

Ampex AG-350 overhaul hints / REV 5

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Before you begin

- The traces on the pc board are EXTREMELY fragile and require careful use of a vacuum-desoldering tool when replacing components. About 75 percent of the electrolytics in the signal path can be replaced with metalized polyester types and I recommend this. The others need upgrading with low ESR electrolytics since there isn't room to use film capacitors.
- The AG-350 (and similar AG-300) electronics was the first Ampex solid-state recorder. At that time (1965), transistor manufacturing was not nearly as good as today so accordingly, all of the AG-350 small-signal transistors were fitted into sockets. Most these are Texas Instruments NPN low-noise Silicon transistors (TI 415). Be aware that these transistors are ECB pinout, not the more common EBC pinout. While typically these do not need replacement, keep in mind that the TI-415 lead configuration is ECB (emitter collector base) when viewed from the flat side of the epoxy case; if you substitute a modern EBC (emitter base collector) equivalent, such as the excellent 2N5088, you must bend the leads slightly to ensure the transistor leads fit into the socket correctly. Or you can use type **2N3707** which has an ECB pinout and is therefore a drop-in replacement.
- The original output transistor (Delco 2N1168) may have failed. This can be replaced with a Central Semiconductor 2N3615. This is a PNP Germanium.
- There are three RCA 40250 (TO-66 case) transistors used; one in the power supply and two in the bias oscillator. While these rarely fail, you can substitute with a 2N3766, 2N3767, or NTE 175.
- There was some factory-selection of components so you might find minor differences (particularly electrolytic capacitor values). Note that the voltage-rating of the power-supply electrolytics was quite low; it would be prudent to select a 35 Vdc part as the regulated supply output is 23 volts.
- In some AG-350 electronics, R55 (2.2 Meg) is not loaded on the board but rather soldered underneath along with a small film capacitor. This was likely done to ensure stability with the associated high-gain Darlington stage (Q13 and Q14). If the selected resistor is too low (for instance 470K), this stage will draw down the supply voltage and might limit the ability of the record amp to supply enough current at the very lowest frequencies. In one unit I serviced, this rolled off the low-frequency response below 80 Hz. I fixed this by installing 2N5088 transistors (which had much higher gain than the original TI-415) and changing R55 to 2.2M.
- Note that for slave units used with AG-300-3, AG-300-4, and AG-300-8, an additional 110 Vdc relay is used to cut the bias coupling input on the rear panel.

Servicing the recorder

- **Keep in mind that the AG-350 is really a 185 nW/m machine.** I have found you can run out of adjustment range for the REC CAL pot if you set it up for elevated levels. If you are using a 250 nW/m MRL calibration tape, set the PLAY calibration to read +3 VU.
- I replaced the large single-section computer-grade electrolytic can after drilling out the wafer rivets. Then I installed a 1 3/8" clamp (Mouser has these too) with a computer-grade electrolytic can. I also drilled out the wafer for the three-section filter can also installed a tag strip for three fresh radial electrolytics.
- Sufficient erase current (to ensure full erasure) is going to be an issue for high-bias tapes.¹ The stock erase head may overheat if you increase erase current from the 40 Vrms (measured at the erase-head connector with the erase head connected) to something higher. Some aftermarket erase heads may tolerate more current. BE CAREFUL here.
- To increase available bias current, change the 2700-ohm resistor (2R67) to 2200 ohms. If that doesn't give you the desired adjustment range, use 1500 ohms. This lets you bias RTM 468 for instance.
- If you have a spectrum analyzer or frequency-selective level meter, adjust the bias oscillator balance to minimize the second harmonic (200 kHz). It should be 50 to 60 dB down.

EQ modification

The record EQ needs some padding to keep the upper midrange flat. Per the late Kurt Greske, here's the mod: "add a .0022 mfd condenser in series with a 20K (22K is fine) resistor between pins 2 and 6 of the 15 NAB equalizer (this adds a loss of high frequency to the equalizer to mimic the response curve of Scotch 111 tape and smooths out the high frequency record response of the recorder at 15 NAB speed—this is not necessary at 7.5 NAB speed though." In some cases, you may need to use a 10K resistor instead of the 20K for flatter record/play response.

Mechanical restoration

- The transport escutcheon is often oxidized. To polish, remove and WET sand with the escutcheon pieces face down on 1200-grit paper on a piece of glass with a cushioning paper underneath the sandpaper. Use light pressure and try to keep motion linear.
- Overhaul reel motors and the capstan motor per standard procedures.
- AG-350 VU meters usually need to have their glass glued. The meter case is brittle and needs to be treated carefully. Also, the #51 lamps (as I recall) are sometimes slightly too large to fit through the holes in the meter case. Sometimes you need to hand-select replacement lamps or ream the hole slightly. Take photos first, then unsolder the VU wires and gently open the case. If the glass is loose, remove it, clean it, then reglue carefully with a few dabs of Pliobond adhesive. You can also use Duco but that's more brittle. Sometimes I use a bit of Duco since it sets up fast and then a few dabs of Pliobond. Less is more.

¹ Due to erase-current limitations, I do not recommend using high-bias tapes; however, Emtec/RTM 911 works nicely.