

modifying the trio jr60 receiver

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This article describes a number of worthwhile modifications to the JR60. These modifications are equally applicable to the Lafayette HE80 receiver.

One of these units was acquired some years ago and it was most disappointing to observe that this particular unit drifted badly even on BC. Many fruitless hours were spent trying to improve it. The conclusion was that it was a heat problem due to compact design. First modification involved replacing the 6CA4 rectifier with silicon diodes. Running the valve heaters continuously helped greatly, but valve life reduced to an unacceptable degree and there was still some drift. The only answer seemed to be transistorisation to eliminate the heat.

This has been a long process over a period of several years and the unit still uses valves for the second IF amp, product detector and 2 metre converter.

The modifications carried out are listed as follows:

(1) A pair of germanium diodes were connected across the antenna input to protect the RF transistor.

(2) The RF valve was replaced with an MPF102 source follower feeding a BF115 amplifier (see AR June 1968) with the emitter resistor unbypassed. A partial bypass (100 ohms in series with 40,000 pF) increases gain but creates cross modulation problems. The existing 1K and 10,000 pF B+ decoupling network was used. The existing AGC decoupling was retained.

(3) The 6CA4 heater winding was connected in series with one of the other 6.3V windings to produce 12.6V AC. This end was connected to a 2500 uF 25V capacitor via a silicon diode. Half-wave rectification seems adequate. The DC output was fed to a 1.5W 12V zener diode via a 300 ohm resistor. This 12V source was fed via a 560 ohm resistor to a 400 mW 6V zener which feeds the local oscillator and BFO. The existing HT wiring was removed from the "remote" socket and 12V connected to this so that the set can be remotely controlled.

(4) The tape recorder outlet was removed and a 3 amp toggle switch fitted in the hole. The converter heater lead was wired in so the heater can be switched off when not in use. This also requires rewiring one dial light so it isn't switched off when the converter is off.

(5) The 6BE6 mixer was replaced with an MPF105, with a 10K source resistor bypassed with 1000 pF capacitor.

The RF transistor was wired to the existing valve socket plus a terminal strip mounted adjacent to the valve socket. The mixer was also wired to the 6BE6 socket. Do NOT wire transistors to 7 pin plugs and plug them into valve sockets if instability is to be avoided.

The original circuit shows a cathode follower between the oscillator and mixer but this was not wired in my set; injection was direct from the oscillator grid to the mixer grid via a 20 pF capacitor.

(6) The 6AQ8 oscillator was replaced with an MPF104 soldered to the valve socket and a terminal strip mounted under one of the socket bolts. No variation was found in calibration with the MPF104 but a slight shift was noticed using a 2N3319. A source follower after the oscillator was tried but it was considered unnecessary. Injection to the mixer is fairly critical. A 5 pF coupling is a good compromise.

The drain end of the RFC must NOT be bypassed since oscillation on top band depends on extra feedback provided by a 10,000 pF capacitor connected to a winding on the top band oscillator coil.

(7) The first IF amplifier was replaced with a MPF105 source follower feeding a BF115 amplifier. To preserve stability the FET should be mounted on the IF transformer and the Bipolar mounted on the 6BA6 IF amplifier socket. Lead length between the FET and the BF115 is not so important, being relatively low impedance. AGC was applied to the gate of the FET via existing components.

From here trouble occurred. Another MPF105, BF115 combination was tried in the second IF but could NOT be stabilised. Replacing the BF115 with a 2N3564 (lower Beta) did stabilise the stage but it then suffered overload. An MPF121 was tried in place of the FET-bipolar combination but had the same overload problem. Not satisfied with the solid state result in this stage, the 6BA6 was re-used.

(8) AGC action was now superior to the original and it was necessary to shunt the S meter with 220 ohms. As each stage was removed from the B+ line the voltage rose as resistive filtering is used. The voltage applied to the second IF 6BA6 screen exceeded valve ratings, so a 22 K ohm 2W resistor was required to feed the screen of this tube.

(9) Several different RF gain control arrangements were tried, but none found satisfactory. Finally the system shown on the circuit was tried. 6.3V AC from the valve heater line was rectified with a silicon diode to produce a negative voltage (no filter capacitor is required) and applied via a 7.5K ohm resistor to the existing 10K RF gain control. The moving arm was connected via a small silicon signal diode

(has to be silicon for high back resistance) and a 1M ohm isolating resistor to the AGC line. This gives limited control but is quite smooth and adequate. It does upset the S meter reading but in practice the RF gain is rarely used since the AGC is adequate.

(10) The 6AL5 NL was replaced with 2 germanium diodes mounted on a 7 pin plug with a back cover to protect the diodes, and plugged into the valve socket. The noise limiter is inferior to the original. A silicon diode was tried but was still not as good as the original, however the noise limiter at best is not very effective so the germanium diodes were left in. The germanium diode detector performs as well as the valve.

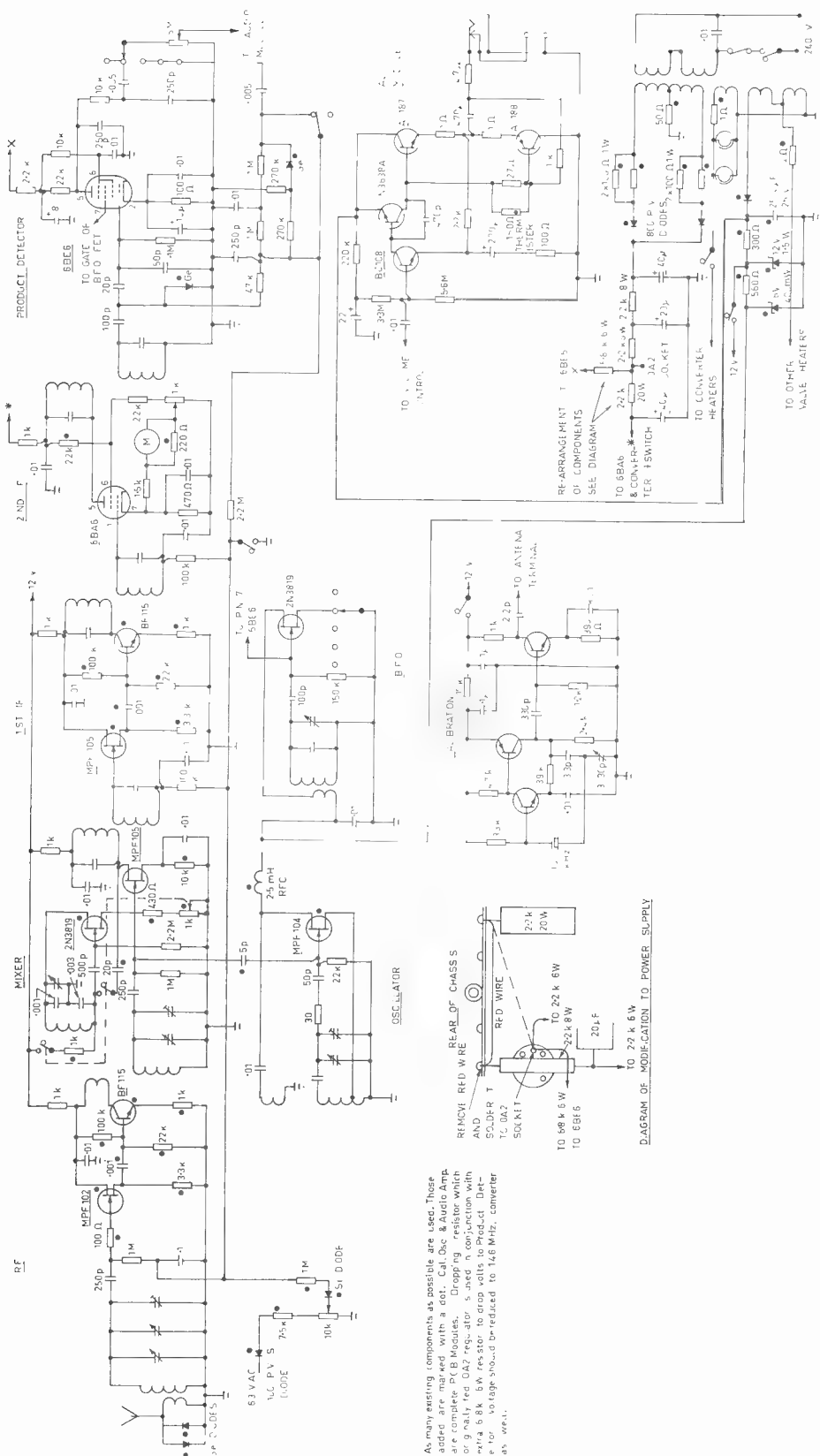
(11) An MPF121 and a 2N3819 were tried as a product detector. The MPF121 worked well on weak signals, but overloaded on strong signals. The JFET worked, but injection was extremely critical (gate injection). Both were inferior to the 6BE6 so the valve was re-installed.

(12) The BFO valve was replaced with a 2N3810 supplied from the 6V DC regulated voltage. The slug in the BFO coil required slight adjustment to centralise the front panel BFO control.

(13) The audio stages were replaced with a transistor amplifier as used in the "EA 270" and solid state Deltahet. The PCB heat sink was home designed so that the unit was self-contained. This amplifier has approximately the same gain as the valve amplifier and produces about the same output with 17V B+ and a 4.7 ohm resistor in series with a 3 ohm speaker.

The speaker should be 8 ohms but all speakers on hand were 3 ohms, hence the 4.7 ohm series resistor. The high input impedance of this amplifier allows retention of the 500K ohm volume control. This module is mounted above the chassis over the sockets of the valve audio amplifier.

(14) The 6AQ8 calibration oscillator and Q multiplier was removed from its socket and a nine pin plug inserted. A 2N3819 was wired to provide the Q multiplier "triode" connections. A 1K ohm switch potentiometer with DPDT switch was fitted in place of the existing 10K ohm potentiometer. This requires enlarging the chassis hole to 3/8", taking care to avoid marking the front panel. Also the shaft of the potentiometer has to be reduced to fit the metric size knobs. This was done using an ordinary file, and some care. (Tip: make a diagram of connections before removing pot). The feed resistor was reduced from 22K to 1K ohm and connected to 12V DC. The original 5,000 pF injection capacitor was reduced to 20 pF since the original design severely detuned



the first IFT. Even with 20 pF some detuning occurs and the capacitor could possibly be reduced, however this has not yet been tried.

(15) Simple replacement of the triode calibration oscillator with a FET did not work. The "EA" circuit (EA Oct. 1970) was built on a home made PCB as shown in the circuit. This circuit works very well and is slightly superior to the original on higher frequencies. This module is mounted above the chassis over the mixer and local oscillator valve sockets.

(16) It is necessary to reduce the HT on the product detector by using an extra 12K ohms of appropriate wattage in the HT feed to reduce the anode voltage to about 100V.

(17) The reduction of current required for valve heaters plus the fact that the TRIO was designed to operate on 220V AC instead of 240V meant that in this set, the heater voltage rose to 7.40V. This was reduced by fitting a 2 ohm resistor in the heater circuit to the 6BA6 and 6BE6 and a 1 ohm resistor in circuit to converter heaters. Resistors were made up from resistance wire. Some electric jug elements are solderable but several strands may be necessary to keep the temperature of the resistor down. (Alternatively suitable resistors may be purchased from a radio parts supplier — Ed.). The existing HT resistors can be re-arranged to reduce the HT to appropriate voltages with the reduced drain. The red wire linking the ends of the 2.2K 8W and the 2.2K 20W nearest the rear of the chassis is removed from the 2.2K 8W and soldered to the B+ pin on the now vacant OA2 voltage regulator socket. From this point an added 6.8K 6W goes to the product detector.

This arrangement requires a minimum of change and gives 170V at the B+ end of the 6BA6 IFT plate winding and 75V at screen of 6BA6 (with 33K extra dropping resistor reduced to 22K) with the converter off. With the converter on, the voltages become 115V at the B+ end of the IFT, and 48V at the screen of the 6BA6 a 125V to the converter. The 2.2K 6W resistor gets fairly hot with the converter on so if prolonged use of the converter is envisaged, a higher wattage resistor in this position may be desirable.

Although some drift is still apparent, the improvement was well worth the effort. The mixture of FETs used shown on the circuit was not deliberate — they just happened to be ones that were on hand, and although they have not been tried, probably MPF102, 104, 105 or 2N3819 would be equally suitable.

Existing valve circuitry has been retained except where the HT had to be changed to 12V or 6V and, where possible, existing HT decoupling and AGC decoupling has been used. The results have been very satisfying.

REFERENCES: Q mult "EA" April 1969 p.58; XTAL CALIB "EA" Oct. 1970 p.101; SOLID STATE MODULES "AR" June 1968; SOLID STATE DELTA-HET "EA" Feb., Mar., Apr., May 1971; EA 270 "EA" Feb., Mar., Apr. 1970.