W5HN

North Texas NTMS Microwave Society

Recent Constructional Projects 2013

December 2013

Dave Robinson WW2R

W5HN

Topics

North Texas NTMS Microwave Society

TV Tuner 2GHz Spectrum Analyser

TF3LJ Teensy Power Meter

PHSNA (Poor Hams Scalar Network Analyser)

477kHz loop antenna

70MHz Transverter

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TV Tuner 2GHz Spectrum Analyser

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2GHz Spectrum Analyser

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Design written up by Stephen Ong

Beaglebone Black Computer board (HDMI output, USB, Ethernet)

RTL2832 USB TV tuner (2MHz display width)

Original had LCD touch screen (unobtanium, $150)

I used mouse, keyboard and 7” VGA display kit

Cost ~$120

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BEAGLEBONE BLACK

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OVERALL

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7” LCD DISPLAY KIT

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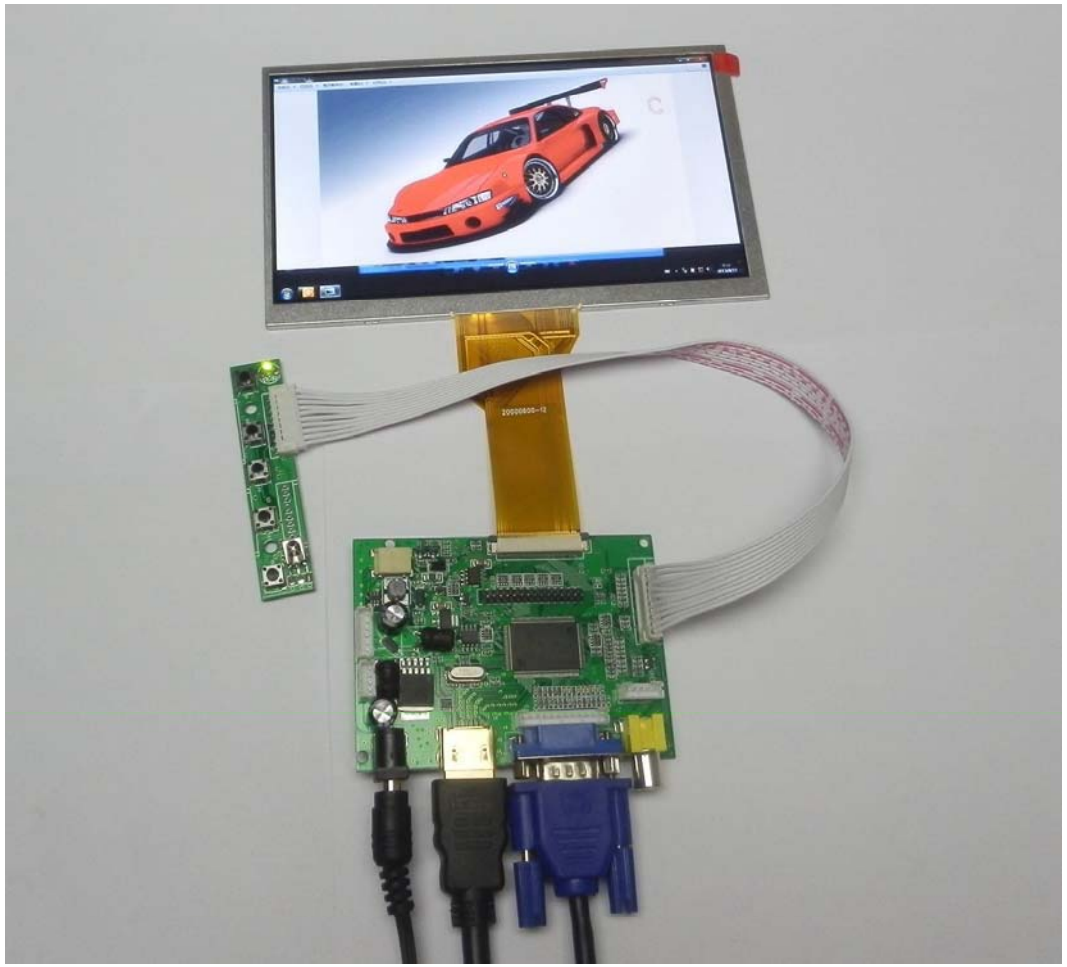

600x480 Resolution
VGA, HDMI, comp Inputs
5-22V
$40 off EBAY

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Display innards

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TF3LJ Power Meter

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TF3LJ POWER METER

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100kHz -500MHz

AD8307 Power Detector -70dBm to +13dBm

Teensy++ Controller

LCD Display

Controllable/Readable by Serial connection

Total Cost $75

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TF3LJ POWER METER

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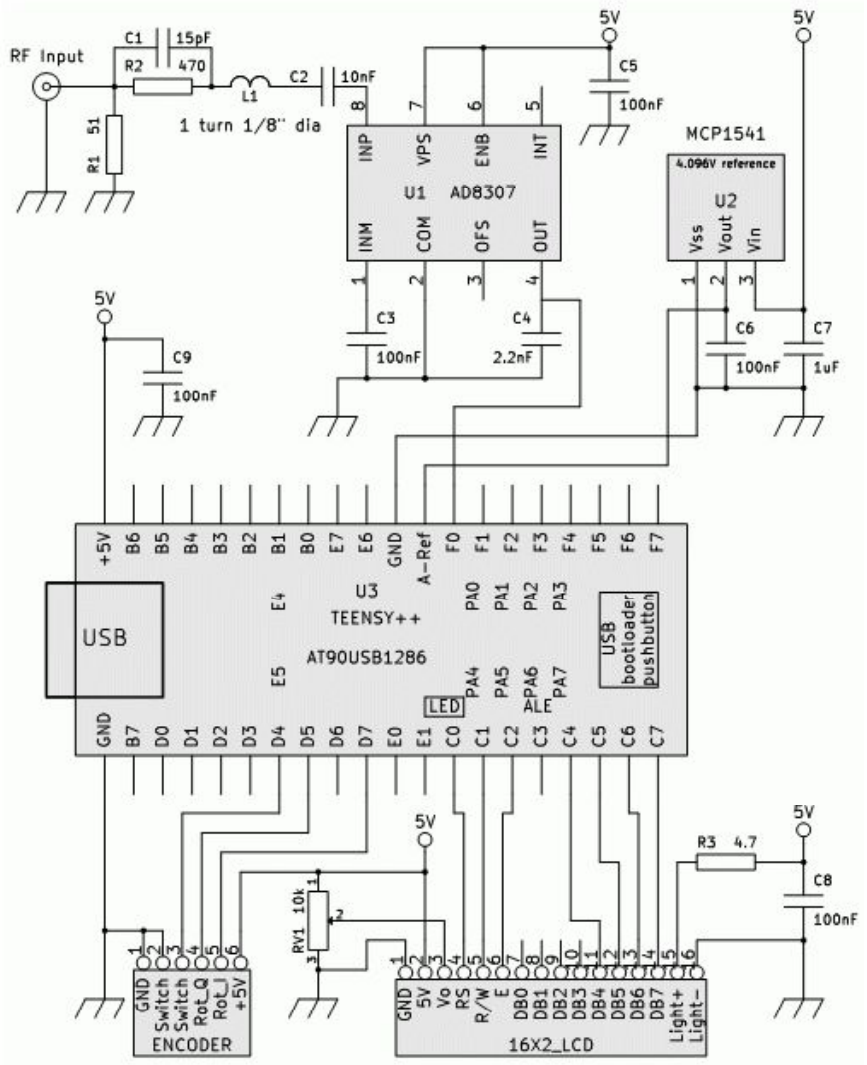

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TF3LJ EXTERNAL

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TF3LJ INSIDE

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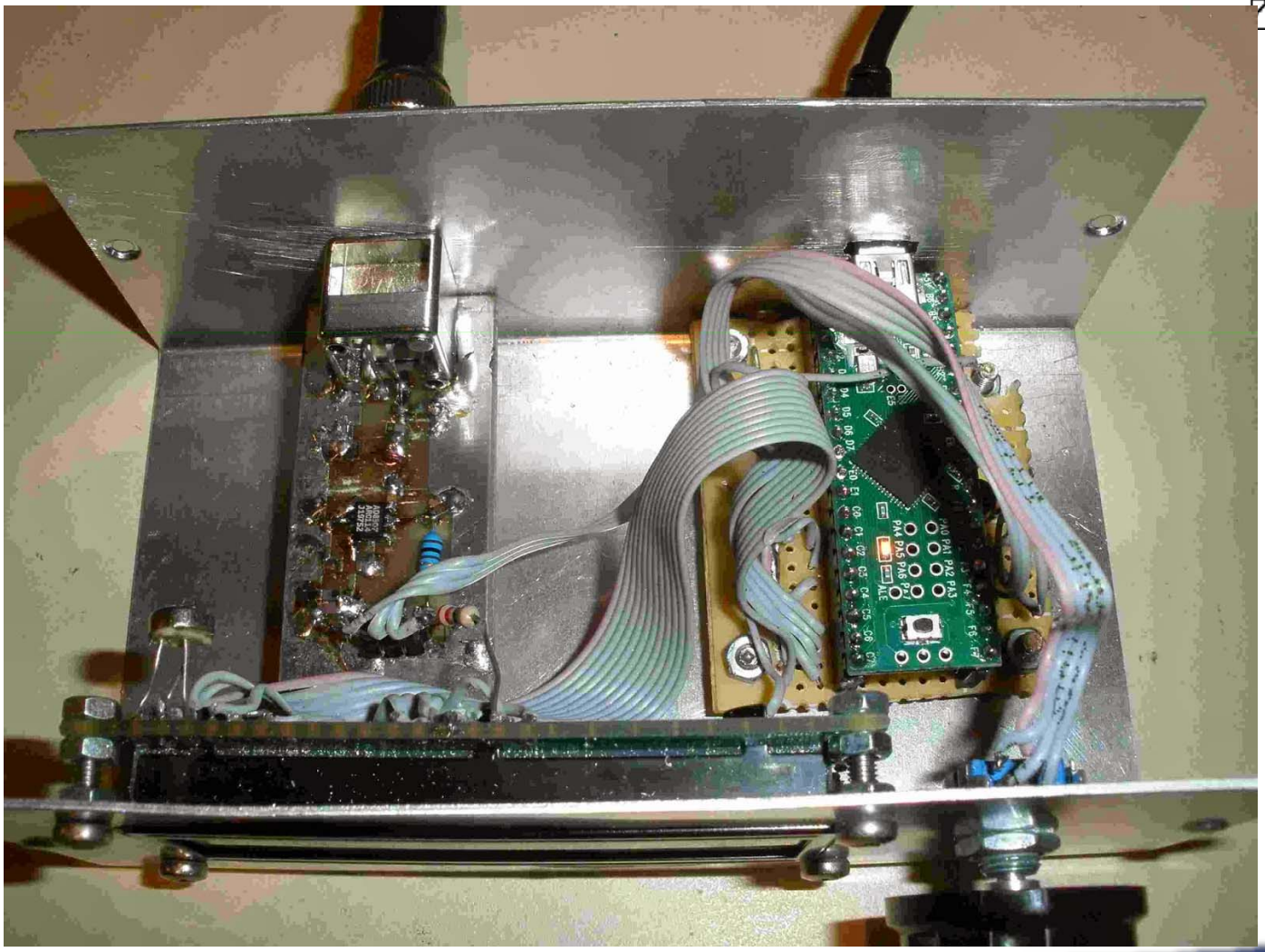

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Serial Output

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Continuous or “on demand” output

$ppoll produces an instantaneous power reading in the format: 1234.123456789012W

$pinst, $ppep and $pavg produce a reading of instantaneous, PEP or average eg: 87.9mW

$pinstdb, $ppepdb and $pavgdb produce a reading of instantaneous, PEP or average eg 19.4dBm

$plong produces a human readable message, example output: Power (inst, pep, avg) eg 10.3mW, 12.2mW, 10.4mW

$pcont will trigger continuous mode reporting. The format reported is the last one selected of the above

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PHSNA

(Poor Hams Scalar Network Analyser)

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PHSNA

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100kHz -35MHz

Scalar Network Analyser: Records Insertion loss/gain

$10 40MHz DDS Module

AD8307 Power Detector

Arduino Controller

Outputs data via serial text stream for plotting in Excel

Total Cost $75

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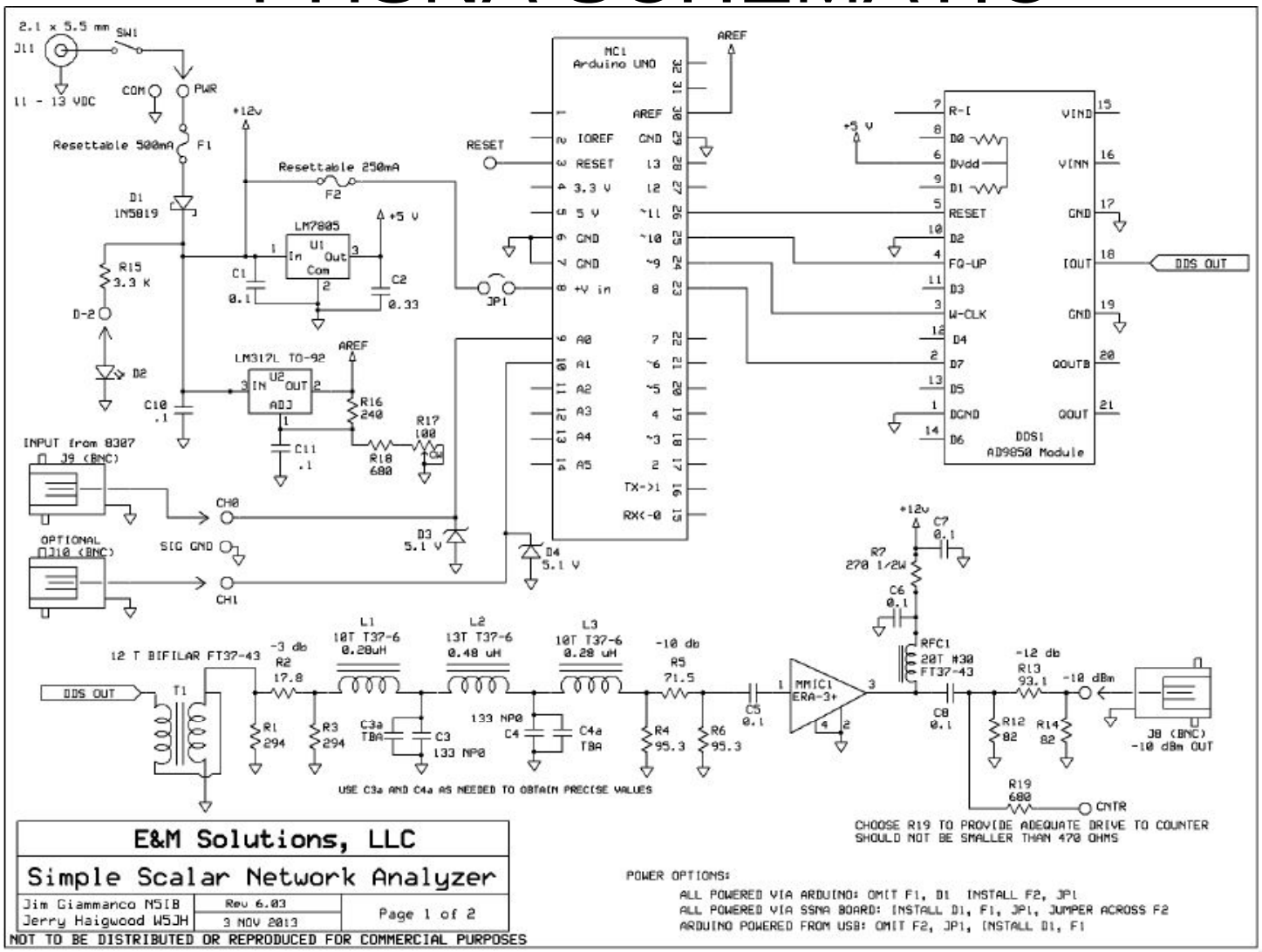
PHSNA SCHEMATIC



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DDS MODULE

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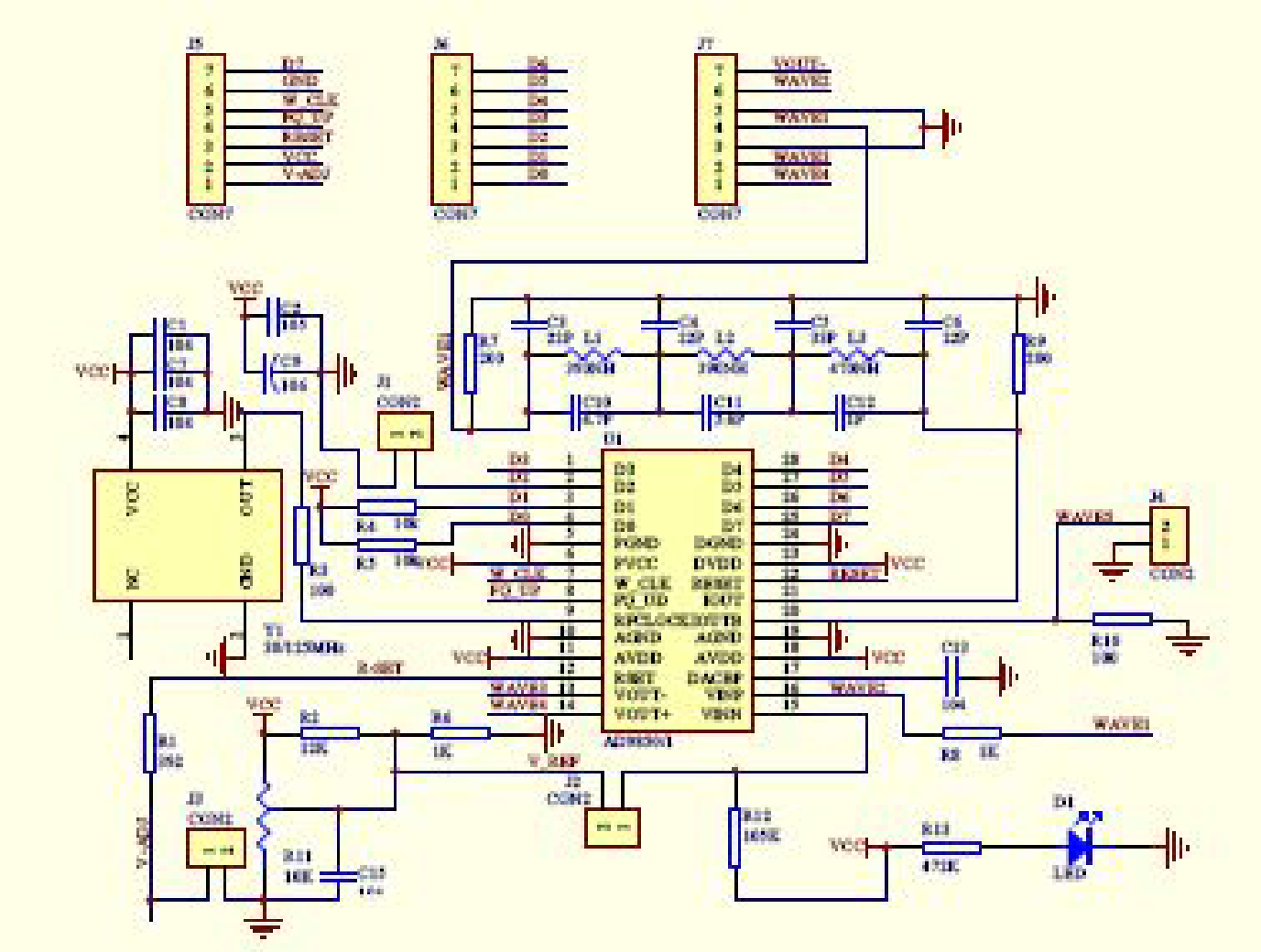

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PHSNA

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PHSNA

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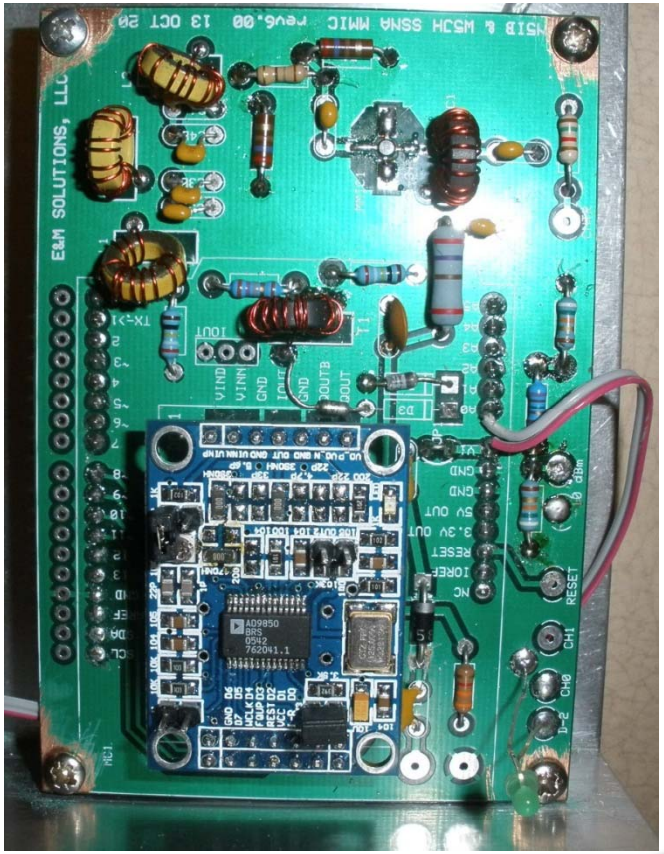

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Calibration RUN

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Connect Signal output to detector Input

Enter starting frequency, kHz:
Starting Frequency is: 17000.000 kHz
Enter ending frequency, kHz:
Ending Frequency is: 26000.000 kHz
Enter step size, Hz:
Step size is: 50000.0 Hz
Press ENTER to begin sweep

After sweep, press 'R' to re-run or any other key for menu

17000000.00, -0.77, 910 (Freq, dBm, A/D Count)
17050000.00, -0.77, 910
17100000.00, -0.77, 910……..
25950000.00, -2.61, 890
26000000.00, -2.61, 890

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Measurement RUN

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Connect Signal output to detector Input via Filter

Enter starting frequency, kHz:
Starting Frequency is: 17000.000 kHz
Enter ending frequency, kHz:
Ending Frequency is: 26000.000 kHz
Enter step size, Hz:
Step size is: 50000.0 Hz
Press ENTER to begin sweep

After sweep, press 'R' to re-run or any other key for menu

17000000.00, -59.45, 273
17050000.00, -59.17, 276
17100000.00, -58.99, 278……..
25950000.00, -57.98, 289
26000000.00, -58.25, 286

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Serial Output

Import into excel, calculate loss &plot

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FREQ	CAL(dBm)	FILTER(dBm)	DELTA(dB)
17000000	-0.77	-59.45	-58.68
17050000	-0.77	-59.17	-58.4
17100000	-0.77	-58.99	-58.22
17150000	-0.86	-58.62	-57.76
17200000	-0.86	-58.25	-57.39
17250000	-0.86	-57.98	-57.12
17300000	-0.86	-57.7	-56.84
17350000	-0.86	-57.42	-56.56
17400000	-0.86	-57.06	-56.2
17450000	-0.86	-56.78	-55.92
17500000	-0.86	-56.5	-55.64
17550000	-0.96	-56.13	-55.17
17600000	-0.96	-55.77	-54.81
26000000	-2.61	-58.25	-55.64

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Serial Output

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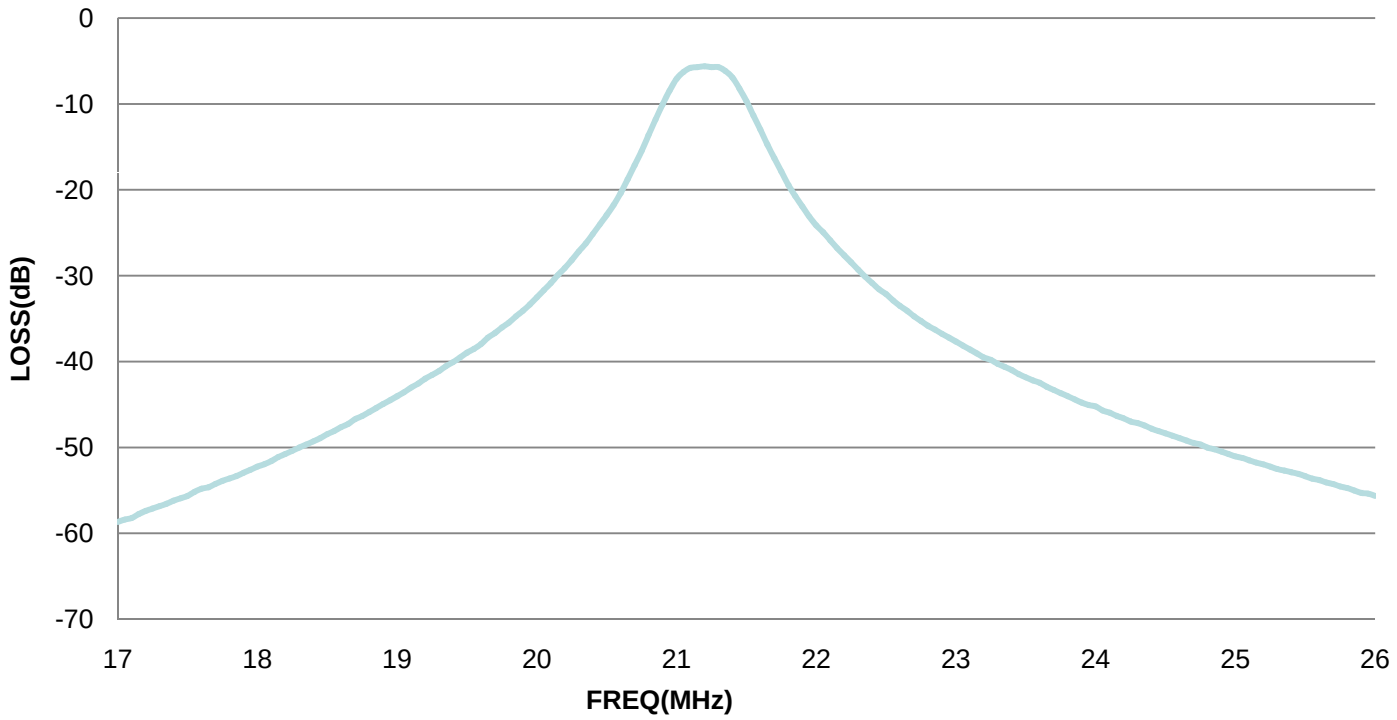
15m BPF



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477kHz loop Antenna

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477kHz loop

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Designed by WA1ZMS

Assembled with help of Bobs milling machine

Tuned to 477kHz with capacitor

Followed by a low noise opamp hi impedance to 50 ohm converter

Not great directivity but deep nulls off ends

Heard WE2XGR/6 in NY from south facing balcony

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477kHz Loop and Preamp

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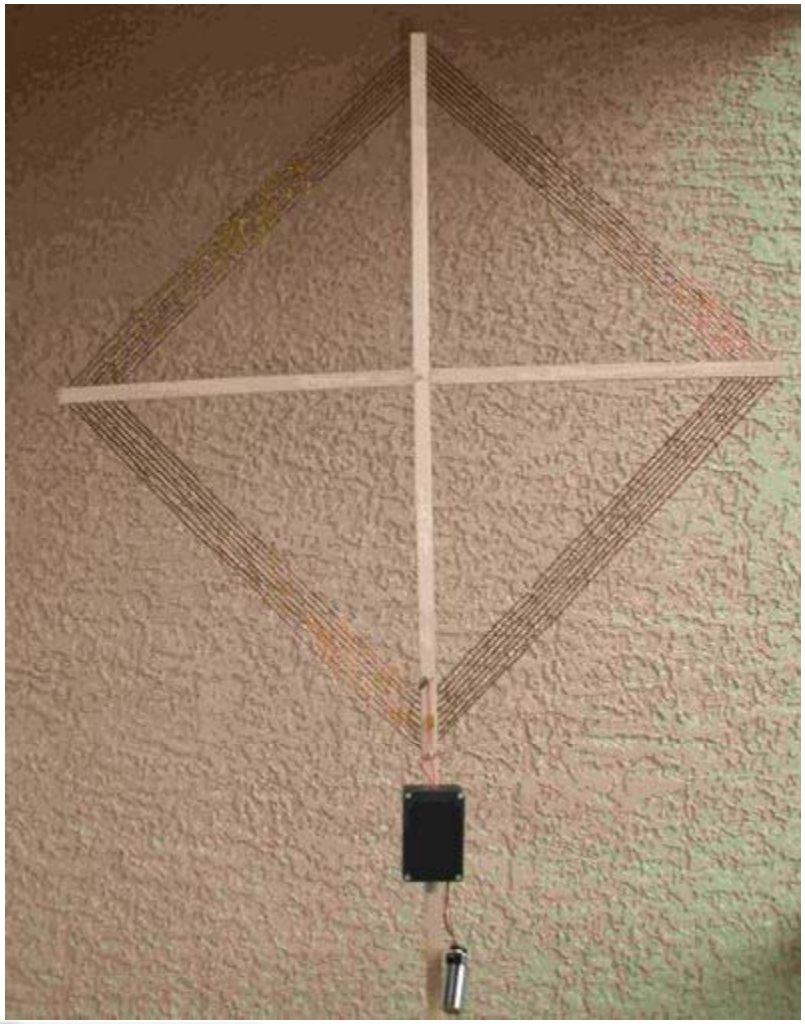

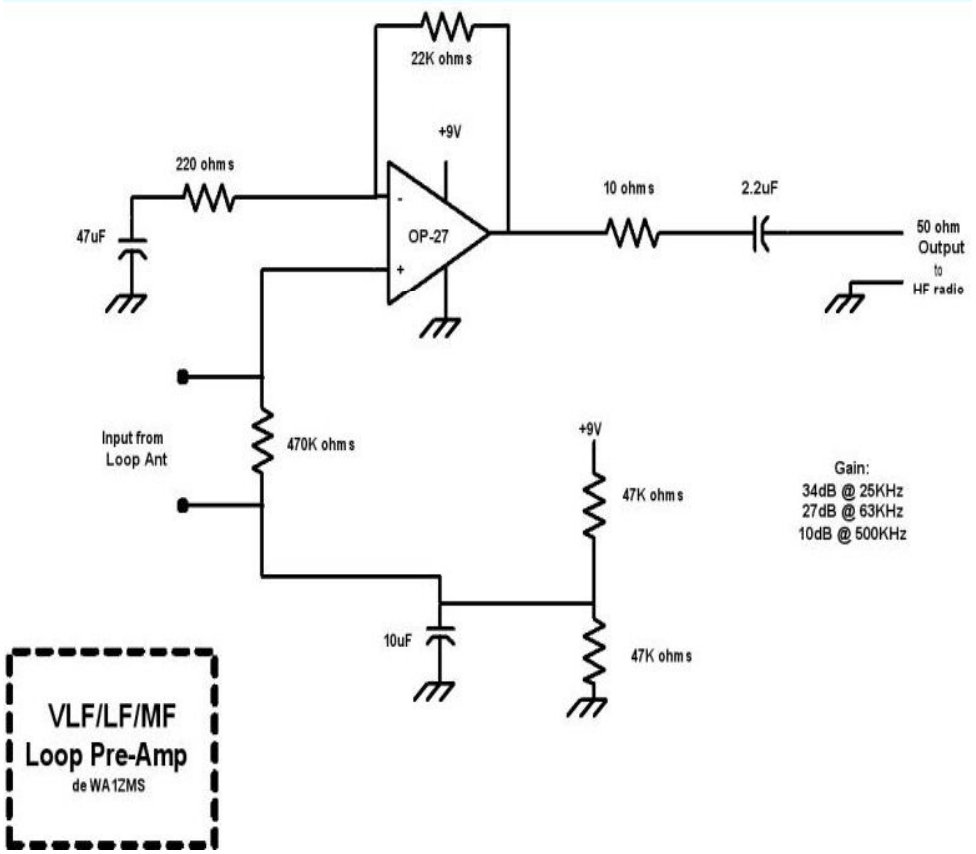

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70MHz Transverter

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70MHZ Transverter

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New design by G4DDK

70/28MHz

Single board 3.5dB NF 100mW output

Off board PA with 7W Power module

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70MHz Transverter

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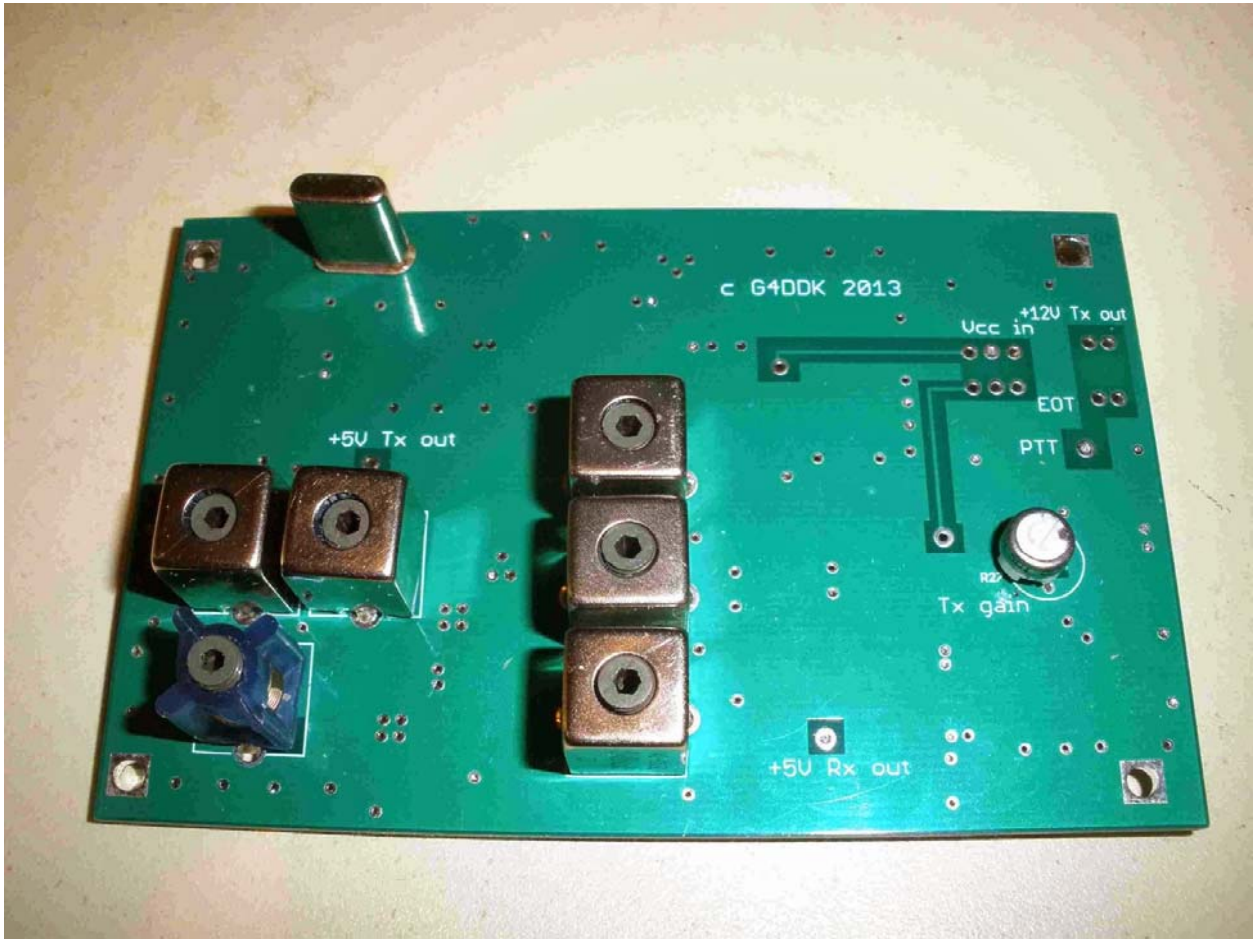

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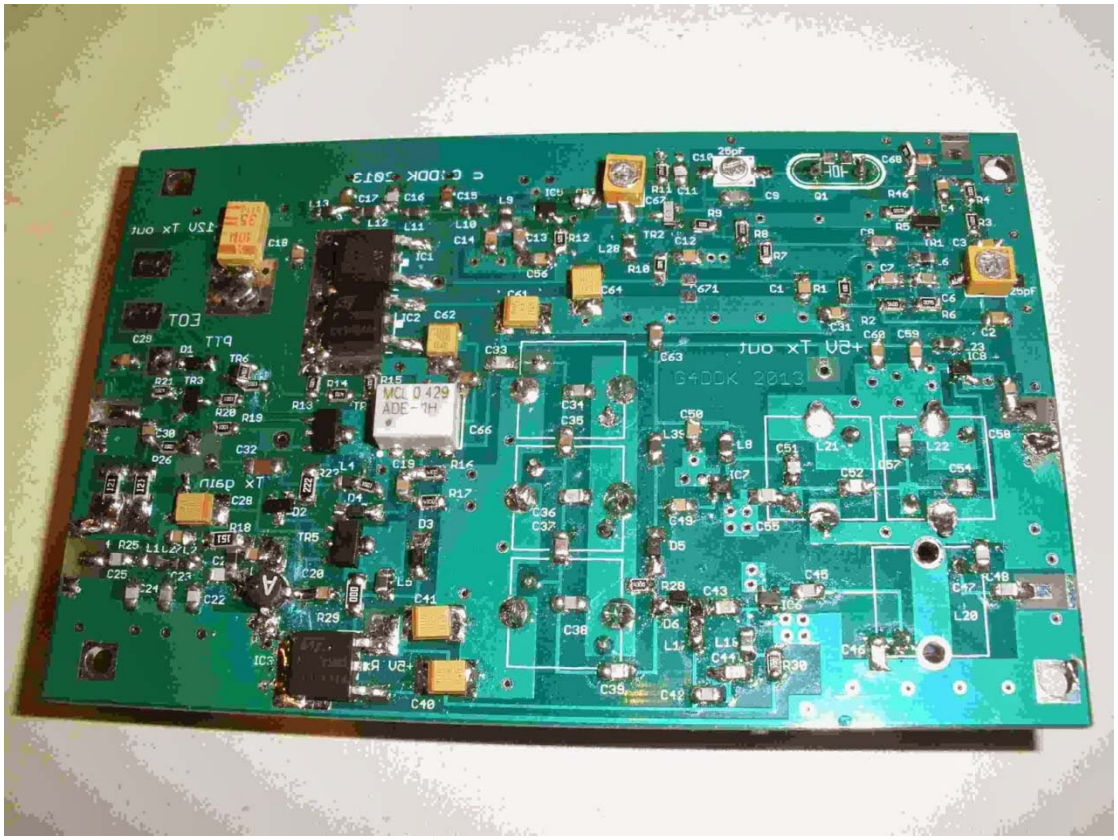

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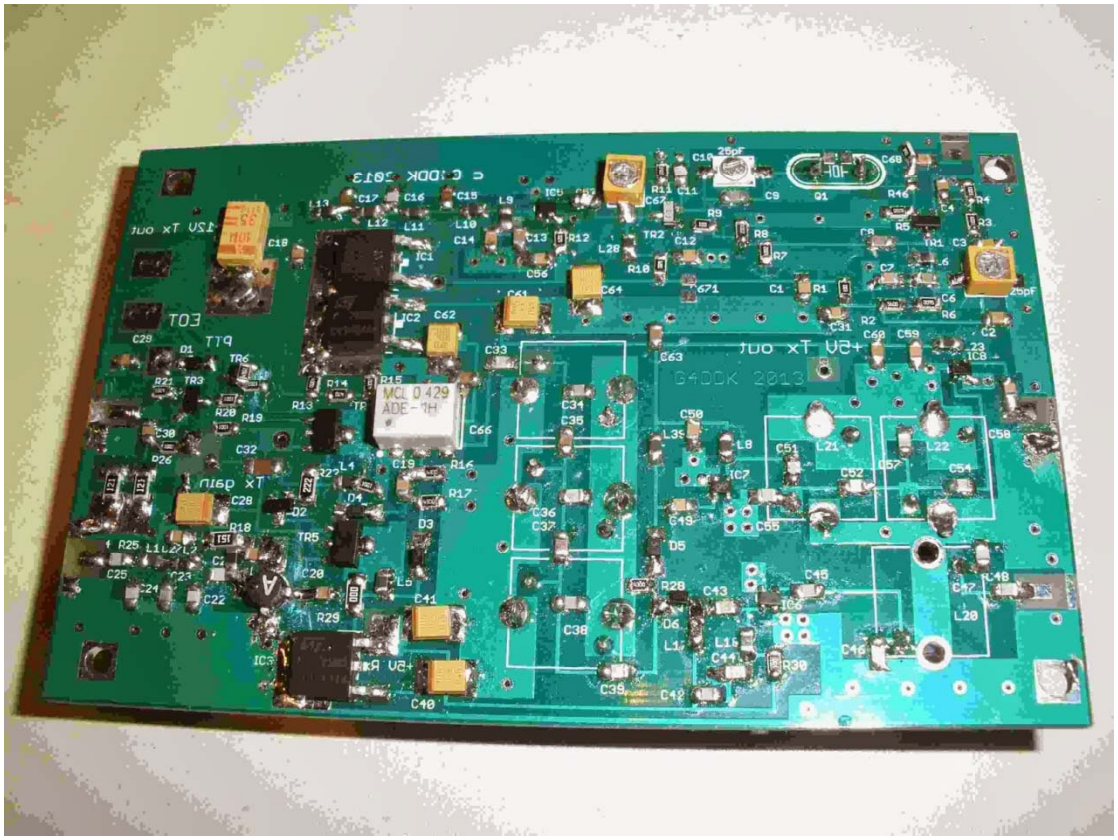
70MHz Transverter



144MHz and 477kHz version under development

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More Information

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- 2GHz TV Tuner spectrum analyser:http://robotics.ong.id.au/2013/08/25/viewrf-rtl-sdr-spectrum-analyzer-for-bbb-software/
- Beaglebone Black http://beagleboard.org/Products/BeagleBone%20Black
- TF3LJ Power /SWR meter: https://sites.google.com/site/lofturj
- Teensy++ SBC: www.pjrc.com
- Arduino: www.arduino.org
- PHSNA: groups.yahoo.com/PHSNA
- WW2R blog: http://g4fre.blogspot.com/
- WA1ZMS loop: http://www.500kc.com/WA1ZMS/
- 70 MHz Transverter http://g4ddk.com/4m%20transverter%20iss%201.1.pdf