Price $10.00

SHURE®

700 AND 706 SERIES

PRO MASTER™

SERVICE MANUAL

Manufactured by
SHURE BROTHERS INC.
222 Hartrey Avenue
Evanston, Illinois 60204 U.S.A.

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Printed in U.S.A.

SPECIFICATIONS*

Type ..... Solid-state power console using discrete components and integrated circuits

Inputs ..... Six input channels (high and/or balanced low impedance), plus two aux input channels (7 and 8)

Input Channel Controls. VOLUME, INPUT ATTENUATOR, A/B PAN (700), LOW and HIGH FREQUENCY EQUALIZATION, EFFECTS/REVERB, MONITOR

Aux Channel Controls... VOLUME, A/B PAN (700)

Master Controls..... MASTER, EFFECTS SEND, REVERB LOW and HIGH EQUALIZATION, REVERB RETURN, MONITOR MASTER

Outputs ..... SPEAKER, MONITOR, EQ OUT, MIX OUT, EFFECTS, HEADPHONES, AUX, MIC

Common Mix Buses .... MIX OUTPUT, EQ OUTPUT (A, B in 700)

Reverb and Effects ..... Built-in reverberation unit; provisions for connection to remote reverb on-off switch and external effects devices

Graphic Equalizers..... 10-band, fully combining, minimum-phase, octave type, normally connected to power amplifier input; 13 dB boost or cut at 63, 125, 250, 500 Hz, 1, 2, 4, 8 and 16 kHz; BELOW 63 Hz 12 dB/octave cutoff filter (10 dB down at 31 Hz)

LED Status Indicators... INPUT CLIP, DB PEAK/feedback frequency, PA OVERLOAD, POWER, TEMP WARNING, SHUTDOWN

Power Output	706; 700 with both channels driven	700 with one channel driven
Per channel/4 ohms	200W min.	240W typical
Per channel/8 ohms	125W min.	145W typical

Measured at 1 kHz, 120 Vac, 1% THD

Distortion ..... THD typically less than 0.1% at 40 Hz and 1 kHz, 0.25% at 15 kHz; IM distortion typically less than 0.25% [One channel driven, 180W or less to 4 ohms, 110W or less to 8 ohms, measured from low-impedance input with individual and master controls at typical settings (orange index marks)]

Low- and High-Frequency Input Equalization ..... ±13 dB at 100 Hz and 10 kHz

Input Clipping Indicators ..... Light 3 dB below input or equalizer clipping level

DB Peak Indicators..... Indicate power amplifier peak voltage; +6 dB LED indicates 100 watts sine-wave output to 4-ohm load. Rise time: 250 μsec to full-scale indication; fall time: 65 msec from full-scale to no indication

PA Overload Indicators ..... Light when power amplifier THD exceeds 1%; fully on at 5%

Temperature Warning Indicator ..... Lights when output transistor temperature exceeds 70°C (158°F)

Shutdown Indicator .... Lights when power amplifier shutdown occurs due to output transistor temperature over 100°C (212°F), air flow or fan failure, or dc at speaker output

Input Sensitivity (full power output)....

BAL LO IMP	0.6 mV
HI IMP	8 mV
AUX	215 mV (700) 106 mV (706)
EQ INPUT	960 mV
PA INPUT	960 mV

SPECIFICATIONS* (continued)

Input Clipping Level . . . . BAL LO IMP 700 mV to 21 mV (INPUT ATTEN −30 to 0)
HI IMP 10V to 335 mV (INPUT ATTEN −30 to 0)
AUX 30V to 10V (VOLUME from 0 to 10)

Voltage Gain . . . . . 94 dB BAL LO IMP INPUT to SPEAKER OUTPUTS
71 dB HI IMP INPUT to SPEAKER OUTPUTS
43 dB AUX INPUT to SPEAKER OUTPUTS (700; 706: 49 dB)
64 dB BAL LO IMP INPUT to MIX OUTPUT
77 dB BAL LO IMP INPUT to MONITOR OUTPUT
74 dB BAL LO IMP INPUT to EFFECTS OUTPUT
16 dB BAL LO IMP INPUT to MIC OUTPUT
58 dB BAL LO IMP INPUT to AUX OUTPUT
81 dB BAL LO IMP INPUT to HEADPHONE OUTPUT
0 dB EQ INPUT to EQ OUTPUT
30 dB PA INPUT to SPEAKER OUTPUTS

Levels and Impedances

Circuit	Nominal Level	Maximum Level	Actual Impedance	Working Impedance
BAL LO IMP INPUT	5 mV	700 mV	1k	19-300 ohms
HI IMP INPUT	50 mV	10V	145k	100k or less
AUX INPUT	0.5V	30V	50k	10k or less
MIX OUTPUT	1V	9V	2.4k	2k or more
EFFECTS OUTPUT	1V	9V	2.4k	2k or more
MONITOR OUTPUT	1V	9V	2.4k	2k or more
EQ INPUT	1V	10V	50k	10k or less
EQ OUTPUT	1V	9V	2.4k	2k or more
AUX OUTPUT	1V	9V	5k	2k or more
MIC OUTPUT	5 mV	75 mV	70 ohms	19-300 ohms
PA INPUT	1V	10V	50k	10k or less
SPEAKER OUTPUT	—	28.3V	—	4 ohms or more
HEADPHONES	—	10V	360 ohms	4 ohms or more

Frequency Response . . . ±2 dB, 40 to 20,000 Hz, BAL LO IMP INPUT to SPEAKER OUTPUTS

Hum and Noise (20 Hz to 20 kHz) . . . . . −127 dBV equivalent input (BAL LO IMP)

Noise (300 Hz to 20 kHz) . . . . −128 dBV equivalent input (BAL LO IMP)

Signal-to-Noise Ratio . . . Greater than 80 dB (below full output) at typical control settings (orange marks, MASTER at 5, INPUT ATTEN at −12)

Mic Input Simplex Power . . . . . 24 Vdc open-circuit, 1.8k series resistance, simplex on/off switch

Power Requirements . . . Models 700 and 706: 120 Vac ±10%, 50/60 Hz; 1100W (700), 600W (706) max. (Can be rewired for other voltages; see *OPERATION AT OTHER VOLTAGES);* Models 700E6 and 706E6: 100, 120, 140, 200, 220 and 240 volts, 50/60 Hz (switch-selectable).

Environmental Conditions
Operating . . . . . −7° to 43°C (20° to 110°F)
Storage . . . . . −40° to 74°C (−40° to 165°F)

Overall Dimensions . . . . . 190 mm H x 584 mm W x 508 mm D (7½ in. x 23 in. x 20 in.)

Weight . . . . . 700: 21.3 kg (47 lb)
706: 17.9 kg (39½ lb)

Construction . . . . . Molded construction with black finish, carrying handle, molded rubber feet, line cord storage

Certifications . . . . . Listed by Underwriters' Laboratories, Inc.; listed by Canadian Standards Association as Certified (700, 706)

*Measurement Conditions (unless otherwise specified): All volume and gain controls for measured channel at maximum; unused channel controls at 0; equalization controls at 0. Measured input terminated as follows (unused inputs unterminated): BAL LO IMP, 150 ohms; HI IMP, 33k; AUX, EQ and PA, 4.7k. All outputs terminated as follows: all high-level outputs, 47k; MIC, 150 ohms; SPEAKER, 4 ohms: HEADPHONES, 200 ohms.

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Model 700

Model 706

DESCRIPTION

The Shure PRO MASTER™ Power Consoles are portable, high-power, eight-input mixer-amplifiers designed for use by professional entertainers and sound system operators. They are all solid-state units, employing the latest developments in integrated circuit, discrete component, and printed wiring technology. The PRO MASTER features pre-fader monitor, and exclusive FEEDBACK FINDER™ and PATCH BLOCK™ rear panel. Models 700 and 700E6 are stereo units, with twin 200-watt (rms) power amps, and Models 706 and 706E6 are mono units, with a single 200-watt (rms) power amp.

Six input channels for microphones and/or aux level sources provide six high-impedance and six balanced low-impedance inputs (which can be used simultaneously). Each input channel is equipped with volume, 0-30 dB attenuator, high- and low-frequency equalization, effects/reverb and monitor controls. Two additional aux (only) input channels (7 and 8) with volume controls are also provided. Models 700 and 700E6 also contain A/B PAN controls.

LED indicators show input clipping, power amp peak output level, power amp overload, power-on, temperature warning, and shutdown conditions.

Master controls include: master volume, effects send, reverb high- and low-frequency equalization, reverb return and monitor. Console outputs are: monitor, effects, stereo headphones, aux, mic, and speakers. In addition, common mix buses are provided: mix output and equalizer output.

Each 10-band graphic equalizer uses minimum-phase, combining-type octave filters. Each filter is continuously adjustable over a ±13 dB range, except for the lowest, which is a 12 dB/octave cut-only switch. The FEEDBACK FINDER circuit switches the LEDs from power amp peak output level indicators to visual indicators of feedback frequency for eliminating feedback by graphic equalizer adjustment.

The built-in electromechanical spring-type reverberation device has provisions for connecting an external reverb on/off switch through the rear panel.

The rear-panel PATCH BLOCK contains a block diagram of the console's circuits, with patching jacks located in the diagram for easy reference.

The Model 700 and 706 consoles' regulated low-voltage power supplies operate over a 120 Vac ± 10% range (operation as low as 100 Vac is possible at reduced output). The consoles can be rewired internally for operation at other voltages (see *OPERATION AT OTHER VOLTAGES*). An unswitched ac receptacle for powering accessory equipment up to 100 watts is supplied. The Models 700E6 and 706E6 operate at switch-selected voltages of 100, 120, 140, 200, 220 and 240 volts. In all models, a regulated 24 Vdc simplex supply is provided for powering condenser microphones. The consoles are protected against damage from open- or short-circuits on inputs or outputs, against heat damage by a cooling fan and automatic thermal shutdown circuit, and against radio frequency interference and line noise.

The structural foam molded cover is fastened to a 19 mm (¾ in.) wood bottom panel and contains a retractile handle, rubber molded feet, and line cord storage.

Models 700 and 706 are Listed by Underwriters' Laboratories, Inc., and listed by Canadian Standards Association as Certified.

MAINTENANCE

The PRO MASTER™ is an exceptionally well-designed unit. All components are of the highest quality, operating well within their respective ratings to assure long life. The following list of Do's and Don'ts describes minimal operating precautions and maintenance to provide years of dependable service.

- DO clean the air filter every 100 hours of operation (more frequently in dusty or dirty areas). Stand the console on its rear bumpers, remove the screw securing the filter, and slide it out of its slot. Rinse the filter in water or a mild detergent solution, allow to dry, and replace.
- DO unplug the console before cleaning. DO clean the outer surfaces of the console with a clean, damp cloth and mild detergent. DON'T use strong solvents or cleaning fluids.
- DO use a 16AWG or larger (700, 700E6; 18 AWG for 706 or 706E6) heavy-duty extension cord when additional line cord length is needed.
- DON'T operate the console with air louvers blocked, or placed on a radiator or heat-producing equipment. Avoid operation in direct, hot sunlight.
- DON'T replace the rear-panel fuse with a different size or type. Use only 10A, 250V (for Model 700, or 700E6 when operated at 100, 120 or 140 volts), or 5A, 250V, slow blow (for Model 700E6 when operated at 200, 220 or 240 volts. For Model 706, use a 4A, 250V SLOW BLOW fuse. For Model 706E6, use a 5A, 250V fuse when operated at 100, 120 or 140 volts, or a 3.15A, 250V SLOW BLOW fuse when operated at 200, 220 or 240 volts.
- DON'T connect the A and B speaker outputs together (700 or 700E6). (See Instruction Manual for monophonic setups.)
- DON'T risk fire or shock hazard by operating the console in rain.
- DON'T use UNbalanced low-impedance microphones with the SIMPLEX 24V switch on; turn off the switch if not required for powering condenser microphones. If simplex power is in use, connect unbalanced low-impedance microphones through a line matching transformer (Shure A95FP) to a HI IMP INPUT.

TROUBLESHOOTING

Should any difficulty be encountered in console operation, the problem can often be traced to some simple source such as an error in interconnection. The following is offered as a basic guide to this type of problem.

SYMPTOM	PROBABLE CAUSE OR CORRECTION
Console is "dead" (no output, POWER LED off)	1. Check that ac power source is "live" and that console is plugged in. 2. Check that power ON/OFF switch is on. 3. Check that rear-panel fuse is good.
Console appears to be overheating (TEMP WARNING LED on)	1. Check air louvers for blockage of proper air flow. 2. Check for proper speaker load or shorted speaker cable. 3. Check air filter and clean if necessary.
Console power amplifiers turn off and remain off (SHUTDOWN LED on)	1. Check for proper air flow (fan remains on during shutdown). 2. Check for hot air from left louvers; console may have overheated (see above). Wait one minute to allow proper cooling. 3. Turn console off for a few seconds and turn back on. 4. If shutdown persists, have console checked by qualified service personnel.
No signal at speaker (all console functions appear normal)	1. Check for defective or improperly connected speaker cables. 2. Check for improper connections to EQ or PA INPUT. 3. Check settings of channel VOLUME and MASTER volume controls.
Console fuse blown	1. Replace with identical fuse. 2. If second fuse blows, have console checked by qualified service personnel.
One of two inputs on same channel not working properly (both ¼-inch and 3-pin jacks in use)	1. Make sure similar microphones are used on both inputs, and microphone impedances match the inputs used. 2. Make sure microphone is not used with accessory equipment on other input. 3. Make sure both microphone switches are on.
INPUT CLIP LED flashing	1. Adjust INPUT ATTEN to reduce channel input level. 2. Reduce input signal level at source.
PA OVERLOAD LED flashes while DB PEAK indicators read less than +6	1. Check for defective (shorted) speaker cable. 2. Check that load impedance is not too low (too many speakers connected).

No DB PEAK/frequency band LED indicators flashing (console output normal)	1. Make certain FEEDBACK FINDER switch is set to A, B, ON or OFF (not between positions).
No console output; no DB PEAK LED indicators flashing	1. Check PATCH BLOCK™ rear panel for improper patching. 2. Check for improper connections to EQ or PA INPUT. 3. Check settings of channel VOLUME and MASTER volume controls.
Loud noise or clicks when certain microphones or cables are used	1. SIMPLEX 24V switch is on (when not needed). 2. Unbalanced cable used when SIMPLEX 24V switch is on. 3. Check for defective microphone cables.
No monitor output (program output normal)	1. Check MONITOR OUTPUT connection to EQ or PA INPUT, or external amplifier. 2. Make sure MONITOR and MONITOR MASTER controls are turned up. 3. Monitor speaker volume control (if present) may be turned down.
Sound quality poor (weak or thin)	1. Excessive equalization on graphic equalizers. 2. Defective input or patching cables.

Two simple methods of localizing problems without opening the console are as follows. These methods can be used to find the abnormal console section with or without test equipment. (The methods are not needed if the problem is obvious: SHUTDOWN, no POWER indication, etc.)

With test equipment: Set all console controls to full clockwise, REVERB RETURN control to full counterclockwise, and PAN (700) and EQ controls to center. Do not connect a speaker or headphone load. Apply a 0.5 mV, 1 kHz test signal across pins 2 and 3 of one of the BAL LO IMP input connectors. Normal voltmeter readings taken at each speaker, rear-panel PATCH BLOCK™ and front-panel HEADPHONES connector are given in Table 1. The top row of figures indicates the voltage in each stage from input to output. Similarly, a 5 mV signal inserted in a HI IMP input will check these same voltages. The other listed inputs give voltage indications only for those circuits following the inserted signal. Ac voltages may vary ±30% from the values shown.

Without test equipment: Using only a microphone and speaker, it is often possible to isolate problem areas using the PATCH BLOCK rear panel. The ability to bypass certain circuits and interchange channel signals provides a simple but powerful tool for troubleshooting. For example, *in a 700 console a suspected channel A equalizer can be* checked by patching between the A MIX OUTPUT and A PA INPUT jacks. The signal bypasses the equalizer, and a talk test will immediately indicate whether the problem has been eliminated.

Similarly, a potentially defective channel B mix amplifier can be verified by patching the A MIX OUTPUT to the B MIX OUTPUT. The presence of a "clean" signal from channel A to the B speaker output indicates that the problem precedes the B MIX OUTPUT jack. Further patching between the EFFECTS OUTPUT and B MIX OUTPUT jacks will isolate the problem to the B MIX amplifier.

TABLE 1. NOMINAL TEST VOLTAGES

INPUT		OUTPUTS							
		Monitor	Effects	Mix	Aux	Mic	Eq	Speaker	Headphones*
Bal Lo Imp	0.5 mV	3.8V	2.7V	0.54V	0.54V	7.0 mV	0.54V	18.0V	11.5V
Hi Imp	5 mV	3.8V	2.7V	0.54V	0.54V	7.0 mV	0.54V	18.0V	11.5V
Aux (700)	0.15V	—	—	0.54V	0.54V	7.0 mV	0.54V	18.0V	11.5V
Aux (706)	64 mV	—	—	0.54V	0.54V	7.0 mV	0.54V	18.0V	11.5V
Eq	0.54V	—	—	—	—	—	0.54V	18.0V	11.5V
PA	0.54V	—	—	—	—	—	—	18.0V	11.5V

*Tip or ring to sleeve.

The above methods are extremely useful for saving time in localizing problem areas. In addition, they may allow use of the console in an emergency until repairs can be made. *Internal servicing should only be performed by qualified* service personnel.

CIRCUIT OPERATION

Most of the PRO MASTER™ circuitry uses conventional operational amplifier technology, and can be serviced using standard voltage-measurement procedures. However, certain circuits are unusual and may not be familiar to many servicemen. This section describes these circuits as an aid to servicing (see Figures 5-38).

PA OVERLOAD LED INDICATORS

The PA OVERLOAD LEDs (D1109) are designed to respond to error signals in their respective differential amplifiers. The overload circuit is comprised of transistor Q607 and associated resistors with the LED connected across the collector and emitter of Q607.

The power amplifier assembly input is the differential amplifier Q605-Q606, which amplifies the difference of the signals at the bases (the input signal to Q605 and the negative feedback signal to Q606). With small error signals (normal power amplifier operation), the dc voltage drop across R611 is approximately 1.6V, sufficient to keep Q607 turned on. Q607's collector-emitter voltage drop is very low (approximately 0.1V), and as long as Q607 is on, the associated overload LED is turned off.

When the differential amplifier input signals differ greatly (such as when clipping or V-I protection takes place), the ac signal across R611 increases rapidly. At about 1% distortion, the large ac signal through R611 causes Q607 to turn off. With Q607 turned off, the current flow is through the associated LED and R616 to ground, lighting the LED.

Note that the circuit is sensitive to the actual power supply voltages; if the ac line input voltage is less than 120V, clipping and overload indication will take place at a lower output level. Note too that the LEDs remain on during shutdown; this is a normal condition because the power amplifiers are still partially powered during shutdown.

DB PEAK/FEEDBACK FINDER™ LEDS

With the FEEDBACK FINDER switch (S903) in the OFF position, LED string D1101-D1108 indicates peak power amplifier output voltage values corresponding to indications of −36 to +6 dB at the SPEAKER OUTPUTS. A +6 dB indication is calibrated through R919 (or R916, Model 700) for a 20 Vrms sinusoidal output (100 watts to a 4-ohm load).

The power amp assembly (A6) has a resistive voltage divider at the power amp output that feeds the DB CAL potentiometer R919. The DB CAL potentiometer sets the point at which the +6 dB LED turns on. The ac signal is then forwarded to a full-wave rectifier (U920).

The rectifier is composed of two sections: a unity gain, inverting precision half-wave rectifier formed by U920A* and its associated components, and an inverting summing amplifier formed by U920B, which has two inputs. The first is via R1045 and R1040, and exhibits a voltage gain of approximately 1.5 times. The second input is from the output of the precision half-wave rectifier via R1041. The gain of this input is approximately 3 times.

When the input signal from the power amp is negative, the output of the precision half-wave rectifier is zero; when the input signal is positive, the rectifier output is negative. When the summing amplifier adds the rectifier output and the non-rectified signal together, the result is an output voltage that is always positive 1.5 V_{IN}.

The FULL WAVE BAL adjustment (R1045) is used to trim the gain in one of the summing amplifier paths so that it is exactly one-half the gain of the half-wave rectifier path. The output of the full-wave rectifier is fed to the network comprised of D940, C925 and R1037, which produces the desired fast attack, slower decay operation. The dc voltage developed at C925 is fed to the LED comparator string via the FEEDBACK FINDER switch (S903).

The dc output voltages from U920 drive the comparators U1101-U1102, which are referenced to a resistive voltage divider. Each doubling of voltage on the input to the comparators turns on the next higher comparator, causing it to light its associated LED, as well as keeping the LEDs below it lit. For example, an input voltage of 1.0V to the comparator lights the −18 dB LED, as well as the −24, −30 and −36 LEDS.

Model 700: Note that when S903 is turned to A or B for feedback determination, the corresponding LED string becomes a readout of frequency for that channel, and the other channel retains its dB peak indicating function.

FEEDBACK FINDER™

The Equalizer outputs are fed to the FEEDBACK FINDER switch (S903) on the Output Controls board (A9), which selects the desired output channel (A or B in Model 700) for display. The FEEDBACK FINDER circuit senses the frequency of the Equalizer signal and converts it to a dc voltage for display on the selected channel LEDs.

*Channel B only; channel A components are shown in the Model 700 A9 Circuit Diagram.

Amplifier U916B clips the input signal to establish a square wave of approximately 1.2 Vpp. U916B also contains the FEEDBACK FINDER THRESHOLD control (R999) which is used to adjust the sensitivity of the circuit. U916B's output is capacitively coupled to comparator U903A via an RC filter (R915, C909) that attenuates any ultrasonic noise present in the signal. The first comparator (U903A) is a zero-crossing detector, with the operating threshold set by the amount of hysteresis in the first stage.

The second comparator (U903B) holds capacitor C910 discharged until the output of U903A goes high. The output of the third comparator (U903C) goes high at the same time as U903A, and stays high until C910 charges to the reference voltage of 7.5V. This time constant is adjustable (through R972, FBF CAL) about the nominal 20 μsec period to calibrate the frequency-to-voltage converter. The resultant 20 μsec pulse from U903D is inverted by U903C and switches a constant current source (Q901) on and off. Thus, the output of U903D is a pulse train with a constant pulse width of 20 μsec and a repetition rate equal to the input frequency. The current pulses are integrated by capacitor C911 into a dc voltage which is directly proportional to the input frequency (approximately 12 Vdc output with an input frequency of 11 kHz). The dc output voltage is fed through switch S903 to the LED comparator strings to indicate the frequency band. For example, a 1 kHz signal will produce approximately 1 Vdc at C911 and light the LED above the 1 kHz graphic equalizer control (and all lower frequency LEDs: 125, 250 and 500 Hz).

POWER AMPLIFIER PROTECTION CIRCUITS

Each power amplifier is protected by a voltage-current (V-I) sensing circuit which limits the V-I conditions in the output transistors to a safe level under overload conditions. Transistors Q610 and Q611 conduct under overload conditions and remove the input signal from the driver transistors (Q608 and Q609), thus limiting the dissipation of the output transistors (Q612-Q615). A single-slope boundary is defined by the values of the resistor network on the bases of Q610 and Q611.

Thermistors RT602 and RT603 (mounted on transistor Q614 and Q615 heat sinks) monitor the transistor case temperatures. RT602 and RT603 decrease in resistance as the case temperatures go up, causing the boundary to "pivot" to a lower value. The benefit of this arrangement is that under severe overload conditions, such as operating into a short circuit, dissipation is limited to a safe value. However, under normal conditions the protection boundary moves out to allow operation with more severe "normal" loads than would otherwise be possible. Capacitors C609 and C610 insure stability during limiting.

Q603 provides pre-driver (Q601) protection as follows. When the current through Q601 reaches a sufficiently high level during overload, the increased voltage drop through resistor R614 is sensed by Q603, which then shorts out the signal to Q601, limiting its collector current to a safe value.

Diodes D609 and D608 are normally reverse-biased and do not conduct. But with highly reactive amplifier loads, the diodes will conduct to prevent reverse-voltage breakdown of the output transistors.

Thermistor RT601 is mounted on output transistor Q613. Comparators U503A and U503B compare a constant refer-

ence voltage of 0.73V to the voltage across RT601. When an unusually high temperature of 70°C (158°F) is reached on the heat sink, RT601's voltage will have dropped to the reference voltage and U503A or U503B will change state, turning on the TEMP WARNING LED (D801). If the temperature continues to rise to 100°C (212°F), RT601's voltage drops below 0.3V, U503C or U503D changes state, turning off Q502 and Q501, opening relay K1, and turning on the SHUTDOWN LED (D802). In this condition, the power amps are partially powered but all other (low-level) circuits and the fan (B1) remain fully on. This condition remains until the temperature on the heat sink drops to 70°C, when the LEDs turn off and full power is restored to the power amps.

RT501 is a positive-temperature-coefficient thermistor with a threshold at 120°C (248°F). It is mounted on the Power Supply board (A5) in front of fan B1 in the path of the air flow through the PC board-fan assembly. When air motion is severely restricted, RT501 heats and its resistance increases (from 450 to approximately 1200 ohms). The current through R502 is reduced and the voltage drop across R502 is not enough to keep transistor Q501 turned on. Q501 turns off, opening relay K1 and turning on the SHUTDOWN LED. It is extremely important that RT501 should be mounted in the path of the air flow, its body perpendicular to the flow, approximately ⅝" from and not bent flat against the power supply board.

The SPEAKER OUTPUTS dc sensor circuit is comprised of comparator U504 and associated components. A portion of the output voltage is derived from the divider network of R640 and R641 on the power amp board. It is fed to the comparator inputs, and capacitors C509 and C510 remove the audio signal leaving only the dc component. When the dc output at the SPEAKER OUTPUTS jacks exceeds ±30V, U504 changes state, cutting off transistors Q501 and Q502, opening relay K1, and turning on SHUTDOWN LED D802. Note that, when the comparator outputs change state, diode D509 and resistor R518 cause "latching"; the power switch must be turned off and back on to reactivate the console. This feature is designed to call attention to the presence of excessive dc at the output, which is an abnormal condition and probably requires servicing.

SERVICE INSTRUCTIONS

WARNING

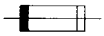
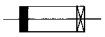
Voltages in this equipment are hazardous to life. Refer servicing to qualified service personnel.

REPLACEMENT PARTS

Parts that are readily available through local electronic parts distributors are not shown on the accompanying Parts List. Their values are shown on the Circuit Diagrams. Commercial parts not readily available and unique parts are shown on the Parts List and may be ordered directly from the factory.

The commercial alternates shown on the Parts List are not necessarily equivalents, but may be used in the event that direct factory replacements are not immediately available. To maintain the highest possible performance and reliability Shure factory replacement parts should be used. When ordering replacement parts, specify the Shure Replacement Kit Number (RKC) or part number, description, *product model number,* and *serial number.*

FUSE REPLACEMENT

To replace line fuse F1, disconnect the line cord from the ac source and remove the rear-panel fuseholder cap. Replace the defective fuse as shown in the table. The following rear-panel symbols denote a fast-operating fuse  and a slow-blow (time lag) fuse 

Model	Operation at	Fuse	Type
700	120 Vac ±10%	10A, 250V	3AB, ABC
700	200, 220, 240 Vac*	5A, 250V	3AB, ABC
700E6	100, 120, 140 Vac	10A, 250V	10A/250V (6.3 x 32 mm)
700E6	*200, 220, 240 Vac*	*5A, 250V,* Time Lag	*T5/250V* (5 x 20 mm)
706	120 Vac ±10%	4A, 250V, SLO BLO	AGC, 3AG
706	200, 220, 240 Vac*	3A, 250V, SLO BLO	AGC, 3AG
706E6	100, 120, 140 Vac	5A, 250V	5A/250V (6.3 x 32 mm)
706E6	200, 220, 240 Vac	3.15A, 250V, Time Lag	T3.15/250V (5 x 20 mm)

*Rewired (see Operation at Other Voltages).

CAUTION

If trouble symptoms—overheating, erratic operation, etc.—were apparent before the fuse blew, or if the replacement fuse blows, a qualified serviceman should troubleshoot the console carefully to find the source of the trouble. Do not continue to replace fuses until the trouble is corrected.

The Consoles also contain four fuses (F501-F504) on the Power Supply board (A5). If replacement becomes necessary, replace only with identical fuses. Models 700 and 706 use type 3AG, 1A, 250V, SLO BLO, with "pigtail" leads. Models 700E6 and 706E6 use 5 mm x 20 mm, 1A, *250V, Time Lag fuses.*

EXTERNAL PARTS

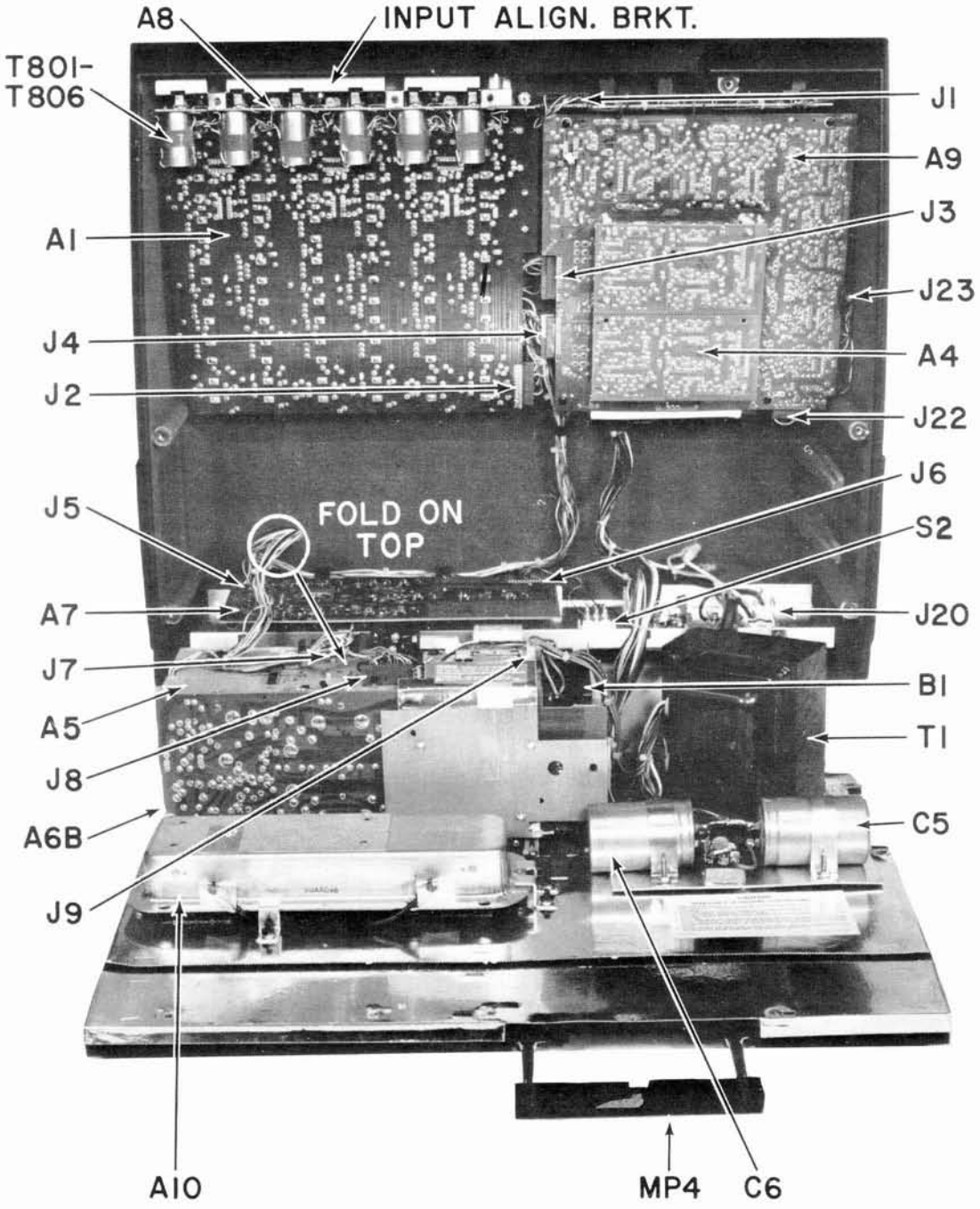
The following parts can be removed and replaced without disassembling the console:

Air Filter (MP1)
Knob, Rotary (MP2)
Knob, Slider (MP3)
Handle (MP4)
Foot (MP5)

All knobs are pull-off types and are interchangeable.

SERVICE ACCESS

Disconnect the console from its ac power source. To open the console for servicing, carefully place the console on a firm, flat surface with the handle upward (sitting on the rear bumpers). Remove the air filter and remove nine screws and eight washers securing the bottom panel to the cover (four from the front and five from the rear of the bottom panel). Carefully rotate the console until the bottom panel rests on the work surface and extend either side



PRINTED CIRCUIT BOARD AND
PARTS LOCATION

FIGURE 1

about 5" over the edge of the work surface. Remove the two exposed screws from the bottom panel. Rotate the console 180° and remove the remaining two exposed screws. Lift the cover straight up. When clear of the bottom panel, rotate it until the cover rests on its rear bumpers. This "open clamshell" position, with the bottom panel horizontal and the cover vertical, provides access to all internal parts and assemblies (see Figure 1).

When closing the console, reassemble as follows to avoid damage. Remove the air filter (if not already removed). Bend and position the left wiring harness to fold on *top of the PC board-fan assembly. Bend and position* the right wiring harness to fold between the fan and power transformer, clearing the fan blades. Center the cover over the bottom panel and lower the cover. With one side of the console extending about five inches over the edge of the work surface, replace four screws and washers in the exposed bottom panel holes. Rotate the console so that the other side extends over the edge of the work surface, and replace four screws and washers. Raise the front of the console so that it is sitting on the rear bumpers with the handle upward and replace the remaining screws and washers. NOTE: The screw next to the left handle mounting bracket does not use a washer. Replace the air filter.

REVERB PAN

To remove the reverb pan (A10), disconnect the input and output leads from the reverb. Remove the screws and nuts holding the unit to the bottom cover plate. The cover plate and foam pads will remain in place. Secure the replacement pan to the cover plate, making sure the side of the reverb with the phono jacks faces the front of the console. Reattach the leads previously removed.

If the console is to be operated with the reverb pan removed, make sure the associated leads are not free to short out any other wiring. Insulate and tie down the two reverb cables and ground lead.

PRINTED CIRCUIT BOARDS

The console's printed circuit boards are mounted by various methods. The following paragraphs describe the best method of removing each board after cable connectors and connecting wires have been removed. *IMPORTANT:* When disconnecting cable connectors or soldered wire connections, make sure connectors or wires are identified for proper reconnection. This may be done by affixing a piece of masking tape marked with the reference designation (connectors) or terminal letter or color (wires).

CAUTION

Similar wire colors are used in different circuits; make sure proper re-connections can be made. Push-on connectors must be removed by pulling straight out from printed circuit board surfaces. Do not apply side force when removing or reconnecting terminals, or damage may result.

Refer to Figure 1 for the location of each board. The function of each board is given in the following table.

Board No.	Function	Component Numbering
A1	Input Controls (Ch. 1-6)	100s, 200s, 300s
A4	Equalizer	400s
A5	Regulated Power Supply	500s
A6	Power Amplifier (2)	600s
A7	Output Connectors	700s
A8	Input Connectors	800s
A9	Output Controls	900s, 1000s
A11	LED Board	1100s

A magnetic screwdriver is recommended for removing boards secured with screws. When removing front-panel jack retaining nuts with a ½" nutdriver or wrench, be careful not to damage the surface around the jack. Boards or parts secured with nylon standoffs may be removed by using a long-nose pliers to squeeze the locking lugs of the nylon standoffs on the circuit board side, and sliding the board outward and off the standoffs. The printed circuit board connectors can be reconnected for testing purposes after disassembly from the cover or bottom panel.

Input Controls (Ch. 1-6) and Input Connectors Boards (A1 and A8): These boards must be removed at the same time. Remove the knobs from the left (Input Controls) side of the front panel. Remove the nine retaining nuts and washers from the front-panel phone jacks (note that the HEADPHONES jack—J815—has an insulating washer behind the metal washer.) Remove connectors J1 and J21 from the Input Connectors board and connector J2 from the Input Controls board. Remove connectors J24 and J25 from the Output Controls board.

Use a long-nosed pliers to release the locking lugs on the board standoffs. As each standoff locking lug is released, push the potentiometer shaft in the vicinity of the standoff to disengage the board. Repeat this procedure for each of 10 standoffs. As the Input Controls board is disengaged from the standoff, all the pot shafts except the six closest to the Input Connectors board will fall clear of the top cover. Using the tips of the long-nosed pliers (or any blunt object that will clear the pot clearance holes in the cover), push the six remaining pot shafts through the top cover. After the Input Controls board has been disengaged, free the three phone jacks on the right hand side from the top cover by grasping the body of the HEADPHONES jack with the thumb and forefinger, and pulling downward until the bushing is free from the top cover. Repeat for the AUX INPUT 7 and AUX INPUT 8 jacks. Free the left side of the Input Connectors board by inserting a medium-size screwdriver between the input alignment bracket and the cover. *Start at Channel 6 and lift the screwdriver handle, freeing* the 3-pin connector and phone jack from the top cover. Repeat for all six channels. When all six channels have been freed, the Input Connectors board and the Input Controls board may be lifted out for service.

To reassemble, first make sure that the LEDs are properly positioned. Position the Input Connectors board in the top cover (do not assemble nuts or washers at this time). Position the Input Controls board at the approximate location of the standoffs. The six rotary pot shafts closest to the *front should be visible through their respective clearance* holes when viewed from the top of the cover. Reach through the respective clearance holes from the outside of the top cover using a hooked tool (or a formed paper

clip) and pop the rotary pot shafts into position. The remaining shafts will fall into position. Before snapping the board into its locked position on the standoffs, check that the LEDs are aligned with their respective holes. Seat the board into its locked position. Assemble the washers and nuts to the phone jacks on the Input Connectors board. Make sure that the insulating washer is behind the metal washer on the HEADPHONES jack. Check that the POWER, TEMP WARNING, and SHUTDOWN LEDs are in their proper locations. Replace all knobs.

Equalizer Board (A4): This board is located at the center of the foil side of the Output Controls board (A9). Removal requires releasing the nylon standoff locking lugs holding the board in place and pulling the board straight out. Disconnect the wiring harness connectors from J401 and J402.

Regulated Power Supply Board (A5): Remove this board by disconnecting connectors J7, J8, and J9, and removing six screws along the edges of the board.

Power Amplifier Boards (A6): The two Power Amplifier boards (Model 700) are identical except for mounting brackets. Remove either board by first loosening the PC board-fan assembly. This is accomplished by removing four screws securing the boards to the bottom panel. Select the power amplifier to be removed (channel B amplifier is toward the front of the console and channel A is toward the back).

Remove the electromagnetic shield (steel) and electrostatic shield (foil) by disconnecting the grounding lug and disengaging the shields from the nylon standoffs. Disconnect connectors J13 and J14 (for channel B; J10 and J11 for channel A). Remove three screws from the edge of the Power Supply board and, using a small Phillips screwdriver, two screws from the fan.

Output Connectors Board (A7): Remove all PATCH BLOCK™ jack retaining nuts and washers, remove board connectors J5 and J6 and unsolder three leads (yellow, green and black) to the MIC OUTPUT jack (P1). The board lifts straight out of the rear of the cover.

Output Controls Board (A9): Remove the knobs from the right side of the front panel. Remove the four screws with lockwashers and insulating washers, and disengage the five nylon standoffs securing the board to the front panel. Remove connectors J3, J4, J22, J23, J24 and J25.

LED Board (A11): This board (two boards in the Model 700) can be removed after the Output Controls board (A9) is removed. The LED board is located directly below the equalizer sliders, and can be removed by lifting upward.

DC OUTPUT BALANCE ADJUSTMENT

In order to eliminate dc offset at the output, a dc balance control (R601, blue) has been provided for each Power Amplifier (A6). This control is accessible from the left-hand side of the console. The dc balance should be checked and adjusted as necessary whenever any Power Amplifier circuit components are replaced. The dc output balance adjustment should be made before making the dc bias current adjustment.

The dc balance adjustment is made with all volume controls down and no speaker load. Connect a dc voltmeter (preferably with a 0.1 Vdc full-scale range) across a SPEAKER OUTPUTS jack (J16-J17 for channel A, J18-J19 for channel B).

WARNING

Use a small screwdriver with an insulated shaft to make this adjustment; hazardous voltages are present in the circuitry near R601.

Carefully adjust the dc balance control for 0 Vdc ±20 mV at the output. NOTE: The normal adjustment range of R601 is ±1V. If the dc offset exceeds this value, other problems exist in the circuit.

DC BIAS CURRENT ADJUSTMENT

Each Power Amplifier (A6) contains a dc bias current adjustment control (R617, orange) to set the dc idling current through output transistors Q612-Q615. This adjustment minimizes crossover distortion without drawing excessive idling power. The bias current should be checked whenever any Power Amplifier circuit components are replaced. The adjustment should be made after the dc output balance adjustment. Both dc bias current controls are accessible from the left-hand side of the console.

The dc bias current adjustment is made with all volume controls down and no speaker load. Remove the Power Amplifier board shield and connect a dc voltmeter with a floating ground across resistor R632 (0.3 ohms, 7W). See Figures 28-31.

WARNING

Use a small screwdriver with an insulated shaft to make this adjustment; hazardous voltages are present in the circuitry near R617.

Starting with the dc bias current control at full counterclockwise, adjust it for 6 ±2 mV across R632. The same voltage should be present across resistors R633, R638 and R639.

DB PEAK INDICATORS/FEEDBACK FINDER™ CALIBRATION

The following calibration procedures should be performed when parts in the DB PEAK LED strings have been replaced. The potentiometers involved on board A9 are the A DB (R916), B DB (R919), FULL WAVE CAL A (R1044), FULL WAVE CAL B (R1045), and FBF (R972). The balance and dB peak calibrations that follow are given for output channel B; the identical steps for channel A use potentiometers R916 and R1044. All procedures can be performed with the cover open and the Output Controls board in place (see Figure 1). Note that the first two procedures apply to the Model 706 and to channel B of the Model 700.

Full Wave Balance

1. Set the console controls to typical settings (orange index marks), the INPUT ATTENuators to 0, and the MASTER controls to 5.
2. Feed a 1 kHz, 150 mV signal from a low-distortion sine-wave signal generator to a channel input HI IMP jack. With an audio voltmeter connected (without a speaker load) to a B SPEAKER OUTPUT jack, adjust the B MASTER or signal generator level control for a 10V output.
3. Connect an oscilloscope across test point TP B (right center of A9) and ground (see Figures 18 and 20).

The scope display should appear as in Figure 2A or B if the Full Wave is out of balance, or as in Figure 2C if it is in balance.

4. If out of balance, adjust the FULL WAVE CAL B (R1045) until the display looks like Figure 2C (alternate peaks have equal heights).
5. Repeat the above steps for channel A with the scope on test point TP A.

DB Peak LED Calibration

1. With the console, signal generator and voltmeter set up as for the Full Wave Balance procedure, vary the signal generator level so that the output across the B SPEAKER OUTPUT jack is 20V.
2. Adjust the B DB (R919) until the channel B +6 DB PEAK LED just barely turns on (dim or flickering).
3. Check for proper operation by decreasing the output to 19V (the +6 LED should turn off) and increasing it to 21V (the +6 LED should be on brightly).
4. Repeat the above procedure for channel A.

Feedback Finder™ Calibration

1. With the console, signal generator and voltmeter set up as for the Full Wave Balance procedure, adjust the signal generator for an 11.3 kHz signal.
2. Set the FEEDBACK FINDER switch to B or ON.
3. Adjust the FBF (R972) so that the 16 kHz (+6) LED barely turns on (dim or flickering).
4. Check for proper operation by decreasing the signal generator frequency to 11.0 kHz (the 16 kHz LED *should turn off) and increasing it to 11.5 kHz (the 16* kHz LED should be on brightly).

BALANCE WAVEFORMS
FIGURE 2

SMALL SIGNAL AND PREDRIVER TRANSISTORS AND INTEGRATED CIRCUITS

All transistors and integrated circuits are mounted on printed circuit boards. When replacing these parts it is imperative that proper lead configuration be followed. A minimum of soldering heat (25W maximum iron) should be used to avoid damage to the part or printed circuit board. When replacing regulators U501 or U502, apply Wakefield Type 120 thermal joint compound to assure good heat transfer. Refer to the *NOTES TO SERVICE ILLUSTRATIONS* for transistor and integrated circuit lead codes.

DRIVER TRANSISTORS

Driver transistors Q608 and Q609 are mounted on heat sink brackets located on the surface of the Power Amplifier boards. Unsolder the transistor leads. When replacing transistors, apply Wakefield Type 120 thermal joint compound to the surface of the transistor to provide good heat transfer from transistor to bracket. Be sure that these transistors are not interchanged in the circuit; they are not identical devices. Q608 is an NPN transistor and Q609 is a PNP transistor. Refer to the *NOTES TO SERVICE ILLUSTRATIONS* for transistor lead codes.

OUTPUT TRANSISTORS

Output transistors Q612 through Q615 are located on the black, finned heat sinks. The replacement procedure is the same as that used for driver transistors Q608 and Q609, except make certain the two diodes mounted below the heat sinks on Q612 and Q613 are thermally coupled (with Wakefield Type 120 thermal joint compound) to the heat sinks above them. Also, make sure that the thermistor assemblies are replaced, and the output transistors are replaced in the same orientation as when they were removed. Position the thermistor lead wires so that they are not in contact with the heat sink or thermistor clip.

NOTE: When replacing output transistors, make certain the replacement transistor matches the other output transistors in part number and beta code (A, B or C).

DIODE BRIDGE RECTIFIER

Silicon diode bridge rectifier D1 is mounted on the bottom panel adjacent to power transformer T1. When replacing this component, apply Wakefield Type 120 thermal joint compound between the heat sink base of the rectifier and the bottom panel to provide heat transfer to the bottom plate. Note that the base of the rectifier is provided with a locating pin. A notch is provided in the bottom plate to position the rectifier such that the locating pin fits into the notch. The terminals are marked to indicate the ac connections to the power transformer and the "+" and "−" dc output connections to filter capacitors C5 and C6.

TRANSISTOR AND DIODE REMOVAL

Most transistors and all diodes used in the console are mechanically supported by their leads. When replacing these devices, proper lead configurations must be followed. Minimum soldering heat (preferably with a low-wattage—25W maximum—soldering iron) should be used to avoid damage to the device. Be sure to place heat-shrinkable tubing or "spaghetti" on leads where the original device contained such tubing. Transistor lead codes are included in the *NOTES TO SERVICE ILLUSTRATIONS* (Figure 4).

ACTIVE COMPONENT CHECKING

Integrated circuits can be checked without removing them from their circuit board. Measure the input, output and power supply voltages as shown on the applicable circuit diagram.

Defective transistors and diodes can be located by use of a standard ohmmeter such as a Simpson 260. Polarity of the ohmmeter must be verified before these checks are made.

With a known diode orientation, measure the diode resistance in the forward and reverse directions. The lowest meter reading will establish the probe at the cathode end (schematic symbol arrow points to cathode) as the "minus" probe while the other probe will be "plus." Some ohmmeters *are not polarized in this manner with relation to* "volts plus probe" and "volts minus probe." With the ohmmeter "plus" probe on the anode end of a diode, and the "minus" probe on the cathode end, the ohmmeter should read approximately 2000 ohms or less. With the meter probes reversed, a reading of about 10,000 ohms or more should be obtained. If either of these conditions is not met, the diode should be replaced.

To check LEDs, connect the cathode (notch or flat) of the LED to the negative terminal of a 9V transistor radio battery. Connect the positive battery terminal through a 4.7k resistor to the LED anode. Replace any LED that does not light.

CAUTION

Do not check LEDs with an ohmmeter. The LEDs may be damaged or erroneous readings may be obtained.

To check transistors, the ohmmeter should be set to the 100- or 1,000-ohm scale. Transistors and diodes must be removed from the circuit before testing. If all conditions in the following table are met, the transistor may be considered free of any major defect; if any of the following conditions are not met, the transistor should be replaced. See *NOTES TO SERVICE ILLUSTRATIONS,* Figure 4, for transistor lead codes.

OHMMETER CONNECTIONS		OHMMETER READING	
"Plus" Lead	"Minus" Lead	NPN Transistor	PNP Transistor
Collector	Emitter	High	High
Emitter	Collector	High	High
Collector	Base	High	Low
Emitter	Base	*	Low
Base	Collector	Low	High
Base	Emitter	Low	*

*Not a significant measurement.

PRINTED CIRCUIT BOARD CONNECTORS

All printed circuit board connectors use the Molex KK Modular Interconnection System. To replace a lead and its associated connector contact, proceed as follows. Using a scribe or other pointed instrument, depress the contact through the slot at the side of the connector housing. This will free the contact and allow it to be removed from the rear of the connector housing. Trim a new lead so that ⅛ inch of wire appears. Insert the trimmed lead in a new contact (Shure Part No. 56A235 or 56A251). Crimp the wire to the contact and solder the wire to the crimped connection. Insert the new contact (with attached lead) in the connector housing, pushing firmly to lock the contact.

FERRITE BEAD RINGS

All input and output connectors in the console contain ferrite bead rings (L701-L711 and L801-L816). Be sure to replace any ferrite bead rings removed during servicing.

SERVICE ILLUSTRATIONS

Immediately following the parts list on the pages that follow are circuit diagrams, parts locating photographs, and board foil drawings. Once a board has been located through the parts location photo (Figure 1), the components on that board can be located from the corresponding parts location photo. The function of the part is shown on the adjacent circuit diagram. NOTE: Each circuit diagram applies to all 700 Series consoles. Portions shown in *red* only apply to Models 700 and 700E6. Further differences are shown in notes at the bottom of each diagram.

OPTIONAL ACCESSORIES

The following optional accessories are specially designed for use with the Shure 700 Series Power Consoles:

A700C Protective Cover
A7S Console Stand

GUARANTEE

This Shure product is guaranteed in normal use to be free from electrical and mechanical defects for a period of one year from date of purchase. Please retain proof of purchase date. This guarantee includes all parts and labor. This guarantee is in lieu of any and all other guarantees or warranties, express or implied, and there shall be no recovery for any consequential or incidental damages.

SHIPPING INSTRUCTIONS

Carefully repack the unit and return it prepaid to:

Shure Brothers Incorporated
Attention: Service Department
1501 West Shure Drive
Arlington Heights, Illinois 60004

If outside the United States, return the unit to your dealer or Authorized Shure Service Center for repair. The unit will be returned to you prepaid.

OPERATION AT OTHER VOLTAGES

The Model 700 and 706 consoles are supplied wired for operation at an input of 120 Vac ±10%, 50/60 Hz. For operation at 240V, 220V, 200V, 140V or 100V, follow the steps listed below. Open the cover as described in *SERVICE ACCESS*. Remove the screws securing the PC board-fan assembly to the bottom panel and remove the assembly to provide working room. For 240V, 220V or 200V operation, unsolder and insulate the black lead from fuseholder XF1 to UNSWITCHED AC receptacle J20 (J20 will be inoperative at these voltages). NOTE: Fan B1 is permanently wired and will continue to operate at 120 Vac with the following wiring changes. (Figure 3 illustrates terminal strip TS1, located between transformer T1 and fan B1, and the jumper and transformer T1 leads which must be moved.)

240V Operation:

1. Cut the bare jumper between the red/black and blue/white leads.
2. Unsolder the yellow/black lead and solder it to the red/black lead.

220V Operation:

1. Perform the above steps for 240V operation.
2. Unsolder the white (AC) lead from the blue/white lead terminal and solder it to the terminal with blue and yellow leads.

200V Operation:

1. Cut the bare jumper between the red/black and blue/white leads.
2. Unsolder the yellow/black lead and solder it to the white transformer lead.
3. Unsolder the white (AC) lead and solder it to the terminal with blue and yellow leads.

140V Operation:

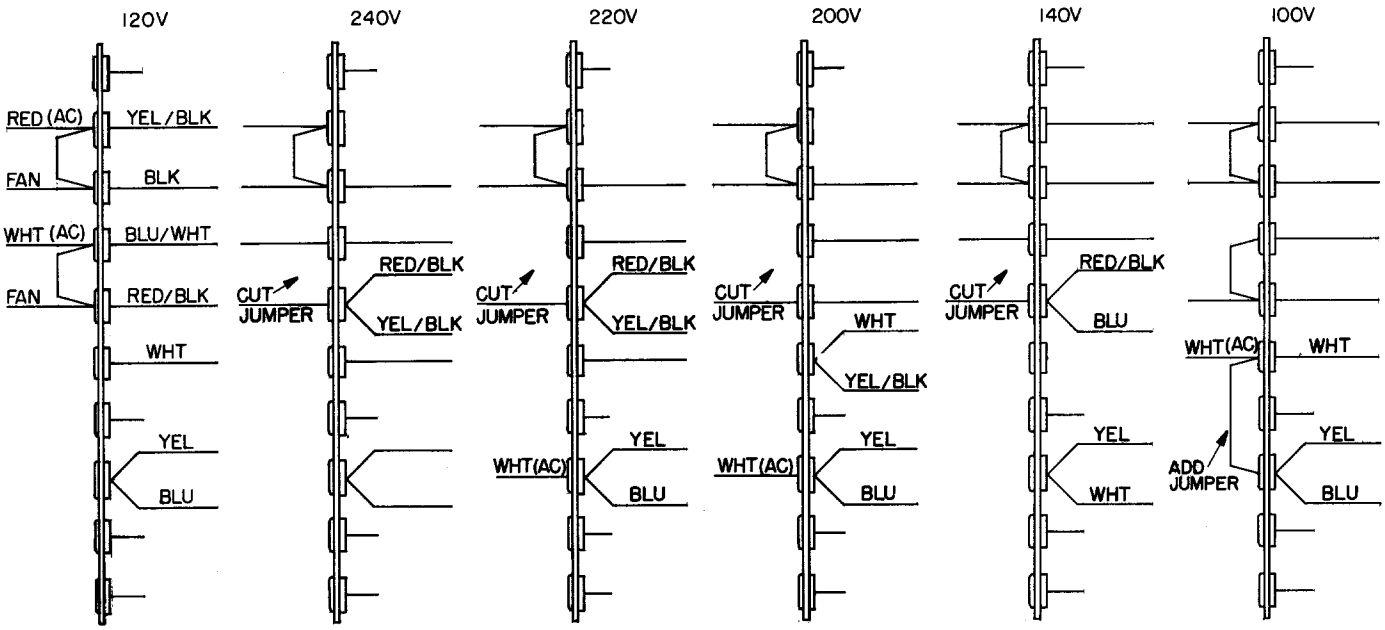
1. Cut the bare jumper between the red/black and blue/white leads.
2. Unsolder the blue lead and solder it to the red/black lead.
3. Unsolder the white transformer lead and solder it to the yellow lead.

100V Operation:

1. Unsolder the white (AC) lead and solder it to the white transformer lead terminal.
2. Solder a jumper wire between the white transformer lead terminal and the terminal with blue and yellow leads.

Reposition the power harness and mount the PC board-fan assembly before testing the unit. For 240V, 220V and 200V operation, obtain a suitable ac plug and attach it to the line cord. Obtain a 5A, 250V, type 3AB or ABC fuse (for the 700 console), or a 3A, 250V, SLO BLO, type AGC or 3AG fuse (for the 706 console), and insert it in place of the present fuse. Check for proper operation by measuring voltage across capacitor C5 or C6: Under no-signal conditions, the voltage should be 54V ±3V. Be sure to mark the rear panel with the new operating voltage.

As supplied, Model 700E6 and 706E6 consoles are set to operate from 240 volts. To change operating voltages, disconnect the ac power (mains) cable, select the desired operating voltage using the rear-panel VOLTAGE SELECTOR switch, and make certain the fuse (F1) is of the proper value.



TRANSFORMER REWIRING
FIGURE 3

REPLACEMENT PARTS LIST

This list describes parts for Models 700, 700E6, 706 and 706E6. Major differences between parts are shown by multiple listings of the part with parenthetical notation of the models. When servicing 706 and 706E6 consoles, disregard reference designations given for parts not present in these models.

Reference Designation	Replacement Kit No.*	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
A1	—	—	90A8005	Input Controls (Ch. 1-6) Board (700, 700E6)	None
A1	—	—	90B2929	Input Controls (Ch. 1-6) Board (706, 706E6)	None
A4	—	—	90A8002	Equalizer Board	None
A5	—	—	90A8006	Power Supply Board (700)	None
A5	—	—	90C8006	Power Supply Board (700E6)	None
A5	—	—	90B2933	Power Supply Board (706)	None
A5	—	—	90D8006	Power Supply Board (706E6)	None
A6A	—	—	90B8018	Power Amplifier Board, Ch. A (all models)	None
A6B	—	—	90A8018	Power Amplifier Board, Ch. B (700, 700E6)	None
A7	—	—	90A2932	Output Connectors Board (700, 700E6)	None
A7	—	—	90B2932	Output Connectors Board (706, 706E6)	None
A8	—	—	90A8007	Input Connectors Board (700, 700E6)	None
A8	—	—	90B3100	Input Connectors Board (706, 706E6)	None
A9	—	—	90A8003	Output Controls Board (700, 700E6)	None
A9	—	—	90B8003	Output Controls Board (706, 706E6)	None
A10	—	—	90A8046	Reverb Pan	None
A11	—	—	90A2945	LED Board	None
B1	—	—	95B877	Fan, Cooling, 70 CFM	Rotron WR2H1
C5, C6	—	—	86A649	Capacitor, Electrolytic, 8000μF, 60 Wvdc (700, 700E6)	None
C5, C6	—	—	86A639	Capacitor, Electrolytic, 4000 μF, 60 Wvdc (706, 706E6)	Sprague 36D252F075AC2A
C101, C103, C111, C112, C201, C203, C211, C212, C301, C303, C311, C312, C508, C513, C904, C905, C911, C918, C930	—	—	86A630	Capacitor, Electrolytic, 4.7 or 5 μF, 35 Wvdc	Sprague, 30D-TE1303; CDE NLW-5-50

*Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST

Reference Designation	Replacement Kit No.*	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
C315, C316, C605, C703, C718, C928, C929	—	—	86N628	Capacitor, Electrolytic, 100 μF, 25 Wvdc	Sprague 30D-TE1211; Mallory MTA-100F35; CDE NLW-100-25
C447, C448, C915, C924, C926, C927	—	—	86F629	Capacitor, Electrolytic, 4.7 μF, 25 Wvdc	Sprague 503D475G025
C501, C502	—	—	86A632	Capacitor, Electrolytic, 1000 μF, 25 Wvdc	Sprague TVA-1211
C503	—	—	86B632	Capacitor, Electrolytic, 1000 μF, 40 Wvdc	None
C504	—	—	86C629	Capacitor, Electrolytic, 33 μF, 16 Wvdc	None
C507	—	—	86B636	Capacitor, Electrolytic, 4 μF, 25 Wvdc	Mallory TNT405U050POA
C819	—	—	86L628	Capacitor, Electrolytic, 220 or 250 μF, 40 Wvdc	CDE BR250-50
C901, C902, C908	—	—	86B629	Capacitor, Electrolytic, 22 μF, 35 Wvdc	Sprague 502D-226G050CE1C; Mallory MTV-25B35
D1	—	—	86A640	Silicon Rectifier, 200V, 25A	Varo VT200/T
D2, D501-D506, D508, D601-D603, D803, D943, D944	RKC21	4	86A404	Silicon Rectifier, 100V, 1/2A	Motorola 1N4002
D101, D102, D201, D202, D301, D302, D801, D802, D804, D1101-D1109	—	—	86D422	Diode, Light-Emitting	Monsanto MV5075C
D103-D106, D203-D206, D303-D306, D509, D510, D604, D605, D701-D708, D901-D906, D925-D936, D938, D939, D941, D942	—	—	86A415	Diode, Silicon, Computer, 75V	TI or GE 1N4148
D507	—	—	86A428	Silicon Zener Diode, 24V, 5W	Motorola 1N5359A
D606, D607	RKC50	2	86A410	Silicon Rectifier, 100V, 1/2A	Motorola 1N4002
D608, D609	RKC46	4	86A406	Diode, Silicon, 200V, 3A	Motorola 1N4721
D937, D940	RKC19	4	86A405	Diode, Germanium, 30V	RCA 1N48, 1N60
F1	—	—	80C323	Fuse, 10A, 250V (700)	Littelfuse 314010

*Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST

Reference Designation	Replacement Kit No.*	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
F1	—	—	80A380	Fuse, Slo-Blo, 5A, 250V (700E6)	Littelfuse 213005
F1	—	—	80E159	Fuse, Slo-Blo, 4A, 250V (706)	Littelfuse 313004
F1	—	—	80B258	Fuse, Slo-Blo, 3.15A, 250V (706E6)	Littelfuse 21303.15
F501-F504	—	—	80A268	Fuse, Pigtail, Slo-Blo, 1A, 250V (700, 706)	Littelfuse 315001
F501-F504	—	—	80B380	Fuse, Time Lag, 1A, 250V (700E6, 706E6)	Schurter 034.3117
J1-J8, J10, J11, J13, J14, J21-J25, J401-J402	—	—	56A251	Connector Contact (only)	None
J9	—	—	56A235	Connector Contact (only)	None
J16-J19	—	—	90BA2600	Phone Jack, 2-Conductor	Switchcraft 11
J20	—	—	95A8005	Outlet, UNSWITCHED AC (700, 706)	None
J30	—	—	95A898	Receptacle, AC Power Line (700E6)	Otto Heil 161-6
J30	—	—	95A689	Receptacle, AC Power Line (706E6)	Otto Heil 6061-3
J701-J705, J707, J709, J710, J801, J803, J805, J807, J809, J811, J813, J814	—	—	90BL2600	Phone Jack, 2-Conductor	None
J707, J708, J711, J712	—	—	90BK2600	Phone Jack, 3-Conductor	None
J802, J804, J806, J808, J810, J812	—	—	95A899	Connector, Receptacle, 3-Pin	None
J815	—	—	90BJ2600	Phone Jack, 3-Conductor, HEADPHONES	None
K1	—	—	55A145	Relay, DPDT	None
L601	—	—	95A8004	Choke Coil, 4.7 μH	None
L701-L711, L801-L816	—	—	80A365	Ferrite Bead Ring	Stackpole 57-3425
MP1	—	—	90BM2600	Air Filter Assembly	None
MP2	—	—	90A8101	Knob, Rotary	None
MP3	—	—	90A2950	Knob, Slider	None
MP4	—	—	65A8013A	Handle	None
MP5	—	—	66A158	Foot	None
MP6	—	—	66A164	Rear Bumper	None
P1	—	—	90E2232	Connector, Plug, 3-Pin, MIC OUTPUT	Switchcraft D3M

*Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST

Reference Designation	Replacement Kit No.*	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
Q501, Q603, Q607	RKC66	1	86A335	Transistor, Silicon, PNP	TI TIS93
Q502	RKC65	1	86A334	Transistor, Silicon, NPN	TI TIS92
Q601	—	—	86A8301	Transistor, Silicon, Power, PNP	None
Q602, Q605, Q606	—	—	86A355	Transistor, Silicon, NPN	Motorola MPS-A06
Q604	—	—	86A8300	Transistor, Silicon, NPN	None
Q608	—	—	86A361	Transistor, Silicon, NPN	RCA 2N6263
Q609	—	—	86A362	Transistor, Silicon, PNP	Motorola 2N3741**
Q610	—	—	86A363	Transistor, Silicon, Power, NPN	Motorola MPS-A20†
Q611	—	—	86A364	Transistor, Silicon, PNP	Motorola MPS-A70†
Q612-Q615	—	—	86A378 86B378	Transistor, Silicon, Power, NPN Transistor, Silicon, Power, NPN	Motorola 2N3773†† RCA TA8638A††
Q901, Q905	—	—	86A348	Transistor, Silicon, PNP	Motorola 2N5087
Q902	—	—	86A352	Transistor, Silicon, Power, NPN	Motorola MPS-U02; GE D40D4
Q903	—	—	86A353	Transistor, Silicon, Power, PNP	Motorola MPS-U52; GE D41D4
Q904	—	—	86A329	Transistor, Silicon, N-Channel, Field Effect	Motorola 2N5458
R1, R2	—	—	45EC561B	Resistor, 560, 5W, 10%	IRC or Dale PW-5
R3	—	—	45EC252B	Resistor, 2.5k, 5W, 10%	IRC or Dale PW-5
R102, R107, R115, R116, R148, R149, R202, R207, R215, R216, R248, R249, R302, R307, R315, R316, R348, R349, R997	—	—	46B82	Potentiometer, Linear Taper, 10k	None
R118, R119, R126, R127, R218, R219, R226, R227, R318, R319, R326, R327, R995, R996	—	—	46C82	Potentiometer, Linear Taper, 50k	None
R131, R132, R231, R232, R331, R332, R926, R939	—	—	46D82	Potentiometer, Linear Taper, 10k	None

**Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

**Selected for 120V BV_{CEO} min.

†Use in emergency only. Select for high gain. May affect power output and reliability.

††Must be matched for manufacturer and beta value.

REPLACEMENT PARTS LIST

Reference Designation	Replacement Kit No.*	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
R139, R144, R239, R244, R339, R344	—	—	46A82	Potentiometer, Audio Taper, 100k	None
R601	—	—	46F33	Potentiometer, 10k, Dc Output Balance	None
R616	—	—	45HC152B	Resistor, 1.5k, 5W, 10%	IRC or Dale PW-5A
R617	—	—	46G33	Potentiometer, 100, Dc Bias Current	None
R632, R633, R636-639	—	—	45HB309C	Resistor, 0.3, 7W, 5%	IRC or Dale PW-7A
R642	—	—	45HC561B	Resistor, 560, 5W, 10%	IRC or Dale PW-5A
R643	—	—	45HC220B	Resistor, 22, 5W, 10%	IRC or Dale PW-5A
R916, R919, R972, R1044, R1045	—	—	46B84	Potentiometer, Linear Taper, 10k	None
R925, R938, R992-R994, R998, R999	—	—	46E82	Potentiometer, Audio Taper, 100k	None
R927-R930, R940-R944, R951-R954, R959-R963	—	—	46B83	Potentiometer, Slide, 50k	None
RT501	—	—	45A43	Thermistor, PTC	None
RT601-RT603	—	—	90A2790	Thermistor Assembly, NTC	None
RV501	—	—	86A904	Metal Oxide Varistor, 56V	GE V56MA2B
S1	—	—	55A139	Switch, Rocker, SPST, ON/OFF (700, 706)	Cutler-Hammer 8021-K25M1V
S1	—	—	55A141	Switch, Rocker, SPST, ON/OFF (700E6, 706E6)	Marquardt 1601
S2	—	—	55C119	Switch, Slide, DPDT. SIMPLEX	None
S3	—	—	55A99	Switch, Rotary, VOLTAGE SELECTOR (700E6, 706E6)	Schurter SWP 033.3007
S901, S902	—	—	55E140	Switch, Slide, DPDT, BELOW 63/FLAT	None
S903	—	—	55E135	Switch, Slide, TPTT, FEEDBACK FINDER™	None
T1	—	—	51A282	Transformer, Power (700, 700E6)	None
T1	—	—	51A285	Transformer, Power (706, 706E6)	None
T701	—	—	90B2150	Output Transformer and Shield	None

*Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST

Reference Designation	Replacement Kit No.*	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
T801-T806	—	—	90L2150	Input Transformer and Shield Assembly	None
U101, U201, U301	—	—	86B808	Integrated Circuit, Quad Operational Amplifier	Raytheon RC4156DB**
U102, U202, U302, U503, U504, U903, U1101, U1102	—	—	86A806	Integrated Circuit, Quad Comparator	Raytheon LM339DB
U401-U404, U701, U912	—	—	86A808	Integrated Circuit, Quad Operational Amplifier	Raytheon RC4156DB
U501	—	—	86A809	Integrated Circuit, Voltage Regulator, Positive	Motorola MC7815CT
U502	—	—	86A810	Integrated Circuit, Voltage Regulator, Negative	Motorola MC7915CT
U913-U921	—	—	86A811	Integrated Circuit, Dual Operational Amplifier	Raytheon RC4559NB
W1	—	—	95A695	Ac Cable and Plug, 9½ ft, 3-Conductor (700)	None
W1	—	—	90B1888	Ac Cable and Plug, 9 ft, 3-Conductor, Single Connector (700E6)	None
W1	RKC82	1	95B510	Ac Cable and Plug, 9½ ft, 3-Conductor (706)	None
W1	—	—	90A1888	Ac Cable and Plug, 9 ft, 3-Conductor, Single Connector (706E6)	None
XF1	RKC72	1	94A935A	Fuseholder (700, 706)	Littelfuse 341001
XF1	—	—	90BP2600	Fuseholder (700E6, 706E6)	Schurter FEC

*Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.
**Selected for low noise figure.

NOTES TO SERVICE ILLUSTRATIONS

GENERAL

The pages that follow contain interconnection diagrams, circuit diagrams, parts locating photos and board foil drawings.

Shure part numbers are not shown in the Parts List if parts are readily available through local electronics parts suppliers. In these instances, the circuit diagrams show only the reference designation and value of the standard parts.

All capacitor values are shown in microfarads unless otherwise designated. All non-electrolytic capacitors are 50 working volts dc or more unless otherwise specified. Electrolytic capacitors are shown in microfarads x volts.

All resistor values are shown in ohms (k = 1000). Resistors are 5% tolerance unless otherwise specified. Resistors are ¼-watt unless otherwise specified.

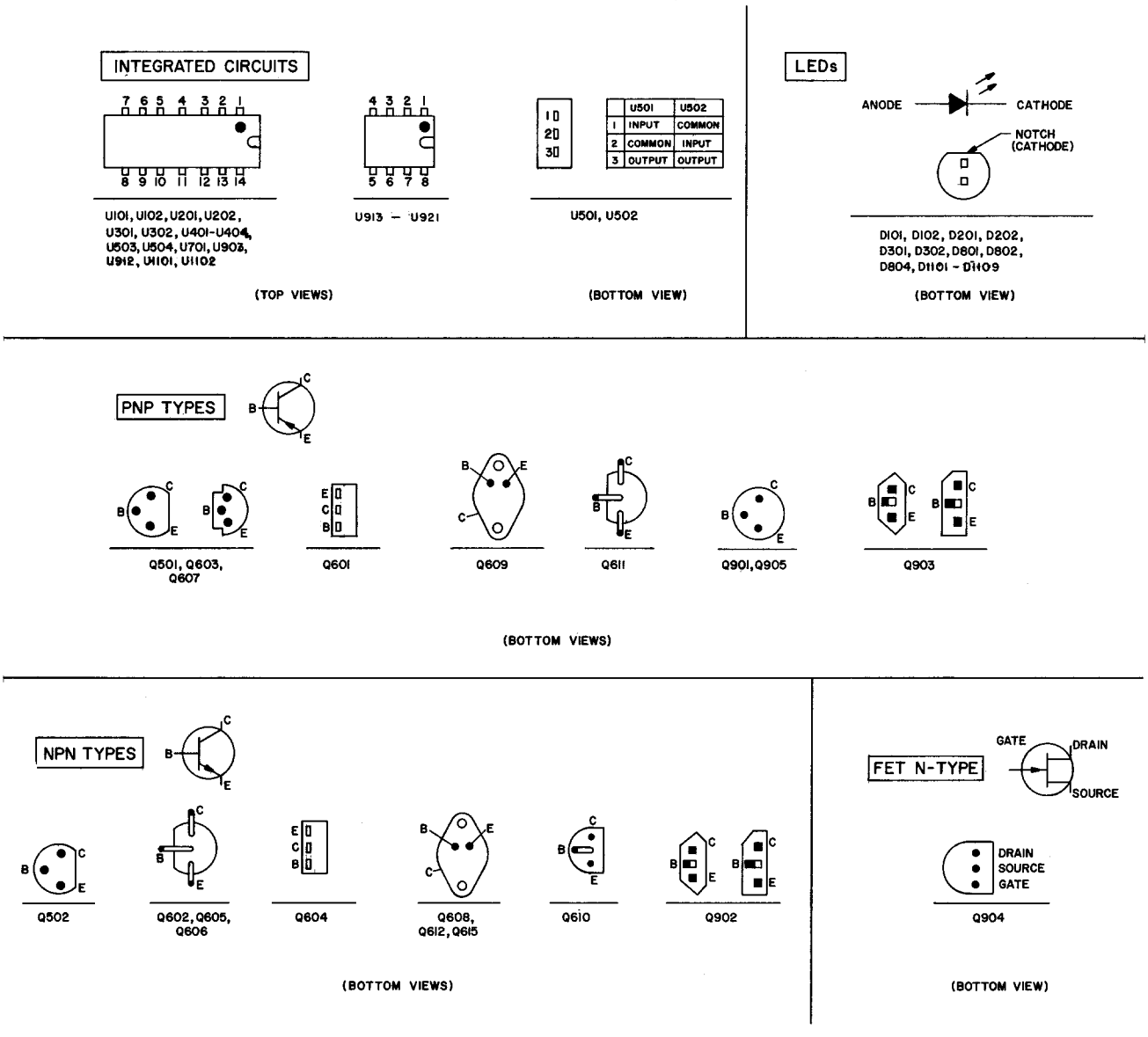
Transistor lead codes are shown in Figure 4. Acceptable replacements are shown in the Parts List.

The following ground symbols denote:

Chassis Ground

Circuit Ground

Printed Circuit Board Ground



LEAD CODES
FIGURE 4

NOTE: The "Wire Interchange" footnotes shown below the connector tables in the circuit diagrams are for manufacturing purposes only. Wires should not be interchanged during servicing as incorrect ohmmeter readings may result.

TROUBLESHOOTING

A general troubleshooting process is as follows: If the console is completely "dead," check the ac power source, fuses, chassis power supply output (54V across capacitors C5 and C6), regulated power supply (+15V between pin E and ground, connector P502, or −15V between pin M and ground, P503, board A5). If the POWER LED is on but the output is low or not present, follow the procedure described under *TROUBLESHOOTING* in this manual. Following localization of the problem, determine that the input and output voltage to the board is correct. If an incorrect voltage is found, perform *Ac* and *Dc Voltage Measurements* as described below to isolate the problem area.

AC VOLTAGE MEASUREMENTS

The numbers within rectangular symbols ▭ on the circuit diagrams denote the ac voltages at that point under the following test conditions:

1. Voltages measured with respect to chassis unless otherwise indicated.
2. Line voltage: 120V, 60 Hz.
3. Test signal of 0.5 mV, 1 kHz applied across pins 2 and 3 of connector J802.
4. Ac voltage measurements may vary ±30% from values shown.
5. Measurements made with ac VTVM of 1 megohm or greater input impedance.
6. No load on SPEAKER OUTPUTS jacks (J16-J19).
7. All controls in full clockwise settings.
8. REVERB RETURN set to full counterclockwise.
9. PAN (700) and EQ controls set to center.

DC VOLTAGE MEASUREMENTS

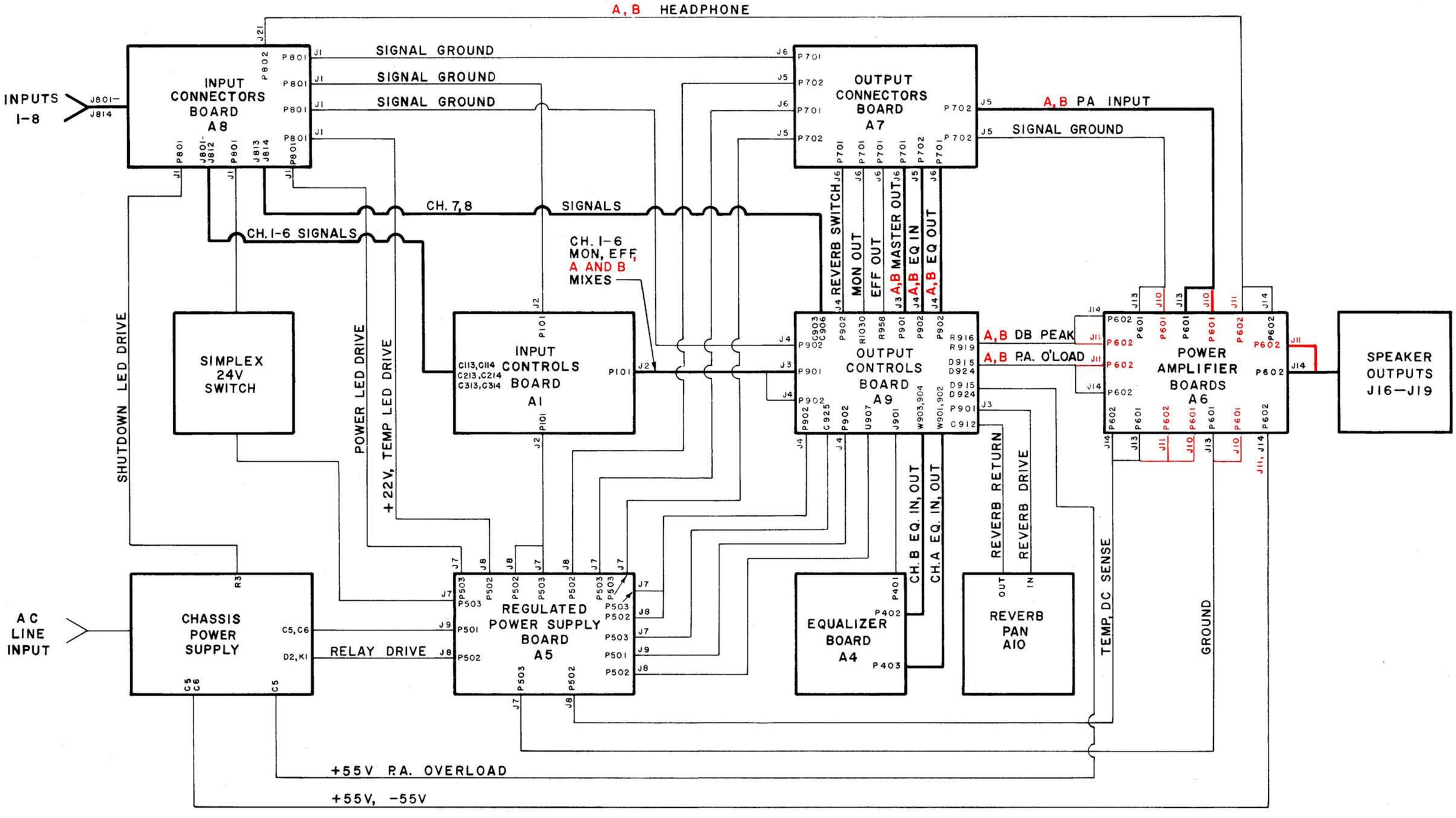
The numbers within elliptical symbols ⬭ on the circuit diagrams denote the dc voltages at that point under the following test conditions:

1. Voltages measured with respect to chassis unless otherwise indicated.
2. Line voltage: 120V, 60 Hz.
3. No input signal applied.
4. Dc voltage measurements may vary ±20% from values shown.
5. Measurements made with VTVM of 11 megohms or greater input impedance.

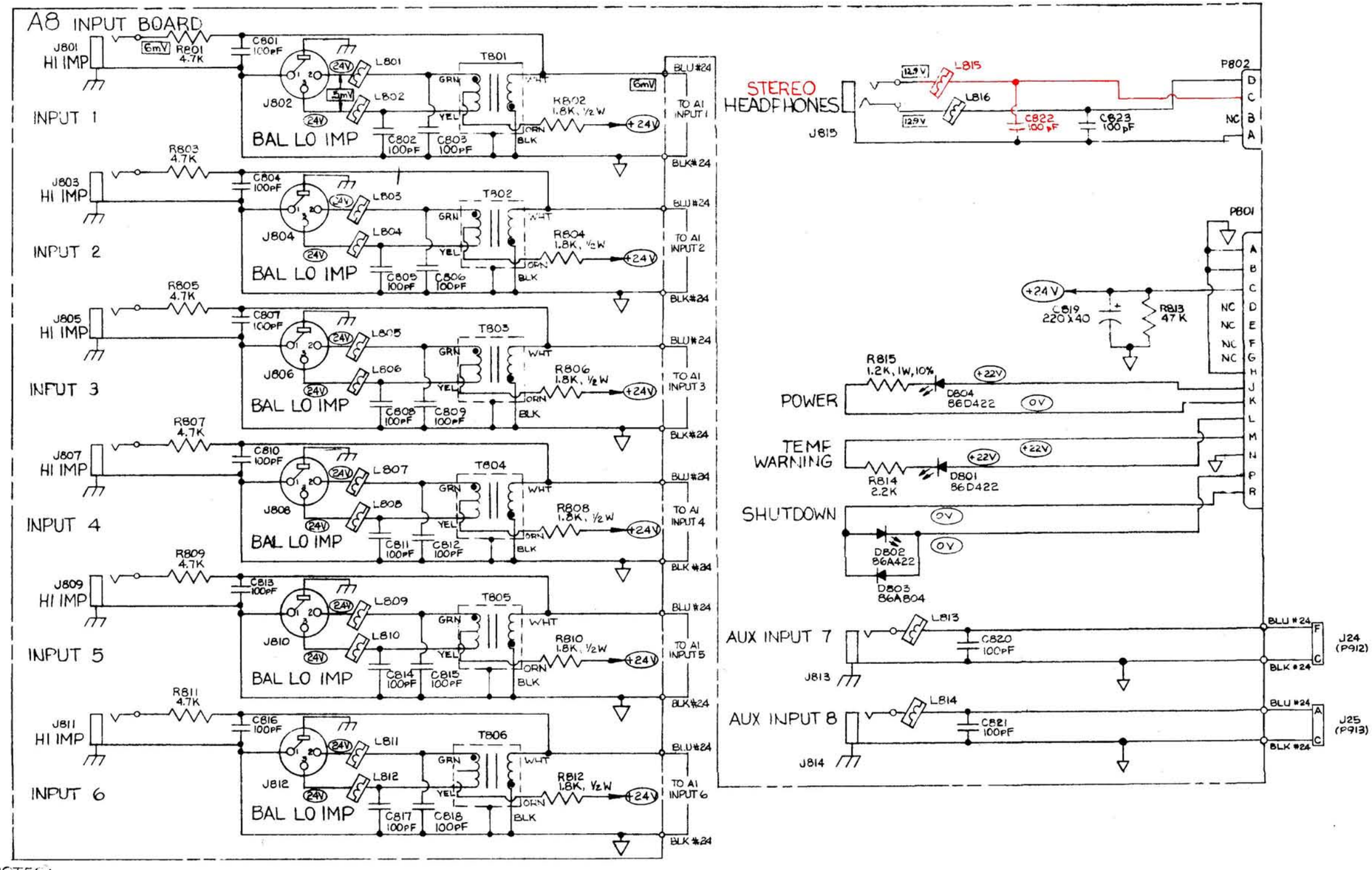
RESISTANCE MEASUREMENTS

With the ac line cord disconnected from the ac source and the Power ON/OFF switch in the OFF position, the following ohmmeter measurements may be made:

1. Reverb pan A10 output coil: approximately 360 ohms; input: approximately 40 ohms.
2. Transformers may be checked for continuity of each winding.
3. To test transistors and diodes, refer to the section on *ACTIVE COMPONENT CHECKING.*



MODEL 700 AND 706 BLOCK DIAGRAM
FIGURE 5



NOTES:

1. ALL CAPACITORS IN μF AND 50V OR MORE UNLESS OTHERWISE SHOWN, ELECTROLYTIC CAPACITORS SHOWN IN μF X VOLTS.
2. ALL RESISTORS 1/4W, 5% UNLESS OTHERWISE SHOWN.
3. THE FOLLOWING DENOTE:
   - CHASSIS GROUND
   - P.C. BOARD GROUND
   - D.C. VOLTAGE
   - A.C. VOLTAGE
4. TEST SIGNAL OF .5mV, 1 KHz APPLIED ACROSS PINS 2 AND 3 OF LOW IMPEDANCE CONNECTORS. AC VOLTAGE MEASUREMENTS MAY VARY ± 30% FROM VALUES SHOWN. ALL P.C. BOARDS ARE INTERCONNECTED AS IN FINAL UNIT.

CONNECTOR: P801 (J1)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#24	BLK *	(J4) P902 R	SIGNAL GROUND
B	#24	BLK *	(J19) P701 D	SIGNAL GROUND
C	#24	YEL/GRN ①	SIMPLEX SWITCH	+24V SIMPLEX
D	——	——	N.C.	——
E	——	——	N.C.	——
F	——	——	N.C.	——
G	——	——	N.C.	——
H	#24	BLK *	(J2) P101H	SIGNAL GROUND
J	#24	ORN/BLK	(J8) P502A	+22V
K	#24	WHT/BLK †	(J7) P503J	POWER INDICATOR LED GROUND
L	#24	ORN/BLK *	(J8) P502B	+22V
M	#24	BRN	(J8) P502P	TEMP WARNING LED DRIVE
N	——	——	N.C.	——
P	#24	WHT/BLK †	(J7) P503K	SHUTDOWN LED GROUND
R	#22	VIO	TERMINAL STRIP-RESISTOR SPLIT	SHUTDOWN LED DRIVE

* WIRES CAN BE INTERCHANGED
** WIRES CAN BE INTERCHANGED
† WIRES CAN BE INTERCHANGED

① IN EARLIER MODELS, YEL/GRN WAS GRN & (J13) P1308 R WAS SIMPLEX SWITCH.

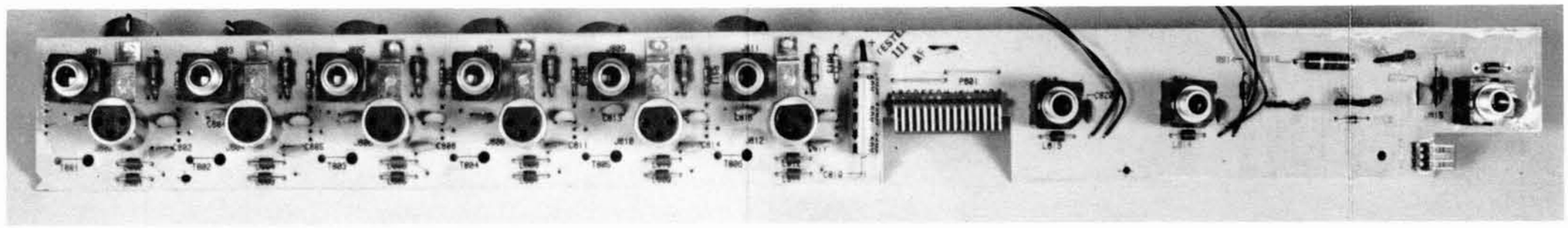
CONNECTOR: P802 (J21)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#22	BLK	SPKR. GND	SPKR. JACK GND.
B	——	——	N.C.	——
C	#22	BLU	(J11) P602B (A)	A HEADPHONE
D	#22	BRN	(J14) P602B (B)	HEADPHONE

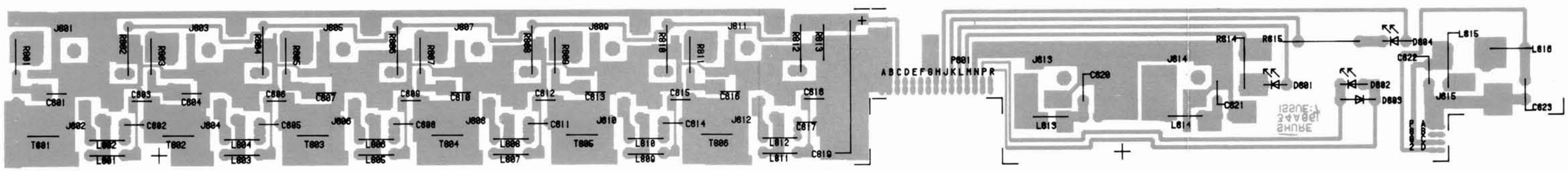
MODEL 706: J815 TIP AND RING ARE CONNECTED.

INPUT CONNECTORS BOARD A8
CIRCUIT DIAGRAM

FIGURE 6



INPUT CONNECTORS BOARD A8
PARTS LOCATION
FIGURE 7

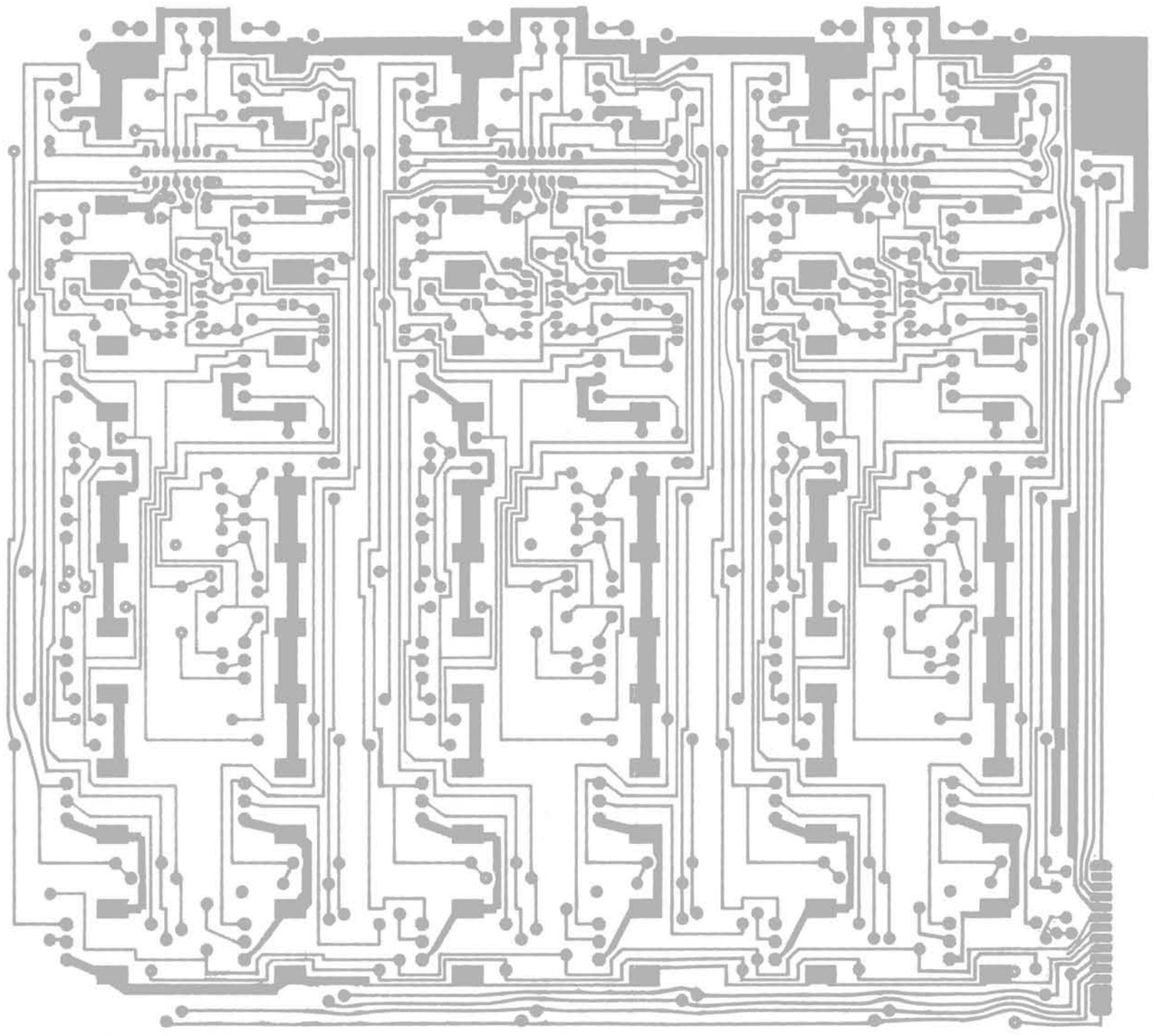


INPUT CONNECTORS BOARD A8
COMPONENT SIDE
FIGURE 8

INPUT CONNECTORS BOARD A8
FOIL SIDE

8007-3/861-7

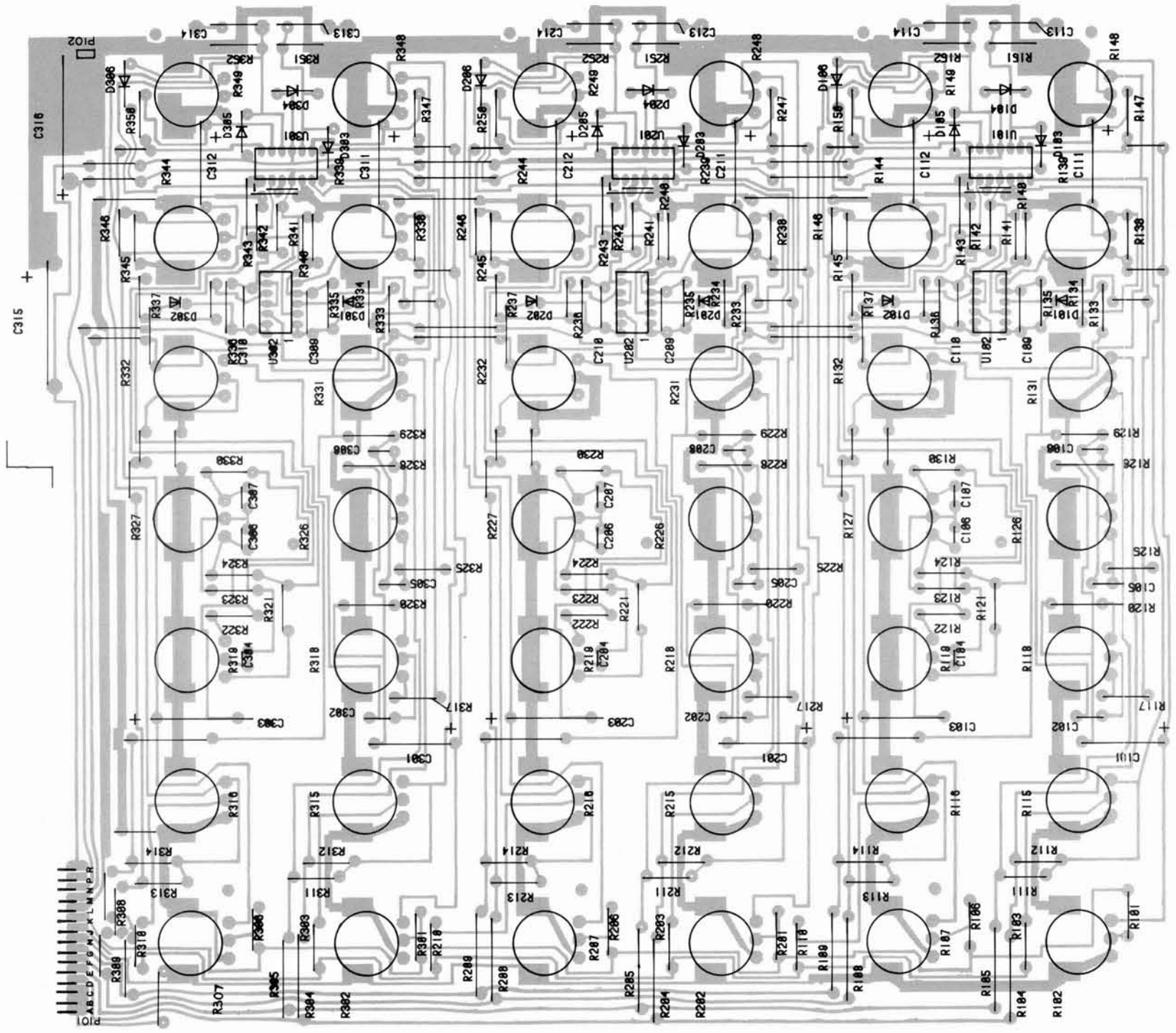
FIGURE 9



INPUT CONNECTORS BOARD A1
FOIL SIDE

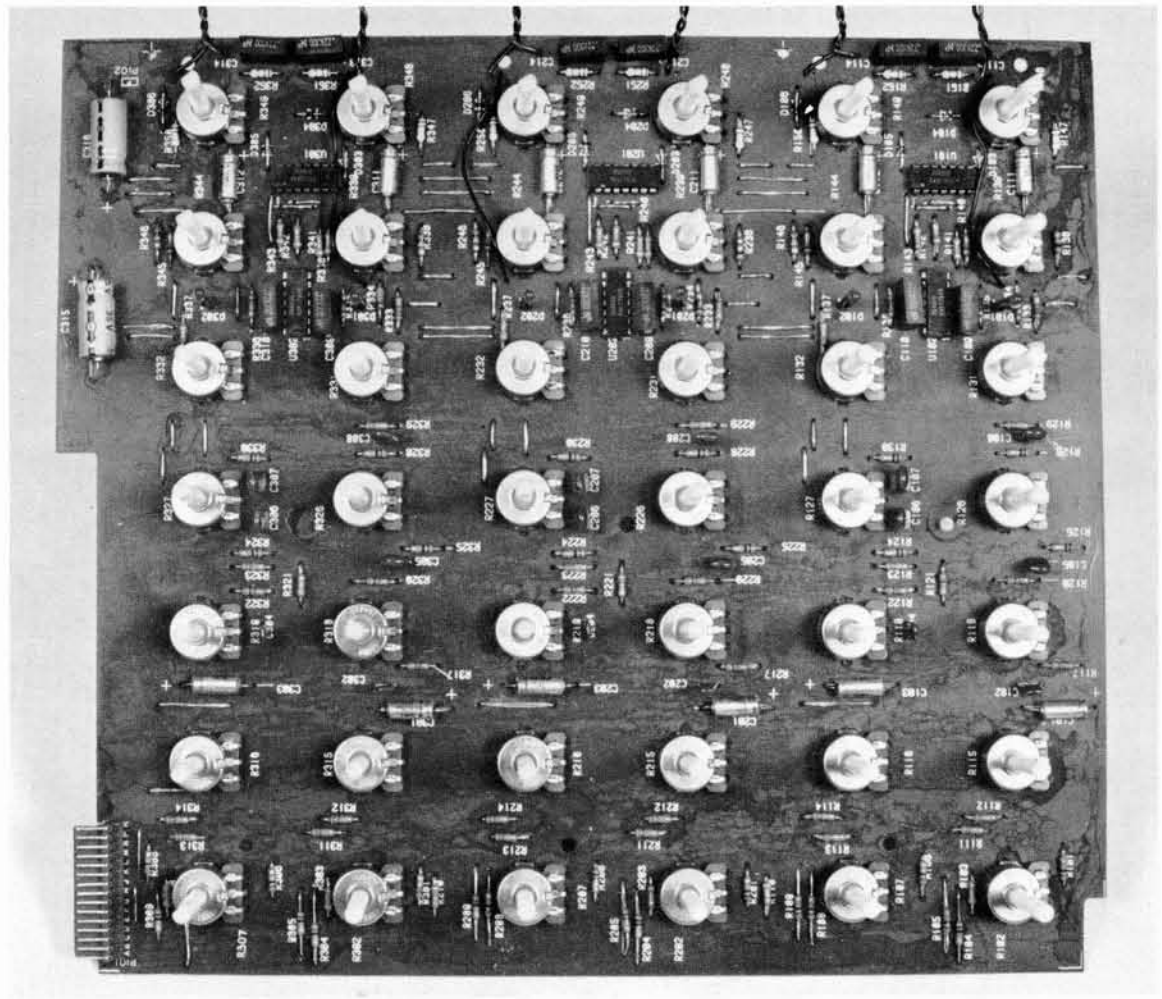
8005-6/890-10

FIGURE 10



INPUT CONTROLS BOARD A1
COMPONENT SIDE

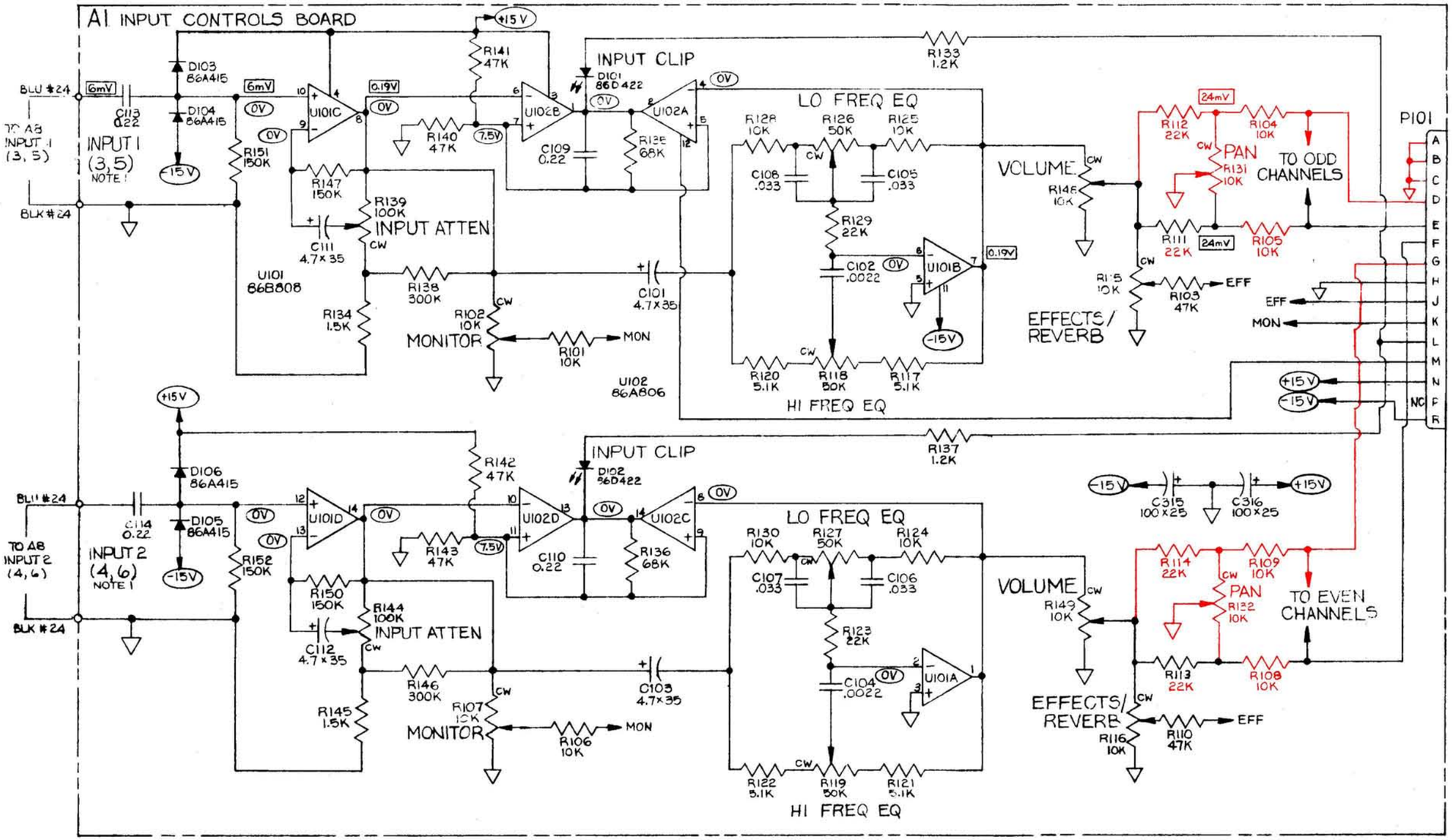
FIGURE 11



INPUT CONTROLS BOARD A1
PARTS LOCATION

FIGURE 12

8005-6/890-10



NOTES:

1. ON INPUTS 3 AND 4 (A2) ADD 100 TO ALL C,D,R AND U NUMBERS. ON INPUTS 5 AND 6 (A3) ADD 200 TO ALL C,D,R AND U NUMBERS EXCEPT C315, C316.
2. ALL CAPACITORS IN µF AND 50V OR MORE UNLESS OTHERWISE SHOWN. ELECTROLYTIC CAPACITORS SHOWN IN µF x VOLTS.
3. ALL RESISTORS 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
4. THE FOLLOWING SYMBOLS DENOTE:
   - ⏚ P.C. BOARD GROUND
   - ⬭ D.C. VOLTAGE
   - ▭ A.C. VOLTAGE
5. TEST SIGNAL OF 6mV, 1KHz APPLIED BETWEEN BLU AND BLK INPUT WIRES FROM 33K OHM SOURCE. ALL VOLTAGES MEASURED AT 25°C WITH 120 VAC AND ALL P.C. BOARDS INTERCONNECTED AS IN FINAL UNIT. VOLTAGE MEASUREMENTS MAY VARY ±30% FROM VALUES SHOWN.
6. EQ AND PAN CONTROLS CENTERED. ALL OTHER CONTROLS FULLY CLOCKWISE.

CONNECTOR: P101 (J2)

PIN	GAUGE	COLOR	TO	FUNCTION
A				SIGNAL GROUND
B				SIGNAL GROUND
C				SIGNAL GROUND
D	#24	YEL/RED	(J3) P901B	ODD A MIX
E	#24	GRA/RED	(J3) P901A	ODD B MIX
F	#24	GRA	(J3) P901C	EVEN B MIX
G	#24	YEL	(J3) P901D	EVEN A MIX
H	#24	BLK	(J1) P801H	SIGNAL GROUND
J	#24	BRN	(J3) P901E	EFFECTS/REVERB MIX
K	#24	ORN	(J4) P902D	MONITOR MIX
L	#24	WHT/BLK	(J7) P503F	INPUT CLIPPING LED GROUND
M	#24	WHT *	(J7) P503M	INPUT CLIPPING LED -15V
N	#24	RED	(J8) P502G	+15V
P	——	——	N.C.	——
R	#24	WHT *	(J7) P503N	-15V

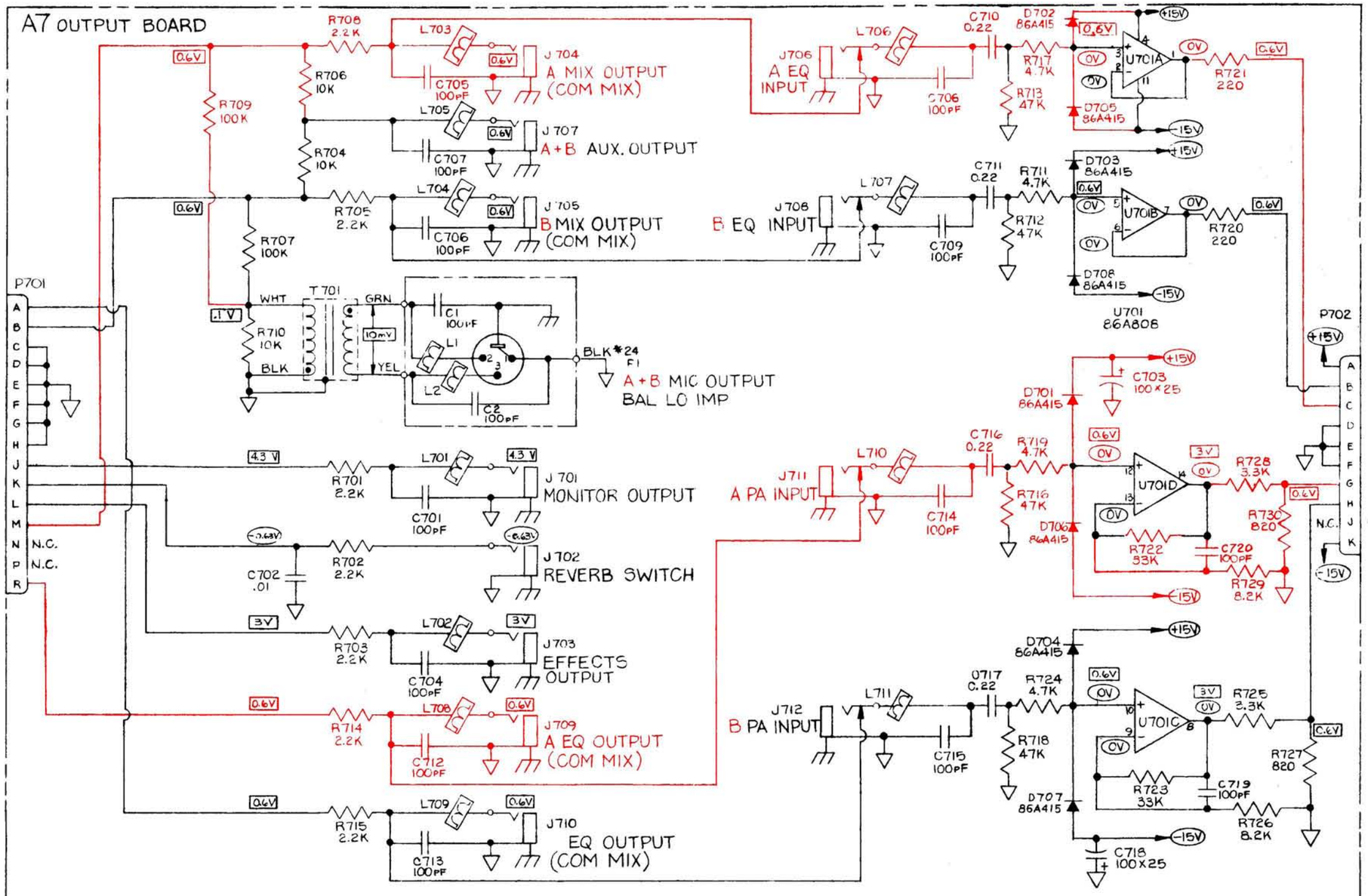
* WIRES CAN BE INTERCHANGED.

MODEL 706: R111, 113 ARE 56K; R105, R108 ARE JUMPERS.

8005-6/890-10

INPUT CONTROLS BOARD A1
CIRCUIT DIAGRAM

FIGURE 13



NOTES:

1. ALL CAPACITORS IN μF AND 50V OR MORE UNLESS OTHERWISE SHOWN. ELECTROLYTIC CAPACITORS SHOWN IN μF x VOLTS.
2. ALL RESISTORS 1/4 W, 5% UNLESS OTHERWISE SHOWN.
3. THE FOLLOWING SYMBOLS DENOTE:
   - CHASSIS GROUND
   - P.C. BOARD GROUND
   - D.C. VOLTAGE
   - A.C. VOLTAGE
4. ALL VOLTAGES MEASURED AT 25°C WITH 120VAC, INPUT AT 1KHZ AND ALL PC BOARDS INTERCONNECTED AS IN FINAL UNIT. VOLTAGE VALUES ARE TYPICAL AND MAY VARY ± 30%.

CONNECTOR P701 (J6)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#24	GRA/BLK	(J4) P902A	B EQ OUTPUT
B	#24	GRA/GRN	(J3) P901M	B MASTER OUTPUT
C	#24	BLK *	(J7) P503B	SIGNAL GROUND
D	#24	BLK *	(J1) P801B	SIGNAL GROUND
E	#22	BLK *	SPEAKER GND.	SIGNAL GROUND
F	#24	WHT/BLK	(J23) P905C ①	PEAK RECTIFIER GROUND
G	——	——	N.C.	SIGNAL GROUND
H	——	——	N.C.	SIGNAL GROUND
J	#24	VIO	(J22) P904H ②	MONITOR OUTPUT
K	#24	BLU	(J4) P902M	REVERB SWITCH
L	#24	YEL/BLK ③	(J23) P905B ③	EFFECTS OUTPUT
M	#24	YEL/GRN	(J3) P901L	A MASTER OUTPUT
N	——	——	N.C.	——
P	——	——	N.C.	——
R	#24	YEL/BLK	(J4) P902C	A EQ OUTPUT

* WIRES CAN BE INTERCHANGED
IN EARLIER MODELS:
① (J23) P905C WAS (A9) C925
② (J22) P904H WAS (A9) R1030
③ (J23) P905B WAS (A9) R958, COLOR WAS GRN

CONNECTOR: P702 (J5)

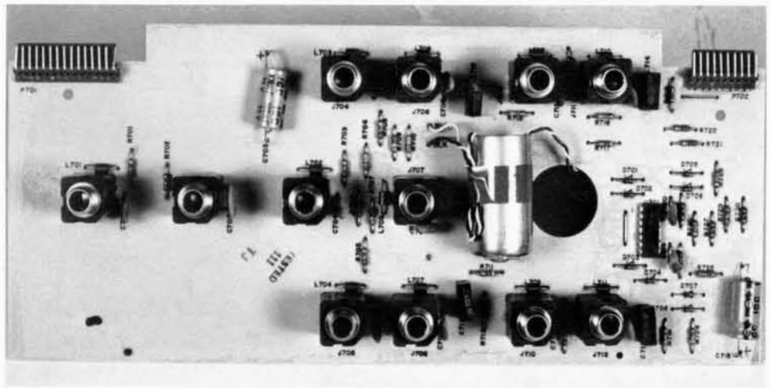
PIN	GAUGE	COLOR	TO	FUNCTION
A	#24	RED	(J8) P502F	+15V
B	#24	GRA/VIO	(J4) P902F	B EQ INPUT
C	#24	YEL/VIO	(J4) P902J	A EQ INPUT
D	#24	BLK †	(J10) P601B(A)	SIGNAL GROUND
E	#24	BLK †	(J13) P601B(B)	SIGNAL GROUND
F	——	——	N.C.	SIGNAL GROUND
G	#24	YEL	(J10) P601C(A)	A PA INPUT
H	#24	GRA	(J13) P601C(B)	B PA INPUT
J	——	——	N.C.	——
K	#24	WHT	(J7) P503P	-15V

† WIRES CAN BE INTERCHANGED.

MODEL 706: D702, R713, R716, R719, R722 ARE JUMPERS.

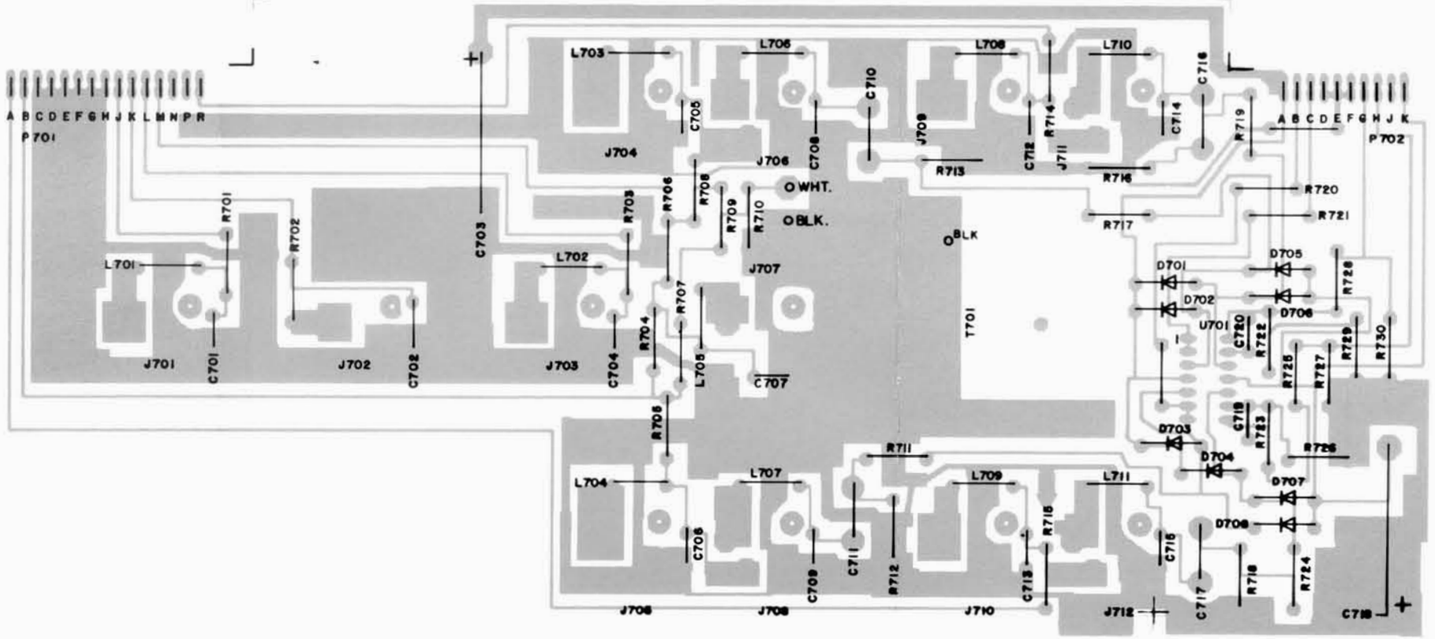
OUTPUT CONNECTORS BOARD A7
CIRCUIT DIAGRAM

FIGURE 14



OUTPUT CONNECTORS BOARD A7
PARTS LOCATION

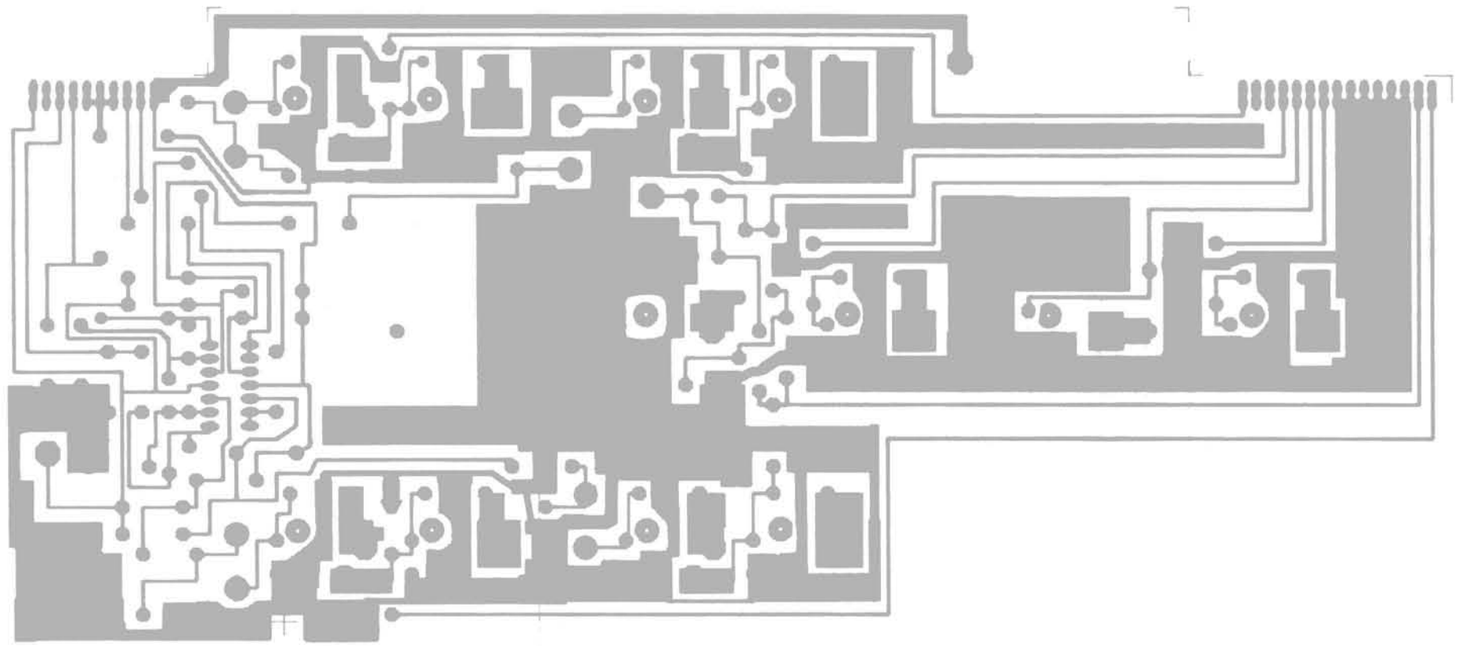
FIGURE 15



OUTPUT CONNECTORS BOARD A7
COMPONENT SIDE

FIGURE 16

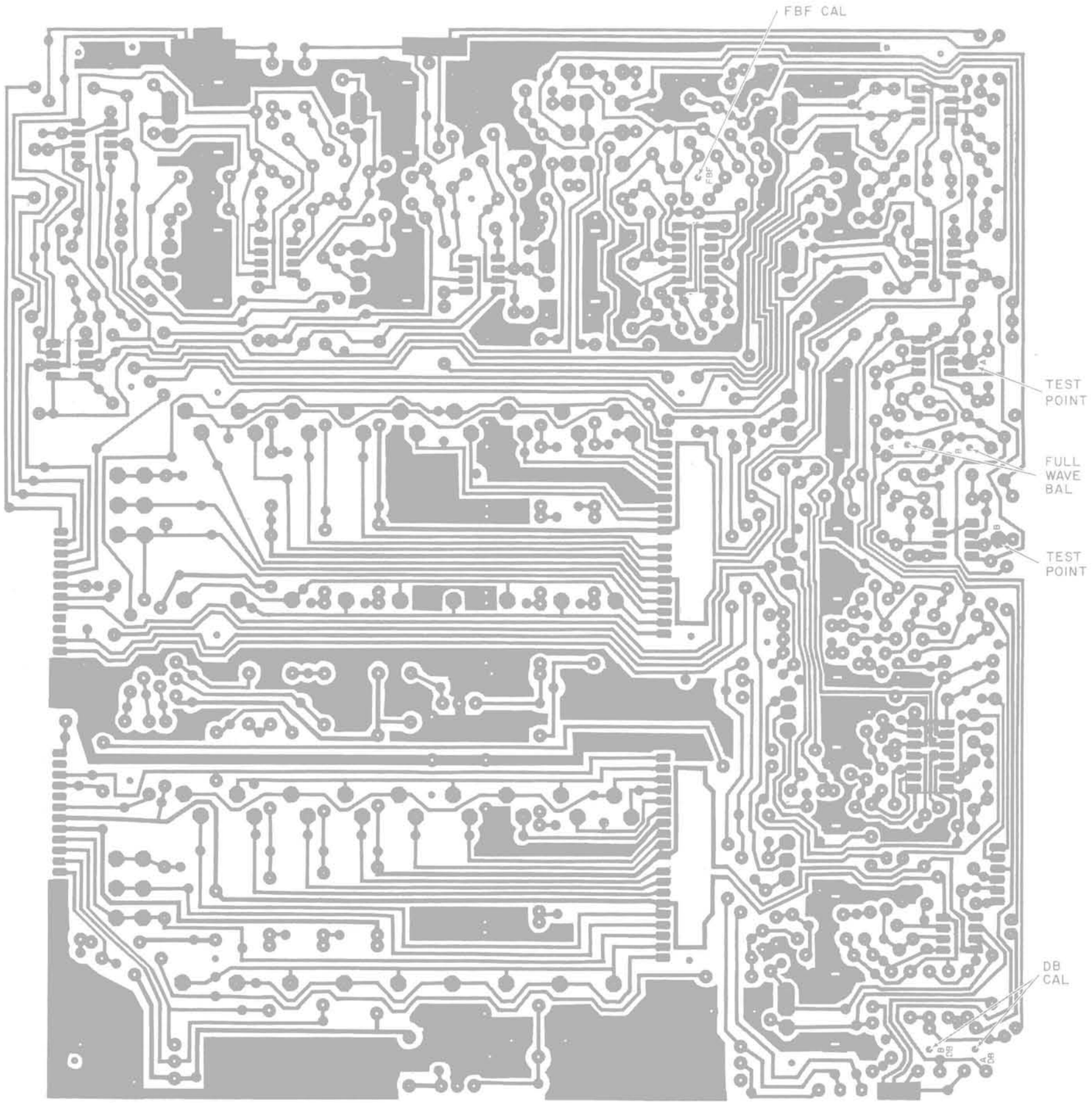
2932-5/8005-8



OUTPUT CONNECTORS BOARD A7
FOIL SIDE

2932-5/8005-8

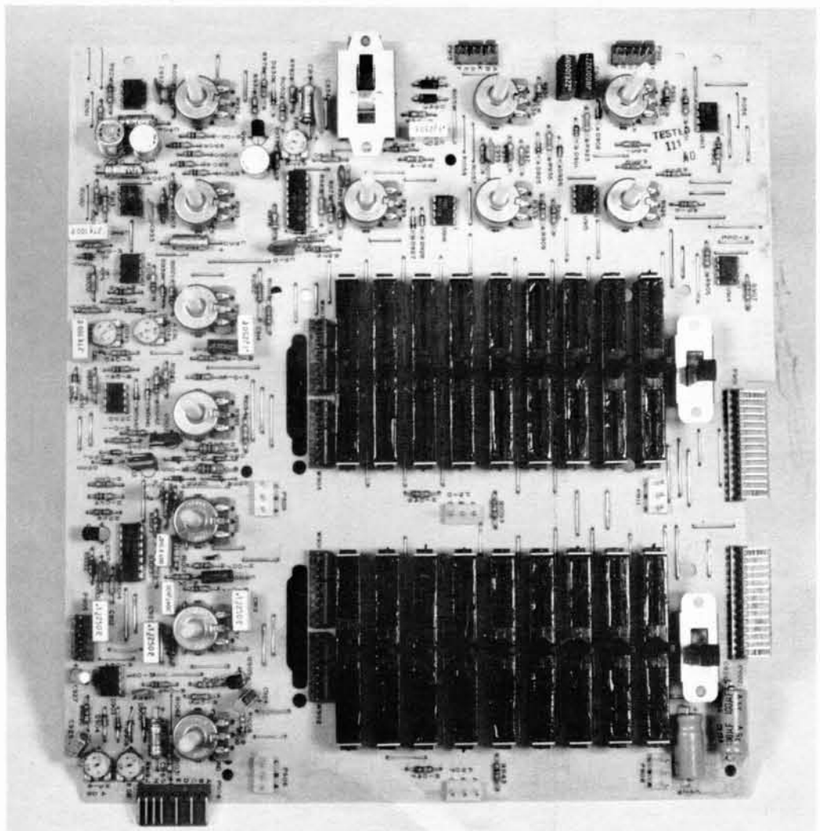
FIGURE 17



OUTPUT CONTROLS BOARD A9
FOIL SIDE

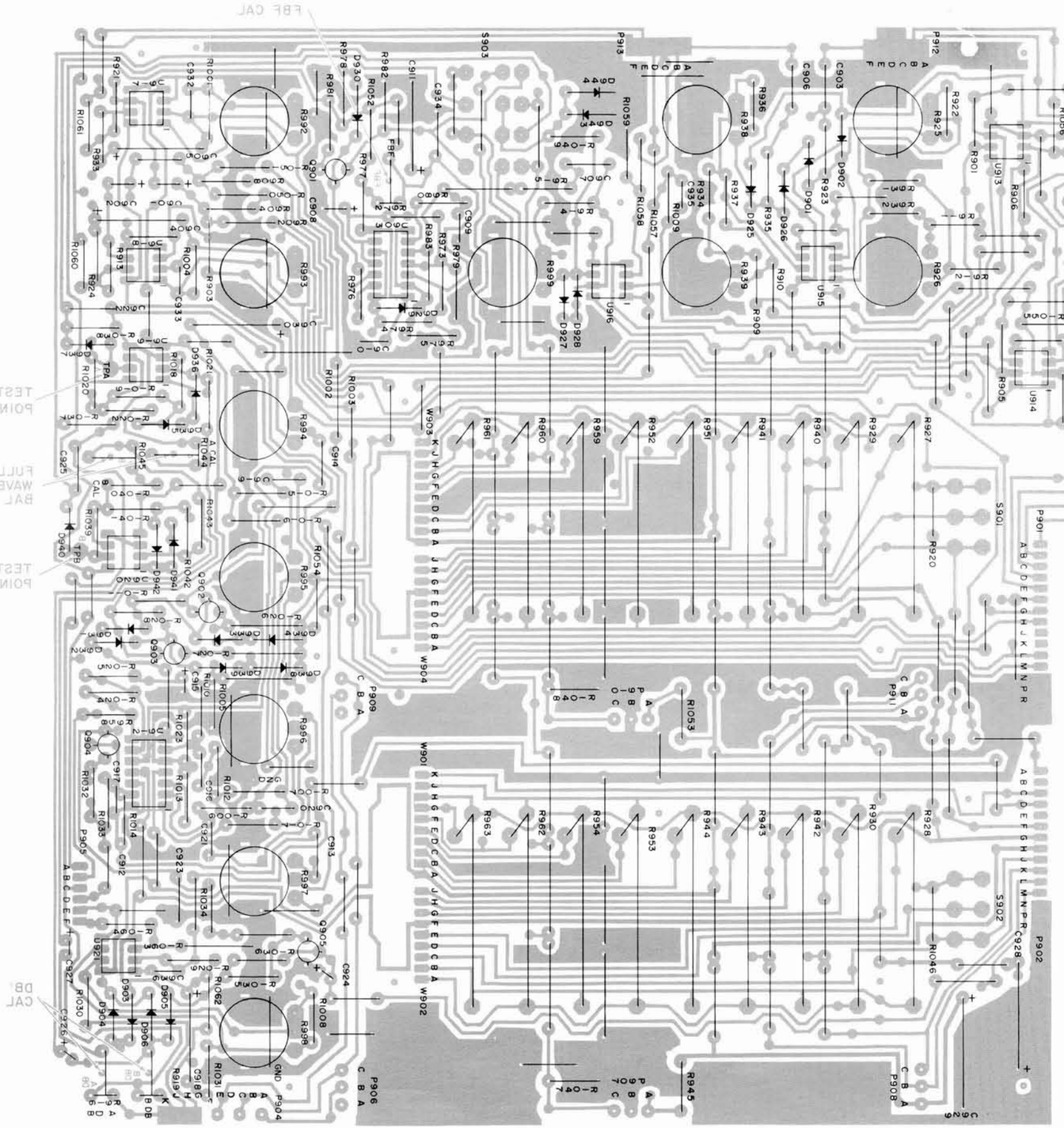
8003-2/8001-3

FIGURE 18



OUTPUT CONTROLS BOARD A9
PARTS LOCATION

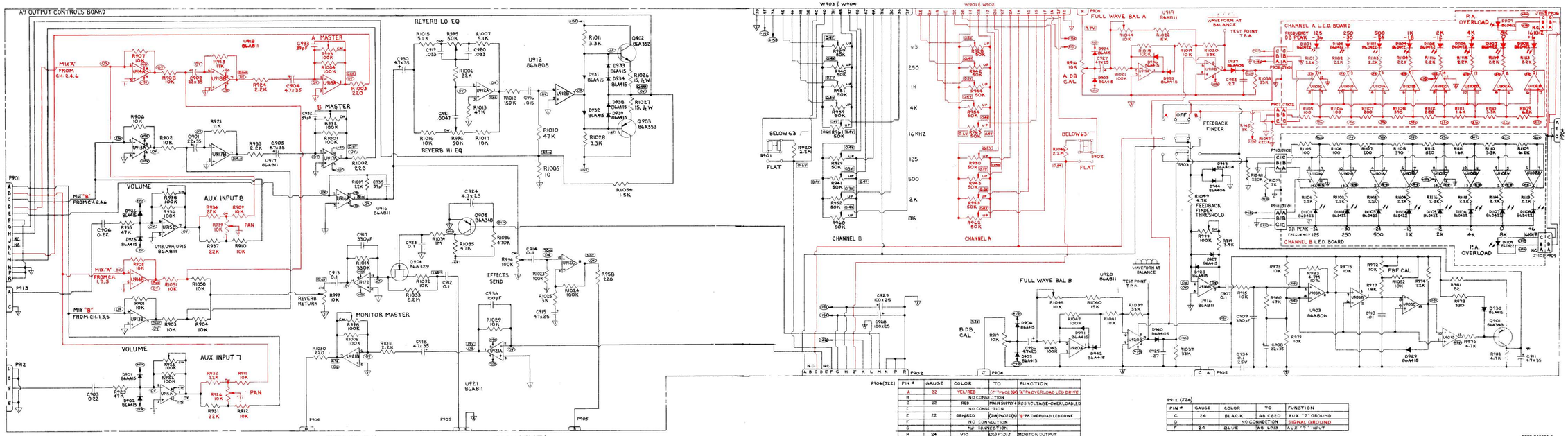
FIGURE 19



OUTPUT CONTROLS BOARD A9
COMPONENT SIDE

FIGURE 20

8003-2/8001-3



NOTES.

1. ALL CAPACITORS IN μF AND 50V OR MORE UNLESS OTHERWISE SHOWN. ELECTROLYTIC CAPACITORS SHOWN IN μF's VOLTS.
2. ALL RESISTORS 1/4 WATT, 5% UNLESS OTHERWISE SPECIFIED.
3. THE FOLLOWING SYMBOLS DENOTE:
   - ▽ P.C. BOARD GROUND
   - ⬭ D.C. VOLTAGE
   - ▭ AC VOLTAGE
   - * VARIABLE WITH FREQUENCY: 0-12V
   - * * +12V WITH LED OFF, +5V WITH LED ON
4. ALL VOLTAGES MEASURED AT 25°C WITH 120VAC INPUT AT 1KHz AND ALL P.C.BOARDS INTER-CONNECTED AS IN FINAL UNIT. VOLTAGE VALUES ARE TYPICAL AND MAY VARY ± 20%.
5. REVERB RETURN CONTROL FULLY COUNTERCLOCKWISE. MIX AND EQ CONTROLS CENTERED. ALL OTHER CONTROLS FULLY CLOCKWISE.

CONNECTOR: P901 (Z3)

PIN	GUAGE	COLOR	TO	FUNCTION
A	#24	GRA/RED	(Z3)P901E	ODD A MIX
B	#24	YEL/RED	(Z3)P901D	ODD A MIX
C	#24	GRA	(Z3)P901F	EVEN B MIX
D	#24	YEL	(Z3)P901H	EVEN A MIX
E	#24	BRN	(Z3)P901Z	EFFECTS/REVERB MIX
F	W2	SHIELD	A10 INPUT	REVERB DRIVE GND
G	W2	WHT	A10 INPUT	REVERB DRIVE HIGH
H	W2	BLK	A10 INPUT	REVERB DRIVE SENSE
J	——	——	N.C.	——
K	——	——	N.C.	——
L	#24	YEL/GRN	(Z3)P901M	A MASTER OUTPUT
M	#24	GRA/GRN	(Z3)P901B	B MASTER OUTPUT
N	——	——	N.C.	SIGNAL GROUND
P	——	——	N.C.	SIGNAL GROUND
R	——	——	N.C.	SIGNAL GROUND

CONNECTOR: P903 (Z4)

PIN	GUAGE	COLOR	TO	FUNCTION
A	#24	GRA/BLK	(Z4)P904A	A EQ OUTPUT
B	——	——	N.C.	——
C	#24	YEL/BLK	(Z4)P901L	B EQ OUTPUT
D	#24	ORN	(Z4)P901K	MONITOR MIX
E	——	——	N.C.	——
F	#24	GRA/VIO	(Z4)P902N	B EQ BUFFER OUTPUT
G	#24	WHT	(Z4)P903R	-15V
H	#24	RED	(Z4)P902E	+15V
J	#24	YEL/VIO	(Z4)P902C	A EQ BUFFER OUTPUT
K	#24	WHT/RED	(Z4)P905Q	PEAK INDICATOR LED-25V
L	#24	YEL	(Z4)P905B	PEAK INDICATOR & GROUND
M	#24	BLU	(Z4)P902K	REVERB SWITCH
N	——	——	N.C.	SIGNAL GROUND
P	——	——	N.C.	SIGNAL GROUND
R	#24	BLK	(Z4)P901N	——

P904 (Z22)

PIN #	GAUGE	COLOR	TO	FUNCTION
A	22	YEL/RED	(Z4)P902M	A PADVERLOAD LED DRIVE
B	NO CONNECTION			
C	22	RED	MAIN SUPPLY	+20S VOLTAGE-OVERLOADLED
D		NO CONNECTION		
E	22	GRN/RED	(Z4)P902D	B PA OVERLOAD LED DRIVE
F	NO CONNECTION			
G	NO CONNECTION			
H	24	VIO	(Z4)P10LF	MONITOR OUTPUT
J	22	GRN	(Z4)P902C	B PEAK INDICATOR DRIVE
K	22	ORN	(Z4)P902M	A PEAK INDICATOR DRIVE

P905 (Z23)

PIN #	GAUGE	COLOR	TO	FUNCTION
A	24	RED	(Z4) P902H	+15VDC (FEEDBACK FINDER)
B	24	YEL/BLK	(Z4) P10IL	EFFECTS OUTPUT
C	24	WHT/BLK	(Z4) P10IF	GROUND (PEAK RECTIFIER)
D	W3	WHT	A10	REVERB RETURN (HOT)
E		SHIELD	A10	REVERB RETURN (SHIELDING)
F		NO CONNECTION		

P912 (Z24)

PIN #	GAUGE	COLOR	TO	FUNCTION
C	24	BLACK	A8 CB20	AUX "7" GROUND
D		NO CONNECTION		SIGNAL GROUND
F	24	BLUE	A8 LB13	AUX "7" INPUT

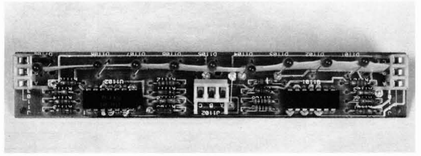
P913 (Z25)

PIN #	GAUGE	COLOR	TO	FUNCTION
A	24	BLUE	A8 LB14	AUX "8" INPUT
C	24	BLACK	A8 CB21	AUX "8" GROUND

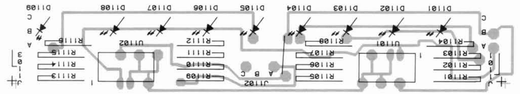
8003-2/8003-3

OUTPUT CONTROLS BOARD A9
CIRCUIT DIAGRAM

FIGURE 21



LED BOARD A11
PARTS LOCATION
FIGURE 22

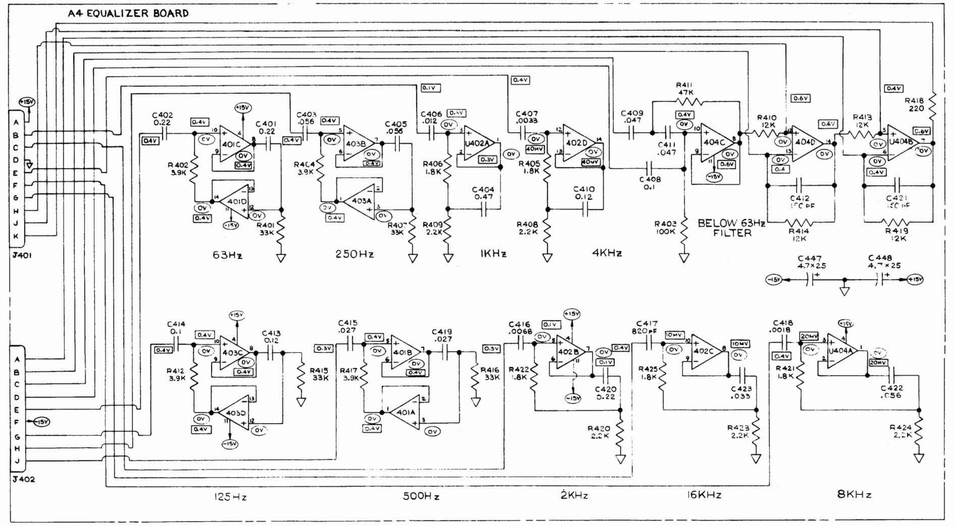


TOP FOIL

BOTTOM FOIL

2948-3/8002-5

LED BOARD A11
COMPONENT SIDE
FIGURE 23

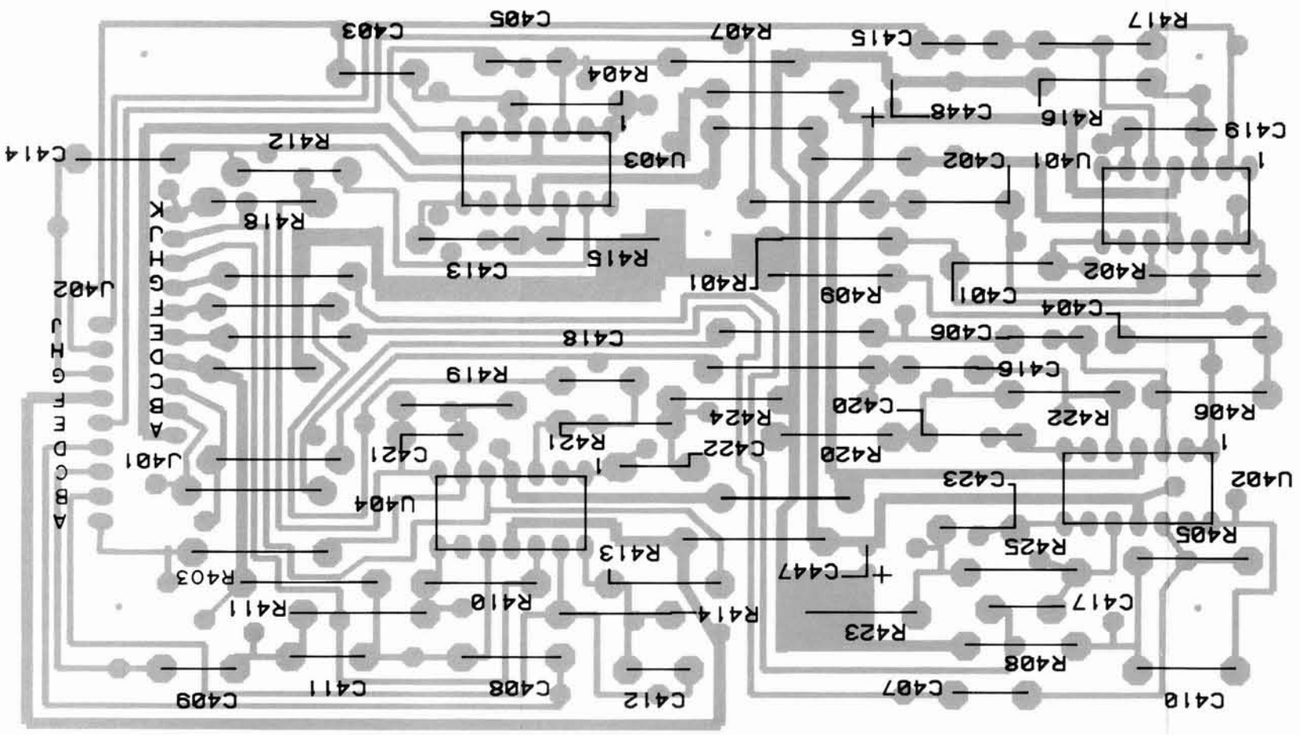


8002-1/8003-3

NOTES:

1. ALL CAPACITORS IN μF AND 50V OR MORE UNLESS OTHERWISE SHOWN.
2. ALL RESISTORS 1/4 W. 5% UNLESS OTHERWISE SHOWN.
3. THE FOLLOWING SYMBOLS DENOTE:
   - P.C. BOARD GROUND
   - D.C. VOLTAGE
   - A.C. VOLTAGE
4. ALL VOLTAGES MEASURED AT 25°C WITH 120 VAC, AND ALL P.C. BOARDS INTERCONNECTED AS IN FINAL UNIT. VOLTAGE MEASUREMENTS MAY VARY ±30% FROM VALUES SHOWN.
5. ALL PIN LETTERS OF J401 & J402 CONNECT TO CORRESPONDING PIN LETTERS OF W901 & W902 AND/OR W903 & W904 ON APPROPRIATE OUTPUT CONTROLS BOARD A9.
6. THIS IS A "BREAKAWAY" BOARD CONTAINING TWO IDENTICAL EQUALIZER CIRCUITS. ONE CIRCUIT IS SHOWN.

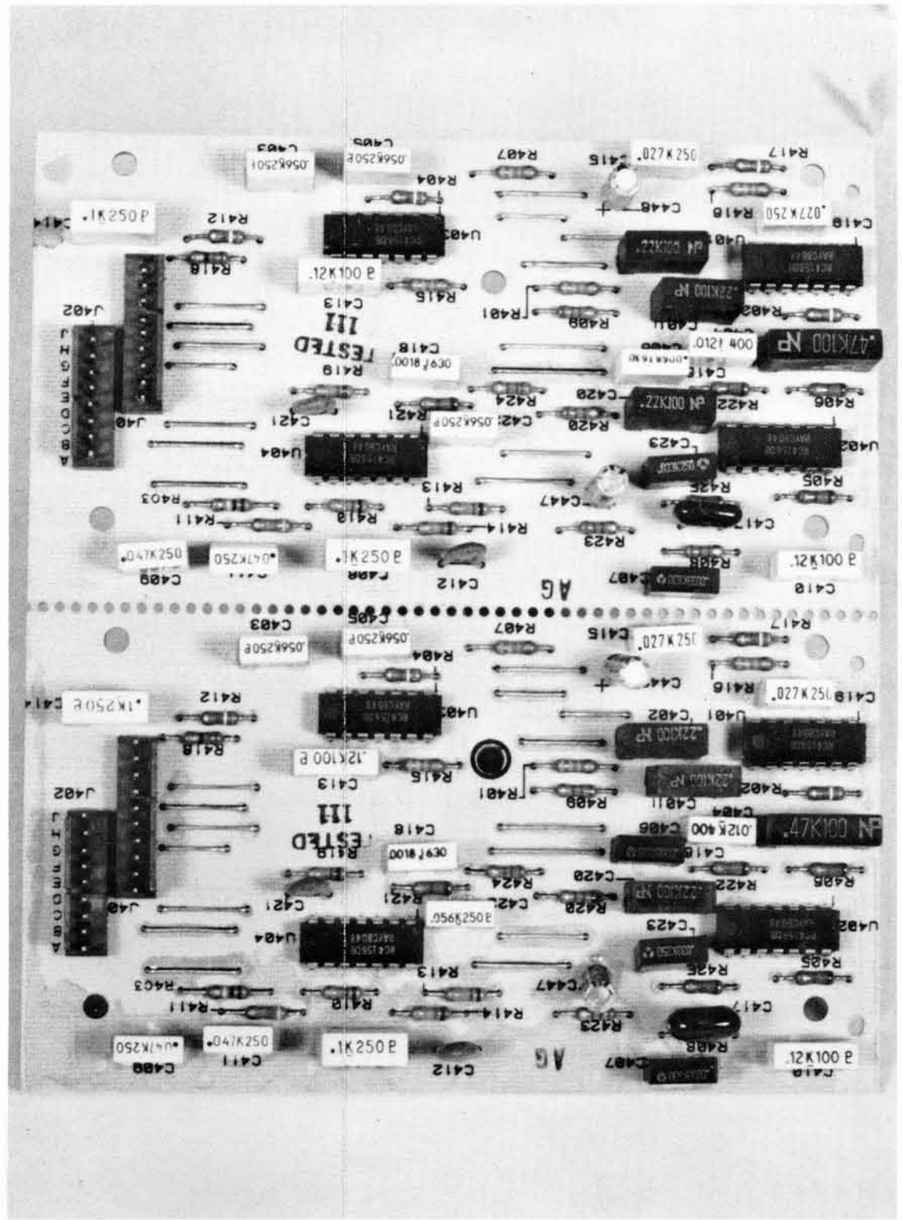
EQUALIZER BOARD A4
CIRCUIT DIAGRAM
FIGURE 24



EQUALIZER BOARD A4
COMPONENT SIDE

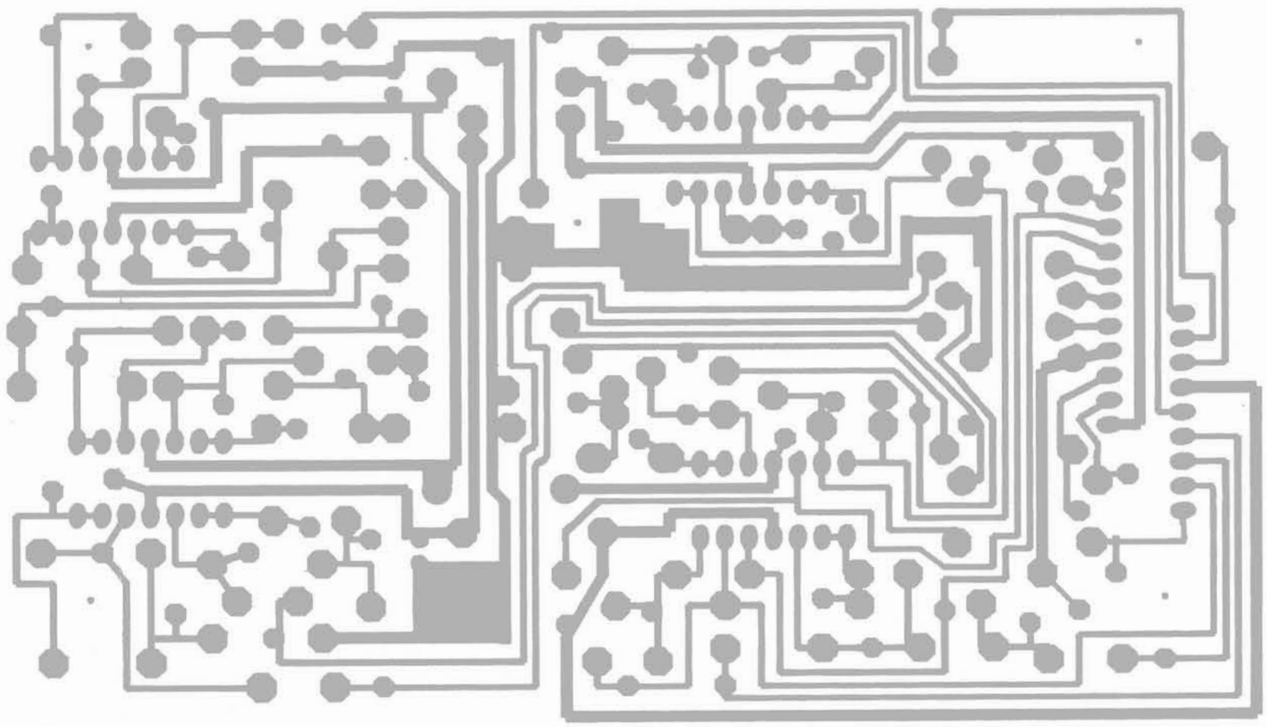
FIGURE 25

8002-1/8003-3



EQUALIZER BOARD A4
PARTS LOCATION

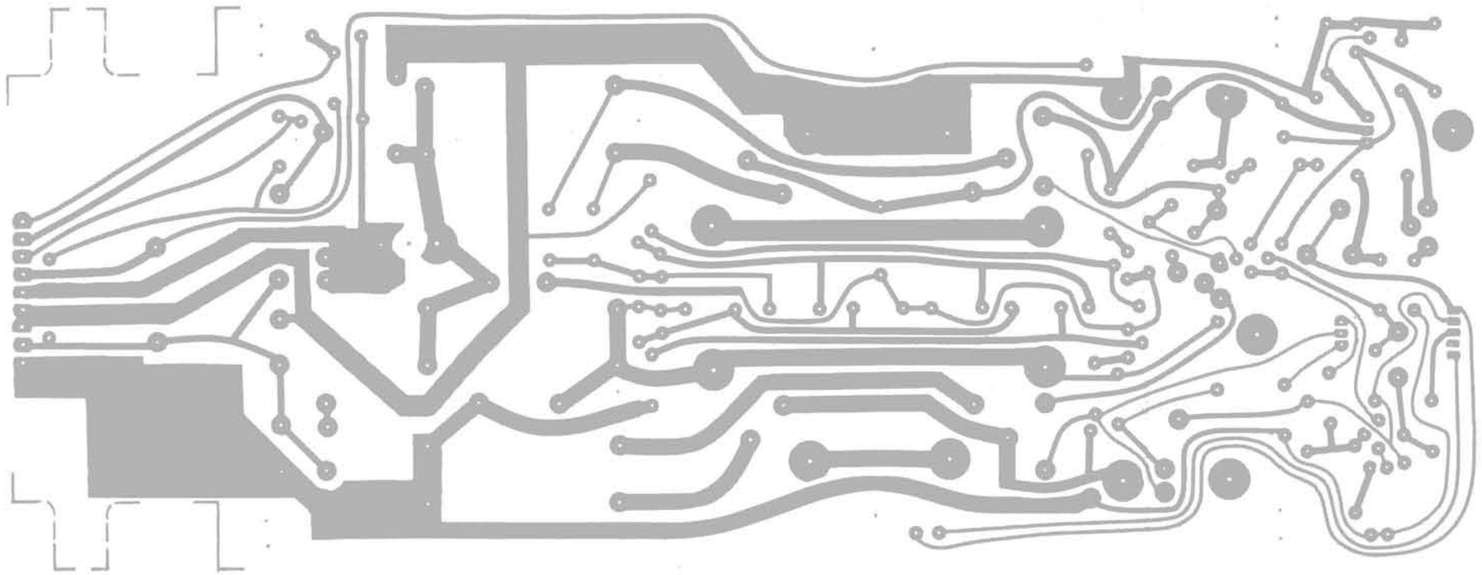
FIGURE 26



EQUALIZER BOARD A4
FOIL SIDE

8002-1/8003-3

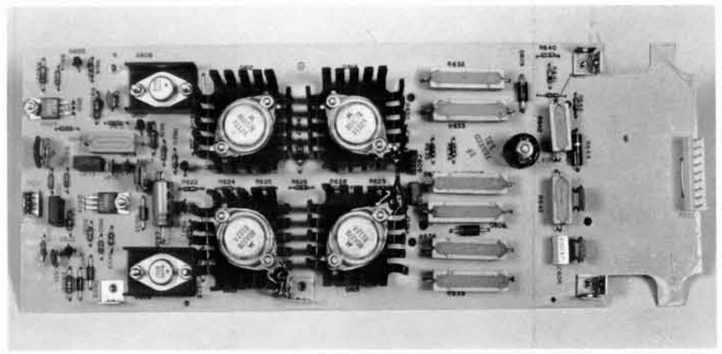
FIGURE 27



POWER AMPLIFIER BOARD A6
FOIL SIDE

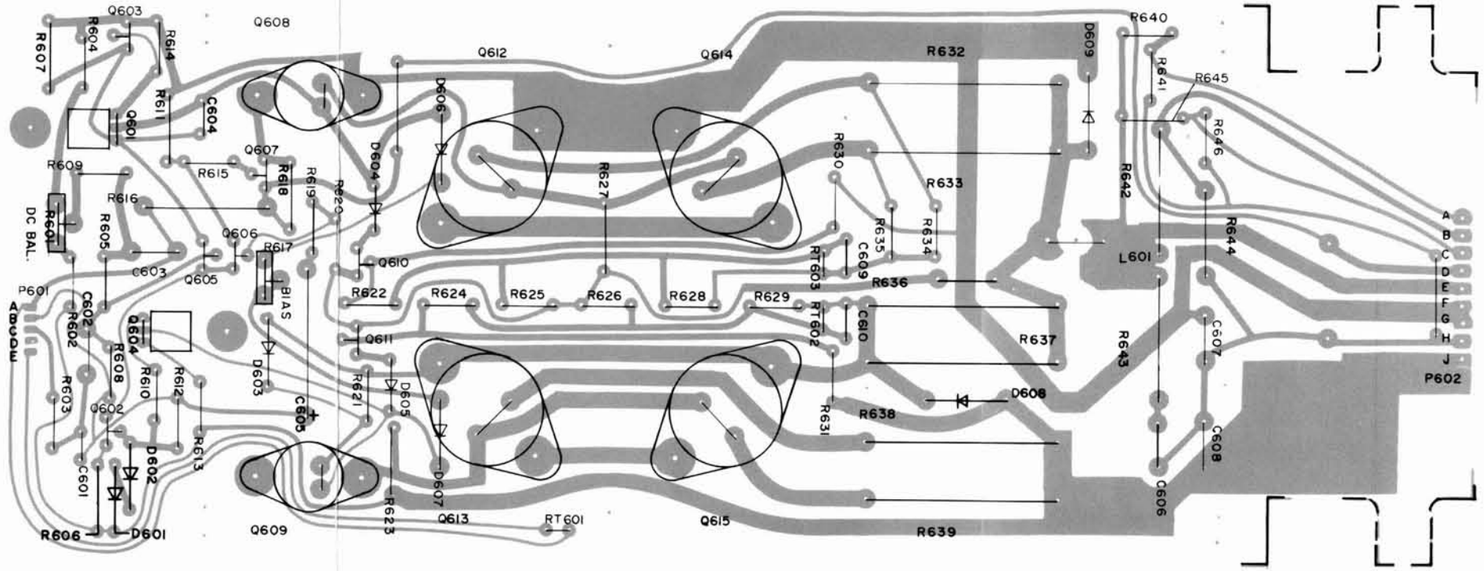
8017-7/894-11

FIGURE 28



POWER AMPLIFIER BOARD A6
PARTS LOCATION

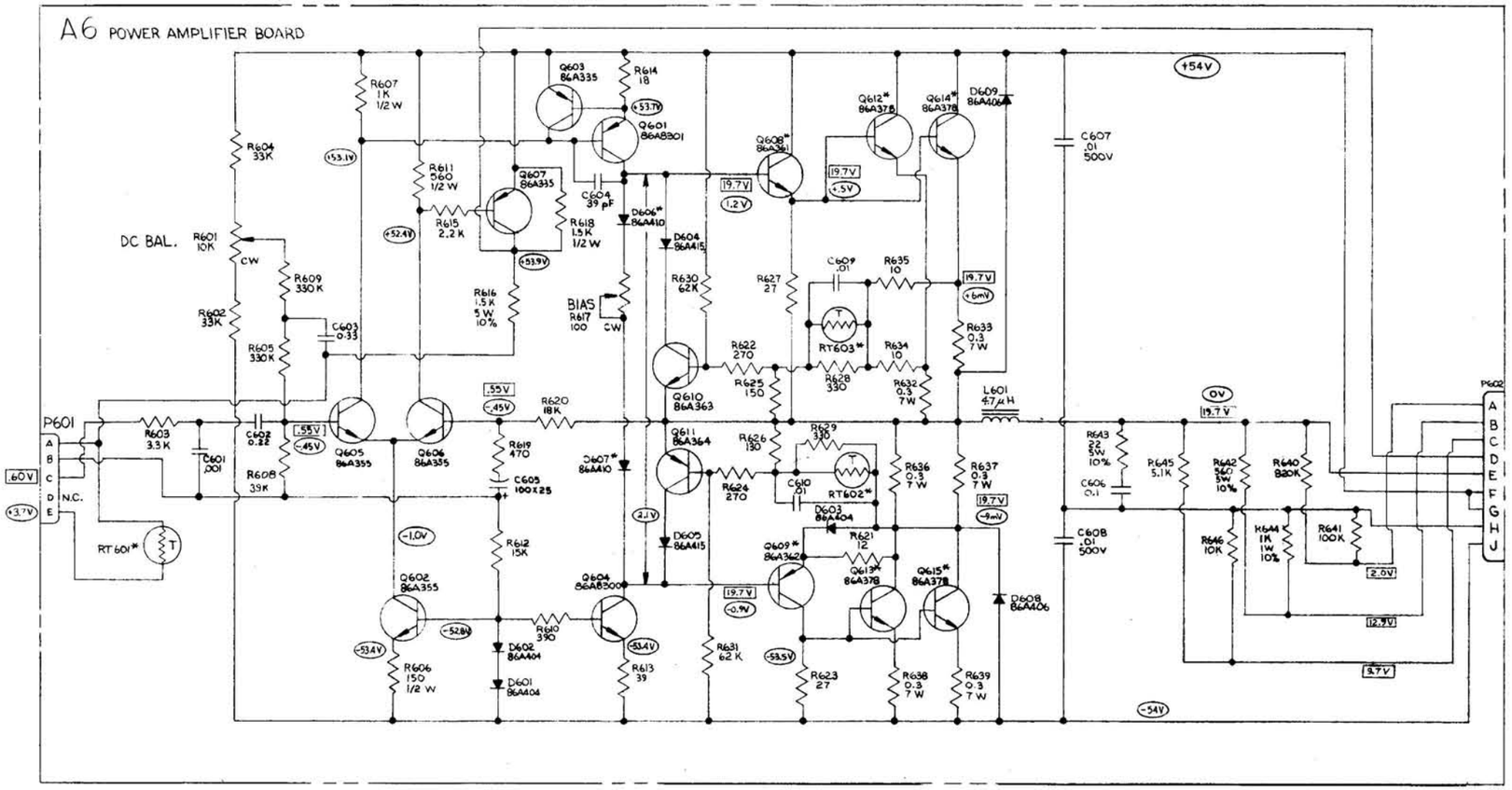
FIGURE 29



8017-7/894-11

POWER AMPLIFIER BOARD A6
COMPONENT SIDE

FIGURE 30



NOTES:

1. ALL CAPACITORS IN μF AND 50 V OR MORE UNLESS OTHERWISE SHOWN, ELECTROLITIC CAPACITORS SHOWN IN μF X VOLTS.
2. ALL RESISTORS 1/4 W, 5% UNLESS OTHERWISE SHOWN.
3. THE FOLLOWING SYMBOLS DENOTE: ◯ DC VOLTAGE ▭ AC VOLTAGE
4. ALL VOLTAGES MEASURED AT 25°C, WITH 120 VAC LINE, 1 KHZ INPUT AND ALL PC BOARDS INTERCONNECTED AS IN FINAL UNIT. SPEAKER AND HEADPHONE OUTPUTS ARE UNLOADED. VOLTAGE VALUES ARE TYPICAL AND MAY VARY ±20%.

* Q608,609,612-615 MOUNTED ON HEAT SINKS.
D606 CONNECTED TO HEAT SINK OF Q612
D607 CONNECTED TO HEAT SINK OF Q613
RT601 CONNECTED TO HEAT SINK OF Q613
RT602 CONNECTED TO HEAT SINK OF Q615
RT603 CONNECTED TO HEAT SINK OF Q614

CONNECTOR: P601(A) (J10)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#24	WHT/BLK	(J7) P503C	NON SIGNAL GROUND
B	#24	BLK	(J5) P702D	SIGNAL GROUND
C	#24	YEL	(J5) P702G	A PA BUFFER OUTPUT
D	——	——	N.C.	
E	#24	YEL/RED	(J8) P502N	A TEMP. WARNING THERMISTOR

CONNECTOR: P602(A) (J11)

A	#22	YEL/BLK	(J8) P502L	A	DC VOLTAGE SENSE
B	#22	BLU	(J21) P602C	A	HEADPHONE
C	#22	GRN	(J22) P904K	A	PEAK INDICATOR DRIVE
D	#22	YEL/RED	(J22) P904A	A	OVERLOAD LED DRIVE
E	#18	YEL	5 SPKR JACK	A	SPEAKER OUTPUT
F	#18	RED	(C5) POS.		MAIN SUPPLY POSITIVE
G	——	——	N.C.		MAIN SUPPLY POSITIVE
H	#18	BLK	(C5-6) C.T.		MAIN SUPPLY CENTER TAP
J	#18	WHT	(C6) NEG.		MAIN SUPPLY NEGATIVE

CONNECTOR: P601(B) (J13)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#24	WHT/BLK	(J7) P503D	NON SIGNAL GROUND
B	#24	BLK	(J5) P702E	SIGNAL GROUND
C	#24	GRA	(J5) P702H	B PA BUFFER OUTPUT
D	——	——	N.C.	
E	#24	GRA/RED	(J8) P502H	B TEMP. WARNING THERMISTOR

CONNECTOR: P602(B) (J14)

A	#22	GRN/BLK	(J8) P602M	B	DC VOLTAGE SENSE
B	#22	BRN	(J21) P602D	B	HEADPHONE
C	#22	GRN	(J22) P904J	B	PEAK INDICATOR DRIVE
D	#22	GRN/RED	(J22) P904E	B	OVERLOAD LED DRIVE
E	#18	GRA	8 SPKR JACK	B	SPEAKER OUTPUT
F	#18	RED	(C5) POS.		MAIN SUPPLY POSITIVE
G	——	——	N.C.		MAIN SUPPLY POSITIVE
H	#18	BLK	(C5-6) C.T.		MAIN SUPPLY CENTER TAP
J	#18	WHT	(C6) NEG.		MAIN SUPPLY NEGATIVE

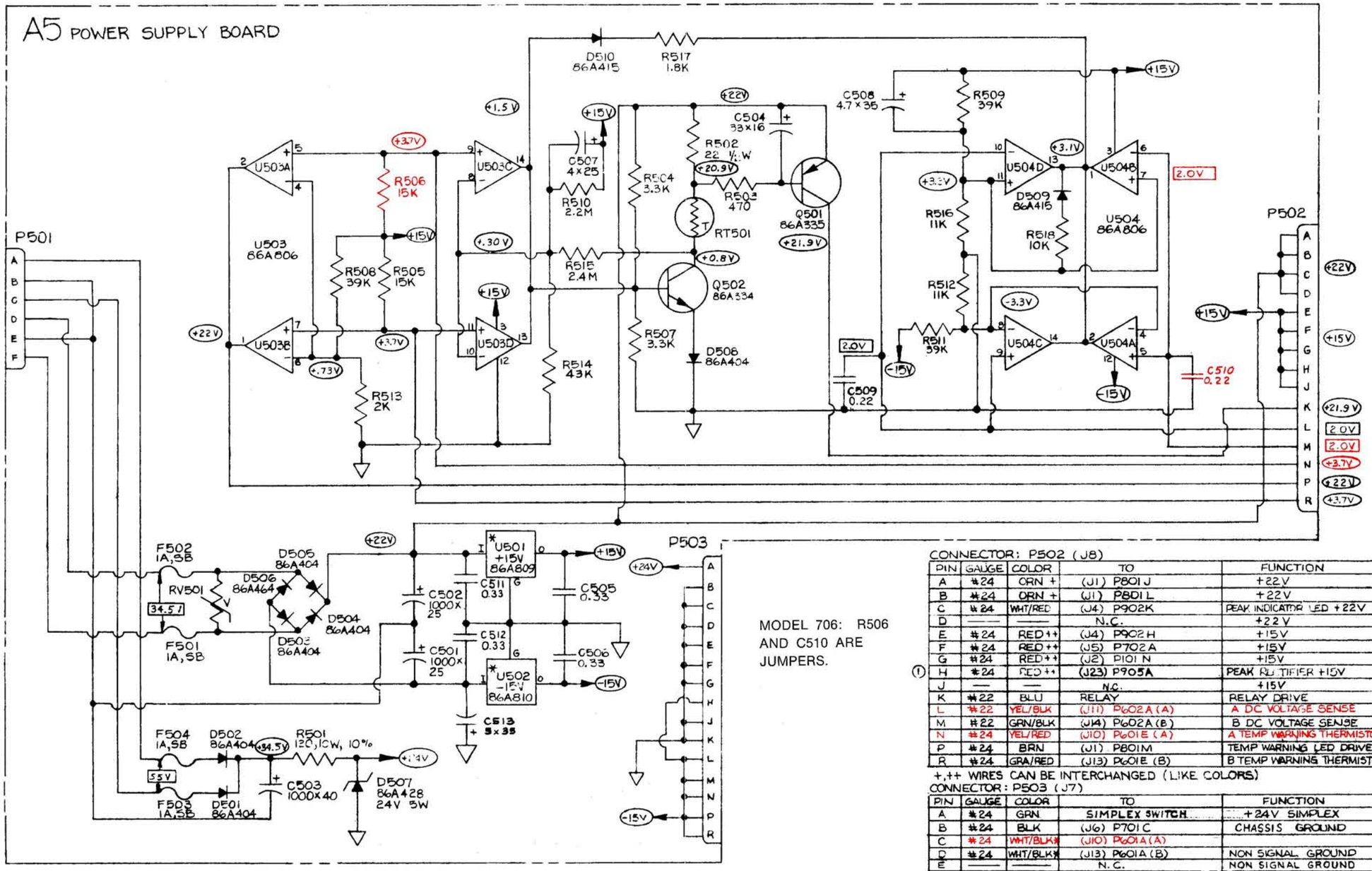
706 HAS REVISIONS LISTED BELOW:
① (J22) P904 E
⑥ (J22) P904 B

IN EARLIER MODELS:
① (J22) P904K WAS (A9) R916
② (J22) P904A WAS (A9) D915
③ (J22) P904J WAS (A9) R919
④ (J22) P904E WAS (A9) D924

POWER AMPLIFIER BOARD A6
CIRCUIT DIAGRAM

FIGURE 31

8017-7/894-11



MODEL 706: R506 AND C510 ARE JUMPERS.

CONNECTOR: P502 (J8)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#24	ORN +	(J1) P801J	+22V
B	#24	ORN +	(J1) P801L	+22V
C	#24	WHT/RED	(J4) P902K	PEAK INDICATOR LED +22V
D	——	——	N.C.	+22V
E	#24	RED++	(J4) P902H	+15V
F	#24	RED++	(J5) P702A	+15V
G	#24	RED++	(J2) P101N	+15V
① H	#24	RED++	(J23) P905A	PEAK RECTIFIER +15V
J	——	——	N.C.	+15V
K	#22	BLU	RELAY	RELAY DRIVE
L	#22	YEL/BLK	(J11) P602A(A)	A DC VOLTAGE SENSE
M	#22	GRN/BLK	(J14) P602A(B)	B DC VOLTAGE SENSE
N	#24	YEL/RED	(J10) P601E(A)	A TEMP WARNING THERMISTOR
P	#24	BRN	(J1) P801M	TEMP WARNING LED DRIVE
R	#24	GRA/RED	(J13) P601E(B)	B TEMP WARNING THERMISTOR

+,++ WIRES CAN BE INTERCHANGED (LIKE COLORS)

CONNECTOR: P503 (J7)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#24	GRN	SIMPLEX SWITCH	+24V SIMPLEX
B	#24	BLK	(J6) P701C	CHASSIS GROUND
C	#24	WHT/BLK*	(J10) P601A(A)	
D	#24	WHT/BLK*	(J13) P601A(B)	NON SIGNAL GROUND
E	——	——	N.C.	NON SIGNAL GROUND
F	#24	WHT/BLK*	(J2) P101L	INPUT CLIPPING LED GROUND
G	——	——	N.C.	NON SIGNAL GROUND
⑧ H	——	——		-15V
J	#24	WHT/BLK**	(J1) P801K	POWER INDICATOR LED GROUND
K	#24	WHT/BLK*	(J1) P801P	SHUTDOWN LED GROUND
⑥ L	——	——	N.C.	LED -15V
M	#24	WHT**	(J2) P101M	INPUT CLIPPING LED -15V
N	#24	WHT**	(J2) P101R	-15V
P	#24	WHT**	(J5) P702K	-15V
R	#24	WHT**	(J4) P902G	-15V

*,** WIRES CAN BE INTERCHANGED (LIKE COLORS)

IN EARLIER MODELS:
① (J23) P905A WAS (A9) U907 PIN 4
⑤ WAS GROUND
⑥ WAS GROUND

CONNECTOR: P501 (J9)

PIN	GAUGE	COLOR	TO	FUNCTION
A	#18	BRN X	T1	T1 SIMPLEX SUPPLY WINDING
B	#22	YEL	(J4) P902L	PEAK INDICATOR LED GROUND
C	#18	BRN X	T1	T1 SIMPLEX SUPPLY WINDING
D	#18	GRN ⊗	T1	T1 LOW VOLTAGE SUPPLY WINDING
E	#18	BLK	SPEAKER JACK GROUND	SPEAKER JACK GROUND
F	#18	GRN ⊗	T1	T1 LOW VOLTAGE SUPPLY WINDING

X, ⊗ WIRES CAN BE INTERCHANGED (LIKE COLORS)

NOTES:

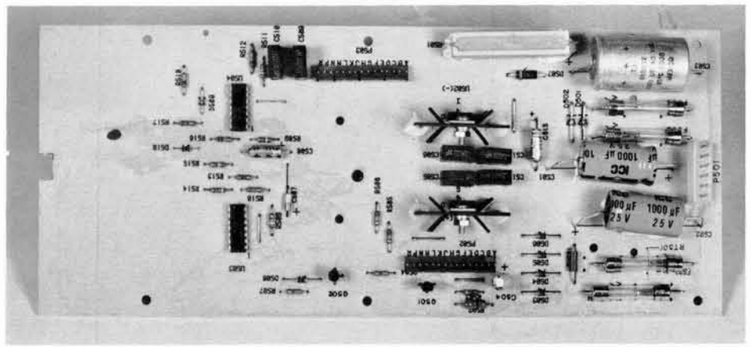
1. ALL CAPACITORS IN µF AND 50V OR MORE UNLESS OTHERWISE SHOWN. ELECTROLYTIC CAPACITORS SHOWN IN µF X VOLTS
2. ALL RESISTORS 1/4 W, 5% UNLESS OTHERWISE SHOWN.
3. THE FOLLOWING SYMBOLS DENOTE:
   - ⏚ P.C. BOARD GROUND
   - ⬭ D.C. VOLTAGE
   - ▭ A.C. VOLTAGE
4. ALL VOLTAGES MEASURED AT 25°C, WITH 120 V A.C. LINE 1 KHZ INPUT; AND ALL P.C. BOARDS INTERCONNECTED AS IN FINAL UNIT. VOLTAGE VALUES ARE TYPICAL AND MAY VARY ± 30%.

* U501 AND U502 MOUNTED ON HEAT SINKS.

REGULATED POWER SUPPLY BOARD A5
CIRCUIT DIAGRAM

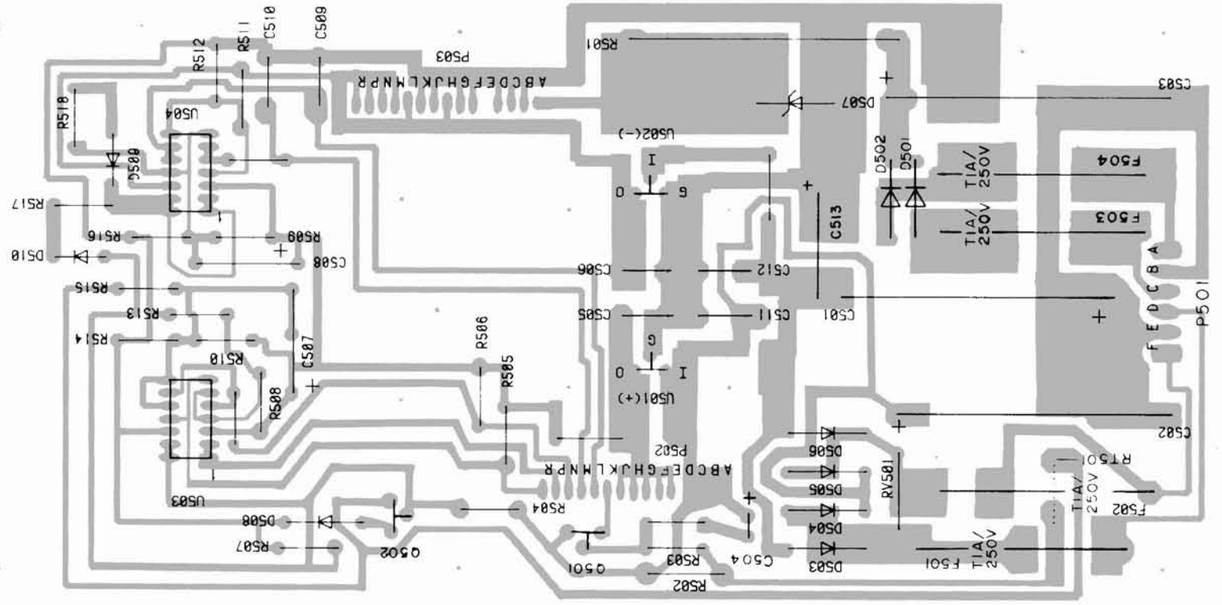
FIGURE 32

8006-7/892-9



REGULATED POWER SUPPLY BOARD A5
PARTS LOCATION

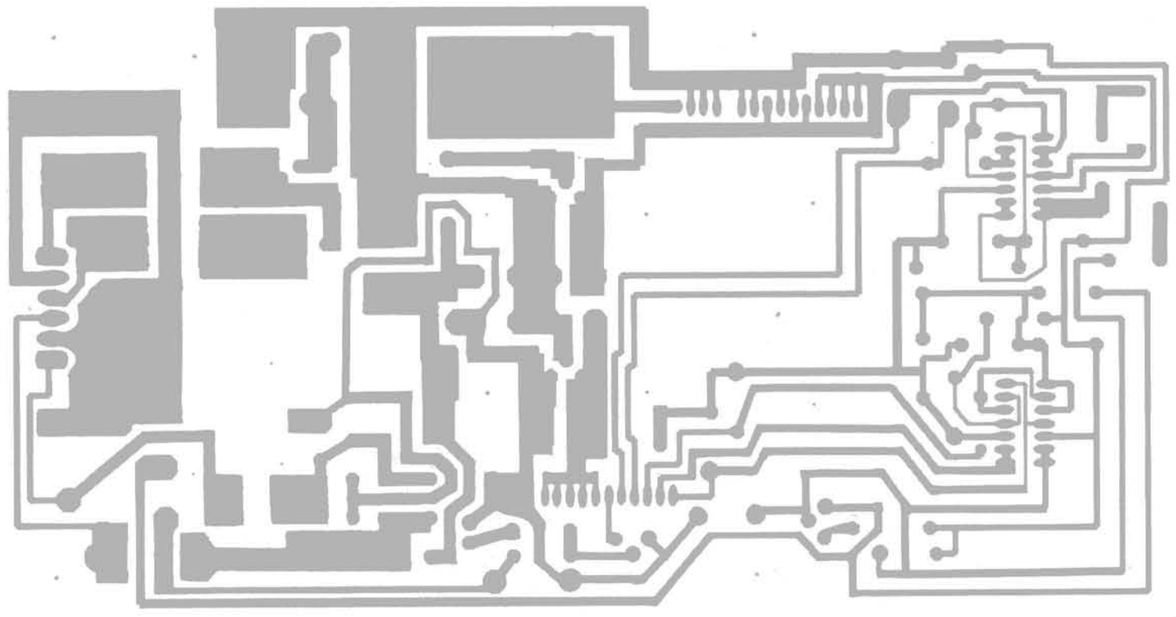
FIGURE 33



REGULATED POWER SUPPLY BOARD A5
COMPONENT SIDE

FIGURE 34

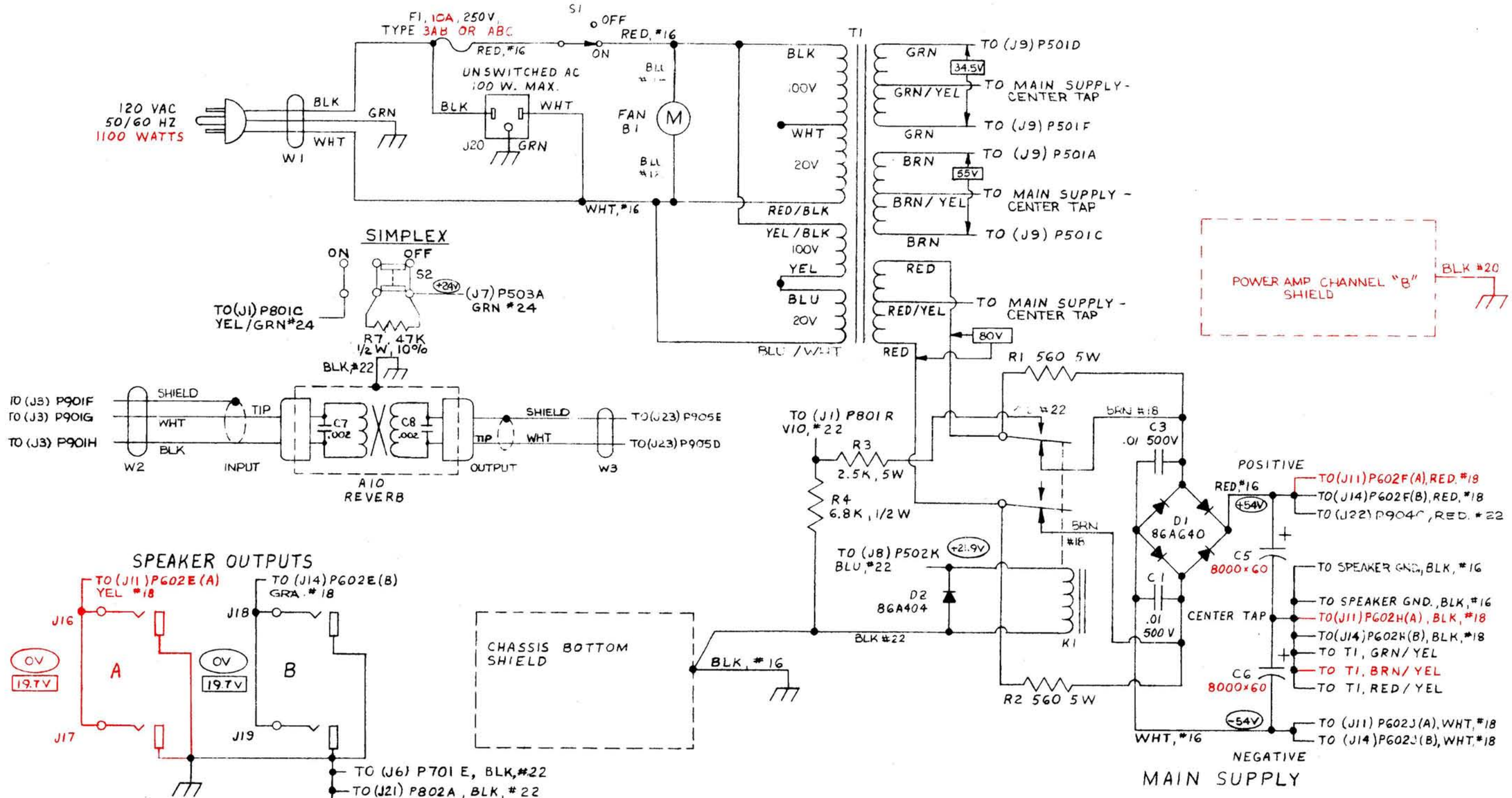
8006-7/892-9



8006-7/892-9

REGULATED POWER SUPPLY BOARD A5
FOIL SIDE

FIGURE 35



NOTES:

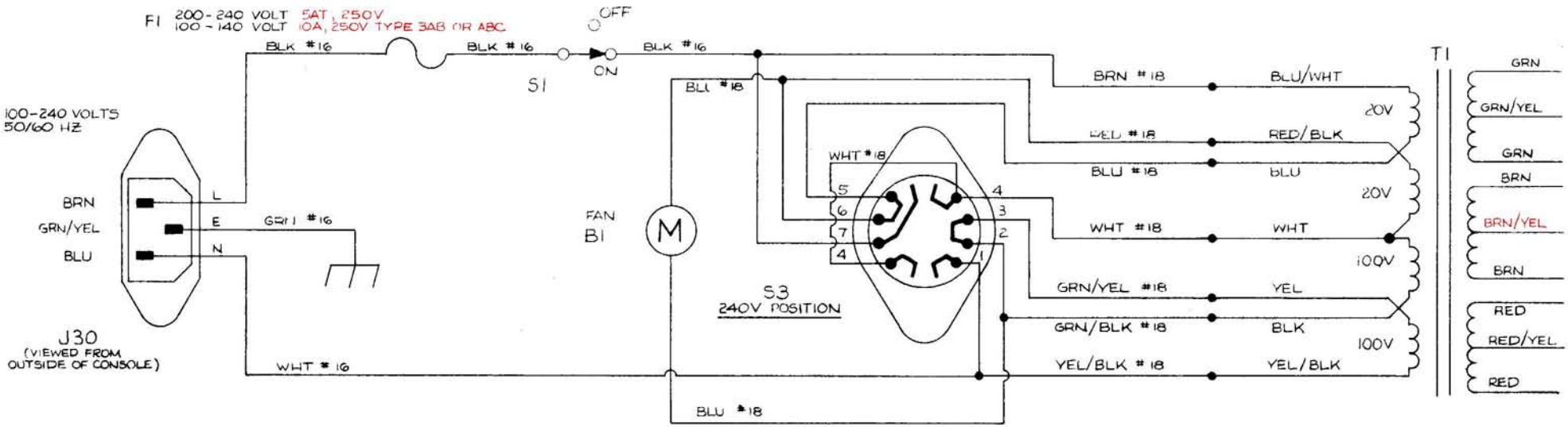
1. FOR REMAINDER OF SCHEMATIC SEE INDIVIDUAL PRINTED CIRCUIT BOARD SCHEMATICS.
2. THE FOLLOWING SYMBOLS DENOTE:
   - CHASSIS GROUND
   - DC VOLTAGE
   - AC VOLTAGE
3. ALL VOLTAGES MEASURED AT 25°C, WITH 120 AC LINE, 1 KHZ INPUT AND ALL PC BOARDS INTERCONNECTED AS IN FINAL UNIT. SPEAKER OUTPUTS ARE UNLOADED. VOLTAGE VALUES ARE TYPICAL AND MAY VARY ±20%.

MODEL 706: W1 IS 600 WATTS.
F1 IS 4A, 3AG, SLO-BLO.
C5, C6 ARE 4000 X 60.

MODELS 700 AND 706
INTERCONNECTION AND MAIN POWER SUPPLY
CIRCUIT DIAGRAM
FIGURE 36

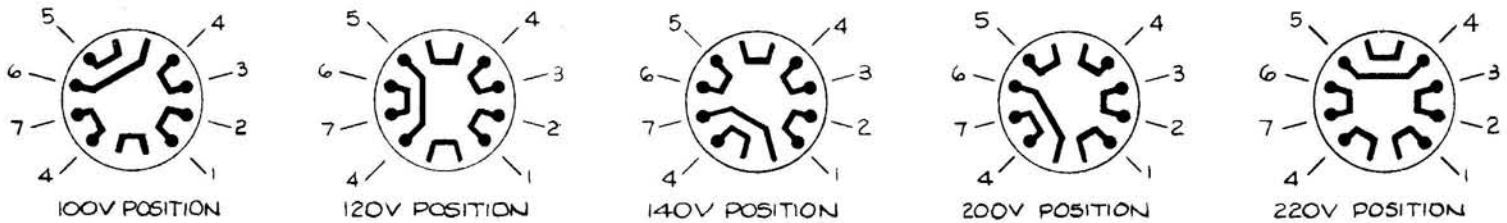
D1405-11-3

F1405-11-5



MODEL 706E6: F1 IS 3.15AT, 250V OR 5A, 250V, TYPE 3AG OR MTH.

VOLTAGE SWITCHING POSITIONS



MODELS 700E6 AND 706E6
MAIN POWER SUPPLY

FIGURE 37

E1405-11-1

G1405-11-1