Multi-Elmac AF-67 Mods and Maintenance

By John Conley, W7ZFB

Some Suggestions

1. Use a 120VAC supply with decent 250V/500V regulation.

2. Always feed a 50 ohm dummy load or ant.

3. Use the set long enough to know how it works and where it will and won't load before PI net mods.

4. Align it on the nose. Align 160M so drive can be peaked at both ends of the band.

5. A 6146 likes 2.5ma grid current and a good tube will easily load to 120ma at 500V and will make about 40W out.

Some Problems

1. An HV glitch may destroy the meter, the 6146 or power supply.

2. The PI net was made for low Z mobile ants, not for 50 ohms.

The stock PI net will normally load OK at one end of 10M but not the other end. Loads too heavy on 15 and 20, 40M OK, 80M OK at 4.0 but NG at 3.5, loads very light on 160M.

3. Drive is too high.

1. is a killer, so fix it first.

Fix the HV terminal strips behind the 6146. These two 2-terminal strips handle HV and RF. They almost all develop charred arc paths underneath and then vaporize suddenly, shorting HV to ground. Think they absorb moisture... When the top one goes, it takes out the choke, maybe the tube and maybe the power supply rectifiers. When the bottom one goes, it takes out the HV meter shunt and the meter if it's in the plate current position. Unhook the choke and wires, remove 1 screw on top and 2 under. Remove metal bracket, then replace both terminal strips with new ones. Or use standoffs. If the .47uH PS wires break, replace with 6T #18 wound on 47/1W. If one pie of the choke fries, cut it out and go with two pies.

Protect the Meter

Put a 1N4007 power supply diode across the meter terminals. Band or cathode to negative terminal. This will not affect the meter readings but in case of an HV glitch, will limit voltage across the meter to about 635mV.

Save the Power Supply

Put a 500ma fast blow fuse in the HV line someplace to save the power supply rectifiers and the tubes.

Fix 10 - 40M Loading

Locate and clip out the only jumper between the middle and bottom bandswitch wafers. Solder a jumper across both sections of the loading cap. Now both loading cap sections are active on all bands. Check smooth loading at both ends of 10-40M. Then remove wire from front section of loading cap to bottom wafer of bandswitch.

Fix 80M Loading

Only works if 10-40M fix done. From the outer end, reduce the 80M coil to 24T. At the bottom bandswitch wafer, remove the jumper from the 80M contact and hook a 430pF silver mica from there to ground. Note plate dips both 80 and 40M. 80M dip is near max C.

Fix 160M Loading

Only works if 10-40M fix done. From the outer end, reduce the 160M coil to 25T. At the bottom bandswitch wafer, remove the jumper from the 160M contact and hook a 820pF silver mica from there to ground. Locate the 160M terminal on the top bandswitch wafer. Unhook the wire going to the plate tuning cap and remove the jumper between the 80 and 160M terminals. Then hook the plate tuning cap wire to the **80M** terminal. And hook a good quality 240pF silver mica from the 160M terminal to ground underneath the band switch support bracket. Since caps vary a bit, if the plate tuning cap won't dip the final at one end of the 160M, raise or lower the 240pF cap one size.

Fix the Drive

Most sets with good tubes and alignment make at least 4ma grid current all bands. Some over 5ma. 6146 likes 2.5ma drive. More spoils power out. Reducing grid current by detuning the grid cap not good idea as spoils the waveform at the PA grid.

Two Options

1. Feed the 6AQ5 screen from 250V thru a 33K/1W resistor. This will help the high grid current but not completely.

2. Install a good quality 50-75K pot in the hole at the top left of the dial. Feed the top of the pot from 250V thru a 22K/1W resistor. Ground the bottom of the pot. Hook the arm of the pot to the screen. Turn the pot full on at startup. Peak grid current then peak and load final to 120ma and check loaded grid current. If more than 2.5ma, reduce with pot. Then reload final.

End

73,

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BA CW frequencies - 3578, 7050, 7118, 14050, 21050, 28050 kHz

W7ZFB Mods to stock Elmac AF-67 updated asof 7/02
Both my AF-67's aka AF-67 QSK have all mods here.
The AF-67 QRO is NOT the same as the AF-67 QSK's.

Rewire key jack to OPEN CKT.

R/R both charred terminal strips next to PA 6146.

R/R R55/R89 at meter, add 1N4004 protect diode across meter.

Blank meter position now reads LV. Drop B+ thru 750K to switch.

Add new 36K/1W from B+ to 6AQ5 screen as too much drive.

Add QSK/SPOT/KEYING MOD to fix the following:
    1. Keying 200ma tough on key and bug contacts.
    2. Spot too weak.
    3. No internal ant relay.
    4. No QSK.
    5. For stability VFO should stay on but leaks into rcvr, so add RIT.
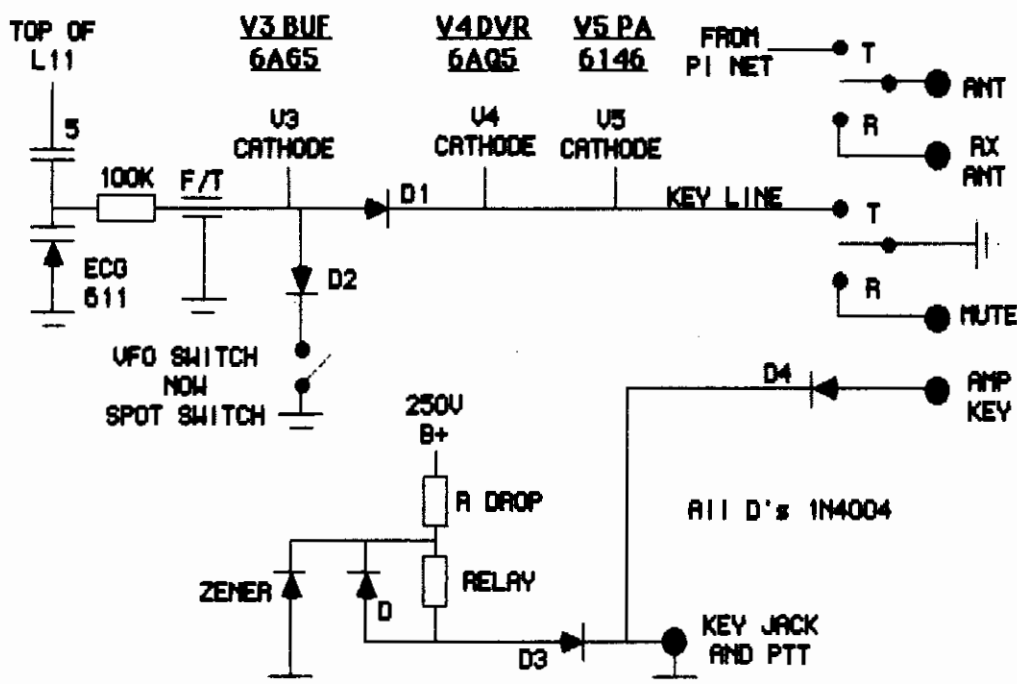
QSK/SPOT/KEYING MOD NOTES
D1 isolates V3 so V4 and V5 won't key with SPOT SW ON.
In spot, D2 holds cathode of V3 at same voltage as D1 does keydown, so voltage
on varicap and VFO freq same in spot and keydown.
D3/D4 isolates +V on relay and amp key lines. Set amp for +V keying, not -V.

RIT ckt left of V3 cathode moves VFO signal in Rx so no VFO feedthru to Rx.
Values shown shift VFO about 5-10KHZ on 160-80M and 15KHz+ on 40M and up.
For more shift, use 7pF vs 5pF and/or use bigger varicap.

Wire B+ direct to VR tube so VFO on all the time.

Relay - any small 9 to 36V DPDT up to 10ma MAX.

Size R DROP = B+ - Vrelay/Irelay. Vrelay appears at key.

Size Zener 5-8V above Vrelay for fast closure. For 12V relay, use 18V zener.
Example: I use 20V/5ma relay, 27V zener, R DROP 43K/2W. On keydown, 27V pulses
relay closed PDQ then Vrelay drops quickly to around 20V.

Best - Put RegDC on VFO fil, put fil and 105VReg into VFO thru feedthru caps.

PI NET MODS
The AF-67 PI NET was designed to match a typical 36Ω mobile antenna.
160M and 15M PI NET values were especially poor for 50Ω antennas.
This mod will give full output on all bands with flat 50Ω antenna.

Remove jumper from SW51B arm to 20-15M taps on SW51C.
Remove 160-80M jumper at SW51A. Add delta Cin 240pF from 160M tap to ground.
Modify L54 to 12.3uH = 23T for 80M, 12.6uH = 24T for 160M.
Remove all wires except arm on SW51C. Hardwire both sections of C58 to output.
At SW51C, add delta Couts to ground. Try 430pF for 80M, 820pF for 160M.

AM MODS
Remove the Class B 5881s and battery. Add Zero Bias Class B 6AG7s.
Add 0.5A fuse in PS HV line in event w/mpy 6AG7 shorts internally.

Stock 12AU7 can't drive both 6AG7 grids to full output. Change to 6CX8,
hardwire all fils for 6.3V, wire as triode AF amp into pentode driver.
Clamp 6CX8 screen at about 220V with 33V/5W zener from bottom of T1 primary.

6BM8 and 6CX8 only ones I found with high power pentodes. Maybe others?

AM ZERO BIAS CLASS B MOD
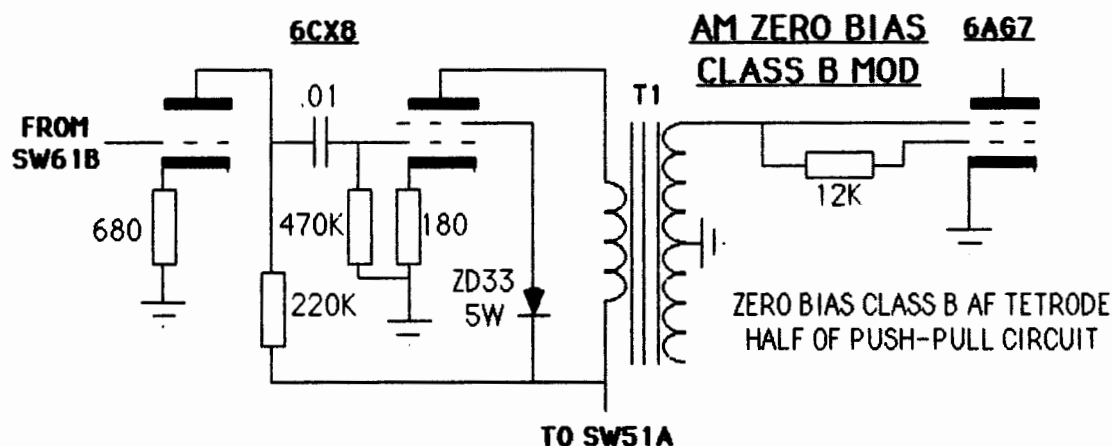
Now more than enough for 100% AM with 6146 loaded to 60W DC input.

end