W1GHZ Transverters – Updates and Notes 2026

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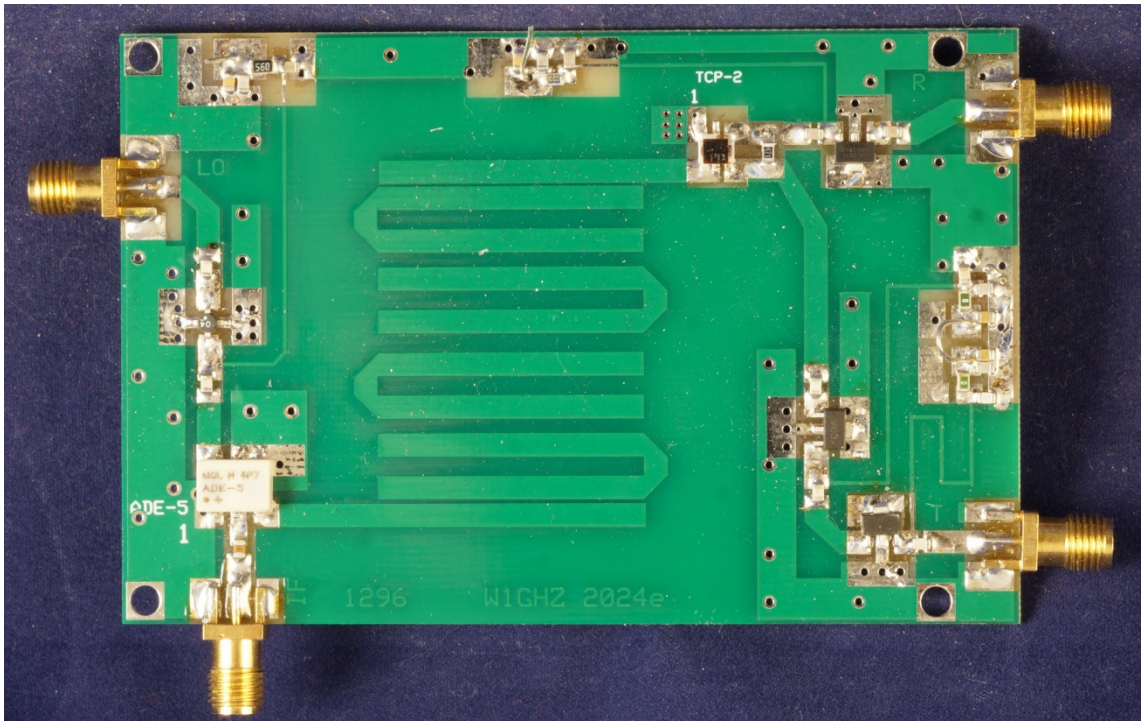
Printed Filters

In 2024, I found that the center frequencies of all the printed filters had moved, probably because the PCB house had shifted to material with a slightly higher dielectric constant, lowering the center frequency. I modified the artwork for all the trnasverter and LO printed filters so that they are centered and allow for the range of manufacturing variations in future. I now also check each batch of boards. If you have a PC board vintage 2020 to 2024 with printed filters, I'd be happy to replace it.

The 1296 transverter filter frequency is moved up to center around 1296 to 1300 MHz rather than the traditional wider band down to 1260 or lower. If someone needs boards for the lower range, I may have a few left.

1296 Tranverter

In addition to moving the center frequency, I experimented with some other MMICs. The receive amplifier, A1, needs more gain to overcome filter and mixer loss. An ADL5611 provides more gain and a reasonable noise figure, reducing the transverter NF to under 5 dB.



1296 Transverter with 2024e PCB

Since many builders now opt for an LO synthesizer, such as the digiLO, rather than the LO PCB, I tested with no LO amplifier, driving the mixer directly. A zero-ohm chip resistor, 1206 size, bridges the amplifier pads. I used an inexpensive ADF4351 synthesizer for the LO source. Like many synthesizers, it doesn't have adequate output, so I added an ERA-1 amplifier and a step attenuator to get the desired +7 dBm LO drive to the mixer.

With a GVA-63 for A2 and GVA-84 for A3, good output power is available – the 1 dB compression point is abou +15 dBm with -6 dBm of IF input, and a bit more IF power easily yields +17 dBm, 50 milliwatts output.

While checking for unwanted output, I found high levels of LO harmonics. I traced these back to the ADF4351 synthesizer , which has a third harmonic output only 10 dB down from the 1152 MHz – that's pretty much the definition of the spectrum of a square wave. I added a 1500 MHz low-pass filter after the synthesizer, removing all harmonics to at least 50 dB down, so the LO signal is now a sine wave.

After adjusting the attenuator slightly for + 7 dBm LO drive, the transmit performance was just about identical. (Note: double-balanced mixers are said to prefer square-wave LO.). Image and harmonic frequencies are down 30 dB or so, and there is still LO leakage at about -7 dBm regardless of output level. A real filter is required if you are adding any serious power amplification.

The LO level is not very critical. The mixer is rated for LO levels of +4 to +10 dBm, and it works fine down to about 0 dBm with about 1 dB reduction in output power, with either sine wave or square wave LO.

Finally, I added a MAR-4 LO amplifier for A1 and drove it directly with the synthesizer, with no significant chamge in performance.

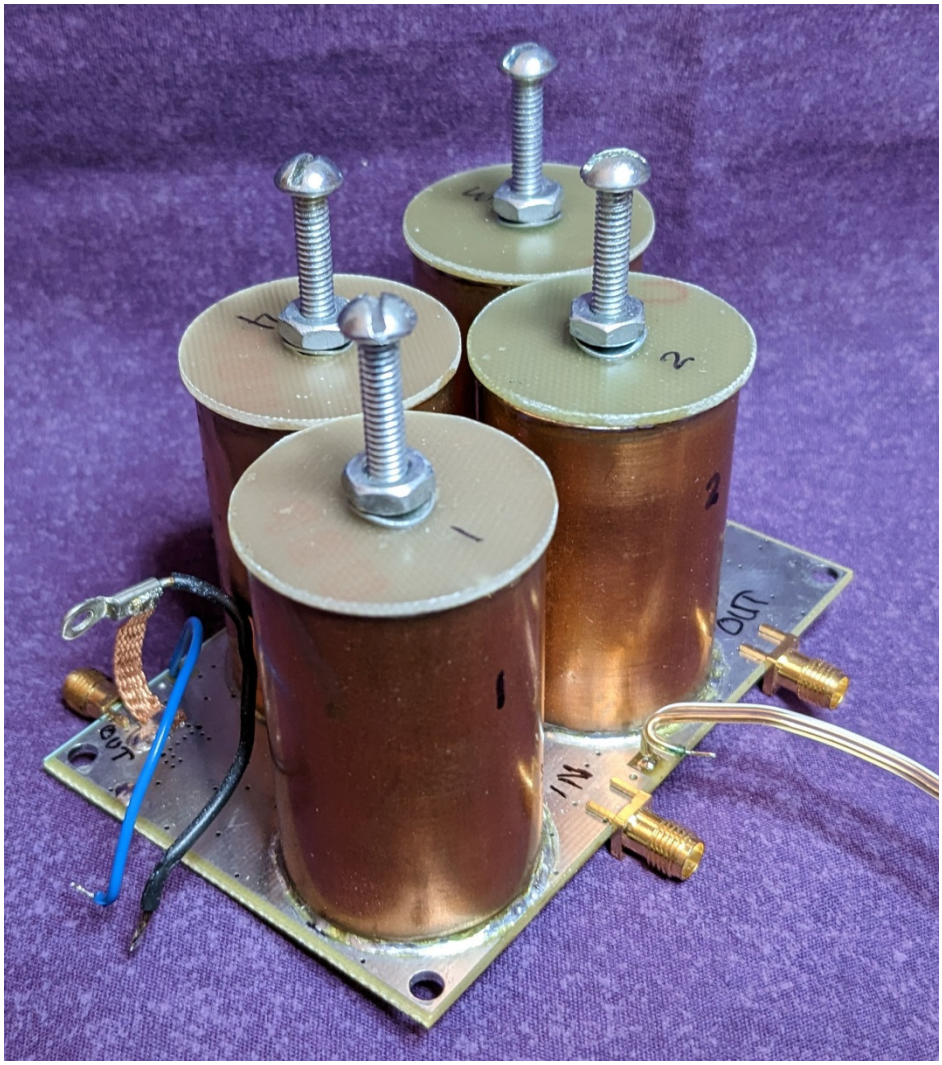
902

Other than the change to the printed filter, no changes are needed. A synthesizer will work fine for the LO.

2304

The newer Mark2 transverter for 2304 and 3456 works well. A synthesizer will work fine for the LO.

The Mark2 PC board can be used for 1296 and possibly 902 by making the pipe caps taller and using longer screws. Here is how KC0IYT did it:



KC0IYT pipecap transverter for 1296 MHz on 2304 PCB

See https://www.newsvhf.com/conf2023/2023papers/MUD23/KC0IYT-Pipe_Coupler_Filters_for_1296MHz.pdf

3400

The Mark2 transverter works fine at 3400 MHz, needing only about one more turn of the pipe-cap tuning screws to move down from 3456. The LO PCB and multiplier won't provide the new LO frequency, so a synthesizer is recommended, and won't need upside-down tuning.

5760

The 5760 transverter rev B works fine. A synthesizer is the recommended LO source. A MAX2870 works up to 6 GHz, but the less expensive ADF4351 only works to 4 GHz, so the multiplier board would be needed.

Multiplier and Personal Beacon Boards

First, make sure you review the 2026 update:
https://www.w1ghz.org/xvtr/Personal_Beacon_Update_2026.pdf

5760: The multiplier board might be improved by the MMICs. The ERA-2 first stage is probably best as a multiplier, but the two output stages could use GVA-63 like the rev B transverter for more gain as a 5760 LO, operating at 5 volts. At lower frequencies, this would be too much gain. One additional update – the bias resistors, R1,2,3 should be 110 ohms.

10 GHz x2,3,4: LO multiplier board: the first stage, A1, would probably multiply better with and ERA-2; same bias resistors as ERA-1. In most applications, the ERA-1 is probably adequate rather than the obsolete NLB-310.

10 GHz x9 multiplier or Personal Beacon: The ERA-2 is good for A1,2, & 3, with bias resistor R4 changed to 110 ohms. For A4 & A5, the ERA-1 is probably adequate rather than the obsolete NLB-310.

For all MMIC multipliers, performance can be affected when driven with high harmonic levels, sometimes reducing output power. Many of the common synthesizer boards produce very high harmonic content. If you are not getting expected performance, try a simple low-pass filter.

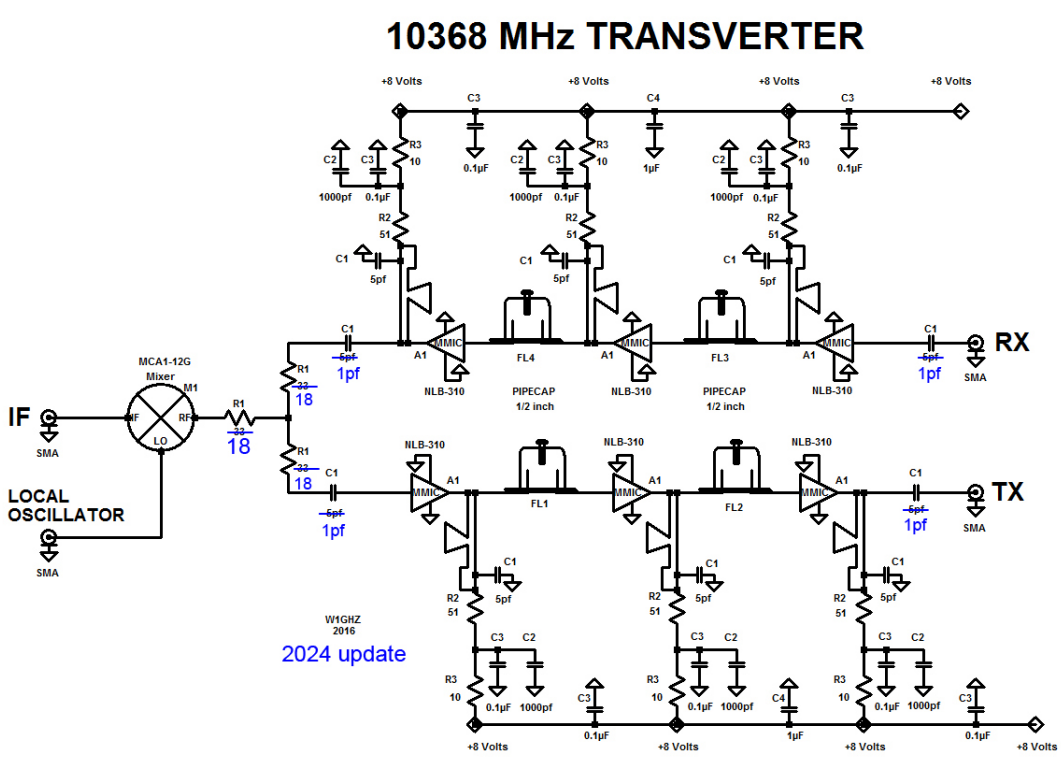
10 GHz Transverter

The 10 GHz transverter has been built and put on the air by a number of hams, and we have learned a bit thanks to their suggestions. A few component changes are suggested as shown in the updated schematic below:

- The resistors in the power divider, R1, are changed from 33 ohms to 18 ohms. This provides a better 50-ohm match for the mixer, and reduces loss a bit.
- The series blocking capacitors, C1, are changed from 5 pf to the 1 pf capacitor suggested in the parts list below. This improves output by perhaps a dB, and probably provides similar receive improvement. More expensive 1 pf ATC capacitors might even be slightly better. The other C1 capacitors, in the bypassing area, are less critical, but the new 1 pf capacitors may also be used if you are ordering parts anyway.

The NLB-310 MMICs are now obsolete and hard to find. As of January 2025, units from Alibaba and ebay sellers sold in lots of 10 test as genuine. Alternatives like the NBB-310 are more expensive.

One suggestion for the RX input stage, A1, only – the GVA-123 can provide a bit more gain and a bit lower noise figure. It doesn't produce as much power as an NLB-310 and is perhaps too expensive to use in all stages. It operates at 5 volts – use the same bias resistors.



Updated schematic with 2024 changes

Suggested Parts List for 10 GHz Transverter and Multiplier Boards

Designator	Value	Mouser #
C1	1 pf	581-06035U1R0BAT2A
C2	1000 pf	80-C0805C102K2GEAUTO
C3	0.1 uf	80-C0805C104K1REAULR
C4	1 uf	581-KGM21AR71E105KL
R1	18	660-RK73B2ATTD180J
R2	51	660-RK73B2ATTDD510J
R3	10	660-RK73B2ATTDD100J
A1	NLB-310	772-NLB-310 No longer available
M1	MCA1-12G+	139-MCA1-12G+
SMA	12.4 GHz	960-EMPCB.SMAFSTJBHT

Notes:

1. The NLB-310 MMICs are obsolete. As of January 2025, units from Alibaba and ebay sellers sold in lots of 10 test as genuine.
2. The SMD capacitors and resistors are much cheaper in quantity. Order at least 10 and have some spares. You will probably lose some of these small parts.
3. The SMA on the IF port can be a cheap Chinese one. The cheap ones work fine up to 5760, but have higher loss at 10 GHz.

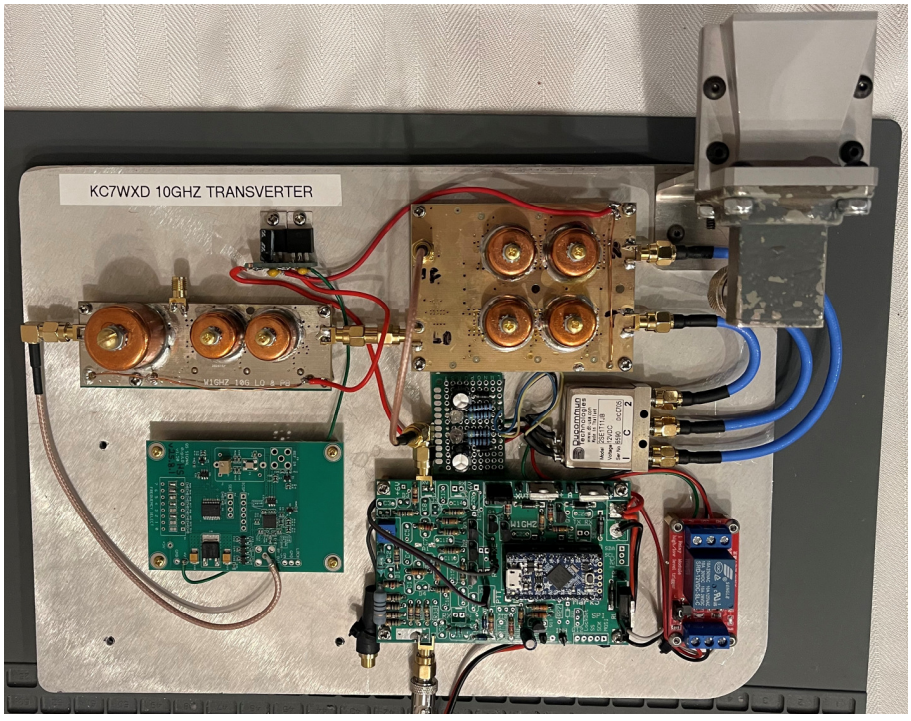
SMA Connectors:

Inexpensive edge-mount SMA connectors from Amazon and ebay work fine up to 6 GHz, but not at 10 GHz. A bag of 100 can be found for around $20 and will last for many projects. Right-angle connectors are not recommended for microwave use unless from reputable manufacturers and should generally be avoided; short pieces of semi-rigid cable are preferable.

Don't use cheap coax adapters!

10 GHz System

In January 2026, Jacob Graham, KC7WXD, completed his first 10 GHz system using these boards and made his first QSO , which you can see at https://www.youtube.com/watch?v=W90v19ZASBo. He sent a photo of the system:



KC7WXD 10 GHz system – Transverter driven by x9 LO multiplier from digiLO. All controlled by Mark5 sequencer at bottom.

Essential Tremors (shaky hands)

Some hams tell me that they can't homebrew anymore because their hands are shaky. So do mine – my doctor says it is Essential Tremors, not Parkinsons, so I can continue. I find that working under a microscope or magnifier with good lighting makes it possible to work with tweezers and tiny SMD parts. I think the optical feedback through the brain steadies my hands. Sometimes they are shaky at first, but just sitting still and looking at the tweezer tip slows it down. No guarantees, but give it a try.

I've also heard that there are new medications can help.

Summary

Hundreds of hams have successfully built and used these transverters, including on EME. Go for it.