

## ACOM1000 TUBE REPLACEMENT INSTRUCTION

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This step-by-step instruction is about the tube replacement and idling currents re-adjustment of ACOM1000 power amplifier. Please follow all details closely since the work is difficult, with many details to keep track about, and might be dangerous too. Do not hesitate to contact your local dealer or nearest ACOM's service for any advice. Please don't attempt tube replacement by yourself, if you don't feel comfortable with repairs!

### **W A R N I N G H I G H V O L T A G E !**

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The amplifier works with high voltages up to 3000V which is LETHAL! For your safety pull the amplifier power plug out of the mains wall outlet and **WAIT AT LEAST 30 minutes EACH TIME BEFORE** you remove the cover of the amplifier. Disconnect all cables from the amplifier (grounding last). Do not touch any part inside before ensuring as described below that no residual voltages are present!

#### **1. REMOVING THE TOP COVER.**

a) First pull the amplifier power plug out of the mains wall outlet. Wait at least 30 minutes (or more if the amplifier has been just powered up).

b) Using a Philips-2 screwdriver, unscrew 9 pcs of "eco-fix" flange-button head screws to release the top cover (2x3 pcs on each bottom-side edge, and three more on the rear-top edge of the box). Don't unscrew four screws that hold the grid above the tube. Keep all screws and washer for the mounting procedure later.

Lift the rear edge of the cover slightly (to 2-3cm) and then pull the cover backwards, in order to release it from front-panel's chutes. Remove the top cover. Do not touch the part inside for now!

You will see inside:

- the MAINS PCB that is mounted on an aluminum sub-chassis, just above the big HV transformer;
- the HV rectifier PCB in front of the MAINS PCB (with four big diodes, one wire-wound resistor, and one disc ceramic capacitor on it);
- the HV filter PCB, located just below the HV rectifier (with 8 electrolytic capacitors on it).

c) Before proceeding, please make sure that no residual DANGEROUS VOLTAGES are present in the amplifier. For this purpose take approximately 1m of WELL-INSULATED lead (adequate for 3000V). Bare it to about 1cm at both ends.

Tighten one end of the wire under the GROUND STUD (on the rear panel). Only AFTERWARDS, holding the wire BY THE INSULATION, at a distance of minimum 10cm (4 Inch), touch with its second end consecutively all parts on the HV rectifier PCB, especially:

- the HV output J3;
- the wire-wound resistor R12 on its both sides;

- the four HV diodes on their both sides.

With the same wire end, on the MAINS PCB touch the diode D19 on its both sides (it is located at the PCB edge, near the powerful transistor that is installed on the chassis).

## 2. REMOVING THE SCREEN ABOVE THE RF DECK.

Using a Philips-1 screwdriver, unscrew 15 pcs of countersunk-head screws to release the aluminum cover above the RF deck. Lift and pull the cover to remove it.

Repeat step 1(c) about residual voltages, this time touching with the grounded wire the copper strip of the plate anti-parasitic suppressors and the tube anode.

Check whether the HV LID crowbar makes a reliable short-circuit across the HV wiring when the cover is missing.

## 3. OLD TUBE REMOVAL

### W A R N I N G H I G H V O L T A G E !

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Prior to continue you must be absolutely sure that there are no residual voltages in the amplifier - see (1) and (2) above!

Be careful - the tube may be VERY HOT!

Prior to remove the tube, you have to uninstall the 16mm (2/3") wide copper strip with UHF anti-parasitic suppressor, that is installed between the tube plate and the big ceramic DC-blocking capacitor (near the plate choke). Use an 8mm-opening wrench to unscrew a hexagon-head screw (M5 brass) from one side of the capacitor (where the connection to the plate choke is made via a soldering lug). Please hold the capacitor for its ceramic body while unscrewing it, in order not to let the second screw to loosen.

Using a Philips-1 screwdriver, unscrew an M3-screw from the plate capacitive divider (this is aluminum / Teflon cylinder installed near the tube, on the tube deck). This way, the entire copper strip, along with the UHF anti-parasitic suppressor is released and can be easily removed from the tube.

Unclip the anode spring clip from tube cap, while pressing the tube to the bottom with a finger. Now unthread the temperature sensor (which seems like a small transistor), out of the rubber chimney. Then unthread the chimney out of the anode heat sink, together with the anti-parasitic suppressor and copper strip (please keep track not to bend the temperature sensor leads).

At last, pull the tube out of its socket, using force directed to TOP ONLY, since bending may destroy tube socket.

## 4. INSTALLING A NEW TUBE

### CAUTION

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Examine new tube pins before inserting it in the socket. They must be straight and not inclined in respect to the ceramic base, otherwise any bent pin could damage the socket's spring contacts, and thus the socket and/or the tube may become unusable.

a) Put carefully the new tube ON the socket, without neither pressing nor inserting the pins. Keep track about the pins orientation. There is a larger gap between two pins (a pin is vacant) and it must coincide with the corresponding socket's gap. Be extremely careful about the tube screen-grid ring, not to bend any of the socket's spring contacts. If needed, slide the tube carefully up and down while you align these contacts. After that, count the ring contacts: there must be 16 of them, closely fitting OUTSIDE the tube screen-grid ring. This ensures that no spring contact has been damaged during installation.

b) Align tubes pins so that EACH one would lie precisely in the gap, and at the width center of the socket's spring contacts. Use very small rotation movements during this alignment. Do not lift tubes during this operation in order not to disorder screen grid ring contacts (otherwise repeat the previous step (a)).

c) Using a force of NO MORE THAN 50...60N (about 5...6kg or 12...15Lbs.), in VERTICAL DIRECTION ONLY, push carefully the tube (holding its plate heat sink) in order to insert the tube in the socket. If you meet a stronger resistance, do not force anymore and go back to recheck (a) and (b).

The tube must fully seat in the socket.

#### **CAUTION**

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After inserting the tube, please recheck all 16 contacts of the tube screen ring.

d) Orient the silicon rubber chimney (together with the anti-parasitic suppressor inside) so that:

- the small hole could be threaded over the temperature sensor later;
- the connections to the capacitive divider and to the ceramic capacitor could be installed to their old places.

Now thread, by small steps in parallel, the chimney over the tube plate heat sink. Keep track not to bend the temperature sensor during this operation. Clip the anti-parasitic-suppressor spring contact to the tube plate and precisely orient the connection lugs to the capacitive divider nut and to the big ceramic capacitor. Align carefully the rubber chimney, so that it firmly contact the tube deck at the base (otherwise a part of airflow would be exhausted uselessly and the tube might over-heat).

At last, install and tighten the screws to the capacitive divider and the ceramic capacitor, using their original screws and lock washers (should have been saved at previous steps).

e) Insure that after the tube replacement all the wiring is restored to its former condition.

#### **5. IDLING CURRENT ADJUSTMENT.**

After each tube replacement, the BIAS voltage needs to be re-adjusted in order to align the new tube regime. There is an information screen "Plate Current" on the LCD, foreseen to monitor the

plate current during this adjustment. The adjustment trimmer-potentiometers is located on the MAINS PCB.

a) Install the cover above the RF deck (15 countersunk screws). In two of the nuts on the middle chassis panel, near the HV LID crowbar and the cover-presence micro-switch sensor, tighten two small strip pieces in order to imitate top cover. Check that they are pressing the crowbar reliably in order not to let it escape during next operations.

### **W A R N I N G H I G H V O L T A G E !**

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Be careful - HIGH VOLTAGES up to 3000V will exist permanently on the accessible PCBs which is LETHAL! Keep away of the parts on the PCBs! Keep track that nobody could access the dangerous parts and do not leave the amplifier without supervision during next adjustment period with the top cover removed!

Connect a dummy load (or an antenna) to the output. Install all cables to the exciter as usually. Now, feed mains voltage, turn on the amplifier and let the tube at least 15 minutes in STANDBY mode. Please guard the accessible HV parts during this period!

Select same bands (preferably lower) on both the amplifier and the exciter.

Use a small-size, flat-tip, insulated screwdriver for next adjustments. On the MAINS PCB, find the two trimmer potentiometers RP1 and RP2 (marked "BIAS1" and "BIAS2"). They control the idling (zero-signal) plate current of the tubes for low- and high- RF-drive levels respectively.

Please note that RP2 will affect both idling levels, while RP1 - only the low level. That is why, the high level is adjusted the first, and only then is set the low level (according to the procedure described below).

b) Select the "Plate Current" information screen on the LCD. Go to the OPER mode. Apply very small drive power in CW mode (1...5W). Following the plate current, adjust R2 (BIAS2) to reach 220mA (200...240 is OK); CCW rotation will increase the current. Don't exceed 15 seconds with the PTT on. If you need more, repeat the adjustment 1-2 minutes later.

c) Do not apply any drive during the adjustment of R1 (BIAS1). Select SSB mode, with the MIC and OUTPUT regulators on the exciter set to minimum.

While monitoring the plate current, adjust R1 (BIAS1) to set the plate current to 70mA (60...80 is OK); CW rotation will increase the current. This adjustment does not affect the previous step.

## **6. REASSEMBLING THE AMPLIFIER**

After the adjustment procedure is completed, switch off the amplifier and pull the amplifier power plug out of the mains wall outlet. After five minutes or later, remove both "cover-presence" imitators. Do not hurry to remove them since the residual voltages will be still high! Do not touch any part inside during reassembling the amplifier, since residual voltages may exist and the tube is still hot.

At last, install the top cover again as described below. Be careful to align screws thread to the nuts and do not force them since any captive nut on the chassis might be damaged.

a) Put the cover above the chassis, while holding its rear edge slightly lifted (to 2-3cm). Align its horizontal and two vertical front edges to the respective front-panel chutes. Then push gently the cover forwards, in order to insert its front edges into the front-panel's chutes. Take care especially to the bottom corners of the cover.

b) Screw in loosely all 9 pcs of "eco-fix" flange-button head screws. Use a Philips-2 screwdriver.

c) Pressing continuously the cover forwards and to the bottom, tighten all 9 screws properly.

**- End -**