REWIND- @SC57

AMPEX

MAINTENANCE MANUAL FOR

TAPE RECORDER MODELS

1050, 1070, 1080
2050, 2070, 2080

SPEAKER MODELS

1015, 1016
2010, 2011

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7890021-03

SEP 1973

SPECIFICATIONS

Specification	Model			
	1070	1050/1080	2070	2050/2080
Pre-amp overall freq. response				
7-1/2 ips	50 to 15000 cps ±4db	50 to 15000 cps ±4db	50 to 15000 cps ±3db	50 to 15000 cps ±3db
3-3/4 ips	50 to 7500 cps ±4db	50 to 7500 cps ±4db	50 to 9000 cps ±4db	50 to 9000 cps ±4db
1-7/8 ips	50 to 4000 cps ±4db	50 to 4000 cps ±4db	50 to 5000 cps ±4db	50 to 5000 cps ±4db
Signal to Noise from peak record level at pre-amp				
7-1/2 ips	46db	47db	49db	50db
3-3/4 ips	42db	43db	45db	46db
1-7/8 ips	38db	39db	40db	41db
Tone Control Range				
100 cps	0 to +12db	N/A	0 to +12db	N/A
10KC	-4 to +10db	N/A	-4 to +10db	N/A
Power Output (rms) each channel	3 watts	N/A	6 watts	N/A
Flutter				
7-1/2 ips	0.15%	0.15%	0.12%	0.12%
3-3/4 ips	0.2%	0.2%	0.15%	0.15%
1-7/8 ips	0.3%	0.3%	0.25%	0.25%
Timing Accuracy				
7-1/2 ips	±1.5%	±1.5%	±1%	±1%
3-3/4 ips	±3%	±3%	±2%	±2%
1-7/8 ips	±4%	±4%	±3%	±3%
Fast Wind Time (1200 feet of tape)	130 seconds	130 seconds	130 seconds	130 seconds
Line Input Impedance	120K	120K	120K	120K
Microphone Input Impedance	1 megohm	1 megohm	1 megohm	1 megohm
Line Input Level	.2V min 2.0V max	.2V min 2.0V max	.2V min 2.0V max	.2V min 2.0V max
Microphone Input Level	3mv min 30mv max	3mv min 30mv max	3mv min 30mv max	3mv min 30mv max
Pre-Amp Output Impedance	1000 ohms	1000 ohms	1000 ohms	1000 ohms
Pre-Amp Output Level	.3 v min	1 V	.3 v min	1 V
Power Amp Output Impedance	8 ohms	N/A	8 ohms	N/A
OVERALL SIZE	19" x 13-1/2" x 7-1/2	N/A	19" x 13-1/2" x 7-1/2"	N/A
Mounting Frame	N/A	18-5/8" x 13" x 5-1/8"	N/A	18-5/8" x 13" x 5-1/8"
Weight	37 lb	27 lb	39 lb	29 lb
Power Requirements (Volume at minimum)	117vac at 1 ampere	117vac at .9 ampere	117vac at 1 ampere	117vac at 1 ampere

NOTE

This manual contains information relative to 1000 and 2000 series equipments. Anyone who is attempting repair, parts replacement, or adjustment should first READ THIS MANUAL. This will shorten trouble shooting time and expedite parts replacement. Please note the various paragraphs relating to specific repairs such as head replacement, torque measurements, etc.

The information in this manual is the latest available. As additional information becomes available, it will be presented on manual change sheets and/or service bulletins.

This manual supercedes all previously printed manuals of the same part number and Service Bulletins No. 1021 CD 1028 CD, 1044 DD, 1049 C,

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CIRCUIT DESCRIPTION

I Playback (Left Channel 2070 only)

During playback, signals from the tape cause a voltage to be induced in the playback head. Since this is a very low voltage, .5mv or less, amplification is required. Tube V1ab amplifies the low level voltage and applies it to volume control R23a. Resistor R23a controls the amount of signal applied to V2a. Output of V2a is applied through S6a and S5d to the tone control circuitry and thus to V2b. Output of V2b is used to drive NPN transistor Q1. Output of Q1 is transformer coupled to power transistors Q2 and Q3. Both power transistors have a small forward bias to eliminate turn-on distortion. When Q2 is conducting because of ac signal, Q3 is turning off due to lack of ac signal, and vice-versa. Capacitor C30 then alternately charges through speaker LS1 and Q2 to B- and discharges through LS1 and through Q3 and ground.

II Reverse Relay (Applying 20 cps Signal)

The mechanical reverse relay appears electrically as a very high Q parallel resonant circuit, thus requires a very small amount of signal power for operation and has a very narrow pass band. When the reverse signal is applied, the following occurs:

The armature of the relay oscillates because of mechanical coupling from REV SIG knob. Since the coil of the vibrator has a dc bias applied, there is an ac voltage developed as a result of the mechanical motion and changing flux path. This ac voltage (20 cps) is applied through S5J to the grid of V6a. Feedback from the plate of V6b applies every frequency except 20 cps back to the grid. The output at the plate, as the result of this feedback is a very low distortion sine wave and is applied through R142 to S5b and again S6d to S6a. Switch S5b is applied to S6a and S5a. The 20 cps signal is then applied to L6-C13, S4d, C8, and S3a to the record head L19 and signal is recorded on the tape. Coil L6-C13 and L5-C18 are traps to prevent the bias signal from getting into the amplifier circuits. Beat frequencies and overloading may result if the bias signal gets into the amplifiers.

NOTE

For reception of 20 cps signal from tape, see next paragraph.

III Reverse Signal (Received from Tape)

Assume tape is moving from left reel to right reel. This is the condition as shown on the schematics. When the 20 cps signal is on the tape, it induces a voltage into head L1a. The voltage is applied to V1ab, output of V1b is applied to S5a, and to the grid of V6a. Output of V6a is applied to grid of V6b. Output of V6b is applied through C82 and S5q to K3 (coil). This 20 cps signal causes the armature of K3 to oscillate (vibrate), causing closure of the vibrator contacts. When the contacts close, K1 is energized. This causes current flow from ground through L10 and closed contacts of K1b and K2a to 30 volt supply, causing the reverse solenoid L3 to operate. Resistor R58 provides hold-in current when K1 contacts open. When L10 operates, S10c contacts change state and the head switch S2a switches the heads. Relay K1 holds in for about 1/2 second because of capacitor C83. When the capacitor discharges, K1 de-energizes and relay K2 is not shorted by K1a contacts and its own contact K2a. Relay K2 therefore energizes because of current flow from ground through upper closed contacts of S10c, through R145, through K2 coil and to 30 volt supply. This causes K2a contacts to change state.

When a second 20 cps signal is received, relay K3 armature vibrates causing K1 to be energized. This causes K1a and K1b contacts to change state (for 1/2 second because of C83). Note that now contact K2a is also closed. Solenoid L3 is shorted by closed contacts K2a and K1b and thus de-energizes, causing motor B1 to reverse and playback heads are switched again by S2a. Contacts S10c go back to the position shown on the schematic. Relay K2 de-energizes, causing K2a contacts to go to position shown on schematic. When the next 20 cps signal is received, K2 will not energize immediately, because it will again be shorted by contacts K2a and K1a when K1 energizes. It will only energize after the motor reverses.

When a plug is inserted into J8, the following occurs:

a. A 30 volt dc pulse of about 1/2 second duration is applied to a projector actuator or other device.

b. The reverse solenoid L10 contacts S10a, S10b, and S10c will not change state because when the plug is inserted into J8, L10 cannot be shorted by K1b and K2a contacts, thus recorder always moves in the same direction unless manually reversed. Relay K2 cannot energize because the second pair of contacts on J8 are also open and the lower part of K2 cannot be grounded.

REPEAT MODE OPERATION

When the play/record knob is in Auto Play, the recorder will reverse automatically in either direction as described previously.

AUTO PLAY MODE OPERATION

When the play/record knob is set to the Auto-Play position, the recorder will play from left to right, reverse as described previously, then will not reverse even if another 20 cps signal is recorded in the right to left direction. The recorder will simply disengage itself. If the AC switch (2000 series only) has been used as a slumber switch, the recorder will shut off completely. The reason is as follows:

The lower contact of K2a will not be grounded by S5s when in the Auto-Play position. This is the position shown on the schematics for S5. Thus when the first 20 cps signal causes K1 to energize, the reverse solenoid L10 operates reversing the motor. Relay K2 will momentarily energize, then de-energize

as K2a contact does not have a ground return. However, reverse solenoid L10 has hold-in current supplied through R146 and remains energized. When the second 20 cps signal causes K1 to energize, reverse solenoid L10 will not be shorted by contacts K1b and K2a, because K2a will not be at ground potential. Thus the 20 cps will come and pass and the recorder will remain in motion from right reel to left reel. When the tape is exhausted from the right reel, the tape tension switch S11 will open and remove power from the reverse solenoid and play solenoid. The recorder will therefore go into neutral (no tape motion) and the motor will return to the rotation giving left to right tape motion. If the slumber switch is used, when the play mechanism returns to neutral, micro switch S9 will open removing power from recorder completely.

MONITOR CIRCUIT

During record, it may be desirous to monitor what is being recorded onto the tape. In models 1070 and 2070, switch S7ab applies a very small signal to the inputs of the power smplifier. The speakers therefore produce very low volume signals when the Monitor switch is on. The models 1050, 1080, 2050, and 2080 have the same feature except that the switch is a front panel control (S14abc).

CHANNEL 2 (RIGHT) OPERATION

The right channel operation is almost the same as left channel operation except that the reverse signal is not associated with this channel.

POWER SUPPLY

The power supplies are conventional. The higher voltage power supply uses a voltage doubler. The lower voltage power supply is full wave.

BIAS OSCILLATOR

The bias oscillator is a tuned push-pull oscillator operating at a frequency of approximately 100kc. Its output is transformer coupled to the erase heads. Bias power for the record heads is supplied through variable capacitors C12 and C49.

REMOVAL OF RECORDER FROM CASE

Top Plate Removal

1. To remove the top plate the plastic head cover and the lower front trim strips must be removed. The head cover is removed by pressing inward along the inside surfaces and lifting off the head cover. The lower front plastic trim strip is removed by pushing inward slightly on the inside edge facing the heads and lifting off. If plastic reel covers and auto-thread reels are installed, they also must be removed.

2. Remove the four Allen screws at upper and lower ends of top plate. Remove the 2 Phillips screws which were beneath the head cover and the two which were beneath the lower front plastic trim strip.

3. The top plate will slide off towards the reels.

CASE REMOVAL

1. To remove the recorder from the case, remove two Phillips screws in each side casting. These are castings at sides which have speaker parts in them.

2. Remove the two Phillips screws at the top of case securing the large decorative casting. These are exposed when top plate is removed.

3. Remove the two Phillips screws at the bottom of case securing the large decorative casting. These are also exposed when top plate is removed.

4. Lift out recorder from the case.

5. The case is installed in reverse manner of removal.

CAPSTAN DRIVE BELT REPLACEMENT

To replace the capstan drive belt (flywheel drive belt), proceed as follows:

1. Refer to the capstan drive belt illustration. Remove the pin at the bottom of the play solenoid. This allows the plunger and brass rod to be removed from the solenoid.

2. Remove the four screws as shown in the illustration.

3. Carefully remove the defective belt from motor pulley and shift fork. Lift up on the capstan housing thrust plate and belt will slide out from beneath thrust plate. Note that the play actuator lever must be moved to allow easy removal of belt.

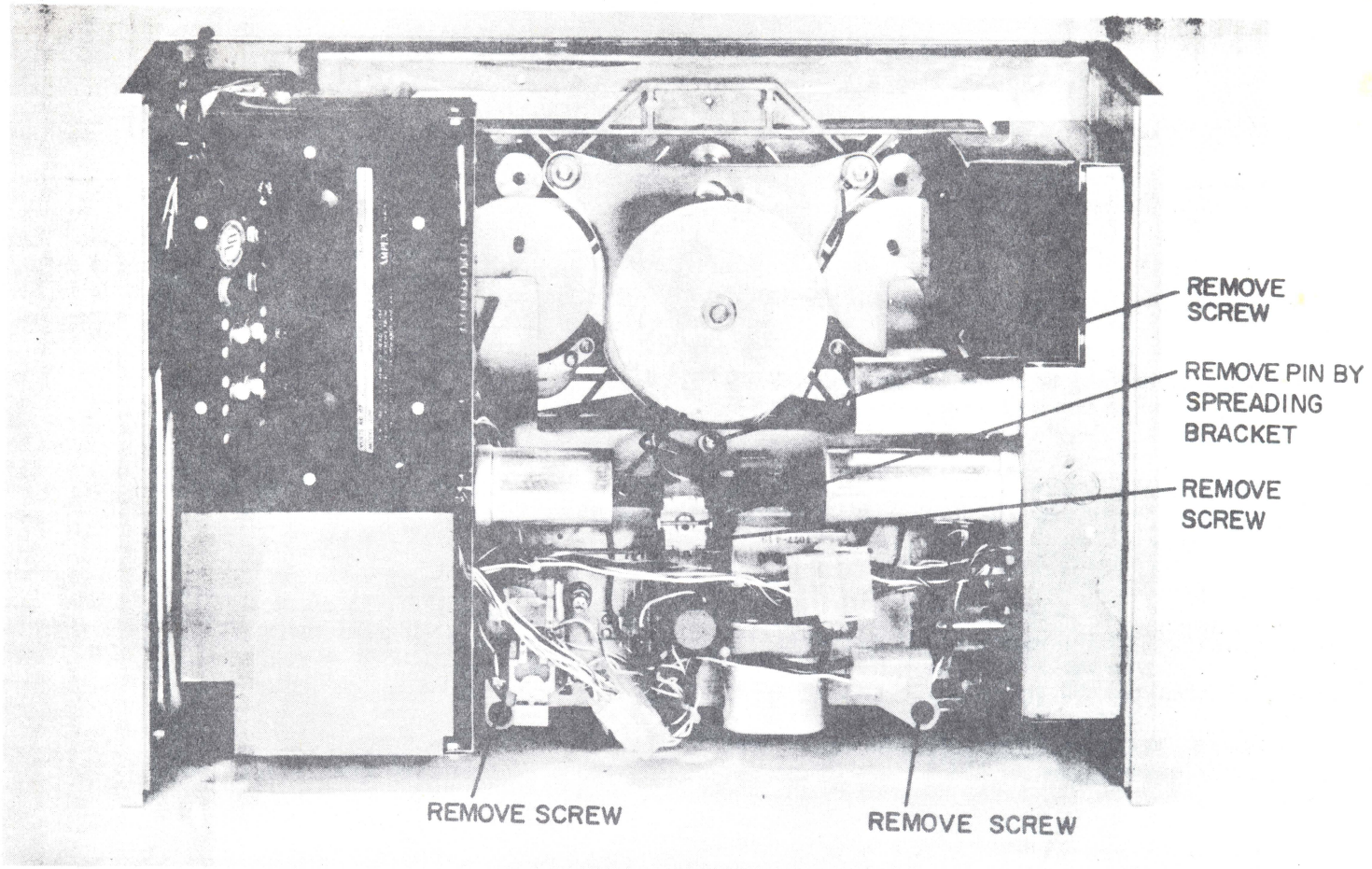
4. Replace belt in reverse manner of belt removal. Carefully install on motor pulley and in belt shift fork.

5. Replace screws in capstan housing and plunger into play solenoid.

6. Replace pin in play solenoid. Replacement is complete and recorder is ready for use.

TORQUE MEASUREMENTS

Torque is a measured force times the distance between the point of measurement and a pivot point. For example, 5 oz. in. of torque would be a force of 5 oz. at 1 inch from the pivot point. A wheel 3 inches in diameter requiring 2-1/2 oz. of pull to move or prevent from moving represents a torque of 3.75 oz. in. (1.5 x 2.5). In the case of an arm or rod, the force required to move or hold stationary must be at right angles to the arms or rod. Otherwise torque measurement will be erroneous. In addition, static friction and or inertia sometimes must be overcome. Therefore, it is adviseable when measuring torque to move the reel very slowly in direction of reel take-up to relieve friction or inertial effects when measuring reel holdback and take-up torques. Note that the torque indications will be different when gauge is held stationary and when gauge is just moving. When measuring holdback tension, note torque measurement after reel has just started to rotate because of pull placed on reel by spring gauge and pull on gauge is steady while reel just rotates.



Capstan Drive Belt Replacement

EQUIPMENT REQUIRED FOR MECHANICAL CHECKOUT AND ADJUSTMENT

The following equipment or its equivalent is required for mechanical checkout and adjustment:

Spring gauge, 0 to 8 oz.
0 to 32 oz.
0 to 64 oz.

a. Flutter Meter, Varo Model FL3D

b. Long Nose Pliers

c. "E" Ring Pliers

d. Set of Allen Wrenches

e. Phillips Screwdrivers

f. Head Cleaner, Ampex P/N 010823

g. Head Demagnetizer, Ampex P/N 010820

h. Flutter Tape, Ampex P/N 31326-01 (7-1/2 ips) and 31336-01 (3-3/4 ips)

j. Alignment Tape, Ampex P/N 31321-04

k. Reel of blank (erased) tape of type to be used on recorder.

l. Ammeter, AC, 0 to 3 amperes

m. Special reel - consists of two standard 3 or 4 inch hub reels which are cemented together. Enables accurate torque measurements. Reel has string or tape installed on top reel, thereby preventing tape or string from rubbing on frame casting.

MECHANICAL CHECKOUT AND ADJUSTMENT

Preliminary Requirements

The following are required for all tests and adjustments unless otherwise specified:

a. Line voltage at 117 VAC.

b. Pre-amp output terminated with 100,000 ohm resistor.

c. A filter, down 3 db at 30 and 18,000 cps must be used for all noise measurements. (See filter construction details).

d. Demagnetize the heads, capstan, and tape guides. Check for cleanliness also. If necessary, clean with head cleaner.

Mechanical Checks

a. Apply power to the recorder. Measure the AC line current with the recorder in neutral (no motion). Line current should be approximately one ampere.

b. Supply Reel Holdback Torque. The supply reel holdback torque should be between 1.9 and 2.7 ounce-inches in both forward and reverse PLAY modes.

The supply reel holdback torque should be between .7 and 1.4 ounce-inches in both forward and reverse WIND modes.

If torque is not within the above limits, adjustment can be made by moving the triangular shaped bracket beneath the casting. (Refer to illustration.) The screw is loosened and the bracket is moved in the direction necessary to give proper holdback torque. Then the screw is tightened. The adjustment is the same for both reels.

NOTE

The supply reel will become the take-up reel and vice-versa, depending upon tape motion.

c. Take-Up Torque. The take-up reel should have a torque of between 1.9 and 2.7 ounce-inches when in forward and reverse PLAY modes

If torque is not within this limit, adjustment can be made by turning the screw which changes spring tension on the white hold-back pulley. This is the white pulley having the small black tire which engages with the large white turntable pulley.

d. Capstan Idler Pressure. In the PLAY mode, a force of 2.3 to 2.65 pounds applied at right angles to the capstan idler arm at the capstan idler shaft should just lift the idler clear of the capstan.

If the force required to just disengage the capstan idler is not within the above limit, adjustment can be made by turning the screw at the lower right of the left hand idler or at the lower left of the right hand idler. (Refer to illustration.)

e. Speed. The average speed with a tape pack radius of 2 to 2-1/2 inches on each reel should be as follows:

7-1/2 ips - plus or minus 1%
3-3/4 ips - plus or minus 2%
1-7/8 ips - plus or minus 3%

f. Fast Wind Time. The time required to transfer 1200 feet of 1-1/2 mil tape from supply reel to take-up reel should be 120 seconds or less.

g. Flutter. Flutter should be measured using Ampex Flutter Tape, part number 31326-01. Flutter at 7-1/2 ips should be 0.12% or less, 3-3/4 ips, 0.15% or less, and at 1-7/8 ips, 0.25% or less. These specifications are for tape movement in either direction.

LUBRICATION

MOTOR LUBRICATION

The motor bearings should have several drops of Ampex Oil P/N 01-0825 after each 1000 hours operation. A small oil port is located on each bearing casting. Do not allow oil to run out between bearing and motor shaft as this is an indication of excessive oil. This oil is similar to OC-11 lubricant.

TRANSPORT MECHANISM LUBRICATION

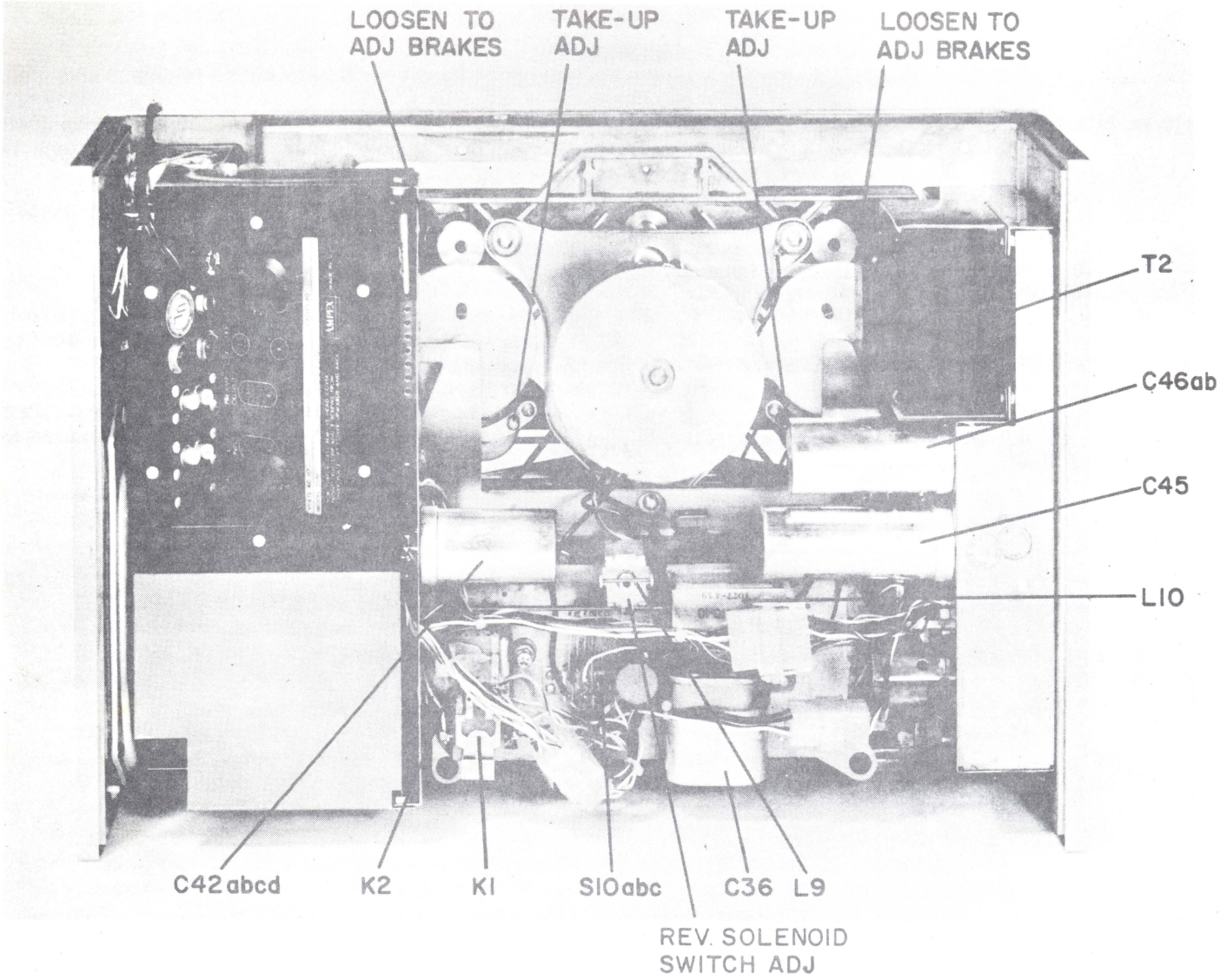
Lubrication of the tape mechanism can be performed by using the following recommendations:

1. Use Ampex P/N 087-060 (grease similar to Shell BRP#1) on all moving but not rotating parts such as yoke bearings, etc.

2. Use Ampex P/N 087-516 (fluid, d.c. 266,000 centistokes), on the tape tension switch (beneath casting) ONLY.

3. Use Ampex P/N 087-527 grease to deaden ringing sounds where necessary. It should never be used on fast moving or rotating parts.

4. Use Ampex P/N 01-0825 on all rotating or fast moving parts. This is the same type oil as is used to lubricate the motor.



Adjustments (beneath deck)

MECHANICAL TROUBLES AND PROBABLE SOLUTIONS

PROBLEM	POSSIBLE SOLUTION
Tape sticks in tape guide	Check brass tape guides. The clearance between tape guide over capstan idler arms shall be approximately .005. It is a MUST that the tape guide shall not, at any place, touch either the idler arm or the capstan roller. If necessary, adjust tape guide as required, by cautiously bending tape guide over idler arm. Check tape for proper width.
Poor speed change action	Position speed selector knob at 3-3/4 ips (center position) and pull compensating rod into selector knob nest; rod shall enter freely. Reposition selector knob at 1-7/8 and 7-1/2 ips (the two extreme positions) and repeat check as above (3-3/4 ips). The compensating rod shall enter the knob nest as freely as possible in both extreme positions. Equalize any interference by bending rod as required.
Poor slack take-up	Place assembly horizontally and check the slack take-up lever: The lever shall have from .010 to .032 clearance between the delrin tube and the left-hand capstan idler cam. To adjust, insert the tip of screwdriver in slot at the lower right tab and open it as required. NOTE: Use a thick enough screwdriver blade to open tab so that it will not nick and/or damage lever; make sure that lever stays flat. Actuate play knob back and forth; it should operate freely.

PROBLEM	POSSIBLE SOLUTION
Poor record slide operation	Check record slide operation. Position recorder vertically on bench, turntables on top and front toward operator. Put play knob in PLAY mode and check. Approximately 1/64 clearance shall be required between record slide lock-pin and top surface of record locking lever. With record slide pushed down, again put play knob in play mode and check. Approximately the same clearance (1/64) should be available between record slide lock-pin and lower surface of record locking lever. Finally, with record locking lever open, push record slide down and watch clearance between record slide lock-pin and lip of record locking lever; there shall be a minimum of .010 between the two. If required, bend record locking lever as required.
Poor take-up in play/record operation	Check play wind pulleys. Position recorder vertically on bench, turntables up, and check. Hold play knob in PLAY mode, push each pulley over spring, and watch; pulleys shall seat with recess onto play drive pulley springs. Further, pulleys shall very freely return fully against play actuator when gently released. Hold play knob in play position and check; a minimum of .005 to a maximum of .037 clearance shall be available between actuator and end of play wind pulleys. To adjust play, bend tonque in center of actuator as required, with a screwdriver.
Auto reverse does not function	Check reverse solenoid reverse rod. Reverse rod shall operate freely; it shall be straight and shall not in any way interfere with other parts, such as wires, etc., within the full length of its travel. If required, gently straighten rod by hand. Also check that the head shift switch is not binding and moves freely.
Check top and bottom reverse solenoid brass rods.	"E" rings should have between 1/32 and 1/16 end play over thrust plate actuating lever. If required, reposition "E" rings with grip ring pliers. CAUTION: To prevent "E" rings from excessive opening and falling out, at all times keep the grip ring plier properly adjusted. Plier stop shall be so adjusted, that "E" shall fit over rods snugly.
Tape rides out between capstan and idler wheel.	Check and adjust (2) capstan idler arm tension. Use any small rod or Allen screw bit and gently pull auto-tape switch delrin sleeve up with finger and insert rod through magnetic casting hole to hold tape switch up. CAUTION: Do not bend parts. With Allen screwdriver, loosen the two idler rollers retaining screws part way, and turn recorder in PLAY mode. P/U Chatillion scale and string loop, insert loop over one of two idler rollers. Set marker to zero on scale, and pull scale tangent with center line of idler roller and capstan. Watch rotation of idler roller carefully, and stop pulling scale at the instant that roller ceases to rotate. Scale shall read between 2 lb. 3 oz. and 2 lb. 13 oz. If tension is too high or too low, adjust cam screw as required. Repeat operation to check the other idler. Be sure that cam screw nuts are retightened after readjustment.
Poor tape pack and excessive flutter	Set speed selector at 7-1/2 ips. Actuate play knob and run transport in play mode and forward (directional knob to the right). Check take-up torque at right turntable; torque shall measure 1.7 to 2.9 oz.-in., on gage. Adjust nylon screw over banana spring at right clutch under transport as required to bring torque within specifications.

PROBLEM	POSSIBLE SOLUTION
	Keep transport running in same direction; check holdback brake torque at left turntable. Torque shall again measure 1.7 to 2.9 oz.-in., as above. Adjust brake lever as required with adjusting fork to bring torque within specifications. Secure lever by locking screw under turntable at left. CAUTION: Never loosen brake lever locking screw more than 1/4 turn to prevent index extrusion on lever from coming off index hole of base plate. Reverse motion by pulling directional knob all the way to the left. Check take-up torque at the left turntable; as above.
Tape spools from supply reel.	Check holdback brake - wind mode. With transport positioned on fixture, head assembly in front, run transport in forward, wind mode. Check holdback torque.
Fast wind poor or slow.	Check fast wind. Use a full (1100 ft.) reel of tape and load on recorder turntable horizontally positioned on bench; load an empty, small hub (1100 ft.) reel on remaining turntable; thread a maximum of 25 ft. of tape from the full reel and stop recorder. Locate directional knob to pull tape from the full reel, and start recorder with fast wind knob in wind mode. Watch the reel with the 25 ft. of tape; it should start immediately as fast wind knob is actuated and with normal speed. If the near empty reel is too slow to start, or it stops completely, clean wind belt, wind pulleys, tires and brake drums with a clean rag dampened in toluol. If it fails again, the drive brake drum under the full reel of tape may have too smooth an O.D. surface. It then cannot adequately be driven by the wind pulley tire because it slips and the only solution left is to replace the brake drum. P/N 425 5007. When a brake drum has been changed on a recorder, the unit should be rechecked, and if required, readjusted for holdback brakes, clutches, and the .005 to .037 clearance between actuator and end of play wind pulley. Check auto-tape switch. Use a full (1100 ft.) reel of tape on turntable at the side of auto-tape switch. Thread tape through head, and wind a small amount of tape on opposite reel (approx. 25 ft.) Position recorder vertically on bench and run it in play mode and at 7-1/2 ips; reverse directional knob and see that the auto-tape switch does not fully open while the slack in the tape is being taken up, and in so doing, stop the mechanism. Repeat the reversal several times; the mechanism should not come to a stop. If defective: Disassemble end frame and power supply, and disassemble dampener by removing grip ring with a grip-ring pliers properly adjusted so that ring is not over-expanded. Completely and neatly clean I.D. of dampener and O.D. of switch with cloth dampened in toluol. With Dow Corning tube squeeze an ample amount of fluid over flat side of nylon rod for approx. 1/2 inch from end, and apply fluid over entire surface of tape switch bearing O.D. Again, squeeze an ample amount of fluid on round side of nylon rod for approx. 1/2 inch from end and apply over entire surface inside dampener bearing. Reassemble dampener over tape switch. If above operation has been carefully done clean, and if a thick layer of fluid has been applied over entire surface of both parts, reassemble parts, clean surplus fluid over the outside of parts, and the tape switch will now open at a slower rate, allowing time for the tape to take up. Reassemble thrust washer and grip ring. Approximately .004 clearance is required between grip ring and thrust washer; reassemble power supply and end frame.

PROBLEM	POSSIBLE SOLUTION
Fast wind knob does not remain engaged.	Check fast wind knob engagement. With tape on, position recorder vertically on bench and run in reverse play mode. Gently move directional knob to the right to pick up knob blacklash (being careful not to distrub solenoid bottoming) and hold directional knob in this position. Carefully push play mode knob down to stop mechanism, and open fast wind knob. Fast wind knob shall open without interference from interlock lever under control plate assembly. If there is interference, the reverse solenoid may not be properly adjusted (see electrical problem and solution). If reverse solenoid adjustment is proper, then the control plate assembly may be defective and should be replaced.
High flutter.	Turn recorder on and check wow and flutter in forward and reverse, at 7-1/2 and 3-3/4 speed. If flutter contents read higher than specified, proceed as follows: (1) check tape guides on top of idler arms; guides may rest too tight on arms and prevent pinch rollers from applying adequate tension on tape. Further, tape guides may be up too far and touching idler pulley when rotating. If so, readjust tape guides to the .005 clearance specification. Use soldering aid to bend guides gently up or down. (2) With a Q. tip saturated with Ampex head cleaner, gently clean faces of magnetic heads, capstan, tape guide washers and spacers. Check to see if capstans are touching tape guides, tape guide washers, or if idler pulleys may be touching tape guide washers. If so, disassemble head assembly, reposition parts, and reassemble. If flutter reading remain higher than specifications at 3-3/4 speed, replace flywheel belt. Recheck for flutter. If flutter is still high, replace flywheel at take-up reel side of transport (depends upon tape movement).

PRELIMINARY REQUIREMENTS FOR ELECTRICAL CHECKS AND ADJUSTMENTS

The following equipment or its equivalent is required for making electrical checks and adjustments. Also refer to mechanical checkout and adjustment section for additional equipment.

a. 2 - 100k resistors

b. 1 - Noise filter (see construction details)

c. 1 - 100/1 capacitive voltage divider (see construction details)

d. 1 - Oscillator, hp 200cd

e. 1 - ACVTVM, hp 400h

f. 1 - Oscilloscope, general

g. 4 - Interconnecting cables and jacks

h. 1 - #1820 28 volt lamp

j. 1 - Varo Flutter Meter, Model FL3D

k. 1 - Variable Voltage Transformer (3 amp)

l. Head Cleaner Ampex P/N 7010110-01

PRELIMINARY CHECKOUT INSTRUCTIONS

For all tests, the pre-amp outputs must be terminated with 100k resistors. Cable lengths to test equipment must be kept as short as possible.

NOISE FILTER

A schematic for the noise filter is shown below. All components should be mounted inside a metal box. The connectors are banana plug type, spaced on center 3/4 inches apart.

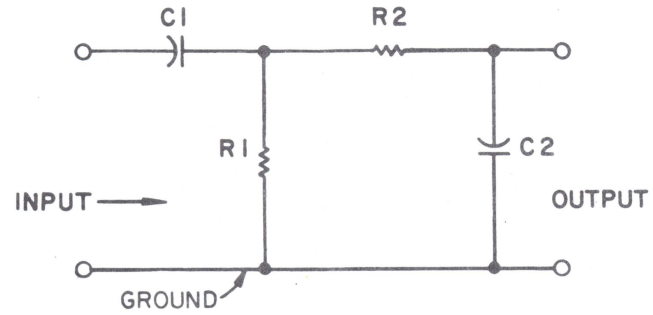
100/1 CAPACITIVE DIVIDER PROBE

Construction details are given for the 100/1 capacitive divider probe. All components must be well shielded to prevent hum pick-up. This probe reduces loading effects to about 3 pf when connected to circuitry. The probe is accurate only when connected to an ACVTVM having an input impedance of 10 meg ohms shunted by 25 pf.

ADJUSTMENT OF PROBE (frequency compensation)

Probe adjustment is made by applying a 1 volt 100kc sine wave to the tip of the probe. The acvtvm is set to the .01 volt range and capacitor C2 is adjusted so the acvtvm indication is .01 volt. The probe will be calibrated accurately enough to cover all Ampex tape recorders.

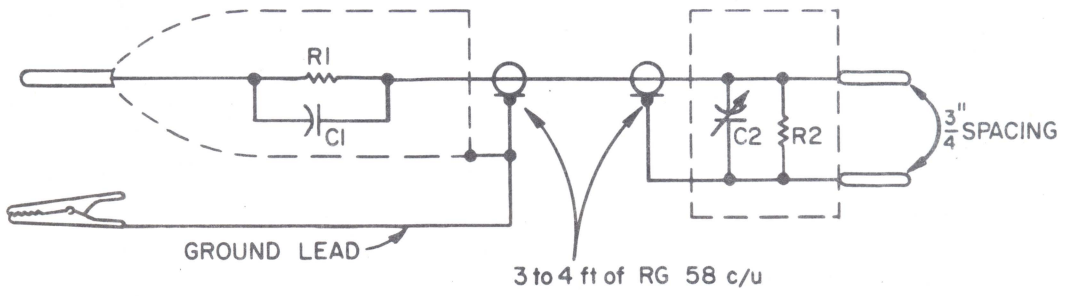
NOISE FILTER



R1, 100K, ±5% ½W C1, .05 UF, ±10%, 400 VDCW

R2, 10K, ±5%, ½W C2, 750 PF, ±5%, 400VDCW

100/1 CAPACITIVE DIVIDER PROBE



R1, 50 MEG ±5% ½W C1, 2.2 PF ±5% 500 VDC

R2, 680K ± 5% ½W C2, 60-350 PF, VARIABLE

HEAD REPLACEMENT AND ALIGNMENT

Head Replacement

Should any of the heads require replacement the following method should be used.

1. Remove top cover plate. Then remove the three screws securing the head mounting assembly. This will allow easy access to the heads.

2. Remove the three screws securing the defective head to the head assembly.

3. Unsolder the four wires from the defective head noting from which terminals the various wires are removed.

4. Resolder the wires to the replacement head using a 15 watt newly tinned iron. Make the soldering connections very quickly to avoid damaging the replacement head.

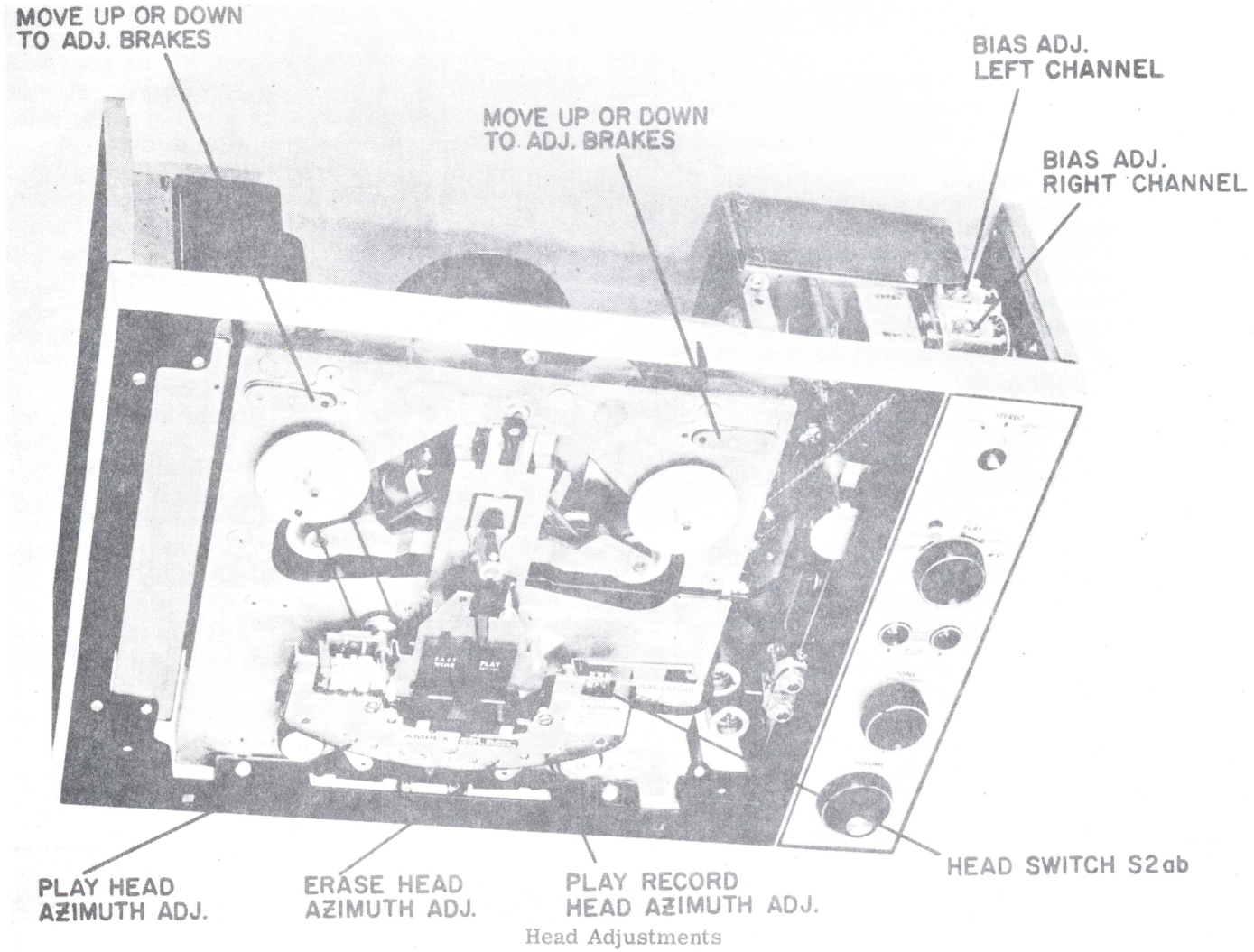
5. Install the head to the head mounting casting. Make sure the three springs are re-installed to allow for head adjustment.

6. Reinstall the head assembly on the recorder and thread tape on recorder.

7. Carefully turn the three screws so that all planes of the head are perpendicular to the tape. The shiny part of the head must be exactly parallel to the oxide surface of the tape. The brass liners in the head should be visible when looking at the head after tape is put on transport. The upper edge of the upper pole pieces of the head should just come to the upper edge of the tape. Using alignment tape P/N 31321-04, adjust the 3 head screws for equal output of each channel using 3kc tone.

8. Using alignment tape P/N 31321-04, adjust the azimuth screw (see illustration) for maximum output using the 15kc tone.

9. The erase head azimuth is adjusted by visually observing that head height is correct and that the head gaps are at right angles to tape. Then record a 15k signal (tracks 1 and 3) at operating level as determined by record neon lamps. Interchange the reels and erase (record level at ZERO) tracks 2 and 4. Then put recorder in reverse play (right to left tape motion) and measure output on original tracks on which 15kc signal was recorded. The signal should be within the recorder frequency specification at 15kc. If 15kc signal is out of specification, it is most likely because the erase head azimuth or height is improper and requires adjustment. Adjust as required.



Head Adjustments

1050/1080/2050/2080 ELECTRICAL CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT	TAPE RECORDER CONTROL SETTINGS				
	SPEED	MONO/ STEREO	REC/PLAY	OFF-ON- MONITOR	VOLUME
PLAYBACK NOISE (each channel) Connect the noise filter to the input of the ACVTVM. Connect the input of the noise filter to the left pre-amp output connector. The ACVTVM indication with tape removed from operating transport should be 27mv or less. Set the speed selector to 3-3/4 ips. The ACVTVM indication should be 37mv or less for operating tape transport with tape removed. Repeat for other channel.	7-1/2	STEREO	REPEAT (2050) PLAY (1050)	ON	Max. CW
PLAYBACK FREQUENCY RESPONSE Connect the ACVTVM to the left pre-amp output connector. Put the standard alignment tape on the recorder. Play the 15kc tone. Adjust the azimuth of the right hand play/record head (left to right tape motion) for maximum indication on ACVTVM. Then connect ACVTVM to right pre-amp out and furtner adjust azimuth for compromise output between the two channels. Azimuth adjustment is made by adjusting the rear-right-hand screw only of the head. Reverse tape and repeat for other head using rear left hand screw. Put tape in reverse play direction and adjust left-hand head azimuth for maximum compromise output as was done for play/record head. Play the 700 cps tone which is operating level. Adjust the left channel volume control to maximum clockwise position. The ACVTVM should indicate between 1.1 and 1.55 volts. Record this indication as it will be used to adjust record level neon indicators. Adjust volume control so ACVTVM indicates .7 volts. Play 50 cps tone on tape. ACVTVM indication must be between .19 and .35 volts. Playback the 100 cps tone. ACVTVM indication must be between .24&.35volts. Playback of 250 cps to 15,000 cps must be between .16 and.32 volts on ACVTVM. Repeat the playback frequency response check for right channel. Then repeat above for tape movement right to left (reverse direction).	7-1/2	STEREO	REPEAT (2050) PLAY (1050)	ON	Mid-Pos.
RECORD LAMP CALIBRATION Apply 500 cps at .1 volt into the left line input. Using a bulk erased tape of the type normally used with the recorder, record several feet of tape. Rewind the tape. With the ACVTVM connected to the left pre-amp output connector, play tape and notice ACVTVM indication. Suppose the indication which was recorded from 700 cps tone at operating level was 1 volt and the ACVTVM indication is now 1.5 volts.	7-1/2	STEREO	RECORD	ON	Max. CW

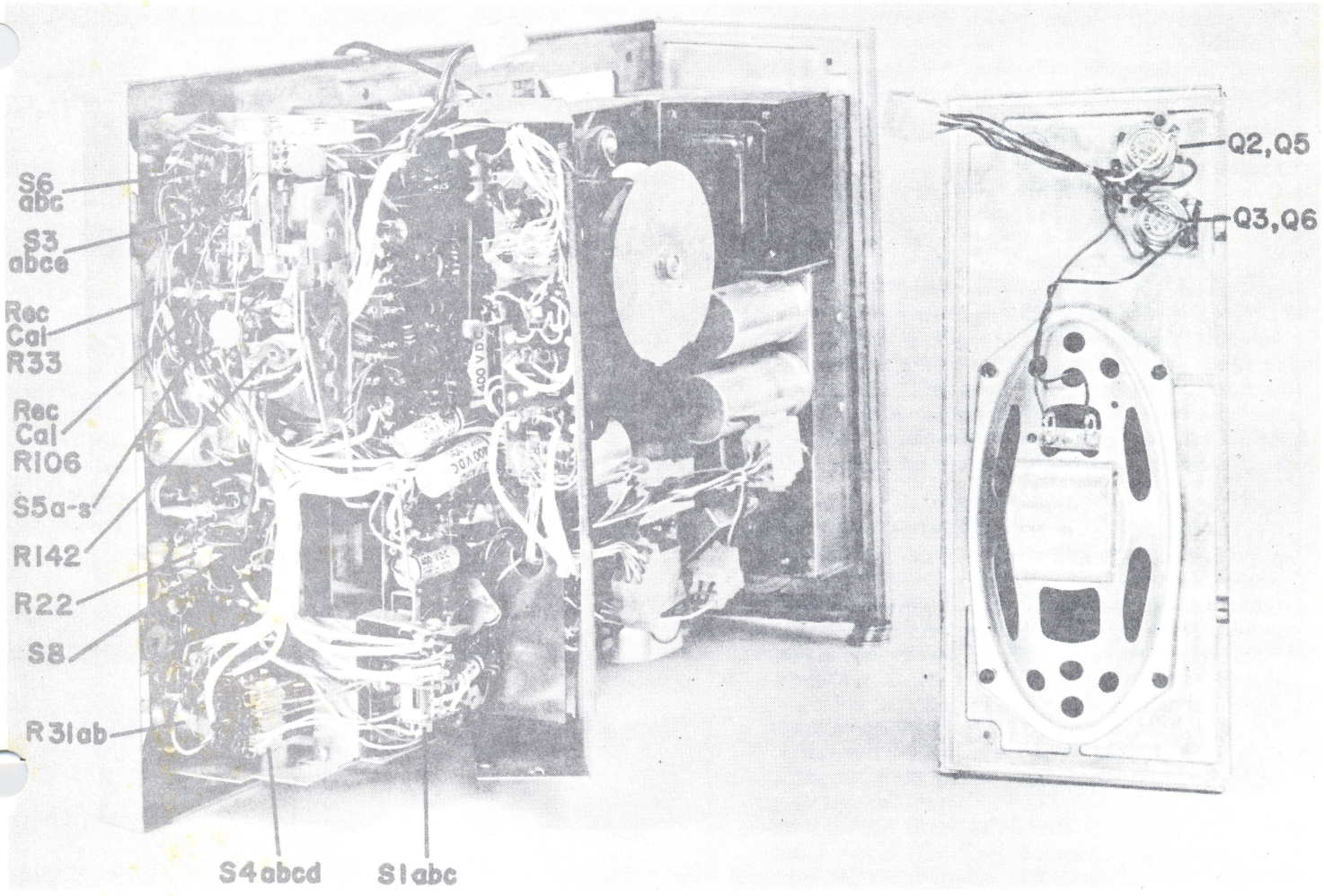
1050/1080/2050/2080 ELECTRICAL CHECKS AND ADJUSTMENTS (CON'T)

CHECK AND ADJUSTMENT	TAPE RECORDER CONTROL SETTINGS				
	SPEED	MONO/ STEREO	REC/PLAY	OFF-ON-MONITOR	VOLUME
RECORD LAMP CALIBRATION (CON'T) Reduce the line input voltage by 3.5db. Adjust R33 until the left channel record neon just lights and then back off R33 until the neon just extinguishes. Record level calibration is set for left channel. Should the level of the recorded tape be lower than 700 cps reference signal, then increase the line input by the difference in db. Repeat the above for the right channel. Record 700 cps signals at operating level (neon just extinguished). Upon playback with volume set at maximum, ACVTVM connected to pre-amp, connector should indicate between 1.1 and 1.55 volts. Repeat the above for the right channel. Adjust record level using R106.					
RECORD BIAS ADJUSTMENTS Apply 500 cps at 1 volt to both line inputs. Connect a 100/1 capacitive voltage divider to the record head side of C12. Adjust C12 for 35 volts (ACVTVM indicates .35 volts because of 100/1 attenuation). Connect the 100/1 capacitive voltage divider probe to the head side of C49. Adjust C49 for 35 volts (.35 volt indication on ACVTVM because of 100/1 divider). Adjust the left volume control so the left record indicator lights, then back off so the indicator lamp just extinguishes. Do likewise for the right channel. Reduce line input to .1 volts and make several minutes of recording at frequencies of 50, 500, 10,000 and 15,000 cps. Rewind the tape and play the recording with the ACVTVM connected to pre-amp output. Output should be within ±4db of output at 500 cps. If output at 15kc is high, increase bias voltage by 3 volts for each db high. For instance, if 15kc is 3db high, increase bias voltage by 9 volts, then recheck frequency. If 15kc is low, decrease bias voltage by 3 volts for each db low. Then recheck record/playback response. Repeat overall response check at 3-3/4ips speed. Do not adjust bias voltage. It is adjusted only at 7-1/2ips speed. Equalization should give proper frequency response. Set record level so indicators light, then back off so they just extinguish. Response at 3-3/4ips should be within ±4db from 50 cps to 9kc using output at 500cps or reference. Repeat record/play response check at 1-7/8ips. Do not adjust bias. Response upon playback should be +2, -6db using output at 250cps as reference.	7-1/2	STEREO	RECORD	ON	As req.
ERASE NOISE Place a bulk erased tape on the recorder. Apply 500cps at .5 volts into both line input connector. Connect the ACVTVM to the left pre-amp through the noise filter. Adjust both record levels for	7-1/2	STEREO	RECORD	ON	As req.

CHECK AND ADJUSTMENT	TAPE RECORDER CONTROL SETTINGS				
	SPEED	MONO/ STEREO	REC/PLAY	OFF-ON- MONITOR	VOLUME
ERASE NOISE (CON'T) normal record level (neon on, then just off). Then increase line input voltage to 2.2 volts and record several minutes of tape with input of 2.2 volts. Remove 500cps from line input. Insert shorted plugs into line input connectors. Rewind tape. Put recorder into record and erase the tape recorded with input of 2.2 volts. Then rewind tape and put recorder into PLAY. ACVTVM indication at left and right, pre-amp output should be 41db below output obtained when playing 700cps signal. For instance, if, when playing the 700cps signal on standard alignment tape with volume at maximum, the output voltage was 1 volt then the noise on the erased portion of the tape should be at least 41db below 1 volt. The noise level tolerance is the same for the right channel.					
CROSSTALK Bulk erase a tape of the type used when record bias was adjusted. Apply a 5000cps signal to the left line input connector. Short the line input connector to the right channel. Adjust the amplitude of the 500cps input until the left record indicator lights, then decrease until record lamp just extinguishes. Record several feet at this level. Then put the recorder into reverse play. With the ACVTVM connected to the right pre-amp output, indication should be .016 volts or less. Apply 5000cps to right line input. Short left line input connector. Put recorder into forward record and record 5000cps at normal recording level. Connect ACVTVM to left pre-amp output connector. Put recorder into reverse play. ACVTVM indications should be .016 volts or less.	7-1/2	STEREO	RECORD	ON	Max. CW
NOTE: This completes electrical check and adjustment for Model 1050 recorder. The following are additional checks required for Model 2050 recorders.					
REED RELAY (VIBRATOR) FREQUENCY Connect a GE#1820 lamp to a single circuit phone plug. Insert the phone plug into the projector actuator jack. Apply a .05 volt 18 cycle signal to the left line input connector. Vary the input frequency slowly to 19.5 cps. The lamp inserted into the projector actuator jack should glow. Increase the input frequency to 20.5cps. The lamp should remain lighted. Increase the input frequency to 21cps. The lamp should extinguish. Maximum vibrations of the relay armature should occur at 20cps. If necessary, adjust the spring loaded screw at the side of the vibrator for maximum oscillation of the armature as the input frequency is advanced from 18 to 20cps. If the lamp does not glow and maximum oscillation occurs at 20cps and armature swing is at least 1/4 inch from low to high position, adjust contacts so they are slightly closer together. Then when armature vibrates,	7-1/2	STEREO	PA	ON	Min. CCW

1050/1080/2050/2080 ELECTRICAL CHECKS AND ADJUSTMENTS (CON'T)

CHECK AND ADJUSTMENT	TAPE RECORDER CONTROL SETTINGS				
	SPEED	MONO/ STEREO	REC/PLAY	OFF-ON- MONITOR	VOLUME
REED RELAY (VIBRATOR) FREQUENCY (CON'T) lamp should light. If armature does not vibrate vigorously, demagnetize the armature. This can be done by applying 300 volts 60 cycles to the relay coil through a 30,000 ohm resistor and slowly reducing the voltage to zero using a Variac or other variable voltage transformer. The recorder should reverse satisfactorily at line voltages of from 105 to 125 volts. Check by applying the 20 cycle signal on the tape and checking for reverse at 105 and 125 volts. The play/record knob must be in repeat to check automatic reversal in both directions. To check the 20cps signal being applied to the tape, put the signal on the tape in the normal manner. Note whether the lower half of the left neon glows. If not, adjust R142 until the lower half glows. The voltage as indicated on the ACVTVM connected to the wiper of R142 and chassis should be between 200 and 250 millevolts. Adjust if required by varying resistance of R142.					



Electrical Adjustments

CHECK AND ADJUSTMENT	TAPE RECORDER CONTROL SETTINGS				
	SPEED	MONO/ STEREO	REC/PLAY	TONE	VOLUME
RECORD BIAS ADJUSTMENT Apply 500cps at 1 volt to BOTH line inputs. Connect a 100/1 capacitive voltage divider probe to the record head side of C12. Adjust C12 for 35v (ACVTVM indicates .35 volts because of 100/1 attenuation). Connect 100/1 divider to record head side of C49. Adjust C49 for 35 volts (.35 volt indication on ACVTVM). Adjust left volume control so left record level indicator lights, then reduce so lamp just extinguishes. Do likewise for right channel. Then reduce line input voltage to .1 volts and make several minutes of recording at frequencies of 50, 500, 10,000 and 15,000 cps. Rewind the tape and play the recording with the ACVTVM connected to the pre-amp output. Output should be within ±4db of output at 500cps. If output at 15kc is high, increase bias voltage by 3 volts for each db out of spec. For instance, if 15kc is 3db high, increase bias voltage by 9 volts. Then recheck. If 15kc is low, decrease bias voltage by 3 volts for each db low. Then recheck record/playback.	7-1/2	STEREO	RECORD	Any Pos.	As Req.
Repeat overall response check at 3-3/4 speed. Do not adjust bias voltage. Equalization should give proper frequency response. Set record level so record lamps light, then just extinguish. Response at 3-3/4 should be ±4db from 50cps to 9kc using 500cps as reference.	3-3/4	STEREO	RECORD	Any Pos.	As Req.
Repeat overall response check at 1-7/8ips. Do not adjust bias voltage. Response upon playback should be +2, -6db using output at 250cps as reference.	1-7/8	STEREO	RECORD	Any Pos.	As Req.
ERASE NOISE Apply 500cps at .45 volts to both line inputs. Connect the ACVTVM to left pre-amp through noise filter. Adjust record levels for normal record level. Then increase line input voltage to 1 volt and record several feet. Rewind the tape. Remove signal from line input and short both line input connector to ground using shorted plugs. Put recorder into record with volume at same setting as during recording. Erase recorded portion of tape. Then rewind and note indication of ACVTVM connected to pre-amp outputs through noise filter. Indication should be at least 41db below 500cps signal obtained by playing standard alignment tape. For instance, if output from standard alignment tape at 500cps was .3v, then ACVTVM indication should be -51.5db (.0025 volts) or less. The above is the same for both channels.	7-1/2	STEREO	RECORD	Any Pos.	As Req.
CROSSTALK Bulk erase a tape of the type used with the recorder. Apply 5000cps at .1 volt into the left line input. Apply a short to the right line input connector. Put the recorder into record and record several feet at normal recording level. Then put the recorder into reverse play (tape moving from left reel to right reel). Connect the	7-1/2	STEREO	RECORD	Any Pos.	As Req.

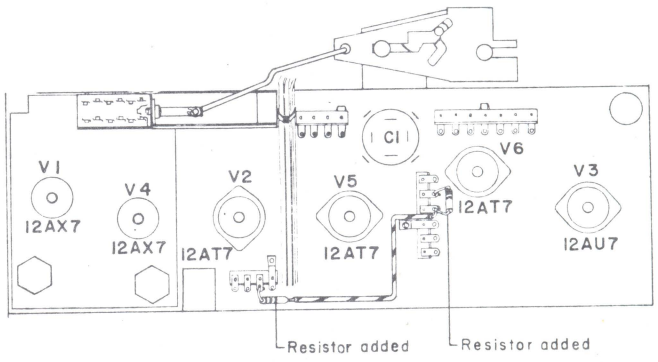
1070/2070 ELECTRICAL CHECKS AND ADJUSTMENTS (CON'T)

CHECK AND ADJUSTMENT	TAPE RECORDER CONTROL SETTINGS				
	SPEED	MONO/ STEREO	REC/PLAY	TONE	VOLUME
CROSSTALK (CON'T) ACVTVM through the noise filter to the right channel pre-amp connector. The ACVTVM should indicate .001 volts or less. Apply 5000 cps at .1 volt into the right line input. Apply a short to the left line input connector. Record several feet of tape at normal recording level. Then put recorder into reverse play. With the ACVTVM connected to the left line output, output should be .001 volts or less.					
NOTE: This completes electrical check and adjustments for the Model 1070 recorder. The following are additional checks required for Model 2070 recorders.					
REED RELAY (VIBRATOR) FREQUENCY Connect a #1820 GE lamp to a single circuit phone plug. Insert the phone plug into the projector actuator jack. Apply a .1 volt 18 cycle per second signal to the pre-amp output connector. Vary the frequency slowly up to 19.5 cps. The lamp inserted at the projector jack should glow. Increase frequency to 20.5 cps. The lamp should remain lighted. Increase frequency to 21 cps. The lamp should extinguish. Maximum vibration of the relay amature should occur at 20cps. If necessary, adjust the spring loaded screw at the side of the vibrator for maximum oscillation of the armature as the input frequency is advanced up from 18cps to 20cps. If the lamp does not glow, and maximum oscillation occures at 20cps and armature swing is at least 1/4 inch from low to high position, adjust contacts so they are slightly closer together. Then when armature vibrates, lamp should light. If armature does not vibrate vigorously, demagnetize the armature. This can be done by applying 300 volts 60 cycles to the relay coil through a 10,000 ohm resistor and slowly reducing the voltage to zero using a Variac or other variable voltage transformer. The recorder should reverse satisfactorily at line voltages of from 105 to 125 volts. Check by applying the 20 cycle signal on the tape and checking for reverse at 105 and 125 volts. The play/ record knob must be in repeat to check automatic reversal in both directions. To check the 20cps signal being applied to the tape, apply signal to the tape in the normal manner. Note whether lower half of the left record neon glows. If not, adjust R142 until the lower half of the left neon lamp glows. The voltage as indicated on the ACVTVM connected to the wiper of R142 and chassis should be between 200 and 250mv. Adjust if required by varying R142.	any	STEREO	REPEAT	Any Pos.	Any Pos.

ELECTRICAL TROUBLES AND PROBABLE SOLUTIONS

PROBLEMS	POSSIBLE SOLUTION
Recorder will not operate	Check for connection of ac plug to ac power receptacle, that tone control is raised or OFF-ON monitor switch is not at OFF, that tape has engaged tape tension switch.
Recorder moves tape but will not play	Make sure record/play switch is not in record of PA, that tape has program recorded on it, that mono 1 - stereo - mono 2 switch is set to correct track, that volume is turned up.
Recorder will not record	Check that clear plastic record button is depressed and that red light is on beneath button, that record/play knob is in record, that volume is turned up to give correct neon record lamp indication.
Recorder will not record 20 cps reversing signal	Check that clear plastic record button is depressed and that record/play knob is moved briskly to rev. sign. position. Left channel neon should glow.
Recorder will not reverse automatically	Check that reverse signal is on tape and that record/play is in repeat or auto play. Check K1, K2, and vibrator (reel relay). Check reverse solenoid L10.
Recorder will not operate with play knob engaged and tape playing after tone control is depressed (2070 only) or after OFF-ON MONITOR (2050 only) is set to OFF	Make sure micro-switch S9 has its arm outside of play lever and not inside. Check S9 for open.
Capstans do not rotate	Check for motor operation, for broken or twisted belt.
Does not erase	Check for clean erase head, that V3 is good, that recorder is in record mode.
Recordings poor	Check for clean heads, that tape bias is correct, that record level is correct as indicated by record neons, that record neons are calibrated, that tubes in associated circuitry are good.
Will not record from line inputs	Make sure there is not a phone plug in the microphone connector, check mike jack (double circuit jack).
No playback or record on Channels 1 or 3 at left to right tape motion. Slight hum present at channel having no output.	Check play-record head for open circuit.
No playback on track 2 or 4 when in right to left take motion, slight hum present at channel having no output.	Check left hand play head for open circuit.
Record response poor or determined by checking playback with alignment tape.	Check equalization switch S4cdgh and components.
Playback response poor as determined by alignment tape.	Check equalization switch S4abef.
Fast wind or play knob does not remain engaged.	Check play solenoid adjustment. With recorder vertically positioned on bench, turntables up and solenoid in front, push directional knob in reverse position. Solenoid plunger should touch bottom or be within .005 inch. To adjust, loosen solenoid lock-nut and plunger, pull direction knob in reverse and hold while screwing in solenoid plunger until it just bottoms, then back off plunger 1/8 turn. Then while carefully holding plunger in position, tighten lock nut.

ELECTRICAL TROUBLES AND PROBABLE SOLUTIONS (CON'T)

PROBLEMS	POSSIBLE SOLUTION
All operations are correct except for erratic reverse.	Check reverse solenoid adjustment. With recorder vertically positioned on bench, turntables up and solenoid in front, pull control plate directional knob all the way in reverse mode. In this manner, solenoid plunger should touch bottom, not being away from bottom more than .005 in. To adjust, loosen solenoid lock-nut and plunger, pull control plate directional knob all the way in reverse and hold. Slowly screw in solenoid plunger until it just bottoms in solenoid; then back plunger out 1/8 turn. With pliers, carefully hold plunger in position and lock plunger with lock nut, using torque of 2 in. lb. Check reverse switch. Actuate solenoid back and forth and see that all switch contact points have approximately an equal amount of contact in both directions. To adjust; loosen 2 switch holding screws, rotate switch in the desired direction and retighten the 2 screws. Check reverse switch adjustment. With fast wind knob in WIND mode and in reverse, move directional knob back and forth within resulting back play (back lash); watch reverse switch contact points. The three contact points should remain in contact and loaded within this amount play.
Motorboat oscillation	To prevent neon popping a 10 meg ohm resistor is installed in parallel with each record level indicator light. To install the resistors remove the recorder from the case. Remove the two screws to expose the pre-amp chassis. Install the two resistors as shown in the illustration below. The resistors are available under Ampex part number 041-244. 
CORRECTING INTERMITTENT OPERATION OF AUTOMATIC REVERSE SYSTEM	To prevent intermittent automatic reverse, the following circuit modifications are made. A. Change R 143, 270K ohm, ½ Watt resistor to 100K ohm, 1 Watt resistor. B. Change R 147, 10K ohm, ½ Watt resistor to 10K ohm, 1 Watt resistor. The replacement parts are available at the factory parts department under the following numbers: 041-158 Resistor, 10K ohm, 1 Watt 041-170 Resistor, 100K ohm, 1 Watt

ORDERING PARTS AND USING THE PARTS LISTS

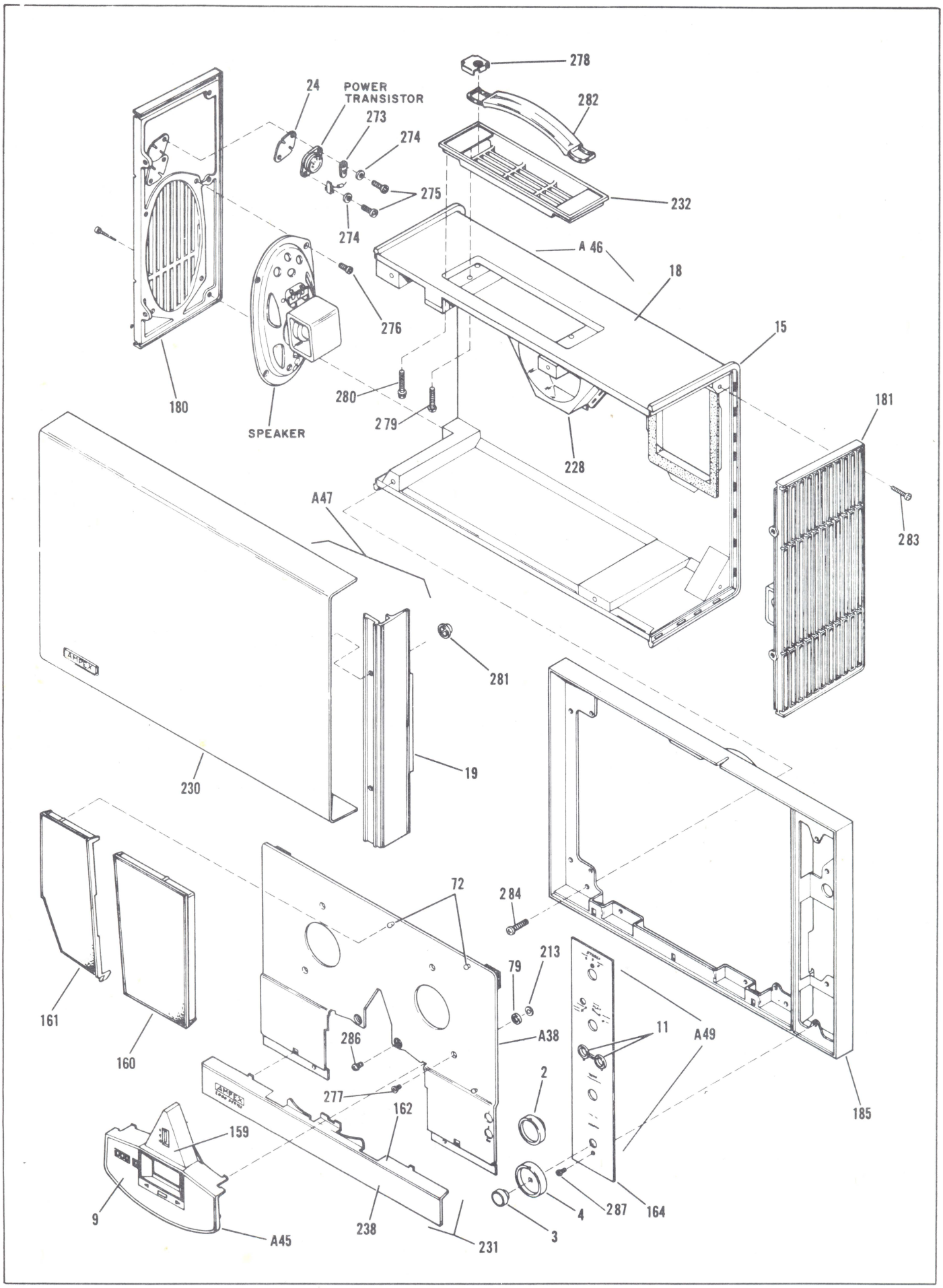
Should parts be needed to repair Ampex equipment described in this manual, order as follows:

1. Give Model and Serial Number of equipment for which parts are to be ordered. Be sure to include description and part number.

2. Using the exploded view, locate part and give part number as listed in this manual. In many cases individual parts are not available and the assembly including the part will be sent.

3. Electrical part numbers can be found by locating the parts on the schematics and then referring to the electrical parts list for part number.

4. Should a part not be found in this manual, order by Model Number, Serial Number and give a complete description of the part including color if applicable.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24
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SPEAKER
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A47
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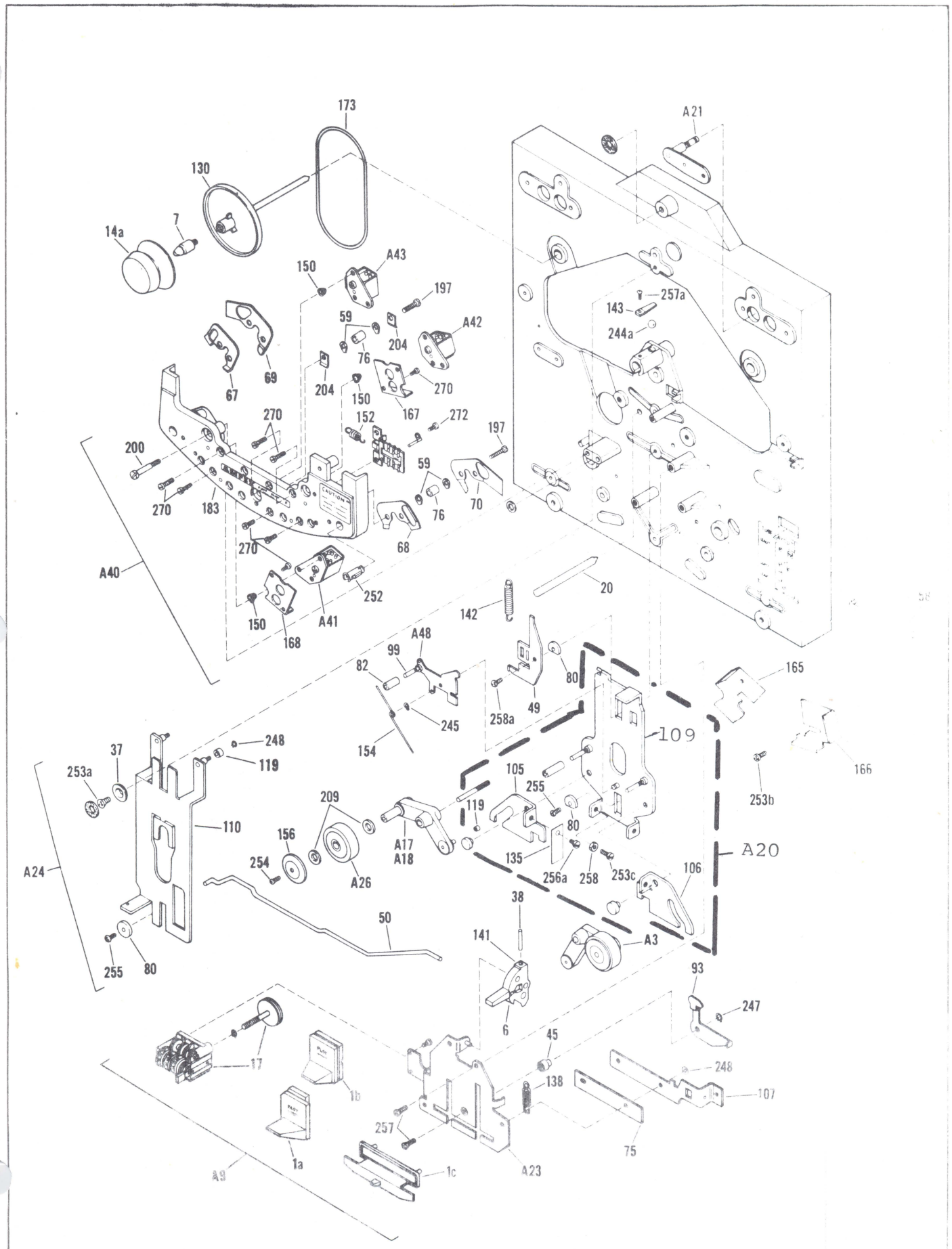
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253a
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119
253b
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110
156
A17
A18
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A20
254
A26
256a
258
253c
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A24
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50
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A3
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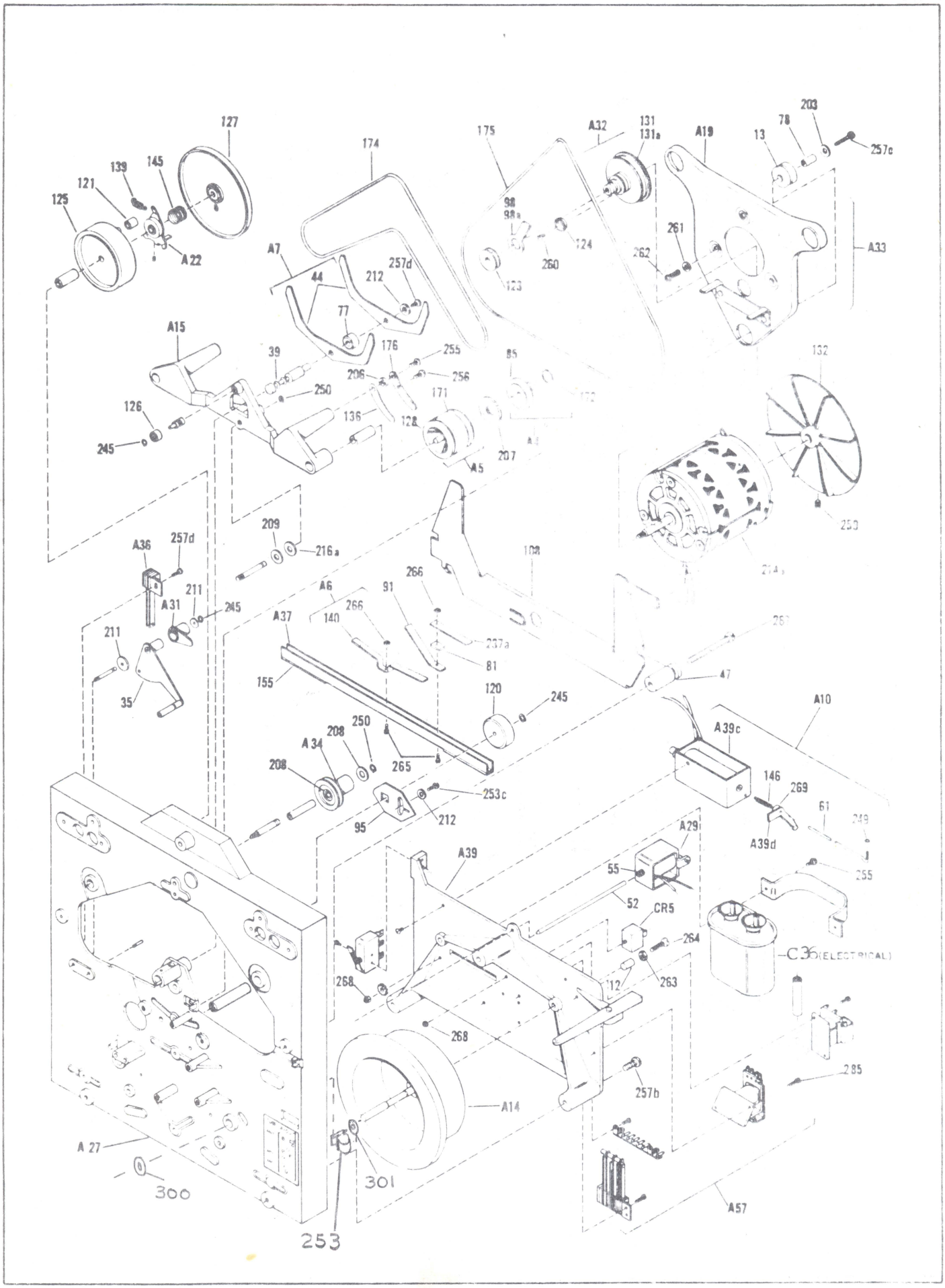
1a
A9
1c
A23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A33
A7
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212
257d
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A15
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255
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256
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85
171
136
128
A5
207
126
245
132
250
209
216a
A36
257d
A31
211
245
A6
266
91
140
266
237a
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A37
155
211
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A10
A39c
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A34
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253c
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A39d
A29
A39
55
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CR5
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C36 (ELECTRICAL)
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257b
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A14
A27
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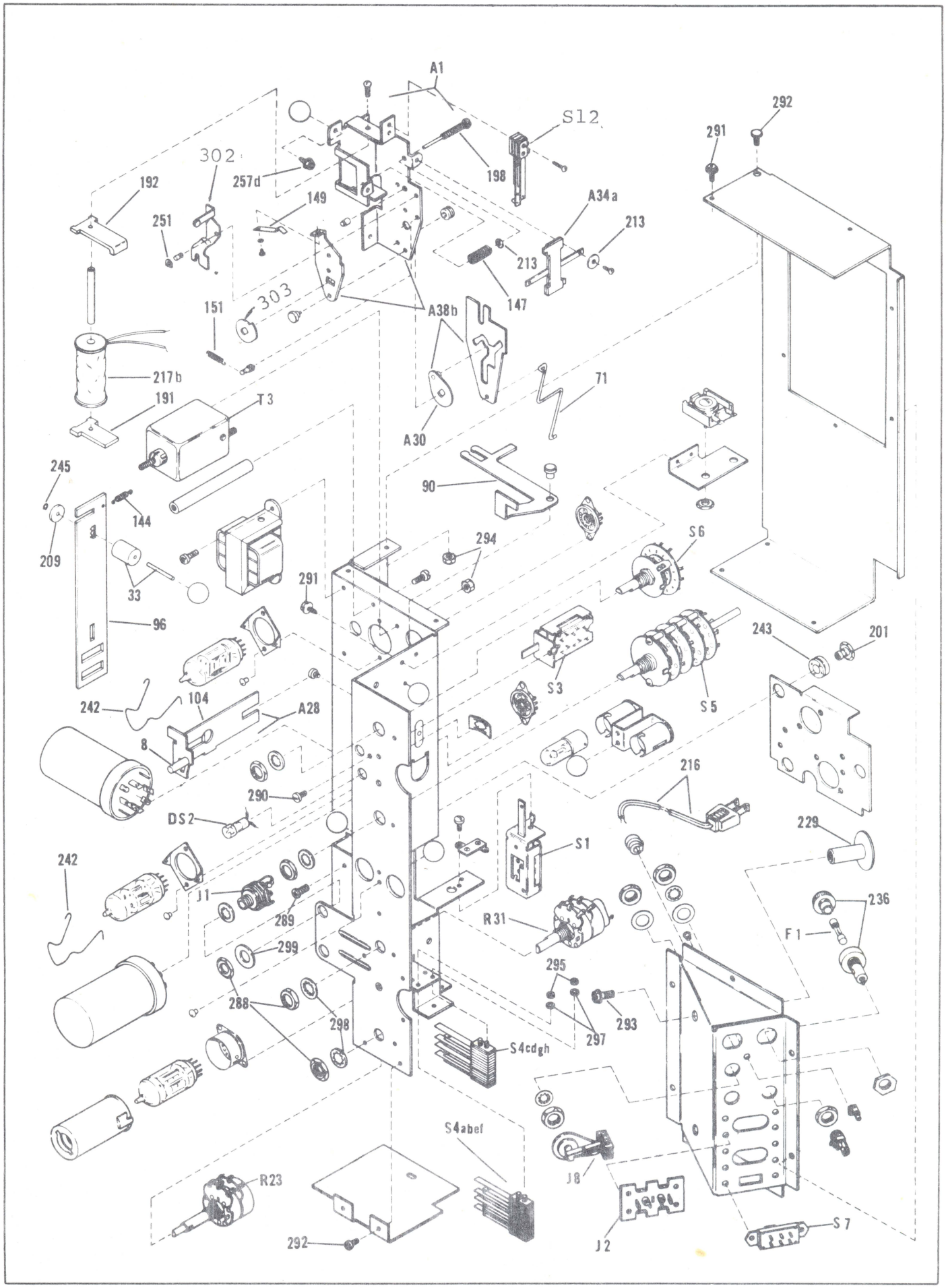
301
253
A57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S12
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T3
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S6
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S5
242
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A28
8
216
290
DS2
229
S1
242
J1
289
R31
236
F1
299
295
288
298
293
297
S4cdgh
S4abef
R23
J8
292
J2
S7

ASSEMBLY PART NUMBERS

REFERENCE NUMBER	ASSEMBLY PART NO.	DESCRIPTION
A-1	4035000-10	Vibrator, complete
A-2	4035001-10	Capstan Idler (L. H.)
A-3	4035001-20	Capstan Idler (R. H.)
A-4	4035002-10	Play Clutch
A-5	4035003-10	Wind Drive Pulley
A-6	4035004-10	Brake Channel
A-7	4035005-10	Belt Shift Yoke
A-8	Not Used	
A-9	4035009-10	Control Plate
A-10	4035010-10	Solenoid - Reverse
A-11 thru A-13	Not Used	
A-14	4045000-10	Flywheel
A-15	4045007-10	Yoke Arm
A-16	4045008-10	Yoke Arm
A-17	4045009-10	Arm - Capstan Idler, (L. H.)
A-18	4045009-20	Arm - Capstan Idler, (R. H.)
A-19	4045010-10	Plate, Motor Mounting
A-20	4045011-10	Play Slide
A-21	4045012-10	Brake Roller Adj.
A-22	4045013-10	Take Up Lever
A-23	4045014-10	Control Plate
A-24	4045015-10	Wind Slide
A-25	Not Used	
A-26	4045017-10	Capstan Idler
A-27	4045018-10	Base Plate, includes bearings
A-28	4045019-10	Record Slide
A-29	4045021-10	Solenoid - Play
A-30	4045023-10	Crank - Switch Arm
A-31	4045024-10	Arm, Tape Switch Dampener
A-32	4045025-20	Pulley, 60 cycles, Motor
	4045025-10	Pulley, 50 cycles, Motor
A-33	4045026-20	Drive Assembly (includes motor)
A-34	4045027-10	Pulley, Idler
A-34a	4045028-10	Armature, Vibrator
A-35	Not Used	
A-36	4045030-10	Switch, Tape
A-37	4045031-10	Brake Channel
A-38	4045032-10	Cover Plate (2070, 2050, 2080)
	4045055-10	Cover Plate (1070, 1050, 1080)
A-38a	4045033-10	Trip Arm - Vibrator
A-38b	4045034-10	Vibrator, complete
A-39	4045035-10	Thrust Plate
A-39a thru A-39b	Not Used	
A-39c	4045037-10	Solenoid - Reverse
A-39d	4045040-10	Actuator - Reverse Solenoid
A-40	4045041-10	Head Mounting Assembly, Complete w/heads
A-41	4045042-10	Head, Play-Record (include code no. when ordering)
A-42	4045043-10	Head, Playback (include code no. when ordering)
A-43	4045044-10	Head, Erase
A-44 (Not Shown)	4045045-10	Reel, Auto Thread
A-45	4045046-10	Head Cover (2000 Series)
	4045046-20	Head Cover (1000 Series)
A-46	4045048-10	Case (1070, 2070)
	7040003-10	Case (2080, 1080)
A-47	4045049-10	Dust Cover (2070)
	4045061-10	Dust Cover (1070, 2080)
A-48	4045058-10	Tape Take Up
A-49	7040023-10	Control Panel, includes bezels, 2070
	7040024-10	Control Panel, includes bezels, 1050, 1080
	7040025-10	Control Panel, includes bezels, 2050, 2080
	7040026-10	Control Panel, includes bezels, 1070

NOTE: For individual parts, refer to the next parts list.

PARTS WITHIN ASSEMBLIES

REF. NO.	PART NO.	DESCRIPTION	PART OF ASSEMBLY
1a	4105001-10	Knob, Wind	4035009
1b	4105002-10	Knob, Play	4035009
1c	4105003-10	Knob - Direction	4035009
2	4105004-10	Knob, General	4012070-02
3	7040001-10	Knob, Left Volume	4012070-02
4	4105006-10	Knob, Right Volume	4012070-02
5	4105007-10	Button - Cord	4055007
6	4105010-10	Knob - Speed Shift	4025001-02
7	4105011-10	Cap - Turntable Screw	4025001-02
8	4105013-10	Record Button	4025000
9	4115001-10	Head Cover Trim (2000 Series) Head Cover Trim (1000 Series)	4045046
10	Not Used		
11	4115004-10	Indicator Bezel	4025000
12	4135000-10	Pad - Thrust Bearing	4035009
13	4135001-10	Shock Mount, Motor	4045026-20
14 (Not Shown)	4135003-10	Liner - Dust Cover	4045049
14a	4135004-10	Holder, Reel, Rubber	
15	4135005-10	Bumper Strip, Rubber	4045048
16	Not Used		
17	4145000-10	Counter	4035009
18	4155000-10	Case - Tape Recorder - 2070, 1070	4045048
19	4155001-10	End - Dust Cover	4045049
20	4165000-10	Pin Actuator	4025001-02
21 thru 22	Not Used		
23	4165003-10	Pin - Slide Actuate	4045023
24	4175000-10	Insulator - Mica	4055008-10 4055008-20
25 thru 30	Not Used		
31	4210051-10	Stud - Vibrator	4045034
32	Not Used		
33	4215001-10	Stud, Equalization Switch Actuator	4045002
34	4215002-10	Stud - Slide Roller	4045015
35	4215003-10	Arm, Tape Switch	4045007
36	Not Used		
37	4215006-10	Guide - Slide	4025001-02
38	4215007-10	Pin - Insert	4025001-02
39	4215009-10	Shaft - Speed Change	4035005
39a	4215000-10	Stud, Slide	4045011
40	4215012-10	Shaft - Yoke	4045018
41 thru 43	Not Used		
44	4215018-10	Guide - Belt, 50 and 60 cps	4035005
45	4215019-10	Post - Interlock	4035009
46	Not Used		
47	4215021-10	Post - Play Lever Support	4025001-02
48	Not Used		
49	4215023-10	Ball Guide	4025001-02
50	4215024-10	Rod Equalization Shift	4025001-02
51	Not Used		
52	4215026-10	Rod - Play Solenoid	4025001-02
53 thru 54	Not Used		
55	4215028-10	Pole	4045020
56 thru 57	Not Used		
58	4215031-10	Rod - Reverse Control	4025001-02
59	4445002-10	Washer, Tape Guide	4045041
60	Not Used		
61	4215035-10	Rod - Reverse Solenoid	4035010
62 thru 66	Not Used		
67	4215043-10	Tape Guide - Upper Left	4045041
68	4215043-20	Tape Guide - Upper Right	4045041
69	4215044-10	Tape Guide - Lower Left	4045041
70	4215044-20	Tape Guide - Lower Right	4045041
71	4215046-10	Rod - Head - Mic. Switch	4055000
72	4215047-10	Stud - Reel Cover	4045032
73 thru 74	Not Used		

PARTS WITHIN ASSEMBLIES (CON'T)

REF. NO.	PART NO.	DESCRIPTION	PART OF ASSEMBLY
75	4225000-10	Spacer - Direction Knob	4035009
76	4225001-10	Spacer - Tape Guide	4045041
77	4225002-10	Spacer - Belt Guide	4035005
78	4225003-10	Spacer - Motor Grommet	4025001-02
79	4225004-10	Spacer - Screw	4045032
80	4225005-10	Spacer - Play Slide	4025001-02
81	4225006-10	Spacer - Brake Spring	4035004
82 thru 84	Not Used		
85	4225010-10	Play Clutch	4035002
86 thru 89	Not Used		
90	4235000-10	Record Interlock Lever	4045002
91	4235001-10	Brake Actuator	4035004
92	Not Used		
93	4235003-10	Lever - Play Wind Interlock	4035009
94	Not Used		
95	4235005-10	Lever - Brake Adjustment	4025001-02
96	4235006-10	Switch Actuator	4055000
97	4235007-10	Arm - Brake Roller	4045012
98	4235008-10	Belt Lifter, Upper, 50 cycle	4045025-20
98a	4235008-20	Belt Lifter - Upper, 60 cycle	4045025-20
99	4235009-10	Stud, Tape Lifter	4045011
100 thru 103	Not Used		
104	4235013-10	Slide - Record	4045019
105	4235014-10	Cam - Capstan Idler (L. H.)	4045011
106	4235014-20	Cam - Capstan Idler (R. H.)	4045011
107	4235015-10	Lever - Reverse Interlock	4035009
108	4235016-10	Lever - Play Actuator	4025001-02
110	4235017-10	Wind Slide Use Ref. A-24	4045015
109	4235018-10	Play Slide Use Ref. A-20	4045011
111 thru 118	Not Used		
119	4255000-10	Roller	4025001-02 4025016
120	4255001-10	Roller - Brake	4025001-02
121	4255002-10	Snubber - Take-up Lever (rubber)	4025001-02
122	4255003-10	Pullev - Idler	4045027
123	7250075-05	Pulley-Fast Wind	4045026-20
124	4255006-10	Belt Lifter - Lower	4045025-20
125	4255007-10	Brake Drum	4025001-02
126	4255008-10	Roller - Yoke	4045008
127	4255009-10	Pulley - Play Wind	4025001-02
128	4255010-10	Pulley - Wind Drive	4035003
129	Not Used		
130	4255012-10	Turntable	4025001-02
131	4255013-10	Pulley, Drive Motor, 50 cycles	4025001-02
131a	4255014-10	Pulley - Drive Motor, 60 cycles	4045025-20
132	4255016-10	Fan - Drive Motor	4045026-20
133 thru 134	Not Used		
135	4275000-10	Spring - Capstan	4045011
136	4275001-10	Pressure Spring - Clutch	4045008
137	Not Used		
138	4275003-10	Spring - Wind Knob Hold	4035009
139	4275004-10	Spring - Brake Pulley	4025001-02
140	4275005-10	Off Position Brake Spring	4035004
141	4275006-10	Spring - Speed Shift Knob	4025001-02
142	4275007-10	Spring - Wind Slide	4025001-02
143	4275008-10	Spring - Speed Shift Index	4025001-02
144	4275009-10	Spring - Equalization Switch	4055000
145	4275010-10	Spring - Play Drive Pulley	4025001-02
146	4275011-10	Spring - Reverse Solenoid	4035010
147	4275012-10	Spring - Vibrator	4035000
148	4275014-10	Torsion Leaf	4045028
149	4275015-10	Spring - Trip Vibrator	4035000
150	4275016-10	Spring - Head Stack	4045041
151	4275017-10	Spring - Trip Lever	4035000
152	4275018-10	Spring Head Switch	4045041

PARTS WITHIN ASSEMBLIES (CON'T)

REF. NO.	PART NO.	DESCRIPTION	PART OF ASSEMBLY
153 (Not Shown)	4275019-10	Reel Spring (Auto Take-up Reel)	4012070-02
154	4275021-10	Spring - Tape Take-up	4045011
155	4285000-10	Felt - Brake Channel	4045031
156	4295000-10	Cover Plate - Capstan Idler (1000/2000)	4035001-10 4035001-20
157 thru 158	Not Used		
159	4295007-10	Head Cover (2000 Series)	4045046-10
	4295007-20	Head Cover (1000 Series)	
160	4295008-10	Cover Reel (Right)	4012070-02
161	4295009-10	Cover Reel (Left)	4012070-02
162	4295010-10	Trim Panel Lower Front (2000 Series)	7045065-10
	4295010-20	Trim Panel Lower Front (1000 Series)	
163	Not Used		
164	4295026-10	Control Panel, Model 2050, 2080	4025000
	4295012-10	Control Panel, Model 2070	
	4295024-10	Control Panel, Model 1070	
	7295028-10	Control Panel, Model 1050, 1080	
165	4295013-10	Head Shield, Lower Left Hand	
166	4295013-20	Head Shield, Lower Right Hand	
167	4295014-10	Head Shield - Upper L. H.	4045041
168	4295014-20	Head Shield - Upper R. H.	4045041
169 thru 170	Not Used		
171	7310001-10	Tire - Wind Drive, replaces P/N 4315000-10, replace in pairs only.	4035003
172	7310000-10	Tire - Play Clutch	4035002
173	4315002-10	Belt - Counter	4025001-02
174	4315003-10	Belt - Yoke	4025001-02
175	4315004-10	Belt - Capstan Drive	4025001-02
176	4335000-10	Pressure Plate - Clutch	4045008
177 thru 179	Not Used		
180	4335004-10	End Frame Left	4055008-10
181	4335005-10	End Frame Right	4055008-20
182	Not Used		
183	4335007-10	Head Mounting Base	4045041
184	Not Used		
185	4335009-10	Mounting Frame (Outer Casting)	4025000
186 thru 190	Not Used		
191	4335014-10	Inner Pole	4035000
192	4335015-10	Outer Pole	4035000
193 thru 196	Not Used		
197	4405000-10	Screw - Tape Guide	4045041
198	4405001-10	Screw - Tension Adjust	4035000
199	4405002-10	Screw - Shoulder	4055000
200	4405003-10	Shoulder Screw - Head Base	4025000
201	4425000-10	Sleeve Nut	4055000
202	Not Used		
203	4445001-10	Washer - Motor Grommet	4025001-02
204	4215033-10	Tape Guide, Center	4045041
205	Not Used		
206	4445004-10	Spacer Washer - Clutch	4025001-02 4045008
207	4445005-10	Washer Felt - Play Clutch	4035003
208	4445006-10	Thrust Washer	4025001-02
209	4445006-30	Thrust Washer	4035001-10 4035001-20
210	Not Used		
211	4445008-10	Thrust Washer - Auto Shut-off	4025001-02
212	4445009-10	Washer - Adjustment	4025001-02 4035005
213	4445010-10	Washer - Torsion Spring	4035000
214	Not Used		
214a	4595000-10	Motor, Drive, Synchronous	4045026
215	Not Used		
216	4735000-10	Line Cord	4055007
216a	4445013-10	Washer, Yoke Shim	

PARTS WITHIN ASSEMBLIES (CON'T)

REF. NO.	PART NO.	DESCRIPTION	PART OF ASSEMBLY
217	4985000-10	Head Base Casting	4335007
217b	4585004-10	Coil Vibrator	
218 thru 227	Not Used		
228	7040000	Tunnel Assembly	4045048
229	7040001-10	Knob (AC Cord Storage)	7012070
230	7045064-10	Dust Cover Sub Assembly (2070)	4045049-10
	7045064-20	Dust Cover Sub Assembly (1070)	
231	7045065-10	Trim Panel, Front Cover (2000 Series)	7012070-02
	7045065-20	Trim Panel, Front Cover (1000 Series)	
232	7110003-10	Grill - Handle Cover	4045048
233 (Not Shown)	7115009-10	Name Plate	4045041
234 (Not Shown)	7115010-20	Name Plate Die Cast	7045064
235	Not Used		
236	085-001	Fuse Holder, Includes Hardware	
237	Not Used		
237a	7270003-10	Spring	4035004
238	7295027-10	Trim, Front Cover (2000 Series)	7045065-10
	7295029-10	Trim, Front Cover (1000 Series)	7045065-20
239	Not Used		
240 (Not Shown)	7445013-10	Washer (Shim)	4025001-02
241 (Not Shown)	265-016	Bushing	4055008-10
242	352-057	Tube Hold Down	4045002
243	350-015	Shock Mount	4055002
244 (Not Shown)	430-229	Retaining Ring	4035007
244a	420-031	Ball Bearing, 7/32" dia.	4025001-10
245	430-229	Retaining Ring	4025001-02
246	430-230	Retaining Ring	4045016
247	430-336	Retaining Ring	4035009
248	430-337	Retaining Ring	4035009
249	430-339	Retaining Ring	4025001-02
250	430-340	Retaining Ring	4025001-02
251	430-352	Retaining Ring	4035000
252	435-107	Tubular Spring Clip	4045041
253	435-110	Speed Clip	4025000
253a	471-334	Screw, 6-32 x 1/4, Flathead Phillips	
253b	471-066	Screw 6-32 x 3/16 pan	4025001
253c	471-494	Screw 6-32 x 5/6, slotted	
254	472-859	Screw, Capstan Idler, 4-40 x 3/16	4035001
255	472-864	Screw, 6-32 x 1/4	4045008
256	472-920	Screw, 6-32 x 1/4 nylon insert	4045008
256a	472-921	Screw, 6-32 x 1/8 slotted	
257	472-868	Screw, 4-40 x 3/16 cad plated	
257a	472-884	Screw, 4-40 x 1/8 Phillips	
257b	472-873	Screw, 8-32 x 1/2 Phillips	
257c	472-874	Screw, 8-32 x 5/8 Phillips	
257d	472-869	Screw, 6-32 x 3/16, Phillips	
258	492-009	Nut, 6-32	
259	477-114	Set Screw, fan	
260	471-053	Screw, 2-56 x 3/16, slotted	
261	502-004	Washer, #8	
262	472-855	Screw, 8-32 Phillips	
263	492-105	Nut, 10-32 Hex	
264	472-952	Screw, 10-32 x 5/8 Phillips	
265	472-639	Screw 4-40 x 5/16 Phillips	
266	498-221	Nut 4-40 Square	
267	472-875	Screw, 8-32 x 1-3/8 Phillips	
268	496-005	Nut, 6-32 Hex	
269	477-105	Screw 4-40 x 1/8 Cup	
270	472-930	Screw, 2-56 x 3/8 slotted	
271	474-303	Screw, #2 x 3/16	
272	472-864	Screw, 6-32 x 3/16	
273	172-001	Solder Lug	
274	7200000-10	Bushing	
275	472-917	Screw, 4-40 x 3/8 Phillips	
276	472-640	Screw, 6-32 x 3/8	

PARTS WITHIN ASSEMBLIES (CON'T)

REF. NO.	PART NO.	DESCRIPTION	PART OF ASSEMBLY
277	472-861	Screw, 6-32 x 5/16 Allen	
278	089-084	Hardware, Handle	
279	472-901	Screw, 10-32 x 1-1/8 Phillips	
280	476-191	Screw #10, 1-1/8 Thread Cutting	
281	498-236	Nut, Acorn, 6-32	
282	089-030	Handle, Case	
283	476-188	Screw, Phillips, black	
284	476-187	Screw, Phillips	
285	472-867	Screw, 4-40 x 1/2 Phillips	
286	472-943	Screw, 6-32 x 3/16 Phillips	
287	471-067	Screw, 1/4-20 x 2-1/4 Hex Head	
288	492-050	Nut, 3/8 x 32	
289	471-069	Screw, 6-32 x 3/8, Phillips	
290	471-067	Screw, 6-32 x 1/4, Phillips	
291	476-998	Screw, #6 x 1/4 Self-Tapping, Slotted	
292	476-070	Screw, 6 x 1/4, Self-Tapping, Phillips	
293	476-080	Screw, #8 x 1/2, Self-Tapping, Hex	
294	496-005	Nut, 9/64 x 5/16	
295	492-020	Nut, 3-48	
296	Not Used		
297	502-044	Washer, Flat Lock	
298	502-007	Washer, Spring, Lock	
299	501-224	Washer, Flat	
	472-945	Screw, 4-40 x 1-1/4, Slotted, Auto Thread Reel	4045048
300	7440028-04	Washer	
301	7440028-02	Washer	
302	4045063-01	Switch Lifter Assy	
303	4235022-10	Trip Cam, Vibrator	

MISCELLANEOUS

	PART NUMBER
Shipping Carton, Models 2070, 2080, 2050, 1070, 1050, 1080	7880024-10
Filler, Carton, Top, Models 2070, 2080, 2050, 1070, 1050, 1080	7880000-10
Filler, Carton, Bottom, Models 2070, 2080, 2050, 1070, 1050, 1080	7880001-10
Filler Pad, Models 2070, 2080, 2050, 1070, 1050, 1080	7880025-10
Mounting Template, Models 2050, 1050	7870000-10
Bag, plastic, for recorder	7710001-10
Detent, record lockout	7220001-10
Screen, bottom shield	4295021-10
Model 2001 Microphone (Less stand)	7680000-10
Stand for model 2001 microphone	7010111
7 inch reel of blank tape	7690000-10
7 inch reel prerecorded demo tape	7950000-20
7 inch empty reel	7060000-10
Warranty registration card	7890003-10
Operating (instruction) manual, 1000 Series	7890004-10
Hinged Box (for reels of tape)	7950001-20
Accessory Bag	7950002-10
Operating (instruction) manual, 2000 Series	7890002-10
Sponge pads (for auto take-up reel covers)	7280002-10

ELECTRICAL PARTS LIST

REF. NO.	PART NO.	CORPORATE PART NO.	DESCRIPTION
A1	Not Used		
A2	750 0000		Packaged circuit, tone
A3	750 0000		Packaged circuit, tone
A4	450 5001-1		Packaged circuit, filter
B1	459 5000-10		Motor, synchronous, drive
C1	754 0007		Cap., dip mica, 390 pf, 500V, 5%
C2	754 0001	030 001	Cap., cer., disc, .02 uf, 500V, 20%
C3ABCD	455 5001-30		Cap., 40-20-20-20 uf
C4	755 0002	031 140	Cap., cer., disc, 0. uf, 500V, 20%
C5	754 0024	035 878	Cap., mica, tub., .015 uf, 100V, 10%
C6	754 0035	034 978	Cap., dip mica, 150 pf, 5%
C7	754 0008	034 442	Cap., dip mica, 820 pf, 300V, 5%
C8	754 0018	034 930	Cap., dip mica, 680 pf, 300V, 5%
C9	754 0024	035 878	Cap., mica, tub., .015 uf, 100V, 10%
C10	754 0004	034 929	Cap., cer., disc, 560 pf, 500V, 10%
C11	754 0029	035 999	Cap., mylar, tub., .1 uf, 400V, 20%
C12	754 0030	034 951	Cap., mica, var., 65-340 pf, 175V, 20%
C13	754 0007	034 288	Cap., dip mica, 390 pf, 500V, 5%
C14	754 0011		Cap., dip mica, 75 pf, 500V, 5%
C15	754 0025		Cap., dip mylar, tub., 1500 pf, 100V, 10%
C16	755 0002	031 140	Cap., Elec., tub., 25 uf, 6V
C17	754 0022	035 861	Cap., tub., .22 uf, 400V, 10%
C18	754 0014-02		Cap., dip mica, 270 pf, 500V, 5%
C19	754 0024	035 871	Cap., dip mylar, tub., .015 uf, 100V, 10%
C20	754 0025-03		Cap., dip mylar, tub., 1500 pf, 100V, 10%
C21	Not Used		
C22	755 0002	031 140	Cap., Elec., tub., 25 uf, 6V
C23	754 0018	034 930	Cap., mica, tub., 680 pf, 300V, 5%
C24	754 0001	030 001	Cap., cer., disc, .02 uf, 500V, 20%
C25	Not Used		
C26	754 0034	034 987	Cap., dip mica, 27 pf, 5%
C27	755 0006	031 648	Cap., Elec., tub., 8 uf, 25V
C28	755 0002	031 140	Cap., Elec., tub., 25 uf, 6V
C29	755 0000-10		Cap., Elec., 40 uf, 100V
C30	455 5000-10		Cap., Elec., tub., 500 uf, 35V
C31	754 0026	035 859	Cap., tub., .47 uf, 100V, 20%
C32 thru C35	Not Used		
C36	454 5000		Cap., 3 uf, motor drive
C37 and C38	754 0038	030 450	Cap., .01 uf, 1400V
C39	754 0003	030 066	Cap., cer., disc, .05 uf, 500V, +20%-80%
C40	Not Used		
C41	755 0004	031 474	Cap., Elec., tub., 40 uf, 250V, -10%+50%
C42ABCD	455 5001-30		Cap., 40-20-20-20 uf
C43	Not Used		
C44	755 0004	031 474	Cap., Elec., tub., 40 uf, 250V, -10%+50%
C45	455 5001-20		Cap., 2000 uf, 50V
C46AB	455 5001-10		Cap., 1000, 1000 uf, 35V
C47 and C48	Not Used		
C49	754 0030	034 951	Cap., mica, var., 65-340 pf, 175V, 20%
C50	754 0007	034 288	Cap., mica, 390 pf, 500V, 5%
C51	754 0001	030 001	Cap., cer., disc, .02 uf, 500V, 20%
C52	754 0034	034 987	Cap., dip mica, 27 pf, 5%
C53	754 0024	035 878	Cap., mica, tub., .015 uf, 100V, 10%
C54	754 0035	034 978	Cap., dip mica, 150 pf, 5%
C55	754 0004	034 929	Cap., dip mica, disc, 560 pf, 500V, 10%
C56	754 0029	035 999	Cap., mylar, tub., .1 uf, 400V, 20%
C57	754 0008	034 442	Cap., dip mica, 820 pf, 300V, 5%
C58	754 0018	034 930	Cap., dip mica, 680 pf, 300V, 5%
C59	754 0008	034 442	Cap., dip mica, 820 pf, 300V, 5%
C60	755 0007	031 649	Cap., Elec., tub., 25 uf, 6V
C61	754 0011-02		Cap., dip mica, 75 pf, 500V, 5%
C62	754 0022	035 861	Cap., mylar, tub., 22 uf, 400V, 10%
C63	754 0025-03		Cap., dip mylar, tub., 1500 pf, 100V, 10%
C64	755 0007	031 649	Cap., Elec., tub., 25 uf, 6V

ELECTRICAL PARTS LIST (CON'T)

REF. NO.	PART NO.	CORPORATE PART NO.	DESCRIPTION
C65	754 0014-02		Cap., dip mica, 270 pf, 500V, 5%
C66 and C67	Not Used		
C68	754 0024	035 871	Cap., dip mylar, tub., .015 uf, 100V, 10%
C69	754 0001	030 001	Cap., cer., disc, .02 uf, 500V, 20%
C70	754 0024	035 871	Cap., dip mylar, tub., .015 uf, 100V, 10%
C71	755 0002	031 140	Cap., Elec., tub., 25 uf, 6V
C72	754 0026	035 860	Cap., mylar, tub., 47 uf, 400V, 20%
C73	755 0006	031 648	Cap., Elec., tub., 8 uf, 25V
C74	755 0002	031 140	Cap., Elec., 25 uf, 6V
C75	754 0026	035 859	Cap., mylar, tub., .47 uf, 100V, 20%
C76	455 5000-10		Cap., Elec., tub., 500 uf
C77	754 0004	030 419	Cap., mica, disc, 560 pf, 500V, 10%
C78	754 0001	030 001	Cap., cer., disc, .02 uf, 500V, 20%
C79	Not Used		
C80	755 0000		Cap., Elect., tub., 40 uf, 75V
C81	754 0028	035 985	Cap., mylar, tub., .047 uf, 400V, 20%
C82	755 0005	031 508	Cap., Elec., tub., 2 uf, 450V
C83	755 5000	031 186	Cap., Elec., tub., 100 uf
C84	754 0001	030 001	Cap., cer., disc, .02 uf, 500V, 20%
C85	754 0002	030 002	Cap., cer., disc, .01 uf, 500V, 20%
C86	754 0002	030 002	Cap., cer., disc, .01 uf, 500V, 20%
CR1	580 032		Diode, arc suppressor
CR2	013 339		Diode, silicon, 1N2864
CR3	013 339		Diode, silicon, 1N2864
CR4	580 029		Diode, 10B1 type
CR5	580 029		Diode, 10B1 type
DS1	060 249		Lamp, neon, record level
DS2	060 121		Lamp, neon, recording indicator
DS3	060 249		Lamp, neon, record level
F1	070 047		Fuse, 1.5 amp, slo-blo
J1	705 0012-10		Jack, 2 circuit, mic.
J2AB and J3AB		148 023	Jack, Pin
J4	763 5001		Jack, 2 circuit, ext. speaker
J5		146 999	Jack, receptable, female, ac power
J6	705 0000-10		Jack, 2 circuit, mic.
J7	763 5001		Jack, 2 circuit, ext. speaker
J8	463 5000-10		Jack, 3 circuit, projector
K1	459 5001-10		Relay, DPDT
K2	459 5002-10		Relay, SPDT
L1AB	404 5042-10		Head, play-record (when ordering, include code number of head)
L2AB	404 5043-10		Head, Play (when ordering, include code number of head)
L3AB	404 5044-10		Head, Erase
L4	758 0001		Coil, 1.8 mh
L5 and L6	458 5007		Coil, 6.9 mh
L7	458 5008-10		Inductor, low voltage, 20 mh
L8	458 5007-10		Coil, 6.9 mh
L9	458 5006-10		Coil, play solenoid
L10	458 5005-10		Coil, reverse solenoid
L11	458 5007-10		Coil, 6.9 mh
L12	758 0001		Coil, 1.8 mh
LS1 and LS2	468 5000-10		Speaker, 4 x 8 oval, 8 ohm 1000/2000
Q1		014 558	Transistor, silicon, SE 7001
Q2 and Q3		014 382	Transistor, power, DTG-110
Q4		014 558	Transistor, silicon, SE 7001
Q5 and Q6		014 382	Transistor, power, DTG-110
R1	751 0020		Res., fixed, comp., 120k, 1/2w, 10%
R2	751 0009		Res., fixed, comp., 1.5k, 1.2w, 10%
R3		041 056	Res., 4.7k, 1/2w
R4	751 0002	041 031	Res., fixed, comp., 1m, 1/2w, 10%
R5	751 0057	042 150	Res., film, 330k, 1/2w, 10%
R6	751 0020	041 073	Res., fixed, comp., 120k, 1/2w, 10%
R7	751 0022	041 076	Res., fixed, comp., 220k, 1/2w, 10%
R8	751 0038	041 244	Res., fixed, comp., 10m, 1/2w, 20%
R9	751 0050	041 533	Res., fixed, comp., 24 ohm, 1/2w, 5%

ELECTRICAL PARTS LIST (CON'T)

REF. NO.	PART NO.	CORPORATE PART NO.	DESCRIPTION
R10	751 0060	048 185	Res., film, 820 ohm, 1/2w, 5%
R11 thru R14	Not Used		
R15	751 0047	041 460	Res., fixed, comp., 56k, 1/2w, 5%
R16	751 0043	041 349	Res., fixed, comp., 30k, 1/2w, 5%
R17	751 0021	041 074	Res., fixed, comp., 150k, 1/2w, 10%
R18	751 0018	041 070	Res., fixed, comp., 68k, 1/2w, 10%
R19 and R20	751 0046	041 431	Res., fixed, comp., 150k, 1/4w, 5%
R21 and R22	Not Used		
R23AB	452 5001-10		Res., variable, dual, 250k
R24	751 0040	041 285	Res., fixed, comp., 3.9m, 1/2w, 10%
R25 and R26	751 0053	041 573	Res., fixed, comp., 75k, 1/4w, 5%
R27	751 0007	041 048	Res., fixed, comp., 1k, 1/2w, 10%
R28	751 0040	041 285	Res., fixed, comp., 3.9m, 1/2w, 10%
R29	751 0018	041 070	Res., fixed, comp., 68k, 1/2w, 10%
R30	751 0002	041 031	Res., fixed, comp., 1m, 1/2w, 10%
R31AB	452 5000-10		Res., variable, dual, 250k
R32	Not Used		
R33		044 771	Res., variable, 2m
R34	751 0017		Res., fixed, comp., 47k, 1/2w, 10%
R35	751 0007	041 048	Res., fixed, comp., 1k, 1/2w, 10%
R36	751 0002		Res., 1m, 1/2w
R37	751 0002	041 031	Res., fixed, comp., 1m, 1/2w, 10%
R38		041 343	Res., 680 ohm, 1/2w, 5%
R39	751 0055	041 838	Res., fixed, comp., 18k, 1w, 5%
R40	751 0064	049 359	Res., fixed, comp., 36k, 2w, 5%
R41	Not Used		
R42	751 0008	041 049	Res., fixed, comp., 1.2k, 1/2w, 10%
R43	751 0027	041 086	Res., 2.2m, 1/2w
R44	751 0036	041 219	Res., fixed, comp., 39k, 2w, 10%
R45	751 0016	041 065	Res., fixed, comp., 37k, 1/2w, 10%
R46	751 0017	041 068	Res., fixed, comp., 47k, 1/2w, 10%
R47	751 0005	041 044	Res., fixed, comp., 470 ohm, 1/2w, 10%
R48	751 0039	041 271	Res., fixed, comp., 27 ohm, 1/2w, 10%
R49	751 0003	041 032	Res., fixed, comp., 10 ohm, 1/2w, 10%
R50	751 0024	041 079	Res., fixed, comp., 390k, 1/2w, 10%
R51	751 0012	041 059	Res., fixed, comp., 8.2k, 1/2w, 10%
R52	041 061		Res., fixed, comp., 12k, 10%
R53 and R54	Not Used		
R55	751 0061	049 012	Res., fixed, comp., 180 ohm, 2w, 10%
R56	751 0062	049 013	Res., fixed, comp., 4.7 ohm, 1/2w, 10%
R57	751 0061	049 012	Res., fixed, comp., 180 ohm, 2w, 10%
R58	751 0062	049 013	Res., fixed, comp., 4.7 ohm, 1/2w, 10%
R59 and R60	751 0063	049 014	Res., fixed, comp., 1.0 ohm, 1/2W, 10%
R61	751 0007	041 048	Res., fixed, comp., 1k, 1/2w, 10%
R62 and R63	Not Used		
R64	751 0032	041 173	Res., fixed, comp., 180, 1w, 10%
R65 and R66	751 0009	041 050	Res., fixed, comp., 1.5k, 1/2w, 10%
R67	751 0028	041 139	Res., fixed, comp., 330 ohm, 1w, 10%
R68	751 0033	041 188	Res., fixed, comp., 680 ohm, 2w, 10%
R69	751 0029	041 146	Res., fixed, comp., 1k, 1w, 10%
R70	751 0034	041 192	Res., fixed, comp., 47 ohm, 2w, 10%
R71 and R72	751 0004	041 038	Res., fixed, comp., 100 ohm, 1/2w, 10%
R73 and R74	Not Used		
R75	751 0020		Res., fixed, comp., 120k, 1/2w, 10%
R76	751 0009	041 050	Res., fixed, comp., 1.5k, 1/2w, 10%
R77	751 0002	041 031	Res., fixed, comp., 1m, 1/2w, 10%
R78		041 056	Res., 4.7k, 1/2w
R79	751 0057	042 150	Res., film, 330k, 1/2w, 10%
R80	751 0020	041 073	Res., fixed, comp., 120k, 1/2w, 10%
R81	751 0022	041 076	Res., fixed, comp., 220k, 1/2w, 10%
R82	751 0038	041 244	Res., fixed, comp., 10m, 1/2w, 20%
R83	751 0050	041 533	Res., fixed, comp., 24 ohm, 1/2w, 5%
R84	751 0060	048 185	Res., film, 820 ohm, 1/2w, 5%
R85	751 0021	041 074	Res., fixed, comp., 150k, 1/2w, 10%

ELECTRICAL PARTS LIST (CON'T)

REF. NO.	PART NO.	CORPORATE PART NO.	DESCRIPTION
R86 thru R90	Not Used		
R91	751 0043	041 349	Res., fixed, comp., 30k, 1/2w, 5%
R92 and R93	751 0046	041 431	Res., fixed, comp., 150k, 1/4w, 5%
R94	751 0018	041 070	Res., fixed, comp., 68k, 1/2w, 10%
R95 and R96	751 0053	041 573	Res., fixed, comp., 75k, 1/4w, 5%
R97	751 0040	041 285	Res., fixed, comp., 3.9m, 1/2w, 10%
R98	751 0022	041 076	Res., fixed, comp., 220k, 1/2w, 10%
R99	751 0007	041 048	Res., fixed, comp., 1k, 1/2w, 10%
R100	751 0018	041 070	Res., fixed, comp., 68k, 1/2w, 10%
R101 thru R104	Not Used		
R105	751 0002	041 031	Res., fixed, comp., 1m, 1/2w, 10%
R106		044 771	Res., variable, 2m
R107		041 343	Res., 680 ohm, 1/2w, 5%
R108	751 0015	041 063	Res., fixed, comp., 18k, 1/2w, 10%
R109	751 0000	041 020	Res., fixed, comp., 47k, 1/2w, 5%
R110	751 0007	041 048	Res., fixed, comp., 1k, 1/2w, 10%
R111	751 0027	041 086	Res., fixed, comp., 2.2m, 1/2w, 10%
R112		041 031	Res., fixed, comp., 1m, 1/2w, 10%
R113 and R114	Not Used		
R115	751 0017	041 068	Res., fixed, comp., 47k, 1/2w, 10%
R116	751 0008	041 049	Res., fixed, comp., 1.2k, 1/2w, 10%
R117	751 0005	041 044	Res., fixed, comp., 470 ohm, 1/2w, 10%
R118	751 0039	041 271	Res., fixed, comp., 27 ohm, 1/2w, 10%
R119	751 0003	041 032	Res., fixed, comp., 10 ohm, 1.2w, 10%
R120	751 0024	041 079	Res., fixed, comp., 390k, 1/2w, 10%
R121	751 0012	041 059	Res., fixed, comp., 8.2k, 1/2w, 10%
R122	751 0036	041 219	Res., fixed, comp., 39k, 2w, 10%
R123	751 0016	041 065	Res., fixed, comp., 27k, 1/2w, 10%
R124	041 061		Res., fixed, comp., 12k, 1/2w, 10%
R125	Not Used		
R126	751 0061	049 012	Res., fixed, comp., 180 ohm, 2w, 10%
R127	751 0062	049 013	Res., fixed, comp., 4.7 ohm, 1/2w, 10%
R128	751 0063	049 014	Res., fixed, comp., 1.0 ohm ½W, 10%
R129	751 0061	049 012	Res., fixed, comp., 180 ohm, 2w, 10%
R130	751 0062	049 013	Res., fixed, comp., 4.7 ohm, 1/2w, 10%
R131	751 0063	049 014	Res., fixed, comp., 1.0 ohm ½W, 10%
R132		041 136	Res., 330 ohm, 1w
R133	751 0025	041 080	Res., fixed, comp., 470k, 1/2w, 10%
R134	751 0020	041 073	Res., fixed, comp., 120k, 1/2w, 10%
R135	751 0010	041 053	Res., fixed, comp., 27k, 1/2w, 10%
R136 and R137	Not Used		
R138		049 364	Res., 12m
R139	751 0002	041 031	Res., fixed, comp., 1m, 1/2w, 10%
R140	751 0005	041 044	Res., fixed, comp., 470 ohm, 1/2w, 10%
R141	751 0017	041 068	Res., fixed, comp., 47k, 1/2w, 10%
R142		044 770	Res., Variable, 100k
R143	751 0023	041 077	Res., fixed, comp., 270k, 1/2w, 10%
R144	751 0037	041 241	Res., fixed, comp., 150 ohm, 1/2w, 10%
R145	Not Used		
R146	751 0035	041 195	Res., fixed, comp., 220 ohm, 2w, 10%
R147 and R148	Not Used		
R149	751 0030	041 147	Res., fixed, comp., 1.2k, 12, 10%
R150 thru R174	Not Used		
R175 and R176		041 031	Res., fixed, comp., 1m, 1/2w, 10%
R177 and R178		047 798	Res., fixed, comp., 15 ohm, 5w, 5%
R179	Not Used		
R180 and R181		041 031	Res., fixed, comp., 1m, 1/2w, 10%
S1ABC	462 5005-10		Switch, mic. play
S2AB	762 5017-10		Switch, head selector
S3ABCD	462 5006-10		Switch, record
S4ABEF	462 5001-10		Switch, record equalization
S4CDGH	462 5000-10		Switch, play equalization
S5A-S	462 5002-10		Switch, selector play-record
S6ABC	762 5016-10		Switch, mono stereo selector

ELECTRICAL PARTS LIST (CON'T)

REF. NO.	PART NO.	CORPORATE PART NO.	DESCRIPTION
S7			Part of R22 (Part No. 452 5001-10)
S8AB	462 5007-10		Switch, monitor
S9		120 384	Switch, auto-shut-off, micro switch
S10ABC	462 5010-10		Switch, motor reverse
S11	462 5009-10		Switch, tape tension
S12	4625008-01		Switch, Vibrator Assy
S14ABC	705 0011-10		Switch, off-on-monitor (1050/1080/2050/2080)
T1	458 5002-10		Transformer, transistor driver
T2	458 5001-10		Transformer, power
T3	458 5003-10		Transformer, bias oscillator
T4	458 5002-10		Transformer, transistor driver
V1AB		012 207	Tube, electron, 12AX7
V2AB		012 034	Tube, electron, 12AT7
V3AB		012 023	Tube, electron 12AU7
V4AB		012 207	Tube, electron, 12AX7
V5AB		012 034	Tube, electron, 12AT7
V6AB		012 034	Tube, electron, 12AT7
W1	473 5000-10		Cord, AC, power

MISCELLANEOUS ELECTRICAL PARTS

085-001	Fuseholder
169-436	connector, female, 12 pins
169-437	connector, female, 9 pins
169-438	connector, female, 6 pins
169-439	connector, male, 6 pins
169-440	connector, male, 9 pins
169-441	connector, male, 12 pins
169-471	pin, connector, male
169-472	pin, connector, female

1015 SPEAKER SYSTEM PARTS LIST

PART NO.	DESCRIPTION
410 5007-10	Button Cord
703 0002-10	Accessories - Speaker System
711 0000-10	Trim Strip
711 5010-10	Name Plate
713 0005-10	Bumper Strip
715 0002-10	Cabinet
717 0004-10	Pad, Sound Absorbing
726 0000-10	Support, Wall Mount
762 0001-10	Switch, High Frequency
768 0003-10	Speaker, 5-1/4 diameter, full range, 8w, 16 ohm
768 0003-20	Speaker, 5-1/4 diameter, Woofer, 8w, 16 ohm
768 0004-10	Speaker, Tweeter, 5w, 16 ohm
773 0002-10	Cable Assembly
031 666	Capacitor, 3 uf, 50 VDCW
264 012	Bushing, Strain Relief
930 059	Speaker Fabric
715 0002-10	Basic Cabinet
715 0002-10	Baffle Board
715 0002-10	Rear Panel
715 0002-10	Relief Tube

1016 SPEAKER SYSTEM PARTS LIST

PART NO.	DESCRIPTION
410 5007-10	Button Cord
703 0002-10	Accessories - Speaker System
711 0000-10	Trim Strip
711 5010-10	Name Plate
713 0005-10	Bumper Strip
715 0002-20	Cabinet
717 0004-10	Pad, Sound Absorbing
726 0000-10	Support, Wall Mount
762 0001-10	Switch, High Frequency
766 0001-02	Terminal Strip
768 0003-10	Speaker, 5-1/4 diameter, full range, 8w, 16 ohm
768 0003-20	Speaker, 5-1/4 diameter, Woofer, 8w, 16 ohm
768 0004-10	Speaker, Tweeter, 5w, 16 ohm
773 0002-10	Cable Assembly
031 666	Capacitor, 3 uf, 50 VDCW
264 012	Bushing, Strain Relief
930 061	Speaker Fabric
715 0002-20	Basic Cabinet
715 0002-20	Baffle Board
715 0002-20	Rear Panel
715 0002-20	Relief Tube

2010 SPEAKER SYSTEM PARTS LIST

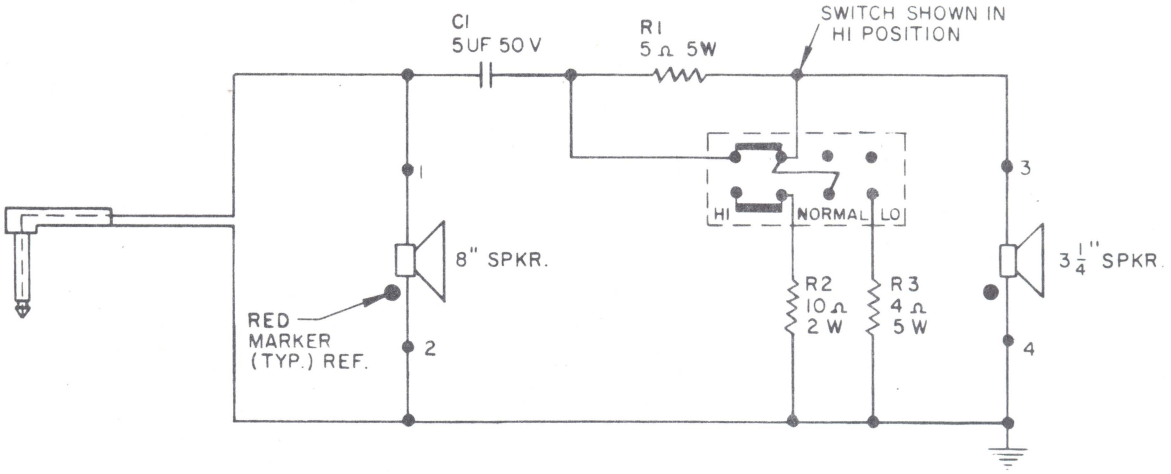
PART NO.	DESCRIPTION
410 5007-10	Button Cord
711 0000-10	Trim Strip
711 5010-10	Name Plate
713 0005-10	Bumper Strip
715 0000-10	Cabinet
717 0000-10	Pad, Sound Absorbing
726 0000-10	Support, Wall Mount
762 0000-10	Switch, High Frequency
768 0001-10	Speaker, 8" Woofer, 15w, 8 ohm
768 0002-10	Speaker, Tweeter, 15 w, 8 ohm
773 0002-10	Cable Assembly
031 653	Capacitor, 5 uf, 50 VDCW
041 189	Resistor, 10 ohm, 2w
047 760	Resistor, 5 ohm, 5w
047 751	Resistor, 4 ohm, 5w
264 012	Bushing, Strain Relief
930 059	Speaker Fabric
715 0000-10	Basic Cabinet
715 0000-10	Baffle Board
715 0000-10	Rear Panel
715 0000-10	Relief Tube

2011 SPEAKER SYSTEM PARTS LIST

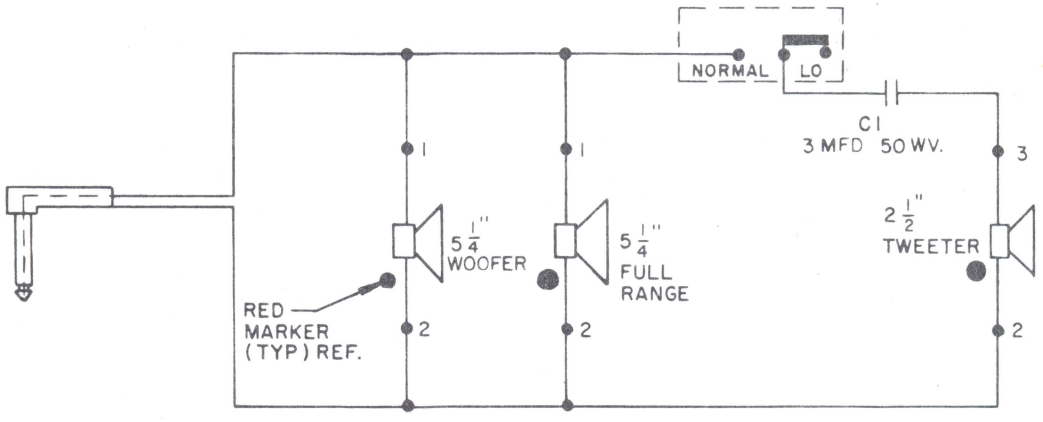
PART NO.	DESCRIPTION
410 5007-10	Button Cord
711 0000-10	Trim Strip
711 5010-10	Name Plate
713 0005-10	Bumper Strip
715 0000-20	Cabinet
717 0000-10	Pad, Sound Absorbing
726 0000-10	Support, Wall Mount
762 0000-10	Switch, High Frequency
768 0001-10	Speaker, 8" Woofer, 15w, 8 ohm
768 0002-10	Speaker, Tweeter, 15w, 8 ohm
773 0002-10	Cable Assembly
031 653	Capacitor, 5 uf, 50 VDCW
041 189	Resistor, 10 ohm, 2w
047 760	Resistor, 5 ohm, 5w
047 751	Resistor, 4 ohm, 5w
264 012	Bushing, Strain Relief
930 061	Speaker Fabric
715 0000-20	Basic Cabinet
715 0000-20	Baffle Board
715 0000-20	Rear Panel
715 0000-20	Relief Tube

DC TUBE AND TRANSISTOR VOLTAGES

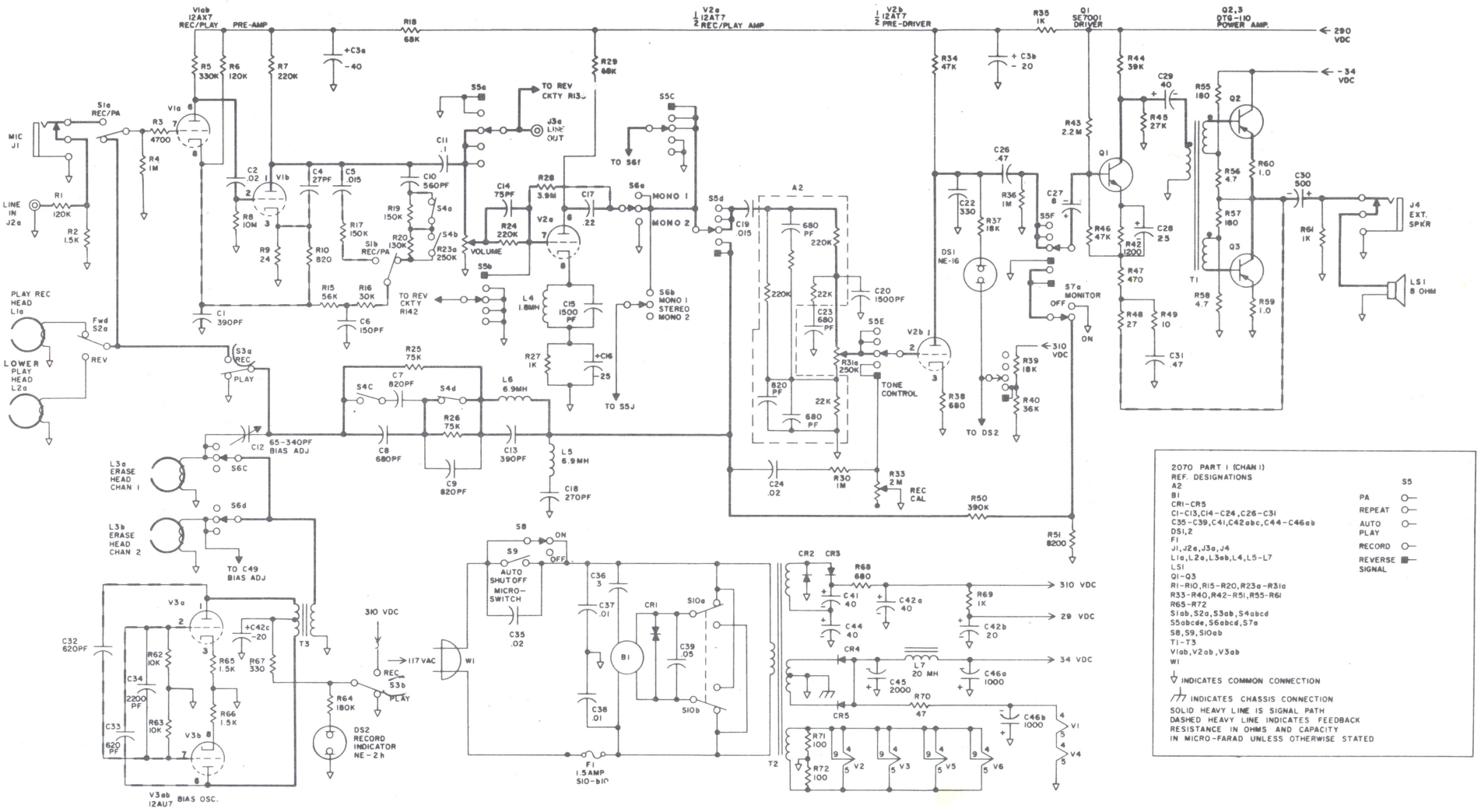
TRANSISTOR	TUBE	PIN	PLAY	RECORD	TUBE	PIN	PLAY	RECORD
	V1, V4	1	77	75	V2, V5	1	150	140
	V1, V4	2	-.4	-.4	V2, V5	2	0V	0V
	V1, V4	3	.04	.04	V2, V5	3	1.7	1.6
	V1, V4	4			V2, V5	4		
	V1, V4	5			V2, V5	5		
	V1, V4	6	110	108	V2, V5	6	145	135
	V1, V4	7	0V	0V	V2, V5	7	0V	0V
	V1, V4	8	1.1	1.0	V2, V5	8	1.8	1.6
	V1, V4	9			V2, V5	9		
	V3	1	0	290	V6	1	110	105
	V3	2	0	-2 to -5	V6	2	0	0
	V3	3	0	11	V6	3	1.3	1.2
	V3	4			V6	4		
	V3	5			V6	5		
	V3	6	0	290	V6	6	145	145
	V3	7	0	-2 to -5	V6	7	0	0
	V3	8	0	11	V6	8	2.5	2.4
	V3	9			V6	9		
Q1, Q4		Emitter	-8.7	-8.9				
Q1, Q4		Base	9.2	-9.4				
Q1, Q4		Collector	+64	+62				
Q3, Q6		Emitter	-.2	-.2				
Q3, Q6		Base	-.4	-.4				
Q3, Q6		Collector	-15	-15				
Q2, Q5		Emitter	-15	-15				
Q2, Q5		Base	-15.3	-15.3				
Q2, Q5		Collector	-30	-30				



Schematic Model 2010 and 2011



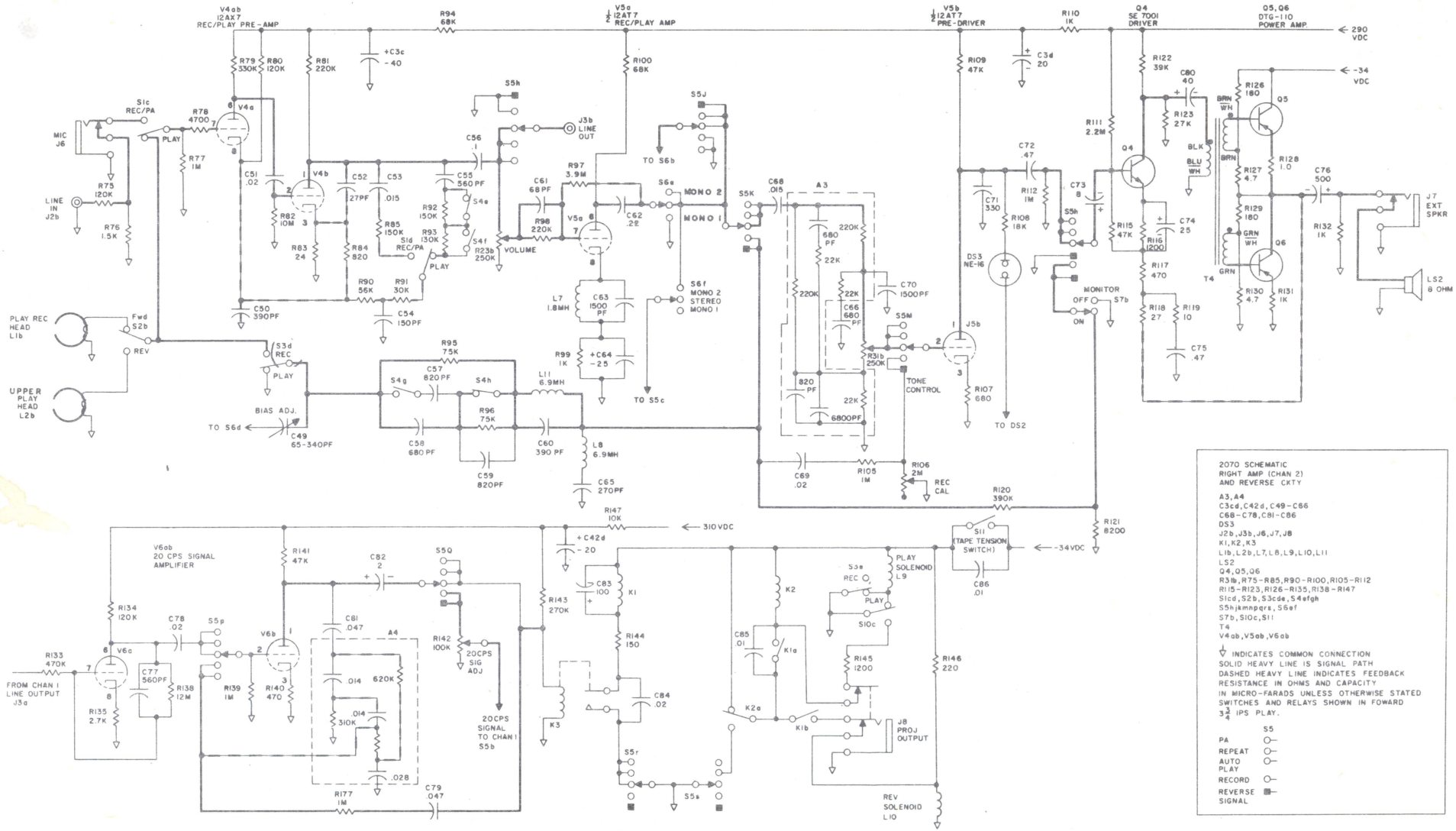
Schematic Model 1015 and 1016.



2070 PART I (CHAN I)
REF. DESIGNATIONS
A2
B1
CR1-CR5
C1-C13, C14-C24, C26-C31
C35-C39, C41, C42abc, C44-C46ab
DS1,2
F1
J1, J2a, J3a, J4
L1a, L2a, L3ab, L4, L5-L7
LS1
Q1-Q3
R1-R10, R15-R20, R23a-R31a
R33-R40, R42-R51, R55-R61
R65-R72
S1ab, S2a, S3ab, S4abcd
S5abcde, S6abcd, S7a
S8, S9, S10ab
T1-T3
V1ab, V2ab, V3ab
W1

INDICATES COMMON CONNECTION
INDICATES CHASSIS CONNECTION
SOLID HEAVY LINE IS SIGNAL PATH
DASHED HEAVY LINE INDICATES FEEDBACK
RESISTANCE IN OHMS AND CAPACITY IN MICRO-FARAD UNLESS OTHERWISE STATED

2070 PS AND LEFT AMP.



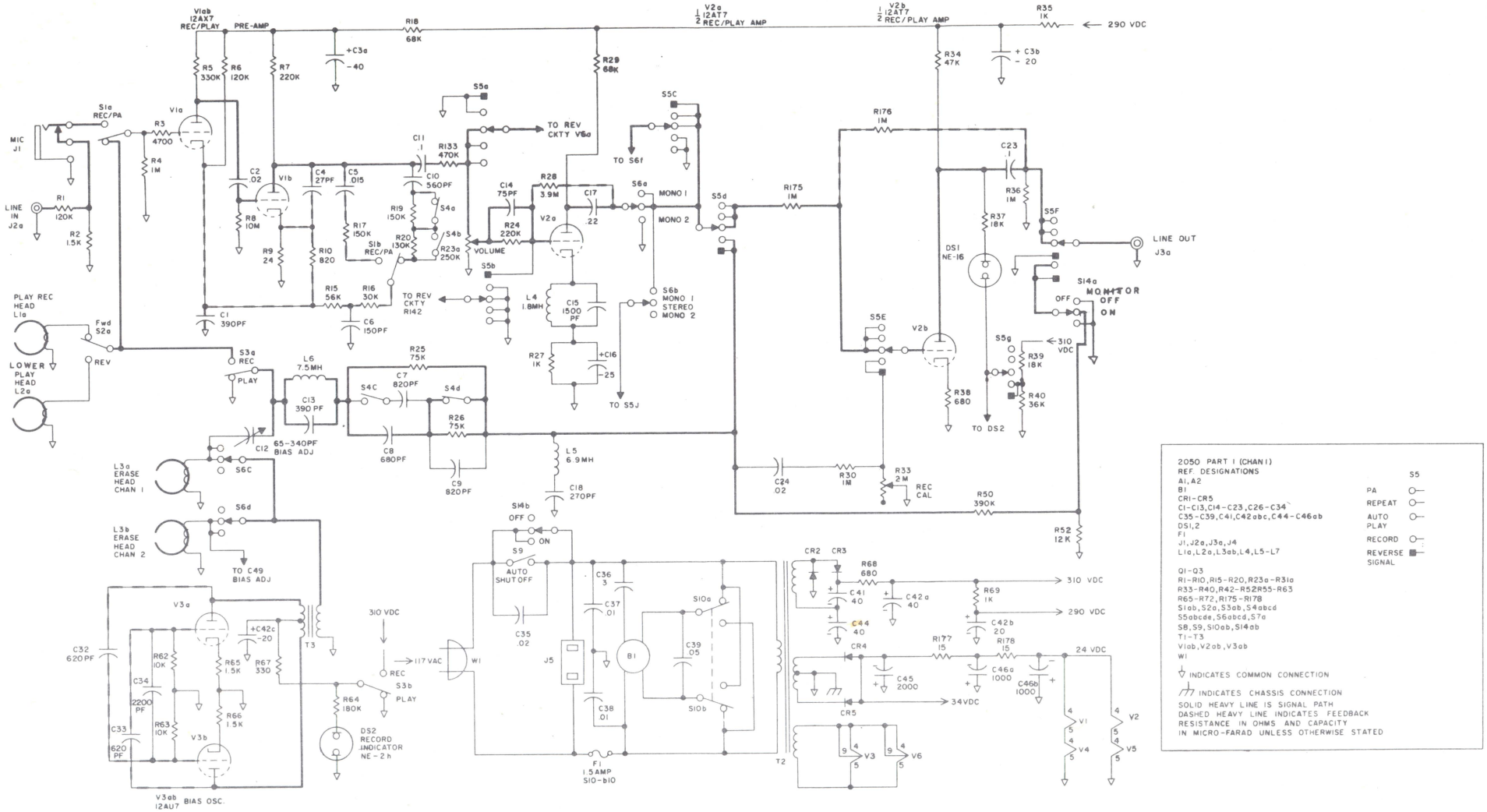
2070 SCHEMATIC
RIGHT AMP (CHAN 2)
AND REVERSE CKTY

A3, A4
C3cd, C42d, C49-C66
C68-C78, C81-C86
DS3
J2b, J3b, J6, J7, J8
K1, K2, K3
L1b, L2b, L7, L8, L9, L10, L11
LS2
Q4, Q5, Q6
R3lb, R75-R85, R90-R100, R105-R112
R115-R123, R126-R135, R138-R147
S1cd, S2b, S3cde, S4efgh
S5hjkmnpqrs, S6ef
S7b, S10c, S11
T4
V4ab, V5ab, V6ab

⏚ INDICATES COMMON CONNECTION
SOLID HEAVY LINE IS SIGNAL PATH
DASHED HEAVY LINE INDICATES FEEDBACK
RESISTANCE IN OHMS AND CAPACITY
IN MICRO-FARADS UNLESS OTHERWISE STATED
SWITCHES AND RELAYS SHOWN IN FOWARD
3¾ IPS PLAY.

S5
PA
REPEAT
AUTO PLAY
RECORD
REVERSE SIGNAL

2070 RIGHT AMP. AND REVERSE CKTY



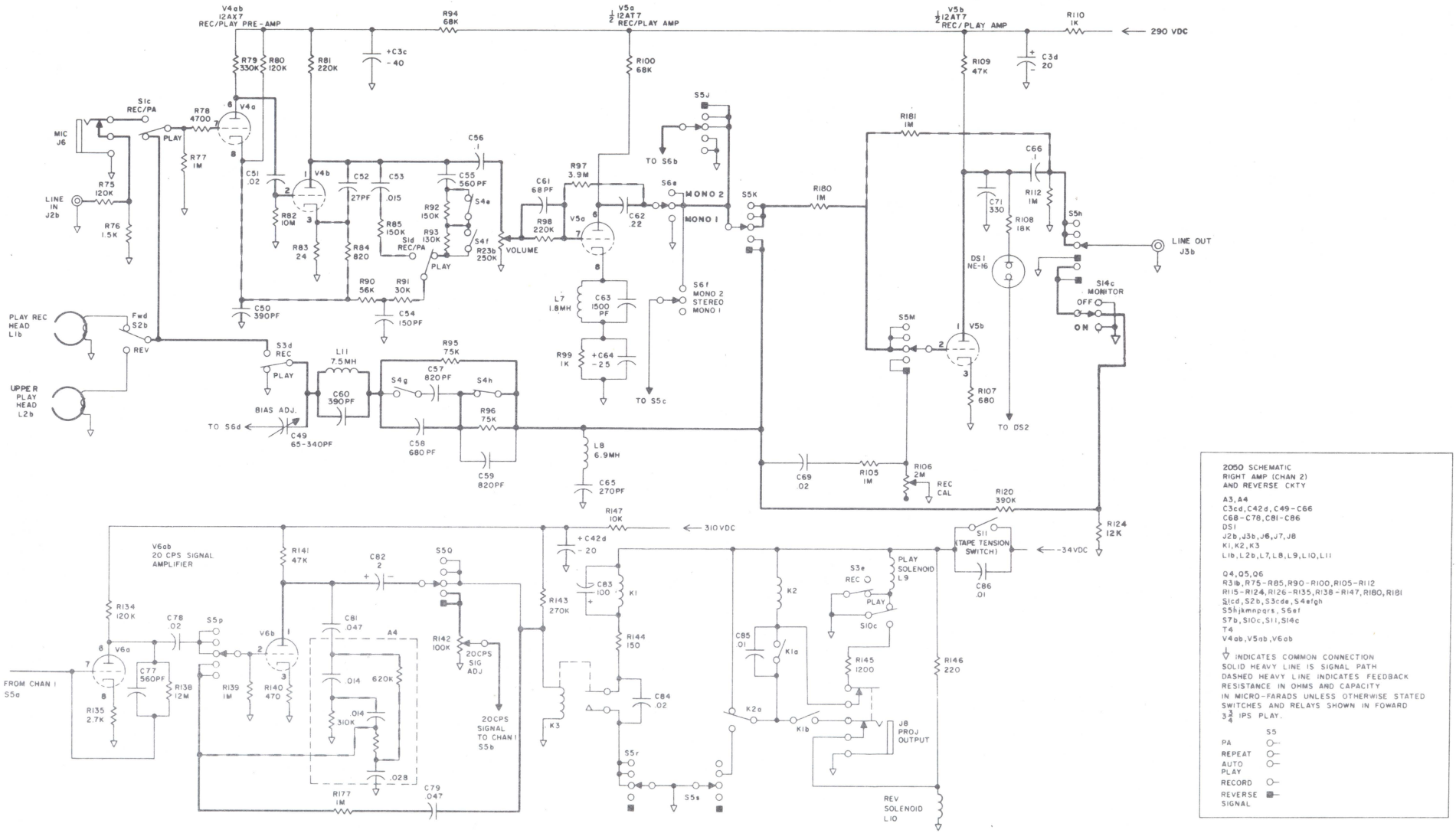
2050 PART 1 (CHAN 1)
REF. DESIGNATIONS
A1, A2
B1
CR1-CR5
C1-C13,C14-C23,C26-C34
C35-C39,C41,C42abc,C44-C46ab
DS1,2
F1
J1,J2a,J3a,J4
L1a,L2a,L3ab,L4,L5-L7

Q1-Q3
R1-R10,R15-R20,R23a-R31a
R33-R40,R42-R52R55-R63
R65-R72,R175-R178
S1ab,S2a,S3ab,S4abcd
S5abcde,S6abcd,S7a
S8,S9,S10ab,S14ab
T1-T3
V1ab,V2ab,V3ab
W1

S5
PA
REPEAT
AUTO PLAY
RECORD
REVERSE SIGNAL

▽ INDICATES COMMON CONNECTION
⏚ INDICATES CHASSIS CONNECTION
SOLID HEAVY LINE IS SIGNAL PATH
DASHED HEAVY LINE INDICATES FEEDBACK
RESISTANCE IN OHMS AND CAPACITY IN MICRO-FARAD UNLESS OTHERWISE STATED

2050/2080 PS AND LEFT AMP.



2050 SCHEMATIC
RIGHT AMP (CHAN 2)
AND REVERSE CKTY

A3, A4
C3cd, C42d, C49 - C66
C68 - C78, C81 - C86
DS1
J2b, J3b, J6, J7, J8
K1, K2, K3
L1b, L2b, L7, L8, L9, L10, L11

Q4, Q5, Q6
R3lb, R75 - R85, R90 - R100, R105 - R112
R115 - R124, R126 - R135, R138 - R147, R180, R181
S1cd, S2b, S3cde, S4efgh
S5hjkmnpqrs, S6ef
S7b, S10c, S11, S14c
T4
V4ab, V5ab, V6ab

▽ INDICATES COMMON CONNECTION
SOLID HEAVY LINE IS SIGNAL PATH
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IN MICRO-FARADS UNLESS OTHERWISE STATED
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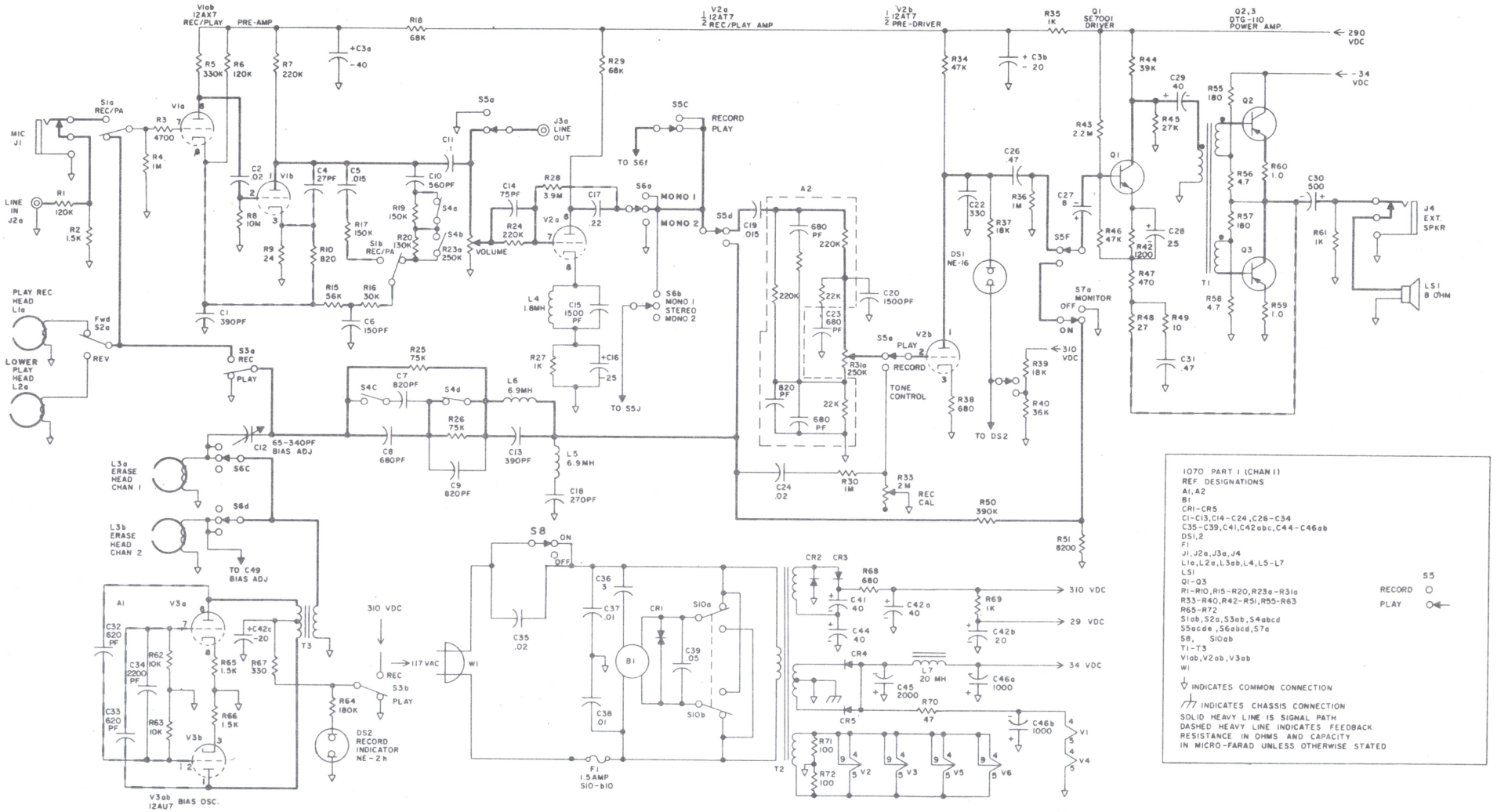
3¾ IPS PLAY.

S5
PA
REPEAT
AUTO PLAY
RECORD
REVERSE SIGNAL

2050/2080 RIGHT AMP. AND REVERSE CKTY



1070 PART 1 (CHAN 1)
REF. DESIGNATIONS
A1, A2
B1
CR1-CR5
C1-C13, C14-C24, C26-C34
C35-C39, C41, C42abc, C44-C46ab
DS1, 2
F1
J1, J2a, J3a, J4
L1a, L2a, L3ab, L4, L5-L7
LS1
Q1-Q3
R1-R10, R15-R20, R23a-R31a
R33-R40, R42-R51, R55-R63
R65-R72
S1ab, S2a, S3ab, S4abcd
S5acde, S6abcd, S7a
S8, S10ab
T1-T3
V1ab, V2ab, V3ab
W1

S5
RECORD ○
PLAY ○←

▽ INDICATES COMMON CONNECTION
/// INDICATES CHASSIS CONNECTION
SOLID HEAVY LINE IS SIGNAL PATH
DASHED HEAVY LINE INDICATES FEEDBACK
RESISTANCE IN OHMS AND CAPACITY
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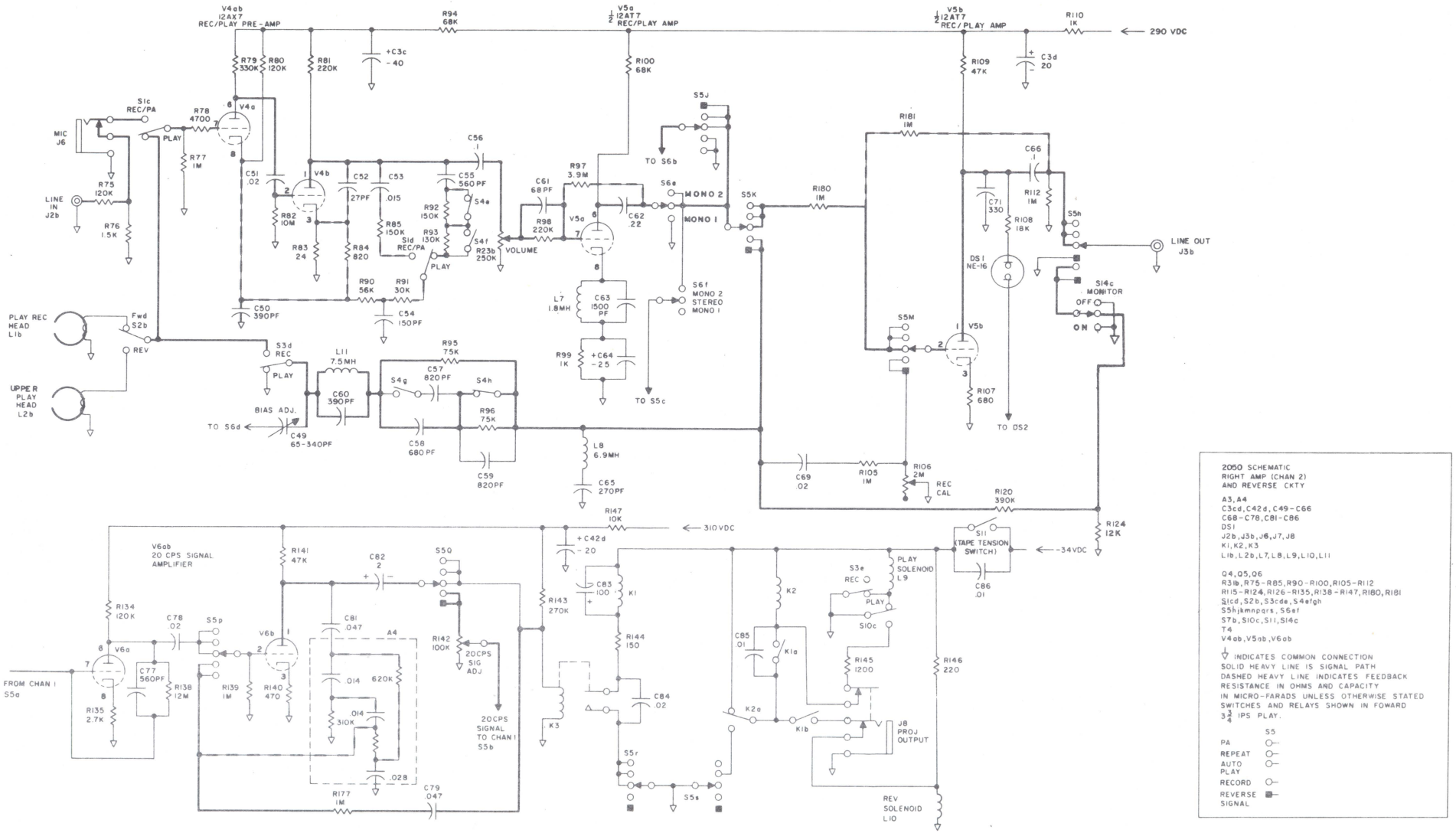
1070 PS AND LEFT AMP.



2050 SCHEMATIC
RIGHT AMP (CHAN 2)
AND REVERSE CKTY

A3, A4
C3cd, C42d, C49 - C66
C68 - C78, C81 - C86
DS1
J2b, J3b, J6, J7, J8
K1, K2, K3
L1b, L2b, L7, L8, L9, L10, L11

Q4, Q5, Q6
R3lb, R75 - R85, R90 - R100, R105 - R112
R115 - R124, R126 - R135, R138 - R147, R180, R181
S1cd, S2b, S3cde, S4efgh
S5hjkmnpqrs, S6ef
S7b, S10c, S11, S14c
T4
V4ab, V5ab, V6ab

▽ INDICATES COMMON CONNECTION
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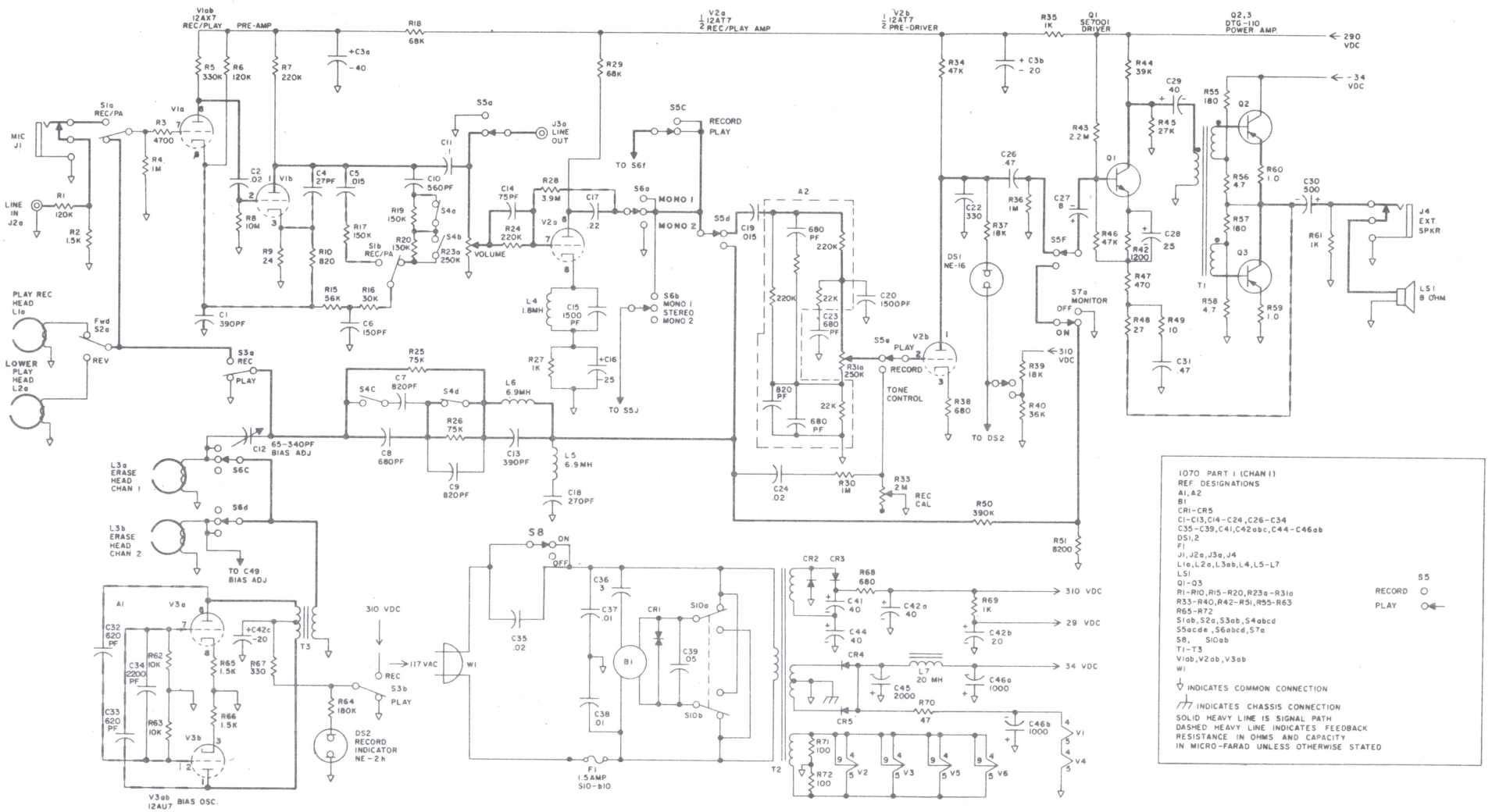
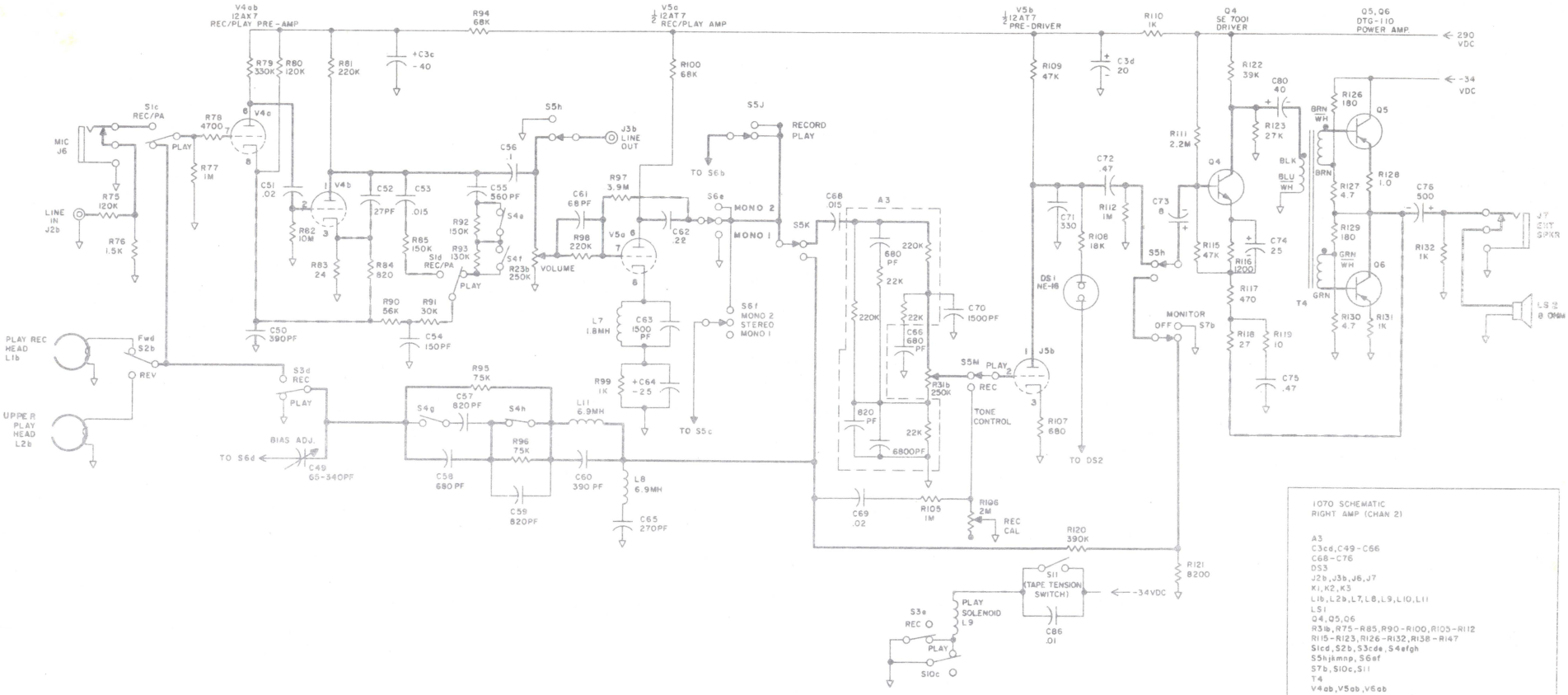
3¾ IPS PLAY.

S5
PA
REPEAT
AUTO PLAY
RECORD
REVERSE SIGNAL

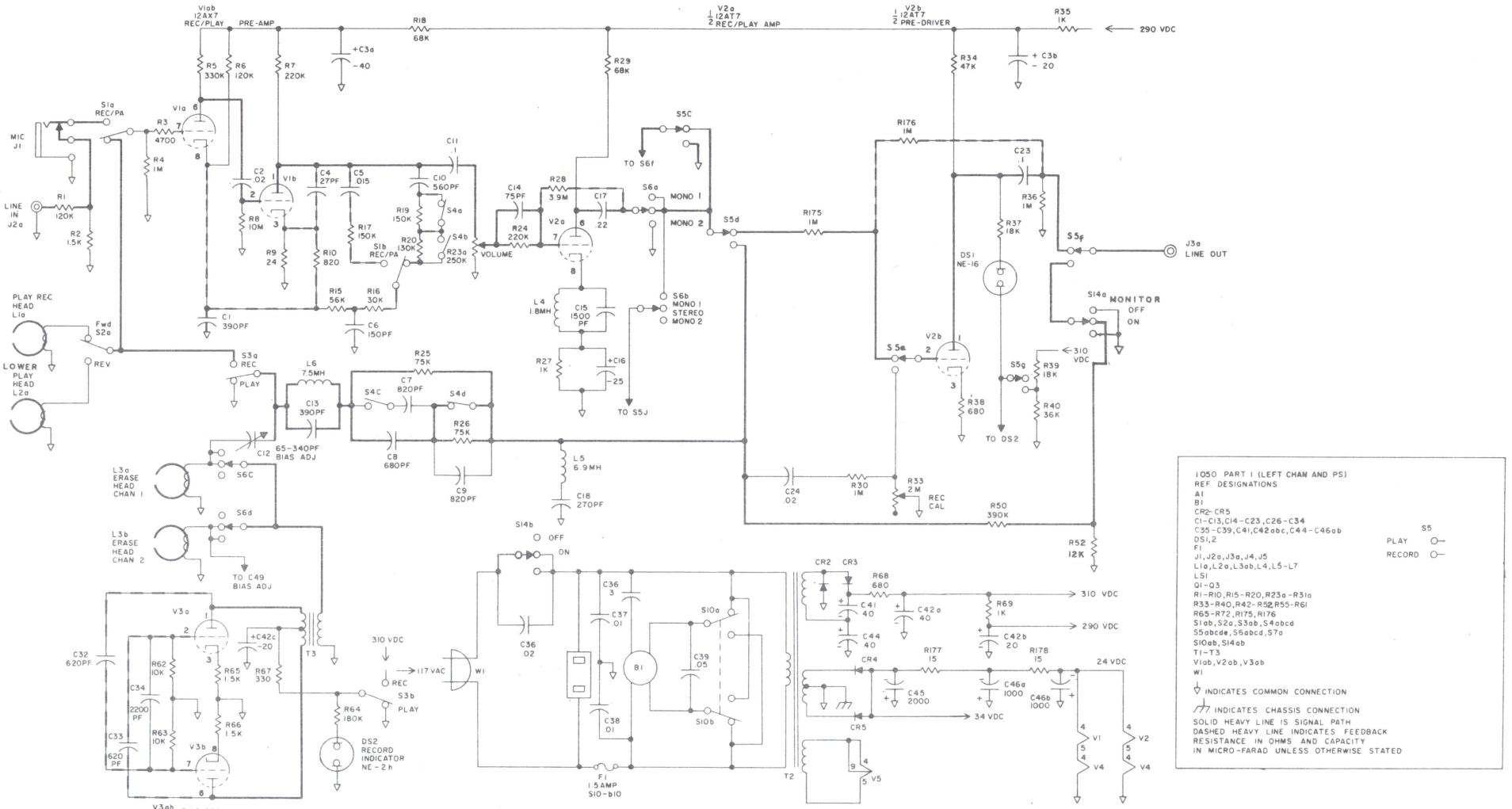
2050/2080 RIGHT AMP. AND REVERSE CKTY



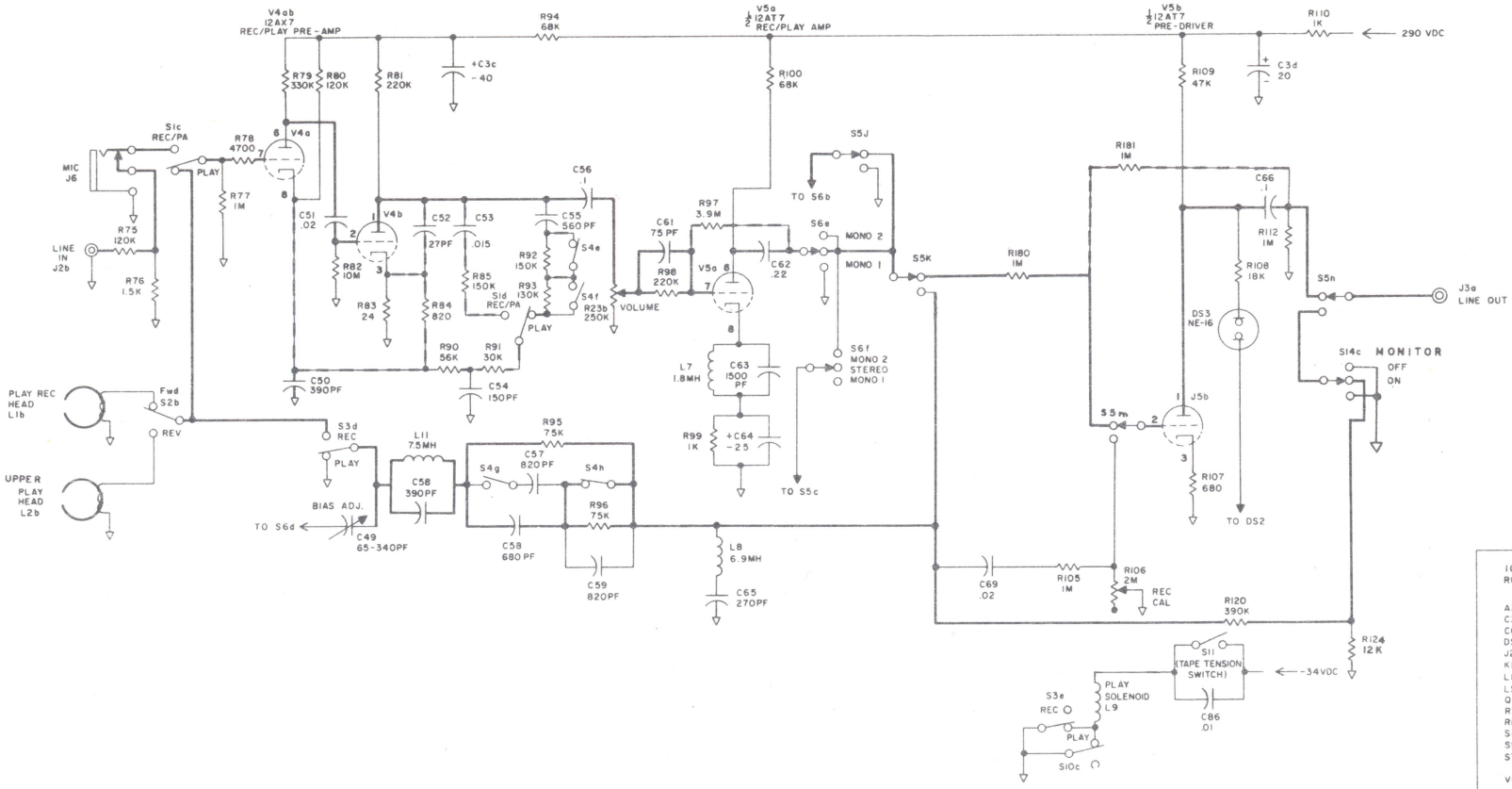
1070 PS AND LEFT AMP.



1070 RIGHT AMP.



1050/1080 PS AND LEFT AMP. (CHAN 1)



1050 SCHEMATIC
RIGHT AMP (CHAN 2)

A3, A4
C3cd, C42d, C49-C66
C68-C78, C81-C86
DS3
J2b, J3b, J6, J7, J8
K1, K2, K3
L1b, L2b, L7, L8, L9, L10, L11
LS2
Q4, Q5, Q6
R3ib, R75-R85, R90-R100, R105-R112
R115-R124, R126-R132, R180, R181
S1cd, S2b, S3cde, S4efgh
S5jkmn , S6ef
S7b, S10c, S11

V4ab, V5ab

⏚ INDICATES COMMON CONNECTION
SOLID HEAVY LINE IS SIGNAL PATH
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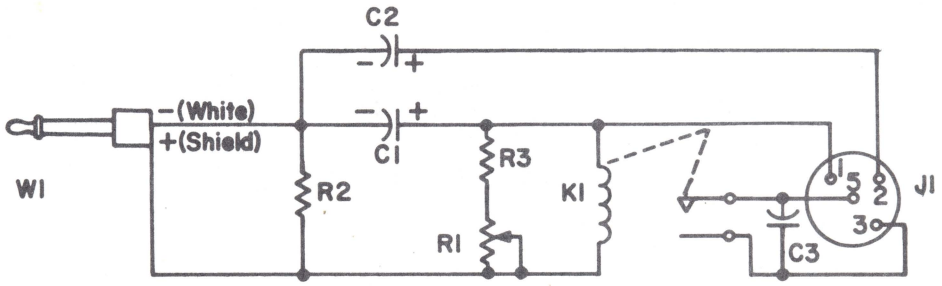
SWITCHES AND RELAYS SHOWN IN FOWARD
3¾ IPS PLAY.

	S5
PLAY	O—
RECORD	O—

1050/1080 RIGHT AMP.



MODEL 100 PROJECTOR ACTUATOR

REFERENCE	NOMENCLATURE	PART NUMBER
C1, C2	Capacitor, 150uf, 50VDCW	7550010-02
C3	Capacitor, .02uf, 500VDCW	7540001-01
J1	Jack	150-228
K1	Relay, SPST	4595002-10
R1	Res. Variable, 2.5K, Lin.	044-862
R2	Res. fixed, 18K, 1/2W, 10%	7510015-10
R3	Res. fixed, 470 ohm, 1/2W, 10%	7510005-10
W1	Cable Assembly (includes plug)	7730000-10
PROJ. ACT. COVER		7290003-10
Rubber feet		7130010-10

ADJUSTMENT OF R1.

Resistor R1 is adjusted for relay K1 contact closure time of 0.3 ± .05 second with 30 to 35 volts dc applied to W1. With pins 1 and 2 of J1 connected together, conact closure time should be 0.6 ± .1 second.

ADDENDUM

Model 2060

To be used with 2000 Series Service Manual, P/N 7890021-

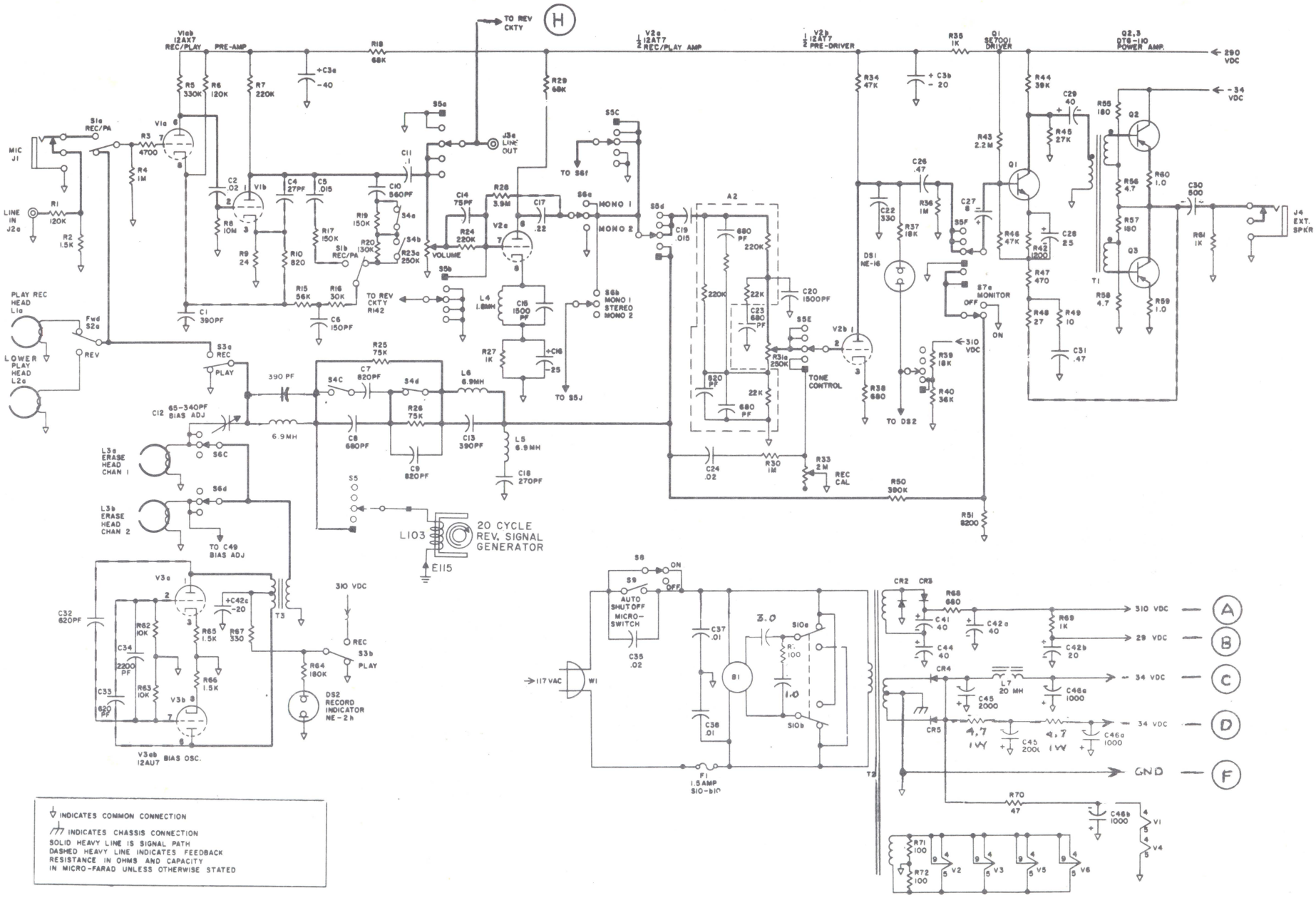
The Model 2060 and Model 2061 (with slide-on speakers) are the same as the Model 2070 with the exception of the reversing circuit. The Model 2060 uses a transistorized reverse signal detector circuit which replaces the resonant reed relay system used in the 2070.

In the 2060, the 20Hz reverse signal is generated by a magnet mounted on the wind idler pulley (Ref. A-34) rotating between the poles of a pick-up coil. The coil is located on the motor mounting plate (Ref.A-19). The 20Hz detector circuit is contained on a separate printed circuit board mounted on the rear of the thrust plate assembly (Ref. A-39). The 20Hz reverse signal amplifier for the 2070 (Ref. V-6) is replaced by a transistor (Ref. Q-7) in the 2060.

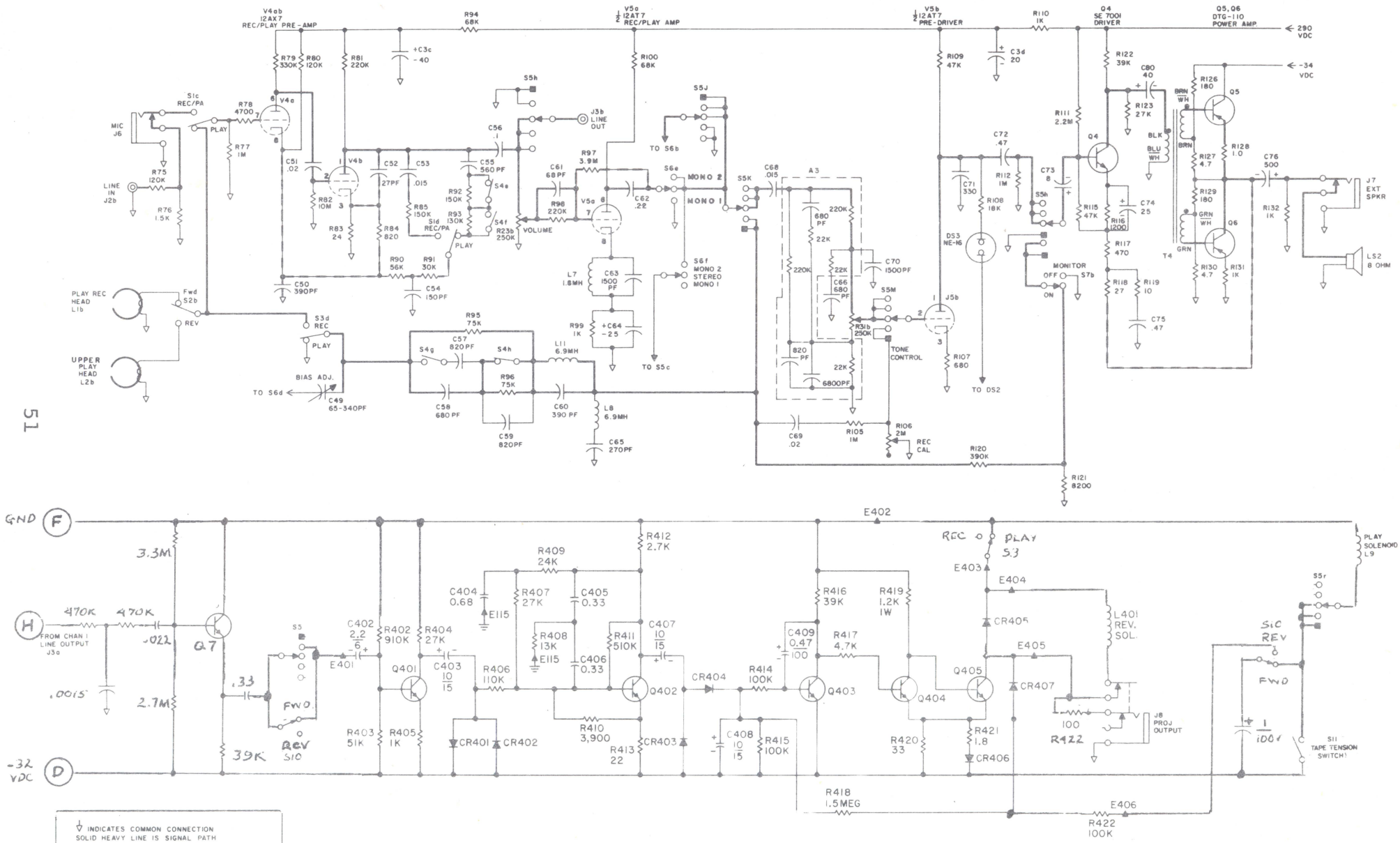
The main parts differences between the two series are indicated below.

Ref. No.	Description	2070	2060
A-1	Vibrator Assembly	4035000-10	-
A-19	Plate, Motor Mtg./w coil	4045010-10	7040086-01
L-103	Coil, 20Hz Generator	-	7580012-01
A-34	Pulley, Idler	4045027-10	7040082-01
C-36	Capacitor, Motor	4545000-10	7540069-01
V-6	Amplifier, Reverse Signal	12AT7	-
Q-7	Amplifier, Reverse Signal	-	4570005-01
---	Circuit Board (Rev. CKt.)	-	7050040-01

Schematics for the 2060 plus the reverse circuit component parts list and layout are shown on the following pages.



2060 LEFT AMPLIFIER AND POWER SUPPLY



INDICATES COMMON CONNECTION
SOLID HEAVY LINE IS SIGNAL PATH
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RESISTANCE IN OHMS AND CAPACITY
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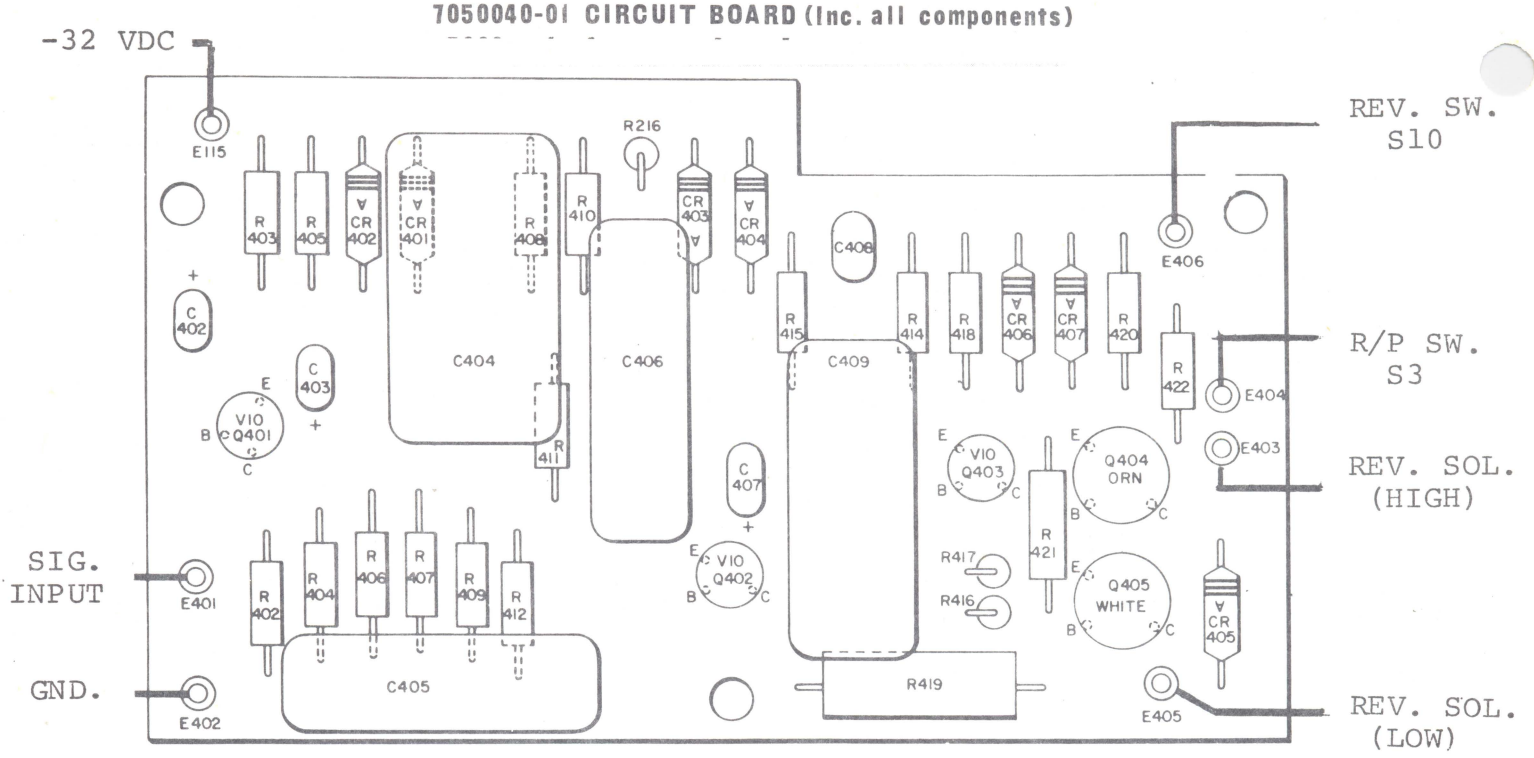
SWITCHES AND RELAYS SHOWN IN FOWARD
3¾ IPS PLAY.

S5	
PA	○
REPEAT	○
AUTO PLAY	○
RECORD	○
REVERSE SIGNAL	■

2060 RIGHT AMPLIFIER AND REVERSE CIRCUIT

AUTO REVERSE CIRCUIT BOARD

7050040-01 CIRCUIT BOARD (Inc. all components)



CAPACITORS

C 402	7551225-10	2.2ufd, 6V.
C 403	7551106-42	10ufd, 15V.
C 404	7543684-19	.68ufd, 100V.
C 405	7543334-15	.33ufd, 75V.
C 406	7543334-15	.33ufd, 75V.
C 407	7551106-42	10ufd, 15V.
C 408	7551106-42	10ufd, 15V.
C 409	7542474-15	.47ufd, 100V.

DIODES

CR401	7570215-21	Diode
CR402	7570215-21	Diode
CR403	7570215-21	Diode
CR404	7570215-21	Diode
CR405	7570215-21	Diode
CR406	7570215-21	Diode
CR407	7570215-21	Diode

TRANSISTORS

Q401	7570005-01	Transistor
Q402	7570005-03	Transistor
Q403	7570005-03	Transistor
Q404	7570008-02	Transistor
Q405	7570008-02	Transistor

RESISTORS

(All resistors ¼W., 5% unless otherwise noted!)

R402	7510137-03	910K ohm
R403	7510117-02	51K ohm
R404	7510118-02	27K ohm
R405	7510111-02	1K ohm, 10%
R406	7510119-02	110K ohm
R407	7510118-02	27K ohm
R408	7510121-02	13K ohm
R409	7510120-02	24K ohm
R410	7510078-02	3.9K ohm, 10%
R411	7510122-02	510K ohm
R412	7510112-02	2.7K ohm, 10%
R413	7510115-04	22 ohm, 10%
R414	7510114-02	100K ohm, 10%
R415	7510114-02	100K ohm, 10%
R416	7510116-05	39K ohm, 10%
R417	7510079-05	4.7K ohm, 10%
R418	7510113-02	1.5M ohm, 10%
R419	7510030-03	1.2K ohm, 1W., 10%
R420	7510072-02	33 ohm, 10%
R421	7510125-02	1.8 ohm, ½W.
R422		100 ohm, 10%

2060 REVERSE CIRCUIT BOARD