

Original text from: <http://www.kitsandparts.com/1watter-V5.php>

The 1Watter is a high quality inexpensive transceiver designed for the QRP enthusiast. Guaranteed 1 full Watt output on any band 160-10 Meters using 12 VDC. Designed for home and portable operation. Full QSK, dual conversion design with great selectivity. Very low noise measured at -137 dBm MDS. The VCXO covers both sides of the standard QRP CW calling frequencies. The PCB size is only 2.5" (63,5 mm) by 3.8" (96,5 mm). Includes keyer chip V4 with true "natural" sidetone

Approximate VCXO Frequency Range by band:

80 Meters - 3,557 to 3,562 kHz

40 Meters - 7,020 to 7,039 kHz

30 Meters - 10,101 to 10,119 kHz

20 Meters - 14,056 to 14,061 kHz

12 Meters - 24,892 to 25,915 kHz

10 Meters - 28,052 to 28,061 kHz

Building Instructions:

DO NOT REMOVE ANY PARTS FROM THE PLASTIC BAGS UNTIL INSTRUCTED TO DO SO

1. Be careful if/when you inventory the parts; they are small and easy to lose. Do not mix up the toroids between the plastic bags. Keep all toroids in their plastic bags until called for installation. Do not mix up the red 1N4148 signal diodes with the red 1N5240B zener diode. If you are missing any parts, contact me immediately. I will ship the parts the same day. If you find extra parts in the kit, check the Addendum else throw them in your junk box.

This kit includes all parts to create a fully functioning transceiver. Included parts are: 2 phone jacks, a bnc jack, a push-button, volume control pot, magnet wire and heat sink. This kit uses several all black ferrite toroids. One (1) FT37-43 and multiple FT37-61 toroids; they look the same. The FT37-43 is included in the bag with the green 100n capacitors. Mark the bag with the green caps as "-43" and the bag with the resistors as "-61". This will help with identification later on when installing inductors and transformers. Install the parts in the order per this document to prevent mechanical installation problems later.

Each 1Watter is provided with a Serial Number, which is attached to the bag holding the PCB and magnet wire. Attach the label to the rear of your 1Watter enclosure or wherever suitable. The Serial Number may later be used for tracking 1Watter QSO contests.

This kit requires the following items to complete the kit:

- No. 22 or 24 gauge hook-up wire to connect the PCB to the controls and enclosure.
- Rosin Solder 60/40 (OK) or 63/37 (Best) and a fine tip solder pencil.
- Tool for adjusting trimmer capacitors - suggest search for GC-8608
- optional freq counter - search ebay [261731946045](https://www.ebay.com/itm/261731946045)
- [Manual for the Frequency Counter](#)
- optional keyer speed adjust potentiometer - recommend 10K linear.
- optional power on/off switch.
- optional case - [Suggested 1Watter Cases](#)
- optional [Universal Interconnect Kit #2](#). Kit includes 30 female pins, 40 male pins and 10 3-pin (1x3) housings.

2. Install all 100n (0.1uF) green capacitors

3. Install all 1/8 Watt Resistors.

You may need a magnifying device to verify the resistor color codes. Bend the resistor leads a sharp 90 degrees from the body of the resistors. R20, the volume control will be connected later. Save 5 cut resistor leads to ground the crystal cases later.

- ___ R1,2: 51 Green-Brown-Black-Gold
 - ___ R3,9,21,22,29: 470 Yellow-Violet-Brown-Gold
 - ___ R4: 2K2 Red-Red-Red-Gold
 - ___ R5: 500 Horizontal mounted black trim pot (in hardware bag)
 - ___ R6 will be a 4K7 or 100K resistor - see parts list or schematic table
100K - Brown-Black-Yellow-Gold or 4K7 - Yellow-Violet-Red-Gold
 - ___ R7,8,17,18,19,26: 4K7 Yellow-Violet-Red-Gold
 - ___ R10: 1K Brown-Black-Red-Gold
 - ___ R11: 1K5 Brown-Green-Red-Gold
 - ___ R12: 1K2 Brown-Red-Red-Gold
 - ___ R13: 1M Brown-Black-Green-Gold
 - ___ R14: 4R7 Yellow-Violet-Gold-Gold
 - ___ R15: 100K Brown-Black-Yellow-Gold
 - ___ R16: 10K Brown-Black-Orange-Gold
 - ___ R23,24 are installed to enable the "natural" sidetone of the 1Watter - recommended option
 - ___ R23,24: 4M7 Yellow-Violet-Green-Gold
 - ___ R25 is only installed if you do not install the keyer speed potentiometer
 - ___ R27: 16K Brown-Blue-Orange-Gold (installed for 40 meters only)
 - ___ R28 is not installed
- If you do not install a speed pot then you must install R25. Install vertically R25, 470 ohms, into the center and right two holes of J9.
- 470 Yellow-Violet-Brown-Gold

4. Install all Diodes - observe polarity.

- ___ D1,2,4,6,7: 1N4148 red glass diodes
- ___ D3: 1N5256B silver 30 V Zener
- ___ D5: MV209 varactor - leave 1/8 inch (3 mm) space between the PCB and diode body
- ___ D8: 1N5817 black diode
- ___ D9,10: NPC-127 blue 5.6 V Zener
- ___ D11: 1N5240B red 10 V Zener

5. Install all IC sockets - observe polarity.

- ___ U2,4,5,6,9: Match the notch on the IC socket with the pattern on the PCB

6. Install all remaining capacitors in the order shown.

- ___ C5 40p trimmer cap - flat side into square hole
- ___ C23,24,26: 50p or 60p brown or Yellow trimmer caps - flat side into square hole
- ___ C1,2,3,4: These caps are detailed in the parts list and listed below
- ___ C1,2,3,4: If the caps are polystyrene, bend one lead 180 degrees and install vertically
- ___ C15: This cap is defined in the parts list and listed below
- ___ C16: This cap is defined in the parts list and listed below

- ___ C17,39: 47n labeled 473 small yellow axial cap
- ___ C18: This cap is defined in the parts list and listed below
- ___ C20: This cap is defined in the parts list and listed below
- ___ C21: This cap is defined in the parts list and listed below
- ___ C22: This cap is defined in the parts list and listed below
- ___ C25: This cap is defined in the parts list and listed below
- ___ C28: This cap is defined in the parts list and listed below
- ___ C29,30,31,32: These caps is defined in the parts list and listed below
- ___ C34: This cap is defined in the parts list and listed below
- ___ C35: This cap is defined in the parts list and listed below
- ___ C12,40: 10uF black electrolytic - observe polarity
- ___ C42,49: 47uF blue electrolytic - observe polarity
- ___ C43: 33uF black electrolytic - observe polarity
- ___ C45: 33p labeled 33J NPO dark tan disk cap
- ___ C50: This cap is defined in the parts list and listed below
- ___ C51: This cap is defined in the parts list and listed below
- ___ C52: 2u2 yellow mono cap marked 225
- ___ Cs: empty - see Mods section
- ___ Cx: empty - see Mods section

7. Install all Voltage Regulators and Transistors

Do not install Q1 at this time.

- ___ U3,7: 78L08 voltage regulator; note orientation on the PCB
- ___ U8: 78L05 voltage regulator; note orientation on the PCB

Temporarily connect a +12V source in series with a 100-200 ohm current limiting resistor to J3-2 pad and power supply ground to J3-3 pad (ground). Measure the tune voltage (10V), at J1 to make sure it is correct. Temporarily put a clipped resistor lead from emitter to collector of transistor Q10. Measure the output voltage of U3 (8V) to make sure it is correct. Remove the clipped resistor lead and remove the power source and continue with parts installation.

- ___ Q2: PN2222
- ___ Q3,6,7: 2N3904
- ___ Q4: MPSH10
- ___ Q5: J310
- ___ Q8,9: J113
- ___ Q10: 2N3906
- ___ Q11: 2N7000 - CAUTION...static sensitive

8. Install all five 8-pin DIP ICs.

- ___ U2: NE602A balanced mixer; the dot positioned towards C18
- ___ U4: NE602A balanced mixer; the dot positioned towards C26
- ___ U5: NE602A balanced mixer; the dot positioned towards C28
- ___ U6: LM386N-4 audio amplifier; the dot positioned towards C37
- ___ U9: ATtiny45 Keyer with Sidetone; the dot positioned towards C46

9. Wind and install all Toroid Inductors. Wind all wires on the toroids [clockwise](#).

9.1 ____L1,2: Install inductors L1 & L2 from the below table.

Trim the wires of L1 and L2 to a half inch each. Strip & Tin the insulation to the base of the toroid using a hot solder pencil. Spread the turns over most of the toroid. Install L1 & L2 into the PCB, pull the leads tight using needle nose pliers, solder and trim. You should be able to straighten the toroid to match the outline on the PCB.

9.2 ____T4: Install transformer from the below table.

Trim the #30 red wires to one inch.

Trim the #27 green wires to half inch.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil. Spread the turns over most of the toroid. Install T4 with the #30 wires into the outside (upper and lower) holes on the PCB and the 3 or 4 turns #27 wire thru the center holes for T4. You should be able to straighten the toroid to match the outline on the PCB

9.3 ____T2: Install transformer from the below table.

Trim the #30 red wires to one inch.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil.

If the green #27 wire is 1 turn...Tin the wire close to the toroid.

If the green #27 wire is 2 turns...Tin & Strip the insulation to the base of the toroid.

Spread the turns over most of the toroid

Install T2 with the red wires into the outside (upper and lower) holes on the PCB and the green wires thru the center holes for T2 pull the leads tight using needle nose pliers, solder and trim

You should be able to straighten the toroid to match the outline on the PCB

9.4 ____T3: Install transformer from the below table.

Trim the red wires to one inch.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil.

If the green #27 wire is 1 turn...tin the middle inch of the wire

If the green #27 wire is 2 turns...Strip & Tin the insulation to the base of the toroid.

Spread the turns over most of the toroid

Install T3 with the red wires into the outside (upper and lower) holes on the PCB and the green wires thru the center holes for T3 pull the leads tight using needle nose pliers, solder and trim

You should be able to straighten the toroid to match the outline on the PCB

9.5 Install inductor L4 using the below table.

____L4: Wind xx turns of #27 green wire on an FT37-43 black ferrite toroid, tightly spaced.

The FT37-43 black ferrite toroid is packed in the bag with the green caps

Trim the wires of L4 to a half inch each.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil.

Spread the turns over most of the toroid

Install L4 into the PCB, pull the leads tight using needle nose pliers, solder and trim

You should be able to straighten the toroid to match the outline on the PCB

9.6 Install transformer T1

____T1: Using an FT37-61 black ferrite toroid, follow instructions in table below.

Trim the #26 red wires to one inch.

Trim the #27 green wires to half inch.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil.

Spread the turns over most of the toroid

Install T1 with the red wires into the outside (upper and lower) holes on the PCB and the green wires thru the center holes for T1

You should be able to straighten the toroid to match the outline on the PCB

9.7 ____L3: Install inductor L3 from the below table.

Trim the wires of L3 to a half inch each.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil.

Spread the turns over most of the toroid

Install L3 into the PCB, pull the leads tight using needle nose pliers, solder and trim

You should be able to straighten the toroid to match the outline on the PCB

9.8 ____L6: Install inductor L6 from the below table.

Trim the wires of L6 to a half inch each.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil.

Spread the turns over most of the toroid

Install L6 into the PCB, pull the leads tight using needle nose pliers, solder and trim

You should be able to straighten the toroid to match the outline on the PCB

9.9 ____L5: Install inductor L5 from the below table.

This inductor determines the upper and lower frequencies of the 1Watter.

Trim the wires of L5 to a half inch each.

Strip & Tin the insulation to the base of the toroid using a hot solder pencil.

Spread the turns over most of the toroid

Install L5 into the PCB, pull the leads tight using needle nose pliers, solder and trim

You should be able to straighten the toroid to match the outline on the PCB

9.10 Install transformer T5

Cut 10" of #34 red wire and 4" of #30 red wire.

____T5: Wind 8 turns of #34 red wire on an BN-43-2402 black ferrite binocular.

The BN-43-2402 black ferrite binocular is packed in the bag with the green caps

Trim the red wires of T5 to one inch each.

Wind 2 turns of #30 red wire on the BN-43-2402 black ferrite binocular.

Trim the #30 wires of T5 to one half inch each.

Strip & Tin the insulation on all 4 wires to the base of the binocular.

The #34 wire leads for the 8 Turn winding go to the two pads closest to the IC, Pins 1 and 2.

The #30 wire leads go to the two pads farthest away from the IC or toward the bottom of the PCB.

Install T5 into the PCB, pull the leads tight using needle nose pliers, solder and trim.

10. Install all Crystals.

There are 5 "IF" crystals included in the kit.

These crystals are graded for frequency and resistance.

If you find a crystal with a black dot, install it in X6.

If you find 2 crystals with black dots, install in X2 & X6.

The Filter Crystals X3,4,5 should not have a black dot.

When installing the crystals, tilt the crystals about 20 degrees while soldering

This will raise the crystal a small bit above the PCB after straightening and will prevent trace shorts to the case of the crystal

Do not overheat the crystals.

___X1: see table

___X2,3,4,5,6: see table

When soldering the crystal cases to ground, do not overheat the crystals

___Solder one resistor lead across the top of crystals X3,4,5

___Solder one resistor lead from the top of X4 to the ground below (top center)

___Solder one resistor lead from the top of X2 to the ground below (upper right)

___Solder one resistor lead from the top of X6 to the ground below (upper right)

11. Connections.

[Suggested 1Watter Cases](#)

Connect a user supplied pot (10K or 100K) to the "speed pot" connector J9.

Connect the speed pot control wiper to the center hole on J9.

If you do not install a speed pot then you must install R25

Install R25, 470 ohms, into the center and right two holes of J9.

Connect the 500 ohm volume pot (R20) using any insulated wire.

Connect the volume control high side to the center of J6 on the PCB.

Connect the volume control cold side to a ground on J6.

Connect the volume control center wiper to a 3.5 mm phono jack

Connect the 3.5 mm phono jack ground to the cold side of the volume control pot.

Connect a user supplied pot (5K or 10K or 100K or 1 Meg) to the "Tune" connector J1.

Connect the tune control wiper to the center hole on J1.

Connect the provided BNC connector to the "Ant" connection next to L1 on the PCB.

Connect paddles or a straight key to J5 via the other 3.5 mm phono connector

Connect the Push Button, one wire to the center of J4, the other wire to one of the ground connections

Before you apply power to the 1Watter, make sure your power polarity is correct

The 1Watter was designed to operate from a [12 volt Sealed Lead Acid Battery](#)

Connect +12.6V volts (+/- 1 volt) to the holes in the upper right corner of the PCB.

12. Receiver Alignment.

Connect any antenna to the 1Watter or a wire at least 1 meter long.

Set the volume control to minimum and apply power to the 1Watter.

Increase the volume control setting until you hear noise/hiss from the speaker.

Adjust C5 and C26, back and forth for maximum noise coming from the speaker/headphones.

You may hear some CW signals by turning the Tune Pot.

13. Transmit Alignment using an Oscilloscope or a Calibrated Accurate Receiver

The band pass filter (X3,4,5) establishes the IF center frequency.

The transmit oscillator part of U2, X2 and L6 should match the IF frequency +/- 100 Hz.

Find a signal in the tuning range of the transceiver. As you tune across the signal, the loudest audio frequencies should be about 600 Hz +/- 100 Hz

Next we will adjust for maximum carrier output.

You will need an HF receiver, oscilloscope or dummy load with power meter.

If you do not have either, we will align the transmitter after we install the final transistor.

The Voltage Controlled Crystal Oscillator and the Transmit Carrier Oscillator are mixed (U2) to produce the 1Watter transceiver frequency of operation.

The mixer (U2) also produces other frequencies that must be rejected.

Preset the power control R5 to half way

Preset C23 and C24 at 50 percent maximum capacitance (see settings in addendum section)

C23 has broad tuning while C24 has very sharp tuning.

Preset the Tune Pot to half way or in the middle.

Place the Keyer into straight key mode

While listening to a receiver near the QRP calling frequency or watching a scope at the junction of R1/D4, adjust C24 to max signal on the scope or receiver.

You should verify that the signal is the QRP frequency and not another mixer freq.

If using a receiver, you will need to hunt for the actual signal.

After finding the signal, readjust both C23 and C24 for maximum signal.

Make sure that you have aligned the filter to the correct frequency and not an alternate frequency generated by the transmit mixer.

14. Install the RF Final Transistor Q1

Q1 is normally a 2N5109 but could be replaced with a 2SC5706 in the future.

Install a 2N5109 with the collector in the top hole, base in the right hole and emitter in the lower hole.

Install a 2SC5706 into the 3 center holes; metal tab towards the center of the PCB.

___ Q1: 2N5109 - leave 1/8 inch (3 mm) space between the PCB and transistor case

These heat sink is factory fresh and offer a very tight fit, so tight in fact that you will need to open up the diameter of the heat sink using a blade screwdriver or other tool. If you open up the heat sink too far, you may easily

provide for a tighter fit by squeezing the heat sink until it provides a proper fit.

___ Q1 heat sink: - slowly push the heat sink over the case of Q1

15. Sidetone volume setting.

The Command Sidetone Volume is fixed/set by R15, 1M & C45, 33p.

To lower the Command Sidetone volume, decrease the value of C45 or increase the value of R15

To raise the Command Sidetone volume, increase the value of C45 or decrease the value of R15

Replacements parts for R15 and C45 are not included in the kit.

The Natural Sidetone volume is set by R23 and R24 resistors near Q8 & Q9

16. Transmit Final Alignment using milliamp meter

Connect a 50 ohm dummy load to the output of the transceiver

Connect a Power Supply (12V) through amp meter

Place the keyer into straight key mode (see instructions below)

Key the transmitter and adjust R5 for exactly 250 milliamps.

If C23 & C24 were not aligned in a prior step then preset C23 and C24 to 50 pct capacitance

Adjusting C24 for maximum milliamps current. Adjust R5 to keep the current at 250 Ma.

Repeat several times until you know that C23 & C24 are peaked and R5 is set for 250 Ma.

If you have a wattmeter, insert it between the dummy load and the transceiver.

It should measure very near 1 watt output.

You may also adjust R5 for 20 volts P-P on a scope.

It is recommended that you do not adjust R5 for more than 1 watt to prevent instability.

It is possible to align your 1Watt output to something other than your desired frequency.

Verify that you have adjusted C23 and C24 to the QRP operating frequency by using a Receiver or Oscilloscope or other instrument capable of verifying your output frequency.

This completes the 1Watter Transceiver alignment.

[The 1Watter Service Manual](#)

[The 1Watter Troubleshooting](#)

17. Optional modifications to and experiments with the 1Watter

17.1 NE602A gain increase for U4 and U5

You may increase the gain by placing a 27K (not included) or higher value resistor (Rx on the PCB) across pins 1 and 8 of U5

17.2 Frequency Range Mods

You may change the frequency span of the 1Watter by changing the number of turns on L5

Too many turns and the oscillator stops working or becomes unstable.

Add capacitance at Cx, between the crystal X1 and L5 and ground. Try 3-10 pF for starters.

18. The 1Watter Keyer Instructions

This is a very basic Iambic-Mode-B Keyer using an ATmel AVR Microprocessor

On power-Up, the keyer defaults to 15 WPM and a sidetone of 625 Hz and annunciates "1W" [.---- .--] via Int'L Morse Code.

Connecting a straight key with a Mono Plug automatically places the keyer into straight key mode.

Moving the "Speed Pot" changes the speed from 5 WPM up to 36 WPM (version 3 and higher only)

The internal timing oscillator in the Keyer Chip is an RC oscillator that runs at 9.6 MHz +/- 10 pct Factory Calibration. Typical accuracy is +/- 5 percent; The accuracy can be improved to +/- 2 percent if one takes the time to calibrate the oscillator and reprogram the keyer chip. This procedure is too time consuming for 200 chips but may be OK for you. The accuracy is typically +/- 5 pct so your sidetone may be off by +/- 5 pct and your keying WPM may also be off. That means if you set the WPM speed to 20 WPM, you may actually have it set at 19 or 21 WPM; should not be a problem.

The keyer is placed into the "Command" mode by pressing and releasing the Cmd Button.

The keyer has the following commands available after pressing the Cmd Button:

"A" (-) Toggles transmit sidetone audio

The sidetone mode setting is saved on power-down.

If transmit sidetone flag was set, then clear flag and announce "Y"; Y=yes, we turn on transmit sidetone audio

If transmit sidetone flag was clear, then set flag and announce "N"; N=no, we turn off transmit sidetone audio

CMD Sidetone Audio is always active when a CMD is issued.

Enable this Mode when using the "natural" transmit sidetone.

"B" (-...) Enter Beacon Mode (version 2 and higher only)

Hit CMD button and enter "B" to start Beacon Mode

Listen for a DIT to acknowledge ready to select message number

Enter message number...1, 2 or 3

Message repeats over and over

Hit paddles, dit or dah or straight key to turn off beacon mode

"E" (.) or "T" (-) Toggles between normal keyer and straight key mode, acknowledged by annunciating "S" (for Straight Key Mode) in code. The keyer mode is NOT saved on power-down.
Connecting a straight key with a Mono Plug automatically places the keyer into straight key mode.

"M" (-- Enter Beacon Message(s) (version 2 and higher only)
Hit CMD button and enter "M" to enter message
Listen for a DIT to acknowledge ready to select message number
Enter message number...1, 2 or 3
Listen for a DIT to acknowledge ready to enter a character
Enter one character at a time, then wait for another "dit"
To enter a word space, do not enter anything in between announced "dits"
At the end of the message, do not forget to add empty character time.
This allows you to pause and listen between CQ calls. Recommend between 10 and 20 word spaces.
Terminate message entry mode by send "AR" or ".-.-."

"R" (.-) Toggles between normal and reverse paddles keys, acknowledged by annunciating "P" (for normal paddles) or "X" (for reversed paddles) in code. The paddles (normal or reverse) are saved on power-down.

"S" (...) Set keyer speed in WPM. Speed is entered as two numerical digits.
After sending the "S" command, the keyer sends a DIT (e) as a prompt for the first speed character (0-4)
After sending the first speed number, wait for another DIT (e) prompt and send the 2nd number (0-9)
Depending upon what you enter, you will hear a "?" for ERROR or an "R" for a "Roger" acknowledgement.
Valid keyer speeds are 1 to 45 WPM (good luck trying to send/use 1 WPM)
The keyer speed setting is saved on power-down.

"F" (.-) Sets the sidetone frequency.
After sending the "F" command, the keyer sends a DIT (e) as a prompt for the tone character (0-9)
Depending upon what you enter, you will hear a "?" for ERROR or an "R" for a "Roger" acknowledgement.
The sidetone frequency setting is saved on power-down.

The following table equates the sidetone number with the sidetone frequency:

0	=	1000 Hz
1	=	833 Hz
2	=	714 Hz
3	=	625 Hz
4	=	555 Hz
5	=	500 Hz
6	=	455 Hz
7	=	417 Hz
8	=	385 Hz
9	=	357 hz

"V" (...- Announces the keyer version number (version 0 and higher only)
This kit includes keyer version 4.

"X" (.-) Puts the keyer into transmit or tune mode

Hit paddles dit or dah or straight key to turn off tune mode

Disable the keyer sidetone for the "natural" transmit sidetone.

The keyer has Deadman Insurance. In the event that the keyer issues 64 successive DITs or 64 successive DAHs, the keyer will shut down and cease to operate.

You must power down the keyer chip to restart normal operation.

To Reset the Keyer to the Default mode, hold the Cmd button active until you hear "1W"
Then immediately release the Command Button, else you will send another Command request.

Source code and hex files for the keyer are available at <http://kitsandparts.com/keyer>

Notes:

Variable capacitor settings:

If you need an alignment tool for the trimmers, look up "GC 8608" - available at newark.com and onlinecomponents.com

We recommend the purchase of the optional Universal Interconnect Kit #2. The kit includes 30 female pins, 40 male pins and 10 3-pin (1x3) header housings.

A crimping tool is available from www.anico-hasmhop.eu for creating cables.

A How-To video <https://www.youtube.com/watch?v=GkbOJSvhCgU>

Addendum Section:

Oct 21 2016 2359 - Here are some data when sub'ing the MV209 varactor with 1SV322 & 1SV324

1W20 freq span using MV209 0V=14056.3 10V=14060.6

1W20 freq span using 1SV322 0V=14059 10V=14064

1W20 freq span using 1SV324 0V=14057.1 10V=14063.6 (my new freq coverage)

1W40 freq span using MV209 0V=7019.6 10V=7039.4

1W40 freq span using 1SV322 0V=7025.7 10V=7047.4 (my new freq coverage)

1W40 freq span using 1SV324 - not tested; I like the above too much.

Sep 30 2018 1630 - If you have low drive level to the final and can not get full 1 watt output, you may try increasing the value of R10, a 1K resistor.

Tracy W4EDJ reported that his 1W40 only had full output when he changed R10 from 1K to 4K7