifier stages from the 18 volt dc supply and its various loads.

The amplified audio at the collector of transistor Q402 is coupled through capacitor C412 to AMPLIFIER VOLUME control R427, and then to driver transistor Q403. Resistor R426 biases the base of this transistor, and also provides a negative feedback path to improve the linearity of this stage. The audio output at the collector of transistor Q403 is coupled through driver transformer T401 to the base of audio power transistor Q1 (through J4-R). Capacitor C413 (with capacitor C7, across transformer T2) limits the high frequency response of the Amplifier to approximately 3000 cps.

Silicon diode CR405 and resistor R428 provide the base bias for transistor Q1. Emitter resistor R7 aids in temperature stability.

A portion of the output of this audio power stage is directed through pin J4-N, capacitor C414, and resistor R422 to J4-L. Resistor R423 adds 120 microamperes dc bias current at this point. The audio is then switched to one of the record heads for recording onto the tape.

The audio coupled through pin J4-N and capacitor C414 is also sent through J4-M and transformer T1 to the handset receiver or telephone line. Voltage divider resistors R411 and R412 adjust the audio level for this purpose.

The output of audio power transistor Q1 is also coupled through transformer T2 to be fed back to the AVC through J4-C. Transformer T2 also feeds speaker volume L-pad R8 and speaker LS1 or earphone jack J9. Resistor R10 provides a dummy load for the Amplifier when speaker LS1 is switched off.

4. VOICE CONTROL:

During the message recording portion of the ANS-REC cycle, the Voice Control monitors the output of the Amplifier. The Voice Control maintains power to hold relay VC operated so long as speech is being recorded. Silence on the telephone line for a period of 12 seconds causes relay VC to release, which initiates the disconnect sequence. The Voice Control also keys the Filter Trap and Oscillator into action after the first 4 seconds of silence, which transmits the warning "talk-down" tone.

Speech appearing at J5-L is coupled through resistor R501 and capacitor C501 to VOICE

CONTROL LEVEL control R502, and then to transistor Q501. Resistors R502 and R503 bias the base of the transistor so that it will conduct only the positive portion of the audio signal. Thus, transistor Q501 rectifies as well as amplifies the speech signal. Resistor R504 and capacitor C502 form a low-pass filter that removes all frequencies above 10 cps. This ensures that steady tones (such as dial tone or hum) will not hold relay VC operated. The fluctuating dc signal is then coupled through capacitor C503 to the base of transistor Q502.

Resistor R506 and 4-SECOND TIME control R507 provide a path to charge capacitor C504 from the 18 volt dc power supply. However, a speech input to the Voice Control will cause transistor Q502 to conduct, which will discharge capacitor C504 through current limiting resistor R508.

If speech is absent for 4 seconds, capacitor C504 will charge to a level sufficient to cause transistor Q503 to conduct. When transistor Q503 conducts, its collector is effectively grounded (through emitter resistor R511).

Collector of transistor Q503 grounded:

- a. Grounds J5-R and J4-D, which activates the Filter Trap.
- b. Grounds the base of transistor Q504 (through resistor R512). This causes transistor Q504 to stop conducting, which raises the voltage level at its collector. This permits dc current to flow through resistor R514, TALK-DOWN TONE control R515, J5-P, and J4-S, which activates the Oscillator. The talk-down tone is then transmitted over the telephone line.
- c. Interrupts the current flow which has been charging capacitor C506 (through resistor R510 and diode CR501). This allows capacitor C506 to start discharging through resistor R517 and 8-SECOND TIME control R516.

If speech is resumed on the telephone line within the next 8 seconds, Q502 will conduct to discharge capacitor C504. Transistor Q503 then stops conducting, which reverses the actions described in a, b, and c, above. This cycle will repeat as many times as the calling party chooses.

If silence continues on the telephone line, C506 discharges through resistors R517 and R516. After 8 seconds (or a total of 12 seconds after speech stops), the voltage at the base of transistor Q505 becomes too low to maintain the bias current required to keep the transistor conducting. When transistor Q505 stops conducting, relay VC releases to initiate the disconnect sequence.

5. OSCILLATOR:

The Oscillator consists of transistor Q404, coils L401 and L402, and associated circuitry.

The Oscillator generates the low-level talk-down tone upon command by the Voice Control. It also generates the high-level transfer and disconnect "beep" tones.

OSCILLATOR FREQUENCY coil L401 provides a positive feedback path from the emitter-follower output to the base of transistor Q404 (through resistor R403), causing the transistor to oscillate at 1400 cps. Capacitor C403 forms a tuned, parallel-resonant "tank" circuit with coil L401 to maintain the 1400 cps oscillating frequency. The generated tone is coupled through capacitor C402 and resistor R405 to BUFFER coil L402 and capacitor C404. These two components form a second "tank" circuit whose purpose is to shunt to ground the unwanted harmonics of 1400 cps. The tone is then coupled to the telephone line through resistor R406, J4-P, and transformer T1.

Resistor R401 and capacitor C401 decouple the Oscillator from the 18 volt dc power supply.

The high-level "beep" tones are generated when relay BD applies +18 volts dc through J4-S. The voltage is removed after one second (by the delayed release of relay BD or DLY) to set the "beep" tone length.

The low-level talk-down tone is generated when the Voice Control applies a low voltage through J4-S. TALK DOWN TONE control R515 adjusts the voltage to vary the tone volume.

6. FILTER TRAP:

The Filter Trap, consisting of FILTER ADJUST COIL L403, capacitor C405, and FILTER ADJUST POTENTIOMETER R430, is a notch-rejection filter tuned to 1400 cps. It is activated by the Voice Control whenever the talk-down tone is transmitted. The purpose of the Filter Trap is to prevent the talk-down tone from entering the AVC, Amplifier, and Voice Control circuits. If the talk-down tone were permitted to pass, it would re-set the Voice Control time-out circuitry.

The audio signal on the telephone line is coupled through transformer T1 and J4-A to a parallel-resonant circuit consisting of coil L403 and capacitor C405. This circuit is tuned to present a very high impedance to a frequency of 1400 cps only. All other frequencies pass through to voltage divider resistors R410 and R409 and on to the Automatic Volume Control.

When the talk-down tone is not being transmitted, the Voice Control connects a dc voltage to zener diode CR406 (through J4-D and resistor R408). The voltage biases the zener diode so that it starts conducting dc current. While conducting current, the zener diode presents a very low impedance to the audio signal, which is bypassed around the Filter Trap (through diode CR406 and capacitor C416).

SECTION VI PARTS

ORDERING INFORMATION

ORDER FROM:

Customer Service Department
Ford Industries, Inc.
5001 S.E. Johnson Creek Blvd.
Portland, Oregon 97206

Telephone: (503) 774-1104

Specify PART or ASSEMBLY number, complete description, and quantity desired. Parts orders will be processed more quickly if received on a Purchase Order.

It is recommended that commonly available parts such as screws, fuses, and resistors be obtained locally.

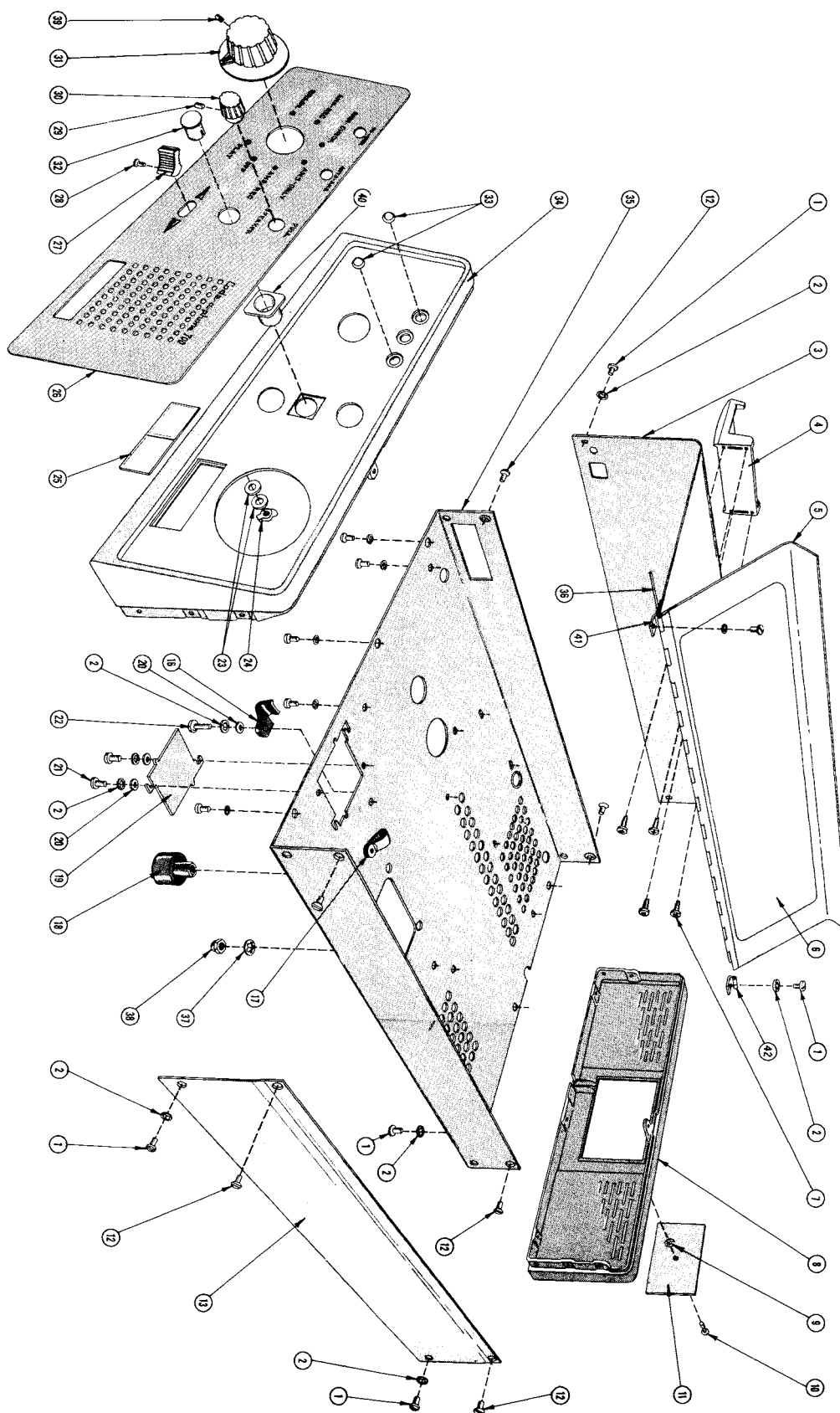
Improvements are incorporated in Code-a-phones as soon as they become available. Ford Industries, Inc. reserves the right to substitute on parts orders in cases where the substituted component will give equivalent or improved performance in the instrument.

CASE PARTS

Item No.	Part No.	Qty.	Description	Item No.	Part No.	Qty.	Description
1	F15-390	22	#6-32 x 1/4" Screw	23	F31-115	8	5/32" x 5/16" x 1/32" Fibre Washer
2	F03-361	25	#6 Lock Washer	24	F07-514	4	1/8" Push-On Fastener
3	30-00-373*	1	Cover	25	P00-138	1	Dial Window
4	P00-123	1	Handset Hanger	26	M00-583	1	Front Panel
5	30-00-374*	1	Cover Door (Includes Item #6)	27	P00-122	1	Rewind-Forward Knob
6	N04-030	1	Instruction Sheet	28	F15-126	1	#3-48 x 3/16" Screw
7	F20-836	4	#6-20 x 3/8" Thread Cutting Screw	29	F02-025	1	#4-40 x 3/16" Allen Set Screw
8	D00-056	1	Rear Casting	30	H03-006	1	Speaker Control Knob
9	F04-011	1	Retaining Ring	31	H03-005	1	Selector Knob
10	F17-395	1	#6-32 x 5/16" Cap-tive Screw	32	P00-209	1	Pilot Lamp Jewel
11	M00-137	1	Terminal Cover Plate	33	P00-105	2	Lamp Jewel
12	F16-390	6	#6-32 x 1/4" Flat Head Screw	34	30-00-376	1	Front Casting (Includes Items #25, #26, #32, #33 & #40)
13	M00-146	1	Side Cover	35	M00-134	1	Bottom Pan
16	F07-703	1	A.C. Power Cable Clamp	36	S00-044*	1	Hinge Pin
17	F07-702	1	Transformer Cable Clamp	37	F03-381	4	#8 Lock Washer
18	P00-119	4	Foot	38	F03-085	4	#8-32 Acorn Nut
19	M00-136	1	Dial Cover Plate	39	F02-042	1	#6-32 x 3/16" Allen Set Screw
20	F05-031	3	#6 Flat Washer	40	P00-210	1	Window Bushing
21	F15-398	2	#6-32 x 3/8" Screw	41	M00-663*	1	Hinge Support (Front)
22	F15-406	1	#6-32 x 1/2" Screw	42	M00-665*	1	Hinge Support (Rear)

* Items #3, #5, #36, #41 and #42 may be ordered together as #30-00-375 Cover Assembly.

FIGURE 24 CASE EXPLODED VIEW



"A" DECK PARTS

Item No.	Part No.	Qty.	Description	Item No.	Part No.	Qty.	Description
	X00-056		A3 Tape Deck (Complete)	51	S00-039	1	Forward Solenoid Link
1	F15-384	5	#6-32 x 5/32" Screw	52	F16-386	4	6-32 x 3/16" Flat Head Screw
2	F03-361	18	#6 Lock Washer	53	F03-375	4	#6 Cup Lock Washer
3	M00-037	1	"A" Deck Cover	54	30-00-244	1	Rewind Shaft
4	F04-013	6	Retaining Ring	55	30-00-379	1	Timer Plate (Includes Item #54)
5	F31-150	8	.192" x .375" x .031" Fibre Washer	56	30-00-043	1	Forward Solenoid Plunger
6	P00-185	4	Tape Roller	57	F03-031	1	#4-40 Nut
7	F04-007	3	Retaining Ring	58	M00-019	1	Timer Arm Bracket
8	F05-607	1	.133" x .344" x .019" Washer	59	A00-103	4	Motor Post
9	F03-620	1	Spring Washer	60	30-00-044	1	Timer Arm
10	F05-505	1	.130" x .188" x .022" Washer	61	30-00-240	1	Rewind Solenoid Plunger
12	B00-013	1	Ball Bearing	62	H00-020	1	Switch Actuator
13	B00-014	1	Ball Bearing	63	F15-210	3	#4-40 x 5/8" Screw
14	H02-038	4	Tape Head Connector	64	S00-008	1	Timer Arm Spring
15	F03-331	11	#4 Lock Washer	65	H05-022	1	2-Lug Tie Point
16	F15-186	5	#4-40 x 3/16" Screw	66	F05-615	1	3/16" x 1/4" x .010" Washer
17	F30-148	1	.190" x .440" x .005" Mylar Washer	67	30-00-054	1	Flywheel/Capstan Assembly
18	M00-017	1	Spool Plate	68	J00-018	1	Motor Belt
19	30-00-335	1	Take Up Spool Assembly	69	J00-019	1	Flywheel Belt
23	30-00-010	1	Supply Spool/Tape Assembly	70	A00-158	1	Motor Pulley
24	F30-145	9	3/16" x 5/16" x .010" Mylar Washer	72	F02-024	2	#4-40 x 1/8" Allen Set Screw
25	A00-218	1	Tape Roller Post	74	J00-020	4	Shock Mount
26	30-00-047	1	Head Bracket (Includes Items #12 and #13)	75	A00-093	1	Rewind Pulley
27	F30-090	3	.129" x .312" x .010" Mylar Washer	76	S00-007	1	Timer Cap Lift Spring
28	F30-175	2	.222" x .375" x .010" Mylar Washer	77	P00-005	1	Counter Gear
29	A00-099	2	Lever Pin	78	F09-208	1	Roll Pin
30	30-00-049	1	Drive Lever	79	30-00-051	1	Spool Shaft
32	P00-003	6	Bearing Pad	80	30-00-052	1	Timer Gear
33	F05-003	4	#4 Washer	82	P00-054	1	Timer Roller
34	30-00-206	1	Pressure Pad	83	F03-061	4	#6-32 Nut
35	J00-033	1	Drive Roller	84	F07-385	1	#6 Solder Lug
36	J00-034	1	Rewind Roller	85	P00-021	1	Timer Gear Plate
37	F30-210	2	1/4" x 1/2" x .010" Mylar Washer	86	F04-036	1	Retaining Ring
38	F04-034	1	Retaining Ring	87	S00-006	1	Timer Cap Clock Spring
39	S00-003	1	Lever Return Spring	88	30-00-053	1	Timer Cap (Includes Item #87)
40	F15-398	2	#6-32 x 3/8" Screw	C201	C05-013	1	.0075 μ f 200 V. Mylar Capacitor
41	F05-709	1	5/32" x 1/2" x .049" Washer	CR201	T02-002	1	TI 58 Silicon Diode
42	30-00-050	1	Rewind Lever	CR202	T02-002	1	TI 58 Silicon Diode
43	30-00-242	2	Lever Guide	CR203	T02-002	1	TI 58 Silicon Diode
44	F15-190	2	#4-40 x 1/4" Screw	H201,			
45	F07-701	1	Cable Clamp	H202	30-00-008	1	Tape Head Assembly
46	S00-001	1	Lever Tension Spring	L201	30-00-280	1	Timer Solenoid
47	F15-390	5	#6-32 x 1/4" Screw	L202	30-00-280	1	Forward Solenoid
48	30-00-046	1	Deck Plate	L203	30-00-281	1	Rewind Solenoid
49	F15-194	2	#4-40 x 5/16" Screw	M201	L01-025	1	117 V.A.C. Motor
50	F04-016	2	Retaining Ring	P201	H01-017	1	15 Pin Plug
				R201	R21-007	1	1.5 K Ω \pm 5% 1 Watt Resistor
				S201	30-00-397	1	Forward Limit Switch
				S202	H00-019	1	Rewind Limit Switch

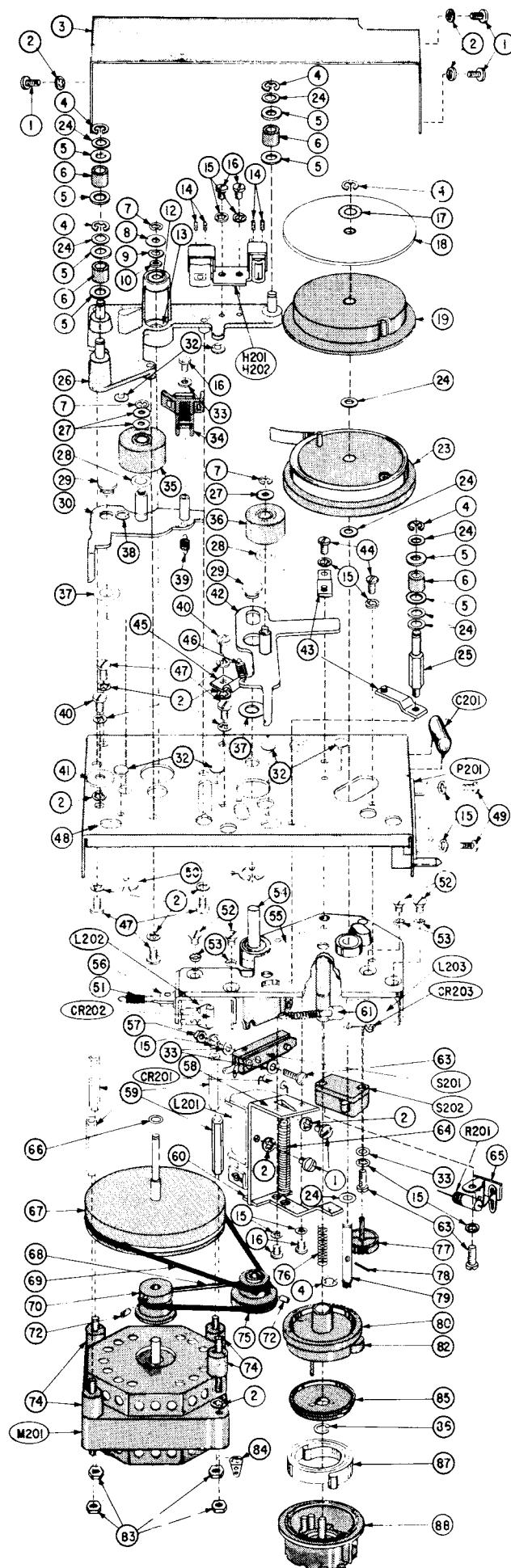


FIGURE 25
"A" DECK
EXPLODED VIEW

"B" DECK PARTS

Item No.	Part No.	Qty.	Description	Item No.	Part No.	Qty.	Description
	X00-058		B3 Tape Deck (Complete)	29	F15-390	15	#6-32 x 1/4" Screw
				30	F03-361	34	#6 Lock Washer
				32	F07-701	4	Cable Clamp
1	30-00-040	1	Upper Trim Plate	33	F15-384	8	#6-32 x 5/32" Screw
2	F18-186	10	#4-40 x 3/16" Phil- lips Head Screw	34	F06-105	2	.089" x 7/16" Rivet
3	M00-114	1	Center Trim Plate	35	F04-016	3	Retaining Ring
4	F19-190	2	#4-40 x 1/4" Phil- lips Head Screw	36	P00-097	1	Tape Positioner
5	P00-084	1	Cartridge Drive Hub	38	P00-098	1	Flange Tape Roller
6	M00-115	1	Lower Trim Plate	39	F07-501	2	Cable Clip
7	30-00-020	1	Take Up Spool	40	H02-038	4	Tape Head Connector
8	F30-085	3	1/8" x 1/4" x .010" Mylar Washer	42	F03-331	7	#4 Lock Washer
9	S00-040	1	Pressure Pad Spring	44	A00-111	1	Trim Plate Hex Post
10	F04-007	6	Retaining Ring	45	P00-128	2	Tape Roller
11	S00-032	1	Drive Solenoid Link	46	F04-013	3	Retaining Ring
12	F20-042	1	#4-40 x 1/4" Thread Cutting Screw	47	F30-145	3	3/16" x 5/16" x .010" Mylar Washer
13	F05-003	6	#4 Washer	48	P00-035	1	Cartridge Interlock Switch Button
14	F30-090	5	1/8" x 5/16" x .010" Mylar Washer	49	J00-021	4	Bearing Cup Liner
15	J00-033	3	Pressure Roller	50	F30-210	6	1/4" x 1/2" x .010" Mylar Washer
16	F30-175	3	7/32" x 3/8" x .010" Mylar Washer	52	J00-022	2	Bearing Cup Liner
17	P00-095	1	Pressure Pad Base				
18	30-00-043	4	Solenoid Plunger	54	F03-715	2	Spring Washer
19	S00-015	2	Return Spring	55	F05-630	4	3/8" x 1/2" x .010" Washer
20	30-00-021	1	Pressure Pad				
22	F04-011	1	Retaining Ring	56	M00-119	2	Lever Back Stop
23	S00-042	1	Tape Positioner Spring	57	30-00-055	1	Upper Deck Plate (Includes Items #34, #48, and #S303)
24	30-00-024	1	Drive Lever				
25	F15-186	9	#4-40 x 3/16" Screw	58	F03-061	8	#6-32 Hex Nut
26	F30-118	2	5/32" x 5/16" x .010" Mylar Washer	59	M00-042	1	Rewind Solenoid Bracket
27	F03-341	2	#4 Split Lock Washer	60	P00-003	9	Bearing Pad
28	30-00-025	1	Rewind Limit Switch Actuator	61	S00-041	2	Solenoid Link

("B" Deck Parts Continued on Page 38.)

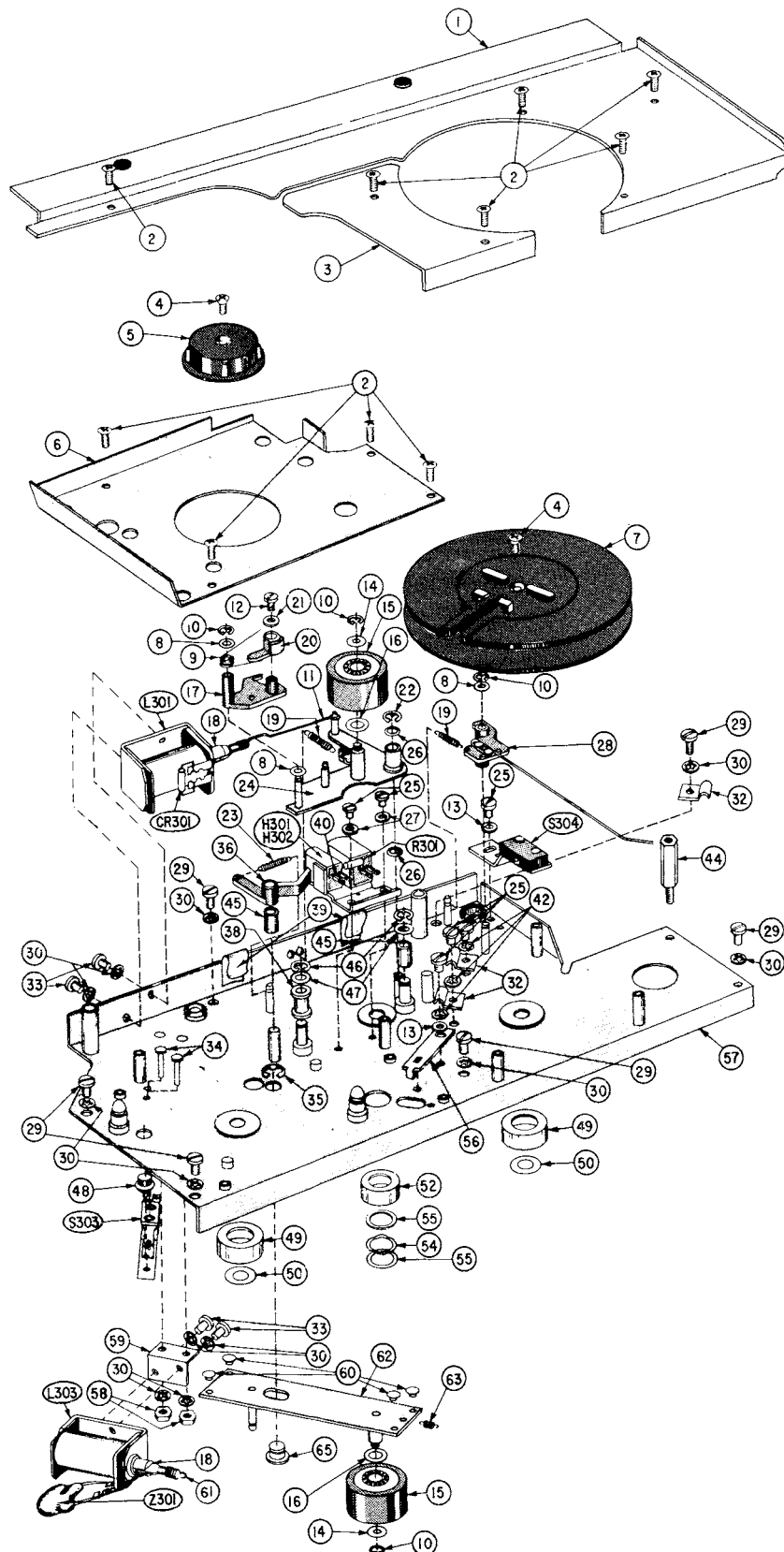


FIGURE 26 "B" DECK EXPLODED VIEW (UPPER PLATE)

Section VI

Parts

"B" DECK PARTS

(Continued)

Item No.	Part No.	Qty.	Description	Item No.	Part No.	Qty.	Description
62	30-00-028	2	Roller Slide	92	P00-023	3	Counter Gear
63	S00-001	2	Slide Return Spring	93	30-00-036	1	Dial Assembly
65	A00-099	2	Slide Retaining Pin	94	F30-050	1	3/32" x 1/4" x
66	J00-017	3	Drive Belt				.010" Mylar
67	30-00-037	1	Capstan/Flywheel				Washer
			Assembly	95	F31-057	1	3/32" x 7/16" x
68	S00-018	2	Brake Spring				.020" Fibre
69	30-00-031	1	Brake				Washer
70	A00-157	1	Motor Pulley	96	F04-004	1	Retaining Ring
72	F02-024	1	#4-40 x 1/8" Allen	97	F15-190	1	#4-40 x 1/4" Screw
			Set Screw	98	P00-099	1	Forward Limit
73	J00-013	1	Take Up Clutch Belt				Switch Actuator
74	30-00-038	1	Take Up Shaft				
			Assembly	C301	C05-012	1	.01 μ f 200 V. Mylar
75	30-00-035	1	Supply Shaft				Capacitor
			Assembly	CR301	T02-002	1	TI 58 Silicon Diode
76	A00-112	5	Deck Plate Spacer	CR302	T02-002	1	TI 58 Silicon Diode
77	F15-194	2	#4-40 x 5/16" Screw	CR304	T02-002	1	TI 58 Silicon Diode
78	F07-385	2	#6 Solder Lug	H301,			
79	A00-113	3	Tape Deck Leg	H302	30-00-009	1	Tape Head Assembly
80	30-00-045	1	Lower Deck Plate	L301	30-00-292	1	Drive Solenoid
			(Includes Item	L302	30-00-292	1	Fast Forward
			#86)				Solenoid
81	S00-017	1	Brake Solenoid Link	L303	30-00-294	1	Rewind Solenoid
82	A00-114	2	Motor Post	L304	30-00-292	1	Brake Solenoid
84	J00-020	4	Motor Shock Mount	M301	L01-026	1	117 V.A.C. Motor
85	F05-716	1	5/32" x 3/8" x	P301	H01-017	1	15-Pin Plug
			.030" Washer	R301	R11-023	1	1.5 K Ω \pm 10% 1/2
86	30-00-033	1	Drag Spring				Watt Resistor
87	A00-096	1	Dial Shaft	S301,			
88	F31-093	1	1/8" x 5/16" x	S302	30-00-039	1	3-Minute/Forward
			.080" Fibre				Limit Switch
			Washer				Assembly
89	F31-216	1	1/4" x 1/2" x	S303	H00-055	1	Cartridge Interlock
			.080" Fibre				Switch
			Washer	S304	30-00-026	1	Rewind Limit Switch
90	30-00-032	1	Gear Plate	Z301	E01-002	1	Arc Suppressor

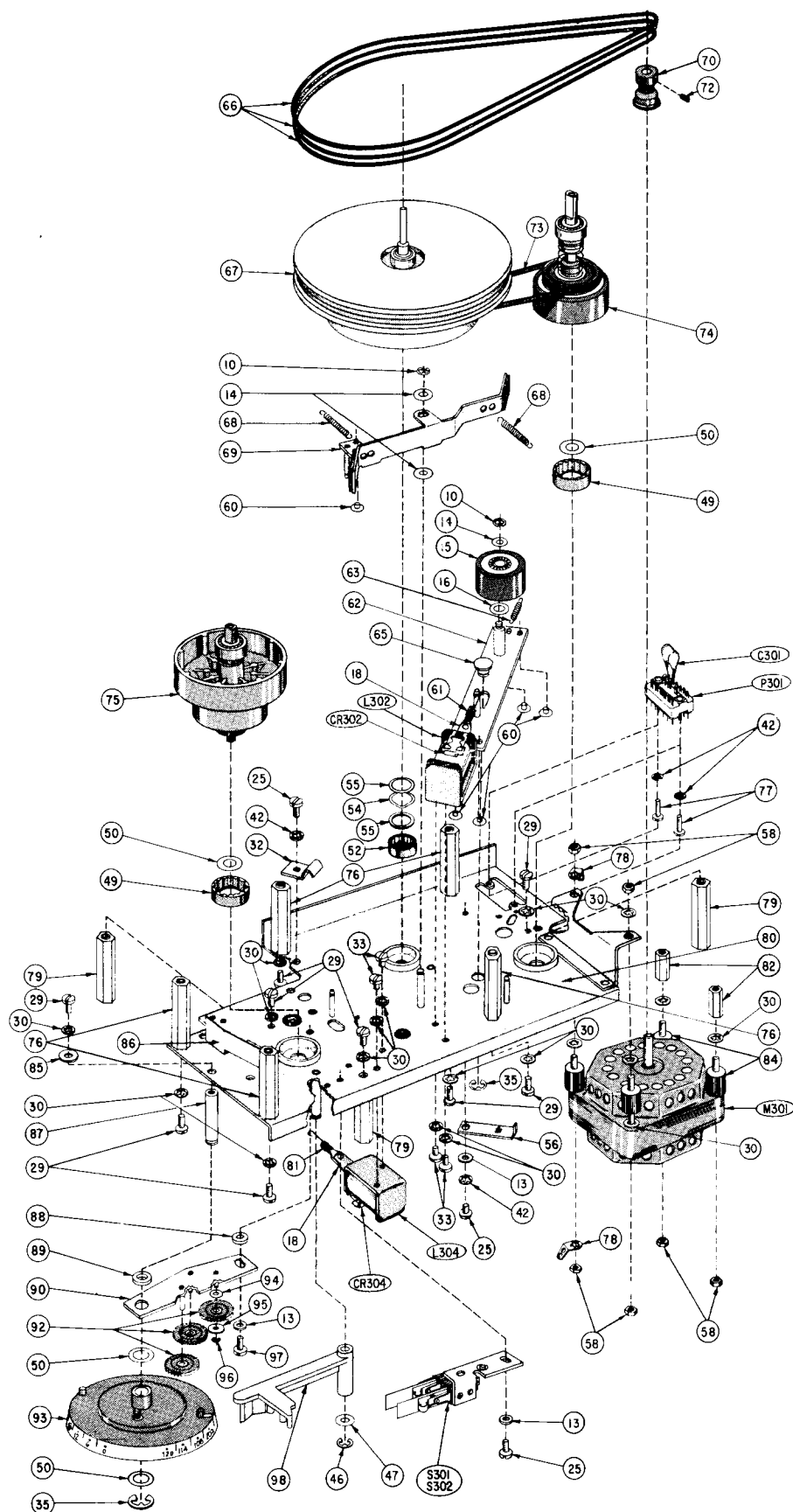


FIGURE 27 "B" DECK EXPLODED VIEW (LOWER PLATE)

AMPLIFIER PARTS

Circuit No.	Part No.	Description	Circuit No.	Part No.	Description
	X00-070	Model 700 Amplifier (Complete)	R404		390 $\Omega \pm 5\%$ 1/2 Watt Resistor
C401	C03-031	1 μ f 25 V. Electrolytic Capacitor	*R405	R12-027	15 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C402	C05-004	.022 μ f 200 V. Mylar Capacitor	R406	R11-020	6.8 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C403	C07-001	.05 μ f 100 V. Polystyrene Capacitor	R407	R10-034	620 $\Omega \pm 5\%$ 1/2 Watt Resistor
C404	C05-003	.056 μ f 200 V. Mylar Capacitor	R408	R12-028	22 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C405	C07-001	.05 μ f 100 V. Polystyrene Capacitor	R409	R11-026	2.7 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C407	C05-001	.1 μ f 200 V. Mylar Capacitor	R410	R11-020	6.8 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C408	C03-046	100 μ f 6 V. Electrolytic Capacitor	R411	R10-035	560 $\Omega \pm 5\%$ 1/2 Watt Resistor
C409	C05-003	.056 μ f 200 V. Mylar Capacitor	R412	R11-037	1.8 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C410	C03-035	50 μ f 25 V. Electrolytic Capacitor	R413	R12-029	39 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C411	C01-025	.5 μ f 100 V. Paper Capacitor	R414	R12-026	10 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C412	C02-004	1 μ f 25 V. Ceramic Capacitor	R415	R12-029	39 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C413	C02-020	.005 μ f 1000 V. Ceramic Capacitor	R416	R10-026	330 $\Omega \pm 5\%$ 1/2 Watt Resistor
C414	C02-004	1 μ f 25 V. Ceramic Capacitor	R417	R12-034	100 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C415	C03-047	5 μ f 6 V. Electrolytic Capacitor	R418	R12-042	120 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C416	C02-004	1 μ f 25 V. Ceramic Capacitor	R419	R12-036	33 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C417	C02-008	.001 μ f 500 V. Ceramic Capacitor	R420	R11-027	1 K $\Omega \pm 5\%$ 1/2 Watt Resistor
†CR401	T02-002	TI - 58 Silicon Diode	R421	R11-021	3.3 K $\Omega \pm 5\%$ 1/2 Watt Resistor
†CR402	T02-002	TI - 58 Silicon Diode	R422	R12-034	100 K $\Omega \pm 5\%$ 1/2 Watt Resistor
†CR403	T02-002	TI - 58 Silicon Diode	R423	R12-035	150 K $\Omega \pm 5\%$ 1/2 Watt Resistor
†CR404	T02-002	TI - 58 Silicon Diode	R424	R11-035	1.5 K $\Omega \pm 5\%$ 1/2 Watt Resistor
CR405	T02-002	TI - 58 Silicon Diode	R425	R11-020	6.8 K $\Omega \pm 5\%$ 1/2 Watt Resistor
CR406	T02-014	6 V. $\pm 10\%$ Zener Diode	R426	R12-042	120 K $\Omega \pm 5\%$ 1/2 Watt Resistor
L401	L10-008	250 mH Coil (OSC. ADJ.)	R427	R00-013	10 K Ω Potentiometer (AMP. VOL.)
L402	L10-008	250 mH Coil (BUF. ADJ.)	R428	R10-028	820 $\Omega \pm 5\%$ 1/2 Watt Resistor
L403	L10-005	250 mH Coil (FIL. ADJ.)	R429	R11-027	1 K $\Omega \pm 5\%$ 1/2 Watt Resistor
P401	H01-016	15-Pin Plug	R430	R00-011	2 K Ω Potentiometer (FIL. ADJ.)
Q401	T01-047	2N2484 NPN Transistor	R431	R12-030	47 K $\Omega \pm 5\%$ 1/2 Watt Resistor
Q402	T01-014	S-3489 Silicon NPN Transistor	R432	R10-027	470 $\Omega \pm 5\%$ 1/2 Watt Resistor
Q403	T01-014	S-3489 Silicon NPN Transistor	T401	L00-026	Driver Transformer
**Q404	T01-014	S-3489 Silicon NPN Transistor			
	P00-070	Transistor Pad (3 Required)			
R401	R10-025	150 $\Omega \pm 5\%$ 1/2 Watt Resistor			
R402	R12-029	39 K $\Omega \pm 5\%$ 1/2 Watt Resistor			
*R403	R12-028	22 K $\Omega \pm 5\%$ 1/2 Watt Resistor			

*Instruments serial numbers 2858 and below:

R403 is R12-022, 22K $\Omega \pm 10\%$ 1/2 Watt Resistor; R405 is R11-024, 8.2K $\Omega \pm 10\%$ 1/2 Watt Resistor.

**Earlier Instruments (serial numbers not available): Q404 is T01-013, S-3406 Silicon NPN Transistor

†Earlier Instruments (serial numbers not available):

CR401 through CR404 are T02-012, SG3117 Silicon Diode.

VOICE CONTROL PARTS

Circuit No.	Part No.	Description	Circuit No.	Part No.	Description
	X00-087	Voice Control (Complete)	Q505	T01-014	S-3489 Silicon NPN Transistor
C501	C01-025	.5 μ f 100 V. Paper Capacitor		P00-070	Transistor Pad (5 Required)
C502	C03-049	25 μ f 25 V. Electrolytic Capacitor	R501	R10-027	470 $\Omega \pm 5\%$ 1/2 Watt Resistor
C503	C03-049	25 μ f 25 V. Electrolytic Capacitor	R502	R00-014	1 K Ω Potentiometer (VC LEVEL)
C504	C03-046	100 μ f 6 V. Electrolytic Capacitor	R503	R12-030	47 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C505	C02-015	.1 μ f 100 V. Ceramic Capacitor	R504	R12-026	10 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C506	C03-043	100 μ f 15 V. Electrolytic Capacitor	R505	R11-027	1 K $\Omega \pm 5\%$ 1/2 Watt Resistor
C507	C02-015	.1 μ f 100 V. Ceramic Capacitor	*R506	R12-030	47 K $\Omega \pm 5\%$ 1/2 Watt Resistor
CR501	T02-002	TI 58 Silicon Diode	*R507	R00-051	200 K Ω Potentiometer (4 SECOND TIME)
CR502	T02-002	TI 58 Silicon Diode	R508	R10-019	47 $\Omega \pm 5\%$ 1/2 Watt Resistor
CR503	T02-002	TI 58 Silicon Diode	R509	R12-028	22 K $\Omega \pm 5\%$ 1/2 Watt Resistor
CR504	T02-002	TI 58 Silicon Diode	R510	R11-029	4.7 K $\Omega \pm 5\%$ 1/2 Watt Resistor
CR505	T02-002	TI 58 Silicon Diode	R511	R10-025	150 $\Omega \pm 5\%$ 1/2 Watt Resistor
CR506	T02-002	TI 58 Silicon Diode	R512	R12-026	10 K $\Omega \pm 5\%$ 1/2 Watt Resistor
CR507	T02-002	TI 58 Silicon Diode	R513	R12-028	22 K $\Omega \pm 5\%$ 1/2 Watt Resistor
**CR508	T02-002	TI 58 Silicon Diode	R514	R11-029	4.7 K $\Omega \pm 5\%$ 1/2 Watt Resistor
CPC	K00-020	S.P.S.T. N.O. 37.5 Ω Reed Relay	R515	R00-012	50 K Ω Potentiometer (TALK-DOWN TONE)
VC	K00-041	D.P.D.T. 1 K Ω Relay	R516	R00-012	50 K Ω Potentiometer (8 SECOND TIME)
	H02-056	Relay VC Socket	†R517	R12-046	51 K $\Omega \pm 5\%$ 1/2 Watt Resistor
	A00-142	Retaining Nut	R518	R12-028	22 K $\Omega \pm 5\%$ 1/2 Watt Resistor
P501	H01-016	15-Pin Plug	††R519	R10-019	47 $\Omega \pm 5\%$ 1/2 Watt Resistor
Q501	T01-014	S-3489 Silicon NPN Transistor			
Q502	T01-014	S-3489 Silicon NPN Transistor			
Q503	T01-013	S-3406 Silicon NPN Transistor			
Q504	T01-014	S-3489 Silicon NPN Transistor			

*Instruments serial numbers 2858 and below:

R506 is R12-039, 100K $\Omega \pm 10\%$ 1/2 Watt Resistor; R507 is R00-015, 100K Ω Potentiometer.

**CR508 added on Series 5 board, serial number 36869 and above.

†Instruments serial numbers 4193 and below:

R517 is R12-014, 33K $\Omega \pm 10\%$ 1/2 Watt Resistor.

††Instruments serial numbers 4194 and above: R519 is added.

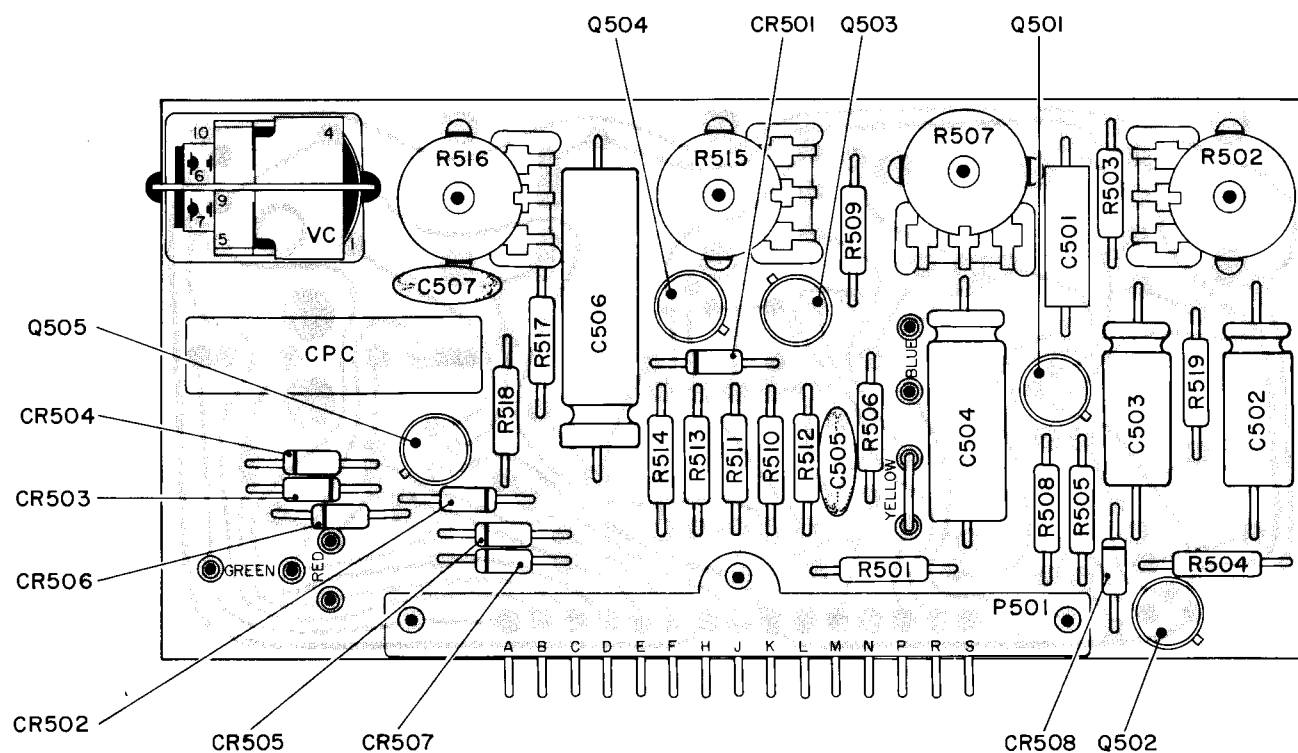


FIGURE 29 VOICE CONTROL, COMPONENT SIDE

DELAY BOARD PARTS

Circuit No.	Part No.	Description	Circuit No.	Part No.	Description
	30-00-102	Delay Board Assembly	CR9	T02-002	TI 58 Silicon Diode
C2	C03-035	50 μ f 25 V. Electrolytic Capacitor	CR11	T02-002	TI 58 Silicon Diode
C3	C02-002	2.2 μ f 25 V. Ceramic Capacitor	R3	R11-028	2.2K $\Omega \pm 5\%$ 1/2 Watt Resistor
C8	C03-044	400 μ f 40 V. Electrolytic Capacitor	R4	R11-028	2.2K $\Omega \pm 5\%$ 1/2 Watt Resistor
*C9	C03-083	950 μ f 40 V. Electrolytic Capacitor	R5	R10-037	270 $\Omega \pm 5\%$ 1/2 Watt Resistor
C10	C05-001	.1 μ f 200 V. Mylar Capacitor	R11	R10-025	150 $\Omega \pm 5\%$ 1/2 Watt Resistor
C11	C03-044	400 μ f 40 V. Electrolytic Capacitor	R13	R10-027	470 $\Omega \pm 5\%$ 1/2 Watt Resistor
C15	C03-045	100 μ f 40 V. Electrolytic Capacitor	R14	R10-025	150 $\Omega \pm 5\%$ 1/2 Watt Resistor
CR1	T02-002	TI 58 Silicon Diode	R17	R10-025	150 $\Omega \pm 5\%$ 1/2 Watt Resistor
CR2	T02-017	IN 4004 Silicon Diode		N05-022	Delay Board Insulator
CR3	T02-002	TI 58 Silicon Diode			
CR8	T02-017	IN 4004 Silicon Diode			

**Instruments serial numbers 3218 and below:
C9 is C03-044, 400 μ f 40 V. Electrolytic Capacitor.*

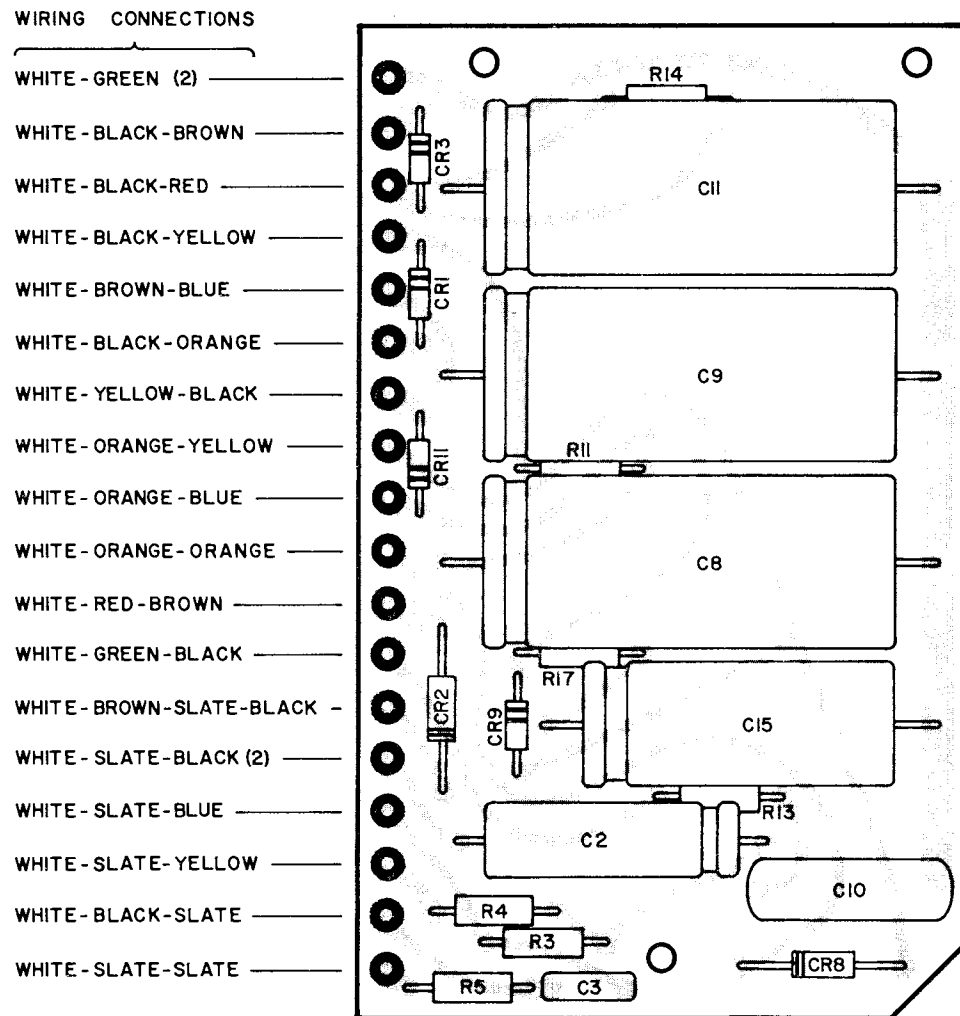


FIGURE 30 DELAY BOARD, COMPONENT SIDE

CHASSIS PARTS

Circuit No.	Part No.	Description	Circuit No.	Part No.	Description
*C1	C05-036	.051 μ f 200 V. Mylar Capacitor		S00-027	2 Pole Relay Hold-Down Clip
C4	C05-014	.01 μ f 400 V. Ceramic Capacitor	RU	K00-011	S.P.D.T. 13,800 Ω Relay
C5	C05-014	.01 μ f 400 V. Ceramic Capacitor		N05-024	Relay Mounting Wafer
C7	C01-023	1 μ f 100 V. Paper Capacitor	LS1	L04-006	4 Ω 3" Speaker
C12	C04-003	1000 μ f 40 V. Electrolytic Capacitor	Q1	T01-021	2N3028 Germanium PNP Transistor (Audio Power)
	N05-002	Capacitor Mounting Wafer	Q2	T01-021	2N3028 Germanium PNP Transistor (Power Supply)
C13	C03-035	50 μ f 25 V. Electrolytic Capacitor		H02-033	Transistor Socket (2 Required)
C14	C04-002	500 μ f 50 V. Electrolytic Capacitor			
**C19	C05-006	.0022 μ f 200 V. Mylar Capacitor	R1	R11-027	1 K Ω \pm 5% 1/2 Watt Resistor
CL1	N00-020	3-Prong A.C. Power Cable	R2	R11-027	1 K Ω \pm 5% 1/2 Watt Resistor
CR10	T02-013	18 V. \pm 5% Zener Diode	R6	R12-036	33 K Ω \pm 5% 1/2 Watt Resistor
CR12	T02-017	Silicon Diode	R7	R20-051	2.2 Ω \pm 5% 1 Watt Resistor
CR13	T02-002	TI 58 Silicon Diode	R8	R00-017	4 Ω L-Pad (SPEAKER VOLUME)
CR14	T02-002	TI 58 Silicon Diode			
†CRB1	T00-012	Bridge Rectifier	R10	R20-010	4 Ω 2 Watt Resistor
E1	E00-014	Pilot Lamp (#334 LSV)	R15	R20-009	2 Ω 5 Watt Resistor
	30-00-098	Pilot Lamp Socket	R16	R11-027	1 K Ω \pm 5% 1/2 Watt Resistor
E2	E00-014	In-Use Lamp (#334 LSV)			
	H02-039	In-Use Lamp Socket	R18	R10-034	620 Ω \pm 5% 1/2 Watt Resistor
E3	E00-014	Auto-Ans Lamp (#334 LSV)	R22	R10-019	47 Ω \pm 5% 1/2 Watt Resistor
	H02-039	Auto-Ans Lamp Socket			
F1	E00-010	3 AG 1 Ampere Fuse	S1	H00-201	Selector Switch
	H10-020	Fuse Holder	S2,S4	H00-059	Rewind/Fast Forward Switch
HS1	E02-003	Handset (w/cord)	S3	30-00-097	Speaker Switch
	N00-044	Handset Cord	S5	30-00-096	A.C. Power Switch
J1	H02-037	A.C. Power Jack		P00-125	Actuator Cam
J2	H02-017	"A" Deck Jack	T1	L00-027	Telephone Line Transformer
J3	H02-017	"B" Deck Jack	T2	L00-028	Audio Output Transformer
J4	H02-031	Amplifier Jack	T3	L00-029	Power Transformer
J5	H02-031	Voice Control Jack			
J8	H02-032	Footswitch Jack	TB1	H04-026	Telephone Line Terminal Board (2 Required)
J9	H02-034	Earphone Jack	TB2	H04-028	Handset Terminal Board
ENA	K00-039	4 P.D.T. 700 Ω Relay		N05-157	Insulator Strip
LS	K00-039	4 P.D.T. 700 Ω Relay	Z1	E01-002	"A" Deck Motor Arc Suppressor
DLY	K00-039	4 P.D.T. 700 Ω Relay	Z2	E01-002	"B" Deck Motor Arc Suppressor
BD	K00-039	4 P.D.T. 700 Ω Relay	Z3	E01-004	Impedance Matching Network
AD	K00-039	4 P.D.T. 700 Ω Relay			
FD	K00-039	4 P.D.T. 700 Ω Relay			
	H02-023	4 Pole Relay Socket (6 Required)			
	S00-026	4 Pole Relay Hold-Down Clip (6 Required)			
ADR	K00-040	2 P.D.T. 700 Ω Relay		30-00-015	Circuit Board Retainer (2 Required)
	H02-025	2 Pole Relay Socket		30-01-320	Telephone Cord

*Instruments serial numbers 3218 and below, C1 is C05-001, .1 μ f 200 V. Mylar Capacitor.

**Instruments serial numbers 2859 and above, C19 is added.

†Instruments serial numbers 4524 and below, CRB1 was four, T00-010, IN1116 Silicon Diodes, CR4 through CR7.

SECTION VII

ACCESSORIES

TAPE CARTRIDGE

The recording tape is necessarily the most fragile portion of any Code-a-phone, and must be handled with care. The Model 700 user should become familiar with the Tape Cartridge removal and replacement procedures. These procedures are part of the Operating Instructions that are printed inside the Model 700 cover door. (See fig. 1.)

The Tape Cartridge is a sealed unit, and should not be disassembled. The only repairs possible are splicing tape breaks and replacing missing tape ends. Always follow exactly the repair procedures below. Improper splices will almost certainly cause machine failure at a later time.

Do not, for any reason, remove more than 15 feet of recording tape from any Tape Cartridge. Otherwise, the Forward Limit Switch (fig. 20) cannot stop the "B" Deck before the recording tape is torn out of the Tape Cartridge.

1. TO SPLICE A BREAK IN RECORDING TAPE:

- a. Lay the broken ends of the Recording Tape on a flat surface as shown in fig. 31-A. Lay the oxide (dull) side down.
- b. Cut through both pieces of Recording Tape with razor blade or scissors. See fig. 31-B.
- c. Place a short length of 1/4" wide Splicing Tape on the ends (fig. 31-C).

Be sure to use splicing tape, available in most radio supply stores. The adhesive substance on ordinary cellophane tape will seep out in time. This will make the recording tape stick to the Drive Roller (fig. 19), causing a snarl which can ruin many feet of recording tape.

- d. Trim the Splicing Tape as necessary. Make sure that adhesive is not exposed. The finished splice should appear as in fig. 31-D.

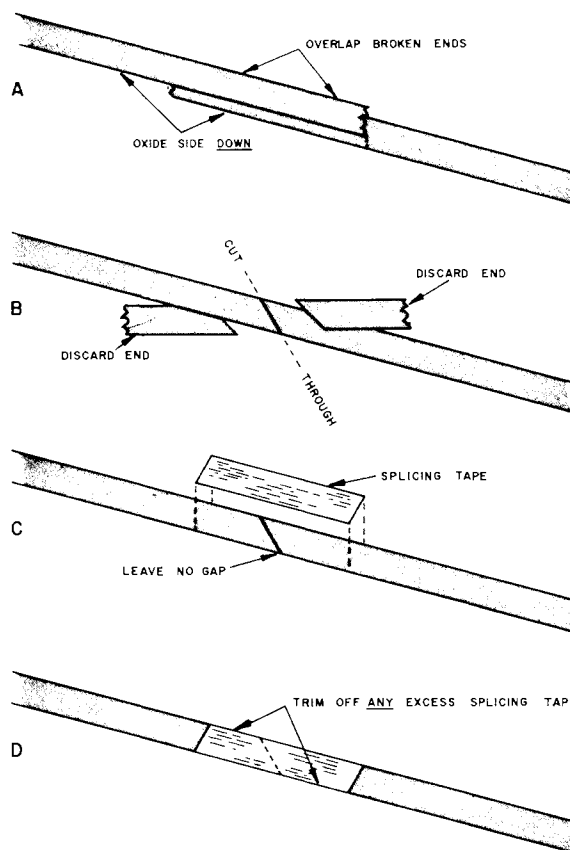


FIGURE 31 METHOD FOR SPLICING
BREAK IN RECORDING TAPE

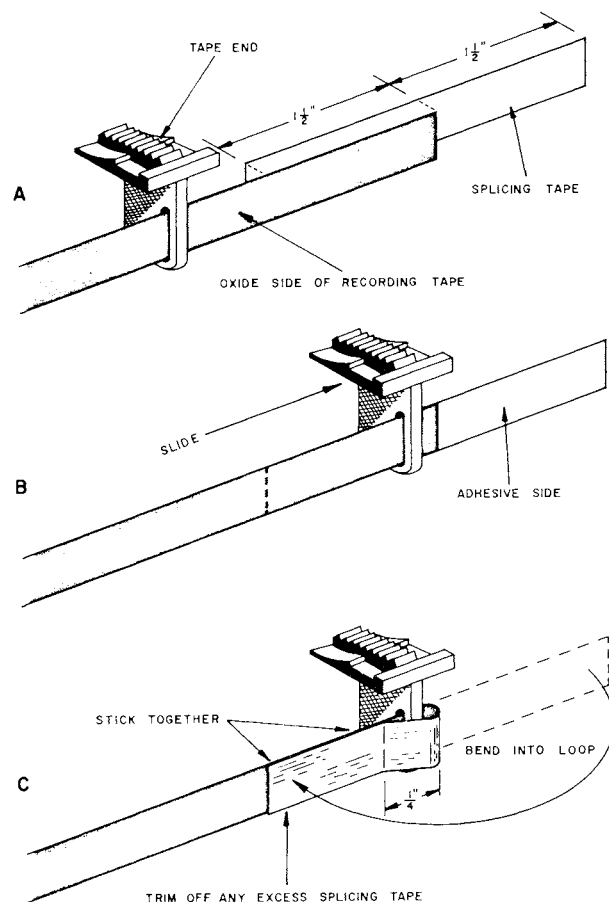


FIGURE 32 METHOD FOR ATTACHING
TAPE END

EARPHONE AND FOOTSWITCH

1. OPERATING INSTRUCTIONS:

- Plug Earphone and Footswitch into jacks on side of Model 700.
- Push Speaker Control in. (See fig. 1.)
- Rotate Selector Switch to PLAY.
- Depress Footswitch until heavy spring tension is felt (first "click"). The "B" Deck Tape Cartridge will play through the Earphone. Rotate Speaker Control to desired volume.
- Depress Footswitch all the way down (second "click"). The "B" Deck will re-wind.

2. FOOTSWITCH CLEANING:

A Footswitch is often required to operate under desks and tables, where the dust level is usually very high. If a Footswitch fails due to dirty switch contacts, clean as follows:

- Remove 2 hinge screws (on the side of Footswitch).

2. TO REPLACE TAPE END:

- Cut off the old frayed end of the recording tape.
- Slip the Recording Tape through the Tape End as shown in fig. 32-A. Make sure that the oxide (dull) side of the Recording Tape faces as shown.
- Stick a 3" length of 1/4" wide Splicing Tape to the Recording Tape as shown (fig. 32-A). Use Splicing Tape only, not ordinary cellophane tape.
- Slide the Tape End as shown in fig. 32-B.
- Bend the Splicing Tape around and stick it to the oxide side of the Recording Tape as in fig. 32-C. Leave a 1/4" loop in the Recording Tape.
- Trim the Splicing Tape as necessary. Make sure that adhesive is not exposed.

3. PARTS:

Part No.	Description
X00-074	Tape Cartridge (Complete)
P00-114	Tape End

3. PARTS:

Part No.	Qty.	Description
X00 - 121		Earphone (Complete)
X00 - 099		700 Footswitch (Complete)



FIGURE 33 MODEL 700 ACCESSORIES

BACKSPACE UNIT

1. OPERATING INSTRUCTIONS:

- a. Plug Earphone, Footswitch, and Backspace Unit into Model 700 as shown in fig. 33.
- b. Push Speaker Control in. (See fig. 1.)
- c. Rotate Selector Switch to PLAY.
- d. Depress Footswitch to first "click." The "B" Deck Tape Cartridge will play through the Earphone. Rotate Speaker Control to desired volume.
- e. When Footswitch is released, the Backspace Unit will cause the "B" Deck to rewind for a short distance. Thus, the next time that the Footswitch is depressed, a few words of the recording will play back a second time. In this way, the last portion of the recording may be "reviewed" each time the Footswitch is depressed.
- f. Rotate the Backspace Control (fig. 33) to adjust the amount of backspace.

- g. Depress Footswitch all the way down (to second "click"). The "B" Deck will re-wind until the Footswitch is released.

2. CIRCUIT DESCRIPTION (See fig. 34):

Depressing the Footswitch to the point of heavy spring resistance causes the "fwd." contacts to close.

"Fwd." contacts closed:

- a. Operates "B" Deck drive solenoid L301 and brake solenoid L304, causing the recording tape to drive forward.
- b. Charges capacitor C1201 through resistor R1205 and diode CR1204.
- c. Connects +18 volts dc to base of transistor Q1201 (through diode CR1203). This holds the transistor in the "off" (non-conducting) condition.

The messages recorded onto the Tape Cartridge will play back through the Earphone until the Footswitch is released, which opens "fwd." contacts.

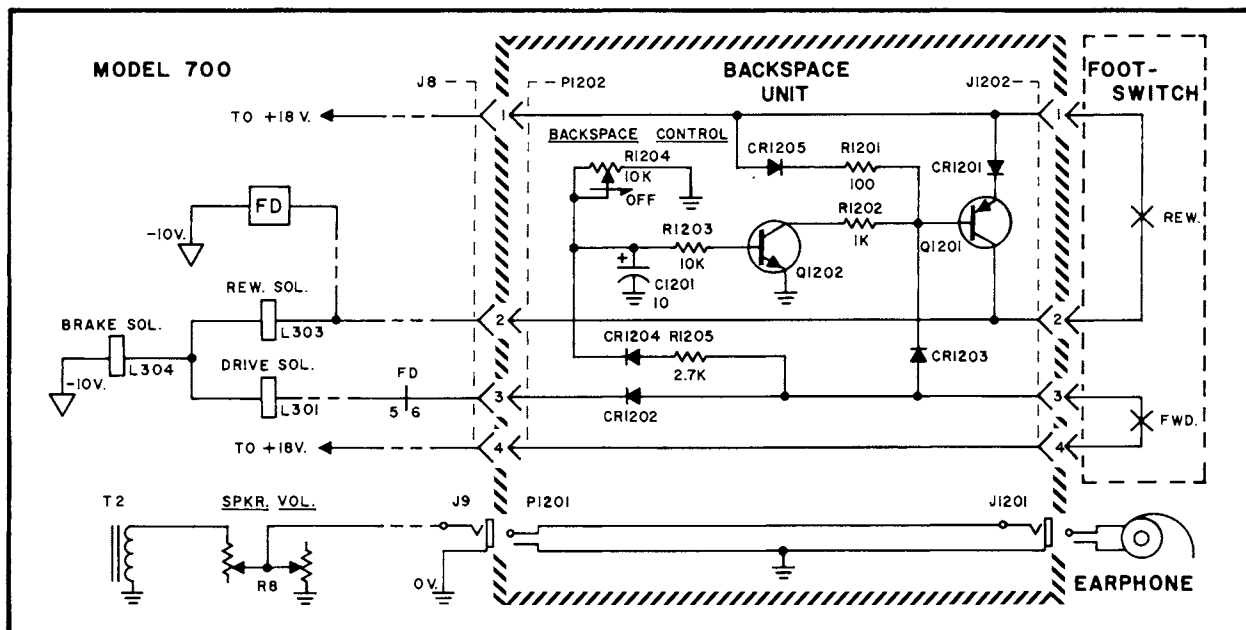


FIGURE 34 BACKSPACE UNIT SCHEMATIC

"Fwd." contacts opened:

- a. Releases drive solenoid L301 and brake solenoid L304, stopping the "B" Deck tape.
- b. Disconnects dc voltage from base of transistor Q1201.

Capacitor C1201 now discharges through resistor R1203 and the base-emitter junction of silicon NPN transistor Q1202. This causes transistor Q1202 to conduct, which allows a dc current to flow through diode CR1201, the base-emitter junction of germanium PNP transistor Q1201, resistor R1202, and transistor Q1202. This base current causes transistor Q1201 to turn "on", which operates "B" Deck rewind solenoid L303 and brake solenoid L304. The tape then rewinds until capacitor C1201 has discharged, turning the transistors "off".

Backspace control R1204 also discharges capacitor C1201. Rotating this potentiometer adjusts the length of time that the "B" Deck rewinds (typically 0-1 second).

Depressing the Footswitch all the way down causes the "Rew." contacts to close. (The "fwd." contacts remain closed.)

"Rew." contacts closed:

- a. Operates relay FD, which releases drive solenoid L301 and brake solenoid L304, stopping the tape.

- b. Operates "B" Deck rewind solenoid L303 and brake solenoid L304, causing the tape to rewind back into the Tape Cartridge.

3. PARTS:

Circuit No.	Part No.	Description
	X00-101	Backspace Unit (Complete)
C1201	C03-033	10 µf 25 V. Electrolytic Capacitor
CR1201	T00-011	1N1692 Silicon Diode
CR1202	T00-011	1N1692 Silicon Diode
CR1203	T02-009	OMC-379 Germanium Diode
CR1204	T02-002	TI 58 Silicon Diode
CR1205	T02-009	OMC-379 Germanium Diode
J1201	H02-034	Earphone Jack
P1201	H01-019	Miniature Phone Plug
Q1201	T01-017	2N1184A Germanium PNP Transistor
Q1202	T01-014	S-3489 Silicon NPN Transistor
R1201	R10-015	100 Ω ± 10% 1/2 Watt Resistor
R1202	R11-006	1 K Ω ± 10% 1/2 Watt Resistor
R1203	R12-005	10 K Ω ± 10% 1/2 Watt Resistor
R1204	R00-025	10 K Ω Potentiometer
R1205	R11-026	2.7 K Ω ± 10% 1/2 Watt Resistor
	H03-004	Control Knob
	P00-132	Plastic Housing

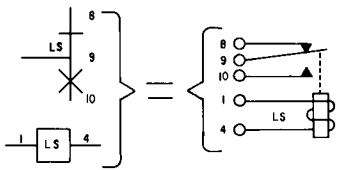
- NOTES
1. ALL RESISTORS $\pm 5\%$, 1/2 WATT UNLESS OTHERWISE NOTED.
 2. ALL CAPACITOR VALUES IN μF .
 3. VOLTAGES MEASURED WITH "A" DECK RUNNING IN ANN-REC.
 4. VOLTAGES MEASURED WITH VTVM BETWEEN POINTS INDICATED AND CHASSIS GROUND. VOLTAGES MAY VARY $\pm 15\%$.
 5. VOLTAGES (NOT MARKED) IN AVC AND VOICE CONTROL CIRCUITS WILL VARY WITH INPUT SIGNAL AND TIME.
 6. THE FOLLOWING COMPONENTS WERE ADDED OR CHANGED IN INSTRUMENTS WITH SERIAL NUMBERS NOTED BELOW:

COMPONENT	VALUE	SERIAL NUMBERS
C1	1-200V	3218 AND BELOW
C2	400-40V	3218 AND BELOW
C19 (ADDED)	0022-200V	2859 AND ABOVE
R403	15K	2858 AND BELOW
R405	82K	2858 AND BELOW
R506	100K	2858 AND BELOW
R507	100K	2858 AND BELOW
R517	33K	4193 AND BELOW
R519 (ADDED)	47K	4194 AND ABOVE
CR81 REPLACES CR4, CR5, CR6, CR7		4525 AND ABOVE

RELAY FUNCTIONAL DESIGNATIONS

AD	"A" DECK
ADR	"A" DECK REWIND
BD	"B" DECK
CPC	CALLING PARTY CONTROL
DLY	DELAY
ENA	ENABLE
FD	FORWARD DELAY
LS	LINE SEIZURE
RU	RING UP
VC	VOICE CONTROL

RELAY SCHEMATIC SYMBOL



SWITCH SI SCHEMATIC SYMBOL

