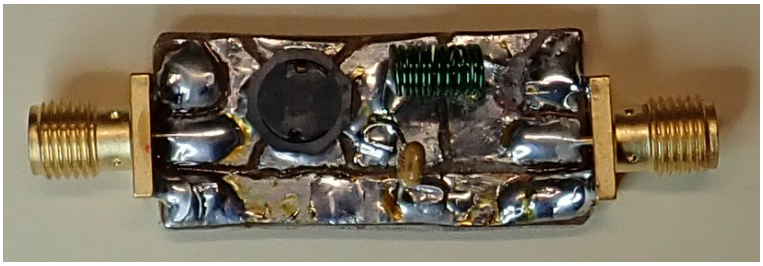
Board cxxe001
2020-12-22
prs DD AF4 (filter)
2020 ipro 1222v15a



Update 2020-12-22.

This board (cxxe01) is a version of David Deane's TRO-2 AF4 section. [1] It's supposed to act as a low pass filter to allow AF to pass from the AF generation section of the board to the RF section without allowing RF to run back into the AF section.

History – The cxxe01 board was originally made in 2017 (2017 ipro 1125v18a). Later in 2017 it was included in the !600-a3 tx2m board. In 2020 that board was taken apart. Then the cxxe001 was altered (2020 ipro 1222v15a). The female rectangular headers were replaced by SMA connector.

1 Experiment 2020-12-22.

This was the first experiment since the board was altered to add the SMA connectors. The HP function generator (50 MHz bandwidth) was hooked up to the input. It put out a ±2V sine wave. A 980 kΩ resistor was used as a load at the output. Two tests were run. For one, the function generator output was measured when it went directly into the load. For the other, the cxxe001 was inserted between the FG and the load.

The cxxe001 needs to block RF in the range of 146 MHz to 148 MHz. Unfortunately I don't have a good FG that will go that high. [2] The HP has a bandwidth of 50 MHz.

[1] David Deane (DD), G3ZOI. His TRO-2 is a 2m ARDF transmitter.

[2] 2020-12-23. I currently only have one function generator that can go up as high as needed. It's the TinySA spectrum analyzer which can be put into a signal generator mode. But I'm not sure it would really work. I also have some of my ICS-525 boards which can go that high. Again though, it's not a real signal generator and the output may interact strangely with the board.

2 Figures and tables.

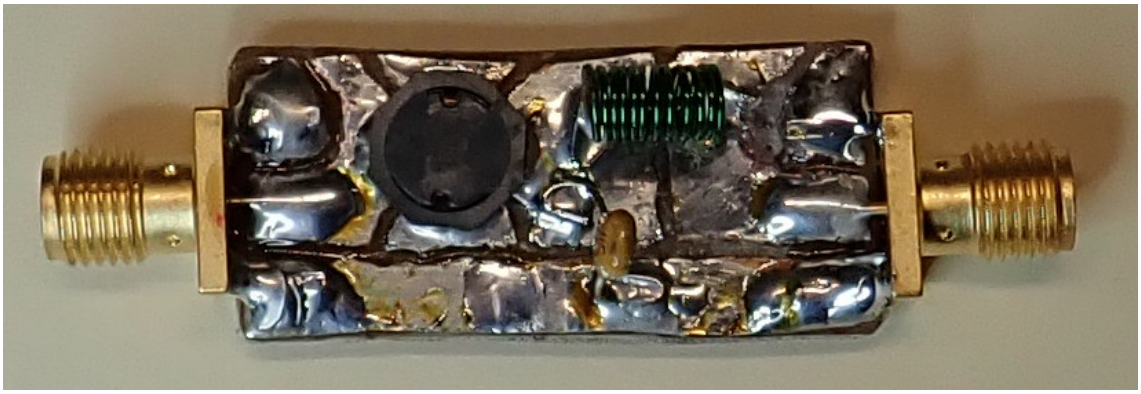


Figure 1: The cxxe001 board front. The input is at left, the output at right. In the circuit, the board should allow AF to go rightward while stopping RF from going in the other direction.

Table 1: Component values I used. The reference numbers are from DD's TRO-2v6 and prefixed with dd.

Ref.	value	notes
dd-RFC3	1.2 uH	At input. !632. Ferrite.
dd-C7	10 nF	!413.
dd-RFC2	air-core	At output. 12 turn, AWG 26 magnet wire, ID 3 mm.
connectors	SMA	!626.

- dd-RFC3: Wurth Electronics Inc. 4.6 A. Self resonant frequency, 150 MHz.
- dd-RFC2: DD has it labeled as "12T/3/0.5". The magnet wire I used was !701-26ga.
- SMA: I used the !626 instead of the cheaper !1072 because the !626 is wider and has longer pins. The board is only one sided copper. So the wider longer-pin SMA resulted in a better mechanical connection.

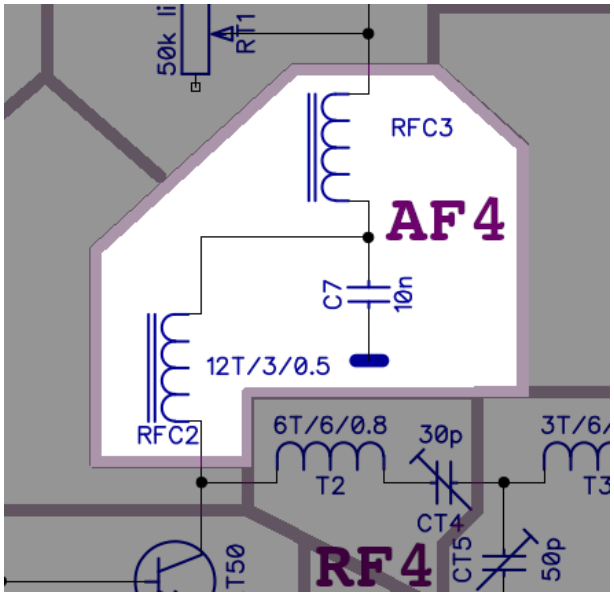


Figure 2: Schematic section from the DD TRO-2v6 transmitter.

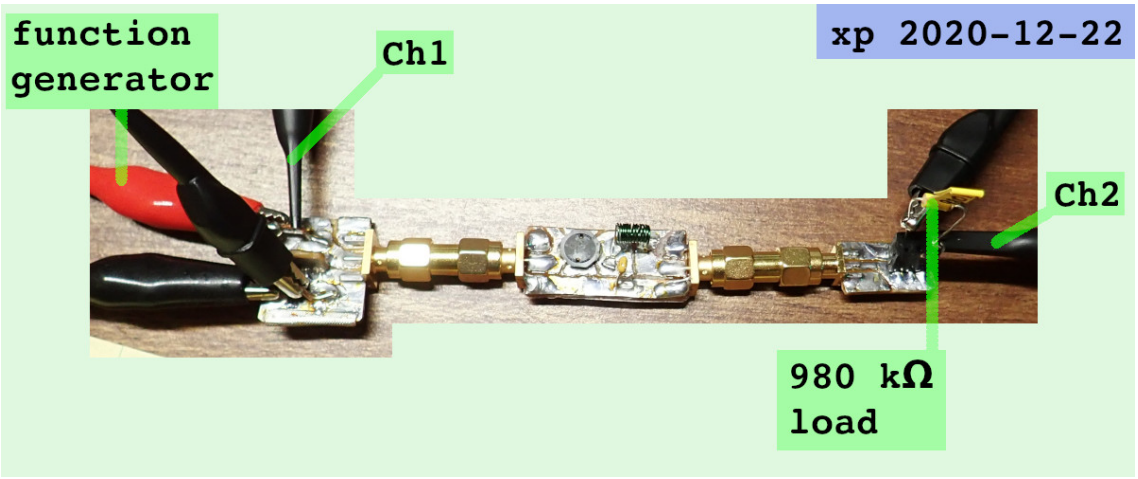


Figure 3: Xp 2020-12-22 setup.

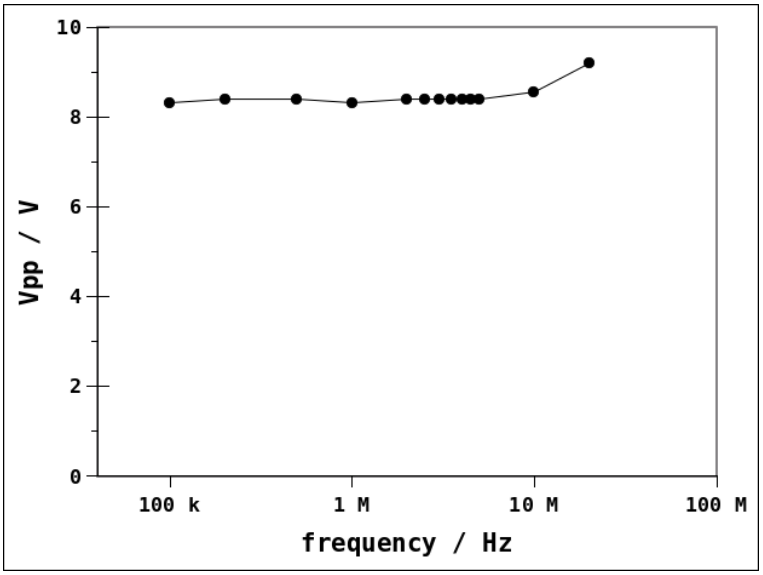


Figure 4: Xp-1222. Function generator response directly into a 980 kΩ load. The output Vpp of about 8 V makes sense. The function generator was set to a sine wave of ±2 V. That's a Vpp of 4 V. The function generator has an output impedance of 50 Ω. Going into the 980 kΩ load, the Vpp should be about twice that it would have going into 50 Ω. The FG has a bandwidth of 50 MHz. The highest frequency tested was 20 MHz. The slight increase at 20 MHz is a bit strange. I would expect Vpp to go down as the frequency approaches the bandwidth of the FG. For this part, I did have Ch1 and Ch2 both hooked up. But I didn't record Ch2 as it alway showed exactly the same as Ch1, which makes total sense.

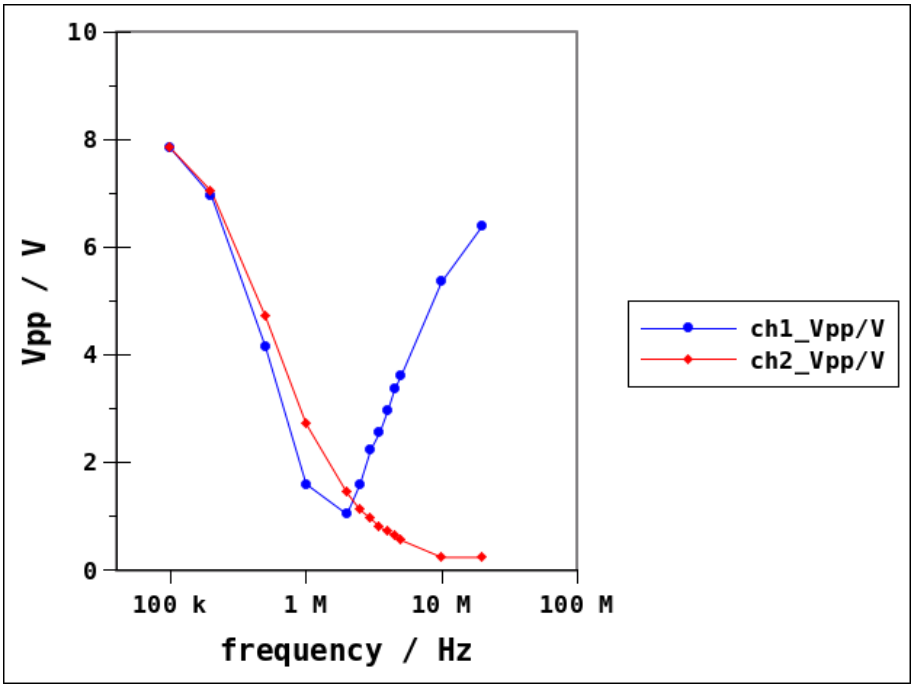


Figure 5: Xp-1222. Vpp. Ch1 is the input, Ch2 the output. I remember that at low frequency, the input and output waves had the same phase. In my hand notes, the 2 MHz point is marked as being shifted 180°. I can't remember and didn't write down what the phase relation was at higher frequencies.

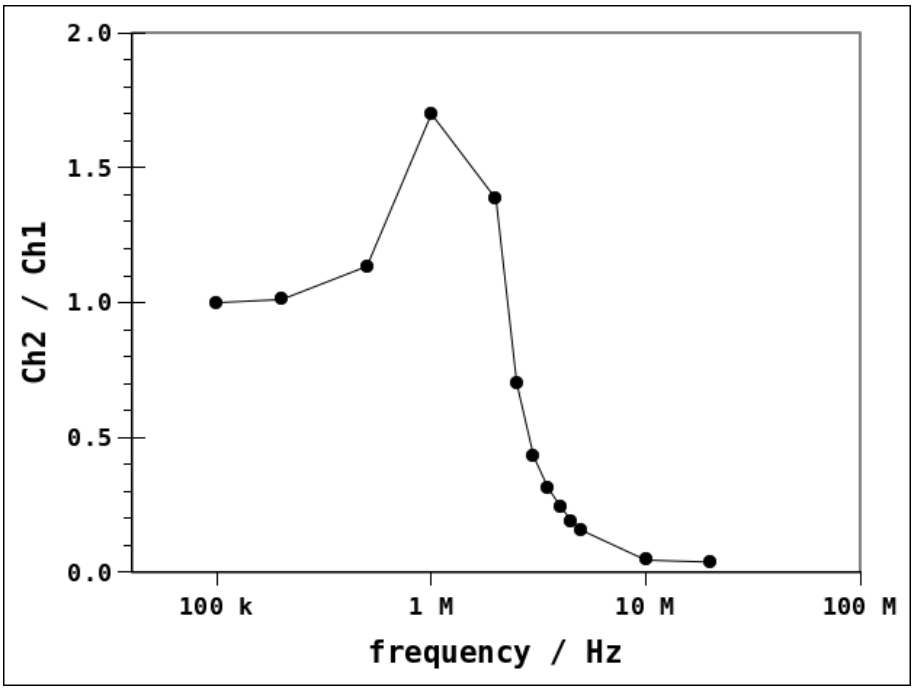


Figure 6: Xp-1222. Ch2/Ch1. If the Ch2 (ouput) voltage rises above the Ch1 voltage, I think the board must be acting as a transformer. If so, the current at the board input must be higher than the current at the board output. I guess this makes sense if the board looks like a low impedance to the function generator. At the output of the board there is a 980 kΩ resistor, which is pretty high impedance.

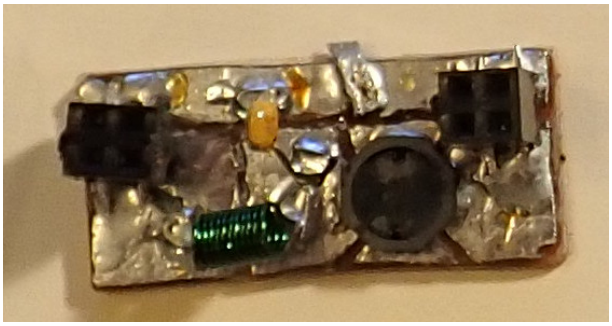


Figure 7: Old version of the board (2017). It has the female rectangular headers instead of SMA. Strange that I took this picture with the input at left.