



DESCRIPTION

The Altec 1224A and 1224AX are rugged electronic crossover biampifiers designed to be installed in the cabinets of permanently installed, portable sound reinforcement and reproduction speaker systems. The 1224A and 1224AX are identical in all respects except for line voltage requirements. The 1224A operates on 120V ac, 50/60 Hz; the 1224AX, on 240V ac, 50/60 Hz. Either model, however, can be field converted to operate on 240V or 120V ac.

The biampifier includes electronic crossover circuitry and separate low-frequency and high-frequency amplifiers in a single, compact package. The electronic crossover circuit divides the input signal into separate bass and treble channels before amplification. Electrically separate amplifiers drive the low-frequency speaker and

high-frequency driver. Crossover frequencies of 500 Hz, 800 Hz and 1500 Hz with 12 dB/octave slope rates are selected by a slide switch located on the back of the unit.

Input connection is made via an XL-type, 3-pin, female connector. A parallel XL-3 pin male connector is provided for conveniently connecting two or more biampifiers to a single driving source. Output connections are made through four push-type connectors on the unit's side.

Two gain controls are provided. A full-range gain control balances the output of the biampifier with another biampifier or conventional amplifier driven from the same source, and a high-frequency gain control provides high-frequency to low-frequency spectral balance.

SPECIFICATIONS

Power Output —

Bass Amplifier: 80 watts rms into 4 ohms
60 watts rms into 8 ohms
Measured from 20 Hz to network-imposed upper limit

Treble Amplifier: 40 watts rms into 4 ohms
30 watts rms into 8 ohms
Measured from network-imposed lower limit to 20,000 Hz

Total Harmonic Distortion: Not more than 0.5% THD at rated output

Intermodulation Distortion: Not measurable by normal IHF method

Minimum Load Impedance: 2 ohms

Input Impedance: 15,000 ohms unbalanced direct
15,000 ohms balanced with 15335A transformer
600 ohms balanced with 15095A transformer

Input Sensitivity: 0.8 volt for rated output with direct input or 15335A transformer
0.2 volt for rated output with 15095A transformer

Crossover Frequencies: 500 Hz, 800 Hz or 1500 Hz with 12 dB/octave rolloff

Frequency Response: ± 1 dB from 20-20,000 Hz (composite output)

Signal-to-Noise Ratio: 80 dB

Gain —

Bass Amplifier: 46 dB (8-ohm load), 49 dB (4-ohm load) with direct input or 15335A transformer
62 dB (8-ohm load), 65 dB (4-ohm load) with 15095A transformer

Treble Amplifier: 47 dB (8-ohm load), 50 dB (4-ohm load) with direct input or 15335A transformer
63 dB (8-ohm load), 66 dB (4-ohm load) with 15095A transformer

Controls:

1 amplifier gain control, continuously variable, +3 dB to -15 dB
1 high frequency control, continuously variable, +9 dB to -20 dB
1 electronic crossover frequency selector switch; 500, 800 or 1500 Hz
1 press-to-reset pushbutton circuit breaker

Connectors —

Input: 1 Cannon XL 3-pin female

Jumper: 1 Cannon XL 3-pin male (to connect to another amplifier)

Output: 4 slip-on-type lugs (high frequency, \pm , -; low frequency, +, -)

Power Requirements —

1224A: 120V ac, 50/60 Hz; 15 watts at zero signal, 150 watts with 8-ohm load, 250 watts with 4-ohm load, at full output

1224AX: 240V ac, 50/60 Hz; 15 watts at zero signal, 150 watts with 8-ohm load, 250 watts with 4-ohm load, at full output

Dimensions —

Overall: 6 $\frac{1}{2}$ " H x 9 $\frac{7}{8}$ " W x 9"D
(16.5 cm H x 25.1 cm W x 22.9 cm D)

Panel Cutout: 5 $\frac{1}{2}$ " H x 9 $\frac{1}{2}$ " W
(14.0 cm H x 24.1 cm W)

Weight: 16 pounds (7.3 kg)

Accessories (must be ordered separately): Altec 15335A Line Matching Transformer, 15,000 ohms balanced
Altec 15095A Line Bridging Transformer, 600 ohms balanced

ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

The biamplifier shall contain electronic crossover circuitry as well as separate LF and HF amplifiers. The biamplifier shall meet the following criteria. Power output; 60 watts bass, 30 watts treble (into 8-ohm load); 80 watts bass, 40 watts treble (into 4-ohm load). THD at rated output, not more than 0.5% at all frequencies from 20 Hz to 20,000 Hz. Input sensitivity for rated output; 0.8V rms direct or with line-matching transformer accessory, 0.2V rms with line-bridging transformer accessory. Input impedance; 15,000 ohms unbalanced direct, 15,000 ohms balanced with line-matching transformer accessory, 600 ohms balanced with line-bridging transformer accessory. Minimum load impedance, 2 ohms nominal. Bass amplifier maximum gain; 49 dB direct or with line-matching transformer accessory, 65 dB with line-bridging transformer accessory. Treble amplifier

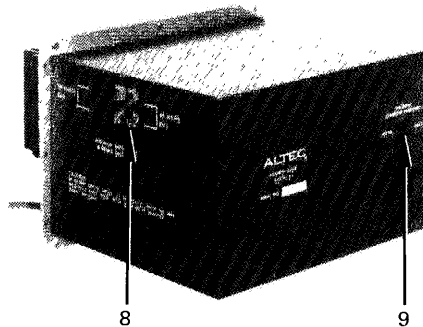
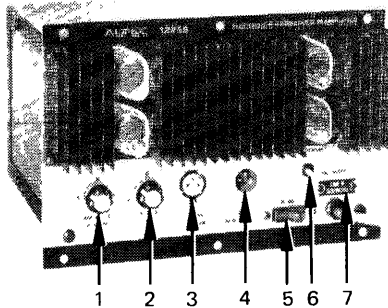
maximum gain; 50 dB direct or with line-matching transformer accessory, 66 dB with line-bridging transformer accessory. Crossover frequency; 500, 800 or 1500 Hz (selectable) with -12 dB/octave crossover slope. The biamplifier shall have a full-frequency gain control, continuously variable from +3 dB to -15 dB and an HF level control, continuously variable from +9 dB to -20 dB. The biamplifier shall be mountable in a wide variety of speaker enclosures. Overall dimensions shall be 6 $\frac{1}{2}$ " H x 9 $\frac{7}{8}$ " W x 9"D, and weight, 16 pounds.

The electronic crossover biamplifier for use with 120V ac, 50/60 Hz power source shall be the Altec Model 1224A.

The electronic crossover biamplifier for use with 240V ac, 50/60 Hz power source shall be the Altec Model 1224AX

1515 SOUTH MANCHESTER AVENUE, ANAHEIM, CALIFORNIA 92803

OPERATING INSTRUCTIONS



OPERATION

Controls

All normal operating controls and input connectors are located on the front panel. Descriptions and functions of controls and connectors are listed in the table.

Normal Control Settings

Recommended initial settings of the **AMPLIFIER VOLUME** and **HI FREQ LEVEL** controls are at the 0 dB positions. Adjust sound system volume to the desired level at the mixer. Then use the **HI FREQ LEVEL** control to boost or attenuate the low or high frequencies for desired results. Finally, adjust the **AMPLIFIER VOLUME** control for the desired sound level.

Ventilation

Air must circulate freely past the front panel of the biampifier to assure best performance. When moving or positioning the speaker enclosure containing the biampifier, be sure that free circulation of air past the heat-dissipating vanes is not restricted by curtains, furniture, walls or other equipment. Allow at least 2 inches of space in front of the vanes to assure adequate ventilation.

Input Connections

Direct input to the 1224A is connected to the **FROM MIXER** plug on the front panel, using an XLR3 type connector. Wiring of the connector is shown in Figure 1. Pin 2 is connected to ground, and pin 3 to the direct input. As shipped from the factory, the 1224A is strapped for direct input at the **ACC 1** socket (pins 6-7, and pins 1-8), located inside the unit.

For balanced input, either the **ALTEC 15335A Line Bridging Transformer** or the **15095A Line Matching Transformer** must be plugged into the **ACC 1** socket within the unit. Input sensitivity for full rated biampifier output is 0.5V rms for the 15335A, and 0.1V rms for the 15095A. Wiring for balanced input is shown in Figure 2.

OPERATING CONTROLS AND FEATURES

Item	Name	Function/Description
1	AMPLIFIER VOLUME control	Provides up to +3 dB gain (clockwise rotation) or -15 dB attenuation (counterclockwise rotation), relative to '0' level position.
2	HI FREQ LEVEL control	Provides up to +9 dB boost (clockwise rotation) of high-frequency portion of signal by shelving the low-frequency portion. Provides up to -20 dB attenuation (counterclockwise rotation) of high-frequency portion of signal. Normal or flat response at '0' position.
3	FROM MIXER jack	Connects input signal from mixer, preamplifier, or other input source. May receive input from another 1224A for multiple system configuration. Cannon type jack.
4	TO ADD AMP plug	Connects another 1224A in parallel, to enlarge the sound system. Up to 20 biampifiers may be connected into a multiple system. Cannon type plug.
5	POWER switch	Applies primary ac power. Pilot light in switch.
6	PRESS TO RESET pushbutton	Restores primary ac power if protective circuit breaker is open. If circuit breaker opens repeatedly, cause should be corrected before resetting.
7	Voltage Rating Plate	Specifies factory connection for primary power; 120V ac, 50/60 Hz; or 240V ac, 50/60 Hz. Plate reversible in event of field modification.
8	40 WATTS - 100 WATTS speakers terminals	Connect HF and LF speakers. Terminals accept push-on connectors without soldering.
9	ELECTRONIC CROSSOVER FREQUENCY switch	Selects 500, 800 or 1500 Hz crossover frequency according to requirements of speaker system.

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Specifications and components subject to change without notice. Overall performance will be maintained or improved.

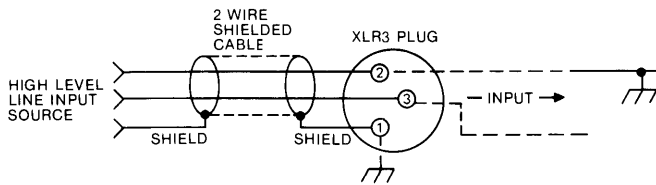


Figure 1. Wiring for Direct Input (unbalanced)

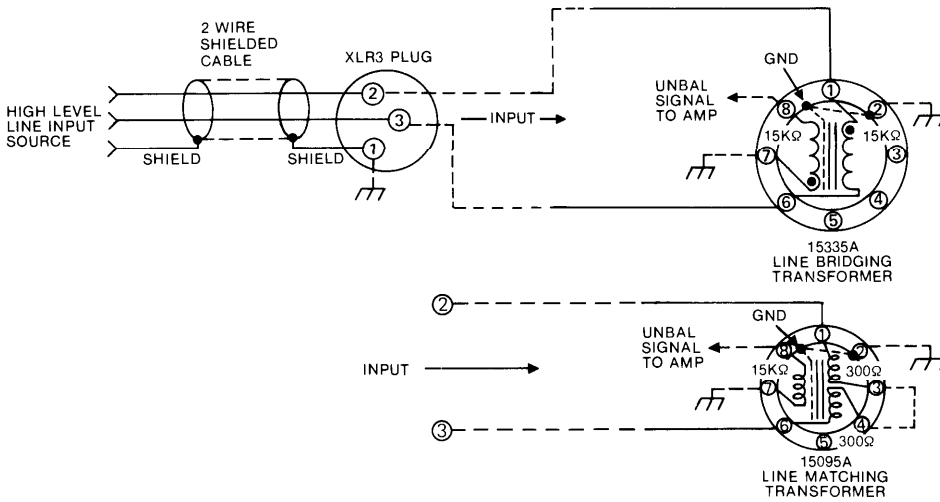


Figure 2. Wiring for Transformer-Isolated Input (unbalanced)

NOTE

The ALTEC 15335A and 15095A transformers are *not* customer serviceable components and therefore must be installed by an ALTEC Qualified Service Representative. See SERVICE instructions for installation procedure.

for operation on 240 volts primary power, if desired. Refer to SERVICE Instructions.

INSTALLATION

The 1224A and 1224AX are designed to be installed at a convenient location in the speaker enclosure. If installation is made in an existing speaker system, the passive crossover network already present in the

system must be removed because the biamplifier contains an electronic cross-over circuit.

If the biamplifier is to be installed in an enclosure not previously prepared for its installation, complete all steps of the following procedure. If the biamplifier is to be installed in an ALTEC enclosure specifically prepared for it, complete only steps 5, 6 and 7 of the installation procedure.

1. Cut rectangular hole 5½" high by 9½" wide in enclosure at desired location. Note required depth to accommodate biamplifier is 9".
2. Insert biamplifier in cutout and mark center points for each of six holes to be drilled for securing hardware. Remove biamplifier from cutout.
3. Use 7/32" (0.218") drill to bore holes, per Step 2, to accept shaft of 8-32 T-nuts supplied with biamplifier. Remove debris from enclosure and edges of holes.
4. Insert six T-nuts in mounting holes, inserting shafts from inner side of enclosure. Gently hammer each T-nut in place until faces of T-nut are flush with enclosure surface.
5. Install supplied speaker wires on appropriate speaker terminals and biamplifier terminals (see Figure 3). Note that minimum speaker impedance is 8 ohms.
6. Verify that ELECTRONIC CROSSOVER FREQUENCY switch of biamplifier is set to appropriate 500, 800 or 1500 Hz position, as required by speaker system.

Connecting 1224A Biamplifiers in Multiple Systems

An interconnecting cable with XLR3 connectors must be used to connect an additional 1224A into the sound system. Up to 20 of the 1224A biampifiers may be connected into a single sound system in this manner. Speaker hookup and parallel multiple system interconnections are shown in Figure 3. The input signal cable is plugged into the FROM MIXER jack. The next 1224A is connected in parallel by plugging in the provided interconnecting cable into the TO ADD AMP jack of the first 1224A, and into the FROM MIXER jack of the second 1224A. Continue this interconnection method to combine as many 1224A biampifiers as required (up to 20 units).

Primary Power Connections

Equipment supplied for domestic use is provided with wiring for 120 volts (1224A). The power input nameplate, located on the front panel above the power cord, is mounted to show the appropriate side specifying connections. Verify that line voltage is in accordance with the voltage rating *before* connecting primary power.

Export equipment is provided with wiring for 240 volts (1224AX), with the power input nameplate mounted to show the corresponding voltage rating.

A biampifier previously wired for 120 volts primary power may be converted

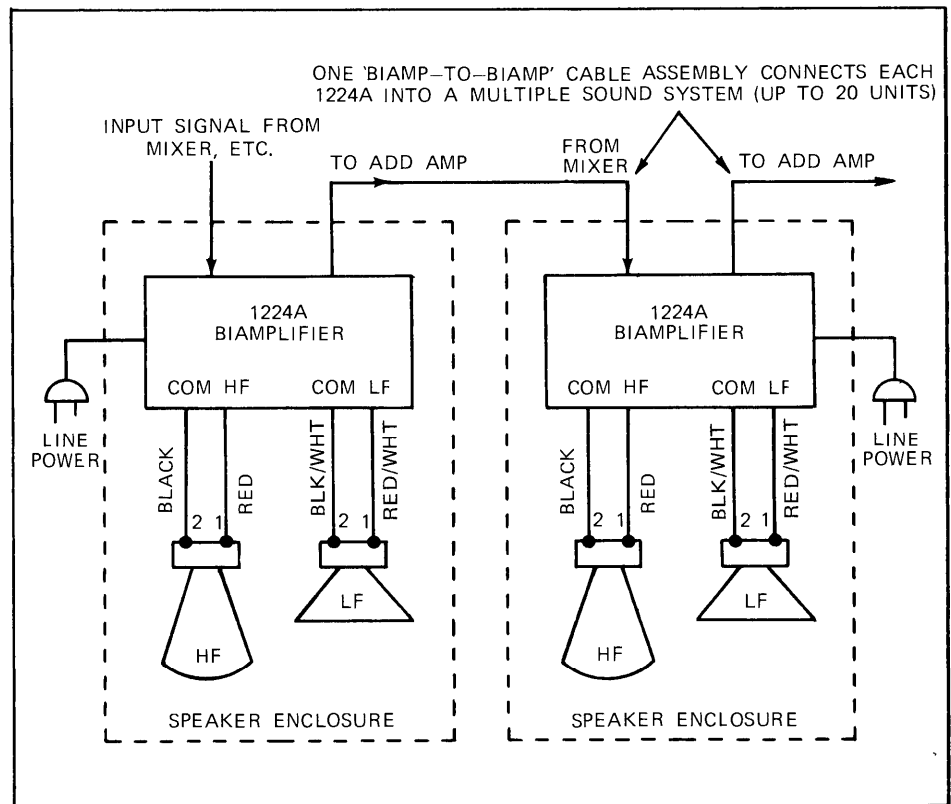


Figure 3. Speaker Hookup and 1224A Interconnections

- Insert biampifier in cutout and secure it to T-nuts with six 8-32 x 1/4" screws supplied.

SERVICE

If a malfunction occurs, service should be performed by an ALTEC Qualified Service Representative. For factory service, ship the 1224A prepaid to:

ALTEC Customer Service/Repair
1491 N. Main Street
Orange, CA 92667

For additional information or technical assistance, call (714) 774-2900 or Telex 65-5415.

NOTICE

REPAIR PERFORMED BY OTHER THAN AUTHORIZED WARRANTY STATIONS (DEALERS) OR OTHER QUALIFIED PERSONNEL SHALL VOID THE WARRANTY PERIOD OF THIS UNIT. TO AVOID LOSS OF WARRANTY, SEE YOUR NEAREST ALTEC AUTHORIZED DEALER OR CALL ALTEC CUSTOMER SERVICE DIRECTLY AT (714) 774-2900, OR WRITE:

Customer Service
ALTEC
1515 South Manchester Avenue
Anaheim, California 92803

Access

Remove the eight screws securing the cover to the chassis. Carefully slide cover off, flexing it slightly to clear the screws that attach the speaker terminal bracket.

Installation of Plug-in Input Transformer Accessory

Verify line power is turned off. Remove chassis cover. Remove plug-in shorting straps from pins 6-7, and from pins 1-8 of ACC 1 socket (J3). See Figure 2. Carefully plug accessory input transformer into socket. Install chassis cover, flexing the side to clear screws that attach the speaker terminal bracket. Secure cover with eight screws previously removed.

Power Driver Bias Adjustment

Adjustment of the power driver bias controls may be required when replacing power transistors, or a power driver printed circuit board assembly. One bias adjusting control is located on each power driver circuit board (PCB); see Figure 4. These controls set bias for proper crossover between negative and positive signal components of power transistors Q1 and Q2 (HF), and Q3 and Q4 (LF); see Figures 4 and 5. Improper adjustment of these controls results in distortion at the crossover frequency. To adjust either bias potentiometer, proceed as follows:

- Verify line power is turned off. Remove chassis from cover.
- To set Power Driver Bias Control R35 for either the HF or the LF driver circuit board, select a dc scale on the

J3 (FOR OPTIONAL PLUG-IN TRANSFORMER)

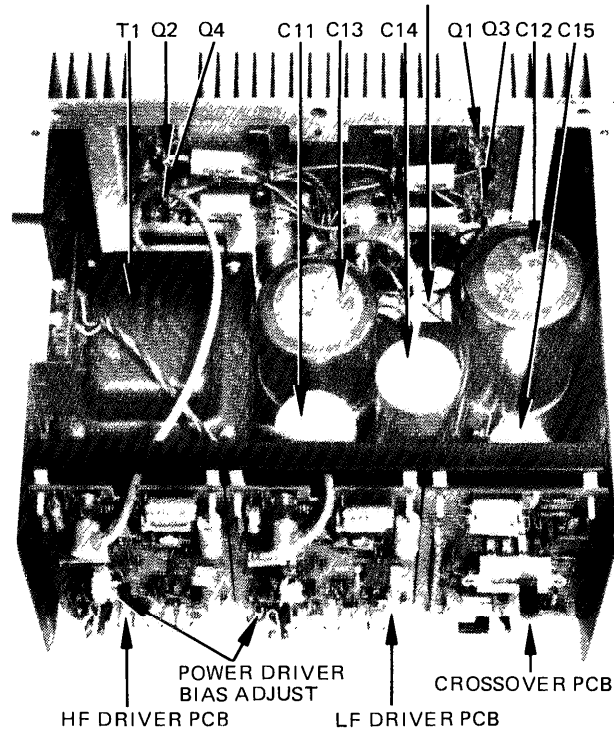


Figure 4. Interior of 1224A Biampifier

- VTVM that will conveniently read 20 mV. Connect the positive (+) to Q1 emitter, and the negative (-) lead to Q2 collector.
- Turn on line power to 1224A.
- Observe reading of VTVM. Reading should be approximately 17.5 mV.
- Adjust Power Driver Bias Control R35 (either HF or LF) as necessary to obtain reading of 17.5 mV (see Figure 4). Clockwise adjustment increases voltage; counterclockwise adjustment decreases voltage.
- Allow stabilization for 15 to 30 minutes for check on drift. If dc voltage reading changes more than ± 15 mV, readjust bias control for 17.5 mV.
- When adjustments are completed, turn off line power. Disconnect VTVM. Replace chassis cover, flexing side to clear screws that attach speaker terminal bracket; secure cover with eight screws previously removed.

Conversion of 120V Primary Power Rating to 240V

For a 1224A biampifier previously wired for 120V ac primary power, use the following procedure to change wiring for 240V (1224AX) operation:

- Remove cover; see **Access** of SERVICE instructions.
- Locate terminal board TB1 on the underside of the chassis (see Figure 5).
- Remove strap 'A' connecting terminals 1 and 2, and remove strap 'B' connecting terminals 3 and 4; solder

strap 'C' to terminals 2 and 3. See Figure 6.

- Remove voltage rating plate from front panel; reverse and reinstall to show 240V ac rating.
- Install chassis cover, flexing the side to clear screws that attach the speaker terminal bracket. Secure cover with eight screws previously removed.

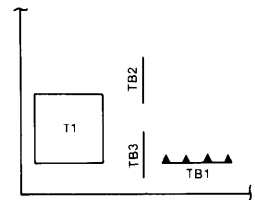


Figure 5. Location of TB1

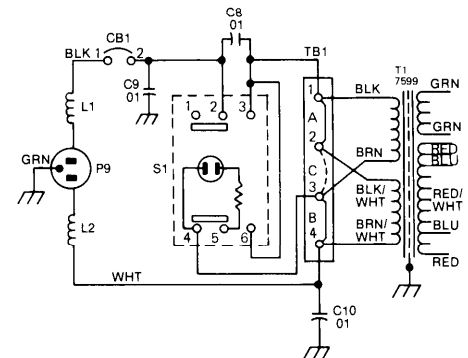


Figure 6. Conversion to 240V, 50/60 Hz Operation

Replacement of Power Transistors

When replacing power transistors on the heat sink, check that the following conditions are met during installation:

1. Mica insulator is not damaged. If damaged, use a new insulator.
2. No grit or metal particles are lodged between transistor and heat sink.
3. Both sides of mica insulator are covered with silicone grease or fluid.
4. Mounting screws of transistor are tight. Threads are not stripped in transistor socket.

Replacement of Circuit Boards

Three circuit board assemblies are located within the chassis (see Figure 4). Use the

following procedure to remove a circuit board assembly for service, or to replace a failed assembly with a new one.

1. Verify line power is turned off. Remove chassis cover.
2. If a power driver circuit board assembly is being replaced, carefully disconnect cable connector from jack.
3. Carefully remove assembly from stand-offs, loosening evenly at each corner.

CAUTION

Do not warp, bend or twist the board, or conductor may fracture or lift from the board.

4. Carefully press new or repaired circuit board assembly into place on stand-offs. Press corners in place evenly

until plastic fasteners lock board into position.

5. If a power driver circuit board assembly is being replaced, carefully press cable connector, previously removed, onto jack. Verify that Power Driver Bias Control is set properly, and readjust as necessary (see 'Power Driver Bias Adjustment').
6. Replace chassis cover, flexing side to clear screws securing speaker terminal bracket. Secure cover with eight screws previously removed.

PARTS LIST

MAIN CHASSIS

Reference Designator	Ordering Number	Name and Description
A1	24-04-100525-01	Knob, control, 3/4"
A2	27-01-042638-02	PCB assembly, crossover
A2	27-01-044652-04	PCB assembly, HF power driver
A3	27-01-044653-03	PCB assembly, LF power driver
C1	15-01-100296-01	Cap., 5000 μ F, 25V
C2	15-01-121231-01	Cap., 6200 μ F, 85V
C3	15-01-100298-01	Cap., 5000 μ F, 60V
C4	15-01-100279-01	Cap., 500 μ F, 50V
C5	15-01-114352-01	Cap., 4000 μ F, 50V
C6,7	15-06-102605-01	Cap., 0.47 μ F \pm 10%, 100V
C8,9,10	15-02-100089-01	Cap., 0.01 μ F \pm 20%, 1400V
CB1	51-03-109809-02	Circuit breaker, 2.2A hold, 3.25A trip
CR1	48-02-108577-01	Rectifier, bridge, SCBR-1, 1.5A, 100 PIV
CR2,3,4,5	48-02-042802-02	Rectifier, 3A, 400 PIV

Reference Designator	Ordering Number	Name and Description
J1	21-02-051385-01	Receptacle, wall mount, C3M
J2	21-02-100722-01	Receptacle, wall mount, XLR3-13
J3	21-02-119337-01	Socket, octal
L1,2	56-01-100458-01	Choke, ferrite bead
Q1,2,3,4	48-03-041840-02	Transistor, 2N3055, selected
R1,3	47-06-014573-01	Pot., 50 K Ω \pm 30%
R2	47-01-102163-01	Res., 1 K Ω \pm 10%, 1/4 W
R4	47-01-102280-01	Res., 4.7 K Ω \pm 5%, 1/2 W
R5,6,7,8	47-02-107434-01	Res., 0.33 Ω \pm 10%, 3W
R9,10	47-02-112166-01	Res., 5 Ω \pm 10%, 5W
R11,12	47-01-102359-01	Res., 2.2 K Ω \pm 10%, 1/2 W
R13	47-01-102098-01	Res., 6.8 K Ω \pm 5%, 1/4 W
R18	47-01-102157-01	Res., 330 Ω \pm 10%, 1/4 W
R19	47-01-102167-01	Res., 2.2 K Ω \pm 10%, 1/4 W
S1	51-02-113986-01	Switch, DPDT, w/pilot lamp
T1	56-08-007599-01	Transformer, power
TB8	21-04-030799-01	Terminal board, 4-terminal

LF POWER DRIVER CIRCUIT BOARD ASSEMBLY

Reference Designator	Ordering Number	Name and Description
C1	15-01-107452-01	Cap., 10 μ F, 50V
C2,6	15-01-100240-01	Cap., 50 μ F, 50V
C3,7	15-01-110771-01	Cap., 5 μ F, 50V
C4	15-01-107500-01	Cap., 100 μ F, 50V
C5,9,10	15-06-108173-01	Cap., 0.47 μ F \pm 20%, 100V
C8	15-02-107454-01	Cap., 100 pF \pm 10%, 100V
C11,12	15-02-100307-01	Cap., 0.01 μ F \pm 20%, 100V
C14	15-02-100302-01	Cap., 470 pF \pm 10%, 100V
C15	15-02-118676-01	Cap., 200 pF \pm 10%, 500V
CR1,2,3	48-01-107017-01	Diode, 1N456A, 100 mA, 25V
CR6,7	48-01-042787-01	Rectifier, 1A, 400 PIV
CR8	48-01-110786-01	Diode, Zener, 23V \pm 5%, 2W
J7	21-01-109731-01	Jack, phono
Q1,2	48-03-110773-03	Transistor, X29E1491, selected
Q3	48-03-107447-03	Transistor, 2N5320, selected
Q4	48-03-108557-03	Transistor, 2N5367, selected
Q5	48-03-101098-03	Transistor, 2N2712, selected
Q6	48-03-042847-01	Transistor, 40872, selected
Q7	48-03-042839-01	Transistor, 40871, selected
Q8	48-03-112928-02	Transistor, 2N5305W, selected
R1	47-01-102176-01	Res., 12 K Ω \pm 10%, 1/4 W
R2	47-01-102181-01	Res., 33 K Ω \pm 10%, 1/4 W

Reference Designator	Ordering Number	Name and Description
R3	47-01-102116-01	Res., 39 K Ω \pm 5%, 1/4 W
R4	47-01-102063-01	Res., 240 Ω \pm 5%, 1/4 W
R5,6,33	47-01-102169-01	Res., 3.3 K Ω \pm 10%, 1/4 W
R7,16,17, 25,27	47-01-102151-01	Res., 100 Ω \pm 10%, 1/4 W
R8	47-01-102067-01	Res., 360 Ω \pm 5%, 1/4 W
R9	47-01-102178-01	Res., 18 K Ω \pm 10%, 1/4 W
R10	47-01-102183-01	Res., 47 K Ω \pm 10%, 1/4 W
R11,12	47-01-102355-01	Res., 1 K Ω \pm 10%, 1/2 W
R14,18,19, 20,28,30	47-01-102171-01	Res., 4.7 K Ω \pm 10%, 1/4 W
R15	47-01-102147-01	Res., 47 Ω \pm 10%, 1/4 W
R21	47-01-102347-01	Res., 270 Ω \pm 10%, 1/2 W
R22,23	47-01-102167-01	Res., 2.2 K Ω \pm 10%, 1/4 W
R24,26	47-01-102072-01	Res., 560 Ω \pm 5%, 1/4 W
R29	47-01-102157-01	Res., 330 Ω \pm 10%, 1/4 W
R31	47-01-000001-01	Res., selected in test, \pm 5%, 1/4 W
R32	47-01-102163-01	Res., 1 K Ω \pm 10%, 1/4 W
R34	47-01-102174-01	Res., 8.2 K Ω \pm 10%, 1/4 W
R35	47-05-108936-02	Pot., 5 K Ω \pm 20%, 1/4 W

NOTE: Q8, R33, R34 and R35 relocated to main chassis.

PARTS LIST (Continued)

HF POWER DRIVER CIRCUIT BOARD ASSEMBLY

Reference Designator	Ordering Number	Name and Description
C1	15-01-107452-01	Cap., 10 μ F, 50V
C2,6	15-01-100240-01	Cap., 50 μ F, 50V
C3,7	15-01-110771-01	Cap., 5 μ F, 50V
C4	15-01-107500-01	Cap., 100 μ F, 50V
C5,9,10	15-06-108173-01	Cap., 0.47 μ F \pm 20%, 100V
C8	15-02-107454-01	Cap., 100 pF \pm 10%, 100V
C11,12	15-02-100307-01	Cap., 0.01 μ F \pm 20%, 100V
C14	15-02-100302-01	Cap., 470 pF \pm 10%, 100V
C15	15-02-118676-01	Cap., 200 pF \pm 10%, 500V
CR1,2,3	48-01-107017-01	Diode, 1N456A, 100 mA, 25V
CR6,7	48-01-042787-01	Rectifier, 1A, 400 PIV
CR8	48-01-110786-01	Diode, Zener, 23V \pm 5%, 2W
J7	21-01-109731-01	Jack, phono
Q1,2	48-03-110773-03	Transistor, X29E1491, selected
Q3	48-03-107447-03	Transistor, 2N5320, selected
Q4	48-03-108557-03	Transistor, 2N5367, selected
Q5	48-03-101098-03	Transistor, 2N2712, selected
Q6	48-03-042847-01	Transistor, 40872, selected
Q7	48-03-042839-01	Transistor, 40871, selected
Q8	48-03-112928-02	Transistor, 2N5305W, selected
R1	47-01-102176-01	Res., 12 K Ω \pm 10%, 1/4 W
R2	47-01-102181-01	Res., 33 K Ω \pm 10%, 1/4 W

Reference Designator	Ordering Number	Name and Description
R3	47-01-102116-01	Res., 39 K Ω \pm 5%, 1/4 W
R4	47-01-102066-01	Res., 330 Ω \pm 5%, 1/4 W
R5,6,33	47-01-102169-01	Res., 3.3 K Ω \pm 10%, 1/4 W
R7,16,17, 25,27	47-01-102151-01	Res., 100 Ω \pm 10%, 1/4 W
R8	47-01-102067-01	Res., 360 Ω \pm 5%, 1/4 W
R9	47-01-102178-01	Res., 18 K Ω \pm 10%, 1/4 W
R10	47-01-102183-01	Res., 47 K Ω \pm 10%, 1/4 W
R11,12	47-01-102355-01	Res., 1 K Ω \pm 10%, 1/2 W
R14,18,19, 20,28,30	47-01-102171-01	Res., 4.7 K Ω \pm 10%, 1/4 W
R15	47-01-102147-01	Res., 47 Ω \pm 10%, 1/4 W
R21	47-01-102347-01	Res., 270 Ω \pm 10%, 1/2 W
R22,23	47-01-102167-01	Res., 2.2 K Ω \pm 10%, 1/4 W
R24,26	47-01-102072-01	Res., 560 Ω \pm 5%, 1/4 W
R29	47-01-102157-01	Res., 330 Ω \pm 10%, 1/4 W
R31	47-01-000001-01	Res., selected in test, \pm 5%, 1/4 W
R32	47-01-102163-01	Res., 1 K Ω \pm 10%, 1/4 W
R34	47-01-102174-01	Res., 8.2 K Ω \pm 10%, 1/4 W
R35	47-05-108936-02	Pot., 5 K Ω \pm 20%, 1/4 W

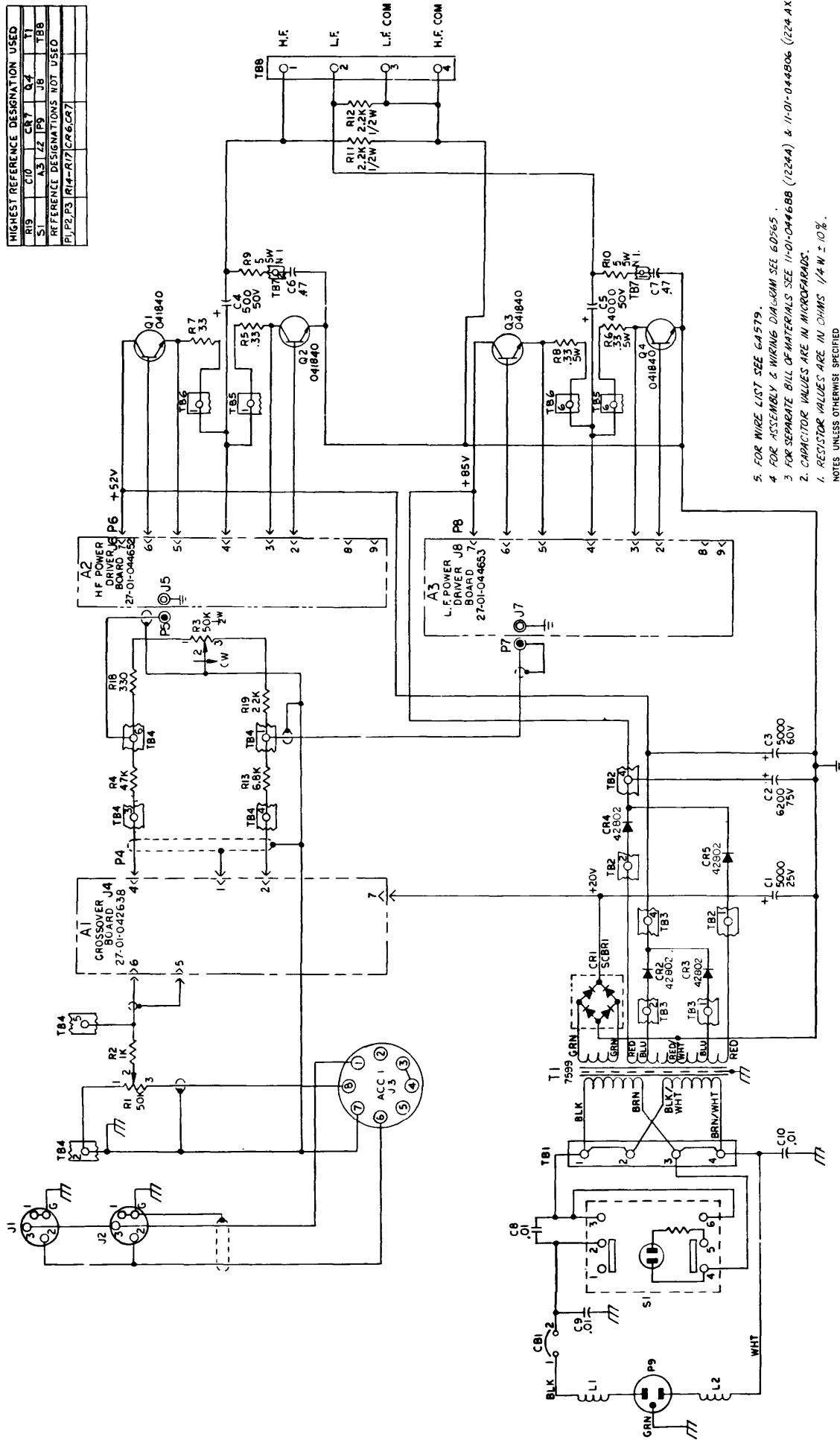
NOTE: Q8, R33, R34 and R35 relocated to main chassis.

CROSSOVER CIRCUIT BOARD ASSEMBLY

Reference Designator	Ordering Number	Name and Description
C1,2	15-01-108543-01	Cap., 5 μ F, 25V
C3	15-01-100240-01	Cap., 50 μ F, 50V
C4,9,10	15-01-107495-01	Cap., 25 μ F \pm 10%, 25V
C5	15-06-051240-02	Cap., 0.025 μ F \pm 5%, 100V
C6,7,8	15-06-109091-01	Cap., 0.012 μ F \pm 5%, 100V
C11	15-02-100110-01	Cap., 0.1 μ F, 100V
Q1,2,3	48-03-119140-02	Transistor, 2N5308 (low noise)
R1	47-01-100482-01	Res., 1 M Ω \pm 10%, 1/4 W
R2,3	47-01-102187-01	Res., 100 K Ω \pm 10%, 1/4 W
R4	47-01-102886-01	Res., 390 K Ω \pm 10%, 1/4 W
R5	47-01-102169-01	Res., 3.3 K Ω \pm 10%, 1/4 W

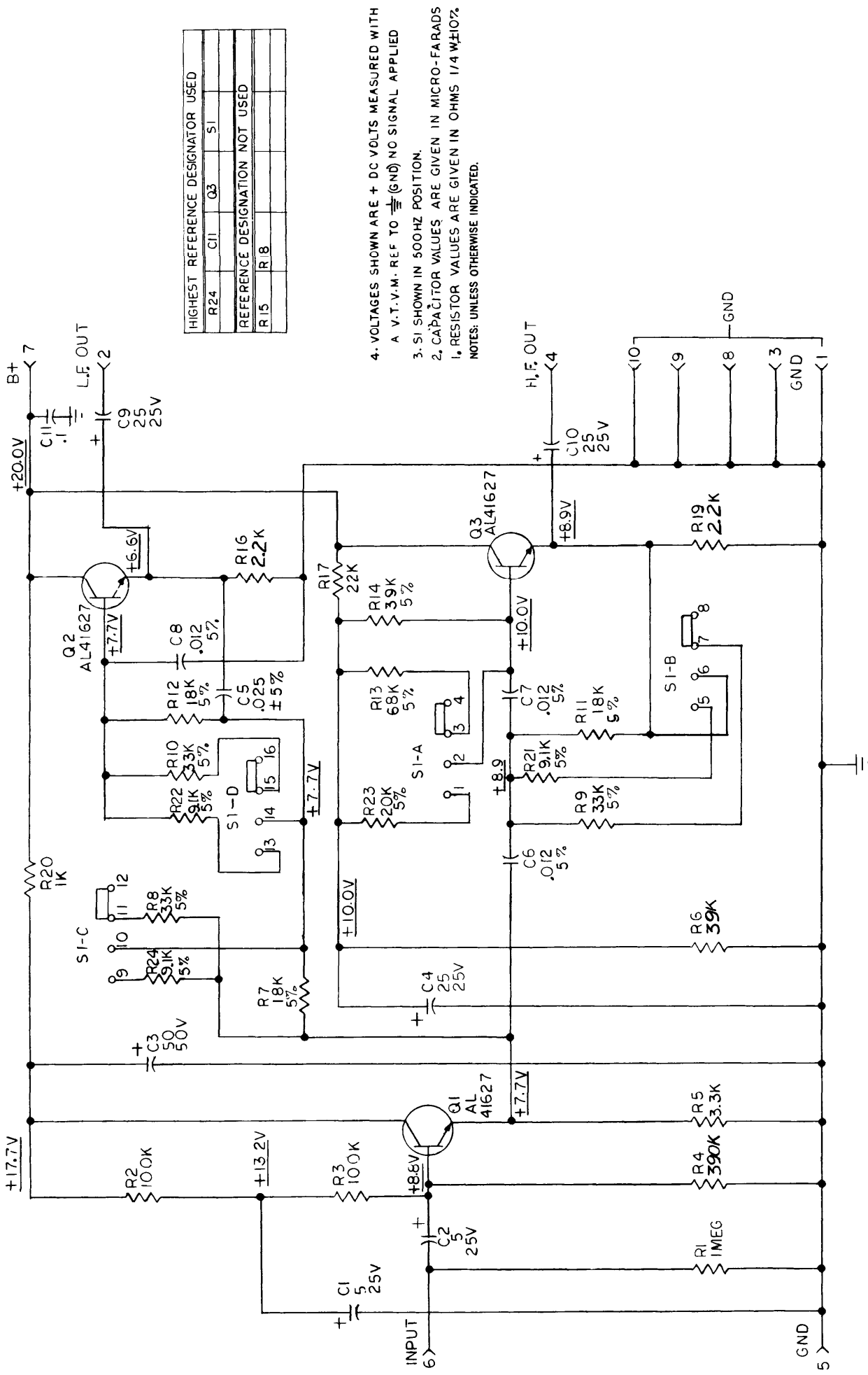
Reference Designator	Ordering Number	Name and Description
R6	47-01-102182-01	Res., 39 K Ω \pm 10%, 1/4 W
R7,11,12	47-01-102108-01	Res., 18 K Ω \pm 5%, 1/4 W
R8,9,10	47-01-102114-01	Res., 33 K Ω \pm 5%, 1/4 W
R13	47-01-102123-01	Res., 68 K Ω \pm 5%, 1/4 W
R14	47-01-102116-01	Res., 39 K Ω \pm 5%, 1/4 W
R16,19	47-01-102167-01	Res., 2.2 K Ω \pm 10%, 1/4 W
R17	47-01-102179-01	Res., 22 K Ω \pm 10%, 1/4 W
R20	47-01-102163-01	Res., 1 K Ω \pm 10%, 1/4 W
R21,22,24	47-01-102101-01	Res., 9.1 K Ω \pm 5%, 1/4 W
R23	47-01-102109-01	Res., 20 K Ω \pm 5%, 1/4 W
S1	57-02-042698-01	Switch, slide, 4P3T

HIGHEST REFERENCE DESIGNATION USED			
R19	C10	CR7	Q4
S1	A3	L2	P9
REFERENCE DESIGNATIONS NOT USED			
P1, P2, P3	R14-R17	CR6, CR7	



5. FOR WIRE LIST SEE 64579.
 4. FOR ASSEMBLY & WIRING DIAGRAM SEE 6D565.
 3. FOR SEPARATE BILL OF MATERIALS SEE 11-01-044666 (1224A) & 11-01-044666 (1224AX).
 2. CAPACITOR VALUES ARE IN MICROFARADS.
 1. RESISTOR VALUES ARE IN OHMS 1/4W ± 10%.
- NOTES UNLESS OTHERWISE SPECIFIED

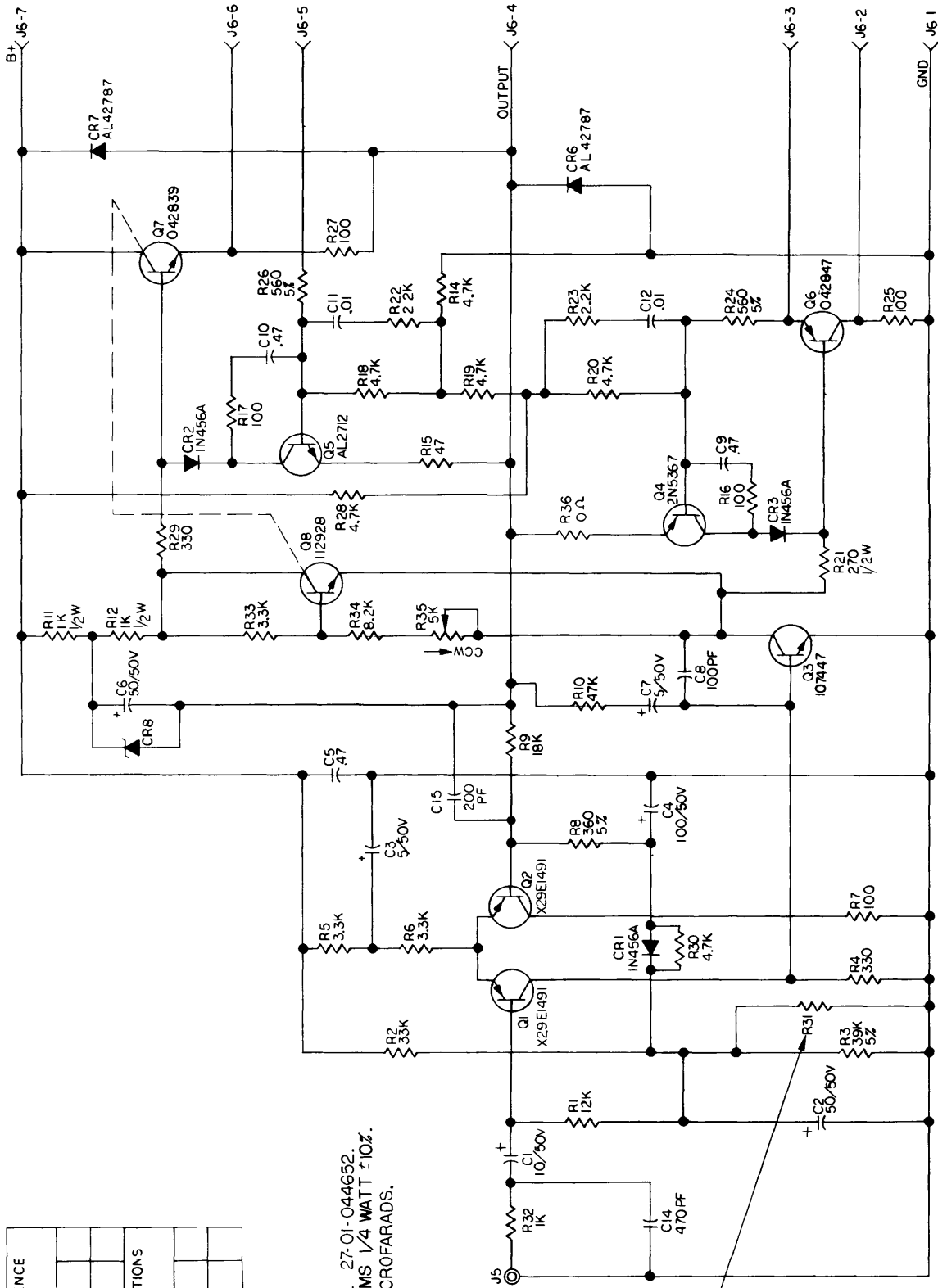
Figure 7. Schematic (6D577-3), 1224A & 1224AX Biampifier



HIGHEST REFERENCE DESIGNATOR USED	
R24	C11
	Q3
	S1
REFERENCE DESIGNATION NOT USED	
R15	R18

- 4. VOLTAGES SHOWN ARE + DC VOLTS MEASURED WITH A V.T.V.M. REF TO GND NO SIGNAL APPLIED
 - 3. SI SHOWN IN 500HZ POSITION.
 - 2. CAPACITOR VALUES ARE GIVEN IN MICRO-FARADS
 - 1. RESISTOR VALUES ARE GIVEN IN OHMS 1/4 W ±10%
- NOTES: UNLESS OTHERWISE INDICATED.

Figure 8. Schematic (3C066-6), Crossover PCB Assembly



HIGHEST REFERENCE DESIGNATIONS	
R36	CR8
Q8	C15
REFERENCE DESIGNATIONS NOT USED	
R13	C13
CR4	CR5

4. FOR ASSY. DWG. SEE 40978.
 3. SEE SEPARATE BILL OF MATERIAL 27-01-044652.
 2. RESISTANCE VALUES ARE IN OHMS 1/4 WATT ±10%.
 1. CAPACITANCE VALUES ARE IN MICROFARADS.
- NOTES: UNLESS OTHERWISE SPECIFIED

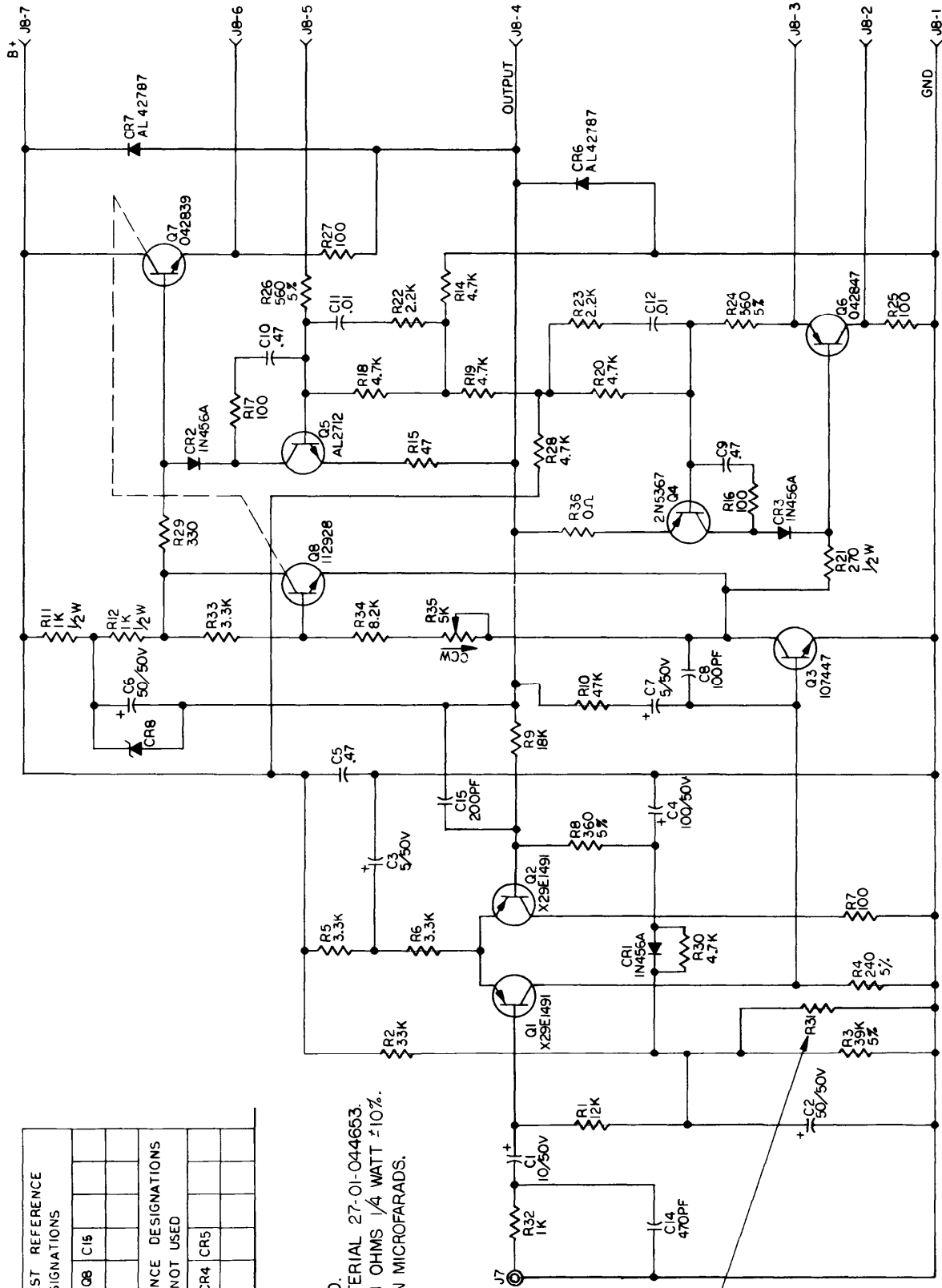
SELECTED RESISTOR 1/4 WATT 5% PER H.F. POWER DRIVEN BOARD PRODUCTION TEST PROCEDURE.

Figure 9. Schematic (4D977-2), HF Power Driver PCB Assembly

HIGHEST REFERENCE DESIGNATIONS	
R 36 CR8	Q8 C15
REFERENCE DESIGNATIONS NOT USED	
R13 C13 CR4 CR5	

4. FOR ASSY DWG. SEE 4C980.
3. SEE SEPARATE BILL OF MATERIAL 27-01-044653.
2. RESISTANCE VALUES ARE IN OHMS 1/4 WATT ±10%.
1. CAPACITANCE VALUES ARE IN MICROFARADS.

NOTES: UNLESS OTHERWISE SPECIFIED



SELECTED RESISTOR 1/4 WATT 5% PER L.F. POWER DRIVER BOARD PRODUCTION TEST PROCEDURE.

Figure 10. Schematic (4D979-3), LF Power Driver PCB Assembly