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# Model V70

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## Operating Procedure

1. Make sure you have read and complied with the INSTALLATION and CONNECTION instructions prior to attempting operation.
2. Make sure your V70 is properly connected to a high-current power receptacle via the attached power cord (see CONNECTIONS).
3. Your preamplifier should be "On" and muted and/or set at minimum gain.
4. Turn the POWER switch from "Off" to "Power." The green "Power" LED indicator should glow immediately, and the high voltage LED is dim. Approximately 30 seconds later the green "High Voltage" LED should also light fully, indicating the proper operation of the high-voltage circuits. Three distinct relay clicks may be heard during the start-up. NOTE: If the "Power" or "High Voltage" indicator lamps fail to light, turn the "Power" switch to "Off" and check the appropriate fuses for possible failure. Extra fuses for both powerline and high-voltage circuits are packed with your V70.
5. Your V70 should now operate satisfactorily. However, a full stabilization or warm-up time of approximately one hour is recommended for best sonic performance.

## Adjustment Procedure

**NOTE:** When removing top cover in preparation for any service adjustments, take care to unplug the fan cord from internal socket before lifting off cover completely. DO NOT ATTEMPT TO UNPLUG FANS UNLESS AMPLIFIER HAS FIRST BEEN DISCONNECTED FROM EXTERNAL AC POWER LINE.

The V70 utilizes very high quality, commercial and computer grade components which, together with conservative operation of all components and tubes, will provide long service life, if installed and operated within the parameters outlined in this Manual.

The output tubes, for example, are operated with electronically regulated "bias" voltage, that includes compensation for varying plate voltage as the line voltage changes. The resulting output tube current is essentially immune to line voltage variation within the normal range of 105-125VAC, or equivalent export line voltages.

After vacuum tube replacement, it is desirable to make a single internal "bias" adjustment to optimize performance and tube life.

**CAUTION:** The following internal procedure should not be attempted by the owner unless he is *technically qualified*. There are high voltages within this unit which can be *lethal* under certain conditions. The internal "bias" adjustment should be accomplished by a qualified individual. It is necessary to remove the top and bottom covers from the V70 for this adjustment. The unit should be off before removal of the covers.

Normally, only the output tube idle current (bias voltage) requires adjustment in the V70. Use the plastic alignment tool provided for this adjustment.

The triode output stages of the V70 are partially cathode-coupled "push-pull Class AB<sub>1</sub>," utilizing our tightly coupled output transformers which provide low distortion and sonic accuracy.

## Output Tube Bias Adjustment

As shipped from the factory, the output "bias" adjustments are set for a nominal 75mA per KT90 tube. Under these idle conditions the tubes are each dissipating approximately 32 watts of their 50 watt rating (42 watt plate, 8 watt screen). This point of operation provides "enriched" Class AB<sub>1</sub>, and will satisfy the most critical listener.

For best results, operate and adjust the V70 at 120VAC. Adjustment must be made under zero-signal conditions after at least 15-20 minutes of uninterrupted stabilization time.

A digital voltmeter capable of accurate measurements with 0.1mVDC resolution is preferred for accurate adjustment (must have 3½ digit display). Use the plastic alignment tool provided to make the adjustment. The four test points are accessible from the bottom of the circuit board, near the front edge. Test points TP1, TP2 on the schematic diagram are for tubes V9 and V11, and TP3, TP4 are for tubes V10 and V12. (Automatic servo balance circuits take care of tubes V5, V6, V7, V8).

**WARNING.** This adjustment involves measurements of circuits that are 420 volts DC above chassis potential, with large energy storage. Use extreme care to avoid shock hazard and to avoid damage to the V70 or to your meter due to careless use of test leads. All meter test leads connections must be isolated from chassis or earth ground. Start with the meter on its highest range before making connections, and then select the 200mVDC range. Do not attempt current measurements.

Adjust the "bias" for an average reading of 75mVDC (.0650 Volt DC) between TP1-TP2 and between TP3-TP4. The two readings may differ by up to 10% because of minor variations in tubes.

## Servo Balance Calibration

Verify the bias adjustment before setting the servo. The servo adjustments are factory set and should not require readjustment except in the event of a circuit malfunction or component replacement (V70). They are not user adjustments and are not usually required when changing tubes.

Allow 2-3 hours undisturbed warmup with top and bottom covers in place, to fully stabilize tube currents and servo circuit temperatures. The unit should be in a normal horizontal position, with its rubber feet resting on a hard surface for normal ventilation.

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Tip the unit vertically on its handles, and remove the bottom cover. Connect a 3½ digit DVM between TP2 and TP5. **WARNING:** high voltage.

Adjust the 15-turn trimmer through the guide on the left side of the chassis. Use the *plastic alignment tool* supplied with the unit (not a metal screwdriver). Adjust for a null of less than 0.2mVDC indication. Response is very slow and it may take 20-30 seconds for the reading to stabilize after adjustment. Some fluctuation is normal, so use the average reading. For best results, the line voltage should be stable at about 120VAC, although the actual line voltage is not critical. Repeat for the right channel, using TP4 and TP6, and the right side trimmer.

## Servicing

Because of its careful design and exacting standards of manufacture, your V70 amplifier should normally require only minimal service to maintain its high level of performance.

**CAUTION:** The V70 amplifier contains sufficient levels of voltage and current to be *lethal*. Do not tamper with a component or part inside the unit. Even with the power turned off, a charge remains in the energy storage capacitors for some time. Refer any needed service to your authorized Audio Research dealer or other qualified technician.

The twelve (12) vacuum tubes inside the V70 are high-quality KT90 and 6FQ7 tubes. Replacement output tubes should be matched for best sonic performance. (Your V70 comes from the factory with a matched set installed.) Reliable, matched, low gas KT90 tubes — such as those available from Audio Research — are strongly recommended for maximum performance and longevity. Check bias adjustment after replacing tubes.

Additional questions regarding the operation, maintenance or servicing of your amplifier may be referred to the Customer Service Department of Audio Research Corporation: (612) 939-0600.

## Cleaning

To maintain the visual appearance of your amplifier, occasionally wipe the front panel and top cover surfaces with a soft, damp (not wet) cloth to remove dust. A mild, non-alkaline soap solution may be used to remove fingerprints or similar smudges. Cleaners containing abrasives should *not* be used as they will damage the “brushed” grain of the front panel finish.

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## CL-60 /V-70 BIASING INSTRUCTIONS

NOTE: This supplement is not intended to replace the owner's manual instructions included with these models. Please familiarize yourself with that information before attempting the following.

1. Ensure unit is turned off and unplugged.
2. Remove tube cage top on CL60 or V70. Unplug fan cord to remove cage.
3. If replacing tubes, remove old tubes. Note any tube that looks different from the others. For example, a tube with a whitish crust inside the glass envelope (which should appear clear with silver spots) may have lost vacuum. Or a tube that has a brownish cast inside the envelope may have overheated. These clues should be noted in case the amplifier does not function properly when retubed, as component damage may have occurred due to a tube failure.
4. If the amplifier had a tube failure evidenced by an arcing (flashing) tube or has blown either fuse, you should inspect the 100 ohm screen resistors for damage. These act as a "fuse" in the event of severe output tube failure and may be burned, cracked apart or low in value. The 100 ohm resistor is a brown 9/16" long resistor with brown, black, brown, gold identifying bands. These will be mounted on the top of the circuit board near each output tube socket on the CL60, or on the underside of the circuit board beneath each output tube socket on the V70. Use ARC #43100200 (2W 5% wire wound) replacements. Refer to illustration A.
5. Should you be installing Russian 6550s into a CL60 which previously used either Philips or Chinese 6550s or KT88's, no change is necessary. See Step 6. If you are replacing KT90 or KT91 tubes in a V70 with Russian 6550's, you will likely need to change bias trim resistor R97 (49.9K ohm) to a higher value such as 76.8K ohm or 100K ohm in order to properly bias the tubes within the range allowed by the bias pot. Refer to illustration B for part location.
6. Install tubes. Note that matched pairs should be installed as follows: V12 and V8; V10 and V6; V7 and V11; V5 and V9.
7. Locate black .5 ohm resistors at front edge of circuit board. Using a digital volt meter capable of accuracy to .1mVDC, connect negative probe to TP-4 and positive probe to TP-3. Note that test points are the "legs" of the resistor.

VERY IMPORTANT: You must use insulated test leads that do not contact the chassis. Do not attempt this adjustment if using typical pin-type probes as you could slip and touch the chassis which will damage the unit or your meter and probably necessitate a factory repair! A fully insulated probe with a retractable hook that may be securely attached to the test points will

prevent mishaps. Most electronic supply stores carry such a probe.

Ensure correct fuses installed: MDX 6-1/4A line fuse; AGC 1/4A high voltage fuse.

With your DVM set to mV DC scale 200mVDC or less (if not auto ranging), turn on amp.

After a few seconds, bias reading should start to rise. Check across other channel's test points TP-2 and TP-1 to ensure proper operation also. Initially set RV-1 bias pot to about 55mVDC reading. This will rise as tubes warm up.

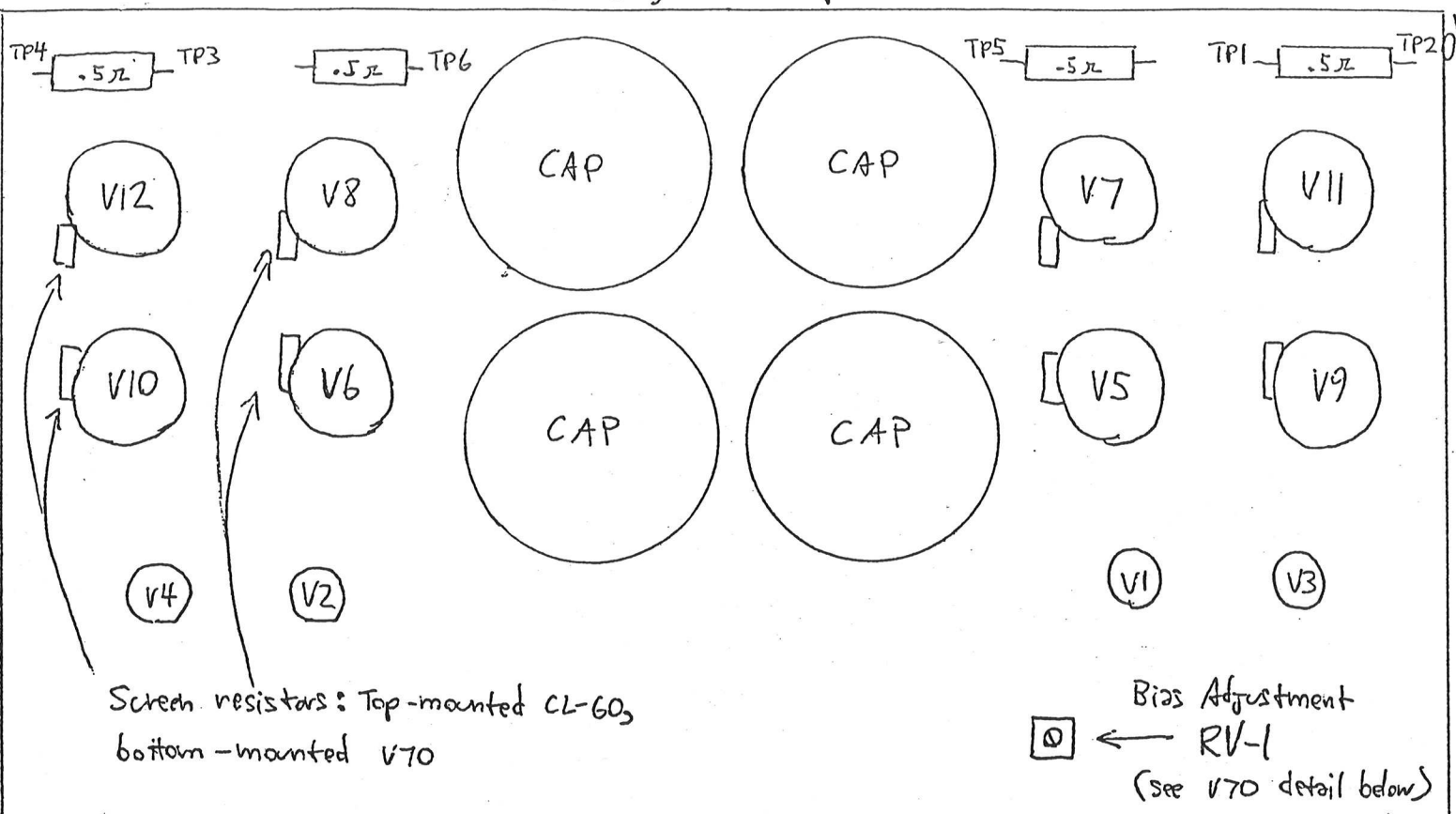
8. After full warmup of approximately 20 minutes, set RV-1 to final reading of 65mVDC across TP-1 and TP-2, TP-3 and TP-4. Bias readings from channel to channel may vary up to 4mV due to minor tube variations. If greater than 4mV difference, you may need to swap tubes from channel to channel to reduce the variation.
9. After at least 30 minutes warmup, recheck bias. If correct, proceed to check servo balance.
10. Move positive probe from TP-1 to TP-5. Leave negative probe connected to TP-2. Reading should be plus or minus .2mVDC. If out of calibration, insert plastic probe into hole in side rail of that channel to engage trimmer. With probes connected as above, turn probe clockwise to make reading positive, counter-clockwise to make negative. Adjust trimmer no more than 1/4 turn at a time to prevent over-adjustment. Allow 5 minutes for servo to stabilize. Observe result. Readjust as necessary.
11. Repeat step 10 with other channel. Connect negative probe to TP-4, positive to TP-6.
12. Should you experience difficulty, Audio Research Field Service Department may be reached at (612) 939-0600 8:00 am - 4:00 pm Monday through Friday.

Illustration A

CL-60, V-70 Top Front

Servo-hole in chassis side

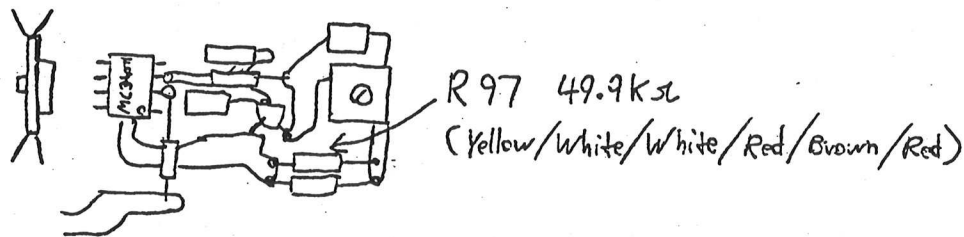
Servo-hole in chassis side



V70 Only

Illustration B

Detail of area of RV-1 and Bias trim resistor R97.



Rear edge of circuit board, top view.