

**MODIFICATIONS OF THE AIDC 3733 AND AIDC 3033 DOWNCONVERTERS FOR AO-40 ---
BY K5GNA (K5GNA@AOL.COM)**

**FOR INFORMATION ON THE AIDC 3731 AND 3031 SERIES DOWNCONVERTERS -- SEE
INFORMATION AT THE END OF THESE INSTRUCTIONS**

As built, the AIDC 3733 or 3033 downconverter has a passband from about 2.1 GHZ to 2.8 GHZ to cover 33 channels of MMDS. With this passband it has no image rejection at 2401 MHZ and therefore, the noise figure that is measured on a noise figure meter is the DSB noise figure. So the downconverter's 1.4 dB of noise figure, as measured on the NF meter, needs to have 3 dB added to it to make it a true SSB noise figure.

The stub notch filter also rejects the signal of interest at 2400 MHZ and this negates the gain in the preamp, therefore the real noise figure at 2400 MHZ can be about 9 dB. It needs to be eliminated.

1. STUB or NOTCH FILTER – This is a piece of small diameter coax that runs from the small green capacitor (actually PCB material), that connects to the 2nd filter and extends at the bottom of the board. It is shorted on the end. As built, the stub attenuates the signal at 2400 MHZ, so SSB NF = about 9 dB. **Cut the stub where the center conductor connects to the green capacitor and it WILL GIVE AN SSB NF OF LESS THAN 4 dB.** Picture of where to cut the stub:
<http://members.aol.com/k5gna/stubfilter.jpg>

Older AIDC 3733's have a longer stub that is open on the end. Picture:
<http://members.aol.com/k5gna/stubfilter1.jpg>

2. FILTER REPLACEMENT – Use the Murata Model DFC22R44P084BHD to give a steep skirted passband from about 2400 to 2480 MHZ. This passband eliminates the image and the LO noise and provides for a real SSB noise figure of less than 1.4 dB. The narrower passband also rejects more interference and provides for 3 dB of improvement.
 - A. INSTALL THE MURATA FILTER ON MY PCB -- NO TEST EQUIPMENT REQUIRED – Cut the stub (described above) and then install the Murata filter on my PCB in place of the SECOND FILTER ONLY. The PCB makes it very easy. **REPLACING THE FIRST FILTER WITH A MURATA FILTER IS NOT RECOMMENDED – IT WILL ONLY INCREASE THE NOISE FIGURE.** The second filter is located after the NF has been determined and the losses in the filter will not increase the NF here. SSB NF is less than 1.4 dB

A picture of the network analyzer's display of the modified preamp only section of the AIDC 3733 with the Murata filter can be seen at: <http://members.aol.com/k5gna/murata.jpg>

INSTRUCTIONS:

1. Remove the second filter's cover – this is the one in the middle. The cover has 5 screws, 2 hex cap screws at the top and 3 pan head screws at the bottom. They are different sizes and not interchangeable. Remove the top cover. PICTURE>>>
<http://members.aol.com/k5gna/2ndfilter.jpg>
2. Remove the combline filter. Unsolder the copper combline filter at each side and remove. Remove the input side first (left) to prevent pulling the pad up. PICTURE >>>
<http://members.aol.com/k5gna/2ndfilterout.jpg>
3. Install the Murata filter on the PCB. SKIP THIS IF YOU PURCHASED IT ALREADY MOUNTED – place the board on a piece of cardboard and use a pair of straight pins through the middle plated through holes to hold the filter in place while soldering. You can read my callsign and the lettering on the filter when they are orientated properly. Solder a couple of pads while pushing down on the filter, then remove the pins and solder all the 5 ground pads and 2 I/O pads. Remove the flux from the board with your favorite flux remover. Do not worry if you get solder on the case around the ground connections, as it is all ground -- just be careful on the input and output connections. PICTURE >>>
<http://members.aol.com/k5gna/filterpcb.jpg>

4. Mount the filter and board with the proper screws that are included in the kit. The 2-56 by ¼ “ screws go at the top where the cap screws went, the 2.5 X 5 MM screws go at the bottom. The 2.5 X 5 MM screws have a finer thread than the 2-56 screws. Use small, #22 - #26 or so, wire to jumper to the pads onto the other circuit boards where you unsoldered the filter from. PICTURE >>> <http://members.aol.com/k5gna/filterpcb1.jpg>
- B. DO NOT REMOVE THE FIRST FILTER to eliminate the losses in the filter and bring the noise figure down below 1 dB.– **YOU WILL END UP WORSE OFF IF YOU DO -- leave the original filter in place. ****** . Some have added a small 50 ohm jumper to replace the filter, but no improvements have been made; the noise figure has only gotten worse. THIS IS NOT FOR BEGINNERS. The filter is at ground, when you bypass it, the gate of the first GAsFET is connected directly to the antenna. LEAVE THE FIRST FILTER ALONE.
3. FREQUENCY DRIFT CAUSED BY TEMPERATURE EXCURSIONS – You will find the Doppler is the real problem, it is usually the Doppler that makes me retune, not the drift of the crystal. The components in the crystal oscillator causes the frequency to drift more than those caused by the temperature variations of the crystal. I have tried PTC thermistors directly on the crystal to keep the crystal's temperature at a constant 60 degrees C, but it didn't help it that much.

I have now improved the stability of mine with the addition of thermal pipe wrap. I use 1 3/8” closed cell polyurethane around the body of the downconverter and it makes a very good thermal blanket which seems to keep the internal temperature much more constant. The downconverter heats up and stabilizes to some extent on its own, the pipe wrap helps it even more. I leave mine on all the time to keep it stabilized. The pipe wrap is split down the side and has a sticky strip to seal it around the downconverter. The 1 3/8” pipe wrap is larger than those I found at Lowes and Builder's Square. I went to a plumbing supply shop to get the larger size to fit the downconverter.
4. POWER SUPPLY OPERATION – The internal 7812 voltage regulator needs almost 15 volts to make it work properly. Operation at 12 volts input will reduce the internal voltage and may reduce gain and increase NF.

12 VOLT OPERATION MODIFICATIONS – The internal 7812 may be removed and bypassed to operate on the 12 volt regulated output from your receiver's preamp power supply. Once again, too much or too little voltage here will reduce the gain and raise the noise figure.

NOTE: THE AIDC 3731 AND THE 3031 SERIES CANNOT BE MODIFIED USING THIS METHOD. THEY MUST BE RETUNED USING MICROWAVE TEST EQUIPMENT.

The AIDC 3733/3033 series units described in these modifications need no test equipment to modify and make them work on AO-40. On the AIDC 3731/3031 series downconverters that I sell, I retune them on an HP 8970 automatic noise figure meter for minimum noise figure at 2.4 GHZ. I adjust the retuned passband on my HP 8757/8350/86290 network analyzer for optimum passband and image rejection. Just using a signal source will not result in the best noise figure
