

SA 12

PRODUCTION INVENTORY LIST

QUANTITY RUN

SERIAL #

PRODUCT

ITEM # DESIGNATION DESCRIPTION QTY/PER QTY/RUN D. CONTROL

1	R1,6,101,106	1.00 MEG MK3	.6	4
2	R2,102	2.21 K MK3	.6	2
3	R3,4,8,13,14,15,16,17,18,54,103,104,108,113,114,115,116,117,118	100 K MK3	.6	19
4	R5,9,105,109	127 ohm MK3	.6	4
5	R7,107	3.48 K MK3	.6	2
6	R10,110	30 K 2W M.O.	.6	2
7	R11,12,111,112	51.1 ohm MK3	.6	4
8	R19,119	22 K 2W M.O.	.6	2
10	R29	4.02 MEG MK3	.5	1
11	R31	470 ohm C.F.	.5	1
12	R30,32	1 K C.F.	.5	2
13	R33	330 ohm C.F.	.5	1
14	R52	2.7 K 2W M.O.	.6	1
15	R51	1 ohm 5W VITREOUS ENAMEL	.6	1
16	R53,153	499 ohm MK3	.6	2
17	R55	4.12 K MK3	.6	1
18	R56	6.04 K MK3	.6	1
19	C1,2,101,102	.47uf/200V PPMF	.6	4

PRODUCTION INVENTORY LIST

PRODUCT

QUANTITY RUN

SERIAL #

QTY/PEN QTY/REQ'D	DESCRIPTION	DESCRIPTION	QTY	QTY
2	PPMF 3uF/200V	C7,107	2	
6	WIMA MKP-10 1uF/250V	C3,4,57,103, 104,157	6	
5	WIMA MKS-3 1uF/63V	C5,6,58, 105,106	5	
1	AXIAL 'LYTIC 10uF/35V	C30	1	
2	3 PF DIPPED MICA	Cp,Cp	2	
2	39 PF DIPPED MICA	C8,108	2	
2	6800uF/10V RADIAL 'LYTIC	C51,52	2	
6	33uF/350V RADIAL 'LYTIC	C53,54,55,56, 155,156	6	
4	TRANSISTOR 2N2222	Q1,2,3,101	4	
6	DIODE 1N4007 .4	D1,2,101,102	6	
2	DIODE 1N4007 .5	D30,31	2	
2	PC-MOUNT BRIDGE RECT. 6A MOUSER 33BR610	BR1,2	2	
1	TIMER I.C. LM555	IC1	1	
4	POT, PIHER 50K P10V	VR1,2,101,102	4	
2	RELAY, TAIKO RKT5-6	K1,101	2	
15	PC-MOUNT QUIK DISCONNECT KEYSTONE 1287	PC-MQD	15	
12	PC-MOUNT FUSE CLIP KEYSTONE 3529	PC-MFC	12	
16	SOLDERPOST CONCORD 10-331-2-04	TMI	16	
2	PEMUT, PEM# KF2-832 ET.	PEMUT	2	

PRODUCTION INVENTORY LIST

PRODUCT

QUANTITY RUN

SERIAL #

QTY/PER QTY/REQ'D COMPL.

ITEM	DESIGNATION	DESCRIPTION	QTY/PER QTY/REQ'D COMPL.
39	HS1	HEATSINK12-2-BRHS	1
40		12-3-PCB PRINTED CIRCUIT BOARD SA-12	1
41	V1,2,101,102	9 PIN TUBE SOCKET CINCH-JONES 9PCB-1	4
42		6DJ8 DUAL TRIODE SOVIET TUBE	4
43	I.C.S	8 PIN I.C. SOCKET	1

SERVICE BULLETIN

**COUNTERPOINT
ELECTRONIC
SYSTEMS,
INC.**

TITLE:

SA-12 HEATSINK REPLACEMENT

SA-12.HS

PAGE	# 1	REV.	08/22/85
		DATE	08/22/85

1. **SCOPE** This document outlines the proper procedure for installing and biasing the output stage for the SA-12.

2. **PURPOSE** To enable field servicing of an SA-12 with defective MOSFETS.

3. **UNITS AFFECTED** ALL.

4. **APPLICABLE MATERIALS** The following supplies are included with this procedure:

- Heatsink Assembly, including matched MOSFETS.
- 1 ohm bias-sensing resistor connected across open fuse.
- Resistor for discharging power supply capacitors.
- 6" of heatsink tubing (1/8" dia).

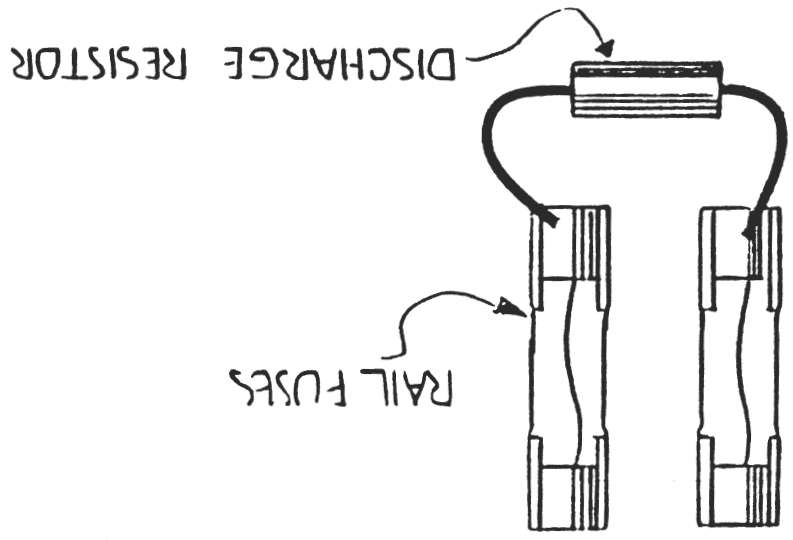
5. **TOOLS REQUIRED** The following tools are required for a neat and reliable job:

- Allen wrench or driver, 3/32" size, used to remove and install heatsink assembly.
- Wire cutters/strippers
- Temperature-controlled soldering station
- digital voltmeter with DC millivolt range.
- heat gun or other source of heat, for use on heatsink tubing.
- solder
- variac or other means of controlling AC mains voltage.
- small screwdriver for adjusting the internal trim pots.

6. MECHANICAL INSTALLATION PROCEDURE

6.1 **Unplug the SA-12** from AC mains and any speakers. Remove the top cover from the unit. If the right channel (close to the power switch) is being replaced, remove Tube V102. If the left channel (side removed from the power switch) is being replace, remove Tube V2.

6.2 **DISCHARGE THE OUTPUT STAGE POWER SUPPLY RAILS:** Using the discharge resistor (not the resistor soldered across the fuse), connect it from +40 to -40 as shown below. Leave the resistor on for about 10 seconds. It may get quite warm...



- 8.3 Adjust this trimpot for 0mV of offset, ($\pm 20mV$).
 - 8.2 Locate the "OFFSET" trimpot (VR102 on right channel, VR2 on left).
 - 8.1 Connect the voltmeter across the speaker terminals.
- 8. SETTING DC OFFSET**
- 7.8 Leave the unit on and proceed to the next section.
 - 7.7 Once you are up to full AC mains voltage, wait the 60 seconds until the front panel LED switches to GREEN and adjust the "BIAS" trimpot to achieve a reading of ~~5mV~~ ^{50mV} ($+5mV$). This corresponds to a bias current of ~~20mA~~ ^{200mA}. *Stow A*
CAUTION: THIS TRIMPOT IS VERY TOUCHY! TURN IT UP (COUNTER-CLOCKWISE) IN SMALL AMOUNTS ONLY...AT FIRST YOU'LL GET NO RESPONSE, THEN THE CURRENT WILL INCREASE VERY RAPIDLY. YOU DO WANT TO AVOID BLOWING THE RAIL FUSE!
 - 7.6 Watching the voltmeter, use the variac to slowly bring the AC voltage up to full line voltage. OBSERVE THE VOLTMETER: A GOOD OUTPUT STAGE WILL TYPICALLY SHOW LESS THAN 1mV. IF YOU SEE VOLTAGES GREATER THAN THIS, STOP. THIS USUALLY INDICATES THAT EITHER THE MOSFETS HAVE BECOME DAMAGED BY STATIC ELECTRICITY, OR YOU NEGLECTED TO PERFORM STEP 7.2
 - 7.5 Turn the SA-12's POWER switch to "ON".
 - 7.4 Plug the SA-12 into the variac, setting the variac to zero volts.
 - 7.3 Connect the DC millivolt meter across the 1 ohm current sense fuse. Turn this trimpot fully clockwise.
 - 7.2 Locate the "BIAS" trimpot (VR101 if right channel, VR1 if left channel). Replace it with the supplied 1 ohm current-sense resistor/fuse.
 - 7.1 On the affected channel, remove one of the rail fuses (+ or - rail) and replace it with the supplied 1 ohm current-sense resistor/fuse.
- 7. BIASING PROCEDURE FOR NEW CHANNEL**
- 6.3 Remove the old heatsink assembly and un-solder the 6 wires. Be certain that you have connected the wires correctly. Use the channel on the opposite side for a guide.
 - 6.4 Install the new heatsink assembly. Use heatsink on the 6 wires. Be certain that you have connected the wires correctly. Use the channel on the opposite side for a guide.

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SA-12 HEATSINK REPLACEMENT

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SA-12.HS

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8.4 Go back and re-check the bias current. You do not need to turn the SA-12 off, simply move your voltmeter back to the 1 ohm resistor/fuse and re-adjust as required.

8.5 It is suggested that you "burn-in" the unit for about an hour, and re-check the bias and offset before proceeding to the next step.

9. CLOSING THE PATIENT

9.1 Turn off the SA-12.

9.2 Discharge the rails capacitors again. Use the procedure outlined in step 6.2.

9.3 Remove the 1 ohm fuse/resistor, and install the original rail fuse back in. (Assuming that the original fuse is still good. If not, use an exact replacement...using a larger or slower fuse will absolutely trash your warranty.)

9.4 Connect your voltmeter across the speaker terminals.

9.5 Insert the Tube back into its socket.

9.6 Turn the unit back on. Typically, the voltmeter can register a offset up to 200mV while the LED is still RED. This voltage is leakage only, and would vanish if the amplifier were connected to a speaker load. When the LED switches to GREEN, the offset should drop immediately to a low value. This value will not "hold still", due to low-frequency noise coming from the Driver Tube, but should remain well under 100mV.

9.7 If everything checks out O.K., the unit can be closed up, and tested with a speaker load.

SERVICE BULLETIN

COUNTERPOINT
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TITLE:
HOT-RODDING
THE SA-12

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REV

1. SCOPE This document outlines the procedure for updating existing SA-12 power amplifiers to current standards.

2. PURPOSE To enable field updating of an SA-12. The sonic effects of this update are:

1. A much "rounder" sound. Mid-bass and bass regions gain impact and detail.
2. Elimination of a mild but noticeable distortion in the lower treble/upper midrange region.
3. Elimination of a tendency toward "leaness" in the overall sound quality.
4. A marked increase in the sense of liveness and presence.
5. A distinct increase in overall detail.

NOTE: This modification brings about a dramatic improvement in the SA-12's sound. The improvement is not subtle. Anyone can hear it. IAR is writing about this change, and there will be considerable interest by owners of existing units.

3. UNITS AFFECTED SA-12's with serial numbers from 11200 to 31250, excluding 31219 and 31249 (these two were done at the factory).

4. APPLICABLE MATERIALS The following supplies are included with this procedure:

-1 ohm bias-sensing resistor connected across open fuse.
-Resistor for discharging power supply capacitors.

5. TOOLS REQUIRED The following tools are required for a neat and reliable job:

-digital voltmeter with DC millivolt range.
-small screwdriver for adjusting the internal trim pots.

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COUNTERPOINT
ELECTRONIC
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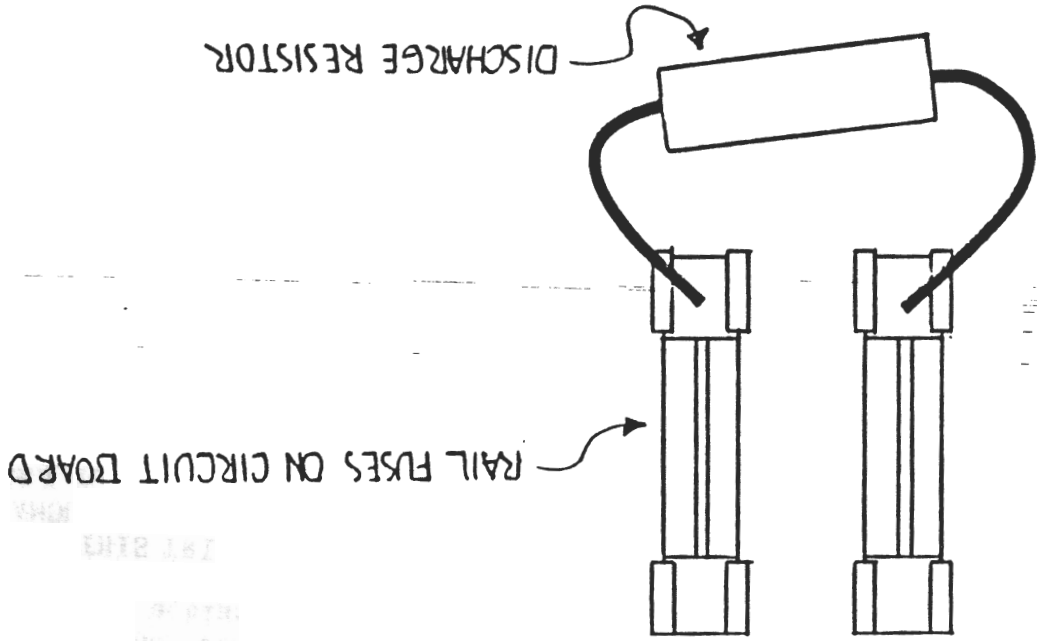
TITLE:
HOT-RODDING THE SA-12

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6. PROCEDURE

6.1 Remove the top cover from the unit. The unit should not be plugged into any AC voltage source.

6.2 DISCHARGE THE OUTPUT STAGE POWER SUPPLY RAILS: Using the supplied discharge resistor (not the resistor soldered across the fuse), connect it from +40 to -40 as shown below. Leave the resistor on for about 10 seconds. It may get quite warm...



After discharge, check to be certain that the rail caps actually are discharged by measuring the DC voltage from the "+" fuse to the "-" fuse. This voltage should be under 2 volts. If not, discharge the capacitors again.

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HOT-RODDING THE SA-12

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6.3 Begin on the right channel. On this channel, remove one of the rail fuses (+ or - rail) and replace it with the supplied 1 ohm current-sense resistor/fuse.

6.4 Connect the DC millivolt meter across the 1 ohm current sense fuse. Set this meter to the range appropriate to measure 1 volt.

6.5 Locate the "BIAS" trimpot (VR101 if right channel, VR1 if left channel).

6.6 Plug the SA-12 into an AC mains outlet, and turn it on.

6.7 Turn the SA-12's POWER switch to "ON".

6.8 Wait the 60 seconds until the front panel LED switches to GREEN and adjust the "BIAS" trimpot to achieve a reading of 500mV (+5mV). This corresponds to a bias current of 500mA.

CAUTION: THIS TRIMPOT IS VERY TOUCHY! TURN IT UP (COUNTER-CLOCKWISE) IN SMALL AMOUNTS ONLY.

GO SLOWLY TO AVOID BLOWING THE RAIL FUSE!

7. SETTING DC OFFSET

7.1 Connect the voltmeter across the speaker terminals.

7.2 Locate the "OFFSET" trimpot (VR102 on right channel, VR2 on left).

7.3 Adjust this trimpot for 0mV of offset, ($\pm 20mV$).

7.4 Go back and re-check the bias current. You do not need to turn the SA-12 off, simply move your voltmeter back to the 1 ohm resistor/fuse and re-adjust as required.

7.5 It is suggested that you "burn-in" the unit for about an hour, and re-check the bias and offset before proceeding to the next step.

7.6 Turn the SA-12 off.

7.7 Discharge the rail capacitors as in step 6.2

7.8 Remove the 1 ohm resistor/fuse and re-install the original fuse.

7.9 Perform steps 6.3 through 7.8 on the left channel.

This completes the modification. Re-install the top cover.

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TITLE:

SA-12 DIODE UPDATE

12diodes

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DATE: 10.4.85

1. SCOPE Modification procedure for improving MOSFET protection circuitry.

2. PURPOSE This modification changes the MOSFET gate protection diodes.

Using a pair of 10v zener diodes, the gate-source voltage difference is clamped to a maximum value of +10v, a value well within the maximum Vgs rating of the devices. SA-12s with the older protection circuit did not clamp warm-up and short-circuit voltages as reliably.

3. UNITS AFFECTED All SA-12s with serial numbers between 11250 and 21250.

NOTE: some SA-12s within this group may have had the update performed. If the unit was returned to the factory for blown MOSFETs, this update has already performed.

4. APPLICABLE MATERIALS 10 v zener diodes, 4 pairs.

5. TOOLS REQUIRED

- * Temperature-controlled soldering iron.
- * Digital voltmeter
- * Resistor for discharging "rail" capacitors.
- * 1,000 ohms, more than 2 watts.
- * Two short lengths of wire for shorting out the amplifier's speaker terminals.

5.1 ESTIMATED TIME TO PERFORM UPDATE: 30 minutes.

IMPORTANT NOTE: MOSFETS are very sensitive to static electricity, which can completely destroy them. It is very strongly recommended that your soldering iron be grounded to the amplifier's chassis. Use a "grounding adaptor", and connect its green tab or wire to a BLACK speaker binding post on the amplifier with a length of wire. Failure to follow this procedure may very likely result in damaged MOSFETS.

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TITLE: SA-12 DIODE UPDATE

12diodes

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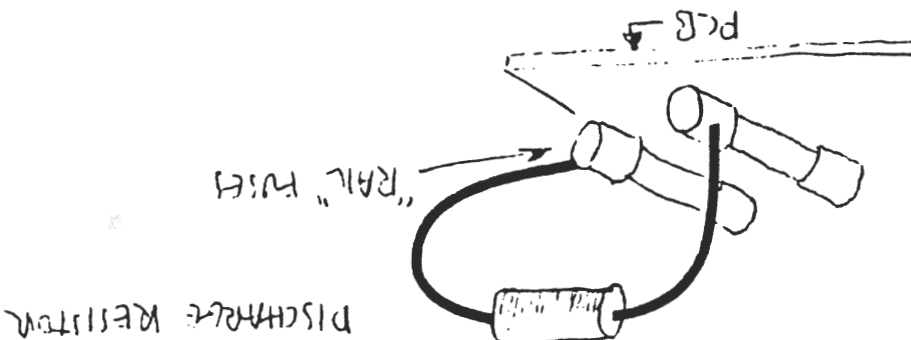
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6. PROCEDURE

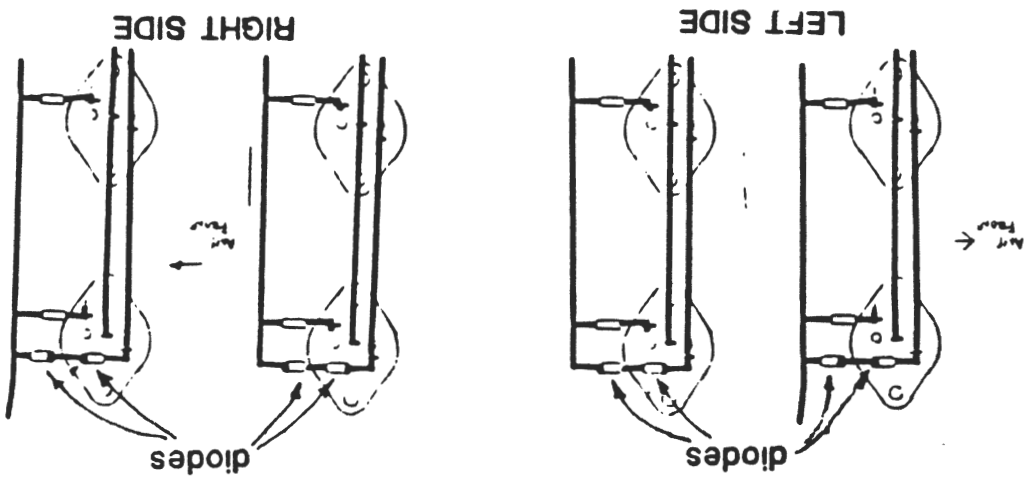
6.1 Be certain that the unit is unplugged.

6.2 Check the voltage of the power supply "rails": Set your voltmeter to DC Volts, 200 volt scale. Locate the "rail" fuses on the PC board. They are marked "+40 and -40". Connect one voltmeter lead to the "+40" fuse, and the other to the "-40" fuse. Check the reading. If it is more than 3 volts, discharge the "rail" capacitors by using the discharge resistor, as shown below.



6.3 Short out the speaker terminals of both channels with a short piece of wire connected between the BLACK and the RED binding post. By connecting the device's gates to their sources through the muting relay, possibility of damaging the MOSFETS due to static electricity will be reduced.

6.4 Locate the original protection diodes. They are on the heatsinks, on the uppermost transistor sockets. You will find 4 sets, (one set per pair of devices.) See the sketch:



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TITLE: SA-12 DIODE UPDATE

12diodes

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1. SCOPE Modification procedure for improving MOSFET protection circuitry.

2. PURPOSE This modification changes the MOSFET gate protection diodes. Using a pair of 10v zener diodes, the gate-source voltage difference is clamped to a maximum value of +10v, a value well within the maximum Vgs rating of the devices. SA-12s with the older protection circuit did not clamp warm-up and short-circuit voltages as reliably.

3. UNITS AFFECTED All SA-12s with serial numbers between 11250 and 21250. NOTE: some SA-12s within this group may have had the update performed. If the unit was returned to the factory for blown MOSFETs, this update has already performed.

4. APPLICABLE MATERIALS 10 v zener diodes, 4 pairs.

5. TOOLS REQUIRED

- * Temperature-controlled soldering iron.
- * Digital voltmeter
- * Resistor for discharging "tail" capacitors. -recommended is any value between 200 to 1,000 ohms, more than 2 watts.
- * Two short lengths of wire for shorting out the amplifier's speaker terminals.

5.1 ESTIMATED TIME TO PERFORM UPDATE: 30 minutes.

IMPORTANT NOTE: MOSFETs are very sensitive to static electricity, which can completely destroy them. It is very strongly recommended that your soldering iron be grounded to the amplifier's chassis. Use a "grounding adaptor", and connect its green tab or wire to a BLACK speaker binding post on the amplifier with a length of wire. Failure to follow this procedure may very likely result in damaged MOSFETs.

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6.5 Make a sketch of the locations of the old diode sets. Clip one diode set out and replace it with a new pair. Go to the next set and replace. Work your way around the amplifier until all 4 sets have been replaced.

Be careful to not overheat the new diodes!! Set yourself up so that you can get in and out quickly.

6.6 Remove the speaker terminal shorting wires.

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7. TESTING

7.1 Double-check your work...make certain that the new diodes have been installed in the right locations.

7.2 If all you did was to replace the protection diodes, and did not replace any MOSFETS, the only test required is to be certain that there is no offset voltage at the speaker terminals with the amplifier turned on and un-muted. (There will be some low-frequency noise, typically less than 200mv.)

7.3 If MOSFETS were replaced, use the test procedure described in "MOSFET REPLACEMENT FOR SA-12".

-You can adjust small offsets by adjusting VR2 (or VR102 depending on which channel you are workin on) the "offset" trimpots. These controls are "rough" set controls, and due to low frequency noise, will fluctuate a bit.

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TITLE: REPLACING SA-12 MOSFETS

12FETS

PAGE 1

APPROX. IMTT: 10.1.85

RIV.

1. SCOPE This document outlines the proper procedure for installing and biasing the replacement SA-12 MOSFETS.

2. PURPOSE To enable field servicing of an SA-12 with defective MOSFETS.

3. UNITS AFFECTED ALL.

4. APPLICABLE MATERIALS The following supplies are included with this procedure:

-Replacement matched MOSFETS

REPLACEMENT SUPPLIED FOR N-CHANNEL DEVICES

REPLACEMENT SUPPLIED FOR P-CHANNEL DEVICES

(These devices are shipped in matched sets. Keep them that way.)

-1 ohm bias-sensing resistor connected across open fuse.
-Resistor for discharging power supply capacitors.

5. TOOLS REQUIRED The following tools are required for a neat and reliable job:

-Phillips screwdriver for removing and installing devices from sockets.
-Flat blade screwdriver for driving the transistor covers off.
-Temperature-controlled soldering station

-Silicone adhesive to cement transistor covers over MOSFETS.
-Dial voltmeter with DC millivolt range.

-variac or other means of controlling AC mains voltage.

-small screwdriver for adjusting the internal trim pots.

IMPORTANT: Do not remove the replacement MOSFETS from their shipping containers until proper handling precautions have been taken. If you have little experience with handling MOSFETS, refer to the enclosed document "Precautions When Handling Power MOSFETS". Failure to follow these procedures will most likely result in blown MOSFETS.

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REPLACING SA-12 MOSFETS

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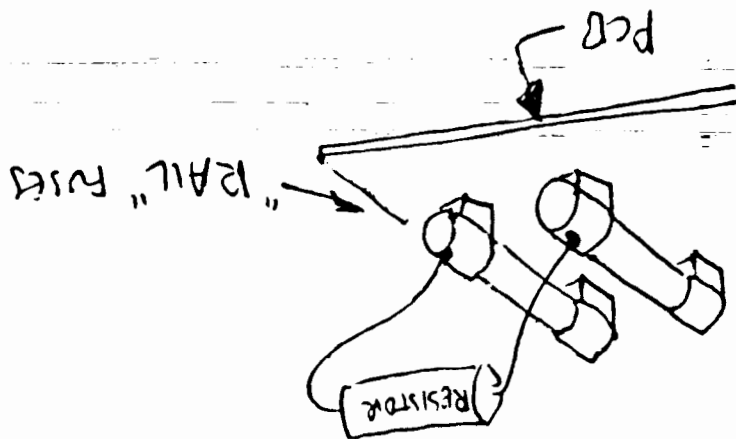
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6. MECHANICAL INSTALLATION PROCEDURE

6.1 Unplug the SA-12 from AC mains and any speakers. Remove the top cover from the unit. Remove both driver tubes, V2 and V102.

6.2 DISCHARGE THE OUTPUT STAGE POWER SUPPLY RAILS: Using the discharge

resistor (not the resistor soldered across the fuse), connect it from +40 to -40 as shown below. Leave the resistor on for about 10 seconds. It may get quite warm...



6.3 Be certain that both your body and the amplifier chassis are grounded.

6.4 Remove the black plastic covers from the defective MOSFETS. The covers are held on with Silicone adhesive. Use the blade screwdriver to pry the covers off, and be careful not to damage the covers.

6.5 Remove the defective MOSFETS with the phillips screwdriver.

6.6 Install the supplied replacement MOSFETS. If the protection diodes need updating, now is a good time to do so. Refer to "UPDATING SA-12 PROTECTION DIODES."

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REPLACING SA-12 MOSFETS

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7. BIASING PROCEDURE FOR NEW CHANNEL

7.1 On the affected channel, remove one of the rail fuses (+ or - rail) and replace it with the supplied 1 ohm current-sense resistor/fuse.
 >>>>>> Remove BOTH rail fuses from the other channel.

7.2 Locate the "BIAS" trimpot (VR101 if right channel, VR1 if left channel). Turn this trimpot fully clockwise.

7.3 Connect the DC millivolt meter across the 1 ohm current sense fuse.

7.4 Plug the SA-12 into the variac, setting the variac to zero volts.

7.5 Turn the SA-12's POWER switch to "ON".

7.6 Watching the voltmeter, use the variac to slowly bring the AC voltage up to full line voltage. OBSERVE THE VOLTMETER: A GOOD OUTPUT STAGE WILL TYPICALLY SHOW LESS THAN 1mV. IF YOU SEE VOLTAGES GREATER THAN THIS, STOP. THIS USUALLY INDICATES THAT EITHER THE MOSFETS HAVE BECOME DAMAGED BY STATIC ELECTRICITY, OR YOU NEGLECTED TO PERFORM STEP 7.2

7.7 Once you are up to full AC mains voltage, wait the 60 seconds until the front panel LED switches to GREEN and adjust the "BIAS" trimpot to achieve a reading of 280mV (+5mV). This corresponds to a bias current of 20mA. 500mA CAUTION: THIS TRIMPOT IS VERY TOUCHY! TURN IT UP (COUNTER-CLOCKWISE) IN SMALL AMOUNTS ONLY...AT FIRST YOU'LL GET NO RESPONSE, THEN THE CURRENT WILL INCREASE VERY RAPIDLY. YOU DO WANT TO AVOID BLOWING THE RAIL FUSE!

7.8 Leave the unit on and proceed to the next section.

8. SETTING DC OFFSET

8.1 Connect the voltmeter across the speaker terminals.

8.2 Locate the "OFFSET" trimpot (VR102 on right channel, VR2 on left).

8.3 Adjust this trimpot for 0mV of offset, (+20mV).

8.4 Go back and re-check the bias current. You do not need to turn the SA-12 off, simply move your voltmeter back to the 1 ohm resistor/fuse and re-adjust as required.

8.5 Now shut off the amplifier, discharge the rails again, and prepare to test the second channel. Start back at step 7.1.

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REPLACING SA-12 MOSFETS

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AMOUNT

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8.5 It is suggested that you "burn-in" the unit for about an hour, and re-check the bias and offset before proceeding to the next step.

9. CLOSING THE PATIENT

9.1 Turn off the SA-12.

9.2 Discharge the rails capacitors again. Use the procedure outlined in step 6.2.

9.3 Remove the 1 ohm fuse/resistor, and install the original rail fuse back in. (Assuming that the original fuse is still good. If not, use an exact replacement...using a larger or slower fuse will absolutely trash your warranty.)

9.4 Connect your voltmeter across the speaker terminals.
9.5 Insert both driver tubes back into their sockets.

9.6 Turn the unit back on. Typically, the voltmeter can register a offset up to 200mV while the LED is still RED. This voltage is leakage only, and would vanish if the amplifier were connected to a speaker load. When the LED switches to GREEN, the offset should drop immediately to a low value. This value will not "hold still", due to low-frequency noise coming from the Driver Tube, but should remain well under 100mV.

9.7 If everything checks out O.K., the unit can be closed up, and tested with a speaker load.

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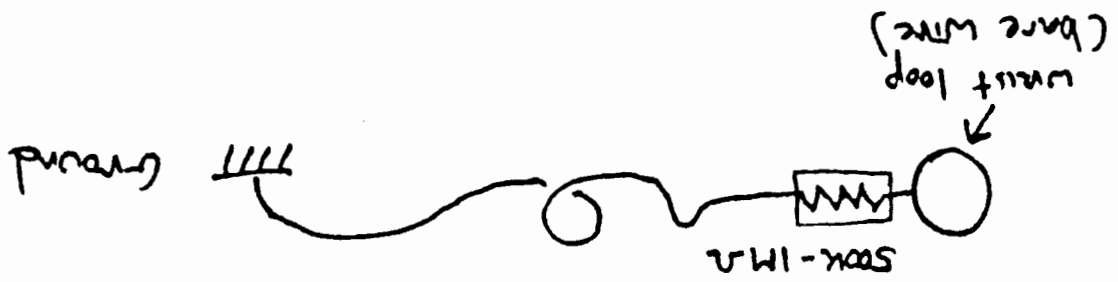
TITLE: Precautions When Handling Power MOSFETS

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Precautions When Handling Power MOSFETS

Most power MOSFETS are not gate-protected. To avoid damage or destruction by static electricity, it is good practice to adopt the following procedures whenever handling power MOSFETS.

1. When handling MOSFETS, the technician's body should be grounded. A metal "wrist ring", shown below, works well. The resistor should be inserted in the ground line close to the technician's body.



2. Power MOSFETS should be kept in their shipping containers until time of actual use.

3. When handling or installing power MOSFETS into circuits, a grounded metal plate should cover the top of the work station. In other words, all work should be performed on a grounded surface.

4. The amplifier being worked on should be grounded.

5. When using a soldering iron, the soldering iron should be grounded. It is perhaps better to use a battery-powered soldering iron, if possible.

6. Power MOSFETS should never be placed in plastic bags or boxes. Grounded metal boxes (or boxes lined with aluminum foil) are O.K.

7. When shipping MOSFETS, use antistatic bags or carriers, unless the gates and sources are connected by resistors or inductors or wire.

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ALTERN. DMT

ATTENTION: TO ALL DISTRIBUTORS AND SERVICE TECHNICIANS

This amplifier has undergone rigorous testing and has passed, however, due to vibrations during shipment, we strongly recommend that the bias to the MOSFET's of this amplifier should be RE-CHECKED.

Please refer to the Service Bulletin Titled: Hot Rodding The SA-12.

To Test, Begin on Page 2: Procedure 6.

California.

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SA-12 DC TEST PROCEDURE

1. GENERAL

1.1. Tubes, fuses and 555 Timer Chip (IC1) should first be removed from unit.

1.2. Visual Inspection

Before testing, inspect the unit visually.
Check chassis for obvious dents and scratches.
Check condition of harness wiring; wiring should be tidy, with firm connections.
Check for installation of all components on output board.
Check tube sockets for proper soldering and keying.
Check for solder bridges, cold joints, breaks, etc.
Check RCA connectors for proper soldering and internal tightness.

1.3. Mechanical Inspection

Check that all PC and chassis screws are tight, and are firmly installed.

1.4. CHECK FOR PROPER MOSFET INSTALLATION: Visually inspect MOSFETS on the heatsinks.

REAR MOSFETS: N-CHANNEL IRF130 or equivalent.
FRONT MOSFETS: P-CHANNEL IRF9140 or equivalent.

SHOULD BE LESS THAN 1 OHMS.

2.2.1. Measure DCR from all four MOSFET gate lines to chassis ground.

2.2. CHECK GROUNDING OF MOSFET GATES:

READING: LESS THAN 1 OHM.

2.1.1. Use ohmmeter to measure DC resistance from Right side of R1 (on circuit board) to Third Prong (Ground Pin) of AC Mains cord.

2.1. CHECK CHASSIS GROUND

2. PREPARE UNIT FOR TESTING

- 4.7 Adjust OFFSET pots (VR2, VR102) to center positions.
- 4.6 Adjust BIAS pots (VR1, VR101) to fully CW position.

DC RESISTANCE OF FILAMENT CIRCUIT: 0.5 TO 0.8 OHMS.

- 4.5 Check DC resistance of filament circuit. Connect ohmmeter minus side of C30.

DC RESISTANCE OF MOSFET BODIES: More than 20K ohms.

- 3.5. Check DC resistance to ground of MOSFET bodies (drains).

- 3.4. Install 555 timer chip into IC socket.

- 3.3. Install four 6DJ8 vacuum tubes into sockets.

board.

- 3.2. Install two 6 AMP fuses into Output Fuse position on circuit

front of BA-12.

- 3.1. Install 10 AMP SLO-BLO into Mains fuseholder on inside

3. INSTALL FUSES, TIMER AND TUBES.

4. LOW VOLTAGE TEST OF POWER SUPPLIES

4.1. Set POWER (ON/OFF) switch to ON position.

4.2. Set Variac to zero volts.

4.3. Plug SA-12 into variac.

4.4. Set DVM to 200 VDC scale.

4.5. Turn variac to 10% of nominal AC mains voltage.

4.6. Observe AC Mains Current Meter.

AC CURRENT SHOULD BE UNDER .15 AMPERES (APPROX.)

4.7. Check voltage at RIGHT side of R153.

VOLTAGE SHOULD BE BETWEEN 34 AND 36 VDC.

4.8. Turn off SA-12.

4.9. Check voltage and polarity at rail fuseholders.

FRONT SIDE, LEFT + FUSE HOLDER: +4
FRONT SIDE, LEFT - FUSE HOLDER: -4
FRONT SIDE, RIGHT + FUSE HOLDER: +4
FRONT SIDE, RIGHT - FUSE HOLDER: -4

IF ANY OF THE ABOVE FOUR VOLTAGES IS LOW, AND FALLING, CHECK FOR LOW DCR TO GROUND OF RAIL. CAPACITORS UNDERNEATH CIRCUIT BOARD CAN SOMETIMES SHORT THROUGH TO CIRCUIT BOARD.

5. FULL VOLTAGE TEST OF POWER SUPPLIES

5.1. Set DVM to 1000 (or higher) DCV scale. Connect to RIGHT side of R153.

5.2. Turn Variac to nominal AC Mains voltage. LED should light RED.

B+ VOLTAGE AT R153 SHOULD BE 280 VDC \pm 10 V.

AC MAINS CURRENT SHOULD BE APPROX. 0.25 AMPERES.

5.3. Tube filaments should begin to light.

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*****
* UNITS WITH NO *
* C7, C107 *
* JAPAN AMPREX *
* TUBES *
* REAR SIDE R4, R104, *
* 90 TO 130 VDC. *
* REAR SIDE R9, R109, *
* 60 TO 80 VDC. *
* REAR SIDE R10, R110, *
* 70 TO 90 VDC. *
*****
* UNITS WITH *
* C7, C107 *
* JAPAN AMPREX *
* TUBES *
* 90 TO 130 VDC. *
* 100 TO 140 VDC. *
* 107 TO 145 VDC. *
*****

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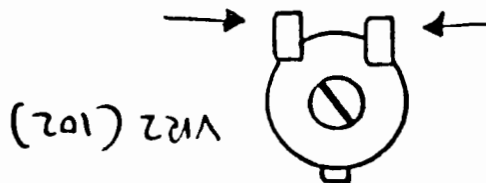
6.1. Check the following voltages:

6. CHECK TUBE VOLTAGES

NOTE: OTHER BRANDS OF VACUUM TUBES WILL HAVE DIFFERENT VOLTAGES. USE THE SPACE BELOW TO MAKE NOTES FOR VOLTAGES OF DIFFERENT BRANDS OF TUBES.

7. CHECK BIAS NETWORKS

7.1. Check DC volts at both sides of VR2 and VR102.



VOLTAGES SHOULD READ + AND - 7 VOLTS (APPROX.)

7.2. Unmute timer circuit. Use clip leads or a pair of pliers to short across R29. This charges up C30, causing immediate unmute. LED should change to GREEN.

7.3. Check P-channel (Front) Gate Lines on both sides.

FRONT GATE LINES SHOULD READ: -1 to -2 VDC.

7.4. Check N-channel (Rear) Gate Lines on both sides.

REAR GATE LINES SHOULD READ: +2 to +3 VDC.

8. PREPARE FOR OUTPUT STAGE BIASING

8.1. Remove all four vacuum tubes.

8.2. Turn off SA-12 Power Switch.

8.3. Discharge Rail Capacitors with 15 ohms resistor.

9. BIAS LEFT OUTPUT STAGE

- 9.1. Install 6 AMP fuse into LEFT + Rail Fuseholder.
- 9.2. Install 1-OHM CURRENT MONITOR into LEFT - Rail Fuseholder. (Use 2-watt, 1-ohm resistor soldered across an open fuse.)
- 9.3. Connect BIAS DVM across ONE OHM RESISTOR/FUSE. Set to 2 VDC.
- 9.4. Connect OFFSET DVM to RED Speaker Connector. Connect DVM Bias lead to circuit board ground. Set DVM to 200mV DC.
- 9.5. Observe AC Current Meter and OFFSET DVM. Turn on SA-12 for on second and watch for high current or high offset.
- 9.6. If everything O.K., unmuter timer with pliers across R29.
- 9.7. Adjust BIAS pot (VR1) for 500mV reading across 1-OH RESISTOR/FUSE.
- NOTE: THIS POT IS VERY TOUCHY AND DIFFICULT TO ADJUST.
- 9.8. Adjust OFFSET pot (VR2) for offset less than 10mV.
- 9.9. Turn off SA-12.
- 9.10. Discharge Rail Capacitors.
- 9.11. Bias Left output stage; go to Step 9.1 and do all steps to Step 9.10 on Left channel.

10. SHUT DOWN PROCEDURE

10.1. Re-install tubes V2 and V102.

10.2. This completes the DC test of the SA-12. The unit is ready for operation.