

b. Servicing the Control Module

In general modular power amplifiers using any negative feedback can be very difficult to troubleshoot for any problem excepting a clearly blown output or driver transistor. This is due to the fact that in a closed loop system a problem will be the same everywhere within the loop. For example, high DC offset could be the result of Q2 thru Q9 being slightly leaky, as well as C29 thru C32, Cr15 or Cr16 having leakage currents. Furthermore, there is no fast method of detecting or measuring this leakage while the loop is closed (unless the device is nearly shorted.)

Having explained some of the theory of operation of the Model 20A, the best tips and advice we can give for a problem of this sort would be from our past service records. We have found that small power devices Q6, Q7, Q8 and Q9 are by far the most prone to partial failure. It may save a great deal of time to simply begin changing these devices first, one at a time. Be sure to check with an ohmmeter that, after replacement, none of these devices is shorted to the metal heatsink bracket. That could be fatal. Secondly, note that the smaller plastic TO-92 devices almost never fail. They all have large collector resistors which almost unconditionally prevent breakdown of these devices (Q2 thru Q7). Also, be sure not to overlook the possibility of cold solder joints, a burned-out resistor, etc.

Note: It is recommended that all output modules be removed while troubleshooting a control module. The control module is fully functional on its own as a voltage amplifier. However, because of its limited power output, it should be tested **without** a speaker-terminal load and at frequencies below two thousand cycles (because of the load which R2 and C1 present at high frequencies.)

c. Servicing the Output Module

A blown collector fuse (F200 or F203) may indicate a blown output device. In almost all cases, when a power transistor fails, the junctions will fuse causing the collector to emitter to become a dead short. The base to collector or base to emitter will often short as well causing F201 or F202 to open. It is a simple matter to place an ohmmeter across a bad device and find a reading below one ohm. Replace any such device making sure to use adequate thermal grease and only mica insulators. The hex nuts should be made very tight and lockwashers always used. Replace the fuses with only the same type, size and rating.

Note: Use only the same manufacturer's power transistor as was removed. Do **not** use replacements. Also, when re-installing output transistors, be sure an insulating sleeve is used on each screw to prevent shorts to the heatsink itself.