

ELECTRIC SECRETARY® MODEL LP-TD-C
MECHANICAL TESTS

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1. GENERAL

1.01 This Section contains the mechanical tests and procedures required to properly maintain the mechanism of the Model LP-TD-C. In addition, explanations of the mechanism sequences are included to familiarize the reader with the mechanical functions of the unit. The disassembly instructions provided will help the technician gain access to the unit's working parts so that he can inspect, clean, lubricate, and adjust these mechanisms according to the procedures included for each of these tasks.

1.02 The Model LP-TD-C will perform best when given occasional service attention as described in this Section. The procedures provided in this Section should be performed in a shop.

1.03 For the protection of service personnel, this unit is equipped with an electrical interlock switch which will break AC power to it when the cabinet back panel is removed. Proceed with caution when operating the Model LP-TD-C with the interlock intentionally defeated and the unit unenclosed.

NOTE: The Model LP-TD-C schematic is shown in Section 997-404-501. When performing the tests and adjustments in this Section, or when reading the explanations of the mechanism sequences, refer to the schematic when necessary.

2. DISASSEMBLY

2.01 Raise the tape deck cover and remove the announcement tape cartridge as follows:

- (1) Ensure that AC power plug is disconnected.
- (2) Move the pressure roller away from the capstan, then lift clear the tape between the capstan and pressure roller (Figure 1).
- (3) Move the switch actuator to the right and lift the tape clear of the record/play and erase heads.
- (4) Lift the announcement tape cartridge off of the "D" shaped spindle.

2.02 Remove the incoming message recording tape reels as follows:

- (1) Unscrew the two knurled hub screws holding the take-up and supply reels to their spindles.
- (2) Lift the recording tape clear of the record/play and erase heads.
- (3) Lift the take-up and supply reels from their spindles.

2.03 Access to the announcement record/play head and erase head may be gained by removing the hex nuts securing each of the two heads.

2.04 Access to the incoming message record/play head and erase head may be gained by removing the hex nuts securing each of the two heads.

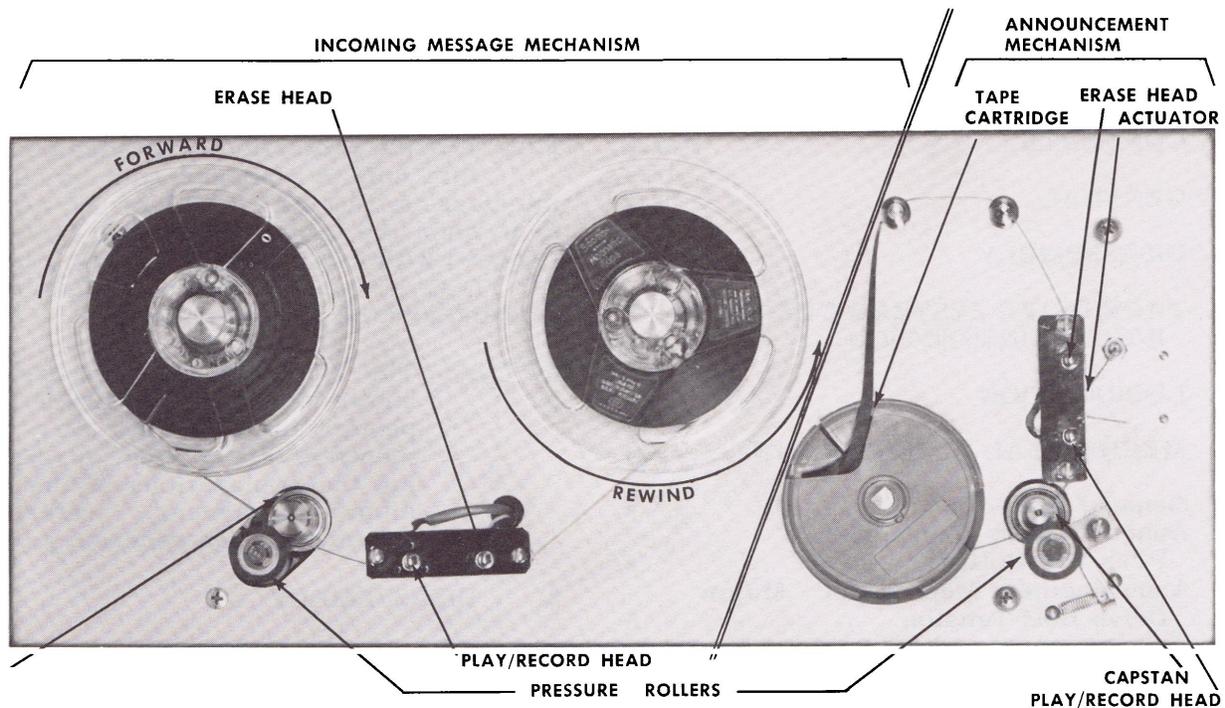


Figure 1. Tape Deck - Top View.

2.05 For ease in servicing, modular construction has been adopted (Figure 2). The answering set is broken down into three major sections:

- (a) Cabinet or wrapper and bottom pan.
- (b) Chassis containing: Power supply, relays, and operating controls and three plug-in printed circuit boards.
- (c) Transport mechanism containing: tape deck motorboard, motors, speaker, and the motor control assembly.

2.06 Removal of the Model LP-TD-C from its cabinet assembly is accomplished as follows:

- (1) Remove the screws that hold the back panel on.
- (2) Remove the back panel by moving its bottom edge upward and toward the rear slightly, and gently pull the back panel away.
- (3) Remove the screws from the sides and front of the wrapper.
- (4) Remove, as one piece, the wrapper, black false cover, and tape deck

cover. Use both hands, lifting the wrapper from rear of unit allowing the whole piece to tilt forward. When wrapper is clear of the control panel, lift it off of the bottom plate pan and away from the two main units of the Model LP-TD-C.

- (5) At the bottom of the unit, remove the screws holding the bottom plate pan to the tape deck and transport assembly.
- (6) At the bottom of the unit, remove the screws securing the main chassis assembly to the bottom plate pan.
- (7) Grip the tape deck plate at both sides and withdraw the tape deck and transport assembly from the bottom plate pan, lifting it up and forward, until sufficient clearance is obtained to allow removal of two Jones plugs. Carefully set the assembly down so as not to damage parts on the underside of the tape transport assembly.
- (8) Unplug both Jones plugs at the main chassis assembly.
- (9) Lift tape deck and transport assembly clear of bottom plate pan and set the unit on the bench.

(10) Lift the main chassis assembly up and out of the bottom plate pan and set the unit on the bench.

2.07 To further disassemble the tape deck and transport assembly:

(1) Remove the four Phillips-head

screws holding the tape deck plate assembly to the tape transport assembly (Figure 1).

(2) Lift deck plate assembly off the tape transport as far as the switch actuator and head assembly wires will allow. Set the deck plate on

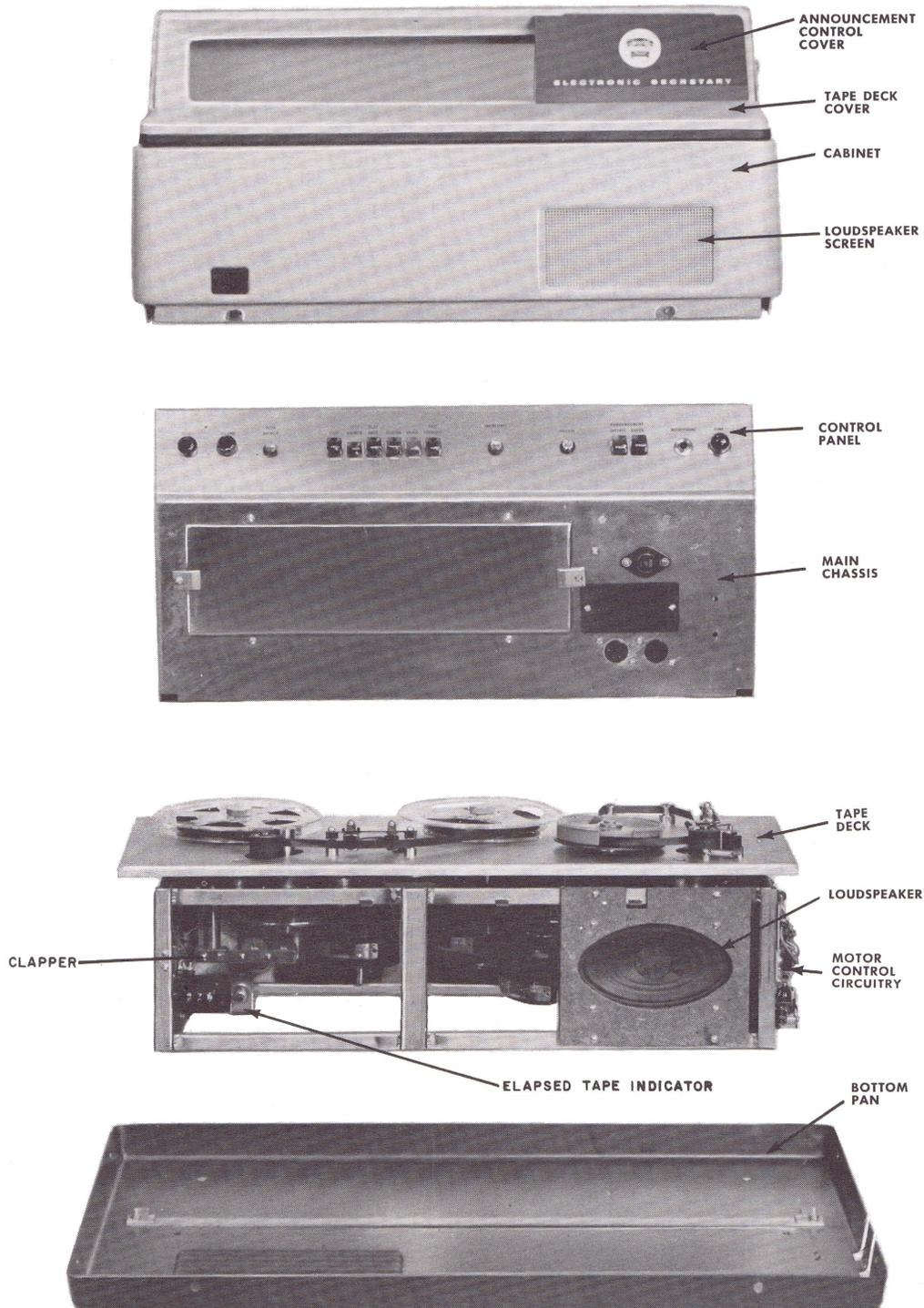


Figure 2. Model LP-TD-C - Major Sections.

its side, leaning it against the tape transport unit.

- (3) Remove the three screws holding the loudspeaker and loudspeaker baffle to the tape transport assembly. Carefully set the loudspeaker on the bench in front of the unit as far as the loudspeaker wires will allow. This affords access to the announcement motor and capstan belt drive assembly.
- (4) To gain access to both sides of the hinged motor control assembly, remove the single screw securing the unhinged side to the motorboard.
- (5) Swing motor control panel outward. This allows access not only to the motor control relays, but also provides additional access to the announcement motor and belt drive mechanisms (belt and flywheel).
- (6) To gain access to the motor control relays, remove the two screws holding the cover over the relays. Remove the cover. At this point in the disassembly of the tape transport assembly, all parts and mechanisms are readily accessible for replacement, repair, or adjustment.

2.08 To remove circuit boards from chassis assembly:

- (1) Remove the two screws fastening the channel support bracket. Lift the support bracket off the top of the cards.
- (2) Remove either of the cards by firmly pulling it up and out of its socket.

NOTE: To quickly access either of the printed circuit cards, first remove the back panel, then the channel support bracket.

3. TAPE DRIVE SYSTEMS CLEANING AND INSPECTION

3.01 Inspect the tapes to assure that they are not kinked or scratched, and that the spliced joints are secure. No foreign material should be present on the tape surfaces except for the lubricant applied at the time of manufacture. The clear area on the tape should be reasonably clean. Should tape condition be otherwise, replacement is indicated.

3.02 Assure that the capstan's pressure roller surfaces, pillars and heads are clean. If cleaning is required, remove the tape cartridges from their mechanisms. Use a soft lintless cloth moistened with denatured alcohol to clean the surfaces.

3.03 When in the mechanisms, the tapes should move freely around the pillars and heads. Assure that the tapes do not bind in the cartridge and that there is sufficient tape slack consistent with running time.

3.04 Assure that motor shafts and flywheel surfaces are clean. If cleaning is necessary, proceed as in paragraph 3.02. USE ONLY DENATURED ALCOHOL ON RUBBER SURFACES.

4. LUBRICATION

4.01 Initial lubrication of the Model LP-TD-C should be sufficient for a long period of service. Generally, both drive system components should be lubricated when the unit is disassembled for adjusting or cleaning or is otherwise disassembled for service.

4.02 Ball bearings on the motors are grease lubricated and sealed when manufactured, and will last the life of the motors under normal service. Should any motor operate with excessive noise or any shaft not rotate freely, the entire motor should be replaced. In no case should lubrication of these bearings be attempted.

4.03 After reassembly, remove any excess oil forced out of the ends of the bearings. All drive surfaces should be cleaned after lubrication.

4.04 Lubricate the guide and bottom plate of the announcement tape cartridge with Cousino Electronics high conductivity friction free formula #EC1-500-LF lubricant, or equivalent.

5. MECHANICAL ADJUSTMENT

General Inspection

5.01 Before making any adjustments, check all hardware for tightness and make sure the unit is completely clean of foreign particles (use forced air).

Announcement Mechanism - Pressure Roller

5.02 Assure that the pressure roller contacts the capstan shaft surface evenly (Figure 1). Move roller slightly away from

capstan surface to check this alignment. Form pressure roller support bracket to align as necessary. Correct pressure roller force against capstan is 600-800 grams.

Announcement Mechanism - Motor
Drive Belt Tension

5.03 Adjust the tension of the drive belt by first loosening the three set screws holding the announcement motor to the motor-board. Then, move the motor away from the announcement pressure roller until the drive belt is taut. Retighten the three set screws.

NOTE: If better access to the announcement motor and its belt drive system is required, remove the loudspeaker and baffle assembly and swing the motor control panel open.

5.04 Place announcement cartridge on the unit and thread the announcement tape through the mechanism.

5.05 Operate the unit in the CHECK function to make certain the running time is correct. A standard announcement tape should "cycle" in 30-seconds.

Announcement and Incoming Message
Mechanism - Record/Play and Erase
Heads

5.06 To assure that the record/play and erase heads are both properly energized and mechanically positioned, perform the following procedures:

- (1) Position the heads on a completely assembled, operating Model LP-TD-C.
- (2) The best head to tape contact may be approximated by loosening the hex nuts holding the head and rotating the head to obtain best possible contact with a tape in the running position and under light tension.
- (3) Adjust the record and erase heads by rotating for maximum tape reproduction level and maximum signal erasure respectively.
- (4) Assure that heads are tight after final adjustment is reached.

Incoming Message Mechanism -
Pressure Roller

5.07 Assure that the pressure roller contacts the capstan surface evenly (Figure 1).

Move the pressure roller to contact the capstan surface to check this alignment. When the incoming message record mechanism is functioning and the pressure roller is pressed against the capstan, the clapper arm assembly should be pulled in flush against the ends of both clapper magnets (Figure 2). When the unit is de-energized, the distance between the clapper arm and the pole pieces of both magnets should be 3/32-inch. To perform these adjustments loosen the two set screws holding the magnet support assembly to the motorboard, and shift the position of the magnet support assembly within the range of the slotted screw holes. Retighten the screws.

6. MECHANISM SEQUENCES

Standby

6.01 Refer to the Model LP-TD-C schematic in Section 997-404-501. Power is introduced to the mechanism through pins 1 and 2 of J4-P4. Current therefore flows from pin 1 of P4 through autotransformer T9 and back to pin 2 of P4. Low voltage (about 30 volts) is applied to the forward and rewind motors from the tap of T9, through K14-4B and 5B, K15-1T and 2T, K16-3T and 4T, K13-3T and 4T, forward motor B4, K13-2B and 1B, K16-3B and 4B, rewind motor B3, and back to T9. Rewind motor B3 and forward motor B4 are therefore connected in series with about 15 volts impressed across each one. As they rotate in opposite directions, they tend to keep a slight tension in the tape, taking up any slack or loop in the tape; however, because the voltage impressed across them is so small, they do not exert enough torque to wind the tape from one reel to another even in an extremely unbalanced condition with all the tape on one reel.

Playback

6.02 Switch S3, PLAYBACK switch is operated.

6.03 Current flows from pin 2 of P4 through CR8 where it is rectified, through the coil of relay K15 (CR11 and R99 act to smooth out the pulsating voltage across K15) through K16-1B and 2B, through the coil of relay K14, which operates, and C61, which charges, through S11 terminals 2 and 1, pin 10 of P4-J4, S3-C terminals 4 and 3, pin 5 of J4 and P4, K13-1T and 2T, S13 terminals 3 and 2, to pin 1 of P4. Current flows from pin 1 of P4 through S13 terminals 2 and 3, K15-3T and 2T, K14-5T and 6T, capstan motor B2, which energizes to drive the capstan through a reduction idler, and back to pin 2 of P4. Current also flows from K15-3T and 2T through K16-3T and 4T,

and K13-3T and 4T, forward motor B4, K13-2B and 1B, K16-3B and 4B, rewind motor B3, and back to pin 2 of P4. As motors B3 and B4 tend to rotate in opposite directions, they hold the tape against the record and erase heads, but as they pull against each other they do not move the tape. Current also flows from the tap of autotransformer T9 through CR12 and CR9, through F3 and R105 (limiting resistor), through K15-2B and 3B, K14-3T and 4T, and pressure roller magnets L6 and L7. When the magnets L6 and L7 are energized, they draw the pressure roller against the capstan, which, by rotating, draws the tape across the head.

Playback to Stop

6.04 Switch S3, PLAYBACK switch is released.

6.05 Relay K15, releases immediately; however, the release of relay K14 is delayed approximately 300-milliseconds due to the discharge of C61. K15-2T and 3T open, removing 115 VAC from motors B3 and B4. K15-2B and 3B open the circuit to pressure roller magnets L6 and L7. DC now flows from CR9, through K15-2B and 1B, K14-2B and 3B, K16-3B and 4B, rewind motor B3, and back to transformer T9; DC also flows from K14-2B and 3B, through K13-1B and 2B, forward motor B4, K13-4T and 3T, K16-4T and 3T, K14-5T and 6T, capstan motor B2, and back to transformer T9. Because of the difference in resistance between B4 and B2 (which are in series) and B3, more current flows through B3. This provides a differential brake when stopping from "Playback" operation. K14 now releases and the mechanism reverts to "Standby."

Rewind

6.06 Switch S4, REWIND switch is operated.

6.07 Current flows from pin 2 of P4, through CR8 where it is rectified, through K15 which operates, through K14-1T and 2T, through the coil of K16, which operates, and C66, which charges, through pin 9 of P4-J4, S4-C terminals 2 and 1, pin 5 of J4-P4, K13-1T and 2T, S13 terminals 3 and 2, and back to pin 1 of P4. Current also flows from pin 1 of P4, through S13 terminals 2 and 3, K15-3T and 2T, K16-5B and 4B, rewind motor B3 and back to pin 2 of P4. B3 operates, rewinding the tape onto the rewind spool. DC flows from CR9 and CR12 through R95 (limiting resistor), K14-1B and 2B, K16-5T and 4T, K13-3T and 4T, forward motor B4, K16-6T and 7T, and back to transformer T9. This small amount of DC on the forward motor

introduces an artificial drag insuring a tight wind of the tape, which will prevent slippage of the tape when stopping from high speeds.

Rewind to Stop

6.08 Switch S4, REWIND switch is released.

6.09 K15 releases immediately; however, the release of K16 is delayed approximately 1 1/2-seconds because of the discharge of C66. Contacts K15-3T and 2T open, removing 115 VAC from the rewind motor B3. DC now flows from CR12 and CR9 through K15-2B and 1B, K16-5T and 4T, K13-3T and 4T, forward motor B4, K16-6T and 7T, and back to transformer T9, thus bringing the unit to a stop. At the same time, low voltage AC flows from the tap on transformer T9, through K14-4B and 5B, K15-1T and 2T, K16-5B and 4B, rewind motor B3 and back to T9 to prevent a tape loop due to bounce of the rewind reel. Relay K16 now releases and the mechanism reverts to "Standby."

Fast Forward

6.10 Switch S6, FAST FORWARD switch is operated.

6.11 Current flows from pin 2 of P4 through CR8 where it is rectified, through relay K15, which operates, through K14-1T and 2T, through relay K13, which operates, and C60, which charges, through K16-1T and 2T, pin 4 of P4-J4, S6-C terminals 1 and 2, pin 11 of J4-P4, S13 terminals 3 and 2 and pin 1 of P4. Current also flows through K15-3T and 2T, through K13-5T and 4T, forward motor B4, which operates, K13-2B and 3B, and back to pin 2 of P4. Current also flows from the tap of T9 through CR12 and CR9 (where it is rectified), K14-1B and 2B, K13-4B and 5B, K16-3B and 4B, rewind motor B3, and back to transformer T9. This small amount of DC on the rewind motor introduces an artificial drag insuring a tight wind of the tape to prevent slippage when stopping from high speeds.

Fast Forward to Stop

6.12 Switch S6, FAST FORWARD switch is released.

6.13 K15 releases immediately; however, the release of K13 is delayed approximately 1 1/2-seconds because of the discharge time of C60. Relay contacts K15-2T and 3T open, removing 115 VAC from motor B4. DC now flows from CR12 and CR9 through K15-2B and 1B, K13-4B and 5B, K16-3B and 4B, rewind motor B3, and back to transformer T9, thus bringing the motor to a stop. Relay K13

now releases reverting the mechanism to "Standby."

Stop by Elapsed Tape Indicator

6.14 Switch S13, elapsed tape indicator (ETI) is opened.

6.15 As power to all the relays is supplied through S13, when this switch is opened in any function, the relays will release as previously described. The mechanism will then come to a stop and return to "Standby."

Reset of Elapsed Tape Indicator

6.16 Switch S9, RESET switch is depressed.

6.17 Switch S13 is temporarily jumpered by S9 and the unit will then operate in any function until S13 (ETI) is reset by the mechanism.

Safety Features

6.18 Transfer of Operation. Relay K13 is interlocked by K16-2T and 1T, and K14-2T and 1T. Relay K16 is interlocked by K13-2T and 1T, and K14-2T and 1T. Relay K14 is interlocked by K13-2T and 1T, and K16-2B and 1B. Therefore, when operations are changed by operating the pushbutton switches, the unit will not go into a new operation until it has first been brought to a stop and the relays have released.

6.19 Power Failure Protection. If power is removed from the unit for any reason while the mechanism is in "Playback," "Rewind" or "Fast Forward," the relays will release as previously described. Power is no longer supplied for braking from CR9 and CR12; however, as C59 is a large capacitor, the energy stored in it is sufficient to bring the unit to a stop, without spilling tape.

6.20 End of Tape Warning. When the capacity of the incoming message tape has been reached, the elapsed tape indicator will read 6-0-0. Switches S12 and S13 operate. Switch S13 stops the mechanism as described in Paragraph 6.15. Switch S12, when closed, supplies high level tone from pin 12 of J1-P1 out to the telephone line. Current flows through S14, F1, pin 1 of J4-P4, terminals 2 and 1 of S13, pin 6 of P4-J4, K3-3B and 4B

through K9 coil (which operates) and back to the AC line. High level tone is supplied from pin 12 of P1-J1 through K9-1T and 2T, K5-3T and 2T, terminal S3 of T1 and out to the telephone line. Current also flows through K5-6T and 7T, pin 8 of J2-P2, Announcement Level potentiometer R38, pin 9 of P2-J2, terminal S4 of T1 and out to the telephone line.

Foot Control

6.21 Connection. The PLAYBACK switch S3 is depressed, and the 4-prong control plug P7 is inserted into J7. The switch S11 is mechanically operated due to the insertion of P7, and the control of the mechanism is transferred to the foot control. AC power now flows from pin 1 of J4-P4, S13 terminals 2 and 3, K13-2T and 1T, pin 5 of P4-J4, S3-C terminals 3 and 4, pin 10 of P4-J4, S11 terminals 1 and 3, pin 4 of J7-P7 to terminal 1 of the PLAY switch in the foot control.

6.22 Play Function. Depressing the PLAY switch (green pedal) will cause 115-volts AC to flow from terminal 1 and 2 of the PLAY switch, pin 1 of P7-J7, and through the coils of relays K14 and K15. (Refer to "Playback," Paragraph 6.03, for further explanation of operation in the "Playback" mode.) Foot control relay K17 operates and capacitor C58 charges.

6.23 Backspace Function. Releasing the PLAY switch causes current to flow from terminals 1 and 3 of the PLAY switch to K17-2T and 1T, pin 3 of P7-J7, thus energizing K15 and K16 and causing the rewind motor B3 to be energized. The length of backspace is determined by the Backspace potentiometer R97.

NOTE: Backspace feature is available on foot switch WW-758-15. A foot switch without the backspace feature (WW-759-15) is also available.

6.24 Rewind Function. Depressing the REWIND switch (red pedal) causes current to flow from pin 4 of J7-P7, through the PLAY switch terminals 1 and 3, REWIND switch terminals 1 and 2, to pin 3 of P7-J7, thus energizing K15 and K16. This energizes the rewind motor B3 causing the unit to rewind. Refer to "Rewind," Paragraph 6.07, for further explanation of operation in the "Rewind" mode.