

Pacific Antenna 40M Easy Receiver Kit



Description

The Easy Receiver kit from Pacific Antenna is designed to be easy to build and use. It covers approximately 75kHz of the 40M band and can be assembled in about 1-2 hours.

It has no toroids to wind and only one adjustment (trimcap) to set the frequency.

It is a direct conversion design employing a front end bandpass filter, NE602 mixer and LM386 audio amplifier.

Our Easy Receiver is designed to work with our Easy Transmitter, Easy Audio Filter, Easy Tuner and Easy Keyer and Easy TR switch to make a complete QRP station.

These boards are designed so that, if desired, they can be stacked together to produce a compact assembly.

Support

PACIFIC ANTENNA

Web: www.qrpkits.com

Email: qrpkits.com@gmail.com

Tools Needed

- Soldering Station or 15-35 watt soldering iron with small tip.
- Solder 60/40 or 63/37 Tin-Lead
- Small Diagonal Cutters
- Small Needle Nose Pliers
- Pencil, Pen, and/or Highlighter
- BRIGHT work light

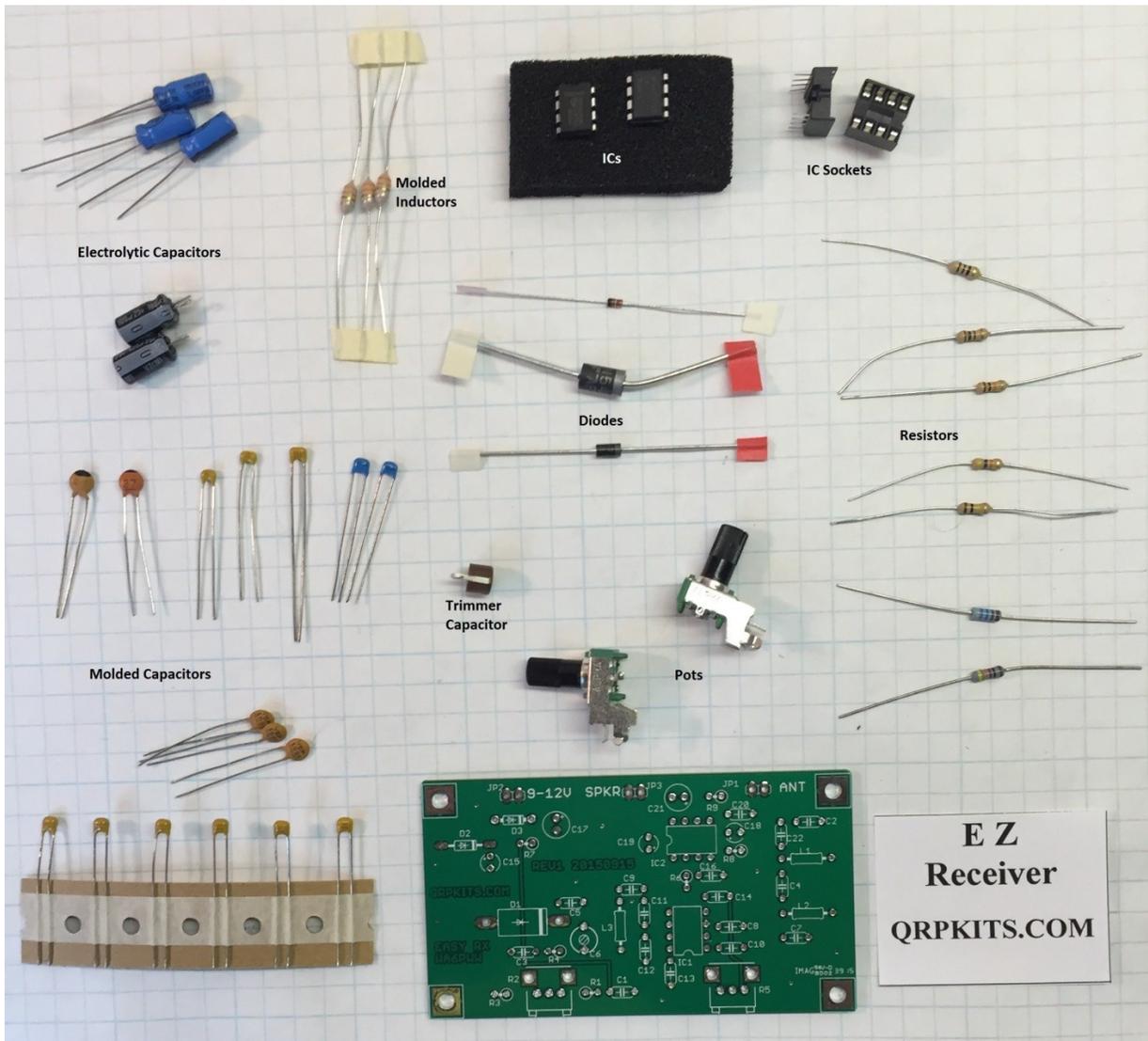
Optional

- Magnifying headpiece or lighted magnifying glass.
- Multi-meter
- Solder Sucker and/or Solder Wick
- Small multi-blade Screw Driver
- Knife or Wire Stripper
- Small Ruler
- Cookie Sheet to build in and keep parts from jumping onto the floor.

Construction Techniques

- There is no need to print out the whole assembly manual unless you want a copy. Print the Parts List and Schematic then view the rest of the manual on a computer, laptop, or tablet.
- The Parts List has columns for inventory and construction.
- Please take time to inventory the parts before starting. Report any shortages to QRPKITS.com (In many cases it may be faster and cheaper to pull a replacement from your parts supply, but please let us know if we missed something.)
- Use the first column to check the parts as you inventory them.
- Use the second column to check the parts as you install them.
- Pre-sorting the resistors and capacitors can speed up the assembly and reduce mistakes.
- You can insert several parts at a time onto the board. When you insert a part bend the leads over slightly to hold the part in place, then solder all at the same time. Clip the leads flush.
- Most parts should be mounted as close to the board as possible. Transistors should be mounted about 1/8" above the board. Solder one lead on ICs or IC sockets and then check to make sure the component is flush before soldering the remaining leads.
- If you are a beginner, new to soldering, there are a number of resources on the web to help you get on the right track soldering like a pro. Google Soldering Techniques.

Parts Identification:



Note: Parts included in the kit may vary slightly from those shown in photograph. This is due to changes in manufacturers or suppliers and does not affect the kit performance.

Inventory and Parts List

Inventory	Inst.	Qty	Parts	Value	Identification	Description
		1	R9	10 Ohm	brn-blk-blk-gold	RESISTOR, 1/4W , 5%
		1	R7	150 Ohm	brn-grn-brn-gold	RESISTOR, 1/4W , 5%
		1	R8	10K Ohm	brn-blk-org-gold	RESISTOR, 1/4W , 5%
		1	R6	47K Ohm	yel-vio-org-gold	RESISTOR, 1/4W , 5%
		1	R4	100 K Ohm	brn-blk-yel-gold	RESISTOR, 1/4W , 5%
		1	R10	33 K Ohm	Org-org-org-gold	RESISTOR, 1/4W , 5%
		1	R1	4.3K 1%	Yel-org-blk-brn-brn	RESISTOR, 1/4W, 1%
		1	R3	430 1%	Yel-org-blk-blk-brn	RESISTOR, 1/4W, 1%
		1	C4	4.7pF	4.7	CAPACITOR, disk ceramic
		1	C5	27pF	27	CAPACITOR, disk ceramic
		1	C7	150pF	151	CAPACITOR, monolythic
		1	C22	180pF	181	CAPACITOR, monolythic
		1	C9	220pF	221	CAPACITOR, monolythic
		2	C11, C12	470pF	471	CAPACITOR, monolythic
		3	C2, C10, C16	1000pF	102	CAPACITOR, monolythic
		6	C1, C3, C8, C13, C14, C20	0.1uF	104	CAPACITOR, monolythic
		3	C15, C18, C19	10uF	10 uf	ELEC. CAPACITOR 25V+
		2	C17, C21	100uF	100uf	ELEC. CAPACITOR 25V+
		3	L1, L2, L3	3.3uH	org-org-gold-silver	INDUCTOR, molded
		1	D2	1N5234	234B (glass body)	DIODE, Glass
		1	D1	1N5401	1N5401	DIODE, Large Black Plastic
		1	D3	1N5817-B	1N5817	DIODE, Small Black Plastic
		2	SC	Sockets		IC Sockets, 8 pin
		1	IC2	LM386	386	Audio Power Amplifier, 8 pin Ic
		1	IC1	NE602	NE602A	NE602 8 pin IC
		1	C6	50pF	brn	Trimmer capacitor, brown
		1	R5	10K A	A10K	Potentiometer, Volume
		1	R2	10K B	B10K	Potentiometer, Tuning
		1	BNC	BNC		BNC Antenna Connector
		1	Phone Jack	Audio		3.5mm Mono Audio Jack
		1	Battery Conn.	9V		9V Battery Connector
		12"	Wire	Wire	2-12 inch sections	Hookup wire, 2 colors
		2	Knob	Knobs	.55" knobs	Small Knobs
		1	PCB	PCB	Rev 1A or B	Easy RX Circuit Board

Inserting the Parts

First, install the two IC sockets, making sure to match the end with the notch to the board outline.

- 2 SC Sockets IC Sockets, 8 pin

Resistors

Sort the resistors by value insert and solder them in place. Be sure to check the location and color code for each resistor as you install. [Measuring with an Ohm meter is also a good idea.]

- R9 10 Ohm brn-blk-blk-gold
- R7 150 Ohm brn-grn-brn-gold
- R8 10K Ohm brn-blk-org-gold
- R10 33K Ohm org-org-org-gold
- R6 47K Ohm yel-vio-org-gold
- R4 100 K Ohm brn-blk-yel-gold
- R1 4.3K 1% yel-org-blk-brn-brn
- R3 430 1% yel-org-blk-blk-brn

Note: The schematic may show different values for R1 and R3. These listed above are the current and correct part values to be used.

Ceramic and Molded Capacitors

First insert and solder the molded capacitors.

- C4 4.7pF 4.7 CAPACITOR, disk ceramic
- C5 27pF 27 CAPACITOR, disk ceramic
- C7 150pF 151 CAPACITOR, monolithic
- C22 180pF 181 CAPACITOR, monolithic
- C9 220pF 221 CAPACITOR, monolithic
- C11 470pF 471 CAPACITOR, monolithic
- C12 470pF 471 CAPACITOR, monolithic
- C2, 1000pF 102 CAPACITOR, monolithic
- C10 1000pF 102 CAPACITOR, monolithic
- C16 1000pF 102 CAPACITOR, monolithic
- C1 0.1uF 104 CAPACITOR, monolithic
- C3 0.1uF 104 CAPACITOR, monolithic
- C8 0.1uF 104 CAPACITOR, monolithic
- C13 0.1uF 104 CAPACITOR, monolithic
- C14 0.1uF 104 CAPACITOR, monolithic
- C20 0.1uF 104 CAPACITOR, monolithic

Electrolytic Capacitors

Now insert and solder the electrolytic capacitors. These capacitors are polarized. The positive hole is marked on the circuit board with a + symbol. The negative lead of the capacitor is also marked with a black bar on the side of the capacitor. This lead should go in the pad away from the + marking.

- C15 10uF 10uF ELECTROLYTIC CAPACITOR
- C18 10uF 10uF ELECTROLYTIC CAPACITOR
- C19 10uF 10uF ELECTROLYTIC CAPACITOR
- C17 100uF 100uF ELECTROLYTIC CAPACITOR
- C21 100uF 100uF ELECTROLYTIC CAPACITOR

Remaining Parts

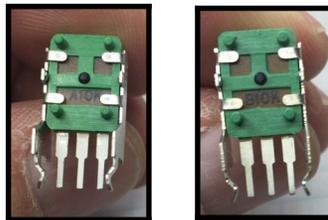
- L1 3.3uH org-org-gold-silver INDUCTOR, molded
- L2 3.3uH org-org-gold-silver INDUCTOR, molded
- L3 3.3uH org-org-gold-silver INDUCTOR, molded
- D2 1N5234 234B (glass body) DIODE
- D1 1N5401 1N5401 (Large Black) DIODE
- D3 1N5817 1N5817 DIODE
- IC2 LM386 Audio Power Amplifier, 8 pin IC"
- IC1 NE602A NE602, 8 pin IC

- C6 50pF brown trimmer capacitor,

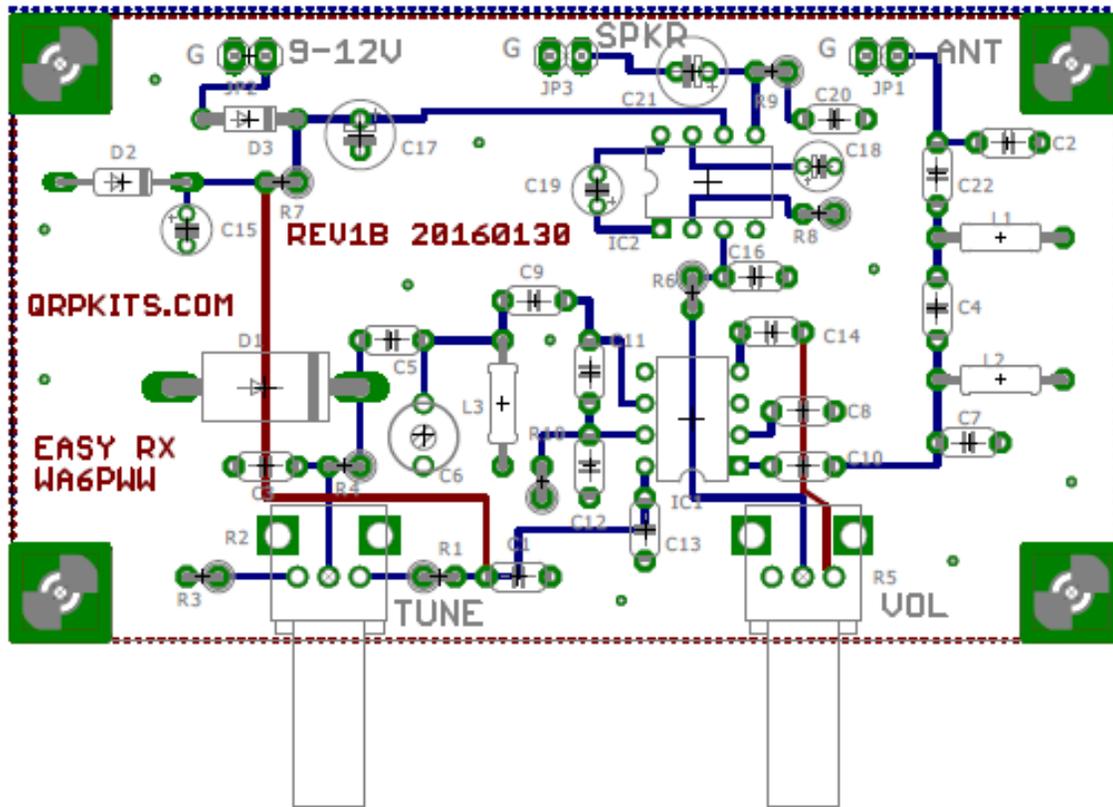
Note: C6 has a flat and round side. It should be installed so that the flat side is oriented toward C5

The last parts to install are the potentiometers. The A10K and B10K identification marks are on the back of the pots and are a bit difficult to read. Use lots of light. The pot marked A10K is the 10K Audio Pot. The pot marked B10K is the Linear Pot.

- R5 A10K Potentiometer, Horizontal, Audio
- R2 B10K Potentiometer, Horizontal, Linear



Board Layout



Final Assembly and Packaging

Your easy receiver kit is now completed. Packaging is left up to the builder. However, for testing, you will find included in the package, an audio connector, 9V battery connector and a BNC along with hookup wire. For initial testing, you can just temporarily connect short wires to the board pads and use alligator leads for connection of antenna and audio out.

Connections are shown by the diagram below

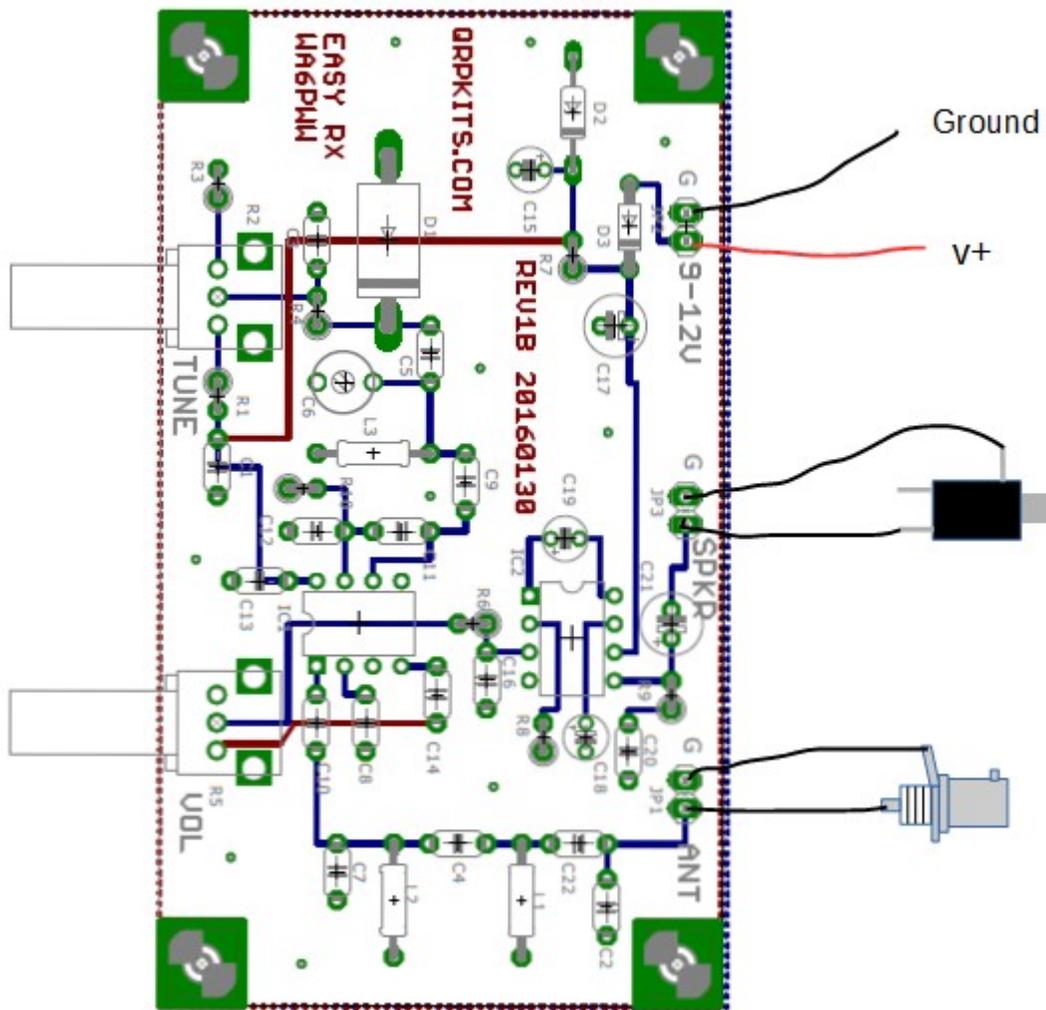
To power your receiver, you will need to supply a source of clean dc power in the range of 9-12V to JP2. This can be from a battery source or a well filtered dc supply. An inline fuse of 1A or less is recommended if a DC supply or 12V battery is used. An inline fuse along with diode D3 serves to protect against reverse polarity damage to the receiver components.

For REV1B and later boards, the connections for power audio and antenna input along with ground are labeled on the board. For earlier board versions, verify by looking at the back of the board to determine which pin is ground as it differs from the REV1B layout shown above.

A speaker or headphone jack should be connected to JP3 as shown by board labels. The supplied audio jack is for 3 pin stereo headphones or amplified speakers so the ring and tip should be connected together at the jack for both channels to be fed audio from the single output of the receiver.

Antenna input is through JP1. The BNC connector that is supplied can be used for connecting an external antenna or alternatively, a section of wire at least 8-10ft long can just be connected to JP1 as a temporary antenna.

Connections to Board



Modifications:

Off board potentiometers can be used to aid mounting in a case. If this is done, it is recommended that the tuning potentiometer be a linear type and the volume pot a log taper (audio) pot for best performance.

For reduced rate tuning, a 10 turn pot can be used for R2.

Setup and Testing

The Easy Rx has a tuning range of approximately 50-75kHz. This will cover the low end of 40M for example where most of the CW activity is found including QRP frequencies such as 7.030 and 7.040.

First verify that when you power up the Easy Rx, and connect an antenna or section of wire, you should hear static and maybe some signals in the headphones. Turning R2 (the left side potentiometer) will change the received frequency and R5 (the right side potentiometer) will adjust the volume of the background static and any signals received.

To setup the receiver for the desired frequency range, only one adjustment is required. This is to set the trim capacitor C6. This step will be aided if you have a receiver that covers the same band and has capability for receiving CW signals.

As the Easy receiver is a direct conversion design, its oscillator runs continuously and can be heard on any nearby receiver. In this case, an antenna lead connected to the nearby receiver can be placed near the Easy Rx board and you will hear a tone on the receiver corresponding to the local oscillator frequency of the Easy Rx.

To adjust C6, ideally you should use a plastic tool. However, if the trim-cap is installed correctly, (with the flat side toward C5) the part you are touching is grounded and therefore, a small metallic screwdriver will be OK to use.

If using a receiver, tune it to a frequency such as 7.025 or other frequency on which you want the Easy Rx reception range to be centered. Place R2 (the tuning knob on the left) to the middle of its range and then turn C6 slowly. You should hear a tone as the local oscillator of the Easy Rx moves across your other receiver. You will need to turn very slowly and listen carefully as it may move quickly across the desired frequency.

Once you hear a tone on your receiver, stop adjusting C6 and you should hear a steady tone in your other receiver. You can now connect an external antenna to the Easy Rx and use R2 to tune around. If the band is active, you should hear some CW signals.

To set the lower range to a desired frequency, rotate the tuning control (R2) fully counterclockwise. This will place it at the lowest frequency. Then using your external receiver set to the lowest frequency you want to use (such as 7.00 MHz for 40 meters) adjust C6 until you hear the Easy Receiver oscillator as a tone in your receiver. Turning R2 clockwise will move up in frequency and you should be able to tune up to approximately 7.075 MHz with R2 fully clockwise.

A crystal controlled transmitter can also be used as a signal source for setting the frequency of the Easy Rx. To do this, you would simply activate the transmitter, preferably into a dummy load so not to cause interference to others. With a short wire or antenna connected to the Easy RX, set R 2 to the middle of its range and tune C6 while listening for the transmitter tone.

Troubleshooting

The easy RX is designed to be a simple kit to build and to use. However, occasionally, problems may happen. In our experience, these are often soldering issues (shorts or cold solder joints) or component misplacement. Here are a few things to check if the kit does not function as it should.

1. Verify component placement, including resistors and capacitors
2. Inspect all solder joints with a magnifying glass, looking particularly for any that may have small whisker shorts or which look dull and blotchy indicating a cold solder joint.
2. Verify orientation of the two ICs in their sockets. One end of the sockets will have a notch and that should be on the same end as the notch in the IC package as well as a dot or other marking for pin 1 of the IC. See the photo on page 3 and diagram on page 7 for examples of proper orientation.

3. Check for correct DC voltages to ground at the following points in the circuit:

-Right side of JP2- should be equal to power supply voltages

-Band end of D3- should be equal to power supply minus approximately 0.7V

-Pins 8 of IC1- should be approximately 6.2V

Pin 6 of IC2 -should be equal to power supply minus approximately 0.7V

If the Easy RX only makes a low level HISS in the speaker or headphones, check the local oscillator operation by placing it near another receiver and listening for the Easy RX local Oscillator. Tune C6 if needed to locate the oscillator in the second Receivers pass band. If there is no oscillator signal then carefully check the circuit around the IC1, NE602/612, to be sure the parts are correct and properly soldered.

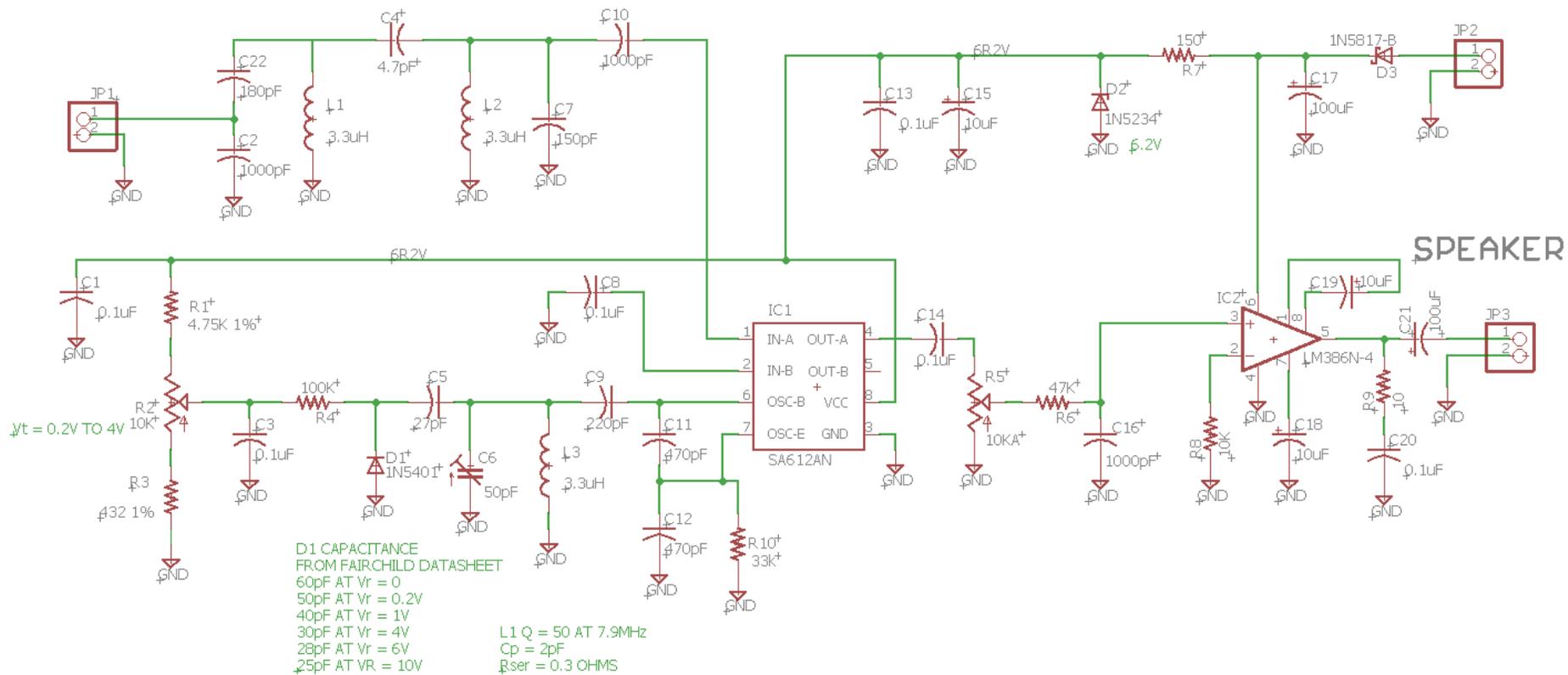
If during tune up the local oscillator could be heard in the second RX but the Easy RX has no output from the speaker/headphones then first touch the junction of R6/C16 the speaker should make a 60 HZ humming sound. If this happens then check the parts and soldering around the volume control. If there is no HUM then check the parts and soldering around IC2, LM386.

If the receiver is functioning and connected to a good antenna, you should be able to hear CW signals when tuning across the band. You will note that each signal will appear twice as you tune. This is expected for a direct conversion receiver as it will hear the signal on both sides of the center frequency.

As you tune up in frequency and hear a signal, you will hear the signal decrease in frequency, go through zero and then increase in frequency again. Again, this is as expected for a DC receiver.

We hope you enjoy your Easy RX kit!

If you have any questions, or experience problems with your kit, please contact us at grpkits.com@gmail.com and we will be happy to assist you.



D1 CAPACITANCE FROM FAIRCHILD DATASHEET
 60pF AT Vr = 0
 50pF AT Vr = 0.2V
 40pF AT Vr = 1V
 30pF AT Vr = 4V
 28pF AT Vr = 6V
 25pF AT Vr = 10V

L1 Q = 50 AT 7.9MHz
 Cp = 2pF
 Rser = 0.3 OHMS