ELECTRONIC SECRETARY® MODEL LP-TD-C ELECTRICAL TESTS

CONTENTS

1. GENERAL

1.01 The data presented in this Section is intended to help a maintenance man perform electrical checks, tests, and adjustments of the Model LP-TD-C. Therefore, this Section includes an explanation of the operating sequences of the unit, functional descriptions of the printed circuit boards, AC and DC voltage measurements, switch and relay contact layouts, and a schematic.

1.02 The operating sequences will familiarize the reader with the proper electrical operation of the Model LP-TD-C. The information concerning the printed circuit boards, adjustment controls on the printed circuit boards, switch and relay contact layouts, voltage measurements and the schematic will serve as ready reference material to the technician should he have to make electrical checks and tests on the unit. In addition, this information will be helpful if the technician finds it necessary to alter the adjustment settings made at the factory.

2. OPERATING SEQUENCES

Standby

2.01 The unit is in the "Standby" condition, when current flows from the AC line (Figure 1) through P8, through interlock switch S14 terminals 2 and 1, F1, pin 1 of J4-P4, autotransformer T9 tap, K14-4B and 5B, K15-1T and 2T, K16-3T and 4T, K13-3T and 4T, forward motor B-4, K13-2B and 1B, K16-3B and 4B, rewind motor D-3, pin 2 of P4-J4 and back through P8 to the AC line. Low voltage (about 30 volts) is taken from the tap of T9. Rewind motor B-3 and forward motor B-4 are connected in series with about 15 volts impressed across each one.

2.02 As the rewind and forward motors rotate in opposite directions, they tend to keep a slight tension in the tape, taking up any slack or loop in the tape; however, due to the low voltage impressed across them, 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.

Announcement Dictate

2.03 Place the unit in the "Automatic Answer" condition by depressing switch S2. Depressing S2 mechanically releases the pushbutton associated with S1, which closes. Current now flows from the AC line through P8, interlock switch S14 terminals 2 and 1, F1, pin 1 of J4-P4, S13 terminals 2 and 3, pin 11 of P4-J4, S1-B terminals 2 and 1, S2-C terminals 1 and 2, through the AUTO ANSWER lamp DS1, which will light, and back through P8 to the AC line.

2.04 The ANNOUNCEMENT DICTATE switch S7 is held operated while the announcement message is being dictated. This will cause current to flow from S2-C terminal 2, through S7-C terminals 1 and 2, pin 14 of J4-P4, the announcment capstan motor B1, which will operate, pin 2 of P4-J4 and back through P8 to the AC line. The announcment capstan motor drives the capstan which advances the announcement tape thus operating tape switch S10. Current now flows from S2-C terminal 2 through pin 16 of J4-P4, S10 terminals 2 and 1, and back through pin 15 of P4-J4. At this point the current will divide and take two paths. One path is through S7-D contacts 2 and 3, through the coil of relay K10,

which will operate, through the diode CR7 and back through P8 to the AC line. When relay K10 operates, a holding circuit is formed through its own 8B and 9B contacts. The other path is through the coil of relay K2, which will operate, through the diode CR7 and back through P8 and the line. Current now flows from terminal 2 of S2-C, through K2-5T and 6T, K2-3T and 4T, K10-2T and 3T, through the DICTATE lamp DS3, which lights, and back to P8 and the AC line.

2.05 The electrical impulses generated by the microphone as the announcement message is being dictated flow through the mike-jack J11, S7-A terminals 3 and 2, pin 3 of J2-P2, and capacitor C17 to the base of transistor 2Q1. At 2Q1 the signal is amplified and fed from the collector through C20 to the base of 2Q2 where it is amplified further. From 2Q1 the signals are fed through capacitor C30 and R49, pin 15 or P2-J2, contacts K10-12T and 11T, K11-3T and 4T, pin 1 of J6, through the record announcement head PU4, and back through pin 2 of P6-J6, to ground.

2.06 DC to start the erase and bias oscillator is supplied by T8, rectified by CR4, filtered, regulated by the zener diode CR6 and fed through terminals 4 and 5 of S2-B, contacts K10-6B and 7B and through pin 8 of J1-P1 to the oscillator transistors 1Q3 and 1Q4.

2.07 Record bias is fed to the record announcement head from terminal 6 of oscillator coil T5 through C36, terminal 5 of P1-J1, contacts K10-5B and 4B, K10-12T and 11T, K11-3T and 4T, pin 1 of J6-P6, through PU4, terminal 2 of P6-J6 and to ground.

2.08 Erase signals are fed from terminal 5 of the oscillator coil T5 through pin 7 of P1-J1, contacts K10-2B and 3B, pin 3 of J6-P6 through the erase announcement head PU3, pin 2 of P6-J6 and to ground. At completion of the announcement message, the DICTATE switch S7 is manually released.

2.09 The release of S7 connects the DC supply at pin 8 of J1-P1 to the 1400 cps oscillator stage 1Q5 and to buffer stage 1Q6 through S7-B terminals 1 and 2 and pin 9 of J1-P1. Stage 1Q6 forms a buffer or isolation stage between the oscillator stage and the line transformer T1 (when in Automatic Record cyle) to eliminate loading of the oscillator circuit. Stage 1Q6 also amplifies the 1,400 cps signal which is then fed through capacitor C44, pin 12 of P1-J1, pin 4 of J2-P2, R29, R25 (the "T" potentiometer), through pin 1 of P2-J2, S7-A terminals 1 and 2, back through pin 3 of J2-P2 and C17 to the base of 2Q1. From the collector of 2Q1, the signal is fed through C20 to the base of 2Q2, where it is further amplified, then fed through C30 and R49, pin 15 of P2-J2, K10-12T and 11T, K11-3T and 4T, pin 1 of J6-P6 through the announcement record head PU4, pin 2 of P6-J6 and to ground.

2.10 A minumum of 2-seconds of tone must be recorded onto the announcement tape to effect the mid-cycle shift, at which time the unit transfers from Announcement Message to Incoming Record during an Automatic Answer Cycle. The DS4 TONE lamp and its associated RC network forms a 2-second timing circuit. When S7 is released, it permits current to flow through terminals 2 and 1 of S7-D, terminals K10-14T and 13T, and through R86 to the timing network. The DS4 TONE lamp will light 2-seconds after current has been applied to it.

2.11 The 1,400 cps tone signal will continue to be recorded until the end of the tape is reached, at which time K10 releases, reverting the unit to the "Standby" condition.

Announcement Check

2.12 The AC switching in ANNOUNCEMENT CHECK is similar to that of ANNOUNCEMENT DICTATE, Paragraph 2.04 except that the ANNOUNCEMENT CHECK switch S8 is depressed instead of S7 and relay K11 is operated instead of relay K10 (Figure 1). After the announcement capstan motor B1 has been latched operated by the closure of tape actuated switch S10, S8 can be released.

2.13 The electrical impulses generated by announcement record head PU4 are fed to pin 1 of P6-J6, K11-4T and 5T, pin 1 of J1-P1, through C31 to the base of 1Q1. At 1Q1, they are amplified and fed through C35 and R57, pin 4 of P1-J1, R90 (VOLUME control), pin 13 of J1-P1, to the base of 1Q2 where they are amplified again and fed to the primary of T6. From the secondary of T6, the signals are fed through pin 15 of P1-J1 to the base of the power transistor QP where they are again amplified and applied to the primary of the output transformer T7. The amplified signals then flow from the secondary of T7 to the loudspeaker LS1, through terminals 17 and 18 of J4-P4.

2.14 DC power for the Announcement Check amplifier is supplied from zener diode CR6 through S2B terminals 4 and 5, K5-2B and 1B, K11-4B and 5B, to the primary of T7 and pin 14 of J1-P1.

Automatic Answer-Announcement Out

2.15 The machine is in the automatic answer condition when switch S2 is depressed. Depressing S2 mechanically releases the push-button associated with S1, closing the switch. Current now flows from the AC line through P8, interlock switch S14 terminals 2 and 1, F1, pin 1 of J4-P4, S13 terminals 2 and 3, pin 11 of P4-J4, S1-B terminals 2 and 1, S2-C terminals 1 and 2, through the AUTO ANSWER lamp DS1, which will light, and through P8 back to the line.

2.16 When ringing current is impressed across terminals L1 and G of TB1, it is fed through K19-1T and 2T, K3-4T and 3T, and C63 to the input of the bridge rectifier CR1. From CR1 rectified ringing current will operate relay K1. This will cause current to flow from S2-C terminal 2, K1-1T and 2T, pin 14 of J4-P4, through announcement capstan motor B1, which will operate, pin 2 of P4-J4 back through P8 and the AC line. The announcement capstan motor drives the capstan, which advances the announcement tape from the cartridge to operate the tape switch S10. K2 operates as described in Paragraph 2.04.

2.17 115-volts AC is applied from S2-C terminal 2 through K2-5T and 6T, K2-3T and 4T, K10-2T and 1T, K11-2B and 1B, through the coil of relay K3 (line load relay), which operates, and DS2 (ANSWER CALL lamp), which lights, through the combined contacts of K18-1B and 2B and K19-1B and 2B, through CR7, and back through to the line. Capacitor C64 smooths out the ripple across relay K3. Resistor R80 limits surge current through CR7.

2.18 Telephone line battery current now flows from L1, through K19-1T and 2T, K3-4T and 5T, K18 coil and back to L2. At the same time, current flows from the AC line as described in Paragraphs 2.03 and 2.17. AC from 1B of K11 is applied through CR13, R-106, C-71, K19-1B and 2B through CR7, and back to the AC line. At this time, K18 operates and K18-1T and 2T forms a latch path for itself. K18-1B and 2B forms a latch path for K19. K18-3B and 4B complete the power supply path through K4 for the CR amplifier. Then C71 reaches full charge and K19 operates. Now, any interruption, reversal, or drop in the telephone line battery will cause K18 to release, which releases the telephone line and K3. The announcement message is now fed from the record announcement head PU4 through pin 1 of P6-J6, K11-4T and 3T, K10-11T and 10T, K10-8T and 7T, to pin 2 of J2-P2. The message is then fed through R26 and C17 to the base of the first amplifier stage 2Q1, from the collector of 2Q1 through C20 to the base of 2Q2, where it is amplified, then fed through pin 14 of P2-J2, K10-4T and 5T, pin 10 of J2-P2, capacitor C24, and the resistor R43 to the base of 2Q3. At 2Q3 the message is again amplified and fed from the collector of 2Q3 through R40 and R38 (the ANNOUNCEMENT LEVEL potentiometer AL), pin 8 of P2-J2, K5-1T and 2T to terminal S3 on transformer T1 where it is delivered to the telephone line.

2.19 At the completion of the announcement message a 1,400 cps tone from the tape is transmitted over the line. A portion of this 1,400 cps tone, as it appears on the collector of 2Q3, is fed through the tuned circuit L2 and C25 which is resonant at 1,400 ± 100 cycles. When the 1,400 cps signal swings positive it is grounded through R45 and CR5; when it swings negative it is fed through R46 and CR3 to the base of CR amplifier stage 2Q4 charging C28. (The RC network of C28 and R47 will determine the length of time the calling party will hear the tone signal before the mid-cycle shift occurs.) When C28 charges sufficiently, forward bias current flows between base and emitter which will trigger the circuit and allow the reverse bias between emitter and collector to flow from the collector through the coil of relay K4, which will operate. 115-volts AC will now be applied from S2-C terminal 2 through K4-1T and 2T and K8-2T and 1T, thus operating relay K5. When relay K5 operates, it forms a holding circuit for itself through K5-8B and 9B and K8-2T and 1T. Relay K3 and lamp DS2 will also be latched in through contacts of K5-8B and 9B and K5-9T and 8T. This makes K3 and DS2 independent of relay K2, which will release upon the completion of the announcement message tape. 115-volts AC is now applied from S2-C terminal 2 through K5-10T and 11T and pin 3 of J3-P4, thus operating relays K14 and K15 to start the tape mechanism as described in Section 997-404-500.

Automatic Answer - Incoming Record

2.20 The voice signals from the telephone line (Figure 1) are now transmitted through transformer T1 secondary terminal S2, K5-5T and 4T, pin 2 of J3-P3, and capacitor C1 to the base of 3Q1. From the collector of 3Q1, the voice signals are fed through the 1,400 cycle rejection filter circuit (L1, C6, C7 and R9) and pin 4 of P3-J3 to the primary of interstage transformer T4. From the secondary of T4 the signals are fed through pin 14 of J3-P3, R23 and C14 to the base of 3Q2 where they are amplified. From the collector of 3Q2 the voice signals take two paths. The first path is to the incoming record head PU2 through C15,

R24, pin 15 of P3-J3 to K5-6B where the voice signals are mixed with the record bias voltage from board No. 1. The voice signals and the record bias are now fed through S2-B terminals 3 and 2 to pin 1 of J5-P5, through the incoming record head PU2, and to pin 2 of P5-J5 to ground. The second path is to the voice control and talk down and time out circuits. The path is from the collector of 3Q2 through pin 1 of P3-J3 to the primary of the interstage transformer T2. From the secondary of T2 voice signals are fed through pin 12 of J3-P3, R21 the voice control potentiometer, capacitor C4 to the base of 3Q3 where they are amplified and fed from the collector to pin 13 of P3-J3 to the primary of the interstage transformer T3. From the secondary of T3 the signals go to pin 11 of J3-P3 where they are rectified by diode CR2 and fed through C9 to the base of 3Q4. The RC network R22 and C13 will filter out any pulses over ten cycles per second. During the announcement message cycle the collector of 3Q4 and the base of 3Q5 will be shorted to ground (positive) through K2-1T and 2T, charging C8. This makes the voice control and time-out circuits inoperative until relay K2 releases. At the end of the announcement cycle S10 restores, releasing K2. With no voice pulses being received C8 begins discharging through R12 and R11, the TD (talk-down) potentiometer which is adjusted to give a 4-second discharge interval. When a voice signal is received, the base of 3Q4 is driven negative causing 3Q4 to conduct, grounding its collector and the base of 3Q5 through R16. Capacitor C8 will charge resetting the TD circuit. If C8 is allowed to discharge sufficiently, 3Q5 will conduct permitting K7 (talk-down relay) to operate. Contacts K7-1T and 2T unground the base of 3Q6, which operates in like manner due to capacitor C12, R15, and R14, the time-out potentiometer. The discharge time of C12 is determined by time-out potentiometer R14 which is adjusted for an 8-second interval. When relay K7 operates, contacts K7-1B and 2B close delivering a -25 db tone to the telephone line (talk-down tone) over the path from tone oscillator stage 1Q5, Tone Level potentiometer R68, pin 10 of J1-P1, through K7-1B and 2B and K5-3T and 2T to terminal S3 of transformer T1. If capacitor C12 is allowed to discharge sufficiently, 3Q6 will conduct permitting K8 to operate. Contacts K8-1T and 2T, when operated, break the latch holding relay K5, which in turn releases relay K3. Relay K3 releases K18, which in turn releases K19, returning the unit to the "Standby" condition.

2.21 If the calling party hangs up, or if any interruption, reversal, or drop in telephone line battery occurs after C71 reaches full charge, relay K18 releases. K18-1T and 2T disconnects the unit from the telephone line. K18-3B and 4B releases K3, and K18-1B and 2B opens the latch path for K19. The unit reverts to "Standby," ready for a new call.

Rewind

2.22 To play back the recorded tape, or to listen to a portion of the recorded tape, the tape is rewound to either the start of the tape or to the portion of the tape desired, as the case may be. When the REWIND switch S4 is depressed (Figure 1) the "Rewind" cycle of operation is initiated, relays K15 and K16 operate, and power is applied to rewind motor B3. The tape begins rewinding from the take-up reel to the supply reel. For the operating description of the mechanism during the "Rewind" cycle, refer to Section 997-404-500.

2.23 During the rewind cycle, the tape travel may be stopped automatically when the elapsed tape indicator reaches the 0-0-0 position, or the tape travel may be stopped manually by operating the STOP button S1. Depressing S1 causes S4 to release. In either case, power to the rewind motor is removed due to the release of relay K15. For the operating description of the mechanism during the "Rewind to Stop" function and the "Stop by. Elapsed Tape Indicator" function, refer to Section 997-404-500.

Playback

2.24 To play back the recorded incoming message, PLAYBACK switch S3 is depressed (Figure 1). Depressing S3 applies 115-volts AC from terminal 1 of S1-B, through S3-C contacts 1 and 2 to the power transformer T8. At T8 the 115-volts AC is stepped down to 27.5 volts and then rectified by CR4. 115-volts is also delivered to pin 10, of J4-P4 placing the mechanism in playback. For the operating description of the mechanism during "Playback," refer to Section 997-404-500.

2.25 The recorded message signals are taken from the incoming record head PU2 and fed through pin 1 of P5-J5, S2-B terminals 2 and 1, pin 1 of J1-P1, capacitor C31 to the base of 1Q1, where they are amplified. From the collector of 1Q1 the signals are fed through C35 and R57, pin 4 of P1-J1, VOLUME control R90, pin 13 of J1-P1 to the base of 1Q2, where they are amplified and fed to the primary of T6. From the secondary of T6 the signals are fed through pin 15 of P1-J1, to the base of the power transistor QP where they are again amplified and applied to the primary of the output transformer T7. The secondary of T7 is

connected to the loudspeaker LS1 through terminals 17 and 18 of J4-P4, and over this path the recorded message is delivered.

2.26 DC power for the playback amplifier is supplied from the power supply through S3-B terminals 1 and 2 to the primary of T7, and to pin 14 of J1-P1.

Rewind - Erase

2.27 To completely erase any messages that have been recorded, simultaneously depress REWIND button S4 and ERASE button S5 (Figure 1). The 50 KC erase-record bias oscillator will be energized and the tape is erased during the rewinding process. If any message on tape is not erased, the unit will automatically erase it during the record cycle. However, because of pauses between new messages, bursts of previously recorded messages may be heard between the new messages. For the operating description of the mechanism during the "Rewind-Erase" function, refer to Section 997-404-500.

2.28 DC to start the erase-record bias oscillator is supplied by T8, rectified by CR4, filtered, regulated by zener diode CR6, and applied through terminals 1 and 2 of ERASE switch S5-B and pin 8 of J1-P1 to bias oscillator transistors 1Q3 and 1Q4. Erase voltage is applied from terminal 5 of oscillator coil T5 through pin 7 of P1-J1, K10-2B and 1B, pin 3 of J5-P5, through erase head PU1, and to pin 2 of P5-J5 to ground.

Fast Forward

2.29 When the FAST FORWARD switch S6 is depressed, relays K13 and K15 are operated, applying power to forward motor B4 (Figure 1). This causes the tape to wind onto the takeup reel. Power is removed from the forward motor due to the release of K15 when the FAST FORWARD switch S6 is released. For the operating description of the mechanism during "Fast Forward" operation, refer to Section 997-404-500.

Foot Control

2.30 The foot control (WW-758-15) enables the transcriber to start, stop, rewind, and back-space the playback mechanism, leaving the hands free to type or perform other tasks. The interval of back-spacing is adjustable. The PLAYBACK switch S3 is depressed and the 4-prong foot control plug P7 is inserted into J7, actuating the SHUNTING MU switch S11. For the operating description of the mechanism by the foot control, refer to Section 997-404-500. (If privacy is desired, insert headset plug into receptacle provided, thus automatically muting the playback loudspeaker.)

NOTE: A foot switch without the back-space feature (WW-759-15) is available.

3. ELECTRICAL ADJUSTMENTS

3.01 This Part presents explanations of the functions of the various circuits and controls on each of the printed circuit boards. This information will be of assistance to the technician should he find it necessary to readjust control settings made at the factory. Refer to the schematic, Figure 1, for the applicable circuitry.

Printed Circuit Board No. 1

3.02 The data presented in Table 1 applies to the circuits and controls on printed circuit board No. 1.

Table 1. Printed Circuit Board No. 1 (Circuits and Controls).

Part	Circuit Application	Function
1Q1	1st AMPLIFIER STAGE	Playback amplifier and check announcement amplifier: feeds 1Q2 through volume control R90.
1Q2	2nd AMPLIFIER STAGE	Playback amplifier and check announcement amplifier: feeds power stage QP thru coupling transformer T6.
1Q3 1Q4	PUSH-PULL 50 KC OSCILLATOR	Dictate Announcement cycle and Incoming Record cycle: supplies erase and record bias.

Table 1. Printed Circuit Board No. 1 (Circuits and Controls) - (Continued).

Part	Circuit Application	Function
1Q5	1400 CYCLE OSCILLATOR	Dictate Announcement cycle: provides the tone signal recorded on the announcement message tape loop during Dictate Announcement cycle. (For use as the midcycle shift tone during the Automatic Answering cycle.) Automatic Answer cycle: provides the midcycle shift tone recorded on the announcement message tape loop.
1Q6	BUFFER STAGE FOR 1Q5	Isolation stage between the oscillator 1Q5 and the line transformer T1. Eliminates loading of the oscillator circuit.
R68	TL (TONE LEVEL)	Controls level of the talk down delivered to telephone line. (Adjusted at factory for -25 db.)

Printed Circuit Board No. 2

3.03 The data presented in Table 2 applies to the circuits and controls on printed circuit board No. 2.

Table 2. Printed Circuit Board No. 2 (Circuits and Controls).

Part	Circuit Application	Function
2Q1	1st AMPLIFIER STAGE	Dictate announcement amplifier and announcement message delivery: feeds 2Q2 through coupling capacitor C15.
2Q2	2nd AMPLIFIER STAGE	Dictate announcement amplifier: drives record announcement head PU4. Announcement message delivery: feeds 2Q3 and CR amplifier stage 2Q4.
2Q3	3rd AMPLIFIER STAGE	Announcement message delivery amplifier: feeds announcement message to telephone line through control R38 (AL) and transformer T1.
2Q4	CR AMPLIFIER STAGE	Automatic Answer Cycle: responds 1,400 cycle tone signal recorded on announcement message tape loop to cause midcycle shift.
R25	"T" (TONE)	Controls the level of 1,400 cycle tone signal introduced into the base of 2Q1 to be recorded on the announcement tape loop when S7 (ANNOUNCEMENT DICTATE button) is released. This tone signal is used to accomplish the midcycle shift during the Automatic Answer cycle.
R38	"AL" (ANNOUNCEMENT LEVEL)	Controls level of the announcement message delivered to the telephone line in Automatic Answer cycle.

Printed Circuit Board No. 3

3.04 The data presented in Table 3 applies to the the circuits and controls on printed circuit board No. 3.

Table 3. Printed Circuit Board No. 3 (Circuits and Controls).

Part	Circuit Application	Function
3Q1	1st AMPLIFIER STAGE	Incoming message record amplifier: applies incoming message to 3Q2 thru the 1,400 cycle rejection filter (L2, C1, C2).
3Q2	2nd AMPLIFIER STAGE	Incoming message record amplifier: drives the Incoming Record Head PU2. Feeds a portion of the incoming message into the voice control amplifier 3Q3, thru the voice sensitivity control VC (R43).
3Q3	PREAMPLIFIER STAGE (VOICE CONTROL)	Automatic Answer Cycle: voice signals are rectified by CR2 and fed to syllabic modulator discriminator stage 3Q4.
3Q4	SYLLABIC MODULATOR DISCRIMINATOR STAGE	Automatic Answering Cycle: operated by rectified voice signal from 3Q3. RC network C9, R15, at input of 3Q4 makes stage responsive to signals below ten cycles per second.
3Q5	TALK-DOWN TONE TIMER STAGE (4 SECONDS)	Automatic Answer Cycle: in the event the level of incoming speech drops below -35 db or disappears entirely for a period of approximately 4-seconds, 3Q5 will conduct, causing relay K7 to operate. A 1,400 cycle tone signal will then be delivered to the telephone line and the 8-second time-out (TO) stage 3Q6 will begin its time-out interval.
3Q6	TIME-OUT TIMER STAGE (8 SECONDS)	Automatic Answer Cycle: when relay K7 operates, a 1,400 cycle tone is delivered to the telephone line and the ground is also taken off the base of 3Q6. Relay K8 (in 3Q6 collector circuit) will operate when 8-seconds of time elapses, breaking the supply to K5, ending the incoming record cycle, and restoring the LP-TD-C to "Standby."
R11	TD (TALK-DOWN)	Controls the silent interval required before relay K7 operates, delivering talk-down tone to the telephone line. (Set for 4-seconds at the factory.)
R14	TO (TIME OUT)	Controls the silent interval required, after the talk-down signal has been delivered, for the Answering Set to disconnect itself from the telephone line. (Set for 8-seconds at the factory.) NOTE: The TD and TO adjustments are additive, giving a total silent period of 12-seconds required to end the Automatic Answer cycle, by the Voice Control.
R21	VOICE CONTROL	Sensitivity control for Syllabic Modulator Discriminator Stage. (Set at factory for -35 db.)

4. AC SIGNAL AND DC VOLTAGE MEASUREMENTS

4.01 The following instruments were used to make the AC signal and DC voltage measurements:

(a) AC VTVM - Ballentine

(b) DC VTVM - Hewlett-Packard No. 410B

(c) AC Meter - Weston

(d) Audio-Generator - Hewlett-Packard No. 200 AB

4.02 Table 4 contains the AC signal measurements for the various stages of the Model LP-TD-C and Table 5 the DC voltage measurements for this unit.

Table 4. Model LP-TD-C AC Signal Measurements.

Set Operation	Freq. In	Level In	Point	1Q1 Base	1Q1 Coll.	Board 1 Pin 4	1Q2 Base	1Q2 Coll.	QP Base	QP Coll.	Spkr.	Conditions
Playback	400	.8 MV	PU-2	.7 MV	31 MV	19 MV	19 MV	2.8V	.81 V	5.1 V	1.7 V	Note 1
Playback	1000	.8 MV	PU-2	.66 MV	30 MV	17 MV	17 MV	3.0V	.87 V	6.1 V	2.1 V	Note 1
Playback	3000	.8 MV	PU-2	.63 MV	30 MV	17 MV	17 MV	2.7 V	.82	7.1 V	2.4 V	Note 1

				2Q1 Base	2Q1 Coll.	2Q2 Base	2Q2 Coll.	2Q3 Base	2Q3 Coll.	Al. Pot. Arm	L_1 L_2	Junct. Of C45,R45,C27,R46	DC MEAS. 2Q4 Base	DC MEAS. 2Q4 Coll.	CR MA	Conditions
Announce Del.	400	1 MV	PU-4	.12 MV	2.1 MV	2.1 MV	190MV	70MV	2.2V	1V	.94V					Note 2
Announce Del.	1000	1 MV	PU-4	.1 MV	2.9 MV	2.9MV	250MV	60MV	3.5V	1.5V	1.4V	.91V	-.78V	-6.7	6MA MAX.	Note 2
Announce Del.	1400	1 MV	PU-4	.19MV	3.4 MV	3.4MV	300MV	70MV	2.1V	1 V	.92V	3.1V	-2.1V	-1.9	10MA MIN.	Note 2
Announce Del.	3000	1 MV	PU-4	.11MV	3.6 MV	3.6MV	310MV	55MV	4.2V	1.9V	1.7V					Note 2

								Pin 15 (PU-4) Board 2	Conditions
Announce Dictate	400	1 MV	J-11	1 MV	9.6 MV	9.6MV	1.4 V	27 MV	Note 3
Announce Dictate	1000	1 MV	J-11	1 MV	10 MV	9.6MV	1.4 V	140 MV	Note 3
Announce Dictate	3000	1 MV	J-11	1 MV	10 MV	10 MV	1.2 V	500 MV	Note 3

				3Q1 Base	3Q1 Coll.	Board 3 Pin 4	Board 3 Pin 14	3Q2 Base	3Q2 Coll.	Board 3 Pin 15 (PU-2)	Conditions
Incoming Record	400	100 MV	L1,L2	65 MV	510 MV	480MV	60MV	10MV	1.3V	11 MV	Note 4
Incoming Record	1000	100 MV	L1,L2	56 MV	500 MV	390MV	48MV	7.4MV	1.0V	50 MV	Note 4
Incoming Record	3000	100 MV	L1,L2	56 MV	460 MV	460MV	58MV	6.7MV	1.3V	380MV	Note 4

NOTES:

1. Set in playback, volume pot maximum clockwise.
2. Set in announcement delivery, A1 pot (Board 2) maximum clockwise, 600 ohm load on L1, L2. During 1400 cycle test K4 1T & 2T blocked open.
3. Set in announcement dictate. Board No. 1 removed. Switch S7 blocked operated.
4. Set in incoming record. Board No. 1 removed.
5. All tests made with 117V 60 cps power source connected to P8.
6. AC voltages measured with AC vacuum tube voltmeter with 2 megohms minimum loading resistance.
7. Normal variations of ± 30% or greater from listed values may be encountered especially as signal progresses through amplifiers.
8. High frequency oscillator output level is checked with set in Announcement Dictate or Incoming Record with Board No. 1 inserted. Measure 35 VAC min. from Pin 7 Board 1 to ground (Erase level). Measure 28-30 VAC min. from Pin 5 Board 1 to ground (Bias level). Measuring instrument used to be per note 6 also must have accurate response to 50 KC or better.

Table 5. Model LP-TD-C DC Voltage Measurements.

BOARD NO. 1

Set Operation	1Q1			1Q1	1Q2			1Q3			1Q4			1Q5			1Q6			Pin 8	Pin 9	Pin 14	CR-6	Conditions
	Emitter	Base	Coll.	Return	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.					
Incoming Record								-1.15	+6.2	-12	-1.15	+6.2	-12	-.8	-.3	-7.7	-.4	-.6	-4.1	-12	-12		-12	No Sig In.
Announce Dictate								-1.15	+6.2	-12	-1.15	+6.2	-12							-12			-12	No Sig In. S-7 Pressed
Announce Dictate								-1.15	+6.2	-12	-1.15	+6.2	-12	-.8	-.3	-7.7	-.4	-.6	-4.1	-12	-12		-12	1400~ OSC Sig In S7 released
Playback	-1.9	-2.1	-4.4	-10.6	-2.7	-2.8	-10.4															-11.5	-11.5	No Sig In.

BOARD NO. 2

	2Q1			2Q2			2Q3			2Q4			Pin 9	AL Pot Setting	CR-6	Conditions
	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.				
Announce Delivery	-.9	-1.05	-6.2	-.9	-1.05	-6.0	-3.3	-3.5	-7.1	0	0	-12	-12	Set for -5 DBM OUT	-12	No Sig In
Announce Delivery	-.9	-1.05	-6.2	-.9	-1.05	-6.0	-3.3	-3.5	-8.6	0	0	-12	-12	Min (CCW)	-12	No Sig In
Announce Delivery	-.9	-1.05	-6.2	-.9	-1.05	-6.0	-3.3	-3.5	-8.8	0	0	-12	-12	Max (CW)	-12	No Sig In
Announce Dictate	-.9	-1.05	-6.2	-.9	-1.05	-5.7	-3.3	-3.5	-7.1	0	0	-12	-12	Set For -5 DBM OUT	-12	No Sig In

BOARD NO. 3

	3Q1			3Q2			3Q3			3Q4			3Q5			3Q6			Pin 5	CR-6	Conditions
	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.	Emitter	Base	Coll.			
Incoming Record	-2	-2.15	-8.6	-.23	-.38	-5.2	-2	-2.2	-10	0	0	0	0	0	-12	0	0	-12	-12	-12	No Sig In. Announce Mech Running
Incoming Record	-2	-2.15	-8.6	-.23	-.38	-5.2	-2	-2.2	-10	0	0	-2	-1.7	-2	-1.8	-1.7	-1.9	-2.1	-12	-12	No Sig In. Announce Mech stopped K8 1T and 2T shorted

MAIN CHASSIS

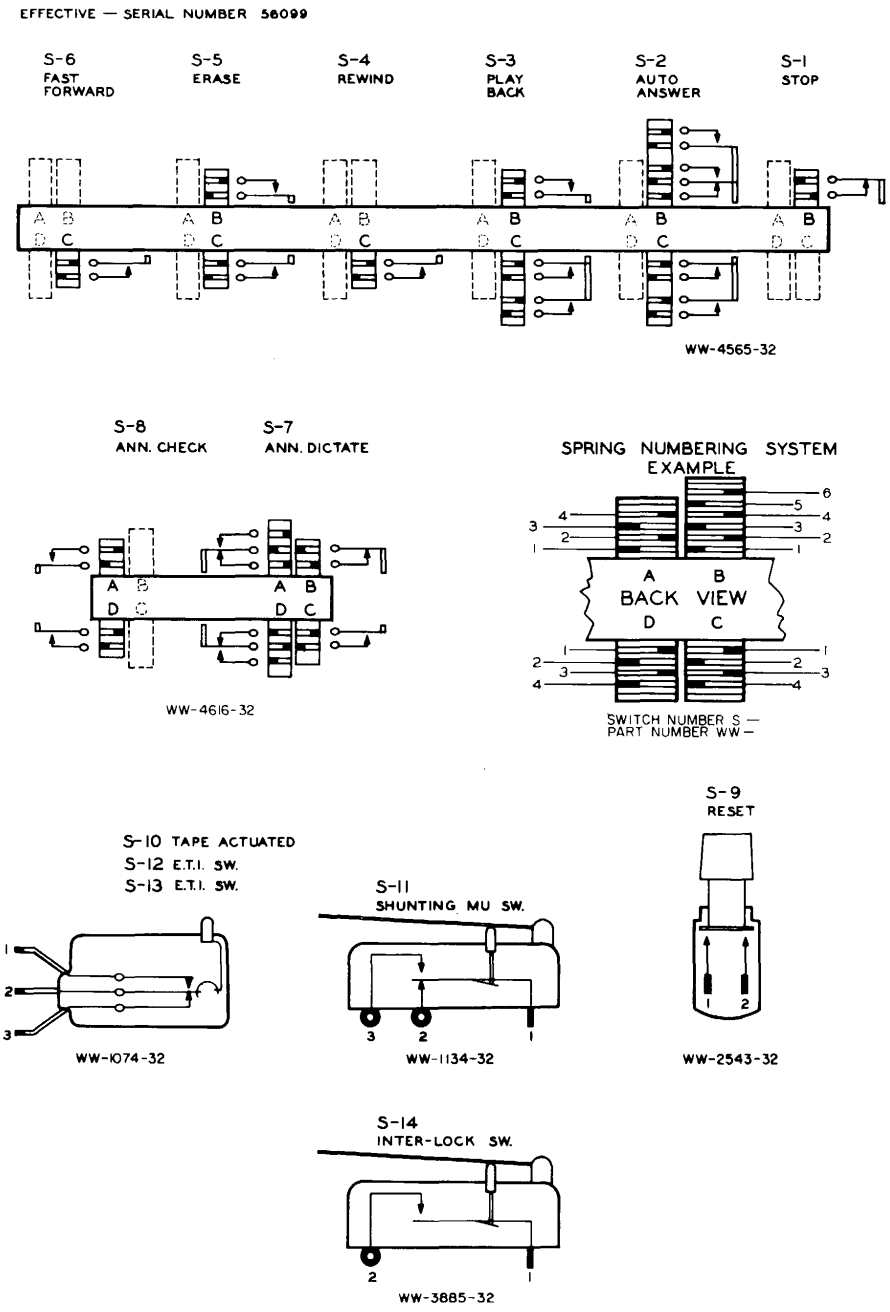
Set Operation	QP			Power Supply		
	Emitter	Base	Collector	Rectifier	First Filter	CR-6
Playback & Announce Check	-1.2	-1.45	-11.0	-26	-21	-11.5
All Except Playback & Announce Check				-27	-22	-12

NOTES:
1. All DC Voltages measured with 117 volt 60 cps power source connected to P-8.
2. All DC Voltages measured with vacuum tube voltmeter, having 11 megohms minimum loading resistance.
3. Normal variations of ± 20% from listed values may be encountered, and greater when voltages are influenced by control settings.

5. MODEL LP-TD-C SWITCH CONTACT LAYOUT

5.01 Table 6 illustrates the spring combinations of the various switches used in the Model LP-TD-C telephone answering set. The contacts are shown in their unoperated condition.

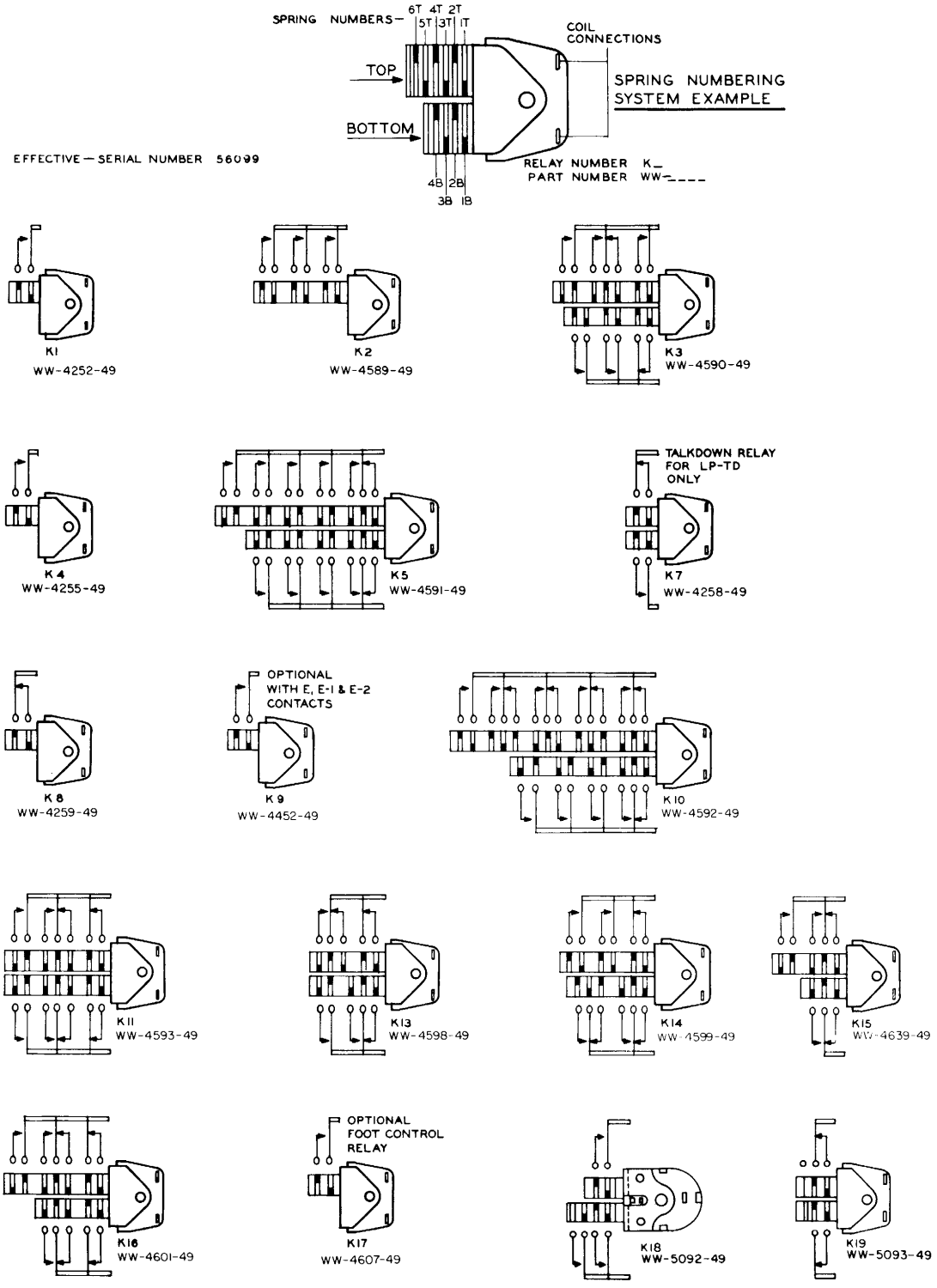
Table 6. Switch Contact Layout.



6. MODEL LP-TD-C RELAY CONTACT LAYOUT

6.01 Table 7 illustrates the spring combinations of the various relays used in the Model LP-TD-C telephone answering set and also illustrates the spring numbering system. The springs are shown in their unoperated condition.

Table 7. Relay Contact Layout.



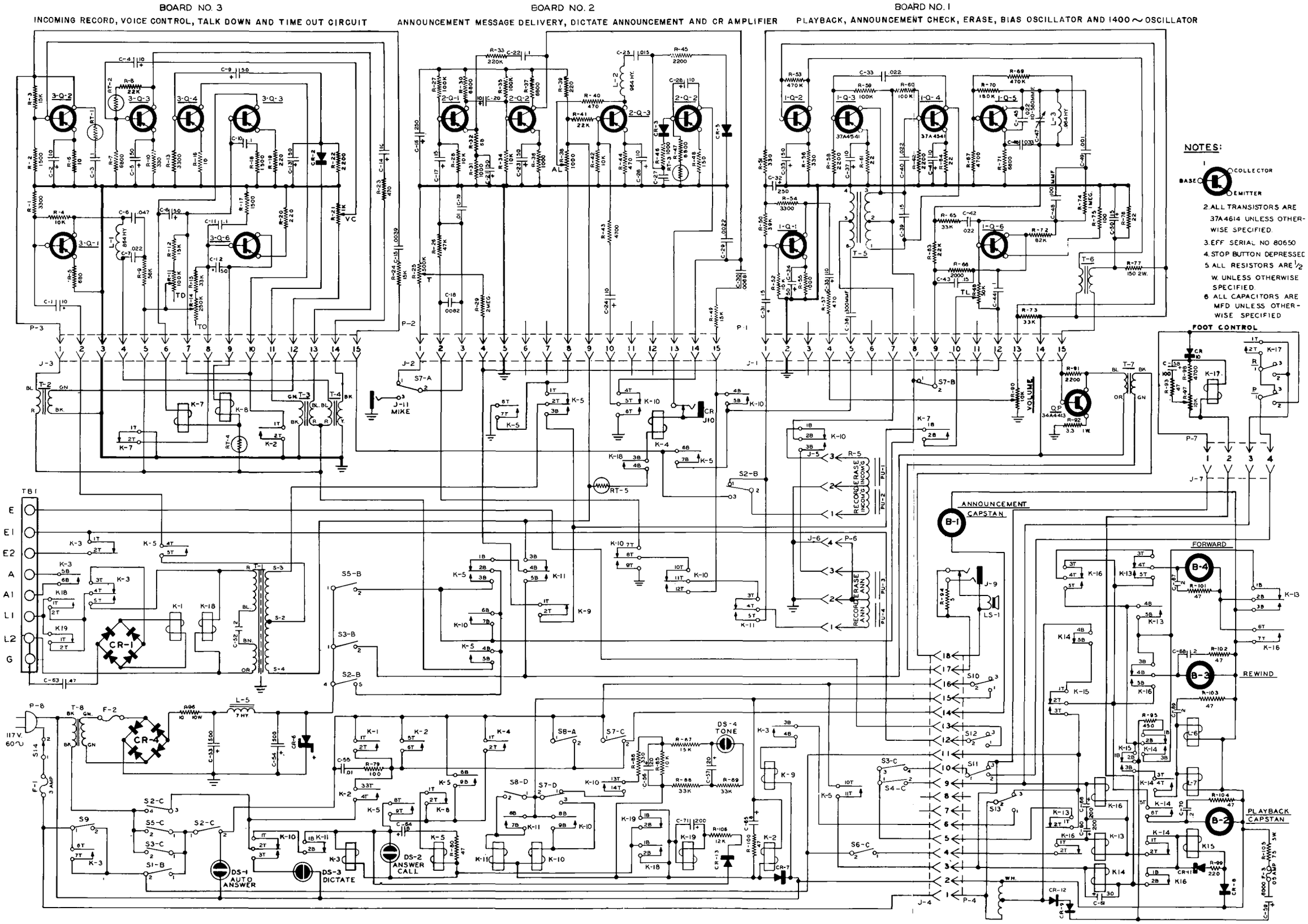


Figure 1. Model LP-TD-C Schematic (WW-5930-54E)