ATS-3B Filter Module Details, Including Modifications

KX0R

These are the values for all the components in my ATS-3B filter modules. I believe I have optimized most of these filters for best overall performance of both receiver and transmitter in my ATS-3B. I tried to get 5W of RF output on all bands with a 12.0V supply, without causing excessive current draw, poor efficiency, or excessive spurious outputs. I also made sure the trimmers for the receiver input filters peak within their range of adjustment, rather than at minimum or maximum capacitance. All tuning was done at the default frequencies for the ATS-3B.

The transmit filters all may be adjusted for slightly less output, with increased efficiency and reduced current draw, if desired. Adjusting for more power than 5W at 12V is not recommended, because of heating and excessive current draw; these effects are worse at higher frequencies. At 5W the overcurrent circuit trips easily if the rig sees a mismatch, such as while tuning a matching network. It's a good idea to reduce the supply voltage to the rig while tuning. The current trip point may be adjusted up about 10% by putting a 5.6K resistor across R47, on the bottom of the board…just don't blame me if you damage your rig. Steve put that circuit there for several good reasons.

Toroid inductors are tuned by spreading or tightening the turns. I use a letter (T) to mean that the turns are close together (Tight). (T) yields the highest inductance for a given winding. (O) means open, with the turns evenly spaced around the entire core. (O) provides the minimum inductance for the winding. (M) means medium, or in-between (T) and (O). (MT) means medium tight. I increased the wire gauge on several inductors, because I prefer working with the larger wire, and it may be slightly more efficient. The gauge must not be increased more than shown here, because the turns will be spaced more widely, resulting in inductance too low, insufficient range of adjustment, or no way to fit the turns in the available space on the core.

All cores were tacked to their boards with a dab of hot glue. If the dab is small, adjustments are still easy to make. Hot glue has the advantage that the coil can be removed easily with application of a little hot air. Q measurements have confirmed that hot glue is acceptable for low power toroid inductors.

Each filter module is a complex, multivariable device, and most adjustments interact. Many combinations will work just fine. When you adjust the transmit filters, you control the impedance seen by the final mosfets; this affects the power output, the current draw, and the efficiency. Harmonic output is also suppressed by these filters. Please start with the values suggested in the manual, and understand that large changes from those values could result in destruction of the

mosfet finals, reduced output, spurious signals, and other undesirable effects. Experiment by changing one variable a little bit at a time, while monitoring various parameters that may be affected. Adding capacitance in parallel is possible on either side of the board. Parts can be tacked in place temporarily until you know where you need to be.

The small capacitors in the transmit filter may be damaged by handling when hot. Use small solder braid, and be gentle if you remove any caps. Don't apply force to the leads or the ends when they're warm. If the epoxy is cracked near a lead at one end, the part probably should be replaced.

The receiver front-end filters are adjusted for peak output with trimmers CT2 and CT3. This can be done by ear, but it's easier if you use a meter or scope to monitor the audio output. I like my old HP400D analog VTVM for this. You must to keep the signal peaked in the receiver's passband for these adjustments. The input signal should be set below the threshold of the rig's AGC.

You should see a double peak on CT2 and CT3 – if you only get one peak per 360 degree revolution, it means that resonance is slightly outside the range of adjustment. The adjuster of each trimmer looks like a little arrow. If the arrow points toward the flat side of the trimmer, you're at minimum capacitance; if the arrow points directly away from the flat side, you're at maximum capacitance. For best receiver sensitivity, you'll need to move resonance so you see a double peak. You may have to vary LF3, LF4, C5F, and/or C7F to move the filter within the range of adjustment. C6F, the coupling cap for the double-tuned circuit, should be left as recommended in the manual.

If you can't find resonance, or you think your receiver's sensitivity is way down on one band, inspect the board closely – looks for poor soldering of the magnet wire, and look for solder bridges (shorts) on both sides of the board. I was more than 30 db down on 80 meters, until I found a tiny solder bridge across the link on LF3.

Your results may vary from mine. Changes result from different winding styles, component tolerances, and combinations of variables.

Component values and notes for each band are listed on separate pages here. Changes from the original values in the manual are in RED.

All components are listed by their functional order in the schematic drawing, from the mosfet drains to the output. This is different from the order in the table in the manual.

The only thing more tedious than adjusting all these modules is writing up the results here! Getting these little modules just right takes a lot of patience – don't mess with them unless you have some time.

80M Filter Module – ATS-3B

C1F	680 pf
LF1	23T #28 T30-2 (M)
C2F	1500 pf
LF2	26T #30 T30-2 (M)
C3F	100 pf
C4F	680 pf
LF3	60T #32 6T link T37-2 (T)
LF4	75T #30 T37-2 (T) 22 uH (replaced molded part)
C5F	82 pf
C6F	4.7 pf
C7F	10 pf
RF1	100K

Notes:

LF4, originally an 18 uh molded inductor, was replaced with a 22 uh toroid to correct tuning near maximum capacitance on CT2. C5F and C7F also were increased.

Sensitivity was checked from 3.50 to 3.70 Mhz, and is fine.

I had trouble with the rig displaying an "E" when changing over to the 80M module, or when removing and replacing it, when it had no resistor installed for RF1. 100K seems to correct this problem.

40M Filter Module – ATS-3B

C1F	330 pf
LF1	15T #26 T30-2 (O)
C2F	830 pf
LF2	17T #26 T30-2 (T)
C3F	68 pf
C4F	330 pf
LF3	45T #30 4T link T37-2 (T)
LF4	8.2 uH molded
C5F	none
C6F	4.7 pf
C7F	none
RF1	22K

Notes:

I added 150 pf in parallel with C2F (680 pf) - this adds up to 830 pf. Power output and supply current were low prior to this change.

30M Filter Module – ATS-3B

C1F	220 pf
LF1	12T #26 T30-2 (O)
C2F	560 pf
LF2	14T #26 T30-2 (T)
C3F	47 pf
C4F	220 pf
LF3	45T #30 4T link T37-2 (T)
LF4	8.2 uh molded
C5F	none
C6F	2.2 pf
C7F	none
RF1	10K

Notes:

The only changes for this module were the use of #26 wire for LF1 and LF2

20M Filter Module – ATS-3B

C1F	150 pf
LF1	12T #26 T30-6 (O)
C2F	330 pf
LF2	15T #26 T30-6 (M)
C3F	22 pf
C4F	150 pf
LF3	38T #30 4T link T37-2 (M)
LF4	5.6 uh molded
C5F	none
C6F	2.2 pf
C7F	none
RF1	2.2K

Notes:

The only changes for this module were the use of #26 wire for LF1 and LF2

17M Filter Module – ATS-3B

C1F	69 pf
LF1	12T #26 T30-6 (MT)
C2F	220 pf
LF2	15T #26 T30-6 (M)
C3F	15 pf
C4F	200 pf
LF3	27T #30 3T link T30-2 (M)
LF4	3.3 uh molded
C5F	none
C6F	2.2 pf
C7F	none
RF1	470 ohms

Notes:

C1F was increased from 22 pf to 69 pf by adding 47 pf in parallel. C4F was raised from 100 pf to 200 pf by adding 100 pf in parallel with the original cap. With the original values, the peak voltage on the drains was close to 50V, and the second harmonic was a little high at -39 dbc, with a 12V supply. After the caps were increased and the coils adjusted, the peak drain voltage dropped to about 35V, and the second harmonic dropped several db. Power output and supply current are a good compromise.

15M Filter Module – ATS-3B

C1F	69 pf
LF1	10T #26 T30-6 (MT)
C2F	220
LF2	13T #26 T30-6 (O)
C3F	15 pf
C4F	182 pf
LF3	27T #30 3T link T30-2 (M)
LF4	30T #26 T37-6 (M)
C5F	none
C6F	2.2 pf
C7F	none
RF1	51 ohms

Notes:

15M changes are similar to those for 17M. C1F was increased from 22 pf to 69 pf by adding 47 pf in parallel. C4F was raised from 100 pf to 182 pf by adding 82 pf in parallel with the original cap. With the original values, the peak voltage on the drains was close to 50V, and the second harmonic was a little high at -38 dbc, with a 12V supply. After the caps were increased and the coils adjusted, the peak drain voltage dropped to about 36V, and the second harmonic dropped several db. LF1 is the master power control, and it's sensitive to adjustment. Power output and supply current are a good compromise.