

Cal Amp 31732 Modification for 2400 MHz reception

By Ward WCOY

(HTML-typeset & Web-creation by Mak SV1BSX, May 2002)



The Cal Amp 31732 converter is built with a multi-section printed S-Band filter.

Its response begins to roll off at 2500 MHz, and is about 20 dB down at 2400 MHz. Reception of AO-40 is not practical without modifying this filter. The method that I chose is simple if the materials can be located, and can be applied to other converters that have a large S-Band filter. The filter's response was modified by placing a layer of dielectric material over the filter's printed circuit board traces.

The material that I used is adhesive-backed PTFE (Teflon brand) tape that I have had on the shelf for quite a few years. The tape is 0.015 inch (0.381 mm) thick.

Two strips were placed side-by-side to cover the filter as shown in the photo.

Cutting a copper trace as shown in the photo also improved the response.

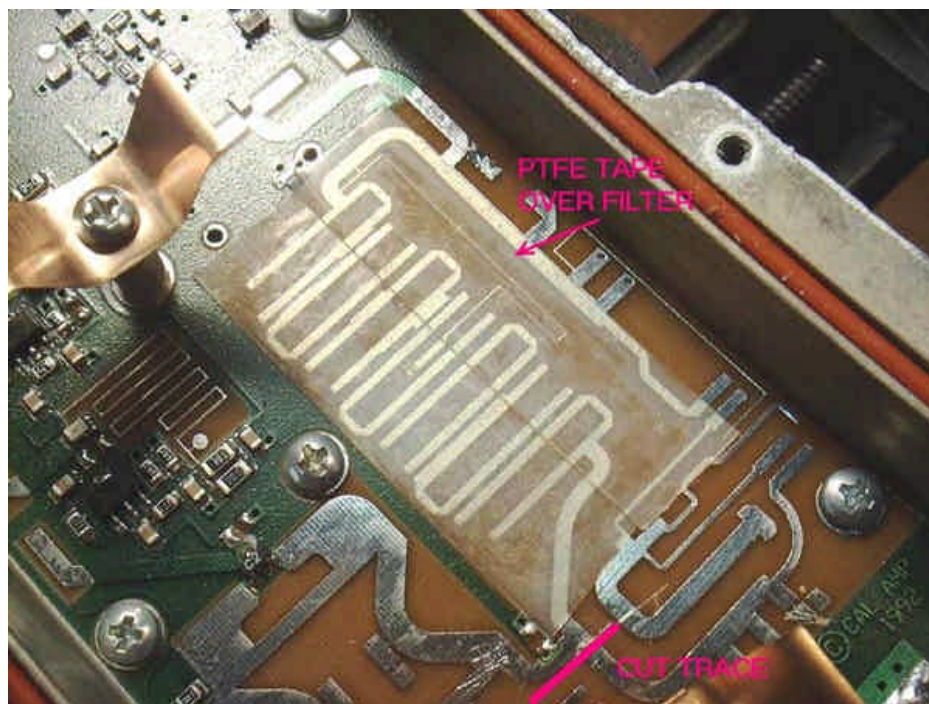


Fig.1 - PTFE tape placed over the hairpin stripline filter

The filter passband response is as shown in the plot after applying the PTFE tape.

The response peaks above 2500 MHz, but is still good at 2400 MHz. Some attenuation can be tolerated since the filter is after two gain stages. The image rejection for a 145 MHz IF was measured as 35 dB when crystal was replaced and the cover was in place. A source for the tape may be found by searching the web.

I have not tried using this, but plumber's tape for joining pipes is PTFE. Many layers of this tape will need to be applied to get the correct thickness of .015". This is roughly the thickness of 10 sheets of paper. With the crystal changed to 8.8125 MHz for a 145 MHz IF the following performance was measured:

Rx Freq / MHz	IF Freq / MHz	Gain / dB	Noise Figure / dB
2356	100	34.7	1.7
2376	120	34.8	1.6
2396	140	34.2	1.7
2401	145	33.9	1.8
2406	150	33.7	1.8
2426	160	33.5	1.8
2446	180	33.5	1.7
2466	200	34.4	1.5

Fig.2 Frequency, Gain and Noise Figure characteristics of Ward's modified unit...

Crystal Change for 145 MHz IF

The converter was modified with the same ICM crystal, catalog #540288, that is used to modify Drake 2880s. Changing the crystal can be done without removing the printed circuit board from the enclosure. I first unsoldered the top of the crystal can where it is attached to the PCB. Next I heated each leg and pulled it from the board.

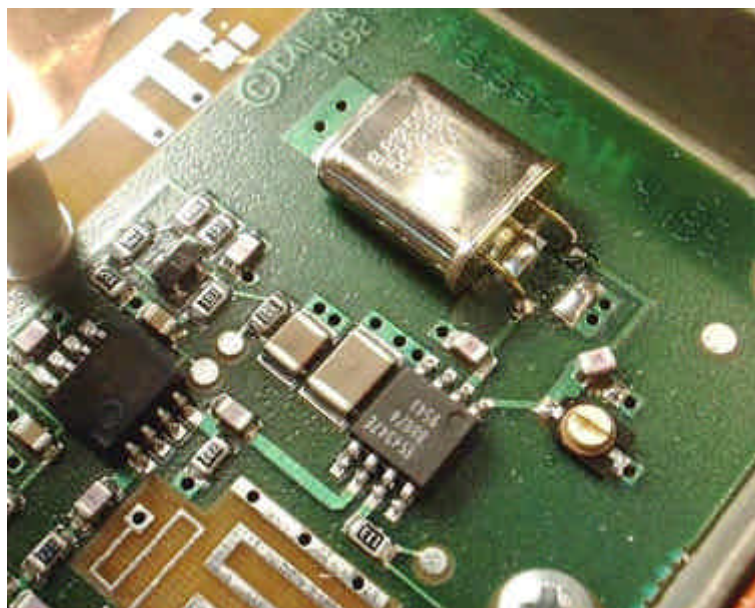


Fig.3 The modification necessary to use a stock Drake crystal with these units

The trimmer capacitor located near the crystal can be used to adjust the frequency. However, this cut of ICM crystal cannot be tuned to 2256 MHz without modifying the circuit. Removal of the chip capacitor located between the trimmer and the crystal allowed the frequency to be set correctly. The chip capacitor in the photo is rotated so that it only makes contact with one pad. (This is an attempt to compensate for the different loading capacitance that drake crystals have compared to the 33pf loading for the crystal used in the 31732 - A.M) The following LO phase noise measurements were taken on the modified circuit:

Offset Freq. from Carrier/KHZ	0.5	1.0	2.0	5	10	20	50	100	200	300
L.O. Phase Noise dBc/KHZ	-80.17	-73.8	-73.5	-79.7	-86.3	-92.7	-100.5	-107.2	-110.3	-110.8

Fig.4 Local Oscillator phase noise measurement for the 31732

Power Supply Requirements

This converter is to be fed with 16 to 24 Volts on the center conductor of the cable attached to the F-connector. A 78M12A regulator IC is used internally to supply 12 Volts. This regulator requires nearly 14 Volts to regulate correctly and have the 12 Volt output required by the converter. The 13.6 volt supply voltage inserted onto the center conductor by many radios to power LNAs will not provide the correct regulation and supply voltage after this regulator, especially after voltage drop through a long coaxial cable. You may find that the converter works well enough, but noise and stability problems could result. (A suitable low volt drop 12V regulator is being researched as a replacement - A.M)

Note: This page is just a copy from "[WCOY prototype page](#)".
I've transfered on my Web in order to help anyone interested for this, since the page does not longer exist into WCOY's Web.

HTML Web-creation by Mak SV1BSX, May 2002
<http://www.qsl.net/sv1bsx>