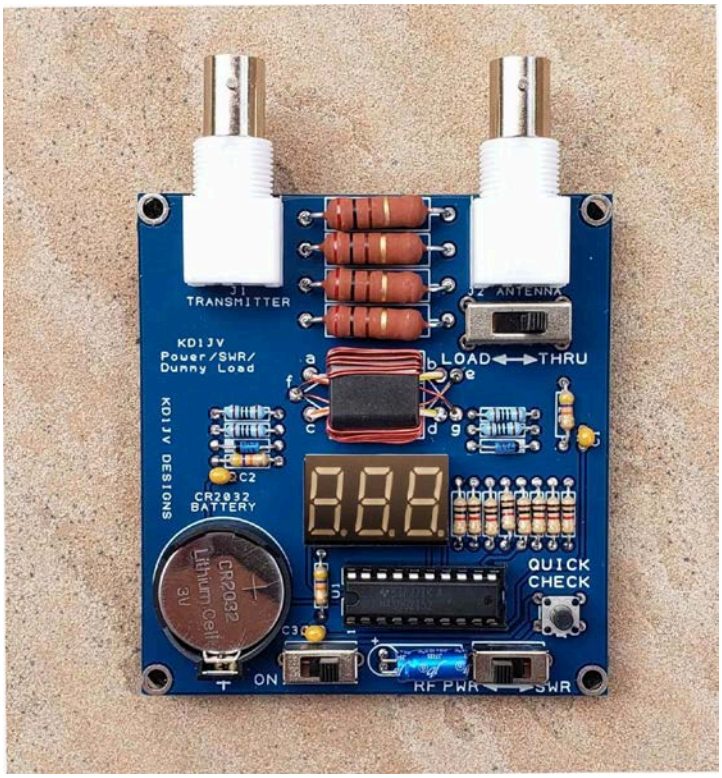
QRPBuilder
KD1JV Digital Power/SWR/Dummy Load

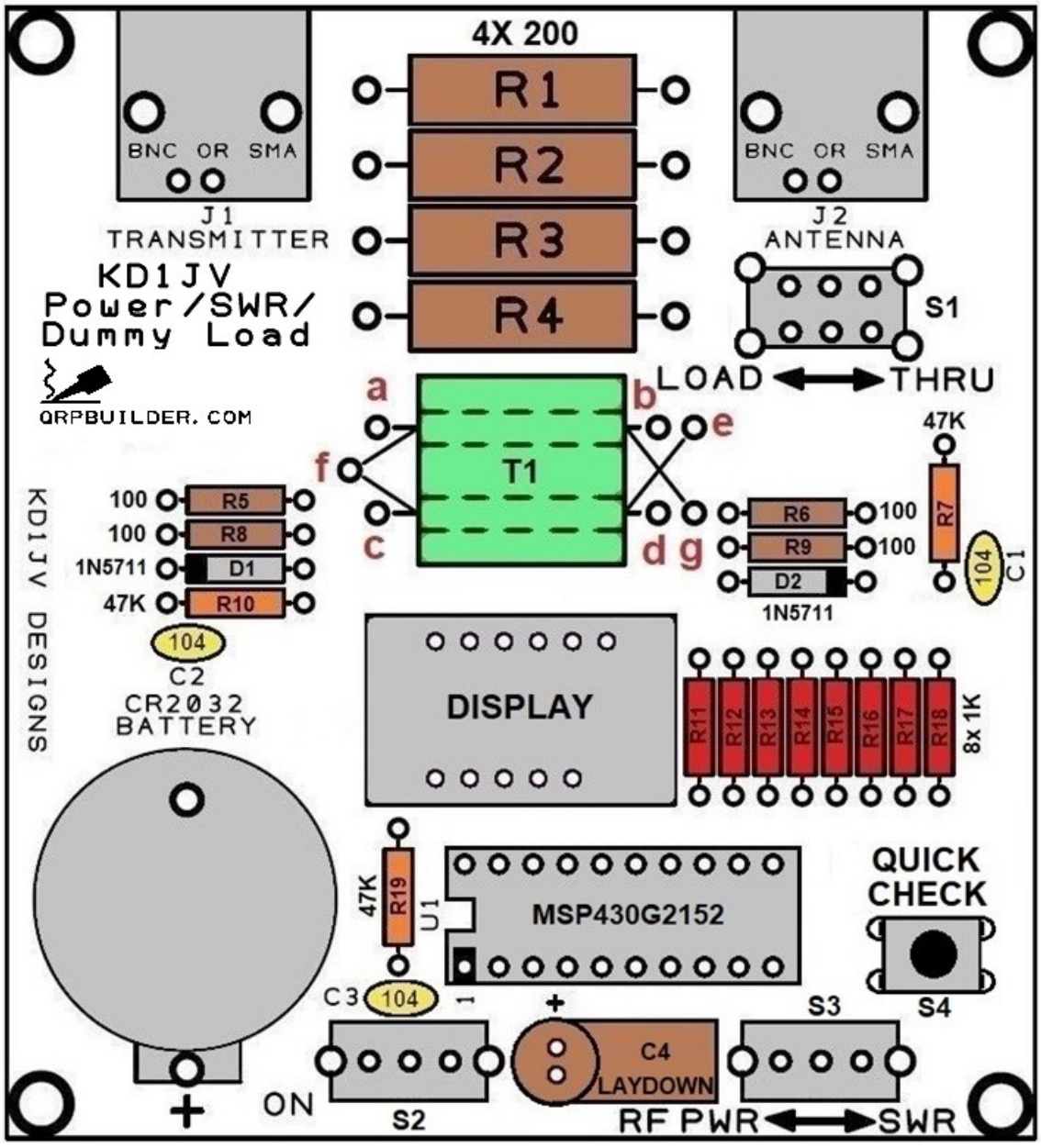


First, familiarize yourself with the parts and check for all the components. If a part is missing, please contact us and we will send one. To request a part, please use grpbuilder@gmail.com.

Parts List

1 – KD1JV Power/SWR/Dummy PCB
1 – U1, TI MSP430G2152 IC mpu
2 – D1,2, 1N5711, Schottky diode, glass w/band
1 – 3 digit, 7 segment display, w/red filter plastic
4 – R1,2,3,4, 200 ohm, 3W resistors (red-black-brown-gold)
4 – R5,6,8,9, 100 ohm, 1/4W 1% resistors, blue body, (brown-black-black-black-brown)
3 – R7,10,19, 47K, 1/4W resistors (yellow-violet-orange-gold)
8 – R11,12,13,14,15,16,17,18, 1K, 1/4W resistor (brown-black-red-gold)
3 – C1,2,3, 100nF, (.1uF) capacitor, marked (104)
1 – C4, 100uF 16V electrolytic capacitor, long lead is positive
1 - 20 pin dip socket
1 – CR2032 battery holder
1 – S1, DPDT slide switch
2 – S2,3 SPDT slide switch
1 – S4, tactile switch, NO
1 – T1, BN43-202 binocular core, black
2 – J1,2, BNC right angle female pcb jacks
4 – Self adhesive rubber foot
5ft. – 26AWG magnet wire
6” – 26AWG insulated stranded wire

Print the graphic below for the part placements:



Start with the smallest components first:

[ ] R5,6,8,9 - 100 ohm 1% resistors (brn-blk-blk-blk-brn)
[ ] R7,10,19 - 47K ohm resistors (yel-vio-org-gld)
[ ] R11,12,13,14,15,16,17,18 - 1K ohm resistors (brn-blk-red-gld)

[ ] D1,2 – 1N5711, glass diode, match the component band with the silkscreen band

[ ] C1,2,3, 100nF, (.1uF) capacitor, marked (104)

When mounting the 3W resistors, *do not mount them flush to the surface.* Keep the resistor 1/16" off the surface of the pcb to allow for airflow. You can use multiple folded paper, a thin slat of wood like a popsicle stick, tongue depressor, or a couple of toothpicks to space them off the board, and remove after soldering. Don't press the resistors tight against the stick or it will be difficult to remove.

[ ] R1,2,3,4 - 200 ohm 3W resistor, (red-blk-brn-gld)

[ ] 20 pin dip socket

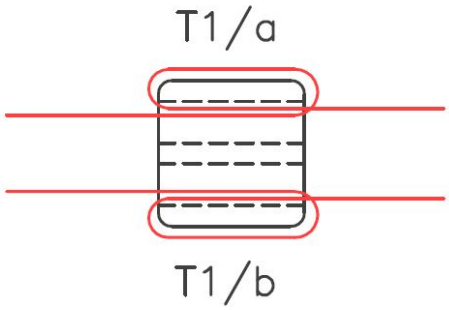
[ ] S2,3 - SPDT switch
[ ] S1 – DPDT switch
[ ] S4 – tactile switch

[ ] CR2032 battery holder

[ ] C4 - 100uF electrolytic capacitor, long lead is positive.

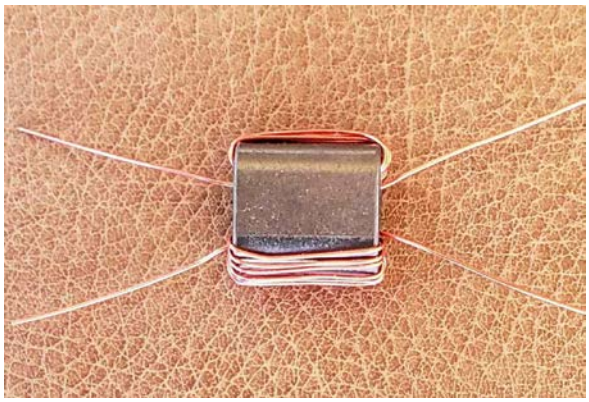
Winding T1

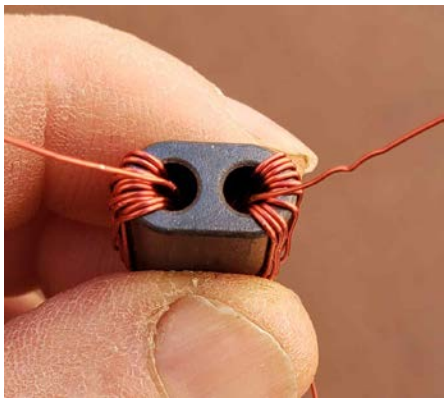
Wind the T1 secondaries as show below. In this application, we are saying *each time the wire passes thru a single binocular hole, counts as one turn.* There are two secondaries to wind. One on each side of the binocular core. With an 20" length of 26 AWG wire wind 12 turns thru T1/a, and with another 20" of wire, wind 12 turns through T1/b. Wind them tight against the core. When there are 12 turns through the hole, you will be able to count 11 strands of the wire on the outside of each side.



This above graphic illustrates 2 turns on each side.

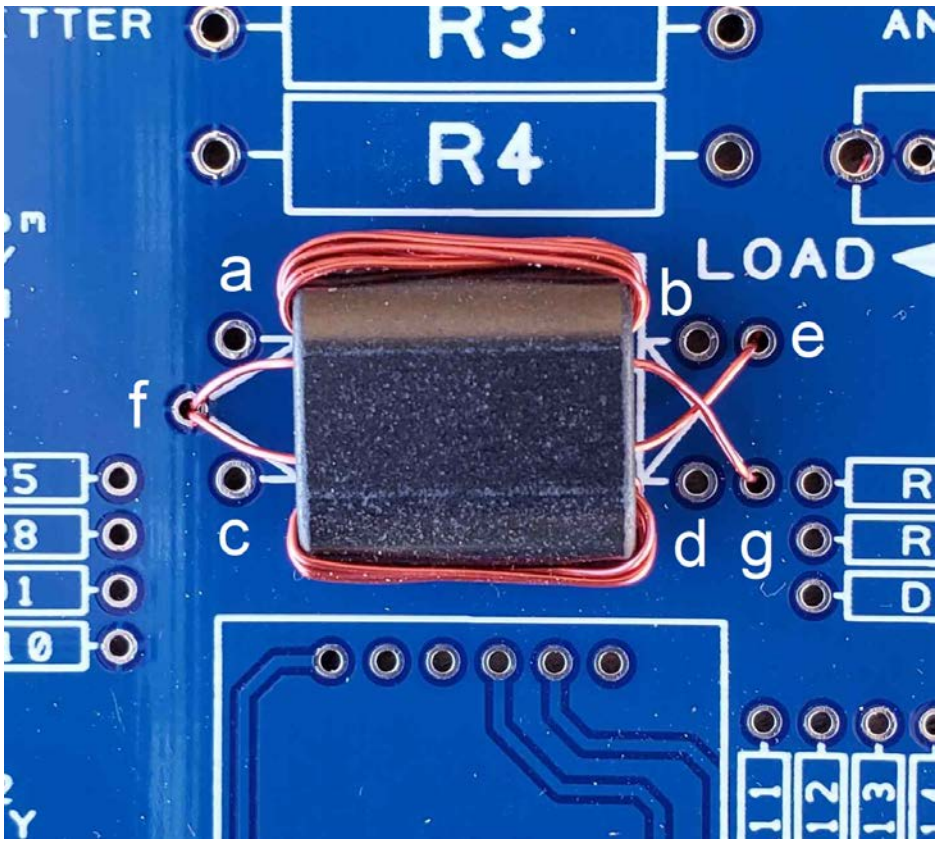
The picture below shows the core with the two secondaries only.



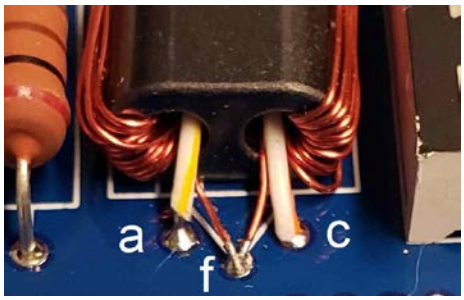


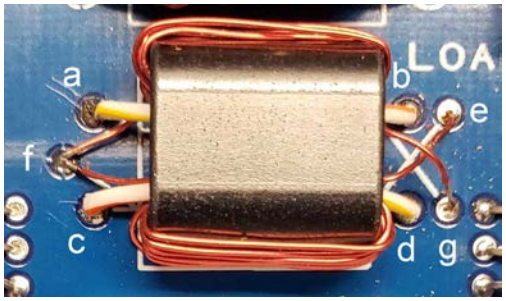
[ ] At this time solder the core with the secondaries to the board. The magnet wire insulation can be burned off with a soldering iron. Turn the temp up as high as it will go and make a little blob of solder on the tip of the iron. Tin the wire before mounting the core, as the solder pad will suck away too much heat to melt through the insulation and make a reliable connection. The core should be mounted snug to the board, but make sure you don't pull the wire through the hole past your tinned area.

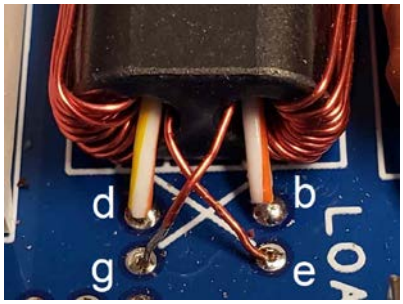
. The two left side leads are soldered to the common hole, marked “f”. The right leads are crossed and soldered to “e” and “g”. Be sure the two leads on the right do not short against each other at the crossing.



There are two T1 primaries. Each one is a single short piece of 26AWG stranded wire passing straight through each hole of the binocular core. One is soldered to “a & b” and the other is soldered to pads “c & d”, as shown below.







[ ] Install the display, 3 digit, 7 segment led, only goes on one way. Then, trim and attach the red plastic filter to the display with some super glue.
[ ] J1,2 - Solder the two female BNC connectors
[ ] U1 - plug the MPU into the socket carefully to avoid bending the pins. Observe pin1 location.

When inserting IC, the pins are flared so that they can be retained by automatic insertion tools. Gently rock it on a flat surface so the pins are parallel and it will insert into the socket more easily.

[ ] Attach four rubber feet on the back side

This completes the assembly.

Operation:

Install a CR2032 coin cell, positive side up. Turn [ON] S2. If S3 is in the [PWR] position the display should display all digits for 1 sec., then [0.00]. With S1 to the [THRU] side the signal passes thru to the antenna. RF Power and SWR can be displayed by switching S3. On the display, [_._] means no power applied when in the SWR position. If you are just testing your transmitter with the internal dummy load, *unplug the antenna if connected*, switch S1 to [LOAD], the RF energy goes to the dummy load alone, otherwise your readings will reflect the dummy load and the antenna load combined. Limit the input power to 10 Watts. Somewhat over 10W, it will display [-.OL]. Checking the internal load for SWR, with RF input, the display should read [01.0]. While the power switch S2 is turned on, the display will go to sleep in about 10 sec. flashing [-] to let you know it is still on. It will wake from sleep mode when it senses RF. The “QUICK CHECK” button can be pushed at any time instead of sliding the power to [ON]. This can preserve battery life as opposed to leaving the unit on continuously.

Question: *Why don’t I see infinite SWR with antenna unplugged?*

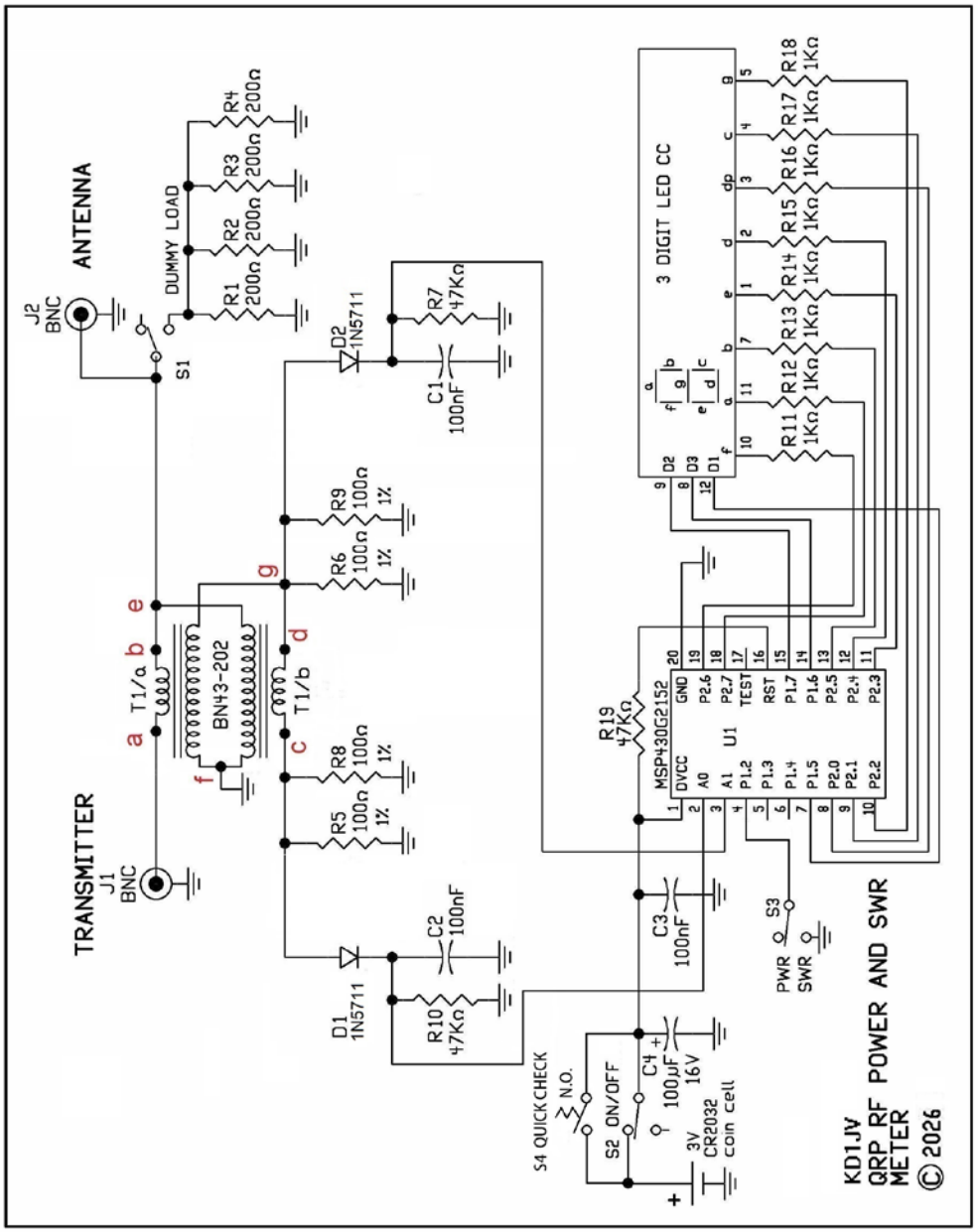
Steve: On the power meter, infinite SWR doesn’t produce a stable reading due to noise and any inherent imbalances. Random text or numbers may display. SWR is Vf + Vr / Vf -Vr so if Vf and Vr never exactly match, there is a non-zero result in the divisor, so it will come up with a non-zero answer.

Question: *Can I measure power while I am transmitting?*

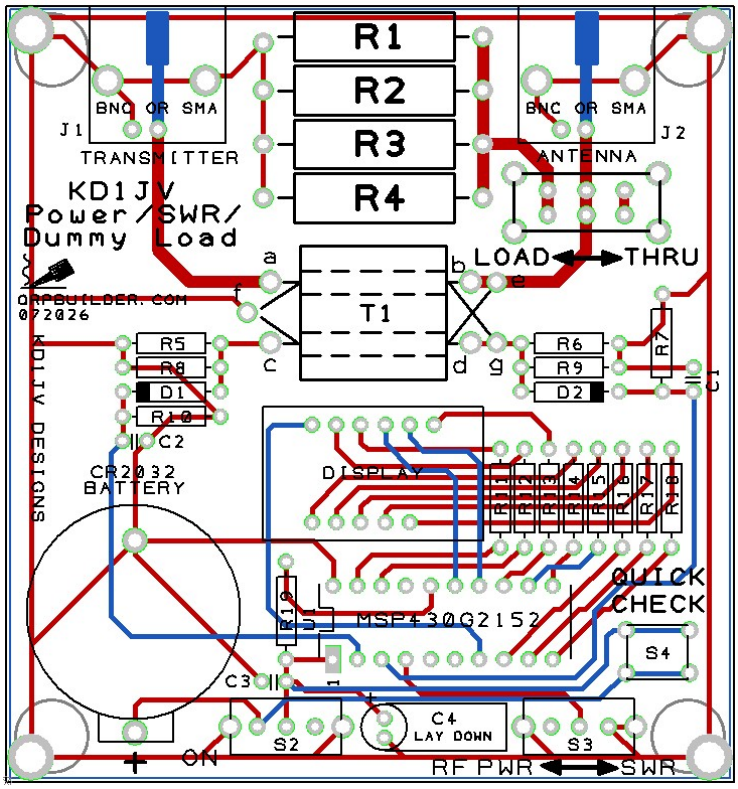
Ken: Yes you can, but remember your antenna can be a blend of C and L loads and may not display the same value as connected to a pure resistive 50Ω load.

Question: *Why does this power meter/SWR bridge have different readings from my "xxxx", "yyyy", and "zzzz" brand power measuring devices and which one do I believe?*

Ken: It's a $25 tool, there are always compromises made in design and in component tolerances. Every attempt has been made within confines of the design to give the best results. For the most accurate results use a Bird® wattmeter, or even better, a good oscilloscope with good calibrated probes.



Board tracks. Most “floating” pads are connected to the ground plane, not shown for clarity.



Notes: