Code-a-phone®

MODEL 200A

SERVICE MANUAL

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LIST OF ILLUSTRATIONS

GENERAL

The Code-a-phone Model 200A is an electronic instrument that will automatically answer a telephone line and transmit a recorded announcement of up to 3 minutes duration.

The Model 200A utilizes a plug-in tape deck which may be easily removed for servicing. The tape deck provides a maximum recording capacity of 3 minutes and incorporates a variable cycle feature to set the announcement length each time it is recorded. Announcements are recorded and checked with a telephone-type handset.

A Calling Party Control circuit is enabled during the automatic cycle to disconnect the Model 200A from the telephone line whenever the calling party hangs up. This feature will operate only with certain types of telephone Central Office equipment.

The Code-a-phone Model 200 is basically an automatic telephone answering machine with answer only capability. At serial number 2-1827 extensive internal changes were incorporated and the machine became the Model 200A. Improvements made at that time include sealed ball bearings for greatly extended life of the tape deck, addition of the Calling Party Control circuit, improved ring-up circuit, and an improved power supply featuring complete transformer isolation. The Model 200A may be distinguished from the Model 200 by the two-color front panel on the newer machine.

SPECIFICATIONS

GENERAL

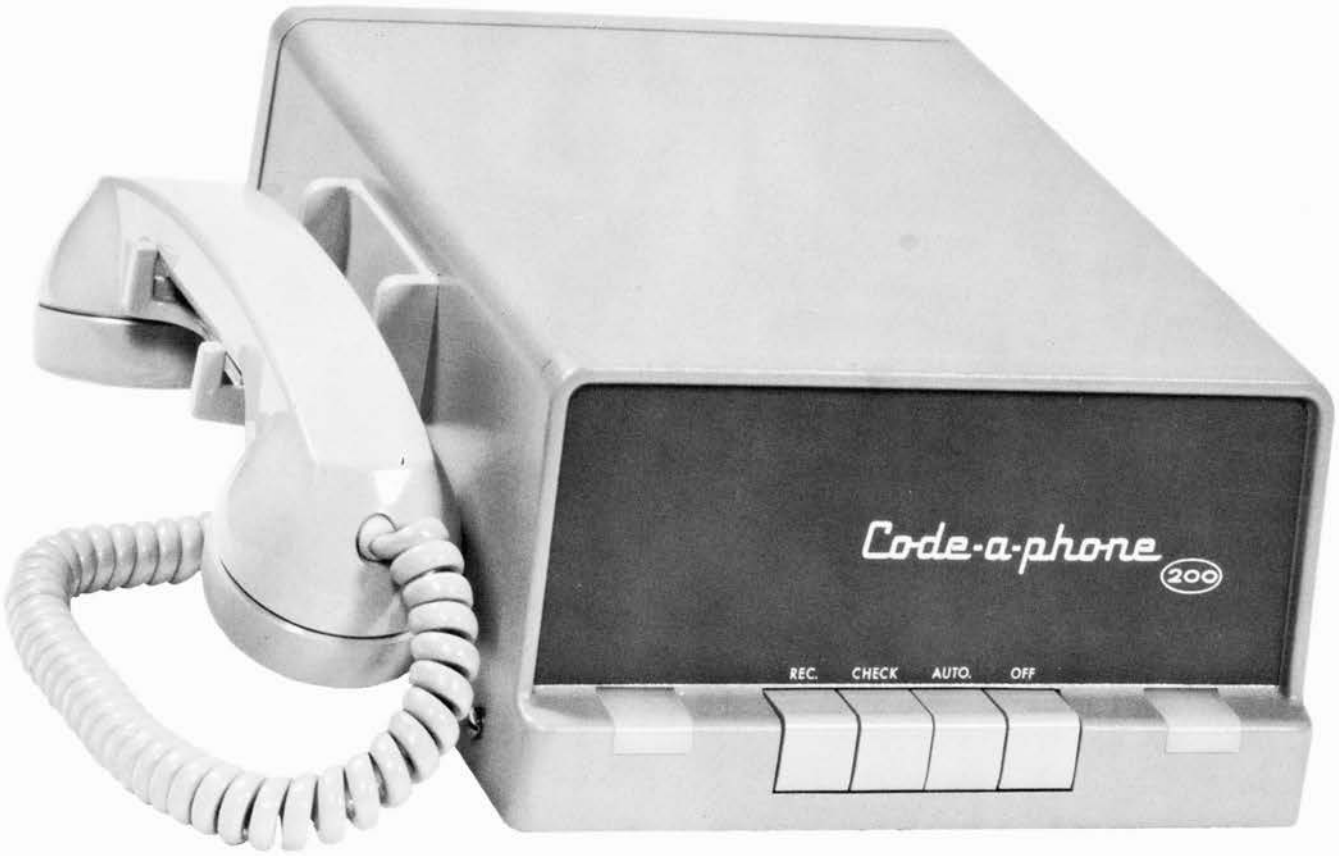
WEIGHT	13-1/2 pounds (shipping weight 16 pounds)
DIMENSIONS	8'' wide 4-1/4'' high 10-1/2'' deep

ELECTRICAL

POWER REQUIREMENTS	105-130 volts, 60 cycle A.C. only 45 watts (maximum) 0.6 watts (in standby AUTO.)
AMBIENT TEMPERATURE OPERATING RANGE	0^{O} F. to 120^{O} F.
RECORDING CAPACITY	3 minutes (6 minute tape deck available.)
TAPE SPEED	1-5/8 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 SENSITIVITY	Minimum 50 volts RMS @ 20 cps
ANNOUNCEMENT LEVEL	— 3 DBM (0.55 volts) average
CALLING PARTY CONTROL SENSITIVITY	Minimum 20 milliamperes D.C. through telephone line



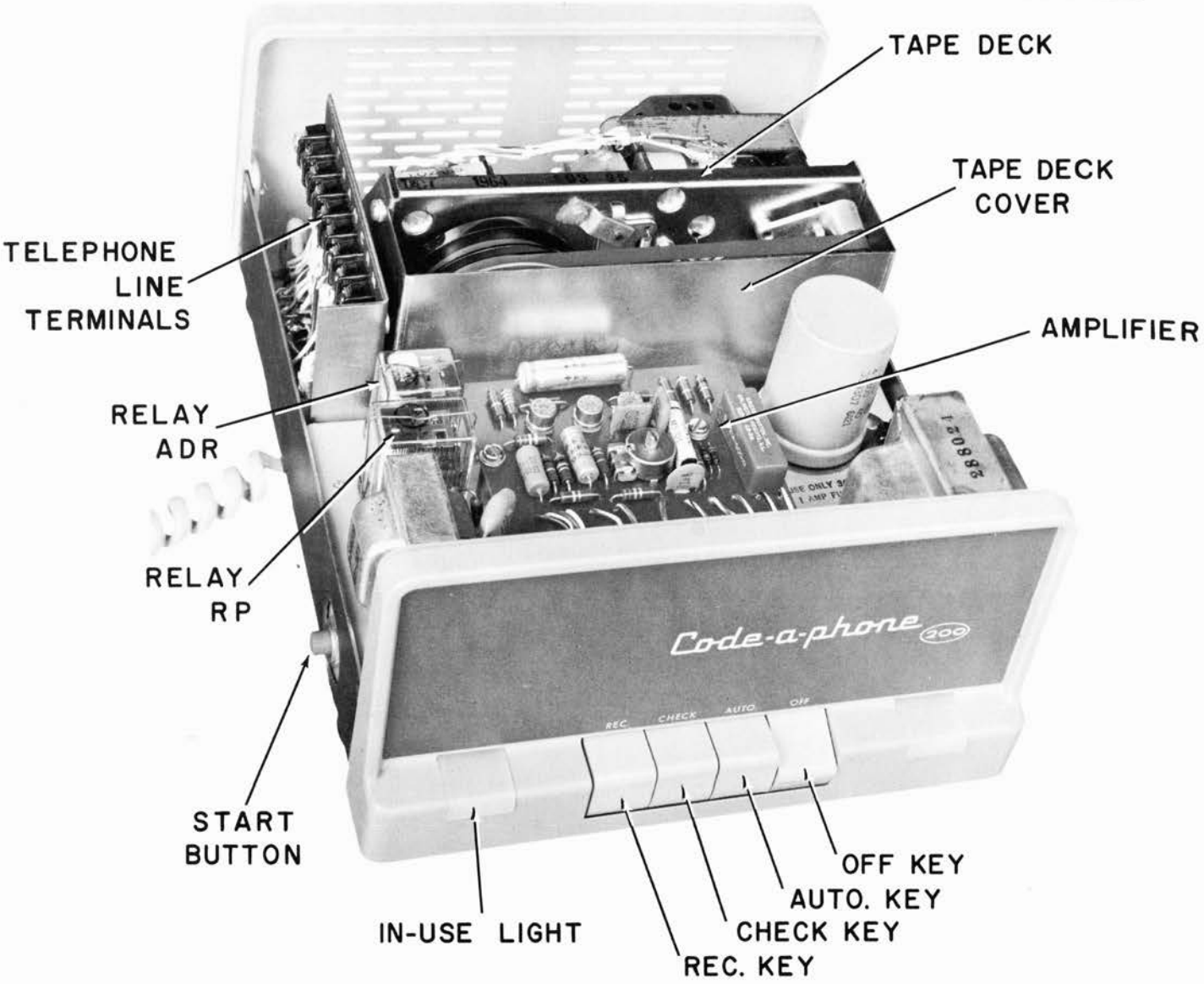


FIGURE 1 MODEL 200A, COVER REMOVED

OPERATING INSTRUCTIONS

TO RECORD AN ANNOUNCEMENT:

1. Depress REC. key.
2. Momentarily depress START button.
3. When IN USE light comes on (in about two seconds), dictate the announcement into the handset. The previous announcement will be erased as the new one is being recorded.
4. When the announcement is completed, depress CHECK or AUTO. key. The announcement length will be set automatically and the tape deck will rewind.

TO CHECK THE ANNOUNCEMENT:

1. Depress CHECK key.
2. Momentarily depress START button. The announcement will be reproduced through the handset.

AUTOMATIC ANSWERING:

Depress AUTO. key. The Model 200A will automatically answer the telephone line with the recorded announcement.

OFF:

Depress OFF key. This will disconnect the Model 200A from both A.C. power and the telephone line. The local telephone instrument may then be used in the normal manner.

INSTALLATION

LOCATION:

Place the Model 200A within eight feet of a 117 volt A.C. power outlet and on a desk, table, or shelf that will securely support its 13-1/2 pounds. Bear in mind that the instrument will require more frequent maintenance if operated in an environment of extreme heat, cold, or dust conditions.

CONNECTIONS:

1. Remove 2 screws on each side of Model 200A and lift off cover.
2. Run 2, 3, 4, or 5 conductor cable (as required) through hole in bottom pan and secure with cable clamp, 6-32 screw, and lock washer as shown in fig. 2. (Cable and hardware are not supplied with the Model 200A.)
3. Connect cable to telephone line:
   a. As in fig. 3 for use with telephone set only, either with individual or 2-party service, or with private exchange (PBX or PABX) line.
   b. As in fig. 4 for use with key telephone system where it is desired that the Model 200A answer a particular one of the incoming lines.
   c. As in fig. 5 for use with PBX or PABX trunk.
   d. As in fig. 6 for use with key telephone set where it is desired that the buttons on the telephone set select the line to be answered by the Model 200A.
   e. For special applications, connect audio leads between terminals "R" and "T", and ringing leads between terminals "R" and "G". Strap "T" to "G" if audio and ringing leads are the same cable pair.

   NOTE

   At least 20 milliamperes D.C. current must be available at terminals "R" and "T" at all times during the automatic cycle, or the Model 200A will not answer. If this current is not available, disable the Calling Party Control circuit by soldering in a strap as shown in fig. 12.
4. Replace Model 200A cover.
5. Plug A.C. power cable into 117 volt A.C. power outlet.

TEST:

Check the Model 200A and its installation as follows:

1. Referring to the OPERATING INSTRUCTIONS on page 1, record a test announcement onto the Model 200A. Verify that the IN USE light works (fig. 1).
2. Check the announcement through the handset.
3. Depress the AUTO. key and call the Model 200A from another telephone to verify the quality of the announcement.
4. Call the Model 200A a second time to verify that the telephone line was released properly after the first call.
5. Erase the test announcement by depressing the REC. key and START button while covering the microphone.

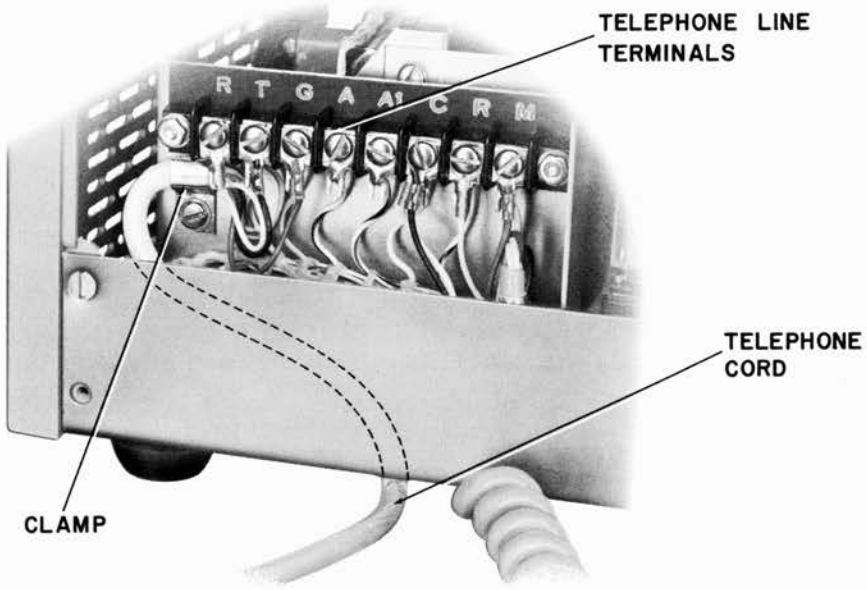


FIGURE 2 TELEPHONE CORD INSTALLATION

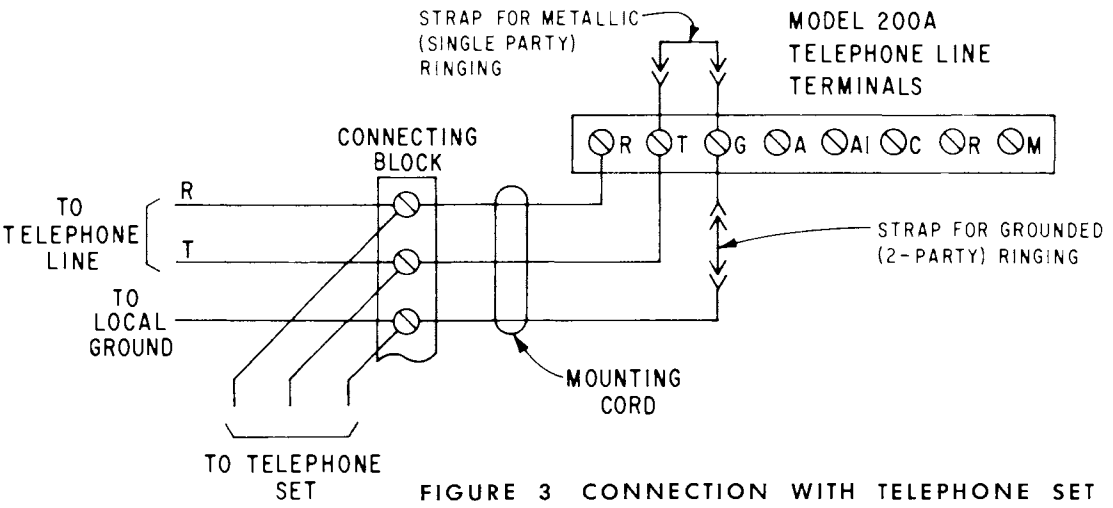
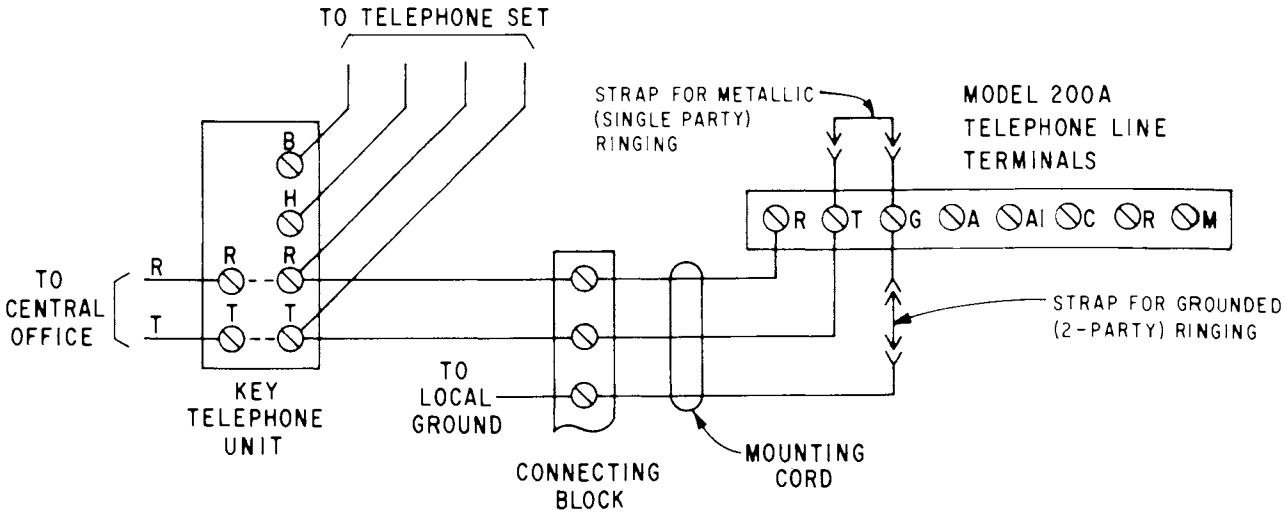
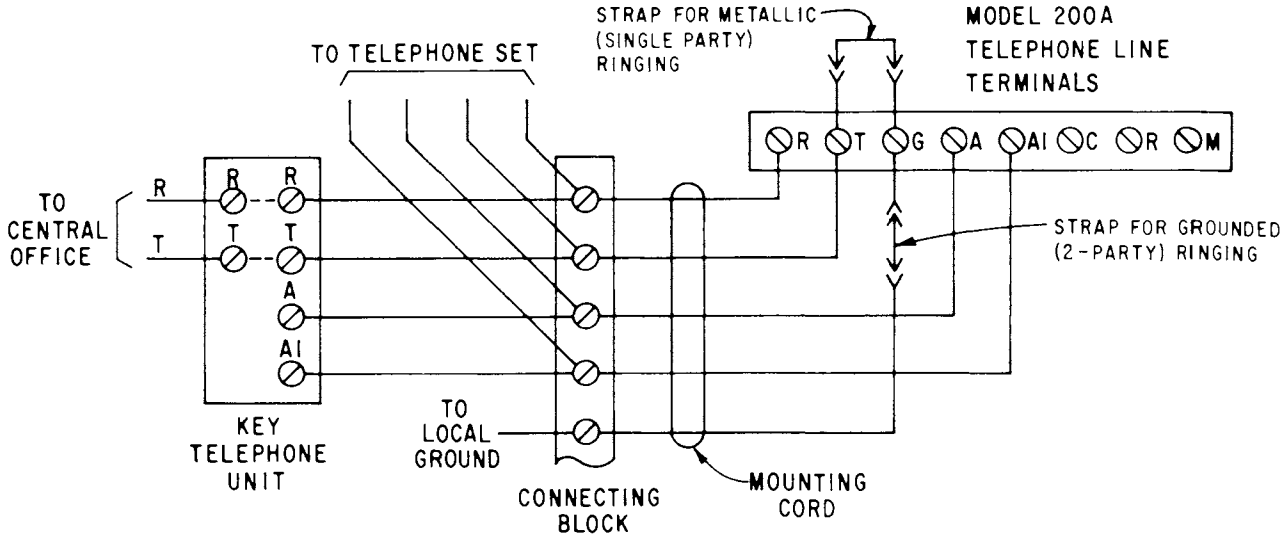


FIGURE 3 CONNECTION WITH TELEPHONE SET ONLY



WITH 1A KEY TELEPHONE SYSTEM



WITH 1A1 OR 1A2 KEY TELEPHONE SYSTEM

FIGURE 4 CONNECTION INTO KEY TELEPHONE SYSTEMS

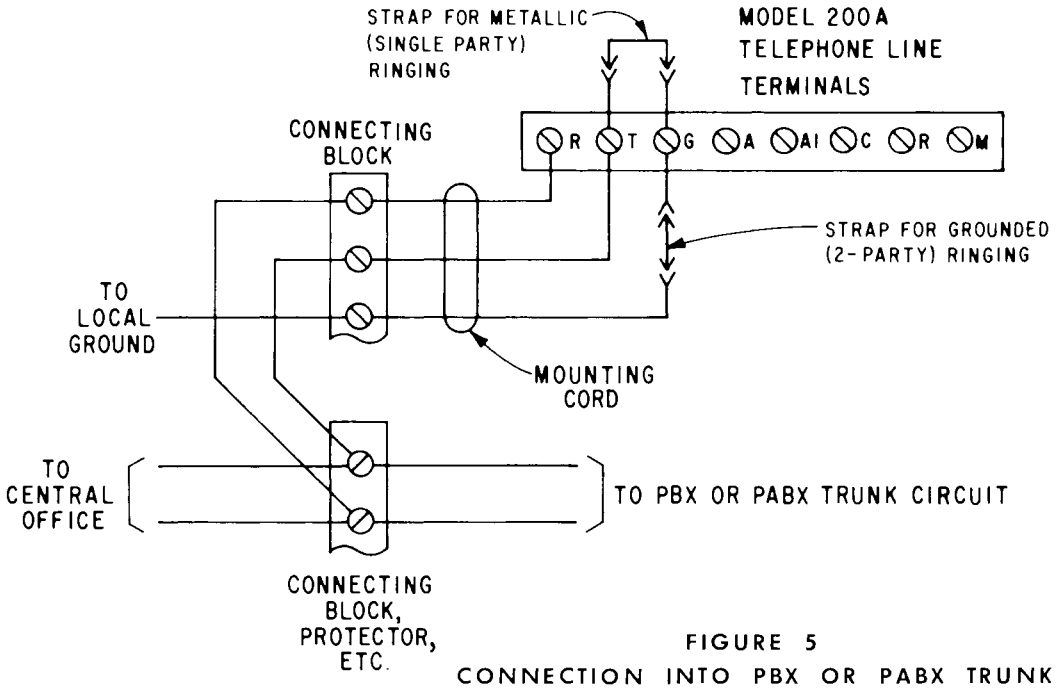


FIGURE 5
CONNECTION INTO PBX OR PABX TRUNK

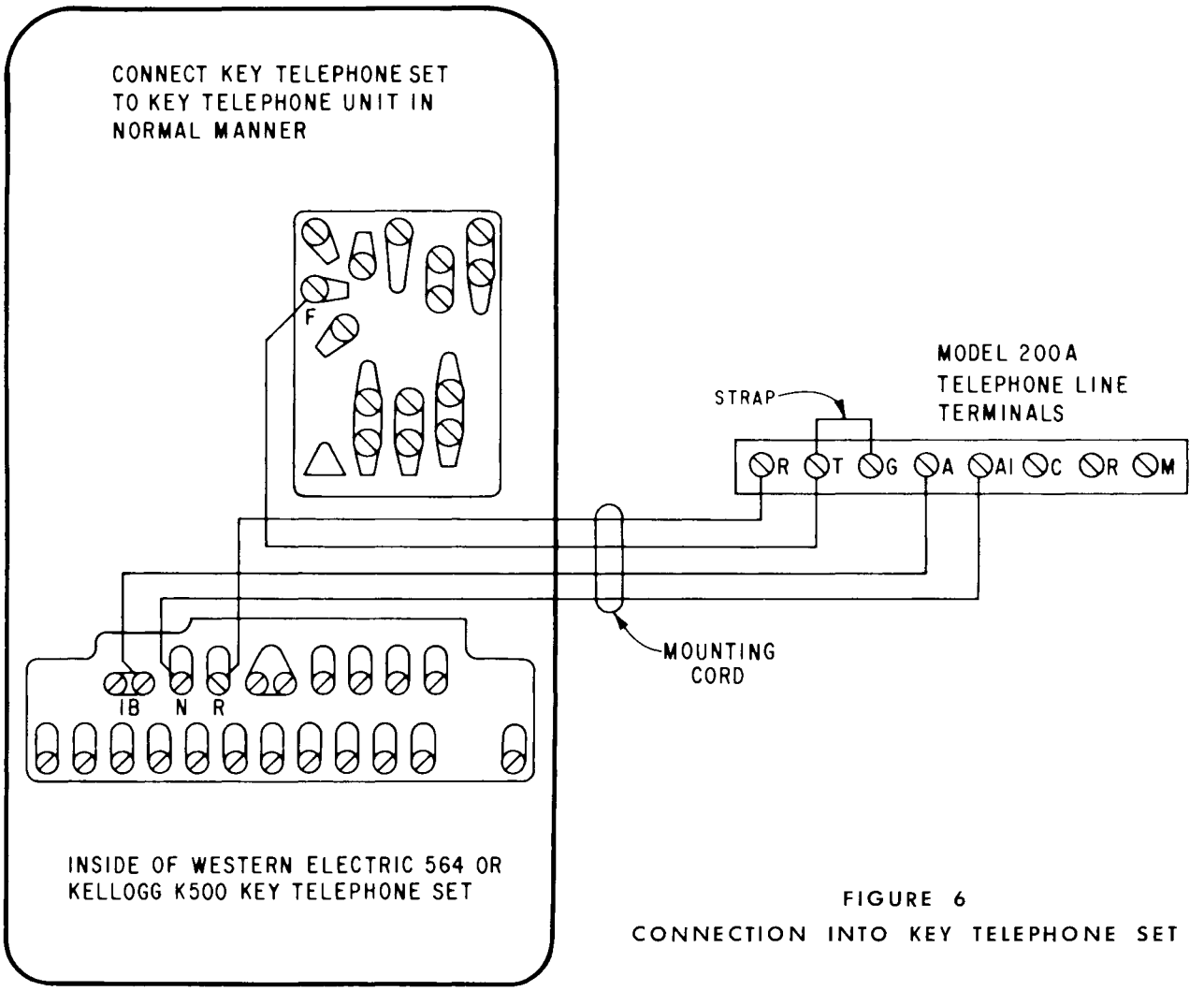


FIGURE 6
CONNECTION INTO KEY TELEPHONE SET

PREVENTIVE MAINTENANCE

The Model 200A is an extremely reliable machine and experience has shown that component deterioration and mechanical wear are not problems under normal use. However, a slow but inevitable building up of recording tape oxide on critical parts in the tape deck will gradually reduce audio quality.

Under normal conditions, the service interval for cleaning the tape deck is one thousand hours of machine operation. This will occur approximately every three years of use in the average installation. Very heavy use and severe environments (such as high dust conditions or heat) will shorten the interval for which preventive maintenance is indicated.

A Model 200A can be maintained in top working condition by performing the CHECK-OUT on page 10 yearly, and by cleaning the tape deck as described on page 9 every thousand hours of machine operation.

SERVICE PROCEDURE

Service of an "out of order" Model 200A should follow four steps:

1. LOCATION OF TROUBLE:

   Substitution of a suspect plug-in component is often a quick way of locating a trouble. Also, it is helpful to utilize the CIRCUIT DESCRIPTION starting on page 11. Operate the machine in the function that does not work properly and follow the machine operation in the description. The faulty component or adjustment should then be revealed.

   Troubles in the electronic circuits can be located by the use of conventional trouble-shooting techniques, such as signal tracing and measurement of voltages at critical points. The correct voltages are marked on the MODEL 200A SCHEMATIC, page 21.

2. REPAIR:

   It is often possible to repair a trouble by simply replacing a plug-in component, allowing the machine to be returned to service with a minimum of delay. The faulty component may be repaired, tested, and returned to the spare parts stock at a later time.

   Telephone grade (or better) components should always be used in the repair of a Model 200A. The Code-a-phone factory is the only sure source of quality repair parts. See page 14 for information on ordering.

3. ADJUSTMENT:

   Repairs which involve replacement of electronic parts will usually affect calibration of the Model 200A circuits. After such repairs, the amplifier must be re-adjusted as described on page 10.

   The solenoids, if replaced, must be adjusted as described on page 9.

4. TEST:

   A complete test of all functions of the Model 200A should always be included in the service of the machine. Follow the CHECK-OUT procedure on page 10.

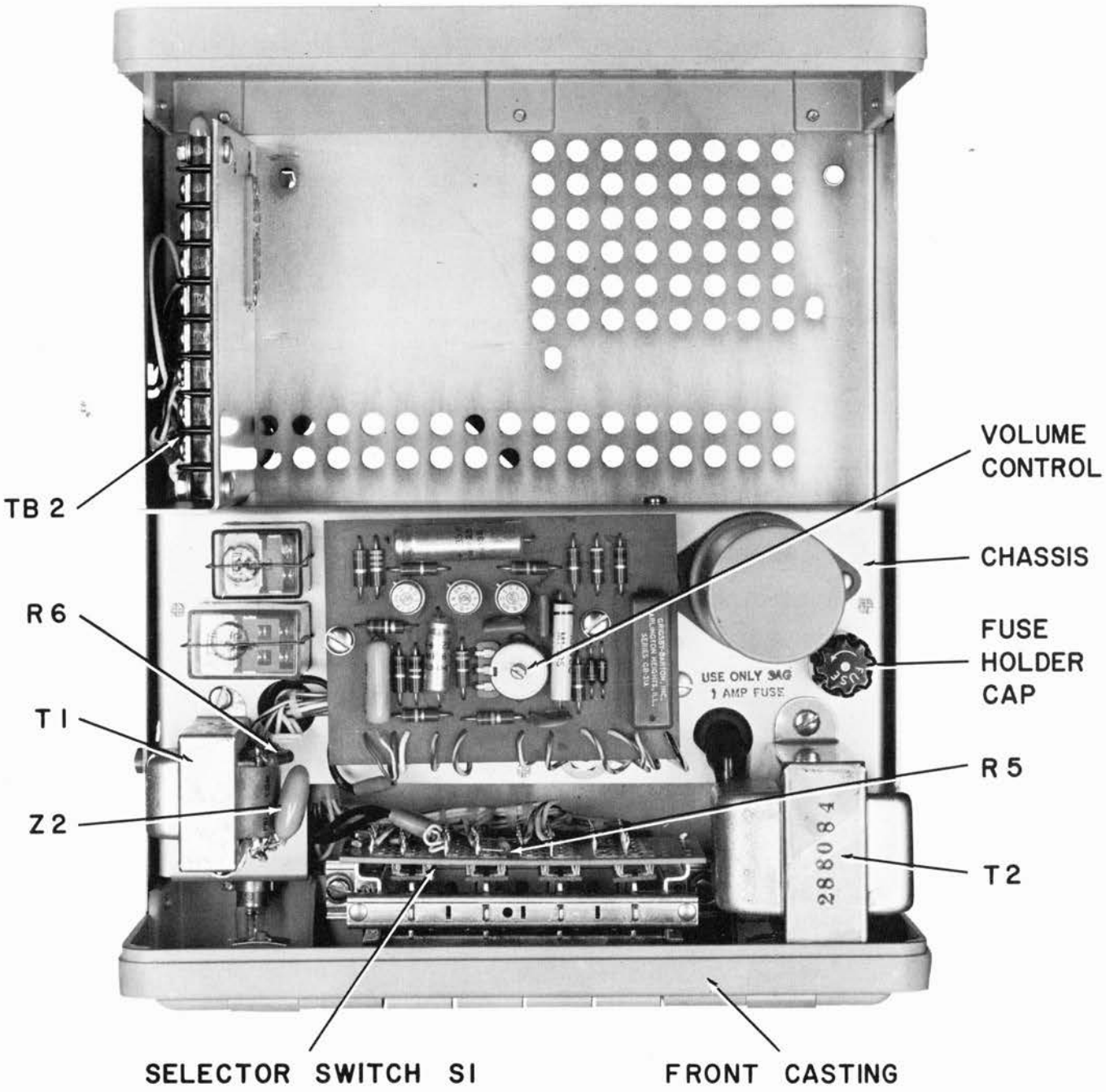


FIGURE 7 MODEL 200A, COVER AND TAPE DECK REMOVED

DISASSEMBLY

1. COVER:

   a. Remove 2 screws on each side of Model 200A.

   b. Spread sides of cover slightly to clear START button (fig. 1) and lift straight up to remove.

2. FUSE F1 (fig. 7):

   a. Remove cover (above).

   b. Unscrew quarter turn and remove fuse cap and fuse.

3. RELAYS RP and ADR (fig. 1):

   a. Remove cover (above).

   b. Release hold-down clip and unplug relay.

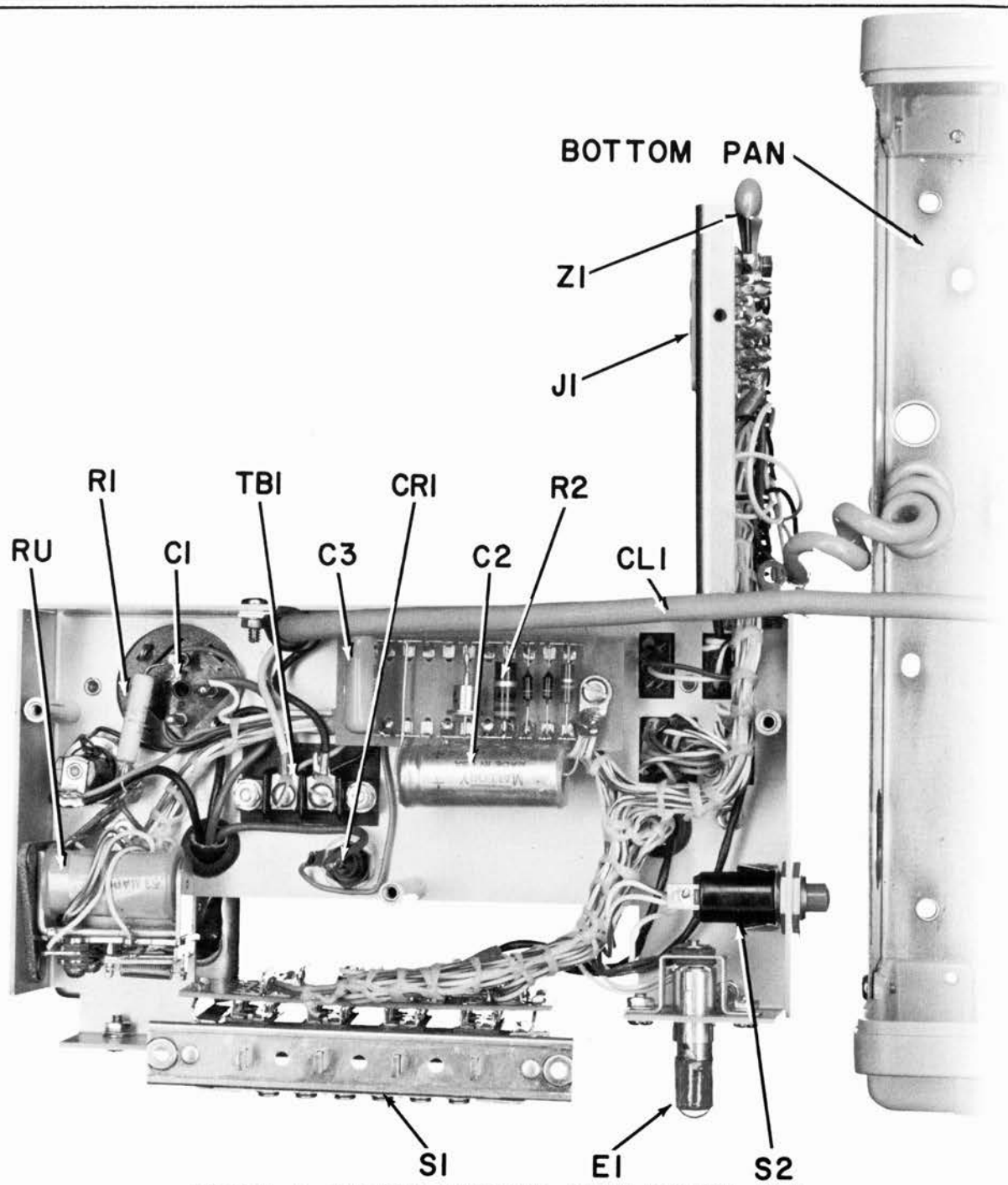


FIGURE 8 CHASSIS REMOVED FROM BOTTOM PAN

4. TAPE DECK (fig. 1):

   a. Disconnect machine from A.C. power source.

   b. Remove cover (page 6).

   c. Remove the 3 screws from bottom of machine that secure tape deck.

   d. Carefully unplug and lift out tape deck.

5. CHASSIS (fig. 7):

   a. Remove tape deck (above).

   b. Remove 2 screws that secure selector switch to front casting (fig. 7).

   c. Remove 4 screws from bottom of machine that secure chassis.

   d. While feeding A.C. power cable and handset cord through holes in bottom pan, carefully remove chassis and lay upside down beside bottom pan as in fig. 8.

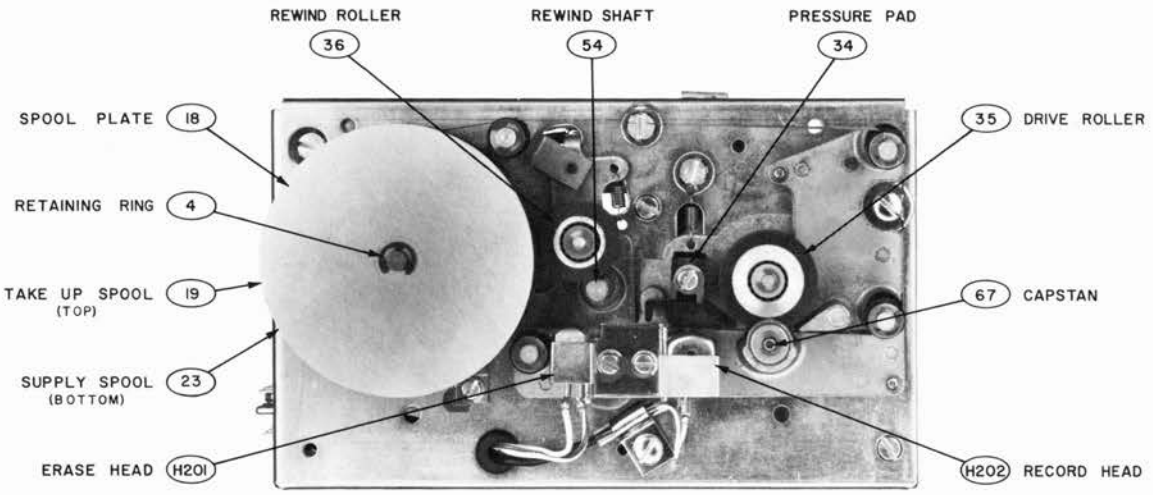


FIGURE 9 TAPE DECK FRONT VIEW, COVER REMOVED
(Circled numbers correspond with items in fig. 15.)

TAPE DECK MAINTENANCE

1. RECORDING TAPE:

a. Removal:

(1) Remove tape deck from machine (page 7).

(2) Remove three 6-32 x 5/32" screws and tape deck cover (fig. 1).

(3) Remove retaining ring and spool plate (fig. 9).

(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 (items 19 and 20 on fig. 15). Leave clock spring inside spool.

(7) Remove plastic 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 to spool in the manner shown in fig. 10, 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.

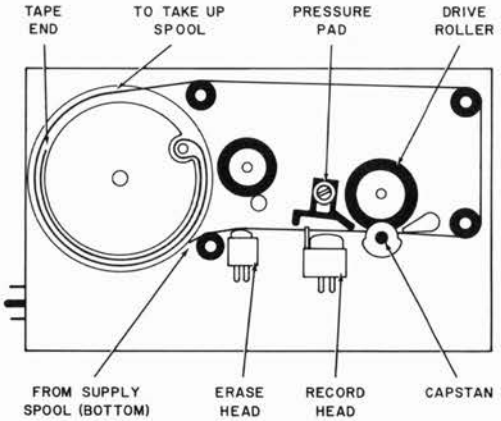


FIGURE 10 RECORDING TAPE PATH

(2) Make sure that timer roller on timer gear is midway between rewind limit switch and counter gear (fig. 11).

(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. 10. Do not secure free end yet.

(5) Replace plastic washer.

(6) Replace take up spool, making sure that end of clock spring hooks onto pin on supply spool.

(7) Holding supply spool, wind take up spool clockwise to wind up clock spring until definite resistance is felt (25 to 30 turns) then unwind 10 turns.

(8) Connect free end of tape as shown in fig. 10.

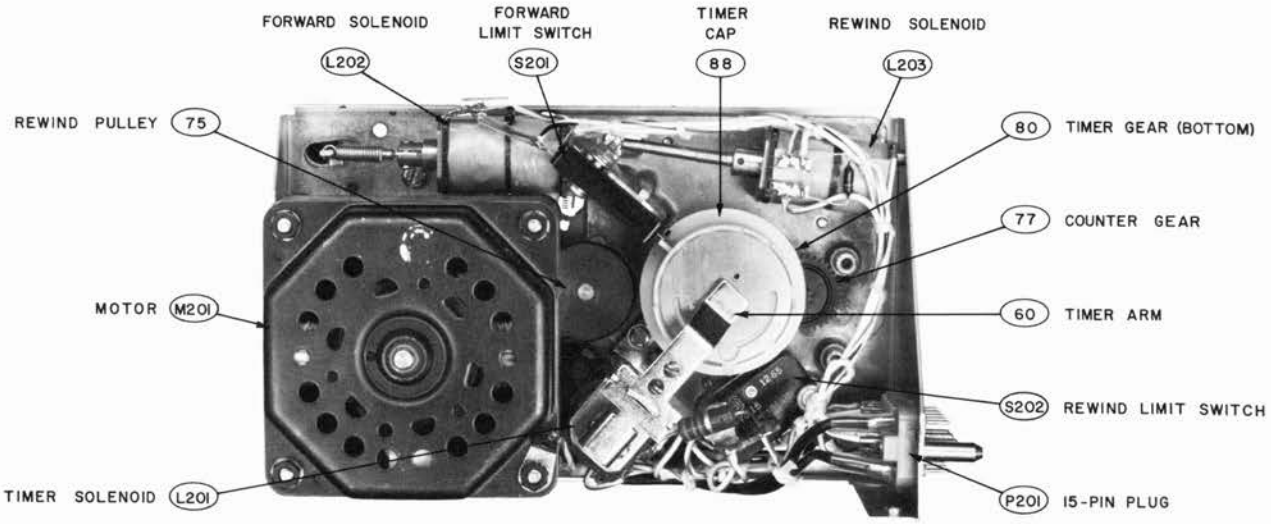


FIGURE 11 TAPE DECK REAR VIEW
(Circled numbers correspond with items in fig. 15.)

(9) Rotate spools counterclockwise to wind tape 10 turns onto take up spool.

(10) Replace spool plate and retaining ring (fig. 9).

(11) Replace tape deck cover with three 6-32 x 5/32" screws and lock washers.

2. CLEANING:
Parts of the tape deck that come in contact with the recording tape will accumulate oxide from the tape that must be removed occasionally to prevent loss of recording quality.

a. Remove tape deck from machine (page 7).

b. Remove three 6-62 x 5/32" screws and tape deck cover (fig. 1).

c. With cloth or swab moistened in alcohol clean erase and record heads, pressure pad, drive roller, and capstan (fig. 9).

In addition, all drive surfaces must be kept clean and free of oil.

a. Remove 4 nuts and motor, disengaging motor belt (fig. 11).

b. With cloth moistened in alcohol clean flywheel, motor pulley, rewind pulley and both belts.

c. Replace motor and belt and rap motor laminations sharply with soft faced mallet to align bearings.

3. LUBRICATION:
The tape deck will not require lubrication for the service life of the Model 210A. The rotating shafts operate in Delrin sleeves or prelubricated 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 Tape 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.

4. ADJUSTMENTS:

a. Pressure pad (fig. 9):
Operate forward solenoid (fig. 11) by depressing plunger by hand. Loosen clamp screw and adjust pressure pad so that tape wraps lightly around record head. Be sure that tape will not pinch between pressure pad and record head or head mount.

b. Forward solenoid (fig. 11):
Operate solenoid by depressing plunger with sharp instrument. Plunger should travel 1/32" before bottoming after pressure roller contacts capstan. 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. 11):
Operate solenoid by depressing plunger by hand. Plunger should travel 1/16" to 1/8" before bottoming after rewind roller contacts supply spool. 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. 11):
Operate machine in REC. function. When START button is depressed, timer cap should lift 1/32" to 3/64", to disengage from timer gear. Adjust by bending timer arm (fig. 11).

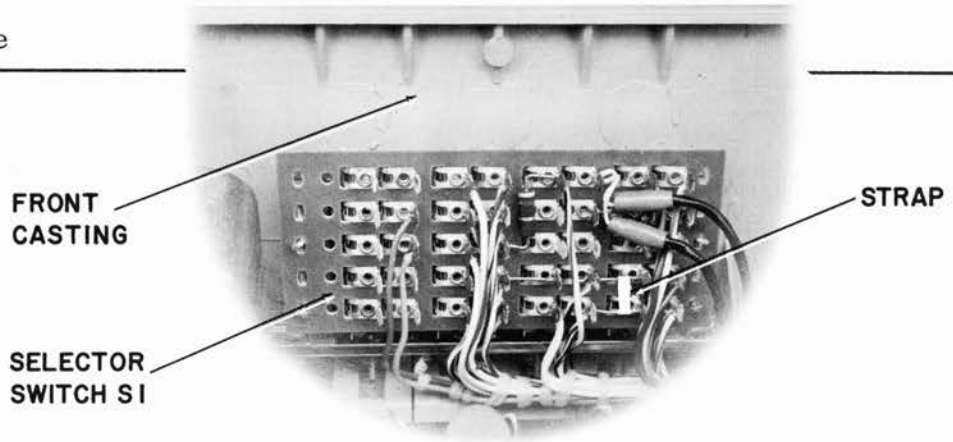


FIGURE 12 CALLING PARTY CONTROL DISABLE STRAP

AMPLIFIER ADJUSTMENT

1. EQUIPMENT REQUIRED:
   a. A.C. Vacuum Tube Volt Meter. Must be able to read audio levels from 0.01 volts to 0.6 volts RMS.
   b. Audio Signal Generator. Must have sine wave output of 1000 cycles per second at a level of 0.01 volts into a 100 Ω load.
   c. Shielded test leads.
   d. 600 Ω resistor.
2. PREPARATION:
   a. Remove the Model 200A cover (page 6).
   b. Connect 600 Ω resistor across telephone line terminals "R" and "T" (fig. 2) to provide an amplifier load.
   c. Disable the Calling Party Control circuit by installing a strap as shown in fig. 12.
   d. Unscrew microphone cap and remove microphone from handset (fig. 13) to prevent room noise from affecting measurements.
   e. Connect Model 200A to 117 volt A.C. outlet.
3. PROCEDURE:
   a. Connect Signal Generator to terminals "C" and "M" (fig. 2). Be sure that test lead shield connects to terminal "C" and to ground terminal on Signal Generator.
   b. Connect AC VTVM to Signal Generator to monitor the signal level.
   c. Set Signal Generator for an output of 0.015 volts (as read on the AC VTVM) at 1000 cps.
   d. Depress REC. key and START button on Model 200A. The tape deck will drive forward.
   e. When IN USE light comes on (in about 2 seconds), re-adjust the Signal Generator output to 0.015 volts. The tape deck will record this tone.
   f. After approximately 15 seconds, disconnect the test leads from terminals "C" and "M" to record silence.
   g. After an additional 15 seconds, depress CHECK key. The tape deck will stop and rewind.
   h. Disconnect AC VTVM from Signal Generator and connect AC VTVM to terminals "R" and "T" (across 600 Ω resistor added earlier).
   i. Depress START button. As soon as the tape deck starts to drive forward, depress AUTO. key. The Model 200A will play back the recorded test tone into the AC VTVM.
   j. Adjust Model 200A VOLUME control (fig. 7) for a reading of 0.5 to 0.6 volts on the AC VTVM.
   k. When the silent portion of the recording is reached, the AC VTVM reading should drop to 0.011 volts or less. This is the noise reading.
   l. Remove the test leads, 600 Ω resistor, and Calling Party Control disable strap and replace the microphone in the handset. Replace the Model 200A cover.

CHECK - OUT

1. Connect Model 200A to a telephone line as described on page 2.
2. Plug A.C. power cable into 117 volt A.C. power outlet.
3. Referring to the OPERATING INSTRUCTIONS on page 1, record a test announcement. Verify that the IN USE light works (fig. 1).
4. Check the announcement with the handset.
5. Depress the AUTO. key and call the Model 200A from another telephone.
6. Erase the test announcement by depressing the REC. key and START button while covering the microphone.

ANNOUNCEMENT RECORD

This function is enabled by depressing REC. key to operate REC. section of selector switch S1.

REC. section of switch S1 operated:

1. Connects handset microphone to recording input "F" of amplifier.
2. Connects record head H202 to recording output "E" of amplifier.

The announcement record cycle is initiated by momentarily depressing START switch S2 to operate relay RP through diode CR3.

Relay RP operated:

1. Completes latching circuit to hold relay RP operated.
2. Applies dc voltage to erase head H201.
3. Operates timer solenoid L201, releasing timer cap from its mating timer gear to reset the variable forward limit switch actuator to its zero position (fig. 11).
4. Operates forward solenoid L202 to pull drive roller into contact with recording tape and capstan (fig. 9).
5. Operates relay ADR to apply ac power to Motor M201, causing capstan to rotate.

The recording tape winds from the supply spool, past erase head H201 and record head H202, and onto the take up spool (fig. 10). The supply and take up spools are mechanically coupled internally through a clock spring to maintain proper tension on the tape. After approximately 2 seconds, the timer roller on the timer gear releases rewind limit switch S202 (fig. 11).

Switch S202 released:

1. Lights IN USE light E1.
2. Applies dc power to "C" on amplifier.
3. Applies dc bias voltage to handset microphone (through "C" and "H" on amplifier).
4. Connects relay ADR to alternate source of dc power through diode CR2.

Lighting of IN USE light E1 indicates that recording is occurring. Resistors R114 and R115 provide approximately 0.15 volts dc bias to the handset microphone. Speech dictated into the microphone causes the resistance of the carbon element to fluctuate rapidly, resulting in an audio signal which is coupled through capacitor C104 and amplified by transistor Q103. Resistors R107 and R108 bias the base of the transistor, with resistor R108 also providing negative feedback to reduce distortion in this amplifier stage. Resistor R109 is the collector load. The amplified signal is fed through capacitors C106 and C107 and resistor R112, where resistor R111 adds approximately 120 microamperes of dc bias current from the power supply. The signal is then sent to record head H202 to be recorded onto the tape. The previous message is erased progressively as the tape passes over erase head H201.

The announcement record cycle is terminated by depressing CHECK or AUTO. keys to mechanically release REC. key.

REC. key released:

1. Disconnects handset microphone from recording input of amplifier.
2. Disconnects record head H202 from recording output of amplifier.
3. Disconnects erase head H201 from dc power.
4. Releases timer solenoid L201 to lock timer drum to timer gear (fig. 11). This sets the variable limit switch actuator so that subsequent message reproduction is limited to the recorded interval only.

Relay RP released:

1. Releases forward solenoid L202, stopping the tape.
2. Operates rewind solenoid L203, pulling rewind roller into contact with rim of supply spool (fig. 9). This drives the supply spool and rewinds the tape at six times the forward speed.

When the tape has been completely rewound, the timer roller on the timer gear operates rewind limit switch S202 (fig. 11).

Switch S202 operated:

1. Releases rewind solenoid L203, stopping the tape.
2. Releases relay ADR, which removes ac power from motor M201.
3. Removes dc power from amplifier.
4. Removes dc bias voltage from handset microphone.
5. Extinguishes IN USE light E1.

This terminates the normal announcement record cycle.

If the REC. key is not released after 3 minutes, the 3 minute pin on the timer gear (items 137 and 136, fig. 15) presses against a tab on the timer cap (item 143), operating forward limit switch S201 to release relay RP.

Relay RP released:

1. Releases timer solenoid L201 to lock timer drum to timer gear to set 3 minute message length.
2. Machine operation continues as described under "Relay RP released:", above.

ANNOUNCEMENT CHECK

This function is enabled by depressing CHECK key to operate CHECK section of selector switch S1. This connects the handset receiver to the output of transformer T1.

The announcement check cycle is initiated by momentarily depressing START switch S2 to operate relay RP through diode CR3.

Relay RP operated:

1. Completes latching circuit to hold relay RP operated.
2. Operates forward solenoid L202 to pull drive roller into contact with recording tape and capstan (fig. 9).
3. Operates relay ADR to apply ac power to motor M201, causing capstan to rotate.

The recording tape winds from the supply spool, past the record head, and onto the take up spool (fig. 10). The supply and take up spools are mechanically coupled internally through a clock spring to maintain proper tension on the tape. After approximately 2 seconds, the timer roller on the timer gear releases rewind limit switch S202 (fig. 11).

Switch S202 released:

1. Lights IN USE light E1.
2. Applies dc power to "C" on amplifier.
3. Connects relay ADR to alternate source of dc power through diode CR2.

The message on the recording tape induces an audio signal of approximately 0.0005 volts RMS across record head H202. The signal is coupled through "A" on amplifier and capacitor C101 to transistor Q101. Resistors R101 and R105 bias the base of this transistor, which is directly coupled to transistor Q102. Emitter resistors R102 and R104 aid in temperature stability of these amplifier stages, and resistor R105 provides dc feedback to improve the overall stability. Bypass capacitor C102 limits the low frequency response of the amplifier to approximately 300 cps. Resistor R110 and capacitor C105 decouple the first two amplifier stages from the dc power supply and its various loads. Signal from transistor Q102 is coupled through capacitor C103 and VOLUME control R107 to transistor Q103. Resistors R107 and R108 bias the base of this transistor, with resistor R108 also providing negative feedback to reduce distortion. The amplified message is coupled through capacitor C106, resistor R113, "J" on amplifier, transformer T1, and resistor R5, and reproduced in the handset receiver.

At the end of the announcement, the variable limit switch actuator on the timer cap operates forward limit switch S201 to release relay RP.

Relay RP released:

1. Releases forward solenoid L202, stopping the tape.
2. Operates rewind solenoid L203, pulling rewind roller into contact with rim of supply spool (fig. 9), rewinding the tape.

When the tape has been completely rewound, the timer roller on the timer gear operates rewind limit switch S202 (fig. 11).

Switch S202 operated:

1. Releases rewind solenoid L203, stopping the tape.
2. Releases relay ADR to remove ac power from motor M201.
3. Removes dc power from amplifier.
4. Extinguishes IN USE light E1.

This terminates the announcement check cycle.

AUTOMATIC ANSWERING

This function is enabled by depressing AUTO. key to operate AUTO. section of selector switch S1. This connects the output of audio transformer T1 to telephone line terminal "T".

The automatic answering 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 and capacitor C3 to cause relay RU to "chatter" rapidly. During the intervals that relay RU is operated, dc current flows through resistor R3 to charge capacitor C2. During the intervals that relay RU is released, capacitor C2 discharges through resistor R4 and relay RP. The charge and discharge time constants are such that relay RP will operate after several cycles of 20 cps ringing current have been received. This ensures that momentary transient voltages on the telephone line (such as dial tap from dialing an extension telephone) will not ring up the machine.

Relay RP operated:

1. Connects transformer T1 and relay CPC (through "K" and "L" on amplifier) across telephone line terminals "R" and "T" to provide dc termination to trip the ringing circuits in the telephone central office. Current through the telephone line operates relay CPC to complete a latching circuit (through "M" and "N" on amplifier) to hold relay RP operated. (Diodes CR101 and CR102 shunt dc 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 the Model 200A will transmit.)
2. Shorts terminals "A" and "A1" to provide indication to external circuits that the telephone line is seized.
3. Operates forward solenoid L202 to pull drive roller into contact with recording tape and capstan (fig. 9).

4. Operates relay ADR to apply ac power to motor M201, causing capstan to rotate.

The recording tape winds from the supply spool, past the record head, and onto the take up spool (fig. 10). After approximately 2 seconds, the timer roller on the timer gear releases rewind limit switch S202 (fig. 11).

Switch S202 released:

1. Lights IN USE light E1.
2. Applies dc power to "C" on amplifier.
3. Connects relay ADR to alternate source of dc power.

The announcement on the recording tape is detected by record head H202, amplified by transistors Q101, Q102, and Q103, and coupled through transformer T1 to be reproduced at terminals "R" and "T". Resistor R6 and impedance matching network Z2 maintain a source impedance of 600 Ω over the frequency range of 300 to 3000 cps.

At the end of the announcement, the variable limit switch actuator on the timer cap operates forward limit switch S201 to release relay RP.

Relay RP released:

1. Disconnects transformer T1 and relay CPC from terminals "R" and "T" to release telephone line.
2. Opens terminals "A" and "A1".
3. Releases forward solenoid L202, stopping the tape.
4. Operates rewind solenoid L203, pulling the rewind roller into contact with the rim of the supply spool (fig. 9), rewinding the tape.

When the tape has been completely rewound, the timer roller on the timer gear operates rewind limit switch S202 (fig. 11).

Switch S202 operated:

1. Releases rewind solenoid L203, stopping the tape.
2. Releases relay ADR to remove ac power from motor M201.
3. Removes dc power from amplifier.
4. Extinguishes IN USE light E1.

This terminates the normal automatic answering cycle, and the Model 200A is ready to answer another call.

Certain telephone central offices provide a momentary break (or reversal of direction) in the dc 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 RP. Machine operation then continues as described under "Relay RP released:", above.

ORDERING INFORMATION

ORDER FROM:

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

Telephone: (503) 774-1104
TELEX: 03-6520

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.

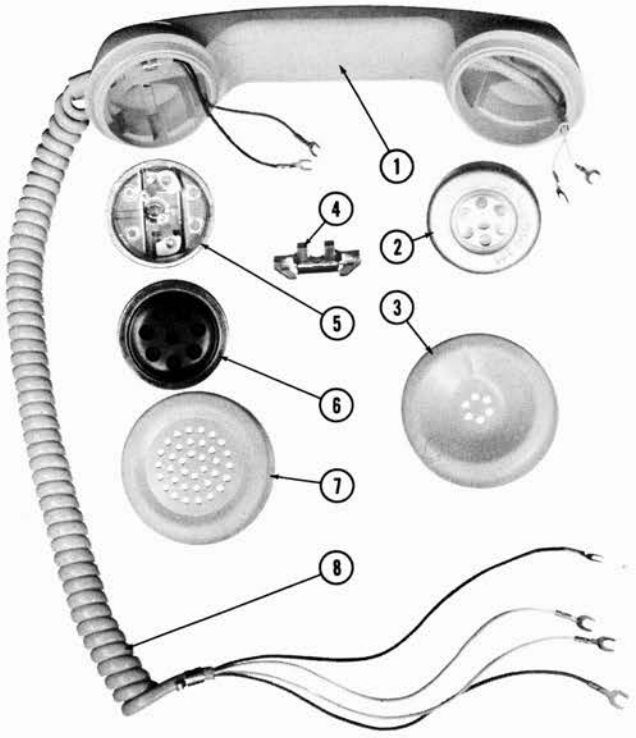


FIGURE 13 HANDSET DISASSEMBLED

HANDSET PARTS

Item No.	Part No.	Description
	E02-004	Handset (Complete)
1	X10-017	Shell
2	X10-016	Receiver
3	X10-015	Receiver Cap
4	X10-018	Strain Relief
5	X10-019	Microphone Holder
6	X10-020	Microphone
7	X10-021	Microphone Cap
8	X10-022	Handset Cord

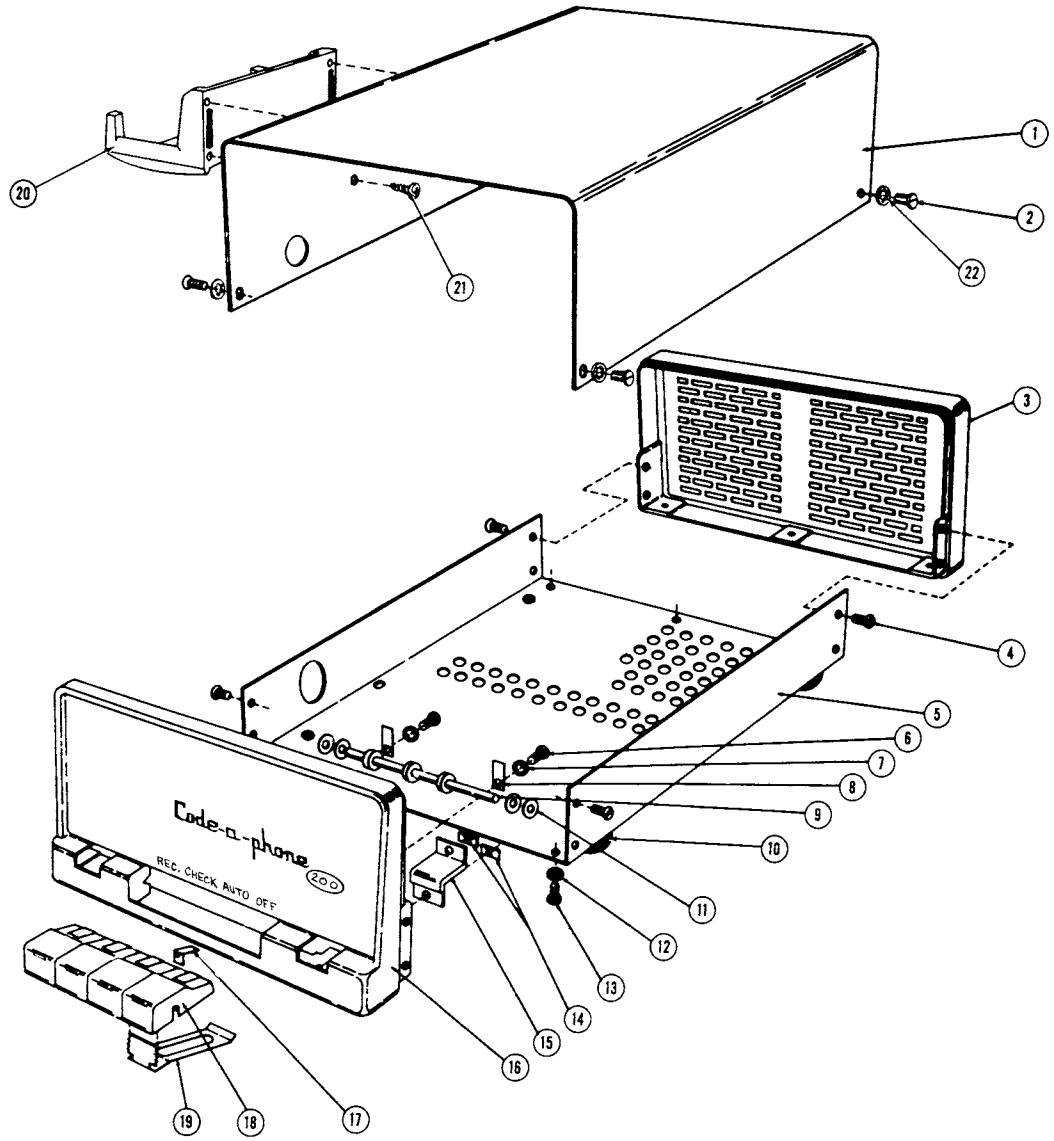


FIGURE 14 CASE EXPLODED VIEW

CASE PARTS

Item No.	Part No.	Qty.	Description
1	M00-188	1	Cover
2	F15-390	4	6-32 x 1/4" Pan Head Screw
3	D00-036	1	Rear Casting
4	F16-398	4	6-32 x 3/8" Flat Head Screw
5	30-00-083	1	Bottom Pan (w/Feet)
6	F20-082	2	6-32 x 1/4" Thread Cutting Screw
7	F03-361	2	#6 Lock Washer
8	M00-004	2	Key Shaft Retainer
9	A00-001	1	Key Shaft
10	P00-182	4	Foot
11	F31-147	10	Fibre Washer
12	F03-361	5	#6 Lock Washer
13	F15-390	5	6-32 x 1/4" Pan Head Screw
14	F07-511	4	1/8" Push-on Fastener
15	P00-002	2	Window
16	30-00-202	1	Front Casting
17	M00-010	4	Key Bearing Plate
18	H03-003	4	Key
19	M00-003	4	Key Return Spring
20	P00-123	1	Handset Hanger
21	F20-836	4	6-20 x 3/8" Thread Cutting Screw
22	F03-361	4	#6 Lock Washer
	N13-007		1/2 Pint Can Olive Grey Paint

TAPE DECK PARTS

Item No.	Part No.	Qty.	Description
	X00-084		A6 Tape Deck (Complete)
1	F15-384	5	#6-32 x 5/32" Screw
2	F03-361	17	#6 Lock Washer
3	M00-037	1	"A" Deck Cover
4	F04-013	6	Retaining Ring
5	F31-150	8	.192" x .375" x .031" Fibre Washer
6	P00-185	4	Tape Roller
7	F04-007	3	Retaining Ring
8	F05-607	1	.133" x .344" x .019" Washer
9	F03-620	1	Spring Washer
10	F05-505	1	.130" x .188" x .022" Washer
12	B00-013	1	Ball Bearing
13	B00-014	1	Ball Bearing
14	H02-038	4	Tape Head Connector
15	F03-331	11	#4 Lock Washer
16	F15-186	5	#4-40 x 3/16" Screw
17	F30-148	1	.190" x .440" x .005" Mylar Washer
18	M00-017	1	Spool Plate
19	P00-062	1	Take Up Spool
20	S00-005	1	Take Up Clock Spring
22	F30-156	1	.200" x 1.375" x .005" Mylar Washer
23	30-00-010	1	Supply Spool/Tape Assembly
24	F30-145	4	3/16" x 5/16" x .010" Mylar Washer
25	A00-218	1	Tape Roller Post
26	30-00-047	1	Head Bracket (Includes Items #12 and #13)
27	F30-090	2	.129" x .312" x .010" Mylar Washer
28	F30-175	2	.222" x .375" x .010" Mylar Washer
29	A00-099	2	Lever Pin
30	30-00-049	1	Drive Lever
32	P00-003	6	Bearing Pad
33	F05-003	4	#4 Washer
34	30-00-206	1	Pressure Pad
35	30-00-022	1	Drive Roller
36	30-00-023	1	Rewind Roller
37	F30-210	2	1/4" x 1/2" x .010" Mylar Washer
38	F04-034	1	Retaining Ring
39	S00-003	1	Lever Return Spring
40	F15-398	2	#6-32 x 3/8" Screw
41	F05-709	1	5/32" x 1/2" x .049" Washer
42	30-00-050	1	Rewind Lever
43	30-00-242	2	Lever Guide
44	F15-190	2	#4-40 x 1/4" Screw
45	F07-701	1	Cable Clamp
46	S00-001	1	Lever Tension Spring
47	F15-390	5	#6-32 x 1/4" Screw
48	30-00-046	1	Deck Plate
49	F15-194	2	#4-40 x 5/16" Screw
50	F04-016	2	Retaining Ring
51	S00-039	1	Forward Solenoid Link
52	F16-386	4	6-32 x 3/16" Flat Head Screw
53	F03-375	4	#6 Cup Lock Washer
54	30-00-244	1	Rewind Shaft
55	30-00-379	1	Timer Plate (Includes Item #54)
56	30-00-043	1	Forward Solenoid Plunger
57	F03-031	1	#4-40 Nut
58	M00-019	1	Timer Arm Bracket
59	A00-103	4	Motor Post
60	30-00-044	1	Timer Arm
61	30-00-240	1	Rewind Solenoid Plunger
62	H00-020	1	Switch Actuator
63	F15-210	3	#4-40 x 5/8" Screw
64	S00-008	1	Timer Arm Spring
65	H05-022	1	2-Lug Tie Point
66	F05-615	1	3/16" x 1/4" x .010" Washer
67	30-00-054	1	Flywheel/Capstan Assembly
68	J00-018	1	Motor Belt
69	J00-019	1	Flywheel Belt
70	A00-158	1	Motor Pulley
72	F02-024	2	#4-40 x 1/8" Allen Set Screw
73	J00-006	1	Oil Seal
74	J00-020	4	Shock Mount
75	A00-093	1	Rewind Pulley
76	S00-007	1	Timer Cap Lift Spring
77	P00-005	1	Counter Gear
78	F09-208	1	Roll Pin
79	30-00-051	1	Spool Shaft
80	30-00-052	1	Timer Gear
82	P00-054	1	Timer Roller
83	F03-061	4	#6-32 Nut
84	F07-385	1	#6 Solder Lug
85	P00-021	1	Timer Gear Plate
86	F04-036	1	Retaining Ring
87	S00-006	1	Timer Cap Clock Spring
88	30-00-053	1	Timer Cap (Includes Item #87)
C201	C05-013	1	.0075 μf 200 V. Mylar Capacitor
CR201	T02-002	1	TI 58 Silicon Diode
CR202	T02-002	1	TI 58 Silicon Diode
CR203	T02-002	1	TI 58 Silicon Diode
H201, H202	30-00-008	1	Tape Head Assembly
L201	30-00-280	1	Timer Solenoid
L202	30-00-280	1	Forward Solenoid
L203	30-00-281	1	Rewind Solenoid
M201	L01-025	1	117 V.A.C. Motor
P201	H01-017	1	15 Pin Plug
R201	R21-002	1	1.5 K Ω ± 10% 1 Watt Resistor
S201	30-00-275	1	Forward Limit Switch
S202	H00-019	1	Rewind Limit Switch

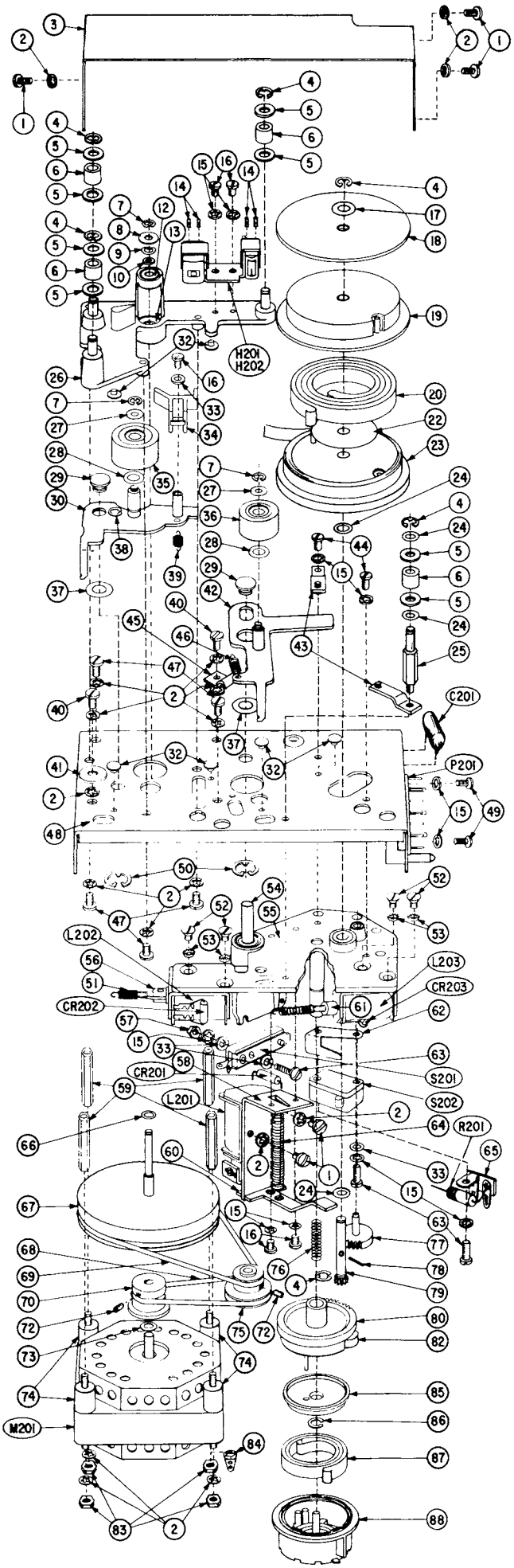


FIGURE 15
TAPE DECK
EXPLODED VIEW

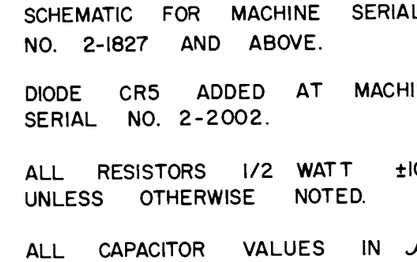
CHASSIS PARTS

Circuit No.	Part No.	Description
C1	C04-021	500/500 μf 40 V Electrolytic Capacitor
C2	C03-045	100 μf 40 V Electrolytic Capacitor
C3*	C05-003	.056 μf 200 V Mylar Capacitor
CL1	N00-001	A.C. Power Cable
CR1	T00-010	1N1116 Silicon Rectifier
CR2	T00-011	1N1692 Silicon Diode
CR3	T02-002	TI 58 Silicon Diode
CR4	T02-002	TI 58 Silicon Diode
CR5	T02-002	TI 58 Silicon Diode
E1	E00-015	IN USE Light (G.E. 757)
F1	E00-010	3 AG 1 Amp Fuse
J1	H02-017	Tape Deck Socket
ADR	K00-015	2 P.D.T. 700 Ω Relay
RP	K00-014	4 P.D.T. 700 Ω Relay
RU	K00-011	S.P.D.T. 13,800 Ω Relay
R1	R20-009	2 Ω 5 Watt Resistor
R2	R20-014	82 Ω 1 Watt 10% Resistor
R3**	R11-006	1K Ω 1/2 Watt 10% Resistor
R4	R12-022	15K Ω 1/2 Watt 10% Resistor
R5	R11-003	4.7K Ω 1/2 Watt 10% Resistor
R6	R11-023	1.5K Ω 1/2 Watt 10% Resistor
S1	H00-065	Selector Switch
S2	H00-005	Start Switch
T1	L00-031	Output Transformer
T2	L00-030	Power Transformer
TB1	H04-027	A.C. Power Terminal Board
TB2	H04-023	Telephone Line Terminal Board
Z1	E01-002	Motor Arc Suppressor
Z2	E01-004	Impedance Matching Network
	F07-715	A.C. Power Cable Clamp
	H02-003	IN USE Light (E1) Socket
	H02-023	Relay RP Socket
	H02-025	Relay ADR Socket
	H10-020	Fuse (F1) Holder
	S00-026	RP Relay Hold Down Clip
	S00-027	ADR Relay Hold Down Clip

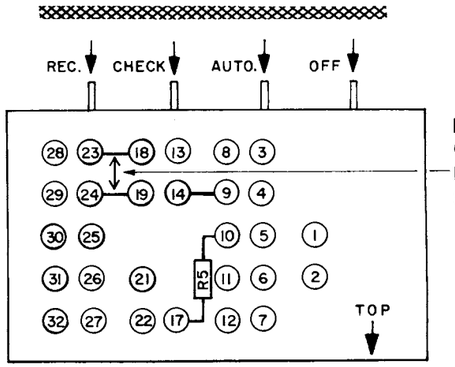
* Below Serial No. 2-2342, Capacitor C3 is .1 μf.
** Below Serial No. 2-2342, Resistor R3 is 2.2KΩ.

NOTES:

1. SCHEMATIC FOR MACHINE SERIAL NO. 2-1827 AND ABOVE.
2. DIODE CR5 ADDED AT MACHINE SERIAL NO. 2-2002.
3. ALL RESISTORS 1/2 WATT ±10% UNLESS OTHERWISE NOTED.
4. ALL CAPACITOR VALUES IN μf.
5. VOLTAGE VALUES MEASURED WITH 20K Ω PER VOLT D.C. VOLTMETER BETWEEN POINTS INDICATED AND CHASSIS GROUND. VOLTAGES MAY VARY ±15%.
6. VOLTAGES MEASURED WITH TAPE DECK RUNNING IN "REC."
7. ADR CONTACTS 9 AND 10 ADDED AT MACHINE SERIAL NO. 2-2402



RELAY SYMBOLS



SELECTOR SWITCH S1

POSITION OF C.P.C. DISABLE STRAP

FIGURE 17 MODEL 200A SCHEMATIC