

Ten-Tec Argonaut V (Model 516) Low Output Repair

(Note: Those undertaking this repair do so at their own risk. The procedures outlined located a faulty band-switch diode and worked for me. Your circumstances may differ (i.e. the problem may be another component). This procedure has not been approved by Ten-Tec, Inc. or any of its staff.)

Symptoms:

My Argonaut V developed a problem with low output power on all bands except 80 metres. The output on 80 was 20 watts on 160 it was 12 and on 40 metres 10 watts. On the upper frequencies power dropped off to approximately 1 to 2 watts.

Troubleshooting:

Section 4.5.1 and 4.5.2 of the manual describe the transmit band switching circuit. The circuits are in schematic diagrams **Argonaut V Pwr Amp** (pages 2, 3 and 4 of 5).

The switching circuit applies approximately +8 volts to the appropriate band circuitry and connects the power amplifier with the rest of the transmitter section. All other bands should have approximately -150 volts (with the Argonaut V at full power).

With the top off of the rig you can access all the necessary test locations to determine if the band switch circuitry is functioning properly (*use caution*). A series of coils are located on the circuit board (see figure 1) that is attached to the heat sink. These coils are a part of the various band-switching stages and are connected to the **Bandout** rail. They are identified as 160 metres (L32) at the left, L28, L24, L21, L18, L15 and end with the 15 through 10 metre coil (L12) at the right. (The latter coil is air wound all others are wound on ferrite cores.)

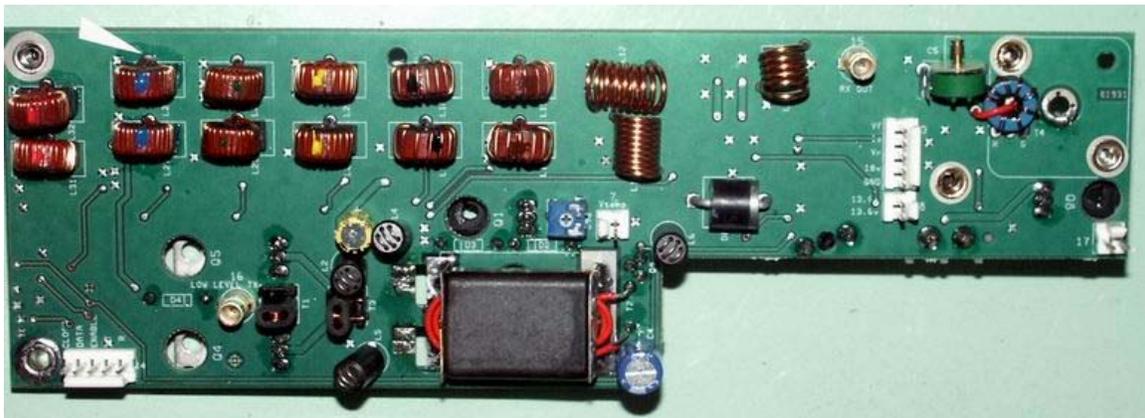


Figure 1: Test points (PA board removed from rig)

Test voltages can be checked with the PA board in the rig and the top cover removed. The voltages (referenced to chassis ground) are measured where the coil is attached to the

top of the PC board (see arrow on 80 metre coil). The measurement is made with the rig in key down CW at full power into a dummy load. All coils should have approximately -150 volts **except** the selected band, which should read approximately +8 volts. Check all bands and all coils.

Test Results:

In my tests the voltages when the rig was on 80 metres were correct. That is +8 volts on the 80 metre coil and -150 on all other coils. However, when other bands were selected the voltages were quite different. For example, when 40 metres was selected there was +8 volts on the 40 metre coil, +6 volts on the 80 metre coil and -75 volts on all the others (see table below). This suggested that the 80 metre circuitry was turned on at all times - likely the result of a shorted switching diode or faulty transistor feeding the diodes.

Voltage Measured at:	Rig on 80 metres	Rig on 40 metres	Rig on 20 metres
160 coil	-150 volts	-75 volts	-75 volts
80 coil	+8 volts	+6 volts	+6 volts
40 coil	-150 volts	+8 volts	-75 volts
20, 17 coil	-150 volts	-75 volts	+8 volts

Dismantling and Repair:

Note: *Replacement of transmit band-switching diodes or other band-switching components requires extensive disassembly of the Argonaut V. Proceed at your own risk.*

1. Unplug all connections to the rear of the Argonaut V
2. Remove the lower case (be careful and remember to unplug the speaker)
3. Remove the fan (if installed)
4. Unplug all inter-connecting cables attached to the boards on the rear heat sink
5. Remove the 4 screws that attach the back panel to the Argonaut V.
6. Remove the screws holding the antenna connector (2), power plug (1) plus the counter-sunk screw in the upper right of the heat sink.
7. Remove the rear panel and attached circuit boards.

Place the heat sink assembly on a soft clean surface with the fins down.

8. Remove the small nut and washer from the stud on the lower left (below the antenna connector).
9. Remove the screws and any associated insulators from Q1, Q4, Q5 and Q8
10. Unsolder the centre conductor of the antenna connector and remove the antenna SO-239 connector.
11. At this point, the option is to remove transformer T2 (with the loops of red wire through it) or unsolder Q2 and Q3. I chose the latter. Use extreme caution while unsoldering the Q2 and Q3 leads from the board near transformer T2 (Figure 2). There are solder pads on the **left end of T2** and to the left of the slot where leads for Q2 and Q3 come through the board.

Using *solder-wick* unsolder and lift all six leads. *Carefully* straighten the leads to allow them to pass through the slot when the board is lifted.

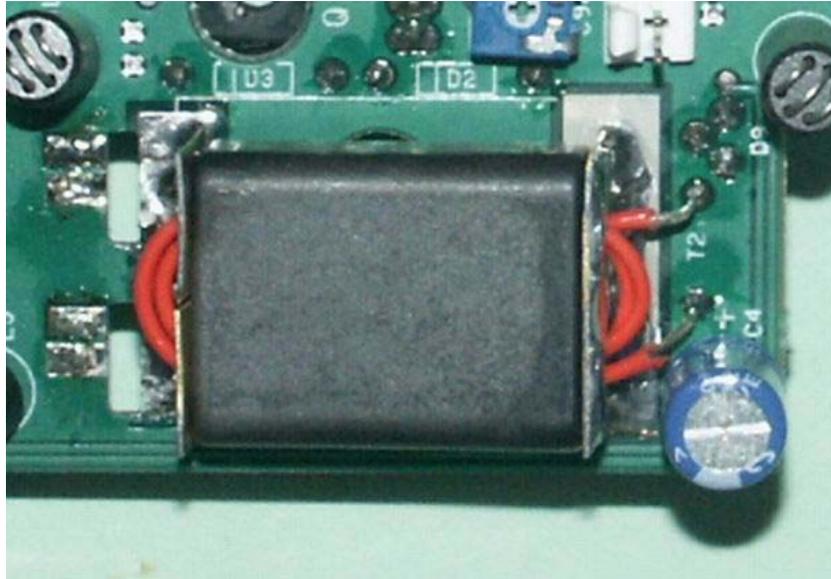


Figure 2: Enlargement of Transformer T2 with red wire primary
(Note: Slots and solder pads to left end of T2)

12. Carefully lift the board. It may be necessary to **gently** pry the transistors (Q4, Q5, Q1 and Q8) as well as diodes D2, D3, D4 and D9 from the rear heat sink panel.
13. Put the screws and hardware back into the transistor mounting holes so they won't get lost! (See figure 3 below). Note that the *Connector Subassembly* board does not need to be removed.

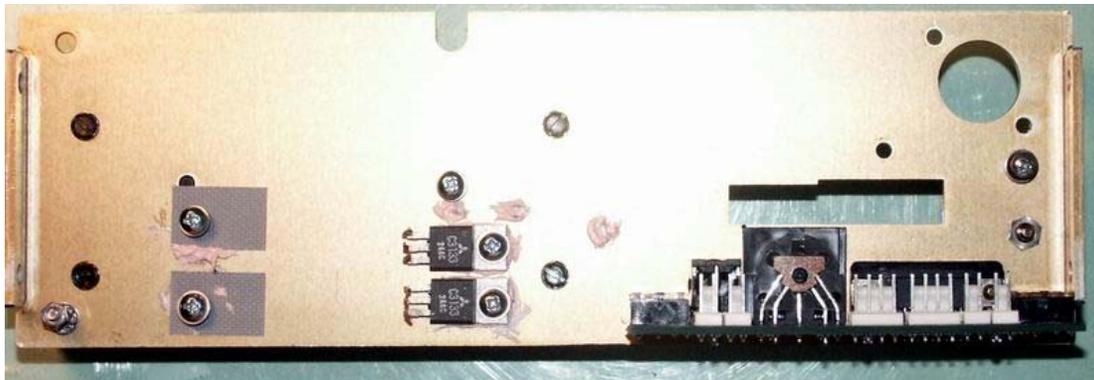


Figure 3: Rear Chassis with Connector Subassembly Attached

14. With the PA board removed from the back plate place it coils down (i.e. fuse up) on a soft cloth.
15. The diodes are located on a pair of *rails* - one *rail* along the bottom of the circuit board (7 diodes) and the second *rail* near the centre of the board (also 7 diodes).

Note: My Argonaut had 13 surface mount diodes and a single 1N4007 (the exception was on the 160 metre switching circuitry).

16. Test the diodes with a DVM. A faulty diode will have a resistance of 100 or 200 ohms or less. The board with the offending 80 metre diode, marked with a white arrow, is shown in the figure 4.

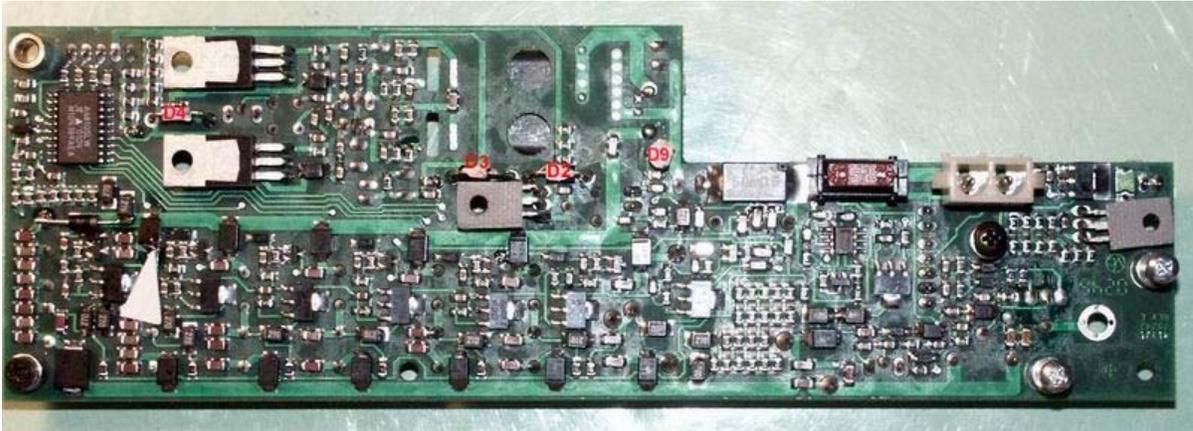


Figure 4: Diode side of PA/LP Filter Board

17. Carefully note the polarity and then unsolder and lift the faulty diode. Test it again to be sure!
18. Replace the faulty diode with a new 1N4007 or surface mount equivalent (ensure that the polarity is correct) and recheck all the diode resistances. They should be similar. (If they are not similar, the problem **may** be the transistor feeding the switching diodes and the transistor will need to be tested and, if faulty, replaced.)
19. Re-assemble the radio in reverse order. (**Note:** Do not forget to apply heat sink compound to D2, D3, D4 and D9 – see red identification in figure above.)
20. Test the Argonaut into a dummy load and reinstall it back into service.

Acknowledgements:

Special thanks to the following for their troubleshooting assistance and encouragement:

- Ten-Tec service manager Paul Clinton and his staff
- Members of the Ten-Tec Reflector ([www.contesting.com/ tentec](http://www.contesting.com/tentec))
- Members of the Ten-Tec516 Yahoo Group
- VA7TB, Ted Baleshta (SK)

73,
Rick
VE7TK / VE7ASR

Prepared: August 6, 2003 – Updated January 28, 2009

Website: <http://www3.telus.net/ve7tk>