Parts List: PSA-2 Balanced Input Module Assembly

Index No.	Schematic Designation	Description	Crown Part No.	PSA-2 Qty.	SA2 Qty.	Other Information
		PSA-2 Balanced Input Module Assembly				
113		#6 Internal Star Lockwasher	C 1823-1	10		
114		SW 6P .37 B STSCR	C 4329-6	10		
115		Balanced Input Module	M42198-8	1		
116		#4 Internal Star Lockwasher	C 1824-9	4		
117		4-40 Hex Nut	C 1938-7	4		
118		F4 40 .37 AS Machine Screw	C 2247-2	4		
119		XLR-31 Panel Connector	C 4902-0	2		
120		Plate	F 9848J6	1		
121		PSA-2 Filter Assembly	M42337-2	1		
122		PSA-2 Shield Board	M42211-9	1		

SECTION 7
MAINTENANCE

7.1 Introduction

Section 7 contains technical information required to effectively and efficiently service and repair the Crown PSA-2/SA2 power amplifier. Included are disassembly and reassembly procedures, required test equipment lists, checkout procedures, basic troubleshooting tips and a soldering technique review.

THIS INFORMATION IS INTENDED FOR USE BY AN EXPERIENCED TECHNICIAN ONLY!

Use this information in conjunction with the Instruction Manual, schematic/board layout diagrams, parts lists and exploded view drawings (the latter located in Section 6 of this manual).

7.2 Required Test Equipment

Many of the service and repair problems with the PSA-2/SA2 can be performed with a limited amount of test equipment. However, in order to return the unit to its "factory new" specifications, the following list of required test equipment is recommended. The "Requirements" column provides information to allow intelligent selection of substitutes if the "Suggested Supplier and Model" is not available or is considered impractical to obtain.

Whenever possible, avoid ground loops in the test equipment caused by connecting the output ground to the input ground. Never connect the ground of the cable going to the load back to input ground. Ground loops are

EQUIPMENT	REQUIREMENTS	APPLICATION	SUGGESTED MODEL
Oscilloscope	Capable of displaying a 10MHz signal	Monitoring output during service and testing	Telequipment D54A or equivalent
Volt-ohmmeter (VOM)	Low-voltage resistance probe (100mv range). High-voltage resistance probe (1.5V range)	Check resistance values (low voltage probe). check semi-conductor junctions for opens or shorts (high voltage probe) Check DC voltages	Triplett 601 or equivalent
Freq. Counter		For accurate general monitoring	Heath SM118A
Signal Generator	Sine/Square wave available; flat frequency response. THD. .1% maximum	Provide test signals for service and checkout	Wavetek 130-Series or equivalent
Circuit Breaker	15 ampere rating	In AC line to unit; protects circuitry from overload if power supply has shorted	
AC Line Voltage Monitor	Peak reading meter (displays rms equivalent to a sinusoidal peak from any wave form)	Monitor Line voltage	Available from CROWN

EQUIPMENT	REQUIREMENTS	APPLICATION	SUGGESTED MODEL
Phase Meter			
AC Voltmeter	100mv low range, flat frequency response to 100KHz	Set output level for testing; check noise level	Hewlett-Packard 400F or equivalent
Filter	20-20KHz bandpass, low noise 20Hz-20KHz	Between preamplifier and voltmeter in noise test	Information available from CROWN
Intermodulation Distortion Analyzer	Residual (.002% or lower)	Check IM distortion	Information available from Crown

especially obnoxious when measuring distortion. An IM analyzer for example has its input and output terminals tied to a common ground. Such a test should use an ungrounded output return with the output lead wrapped around a well-shielded and grounded input cable (See Section 7.9 for additional information).

7.3 Soldering Techniques

Note: Proper continuity between internal components of any electronic device is the key to its successful operation. Therefore, a brief review of the following discussion on soldering techniques may be in order. Because most service work involves component part(s) replacement, hand-soldering with the use of a soldering iron will be the only method covered, even though many exist.

The difference between success and failure in service repair is often determined by the thermal characteristics of an iron and how well it matches the job at hand. One would not use a large flat-head screwdriver to work on a delicate Swiss watch. Likewise, the proper size iron and tip should be used when soldering delicate electronic parts in position.

Iron wattage classification is actually not a very good method of choosing an iron. The reason for this is because of the possible inefficiency of heat transfer to the tip internally. A large wattage iron (125W) may, in effect produce lower tip temperatures than another iron smaller in wattage. Likewise, tip size and shape does not necessarily work in proportion to temperature. Therefore, it is impractical to compare soldering irons by their wattage but more feasible to refer to them by their maximum tip temperature.

Usually, the skilled service technician can pick the right iron and tip for the job from experience or recommendation. In most cases, the miniature or small electrical soldering iron will work well with delicate semiconductor devices (Fig. 7.1). When the proper size iron is used (usually around 700° F. tip temperature), a joint is almost instantly heated (approx. 500-550°) and application of iron and solder melting is simultaneous.

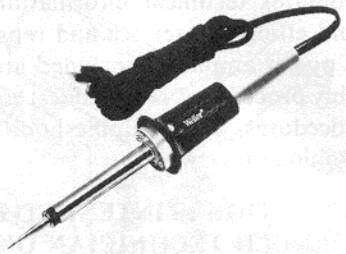
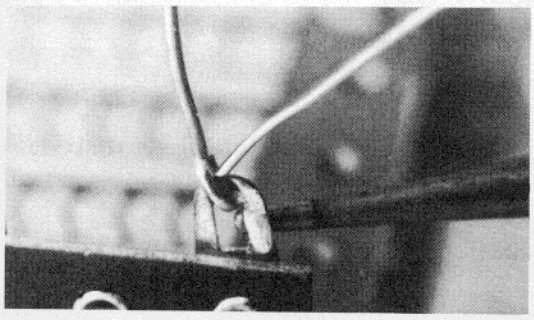


Fig. 7.1 Miniature Soldering Iron

When clean metal is exposed to air a chemical reaction takes place known as oxidation. When heat is applied to metal, oxidation is speeded up and creates a non-metallic film that prevents solder from touching the base metal. By applying a small amount of solder to a hot iron tip, a desirable process known as tinning occurs. The main reason for tinning an iron is to help prevent it from oxidation as well as to aid in heat transfer. Tinning should be performed prior to each use as well as after long idling times.

To help prevent oxidation or remove existing oxidation while soldering, a natural rosin flux core solder should be used. Not only does flux aid in cleaning, but acts as a catalyst in that it helps speed up the joint formation without actually entering itself, into the bond. Never use an acid flux except to clean a highly oxidized tip that will not tin correctly. Crown recommends 63% tin/37% lead composition with a rosin flux core of 2.5% (melting temperature is approx. 361° F.).

Fig. 7.2 shows the correct and incorrect method of applying rosin flux core solder to a joint. Never apply solder to the iron tip directly and allow solder to run onto the joint (flux is burned away and does not clean the joints). Always apply heat to the connection and allow the joint to melt the solder, not the iron. This insures proper wetting and flow of the solder.



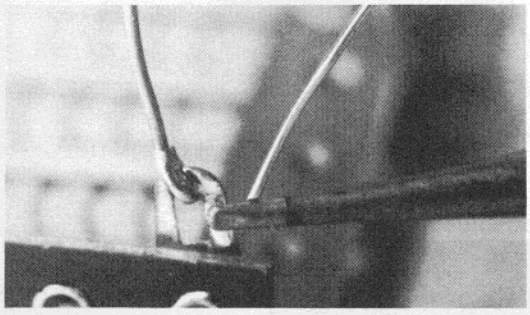


Fig. 7.2 Correct and Incorrect Solder Application

One of the main advantages of using solder to make connections is that it is one of the few joining methods responsive to visual examination. This permits 100% inspection, while other methods require sampling and lengthy electrical tests. With proper inspection of materials used, soldering is the most reliable, time-proved, and versatile form of electrical joining offering the benefits of economy, dependability and speed.

A good solder joint will have the following recognizable features:

a) Proper wetting - mixing of molecules to form a singular, shiny bond of metal
b) Proper flow - feathering out of solder
c) Proper contour - outline of wire under solder
d) Proper fillet - solder filling in holes and crevices.

Because visual inspection is an important part of recognizing a good solder joint, the following examples have been provided to help with familiarization.

Problem: Unsoldered wire.

Characteristics: Properly assembled junction of wire, but without any solder.

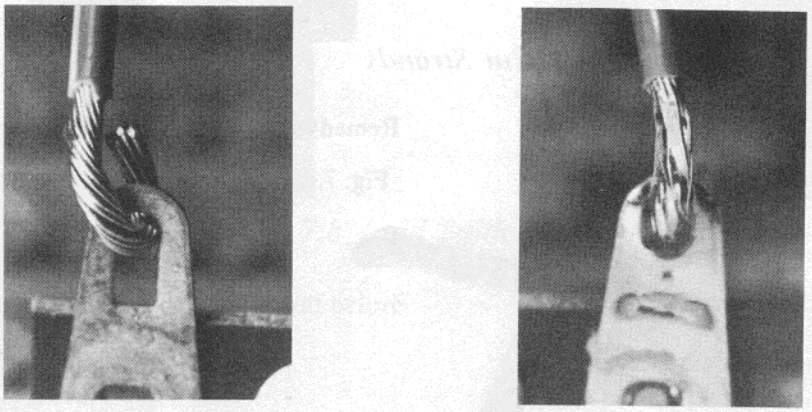


Fig. 7.3 Unsoldered Wire

Cause: Solder not applied.

Remedy: Correct amount of solder applied properly.

Problem: External strands.

Characteristics: One or more strands of wire outside terminal. This defect most common when cup-type terminals are utilized.

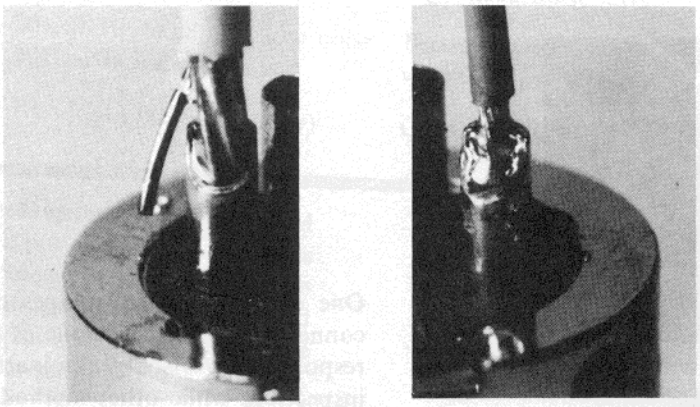


Fig. 7.4 External Strands

Cause: Poor assembly operation, too large diameter wire used.

Remedy: Correct diameter wire tinned prior to insertion.

Problem: Cut strands.

Characteristics: Several strands of wire cut or broken and usually not soldered to terminal.

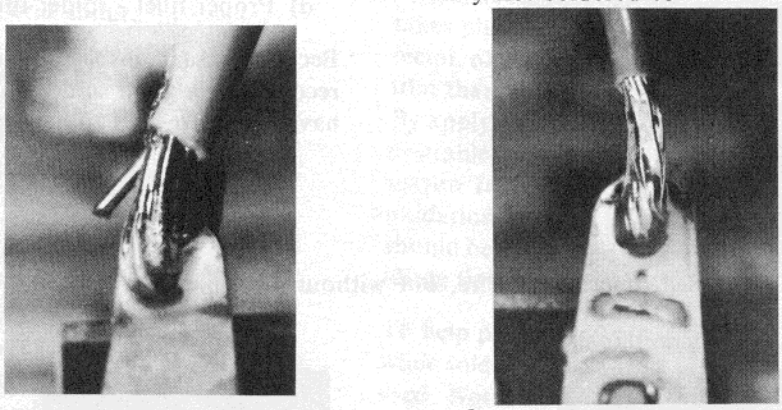


Fig. 7.5 Cut Strands

Cause: Improper wire stripping; wire flexed or bent excessively during or after assembly.

Remedy: Use wire strippers similar to the one shown in Fig. 7.6. Care must be taken to avoid nicking or cutting.

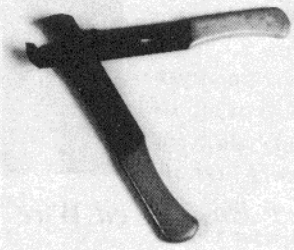


Fig. 7.6 Wire Strippers

Problem: Disturbed joint.

Characteristics: Rough appearance with questionable adhesion.

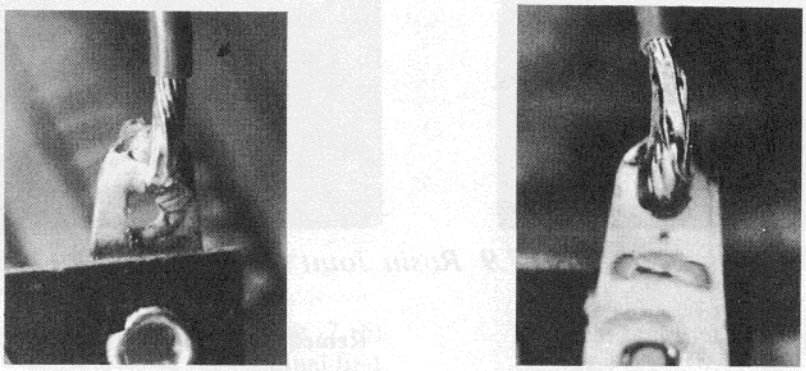


Fig. 7.7 Disturbed Joint

Cause: Movement of wire/joint during cool-off stage.

Remedy: Use of holding vice or similar tool to help prevent movement.

Problem: Cold solder joint.

Characteristics: Joint with dull, frosty appearance; often has poor adhesion as well as imperfect shaping.

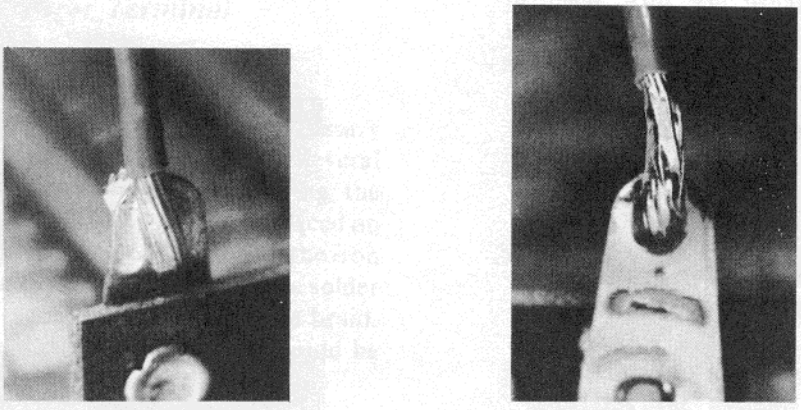


Fig. 7.8 Cold Solder Joint

Cause: Too much heat applied (flux is boiled off before oxide removal action takes place).

Remedy: Correct matching of iron/tip to specific job. Correct solder flux combination is also important.

Problem: Rosin joint.

Characteristics: Joint is separated by a thin coat of flux producing high resistance to current.

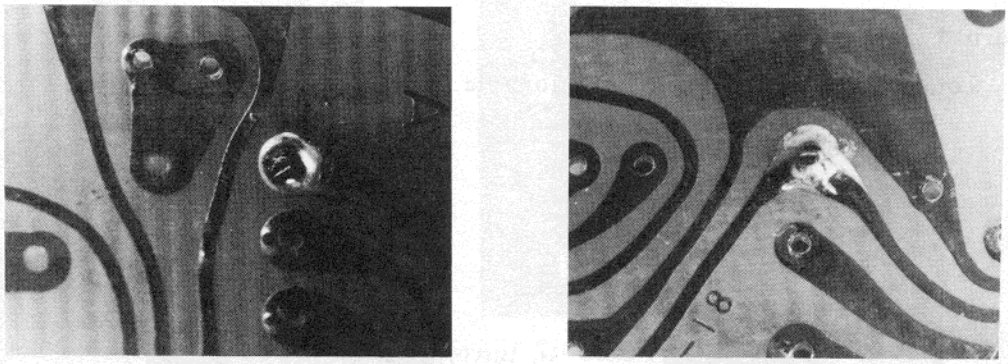


Fig. 7.9 Rosin Joint

Cause: Solder applied previous to terminal reaching minimum temperature (solder melting point).

Remedy: Apply correct amount of heat; remove only after good wetting and fillet is achieved.

When soldering individual component parts to printed circuit boards, several procedures may be followed. The following procedure complies to U.S. Government standards and may be altered to suit a specific situtation.

1. Components leads should be bent to exact spacing of mounting holes in PC board (Fig. 7.10). This allows leads to enter PC board at right angles and relieves stress.

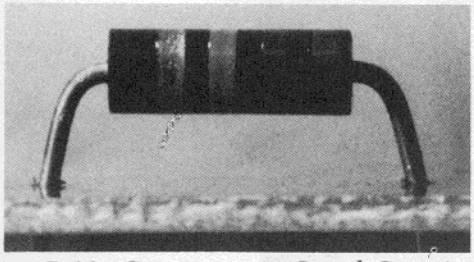


Fig. 7.10 Component Lead Spacing

2. Leads should be bent down tight to pad.

3. Leads should be bent in the direction of the run connected to the pad and clipped at a length approximately ⅛" (Fig. 7.11).

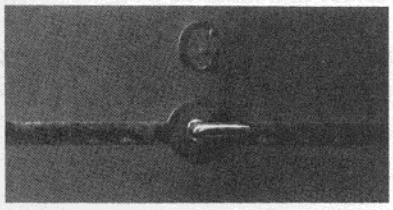


Fig. 7.11 Component Lead Bending

4. Components should be held tight to the PC board while clinching leads on other side (Fig. 7.12) and soldered accordingly. Fig. 7.13 shows acceptable solder joints.

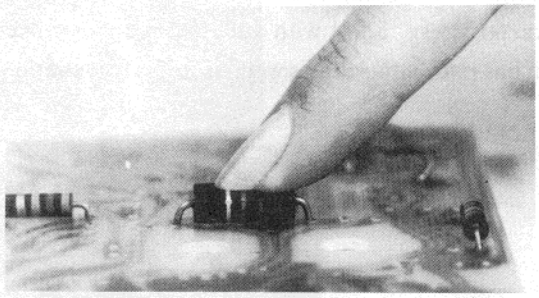


Fig. 7.12 Correct Pressure Applied

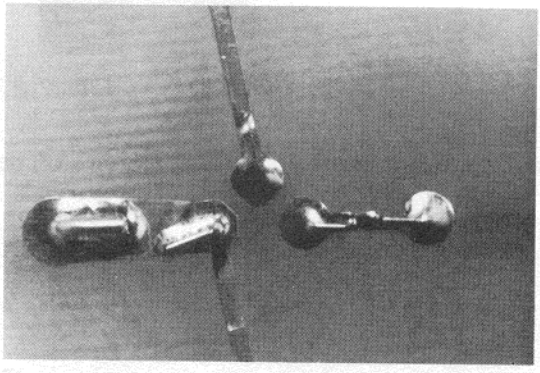


Fig. 7.13 Acceptable Solder Joints

When soldering to lugs (as on potentiometers), the mechanical wire wrap should be a J hook with correct insulation clearance as shown in Fig. 7.14.

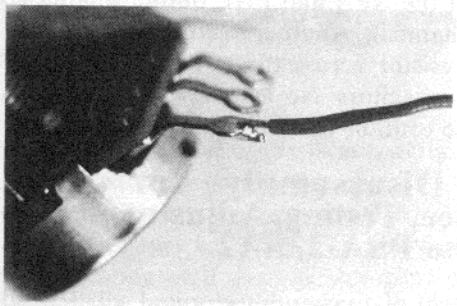


Fig. 7.14 Soldering to a Lug

Turret terminals also utilize the "J" hook (Fig. 7.15). Concentrate on good heat transfer to the terminal first, then the wire. If two wires are to be soldered, be sure of good solder flow to all three.

Fig. 7.15 Turret Terminal

Desoldering

In order to replace a component part, it is often necessary to remove the old part by means of desoldering. Several methods are available, the most common being the braided bare copper method. This wire braid is placed on the lead(s) of the component to be removed with the iron placed on top of the braided wire. This allows the solder to heat up while simultaneously adhering to the braid. When the braided wire is removed, the joint should be clean. (See Fig. 7.16)

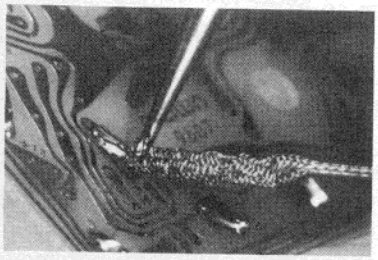


Fig. 7.16 Wire Braid Desoldering

Next, use points of small diagonals to lift ends of component lead wires and remove the part. This procedure is applicable to both PC board desoldering as well as terminal and lug desoldering.

Note: Be sure that lifting of the component lead does not also lift the copper foil pad from the board. Occasionally a small amount of iron will be helpful.

Soldering is one of the most reliable methods of joining electronic component parts and assemblies. When properly used, it can be one of the most helpful tools in service repair work.

7.4 Basic Troubleshooting

As is well known, time is an important factor in providing efficient service repair. Therefore, several time-saving troubleshooting steps are listed below. These hints may or may not already be implemented in your service work. If not, you may wish to experiment with them in order to help improve your efficiency. After all, time is money!

A. Establishing Problems

User complaints about defective operation may not always be clear or simple. Furthermore, the trouble the user has experienced may be due to the system and not the unit itself. If possible, talk to the user about this problem. This will usually be simpler than trying to understand written complaints. A first hand account of the problem can help in:

1) Getting the problem to re-occur on the service bench.
2) Getting an understanding of the probable cause. Some troubles will be obvious upon visual inspection. When the trouble (or its symptoms) is not so obvious ask:
   a) Exactly what was the problem; how was it noticable?
   b) How was the unit being used?
   c) Has the system as a whole been carefully examined for possible external problems?
   d) How long had the unit been operating when the problem occurred? Was it heat related?

If the user is unavailable or unable to explain the trouble the next step is a thorough visual inspection.

B. Visual Inspection

A good visual inspection may often save hours of tedious troubleshooting. Make a habit of proceeding in an orderly manner to insure that no vital part of the

following procedure is omitted. The visual inspection can be performed in 10 to 15 minutes. It is recommended both as a preventive maintenance procedure and also for its value in determining cause of malfunction.

1) Check that all external screws are tight and that none are missing.

2) Check all fuses/circuit breakers.

3) Check for smooth and proper operation of switches, etc.

4) Inspect line cord for possible damage to cap, jacket and conductors.

5) Remove protective covers as outlined in disassembly instruction (Section 7.6).

6) Check that all attaching parts for internal circuits are tight and that none are missing.

7) Inspect all wiring for charred insulation, or discoloration as evidence of previous overheating.

8) Check that all electrical connections are secure. This includes wire terminals, screw and stud type terminals, and all soldered connections.

9) Check for obvious destruction of internal structural parts. Distortion in any of these parts could mean that the unit has been dropped or subjected to severe shock.

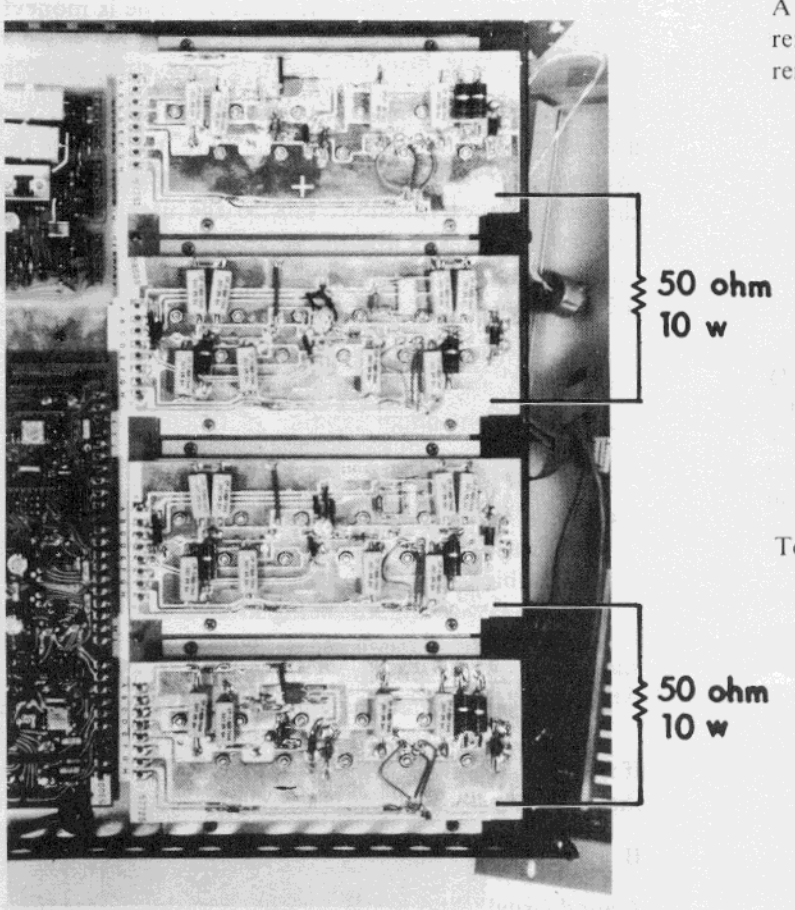


Fig. 7.17 Discharge Points

7.5 Discharging Instructions

Both the PSA-2 and SA2 amplifiers incorporate very large-storage capacitors in the power supply (C101, C201, C102, C202). For this reason, at any time the covers are removed it is necessary to discharge the power supply capacitors in order to avoid possible damage to the unit and also to prevent shock hazard. This is best performed by placing a 50 ohm/10 watt resistor across the main trace that surrounds the Crown logo (See Fig. 7.17) of the NPN and PNP output modules (do this on each channel). Another method is to place this same value resistor across the terminals of each of the four power capacitors. No matter which method is used, use extreme caution when handling the discharge device.

7.6 Disassembly for Inspection, Service, Testing, Adjustment and Repair for the PSA-2/SA2

The extent of disassembly required will depend upon the extent of inspection, service, testing, adjustment and repair to be performed. Illustrations referred to in parenthesis (index numbers) are located in the parts list (Section 6) of this manual.

A. Cover Removal

A fairly complete visual inspection can be performed by removing the top (102) and bottom (101) covers. To remove these parts, proceed as follows:

1. Remove the three top cover phillips head screws (107), located nearest to the front panel.
2. Next, remove the three back panel phillips head screws and respective star washers (106) located nearest the top of the unit.
3. Remove the two (one each side) phillips head screws and respective star washers (106,109) centrally located between the side panel air vents.
4. Gently lift the rear of the top cover (102) with fingers placed on each side, through the air vent holes.
5. After complete removal of the top cover, the four output module boards, the main module circuit board and the power supply/logic module board should be exposed.

To remove the bottom cover:

1. Place the unit bottom side up.
2. Remove the nine phillips head mounting screws and respective lockwashers (106,109) from the bottom cover.
3. Remove the four (two on each side) phillips head mounting screws and respective star washers (106) located nearest to the unit, gently lift and remove the cover. When the bottom cover is completely removed, the following components are exposed: the power transformer, power capacitors, output terminal module, relay module, fan package, mother board, input connector module, anti-pop module (on earlier units) and on the PSA-2, the balanced input module.

Warning

Immediately after removing the bottom cover as previously described, discharge the four large capacitors by connecting a 50 ohm resistor (not less than 10 watt rating) across the terminals of each Output Assembly trace (see Section 7.5). Failure to heed this warning could result in serious shock or damage to circuit components when handling modules.

Both the PSA-2 and SA2 have been specially designed for ease of service. Most every component part is in fingers reach for fast and effective replacement. This means it should never be necessary to "replace" a board module itself, unless for testing or if damage was done beyond repair (severed, burnt, etc.). However in order to apply standard repair procedures, it may be necessary to temporarily remove a board module. If so, observe the following procedures.

B. Main Board Module Removal

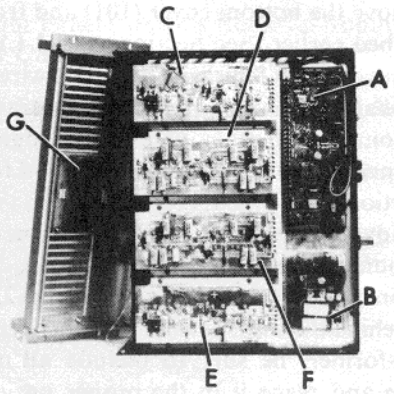
1. Remove the top cover (102) as described in Section A. Locate main module (See Fig. 7.18).
2. Disconnect the four pin input cable by simply applying upward pressure on the plug casing. For future reconnection, note the location of pin No.1.
3. Release the main support of the board by pushing the four retaining clips outward, while simultaneously lifting the board beyond the clips retention points.
4. At this point, apply equal upward pressure along the edge of the board which has inter-connect pins labeled 6 through A. The board will come free as soon as each of these pins are released.

C. Power Supply/Logic Module Removal

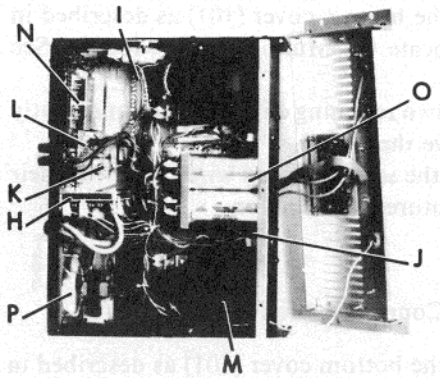
1. Remove the top cover (102) as described in Section A. Locate the power supply module (See Fig.7.18).
2. Release the main support of the board by pushing the two retaining clips outward, while simultaneously lifting the board beyond the clips retention points.
3. Apply equal upward pressure along the edge of the board which has interconnect pins labled A through W. The board will come free as soon as each of these pins are released.

D. PNP/NPN Output Module Assembly Removal (Including output transistor replacement)

1. Remove the top cover (102) as described in Section A. Locate the output assembly(s) which must be removed (See Fig. 7.18).
2. Remove the four phillips head mounting screws (69) being careful not to damage the delicate heat sink (68) fins.
3. Apply equal upward pressure on each short end of the assembly until it is released.
4. If it is necessary to replace an output device, desoldering of the transistor leads as well as screw-nut-washer removal must be performed.
5. To replace U300 (LM334H Thermal Sense IC), remove all four output and driver transistors from the assembly. At that point, the board can be removed from the heat sink fins exposing U300.



A. MAIN MODULE
B. LOW VOLTAGE POWER SUPPLY MODULE
C. CH.1 NPN OUTPUT MODULE
D. CH.1 PNP OUTPUT MODULE
E. CH.2 PNP OUTPUT MODULE
F. CH.2 NPN OUTPUT MODULE
G. DISPLAY MODULE



H. RELAY MODULE
I. MOTHER BOARD MODULE
J. OUTPUT TERMINAL MODULE
K. ANTI-POP MODULE (EARLIER UNITS ONLY)
L. INPUT CONNECTOR MODULE
M. CH. 2 POWER TRANSFORMER
N. PSA-2 BALANCED INPUT MODULE
O. POWER SUPPLY CAPACITOR ASSEMBLY
P. FAN ASSEMBLY

Fig. 7.18 Component Location Diagram

A D D E N D U M

PSA-2 SERVICE MANUAL

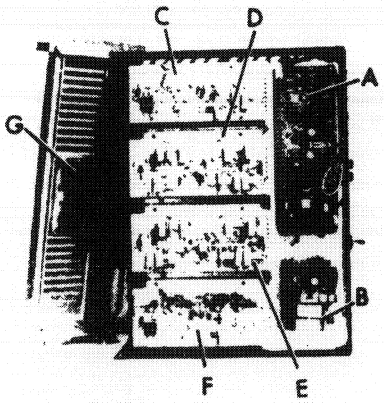
PAGE 7-9

FIG. 7.18

NOTE: E AND F ON PICTORIAL ARE REVERSED!

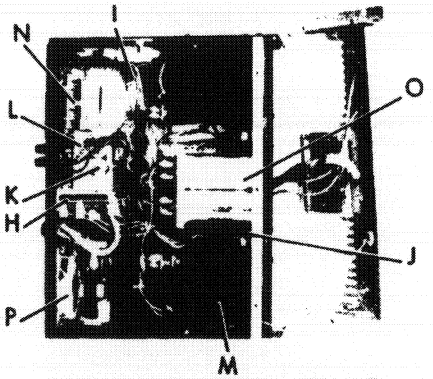
PLEASE CHANGE IN YOUR PSA-2/SA-2 SERVICE MANUAL

A. MAIN MODULE
B. LOW VOLTAGE POWER SUPPLY MODULE
C. CH.1 NPN OUTPUT MODULE
D. CH.1 PNP OUTPUT MODULE



E. CH.2 PNP OUTPUT MODULE
F. CH.2 NPN OUTPUT MODULE
G. DISPLAY MODULE

H. RELAY MODULE
I. MOTHER BOARD MODULE
J. OUTPUT TERMINAL MODULE
K. ANTI-POP MODULE (EARLIER UNITS ONLY)



L. INPUT CONNECTOR MODULE
M. CH. 2 POWER TRANSFORMER
N. PSA-2 BALANCED INPUT MODULE
O. POWER SUPPLY CAPACITOR ASSEMBLY
P. FAN ASSEMBLY

Fig. 7.18 Component Location Diagram

E. Relay Board Module Removal

1. Remove the bottom cover (101) as described in Section A. Locate the Relay Board Module (See Fig. 7.18).
2. Remove the three pozidrive head screw(s) that mount the board support bracket. These screws are easily accessible from the outside of the rear panel (89).
3. After the entire assembly is loose, it is then possible to remove the board itself by pushing the four retaining clips outward and gently lifting the board out of its support bracket.
4. All connections to this board (except T3 primary) are made through removable clips/plugs. If their removal is necessary, note their location for future reconnection. (See Fig. 7.19).

F. Mother Board Removal

Because there are no active component parts on this board, replacement or need for removal is highly unlikely. In addition, special tools and procedures are needed in order to perform this operation successfully. Therefore, factory service replacement is highly recommended.

Should questions or problems arise, contact the Crown Technical Service Department.

G. Output Terminal Board Removal

1. Remove the bottom cover (101) as described in Section A.
2. Remove both power transformers (23,24) as described in Section M.
3. Remove power supply capacitor assembly (25) as described in Section N.
4. Remove the four board mount screws and nuts (not shown on exploded view drawings).
5. Gently pull the board away from the unit to allow the pin-socket combination to disconnect.

H. Muting Module Removal (earlier units only)

1. Remove the bottom cover (101) as described in Section A. Locate the Muting Board Module (See Fig.7.18).
2. Push the two retaining clips outward and gently lift and remove the board.
3. Unsolder the seven colored wires and note their location for future reconnection.

I. PSA-2 Input Connector Module Removal

1. Remove the bottom cover (101) as described in Section A. Locate the input connector module (See Fig. 7.18).
2. Disconnect each of the two-five pin cable connectors. Note their location and pin read-outs for future reconnection (See Fig.7.19).
3. Remove the six pozidrive head switch mounting screws (89) as well as the phone jack nuts (74). For complete removal, it will be necessary to disconnect the multi-cable plug located at the Mother Board Module.

J. SA2 Input Connector Module Removal

1. Remove the bottom cover (101) as described in Section A. Locate the Input Connector Module (See Fig.7.18).
2. Disconnect each of the two-five pin cable connectors. Note their location and pin read-outs for future reconnection (also see Fig.7.19).
3. Remove the six pozidrive head, switch mounting screws (89) as well as the two 3/16" input jack screws. For complete removal, it will be necessary to disconnect the multi-cable plug located at the Mother Board Module.

K. PSA-2 Balanced Input Module Removal

To remove the balanced input module, simply remove the four pozidrive head mounting screws (105) located two on the top row and two on the bottom row.

L. PSA-2/SA2 Display Module Removal (includes front panel removal)

1. Remove the four phillips head front panel mounting screws (108) along with their respective star washers (two screws per side).
2. Remove the six (3 on top; 3 on bottom) pozidrive head cover/front panel mounting screws (107).
3. Loosen the four (two per side) pozidrive head top and bottom front panel extrusion screws (100).
4. Slide the front panel away from the unit as far as the cables will allow.
5. Disconnect the multi-cable connector located at the display board.
6. Remove the four mounting nuts and washers (3,2,1).

M. Power Transformer Removal

1. Remove the bottom cover (101) and front panel as described earlier (See Section A and L).
2. Remove the six "push-on"terminal wires located on the voltage terminal strip, adjacent the transformer.
3. Disconnect all other wires that would inhibit transformer removal. Note their location for future reconnection (See Fig. 7.19).
4. Remove all six (SA2, five) transformer phillips head mounting screws (31); four (SA2, four) are located on the side of the unit and two (SA2, one) are located behind the front panel. Note when remounting the transformer, be sure to include **all** mounting hardware and place it in the proper position (See Fig. 6.31).

PSA-2/SA 2 INTERNAL
HARD-WIRING DIAGRAM
NOTE: NOT DRAWN TO ACCURATE
PHYSICAL PROPORTION OR LAYOUT

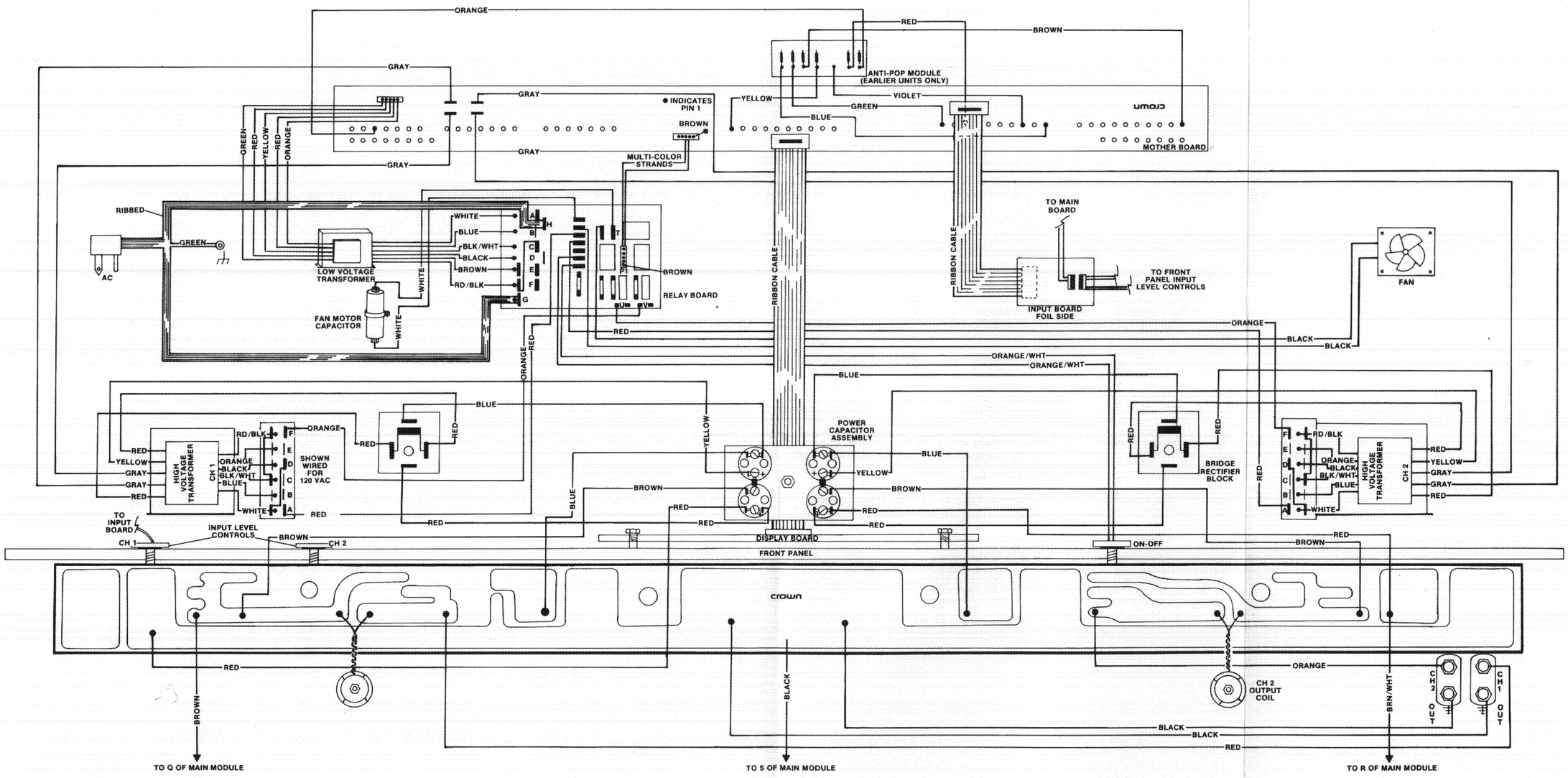


Fig. 7.19 Internal Hard Wiring Diagram

N. Power Supply Capacitor Replacement (C101, C201, C102, C202)

Warning

Before attempting any repair work in this area, be sure to discharge these four large capacitors by connecting a 50 ohm resistor (not less than 10 watt rating) across the terminals of each capacitor.

1. Remove the bottom cover (101) and front panel as described earlier (Section A and L).
2. Remove four phillips head screws (39) from the front panel side, loosening capacitor assembly.
3. With an 11/32" nut driver, loosen and remove the center bracket shaft nut (56).
4. With a firm hold on all four power capacitors, pull back gently and position the assembly for best access to the capacitor terminal screw lugs.
5. Remove desired terminal screws from capacitor with a flat-head screwdriver (large head, small shaft works best).

O. Fan Removal

Note: There are actually two versions of fan filters incorporated in the PSA-2/SA2. Earlier versions used a hand removable, white filter frame. The latest models use a black framed filter that is removable only by loosening four screws (89).

1. Remove the bottom cover (101).
Remove the four-corner phillips head screw-bolt combination (88).
3. Disconnect the motor and frame by removing the correct connectors on the Relay Module.

P. Front Panel Controls Removal (Input Level and On/Off Controls

1. Remove the front panel as described earlier (Section L).
2. Remove knob (15) with proper size allen wrench.
3. Remove mounting nut and washer (18,17) from the respective control.

7.7 Reassembly

Reassembly is essentially the reverse of disassembly. If in doubt about types and sizes of attaching parts, refer to the appropriate illustration in Section 6.

7.8 Repair Instructions

Repair of the unit includes replacement of component parts (both on and off the removable modules), damaged wiring and replacement of any structural parts such as panels and brackets. All replaceable parts are listed in the board layout/parts lists or in the exploded view drawings in Section 6.

Fig. 7.19 shows all amplifier wiring connections including color code, should it become necessary for wire replacement.

Consumable materials (except wire) required in repairing the amplifier are listed in Fig. 7.20. The use of these materials is explained in the last column entitled "Use".

Soldering techniques and common circuit board repair procedures are listed in Section 7.3.

Name	Crown Part No.	Total Unit Qty.	Use
Heat Sink Compound (Type 340)	S 2162-4	--	Mounting output transistors and drivers on output modules
Silicon Sealer (Clear)	S 2422-4	--	Mounting U400 to the NPN/PNP output Module; coupling D300 to Q300 and D400 to Q400
Insulation sleeving black (0.022ID)	B 1644-2	1.5″	Insulating jumper wiring on PNP/NPN Output Modules, etc.
(0.042 ID)	B 1363-9	4.75″	
(0.0133ID)	B 1383-7	2″	
Shrink tubing (0.250 ID)	B 4782-7	2″	SA2 Power Transformer leads
Cable Ties	C 1811-6	28	Misc. wire "wrap-together" device
732 Silastic Rubber	S 3010-6	--	Sealing fan filter to back panel; small drop to seal ribbon cable connectors
Solder (63% tin 37% lead, rosin core)	S 3482-7	--	Soldering electrical connectors in wiring and on printed circuit boards

Fig. 7.20 Consumable Materials Chart

7.9 PSA-2/SA2 Electrical Checkout, Troubleshooting and Adjustment

The following instructions outline an orderly checkout and troubleshooting procedure. The purpose and arrangement of this procedure is to determine the cause of the trouble as quickly as possible; leading to a detection of which component part(s) must be replaced or repaired.

Warning!!

Most adjustments are made with protective covers removed. This means prior to any non-ac-powered testing, discharge all power capacitors; C101, C201, C102, C202, (See Discharge Instructions; Section 7.5). Also, use extreme caution while making any internal adjustments when the unit is powered.

Checkout and Adjustment

	Type of Test/Adjustment	Input Signal Characteristics	Comments
1.	Turn-on (no AC applied)	None	1. Make sure that there is continuity from the rear panel ground terminal strip to: a) Test point P on LV Supply Board b) Test point S on LV Supply Board c) Barrels of unbalanced input jacks d) Black binding post of output banana jacks. With the power switch in the "off" position, connect the necessary input line power and check accuracy with a digital voltmeter. Set delay and low frequency protection slide switches to off.
2.	Power Supply Voltage	None	2. AC power applied; check low and high voltage supplies with an accurate (±1%) voltmeter. The following voltages should be observed (See Fig. 6.3 for test points). a) On the Low Voltage Supply Board: Pin Q -15V Pin R +15V (±.05V) Pin S +24V Pin W -24V (greater than 19V) b) Between the PNP and NPN Output Board Modules, 150-160V should be measured from pin D of the NPN to pin E of the NPN. Check both channels.
3.	Turn-on Delay.	None	3. With the delay switch on, turn unit off and then on again while listening for the "click" of the relays becoming activated. This process should take approximately four seconds. Also note the illumination of "Standby" lights at initial turn-on (they should remain on during the four second delay).
4.	Fan Speed	None	4. Engage high speed by placing a 180K ohm resistor across pins G & H of each of the four output modules. (If the IOC lights are activated at anytime during this test, it may indicate that a problem exists).

Type of Test/Adjustment	Input Signal Characteristics	Comments
5. Main Board Voltage	None	5. Check voltage on test points 1, 2, 3, and 4 (of Main board module; See Fig. 6.9) to ground. Voltages should be somewhere between 10.5V and 13.0V; pins 1 and 3 will exhibit a negative potential whereas 2 and 4 will be positive. If these voltages cannot be obtained, adjust to 12V via the multiplier balance circuitry (See step 11C).
6. Output Assembly Voltage	None	Check voltage on test pins G of each output board assembly. At room temperature (25°C), the voltage should be 2.98V (±.12V).
7. Standby Relay	None	Check the operation of Relay K1 and K2 by grounding their channel standby pins: K1-pin "D" on power Supply Module K2-pin "L" on Power Supply Module.
8. DC Offset	SA2 - None PSA-2-Shorting plug in unbalanced input jack	Adjust R104 and R204 so that with the input level controls fullyclockwise, a dc voltage of ±10mV appears at the output of each channel.
9. Bias	None	Adjust RN102 and RN202 so that 2.5mV appears across pins A to C on both of the negative output modules. Be sure the unit has had sufficient warm-up time (at least 15 minutes).
10. Low Frequency Protect	9Hz sine wave, variable (no load)	Insert a 9Hz signal into the unbalanced input of each channel. Slowly increase the input level; note that when the output reaches approximately 42V, the low frequency protect circuitry will activate.
11. Protection Circuit	A. None (no load) B. 1KHz sine wave; 1V	A. Place a 180K ohm resistor across pins "G" and "H" of each output module while checking the voltage at test pins 1, 2, 3 and 4. The voltage should vary from ±12V without the resistor to ±4V with the resistor. B. When applying a 1V, 1KHz signal into both an 8 and 4 ohm load, no oscillation should be visible (via oscilliscope) in the output waveform. Fig. 7.21 shows a correct waveform.

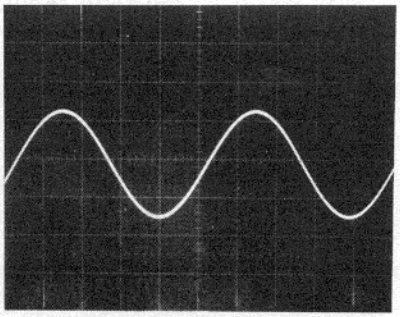


Fig. 7.21 Correct Output Waveform