

ICOM PW-1 REPAIR NOTES

Hans ZS6KR 1 Dec 2013

SYMPTOM: The red protection LED comes on with SEND and the band LED flashes on any band.

NB: PSU problems have adequately been covered in "IC-PW1 Power Supply Repair and Improvements" by AK2F.

SAFE APPROACHES TO IDENTIFYING A FAULT:

Connect a CI-V and Acc cable from an HF ICOM rig set to minimum power output.

Connect Amplifier INPUT only when necessary.

Do not transmit unless specifically mentioned below.

50Ω dummy load with power indication used where mentioned below.

The best way to tackle problems is from the bandfilter backwards. **Do not deviate from the sequence below.**

A) BANDFILTER

- Remove the bandfilter 13-pin plug J8 from the MAIN PCB and test each male band pin (18MHz and 21MHz as well as 24MHz and 28MHz are on one pin) for +12V.
If one is missing, the bandfilter relay driver IC19 (TD72783AFG) is faulty and the cause must be found in the bandfilter.
It will be necessary to replace IC19 on the MAIN PCB alongside J8 and recheck its output.
Do not yet replace J8.
- Remove the bandfilter RF cable connections (4x RCA, combiner and tuner) as well as the PCB from its box.
Check each relay coil in-circuit resistance to be 100Ω as you are measuring two in parallel per band.
If one of the diodes on the coils is SC then that is the reason for failure of one of IC19's outputs.
- Check every ceramic capacitor for cracks and burns.
- Check for dry joints.
- Assuming the J8 socket has all band voltages present, replace J8 and connect a continuity beeper or ohmmeter to the filter input and output screw terminals.
Go through each band with AMP ON by pressing the rig band buttons or UP DOWN to hear continuity close to zero ohms. If one is missing, find the relevant relay and replace. (Takamisawa VS-12TBU-E, 200Ω coil)
- A final check of the bandfilter can be done by connecting the HF rig output to the filter input and a power meter to its output.
Connections to the screw terminals must be as 50Ω coaxial as possible – so make up two coaxes with eyelets on one end and a connector on the other for the rig output and wattmeter.
Input 20-50W power and check the HF rig SWR meter for SWR<1.5 on all band settings and correct output.

B) AMPLIFIERS

Each of the four amplifiers can be quick-checked as follows:

- Since the combiner is physically out of the way, each RCA output socket is accessible and inputting RF into the output cables of the splitter one at the time should show which amplifier has poor gain.
They should all have the same gain.
- Having located a suspect board, check with an ohmmeter between gate and source of the MRF150 devices to show not less than 1MΩ while in-circuit.
A low reading on one - or even on its gate-drain - indicates a faulty device.
Replace both as a matched pair and set biasing as per service manual.
Recheck power output now to be the same as the others.
Each can now be fully tested to 250-300W.
Observe also the 45V power supply on the PCB terminal to regulate properly.

C) SPLITTER

- Disconnect all amplifier outputs. Use INPUT 1 and monitor the top of the four green resistors with an oscilloscope to be 4x the amplitude on each output. The outputs are not easy to reach but are available to a scope probe on the LHS of each amplifier board on the LHS of R15.

D) COMBINER

Since the combiner is loosely available at this stage, connect the four amplifier cables and a metered dummy load to its output screw terminals.

- Remove plug J17 (imbalance input to MAIN next to J8)
- Feed the system on INPUT 1 on 40m with about 5W and observe output to be around 200W. Make sure the imbalance output J17 from the combiner is at zero volts. If not, check the detector diodes.

E) REASSEMBLY

- Insert J17 to MAIN PCB
- Insert the filter PCB into its box. Arrange the relay coil wires away from the top of the filter coils. Screw the brown cable to the PCB input and assemble the filter box cover and combiner to the box. The grey screened wire must come out in such a way to give it enough length to reach the splitter socket J8. Screw on the brown cable to the combiner and insert all RCA plugs.
- Maneuver the filter box into position, and reconnect the coax at the back to the tuner.
- Alternatively the rear output can now be monitored for correct amplifier operation with a wattmeter to the rear connections before connecting to the tuner and after reconnection then to the output SO239. The PW-1 SWR indicator should not deflect.
- Add the filter mounting screws and side plate. When assembling the front plate and covers, make very sure that none of the wiring looms to the MAIN PCB are pinched to chassis!

F) TECH NOTES ON THE PROTECTION SYSTEM

- Removing the balance plug J17 fools the μP IC26 to think there is balance since the balance amp IC3b positive input is already grounded with R237. The μP gets 0V on pin74 via a reverse biased D3. The MAIN diagram is in error by stating that IC3 negative input should be 3,4V. This should be 0,8V or so as the resistor network 33k-6k8 is fed from 4,7V. In some cases it is justified to remove J17 when analyzing problems.
- When all reconnections are made and it still protects check for:
 1. The FOR and REF to pin7 and 8 on the μP are normal with REF=0. Also measurable on J8 pins 2 and 3.
 2. DRIV J8 pin6 is normally <5V. DPO μP pin13 high.
 3. SEND μP pin32 from the μP occurs at zero V.
 4. RESET pin21 high
 5. Vc, Ic, ALCM and TEMP (μP pins 10, 11, 12, 13) should be low.

The μP makes its pin50 PATH output high (AMP ON) and is low on SEND causing bypass of the band filter etc. Transistor Q4 is fed from an 8-pin dual AND gate (though the circuit diagram shows a 5-pin device fed by PATH and SEND via an inverter) which senses the PATH and SEND signals from the μP . If its output does not go high, there is no 12V from Q3 and BYPASS is activated. The grey cable to the filter box then takes the INPUT via relay RL2 on the splitter board straight to the filter box where relay RL15 allows it to pass through via the SWR sensor to the tuner.
