EGV-3B v2

40-30-20m QRP CW Transceiver KIT

Assembly manual

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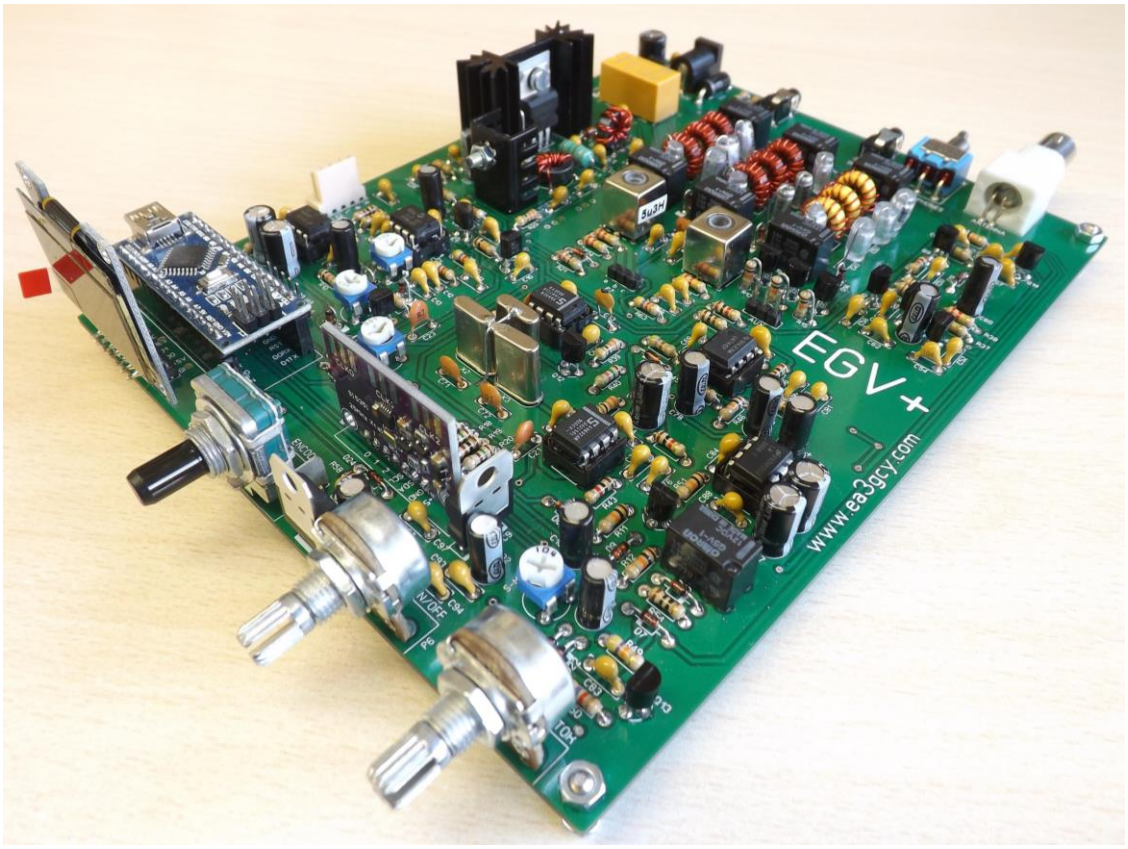


Thank you for building the ***EGV+v2*** 40, 30 and 20m QRP CW Transceiver kit

Have fun assembling it and enjoy QRP! 73 Javier Solans, ea3gcy

INTRODUCTION

This EGV+v2 transceiver is probably the kit that I have produced with more care and illusion in my life.
It is a great honor to name this kit "EGV", the callsign suffix of the late Miguel Montilla, EA3EGV (SK).
With no doubt, this is the kind of kit he liked most.
It was my privilege to establish and share with him the first years of the EA-QRP Club. He has always been a referent in my life; when I remember those wonderful years his humbleness, work capacity and generosity are the virtues which shine his image.
How lucky I was to be able to share the path with you, Miguel. Thanks!

Javier Solans, ea3gcy

Miguel Montilla, EA3EGV (SK)

Miguel got his A class callsign in 1983. He hold previously the call EC3BAY. He was a good CW operator, highly respected among their peers. Holder of many awards and winner of several contests, Miguel enjoyed both the competition and sharing his time with a novel operator, patiently providing information to make a QSO.
He published articles on the journal from URE (Spanish Radio Amateur Union) Unión de Radioaficionados Españoles, on “CQ Radio Amateur” (Spanish edition) and on the G-QRP bulletins, etc.
But, without doubt, what he liked most it was QRP kit building. He loved to build a kit over a weekend and enjoy some placid QSOs made with his new fresh transceiver. Of course, always with the minimum power required!
Miguel EA3EGV was the founder member #1 of the EA-QRP CLUB.
On September 1994 a group of four hams, Miguel Montilla EA3EGV, Miguel Molina EA3FHC, Vicenç Llario EA3ADV and myself, Javier Solans EA3GCY, founded the EA-QRP.

EGV+v2

The *EGV+v2* is the evolution of the legendary EGV-40 kit.
The *EGV+v2* is a 40, 30 and 20m QRP CW transceiver design based on the NE602 integrated circuit used as a receiving mixer and CW demodulator. Band and TX / RX switching, audio mute etc. they are controlled by an ATMEGA328 processor (Arduino NANO compatible).
The Local Oscillator, BFO and CW TX signal are generated by a SI-5351 module that is controlled by the ATMEGA processor. Frequency and other performance data is displayed on a 1.3 "OLED screen.
The *EGV+v2* includes functions like Audio Mute, six frequency steps in two ranges, S-Meter and RIT.
There are only four controls: Tuning, Band, Volume and RF attenuator.
In addition to tuning, all the functions of the controller are carried out by means of the rotary encoder with push button (no more keys or push buttons).
The *EGV+v2* is a single-board design in which all the elements are included.
KB-2 automatic keyer circuit is included on EGV+v2 board. It offers iambic A and B mode, 4 memories and various settings (speed adjustment, adjustable lateral tone, tune function, beacon, straight keyer, etc).
The *EGV+v2* kit uses through-hole parts, you can assemble it to your home, without special soldering irons or any professional measuring set.
A quality soldering iron for electronics and good solder and a cutter pliers is all you need.

Note: experience on radio assembly is required.
It shouldn't be your first transceiver to build.

There are only four controls: Tune, Band, Volume and RF Attenuator, which are sufficient for enjoying the pleasure of QRP!

SPECIFICATIONS

GENERAL:
Frequency coverage:

- 40m
- 30m
- 20m

Note: You can tune below and above the bands (from 6 to 15MHz) but downgrading the characteristics

Tuning steps on two ranges: 10Hz-100Hz-1kHz and 10kHz-100kHz-1MHz.
Modes: CW.
RIT function: without frequency limit
Power requirements: 12 – 14VDC, 1 – 2A transmit, 0.15 – 0.25A receive.
Antenna impedance: 50 ohms nominal.
Controls: Tuning-pushbutton. Pass-Band adjust. Volume. RF attenuator.
Board dimensions: 180 x 140 mm.
Weight: (no enclosure): 0.28 kg.

TRANSMITTER:
Emissión: CW.
RF output: 5W 13.8V.
Output TX Amp: AB class amplifier.
High Quality output Spectrum.
Harmonics output: -45dBc or better below the fundamental frequency.
Other spurious signals: -50dBc or better below the fundamental frequency.
T/R switching: Relays.

RECEIVER:
Type: Superheterodyne. Balanced mixers.
Sensitivity: 0.2uV minimum discernible signal.
Selectivity: 3-pole crystal ladder filter, 700Hz nominal bandwidth.
IF frequency: 4.915MHz.
AGC: acts on the receive path according to the received audio.
Audio output: 250mW, 4-8 ohms.

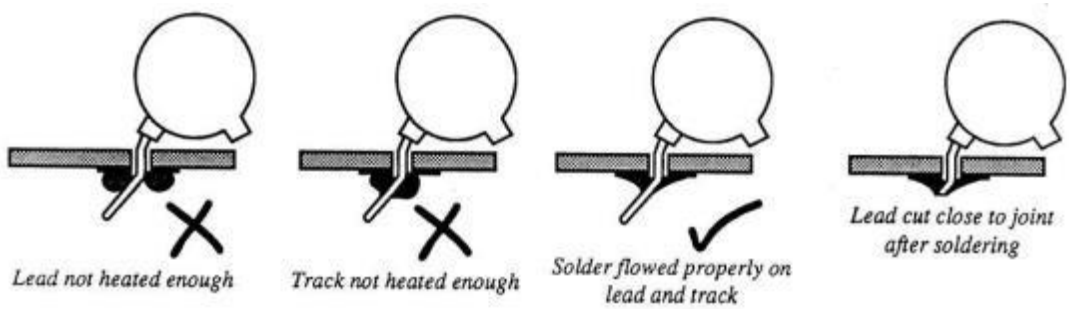
PLEASE READ ALL ASSEMBLY INSTRUCTIONS COMPLETELY AT LEAST ONCE BEFORE YOU BEGIN.

TIPS FOR BUILDERS WITH LITTLE EXPERIENCE

Tools required:
- Fine-tip soldering iron of about 30W, small wire cutters for cutting component leads, wire strippers, long-nose pliers, needle-nose pliers, X-Acto knife, screwdriver for M3 screws, alignment tool for adjusting IF transformers.
- You will need a good light and a magnifying glass to see the fine print on the components and other assembly details.

Instruments required:
- Multimeter, frequency counter or HF receiver, RF power meter, dummy load of about 10W - 50ohms, RF signal generator (desirable but not essential).

Soldering:
There are two essential things to keep in mind to ensure the proper functioning of a kit. The first is to put the component into its proper place on the circuit board, the second is good soldering.



To solder properly, you must use a high-quality solder for electronics and the correct type of soldering iron. Use a small soldering iron that has a fine, pointed tip. The soldering iron should be about 30 watts (if it is not thermostatically controlled). Use only solder intended for electronic soldering; NEVER use extra flux. You should hold the hot soldering iron in contact with both the circuit board and the component lead for about two seconds to heat them up. Then, keeping the soldering iron in place, touch the solder at the junction of the component lead and circuit board trace and wait about two seconds or so until the solder flows between the lead and the trace to form a good joint. Now remove the soldering iron. The soldering iron should have been in contact with the joint for a total time of about 4 seconds. After soldering each joint, you should clean the soldering tip, removing any excess solder. This prevents mixing in old solder and residues from previous soldering operations.

Finding the correct component:

IC's

The component outline for the IC printed on the circuit board has a "U" shaped notch on one end, indicating the end at which pin 1 of the IC is located. There is a similar notch on one end of the IC socket that should be oriented over the "U" printed on the circuit board. Finally, pin 1 of the IC is also marked with a small dimple or dot; this end of the IC should be oriented towards the notch in the IC socket or the "U" of the component outline.

Diodes

Be careful to observe the correct polarity of the diodes. There is a dark-colored band towards one end of the diode. This band should be oriented towards the line printed on the component outline of the circuit board.

Electrolytic capacitors:

These must be placed with the correct polarity. The positive lead (+) is always the long lead. The negative terminal (-) is the short lead and is marked by a stripe on the body of the capacitor. Make sure that the positive lead of the capacitor goes through the hole marked with a "+" on the circuit board.

Toroids:

You may find it convenient to wind and prepare all the toroids before beginning to mount the components. That way you won't have to stop and possibly lose concentration while winding them.

This is the part of the construction that some consider to be the most difficult. I personally find it to be one of the easiest stages, and it can even be relaxing. Look for the most appropriate moment to do it, and most importantly, take your time. The drawings, photos and instructions in the manual will illustrate and make the process easier.

LIST OF COMPONENTS BY VALUE/QUANTITY

Resistor list				
Qty	Value	Checked	Ref.	Identified
4	10 Ω		R7, R17, R53, R54	brown-black-black
6	22 Ω		R29, R30, R39, R42, R61, R62	red-red-black
8	100 Ω		R1, R2, R3, R8, R19, R26, R52, R56	brown-black-brown
2	150 Ω		R18, R20	brown-green-brown
1	220 Ω		R21	red-red-brown
2	330 Ω		R27, R31	orange-orange-brown
3	470 Ω		R16, R41, R48	yellow-violet-brown
6	1K		R10, R25, R34, R43, R44, R55	brown-black-red
2	1K5		R40, R50	brown-green-red
1	2K2		R28	red-red-red
3	4K7		R5, R6, R63	yellow-violet-red
15	10K		R4, R9, R11, R12, R13, R14, R15, R32, R45, R46, R51, R58, R59, R60, R64	brown-black-orange
1	22K		R57	red-red-orange
5	100K		R33, R35, R36, R37, R49	brown-black-yellow
5	220K		R22, R23, R24, R38, R47	red-red-yellow
2	10K		P1, P2 Adjustable	103
1	100K		P4 Adjustable	104
1	1K		P3 Potentiometer	B1K
1	10K		P5 Potentiometer	B10K
1	50K		P6 Potentiometer	B50K
1	Encoder		PEC16-4015F Encoder	--

Capacitors list				
Qty	Value	Checked	Ref.	Identified
51	100n		C1, C2, C3, C4, C5, C6, C7, C9, C10, C11, C12, C13, C14, C20, C23, C24, C26, C27, C28, C29, C32, C33, C37, C38, C39, C52, C54, C55, C56, C58, C59, C61, C62, C64, C66, C67, C69, C73, C74, C75, C76, C80, C81, C83, C88, C89, C90, C93, C94, C96, C97	104 or 0.1
2	1n		C57, C77	102 or 0.001
4	10n		C30, C31, C36, C84	103 or 0.01
1	4p7		C25	4.7
1	15p		C19	15
1	22p		C63	22
2	82p		C21, C22	82
2	180p		C48, C51 **Polystyrene**	180 J
1	220p		C65	221 or n22 or 220
4	270p		C40, C43, C44, C47 **Polystyrene**	270 J
2	390p		C49, C50 **Polystyrene**	390 J
3	470p		C70, C71, C72	471 or n47 or 470
2	560p		C45, C46 **Polystyrene**	560 J
2	680p		C41, C42 **Polystyrene**	380 J
2	1uF		C18, C60	1uF
1	4,7uF		C82	4.7uF or 4u7F
6	10uF		C8, C17, C53, C85, C92, C95	10uF
5	100uF		C15, C16, C68, C78, C87	100uF
2	470uF		C79, C86	470uF
1	1000uF		C91	1000uF

Semiconductor list				
Qty	**Type**	**Checked**	**Ref.**	**Identified**
Transistors				
10	BC547		Q1, Q2, Q3, Q4, Q5, Q6, Q9, Q12, Q13, Q14	C547
2	2N7000		Q10, Q11	2N7000
1	BD135 / C2314 / NTE295		Q7	BD135 or C2314 or NTE295
1	BD140		Q15	BD140
1	2SC1969		Q8	SC1969
ICs				
1	LP2950-33		IC1	LP2950-33
1	78L05		IC4	78L05
1	7809		IC9	7809
1	7805		IC10	7805
2	LM386		IC3, IC8	LM386
1	UA741		IC7	UA741
2	NE602		IC5, IC6	NE602
1	KB-2 CW keyer		IC2	PIC12F(LF)1840
1	SI5351		IC11	SI5351 module
1	ATMEGA328P		IC12	ATMEGA328P module
1	OLED DISPLAY		IC13	OLED 1.3”
Diodes				
20	1N4148		D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D18, D19, D21, D22, D24, D25	4148
2	6V2 Zener		D15, D20	6V2
1	47V 1W Zener		D17	47V
1	BY255		D23	BY255

Inductor/RF Transformer/Crystal/Relay list				
Qty	**Value**	**Checked**	**Ref.**	**Identified**
2	5u3H		L1, L2	5u3
2	FT37-43		L3, L4	black toroid
6	T37-2		L6, L7, L8, L9, L10, L11	red toroid
3	T37-6		L12, L13, L14	yellow toroid
3	4.915Mhz		X1, X2, X3 crystals	4.91
1	Huigang relay		RL1	Huigang HRS2H 12V
7	Omron relays		RL2, RL3, RL4, RL5, RL6, RL7, RL8	Omron G5V-1 12V

Connectors and Hardware				
Qty	**Value**	**Checked**	**Ref.**	**Identified**
1	BNC socket		BNC PCB socket	--
2	Jack socket		Stereo PCB Jack 3.5mm socket	--
1	Supply socket		Power supply PCB Jack 2.1mm socket	--
1	Switch		SPDT PCB switch toggle	--
2	Female pins		15 pin female sockets strip (Arduino)	--
1	Male pins		5 pin male strip polarized socket	--
6	IC sockets		8 pins IC sockets	--
14	Male pins strip		3 + 3 + 5 + 2 + 1 no polarized strip pins	--
2	45° strip pins		7 pin 45° bent strip (to SI5351 and OLED modules)	--
1	Jumper		Jumpers to J1	--
1	Heatsink		Heatsink to Q7	--
1	Heatsink		Heatsink to Q8	--
2	Mica insulator		Mica insulator to Q7 and Q8	--

1	Plastic washer		Plastic through isolator washer to Q3 screw	--
2	M3x10 screw		10mm M3x10 screw to Q7 and Q8	--
4	M3x4 screws		4mm M3x4 screws	--
6	M3 nuts		M3 nuts	--
2	M3 washer		Metal M3 washer to Q7 and Q8	--
4	M3 spacers		Hex 5mm M3 spacers	--
300	300 cms.		300 cms. 0,5mm enamelled wire	--
1	PCB		EGV-3B PCB (printed circuit board)	EGV-3B

LIST OF INDIVIDUAL COMPONENTS

Resistors						
Checked		Ref.	Value	Ident./Comment	Circuit section	Located
		R1	100 Ω	brown-black-brown	CW Keyer	L-2
		R2	100 Ω	brown-black-brown	CW Keyer	L-2
		R3	100 Ω	brown-black-brown	CW Keyer	M-2
		R4	10K	brown-black-orange	CW Keyer	K-5
		R5	4K7	yellow-violet-red	CW Keyer	L-5
		R6	4K7	yellow-violet-red	CW Keyer	L-5
		R7	10 Ω	brown-black-black	CW Keyer	O-1
		R8	100 Ω	brown-black-brown	CW Keyer	J-10
		R9	10K	brown-black-orange	Switches	N-5
		R10	1K	brown-black-red	Switches	N-3
		R11	10K	brown-black-orange	Switches	O-12
		R12	10K	brown-black-orange	Switches	O-12
		R13	10K	brown-black-orange	Switches	H-9/10
		R14	10K	brown-black-orange	Switches	H-10
		R15	10K	brown-black-orange	Switches	H-11
		R16	470 Ω	yellow-violet-brown	VFO input	O-7
		R17	10 Ω	brown-black-black	BFO input	O-8
		R18	150 Ω	brown-green-brown	BFO input	O-9
		R19	100 Ω	brown-black-brown	BFO input	O9
		R20	150 Ω	brown-green-brown	BFO input	O-9
		R21	220 Ω	red-red-brown	Adjustable BPF	J-6
		R22	220K	red-red-yellow	Adjustable BPF	I-9
		R23	220K	red-red-yellow	Adjustable BPF	I-6
		R24	220K	red-red-yellow	Adjustable BPF	I-6
		R25	1K	brown-black-red	TX driver	J-2
		R26	100 Ω	brown-black-brown	TX driver	J-1/2
		R27	330 Ω	orange-orange-brown	TX driver	I/J-1
		R28	2K2	red-red-red	TX driver	J-3/4
		R29	22 Ω	red-red-black	TX driver	J-4/5
		R30	22 Ω	red-red-black	TX driver	H/I-3
		R31	330 Ω	orange-orange-brown	Output Amp	H-2
		R32	10K	brown-black-orange	AGC	C-12
		R33	100K	brown-black-yellow	AGC	D-12
		R34	1K	brown-black-red	AGC	E-12
		R35	100K	brown-black-yellow	AGC	F-12
		R36	100K	brown-black-yellow	AGC	F-12
		R37	100K	brown-black-yellow	AGC	F-13
		R38	220K	red-red-yellow	AGC	F-13
		R39	22 Ω	red-red-black	RX Mix	L-9
		R40	1K5	brown-green-red	IF Filter	L-9
		R41	470 Ω	yellow-violet-brown	CW Dem	K-9/10
		R42	22 Ω	red-red-black	CW Dem	M-10
		R43	1K	brown-black-red	Audio preamp	N/O-11
		R44	1K	brown-black-red	Audio preamp	M-11
		R45	10K	brown-black-orange	Audio preamp	K-11
		R46	10K	brown-black-orange	Audio preamp	K-11/12
		R47	220K	red-red-yellow	Audio preamp	J-10/11
		R48	470 Ω	yellow-violet-brown	S-Meter	K-12
		R49	100K	brown-black-yellow	S-Meter	P-13
		R50	1K5	brown-green-red	S-Meter	Q-13
		R51	10K	brown-black-orange	Audio Amp	M-12
		R52	100 Ω	brown-black-brown	Audio Amp	L-12/13

		R53	10 Ω	brown-black-black	Audio Amp	N-13
		R54	10 Ω	brown-black-black	Audio Amp	O-13
		R55	1K	brown-black-red	Audio mute	I-10
		R56	100 Ω	brown-black-brown	Audio Amp	J-11/12
		R57	22K	red-red-orange	ATMEGA328P	Q-9/10
		R58	10K	brown-black-orange	ATMEGA328P	Q-8
		R59	10K	brown-black-orange	ATMEGA328P	Q/R-6
		R60	10K	brown-black-orange	ATMEGA328P	Q/R-5
		R61	22 Ω	red-red-black	Headphones	A-4
		R62	22 Ω	red-red-black	Headphones	A-5
		R63	4K7	yellow-violet-red	Adjustable BPF	J-8/9
		R64	10K	brown-black-orange	Driver	K1
		P1	10K	Adjustable 103	CW Keyer	M-4
		P2	10K	Adjustable 103	Switches	N-4
		P3	1K	Potentiometer B1K	RX Gain	R-13
		P4	100K	Adjustable 104	S-Meter	P/Q-12
		P5	10K	Potentiometer B10K	Volume	R-10
		P6	50K	Potentiometer B50K	Adjustable BPF	Front Panel
		ENCODER	PEC16F	PEC16-4015F Encoder	ATMEGA328P	R-7

Capacitors

Checked		Ref.	Value	Ident./Comment	Circuit section	Located
		C1	100n	104 or 0.1	CW Keyer	K-4
		C2	100n	104 or 0.1	CW Keyer	L-2/3
		C3	100n	104 or 0.1	CW Keyer	K-1/2
		C4	100n	104 or 0.1	CW Keyer	N-1
		C5	100n	104 or 0.1	CW Keyer	L-2/3
		C6	100n	104 or 0.1	CW Keyer	L/M-3
		C7	100n	104 or 0.1	CW Keyer	M/N-3
		C8	10uF	10uF electrolytic	CW Keyer	K-3
		C9	100n	104 or 0.1	CW Keyer	K-3
		C10	100n	104 or 0.1	CW Keyer	K-6
		C11	100n	104 or 0.1	CW Keyer	L-5/6
		C12	100n	104 or 0.1	CW Keyer	M-6
		C13	100n	104 or 0.1	CW Keyer	M-6
		C14	100n	104 or 0.1	CW Keyer	N-1
		C15	100uF	100uF electrolytic	CW Keyer	O-2
		C16	100uF	100uF electrolytic	CW Keyer	O-1/2
		C17	10uF	10uF electrolytic	Switches	N-3
		C18	1uF	1uF electrolytic	Switches	P-11/12
		C19	15p	15 or 15J	VFO input	O/P-7
		C20	100n	104 or 0.1	BFO input	O/P-8
		C21	82p	82 or 82J	BFO input	N/O-9
		C22	82p	82 or 82J	CW Input	O-6/7
		C23	100n	104 or 0.1	Driver	J1/2
		C24	100n	104 or 0.1	Adjustable BPF	H-8
		C25	4p7	4.7 or 4p7	Adjustable BPF	H-7/8
		C26	100n	104 or 0.1	Adjustable BPF	H-7
		C27	100n	104 or 0.1	Adjustable BPF	I-9
		C28	100n	104 or 0.1	Adjustable BPF	J-9
		C29	100n	104 or 0.1	TX driver	J-1/2
		C30	10n	103 or 0.01	TX driver	K-3/4
		C31	10n	103 or 0.01	TX driver	I-4/5
		C32	100n	104 or 0.1	TX driver	I-1/2
		C33	100n	104 or 0.1	TX driver	G-3/4
		C34a	No used			
		C34b	No used			
		C35	No used			
		C36	10n	103 or 0.01	Output Amp	G-2
		C37	100n	104 or 0.1	Output Amp	F-4
		C38	100n	104 or 0.1	Output Amp	E-3
		C39	100n	104 or 0.1	RX signal	D-3

		C40	270p	270 Polystyrene	40m LPF	F-5/6
		C41	680p	680 Polystyrene	40m LPF	F-7
		C42	680p	680 Polystyrene	40m LPF	E-7
		C43	270p	270 Polystyrene	40m LPF	D-7
		C44	270p	270 Polystyrene	30m LPF	F-7/8
		C45	560p	560 Polystyrene	30m LPF	F-8/9
		C46	560p	560 Polystyrene	30m LPF	E-8/9
		C47	270p	270 Polystyrene	30m LPF	D-8/9
		C48	180p	180 Polystyrene	20m LPF	F-9/10
		C49	390p	390 Polystyrene	20m LPF	F-11
		C50	390p	390 Polystyrene	20m LPF	E-11
		C51	180p	180 Polystyrene	20m LPF	D-10/11
		C52	100n	104 or 0.1	AGC	G-14
		C53	10uF	10uF electrolytic	AGC	G-13
		C54	100n	104 or 0.1	AGC	H-13
		C55	100n	104 or 0.1	AGC	C-13
		C56	100n	104 or 0.1	AGC	C-12
		C57	1n	102 or 0.001	AGC	D-13
		C58	100n	104 or 0.1	AGC	G-12
		C59	100n	104 or 0.1	AGC	E-12
		C60	1uF	1uF electrolytic	AGC	E/F-13
		C61	100n	104 or 0.1	AGC	G-12
		C62	100n	104 or 0.1	AGC	G/H-12
		C63	22p	22 or 22J	RX Mix	K-8
		C64	100n	104 or 0.1	RX Mix	K-7
		C65	220p	221 or n22 or 220	RX Mix	L-7
		C66	100n	104 or 0.1	RX Mix	L-8
		C67	100n	104 or 0.1	RX Mix	L-10
		C68	100uF	100uF electrolytic	RX Mix	L/M-10-11
		C69	100n	104 or 0.1	RX Mix	J/K-10
		C70	470p	470 or n47 or 471	IF Filter	M-7
		C71	470p	470 or n47 or 471	IF Filter	N-7
		C72	470p	470 or n47 or 471	IF Filter	N-8
		C73	100n	104 or 0.1	CW Dem	N-9/10
		C74	100n	104 or 0.1	CW Dem	M-10/11
		C75	100n	104 or 0.1	Audio preamp	M/N-11/12
		C76	100n	104 or 0.1	Audio preamp	M/N-11/12
		C77	1n	102 or 0.001	Audio preamp	I/J-11
		C78	100uF	100uF electrolytic	Audio preamp	L-11
		C79	470uF	470uF electrolytic	Audio preamp	K-12
		C80	100n	104 or 0.1	S-Meter	J-12
		C81	100n	104 or 0.1	Audio Amp	J-12
		C82	4,7uF	4.7uF electrolytic	S-Meter	P-12/13
		C83	100n	104 or 0.1	S-Meter	Q-13
		C84	10n	103 or 0.01	Audio Amp	L-12
		C85	10uF	10uF electrolytic	Audio Amp	K-13
		C86	470uF	470uF electrolytic	Audio Amp	L-13/14
		C87	100uF	100uF electrolytic	Audio Amp	M-13/14
		C88	100n	104 or 0.1	Audio Amp	M-13
		C89	100n	104 or 0.1	Audio mute	C-13
		C90	100n	104 or 0.1	Supply input	A-2
		C91	1000uF	1000uF electrolytic	Supply input	B-1/2
		C92	10uF	10uF electrolytic	ATMEGA328P	Q-11
		C93	100n	104 or 0.1	ATMEGA328P	Q-11
		C94	100n	104 or 0.1	ATMEGA328P	Q-11/12
		C95	10uF	10uF electrolytic	ATMEGA328P	R-9
		C96	100n	104 or 0.1	ATMEGA328P	Q-8
		C97	100n	104 or 0.1	ATMEGA328P	Q-9/10

Crystals						
Checked		Ref.	Frequency	Ident./Comment	Circuit section	Located
		X1	4.915 MHz	4.915 or 4.91	IF xtal filter	M-8
		X2	4.915 MHz	4.915 or 4.91	IF xtal filter	N-7
		X3	4.915 MHz	4.915 or 4.91	IF xtal filter	N-8

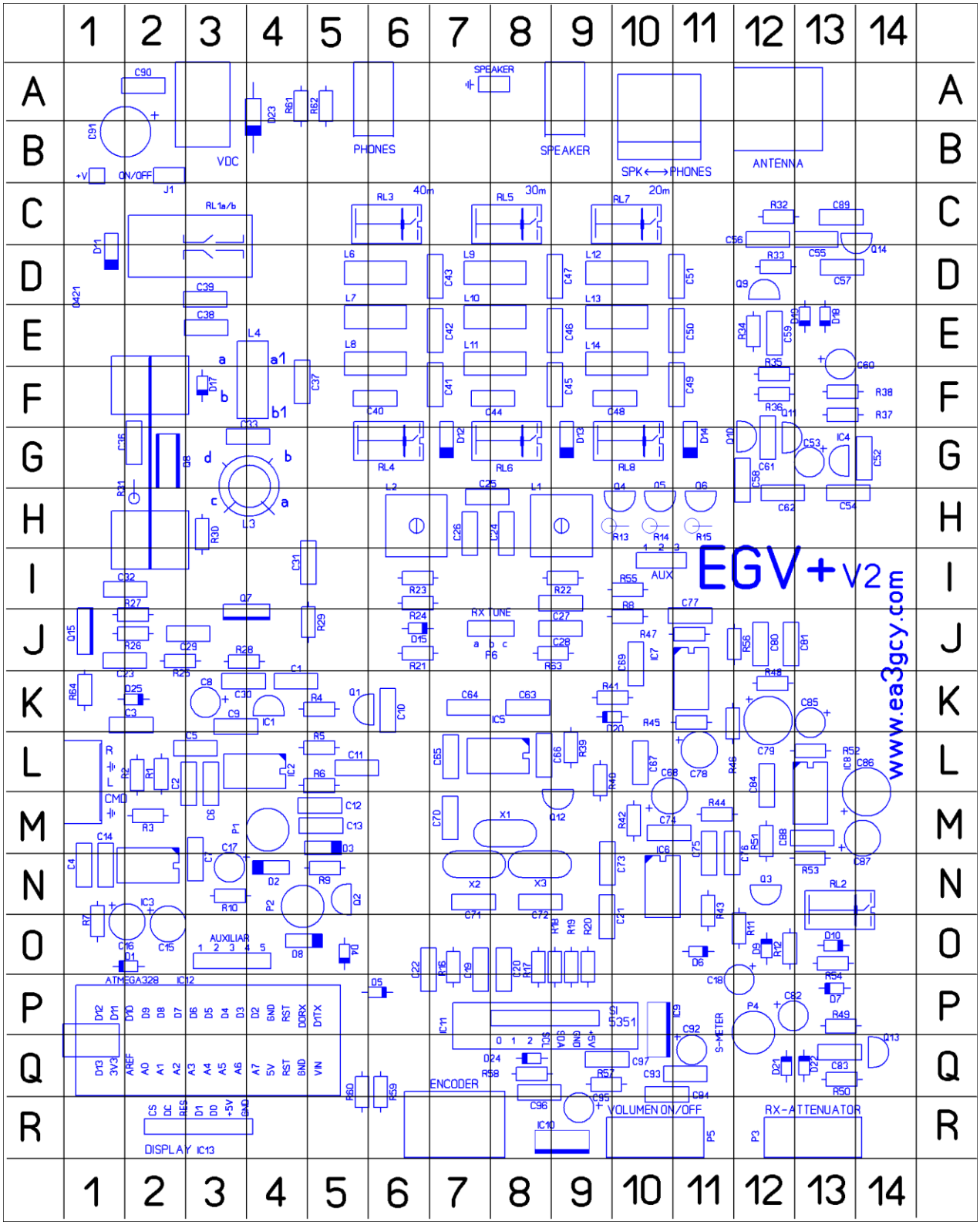
Semiconductors						
Checked		Ref.	Type	Ident./Comment	Circuitsection	Located
		Transistors				
		Q1	BC547	BC547	CW Keyer	K-5
		Q2	BC547	BC547	Key Switch	N-5
		Q3	BC547	BC547	Relay switch	N-12
		Q4	BC547	BC547	Relay switch	H-10
		Q5	BC547	BC547	Relay switch	H-10
		Q6	BC547	BC547	Relay switch	H-11
		Q7	BD135 / C2314 / NTE295	BD135 or C2314 or NTE295	TX Driver	I/J-3/4
		Q8	2SC1969	C1969	TX Output Amp	G-2
		Q9	BC547	BC547	AGC	D-12
		Q10	2N7000	2N7000	AGC	G-12
		Q11	2N7000	2N7000	AGC	G-12
		Q12	BC547	BC547	IF Filter	M-8/9
		Q13	BC547	BC547	S-Meter	Q-14
		Q14	BC547	BC547	Audio Mute	C/D-14
		Q15	BD140	BD140	Driver	J-1
		IC's				
		IC1	LP2950-33	LP2950-33	CW Keyer supply	K-4
		IC2	KB-2	12F(LF)1840	CW Keyer IC	L-4
		IC3	LM386	LM386	CW Keyer	N-2
		IC4	78L05	78L05	AGC	G-13
		IC5	NE602	NE602 or SA602	RX Mix	L-7/8
		IC6	NE602	NE602 or SA602	CW Dem	N-10
		IC7	UA741	741	Audio preamp	J/K-11
		IC8	LM386	LM386	Audio Amp	L/M-13
		IC9	7809	7809	processor supply	P-10
		IC10	7805	7805	processor supply	R-9/8
		IC11	SI5351 Module	SI5351	SI5351	P-8/9
		IC12	ATMEGA328P module	ATMEGA328P module or Arduino NANO	Processor	Q-2/3
		IC13	DISPLAY OLED	1.3” display		R-2/3

		Diodes				
		D1	1N4148	4148	Key switch	O-1/2
		D2	1N4148	4148	Switches	N-4
		D3	1N4148	4148	Switches	M-5
		D4	1N4148	4148	Switches	O-5
		D5	1N4148	4148	Switches	P-6
		D6	1N4148	4148	Switches	O-10
		D7	1N4148	4148	Switches	P-13
		D8	1N4148	4148	Switches	O-4
		D9	1N4148	4148	Switches	O-12
		D10	1N4148	4148	Switches	O-13

		D11	1N4148	4148	Switches	C/D-1
		D12	1N4148	4148	Switches	G-7
		D13	1N4148	4148	Switches	G-9
		D14	1N4148	4148	Switches	G-11
		D15	6V2	6V2	BPF	J-6
		D16	No used			
		D17	1W 47V	47V	TX Amp	F-3
		D18	1N4148	4148	AGC	E-13
		D19	1N4148	4148	AGC	E-13
		D20	6V2	6V2	RX Mix/Dem	K-9/10
		D21	1N4148	4148	S-Meter	Q-12
		D22	1N4148	4148	S-Meter	Q-13
		D23	BY255	BY255	Supply input	A-4
		D24	1N4148	4148	ATMEGA328P	Q-8
		D25	1N4148	4148	Driver	K-2

Inductors/RF Transformers/Relay						
Checked		**Ref.**	**Value/Type**	**Ident./Comment**	**Circuit section**	**Located**
		L1	5u3H	5u3 or 5R3	Adjustable BPF	H-8/9
		L2	5u3H	5u3 or 5R3	Adjustable BPF	H-5
		L3	FT37-43	Black toroid	TX Driver	H-3/4
		L4	FT37-43	Black toroid	TX Output Amp	F-3/4
		L5	No used			
		L6	T37-2	Red toroid	40m LPF	D-5/6
		L7	T37-2	Red toroid	40m LPF	E-5/6
		L8	T37-2	Red toroid	40m LPF	E-5/6
		L9	T37-2	Red toroid	30m LPF	D-7/8
		L10	T37-2	Red toroid	30m LPF	E-7/8
		L11	T37-2	Red toroid	30m LPF	E-7/8
		L12	T37-6	Yellow toroid	20m LPF	D-9/10
		L13	T37-6	Yellow toroid	20m LPF	E-9/10
		L14	T37-6	Yellow toroid	20m LPF	E-9/10
		Relays				
		RL1	RL1a/b	Huigang HRS2H 12V	RX/TX switch	C-3
		RL2	RL2	Omron G5V-1 12V	Audio mute	N/O-13
		RL3	RL3	Omron G5V-1 12V	LPF switch	C-6
		RL4	RL4	Omron G5V-1 12V	LPF switch	G-6
		RL5	RL5	Omron G5V-1 12V	LPF switch	C-8
		RL6	RL6	Omron G5V-1 12V	LPF switch	G-8
		RL7	RL7	Omron G5V-1 12V	LPF switch	C-10
		RL8	RL8	Omron G5V-1 12V	LPF switch	G-10

252-QUADRANT COMPONENT LAYOUT MAP



ASSEMBLY

You can use the “individual parts list” or the “value/quantity parts list.” Using the “value/quantity parts list” is the quickest way to mount components since all the circuit board components of the same value or type can be placed one after the other. However, you will need the “individual parts list” to know how each component is identified and its location on the circuit board. Depending on your personal experience, you may prefer the individual parts list and feel more confident using it.

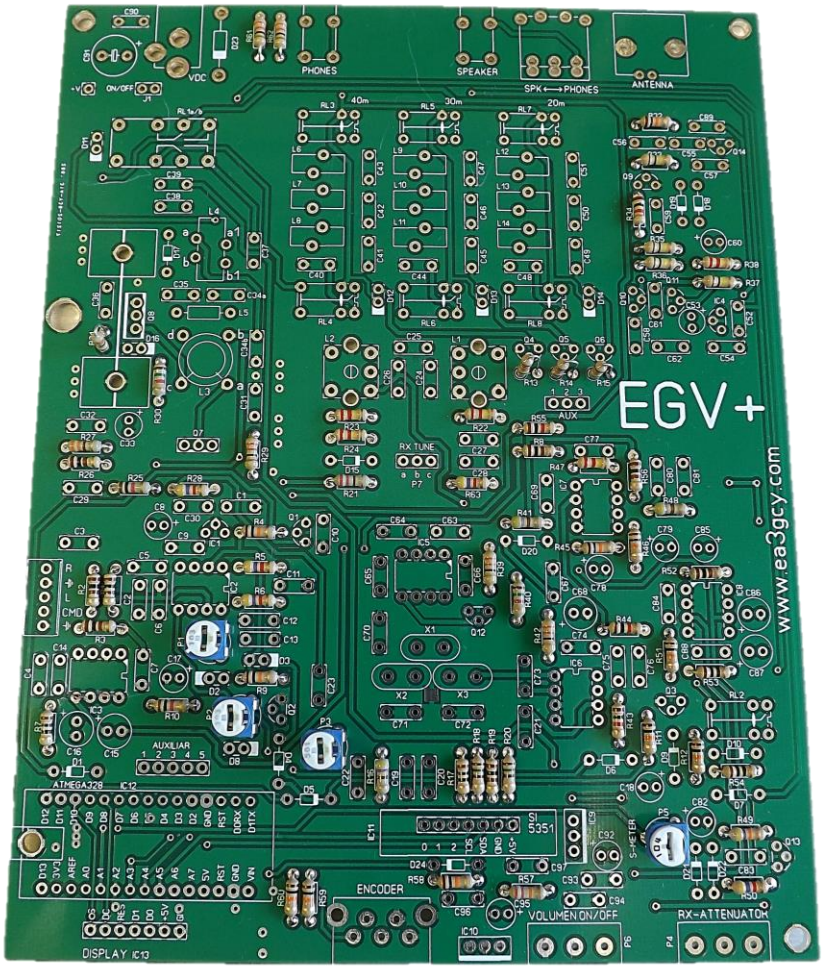
The 252-quadrant component layout map makes it very easy to find the location for all the components. After mounting each component, it can be marked off in the “checked” column.

It is highly recommended that an inventory be taken of all the components to make sure that everything can be located and is ready for assembly. Each builder may have his/her own method of organizing the components. One suggested method is to use a block of Styrofoam packing material and poke the components into it. The components can be sorted by type, value and size (ohms, micro-farads etc.).

RECOMMENDED ASSEMBLY SEQUENCE

⇨ Resistors

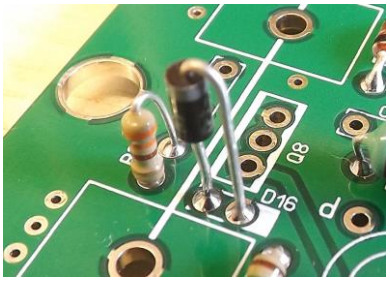
The resistors are installed first. Mount all resistors and trimmers P1, P2 and P4
P3, P5 and P6 are the RF attenuator, Volume and Band adjust potentiometers respectively; which should not be installed yet.
Refer to the parts list, and select the first resistor, R1. Bend the leads as close to the component body as possible (otherwise, they will not fit well into the holes), and place them into the appropriate holes according to the component outline printed on the circuit board. Be careful to avoid confusing the resistors with the axial inductors which are a bit thicker.
All of the resistors have a light-colored body and a gold band on one end. Inserting the resistor leads into the holes, push down on the body of the component so that it rests flat on the board, hold it in place, and then slightly bend the leads to keep the resistor in place. Then turn the board over and solder the leads to the printed circuit trace. Make sure that the resistor body lies flat on the board so that its leads are as short as possible. Please read the notes about soldering, as poor soldering is the most common cause for a kit failing to work for the first time. After soldering the component leads, cut off the excess length as close to the joint as possible. Mount the next resistor in the parts list in the same manner and continue until all the resistors are mounted.
The values which are in decade increments can be easily confused, such as 470, 4K7 and 47K, so be sure to verify the colors before soldering the component in place! If you are in doubt, use a multimeter to check the resistance value.

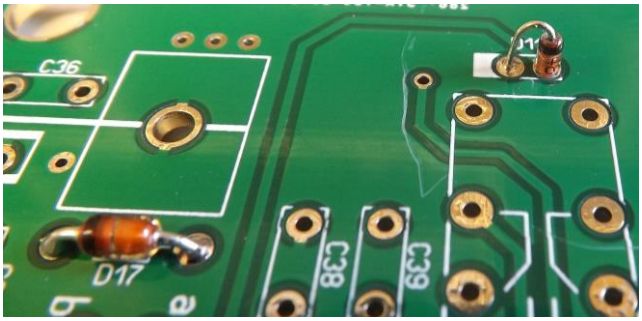


⇨ Diodes

Next mount the diodes, being careful to place them with the correct orientation. There is a dark-colored band on one end of each diode that corresponds to the component outline on the circuit board. There are 19 1N4148 diodes; they are normally orange in color with a black band and they have the type “4148” printed on the body. Note that some diodes are mounted in a vertical position.

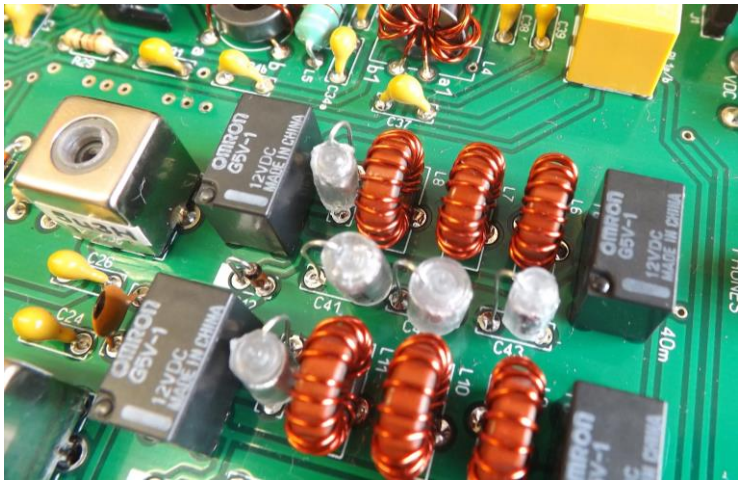
D15 and D20 are Zener diodes, similar in size to 1N4148 but are marked 6V2.
D17 is also a Zener diode (thicker than the others); it is marked 47V.
Diode D23 is a BY255, black, much thicker than the others.





⇨ Capacitors

There are ceramic, polystyrene (styroflex) and electrolytic capacitors. They all have their value printed on the body. Refer to the “identified” column in the parts list.
When you mount them, make sure to leave the leads as short as possible.
C40 through C51 are polystyrene capacitors; these are axial capacitors, but they must be mounted in a vertical position (see image).
The values which are in decade increments can be easily confused, such as 100n and 10n, so be sure to verify the numbers of their value before soldering them in place!
The electrolytic capacitors must be placed with the correct orientation: the LONG LEAD goes in the hole labeled “+” and the SHORT LEAD is "-", indicated by a band containing "-" signs on the side of the capacitor.

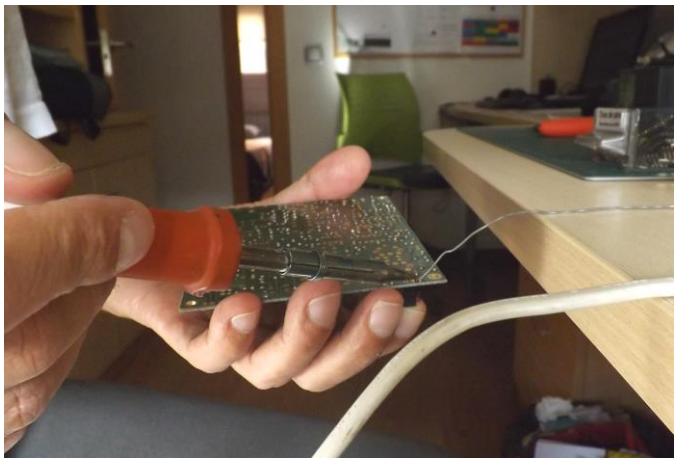


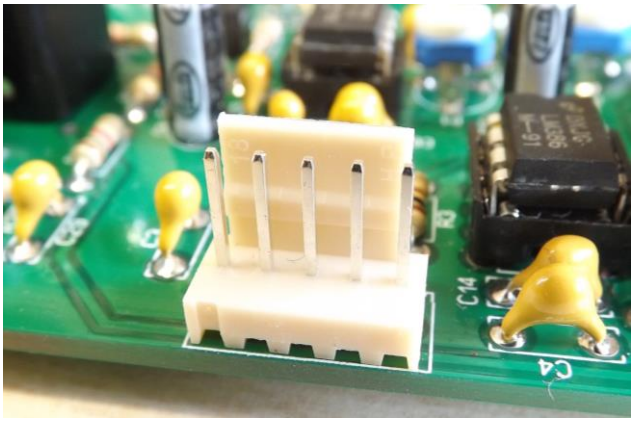
⇨ Pin headers and jumpers

- Place and solder the 5-pin header corresponding to the R, L paddles, CMD switch and GND.
- Place and solder the 2 pin headers “J1” (B-2).
- Place and solder the “AUXILIAR” 5 pins strip (O-3/4).
- Place and solder the “RX TUNE” 3 pins strip (J-7/8).
- Place and solder the “AUX” 3 pins strip (I-10).
- Place and solder 2 x female 15 pin strips for the ATMEGA328P module (Arduino UNO compatible).

Turn the board over and use one hand to insert and hold the header in place, using a “jumper” placed on the header while you solder the pins to avoid burning your fingers. Use your other hand to hold the soldering iron and move the board towards the solder to solder the headers in place. If you have someone available to help you, it will be much easier!

Place jumper on "**J1**" if you do not use an ON/OFF switch.





⇨ Transistors

All of the transistors have their type printed on the component body. Place them according to the corresponding component outline printed on the circuit board.

Be very careful not to confuse the types. Although their body is the same but they are different transistors. Use a suitable magnifying glass to read the marked references printed on them.

Q15 MC140

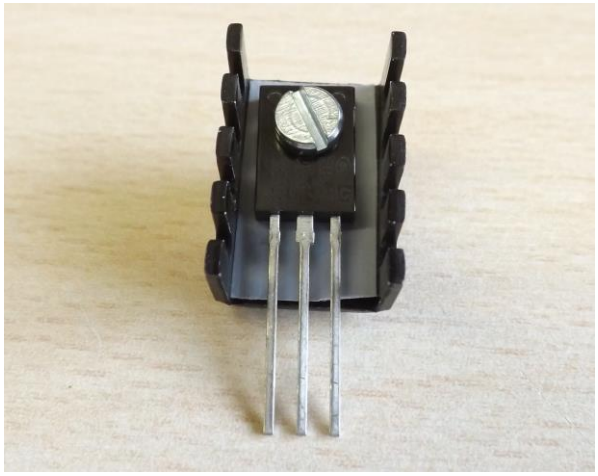
Q15 transistor has to be placed with its face facing away from the board (see image).

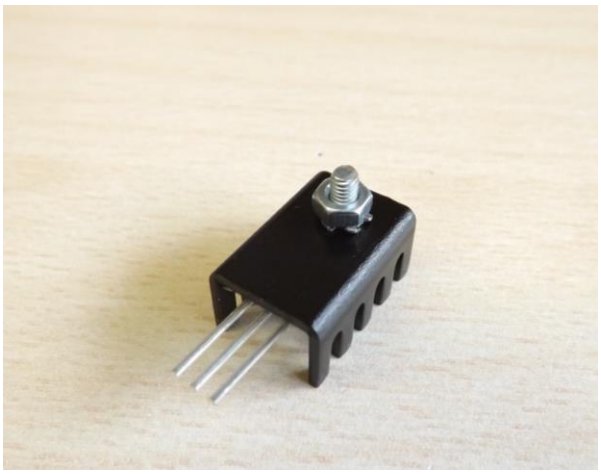
Prepare Q7 and Q8, but do not place them yet. It is better to do it after placing L3 and L4.

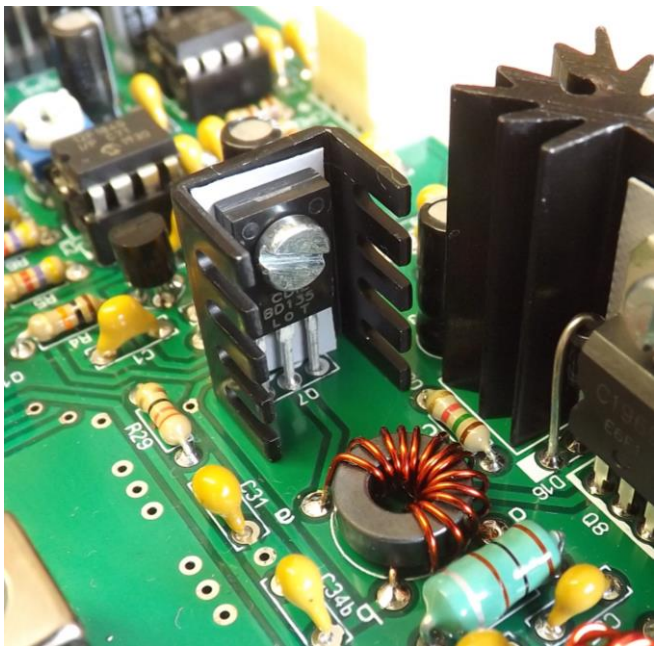
Q7 BD135

Mount Q7 onto the heatsink as shown in the image.

Use a mica insulator sheet that you will find in the kit and trim it 1-2mm so that it seats well within the heatsink.



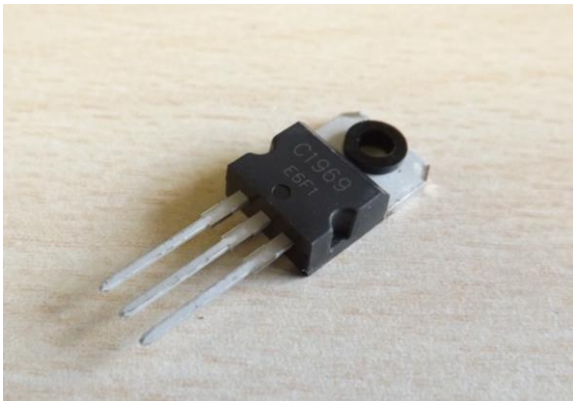


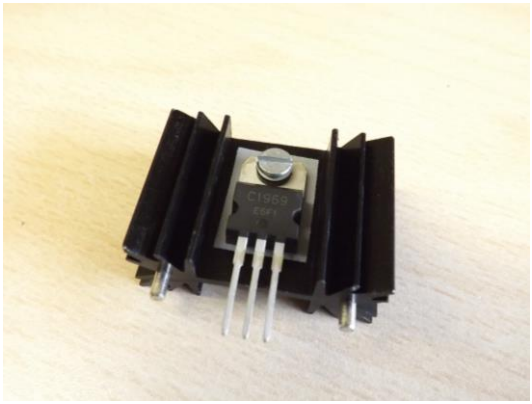


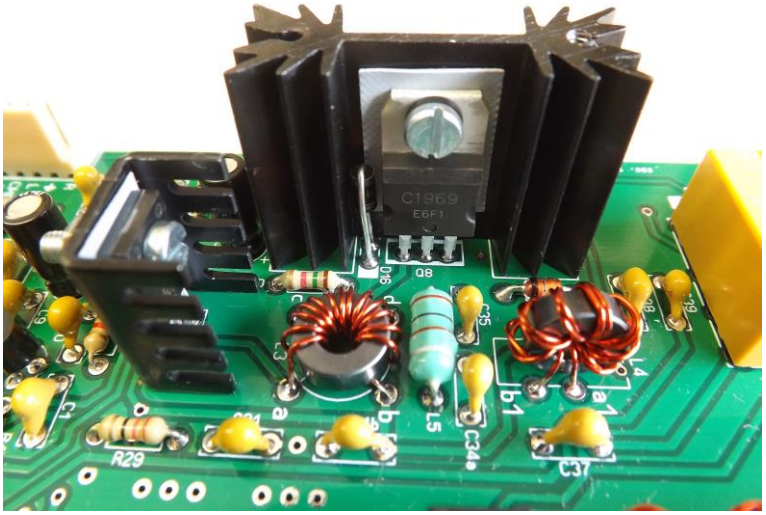
Q8 2SC1969

Mount Q8 (TX power amplifier) onto the heatsink as shown in the image. This transistor is placed with a mica insulator sheet and also a heatsink insulator bushing that insulates the screw from the transistor body.

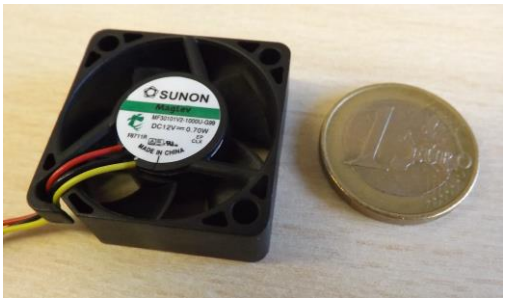
This is an important task; it should be done exactly as shown in the images.







If you plan to work at maximum power and for long periods of time (at base station) it may be advisable to increase the cooling surface. You can add some system to increase the temperature dissipation, for example by an auxiliary metal surface, a mini-fan or other similar system.



You can also screw the Q8 to the base of the metal case through the 6mm hole behind the transistor. In that case the radiator from the kit is not used.

⇨ Integrated Circuits

The component outline for the IC on the circuit board has a “U” shaped notch on one end, indicating the end at which pin 1 of the IC is located. There is a similar notch on one end of the sockets. This should be oriented over the "U" notch outline on the circuit board. Finally, pin 1 of the IC is marked with a small dimple or dot; this end of the IC should be oriented towards the notch in the IC socket or the "U" on the component outline.

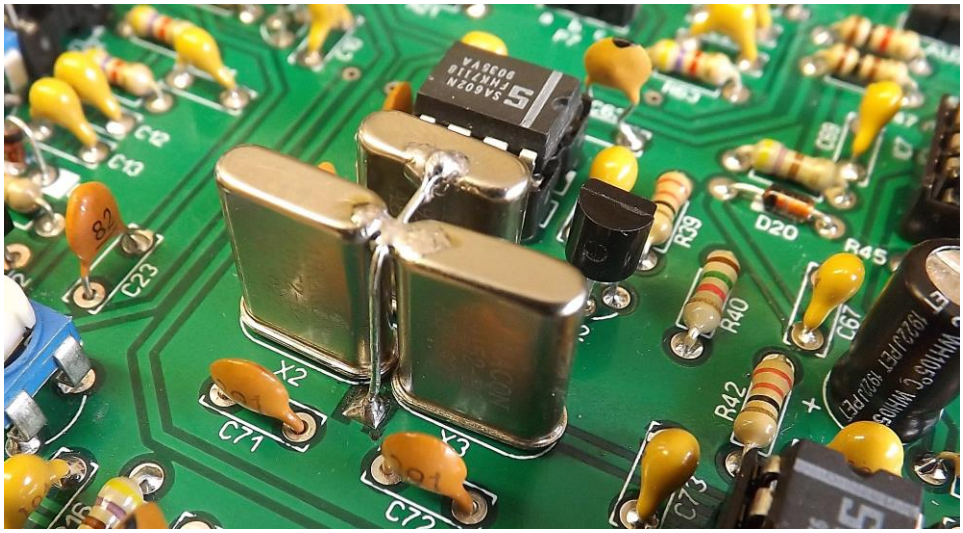
Mount the sockets for IC2, IC3, IC5, IC6, IC7, IC8 in the locations printed on the circuit board. Make sure that the sockets lie flat against the circuit board. Next, insert IC2, IC3, IC5, IC6, IC7, IC8 into their respective sockets.

Install IC1, IC4, IC9 and IC10. These are regulatory integrated circuits. Be careful not to confuse IC1 and UC4 (78L05) with IC10 (7805).

IMPORTANT: Make sure that the IC's are fully inserted into their sockets. A poor contact between the socket and IC can cause malfunction of the kit.

⇨ Crystals

Install **X1** through **X3**.
X1, X2, and X3 are the IF receiver filter. These crystals have been hand-picked (they have handwritten numbers on them) and have the same resonant frequency, in order to obtain the best filter quality.
The crystal housing should not touch the board; place them slightly separated from the board, at a distance of 0.5-1 mm.



Note: *With a scrap piece of wire left, you can solder the crystals housings to GND. Be careful not to overheat the crystals.*

⇨ Relays

Install relays RL1 to RL8. They can only be placed in one position.

Make sure that the body of the relay lies flat against the circuit board.

⇨ Shielded coils (cans)

L1, and L2 are shielded coils equivalent to Toko KANK3334, marked as **5u3H or 5R3**.
They are RF transformers for the bandpass filter. Make sure that they lie flat against the circuit board.
In order to solder the tabs of the shield, you will need to hold the soldering iron a little longer on the joint.

⇨ 40m LPF Toroids L6, L7 and L8

These are the 40m low-pass filter toroids.

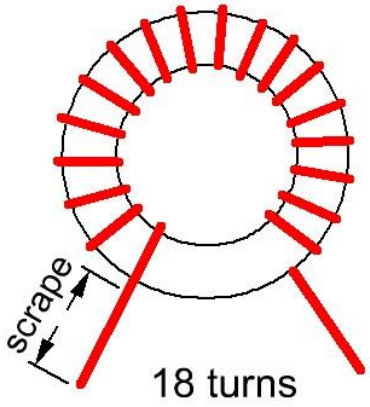
- **L6 and L8** are identical and are wound with **18 turns**.
- **L7** is wound with **20 turns**.

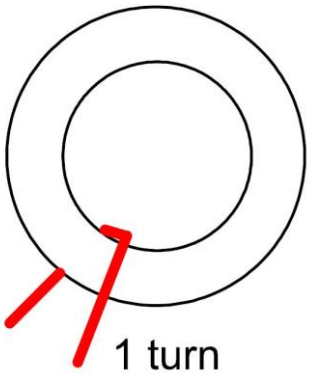
They use T37-2 (red toroids 9.5mm/0.375in outer diameter).
Cut about 26cm (10.3”) of 0.5mm diameter enameled wire and wind the **L6 and L8** toroids with eighteen (18) turns. Spread the turns evenly around the toroid and wind them tightly so that they follow the contour of the toroid and are as tight against the toroid as possible. The turns should be evenly distributed around the circumference of the toroid.
Leave pigtails of about 10mm (0.70”). Scrape off the enamel with a knife from the ends of the wire, in order to solder the toroid onto the board.

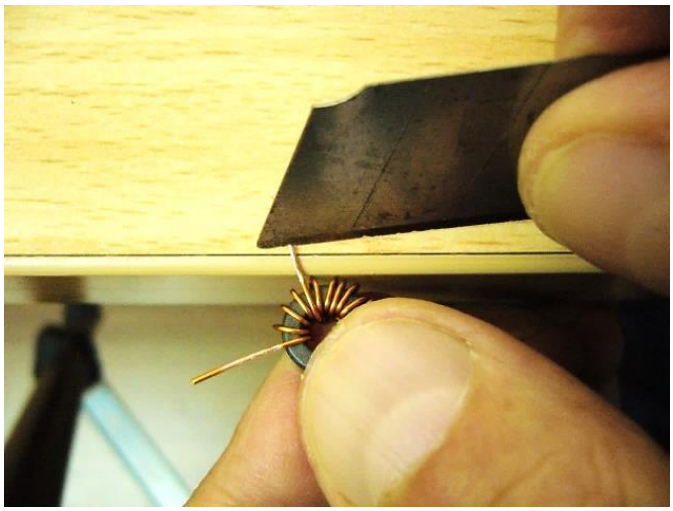
For **L7** cut about 30cm (12”) of 0.5mm diameter enameled wire and wind twenty (20) turns.
Mount and solder the three toroids in place.

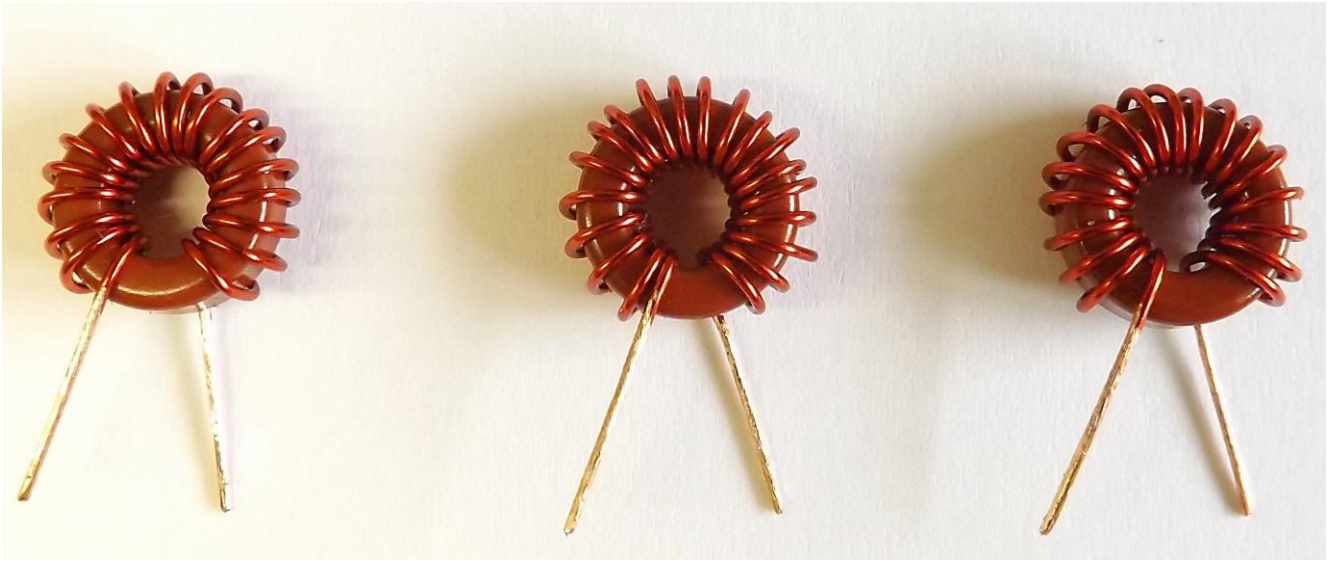
Counting the turns: Count one turn for each pass of the wire through the center of the toroid.

Important: Wind the toroid exactly as shown in the images. One turn more or less will affect the operation and the output power.









L6 (18 turns) L7 (20 turns) L8 (18 turns)

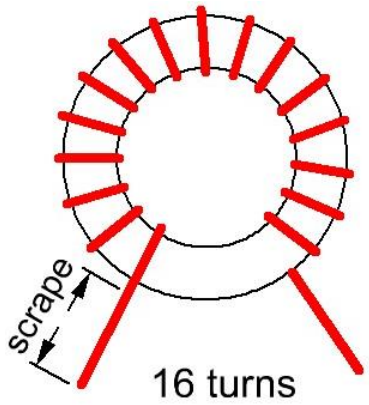
⇨ 30m LPF Toroids L9, L10 and L11

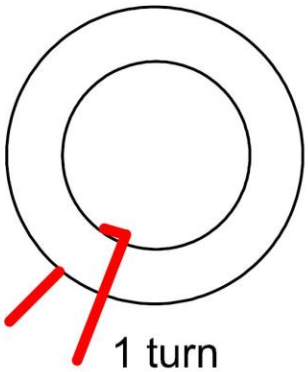
These are the 30m low-pass filter toroids.

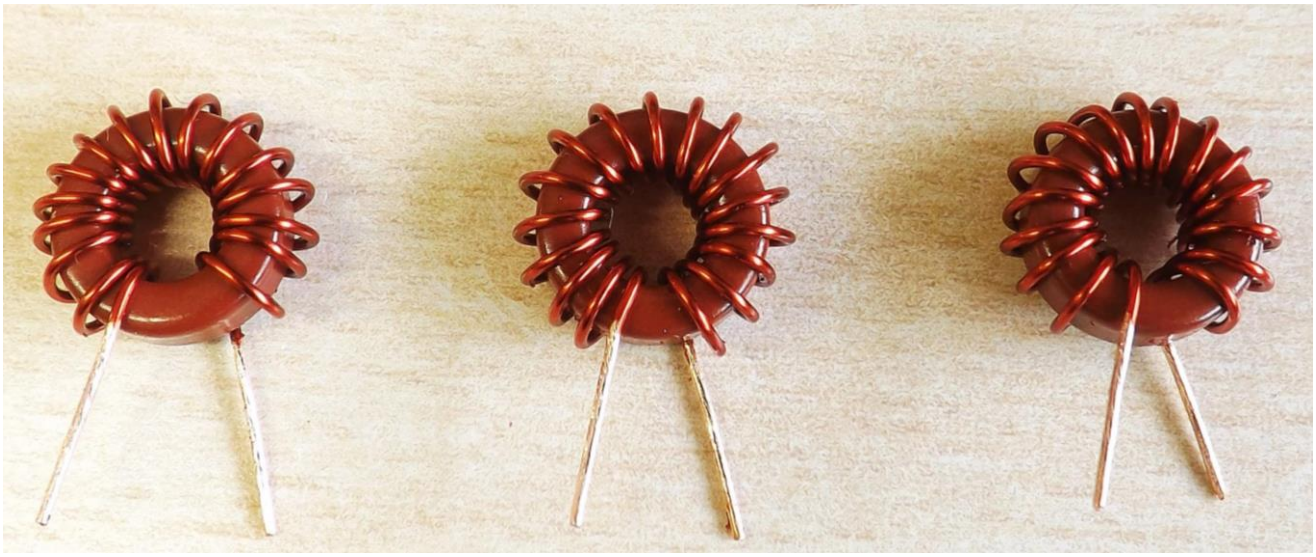
- **L9 and L11** are identical and are wound with **16 turns**.
- **L10** is wound with **17 turns**.
- They use T37-2 (red toroids 9.5mm/0.375in outer diameter).

Cut about 24cm (9.2”) of 0.5mm diameter enameled wire and wind the **L9 and L11** toroids with sixteen (16) turns. Spread the turns evenly around the toroid and wind them tightly so that they follow the contour of the toroid and are as tight against the toroid as possible. The turns should be evenly distributed around the circumference of the toroid.
Leave pigtails of about 10mm (0.70”). Scrape off the enamel with a knife from the ends of the wire, in order to solder the toroid onto the board.

For **L10** cut about 25,5cm (10”) of 0.5mm diameter enameled wire and wind seventeen (17) turns.
Mount and solder the three toroids in place.







L9 (16 turns) L10 (17 turns) L11 (16 turns)

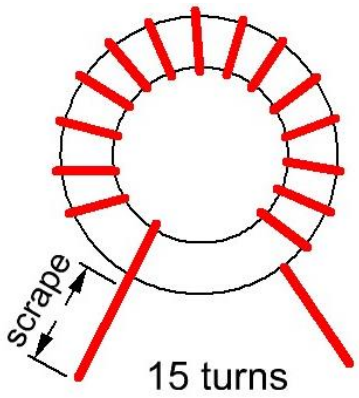
⇨ 20m LPF Toroids L12, L13 and L14

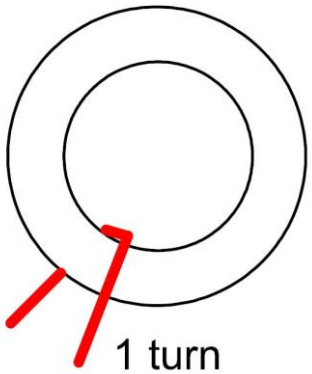
These are the 20m low-pass filter toroids.

- **L12 and L14** are identical and are wound with **15 turns**.
- **L13** is wound with **16 turns**.
- They use T37-6 (yellow toroids 9.5mm/0.375in outer diameter).

Cut about 24cm (9.2”) of 0.5mm diameter enameled wire and wind the **L12 and L14** toroids with fifteen (15) turns. Spread the turns evenly around the toroid and wind them tightly so that they follow the contour of the toroid and are as tight against the toroid as possible. The turns should be evenly distributed around the circumference of the toroid.
Leave pigtails of about 10mm (0.70”). Scrape off the enamel with a knife from the ends of the wire, in order to solder the toroid onto the board.

For **L13** cut about 25cm (9.5”) of 0.5mm diameter enameled wire and wind sixteen (16) turns.
Mount and solder the three toroids in place.





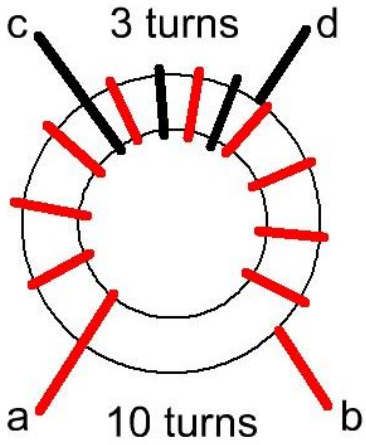
L12 (15 turns) L13 (16 turns) L14 (15 turns)

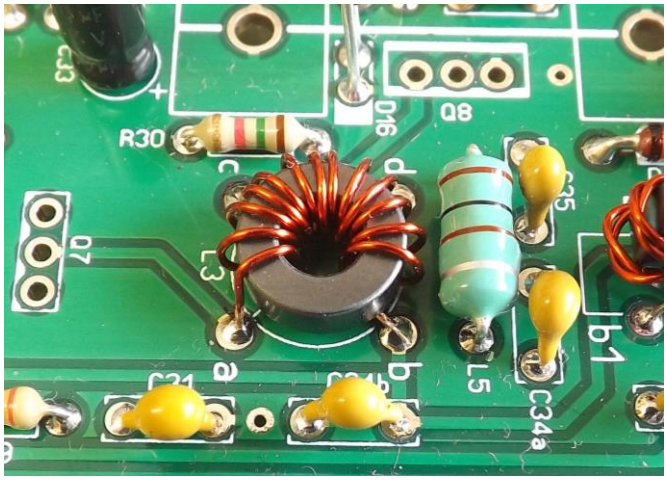
⇨ L3 Toroid Transformer

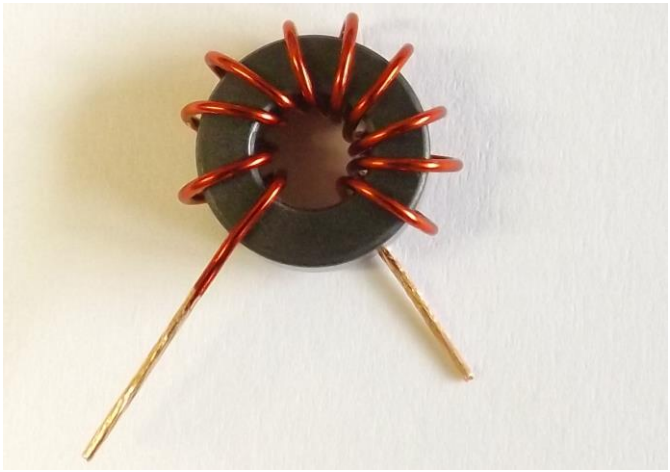
L3 is an impedance matching transformer. An FT37-43 (black toroid 9.5mm/0.375in outer diameter) is used. It has a 10-turn primary and a 3-turn secondary.

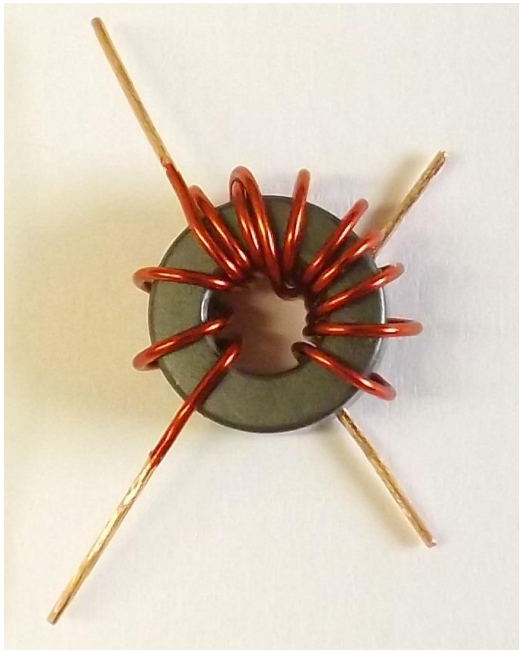
- Take 17cm (7.5”) of 0.5mm diameter enameled wire and wind ten (10) turns on a black FT37-43 toroidal core. Spread the turns evenly around the entire toroid and wind them tightly so that they follow the contour of the toroid and are as tight against the toroid as possible. The turns should be evenly distributed around the circumference of the toroid. Leave pigtails of 10-20mm (0.70”).
- Now take about 8 cm (3.5”) of 0.5mm diameter enameled wire and wind three (3) turns on the other side of the toroid, spacing the turns over the previous winding. Leave pigtails of 10-20mm (0.70”).
- Before inserting them on the circuit board, use a knife or sandpaper to scrape off the enamel from the pigtails of the windings. Solder them in place.
- The 3-turn winding (c-d) faces towards the output transistor Q8 and the 10-turn winding (a-b) towards C31 and C34a.

Counting the turns: Count one turn for every pass of the wire through the center of the toroid.







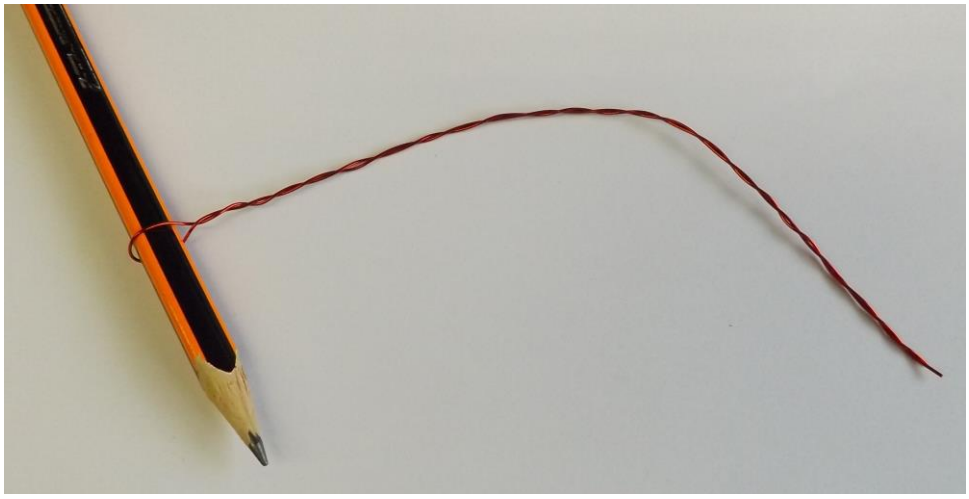


IMPORTANT: Wind the toroid exactly as shown in the images. You must pay attention to number of turns as well as to the direction of the winding.

⇨ L4 Toroid transformer

L4 is an impedance matching transformer with a bifilar winding. An FT37-43 (black toroid with 9.5mm/0.375in outer diameter) is used. It has 8 + 8 turns.

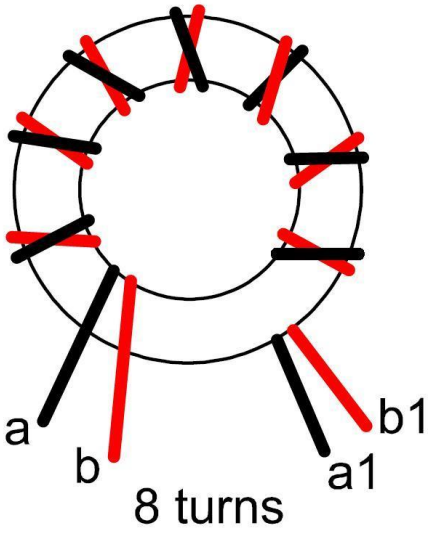
- Cut a 31-32cm (12”) long piece of 0.5mm diameter enameled wire.
- Bend the wire in half.
- Twist it so that there are two twists per cm.

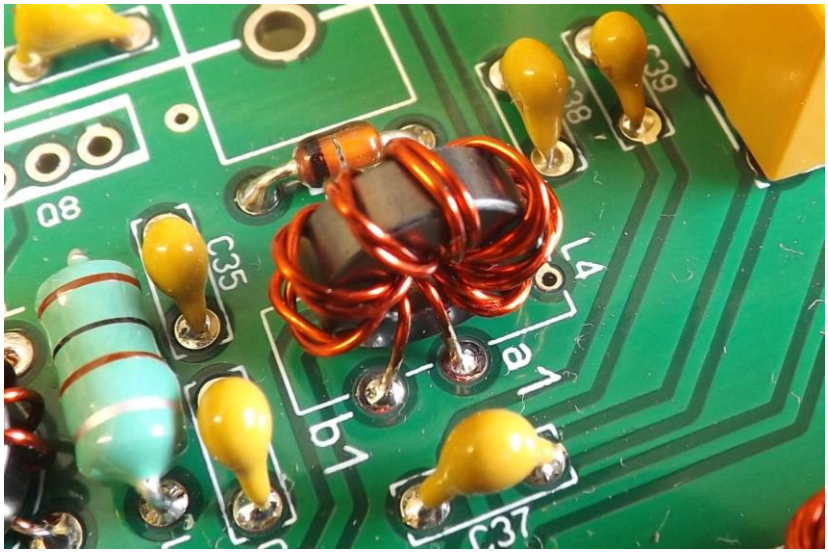


16cm (32cm bent in half)

- Before beginning to wind, leave 15-20mm of wire, measured from the end of the wires to the outer edge of the toroid. Now wind eight (8) turns on the toroid. Remember: Count one turn for each pass of the wire through the center of the toroid.
- Spread the turns evenly around the toroid.

- Cut the ends and separate the two windings.
- Use a sharp knife to scrape the enamel off the ends that will be soldered. The ends of the coils that we have made need to be prepared in this manner before soldering them into the board.
- Using a multimeter in its ohm or continuity function, locate and mark the ends, identifying them as “a” - “a1” and “b” - “b1”.
- Mount the toroid into the appropriate holes as marked on the circuit board.





Note: For greater clarity, the drawing shows one black wire and one red wire. In reality, both wires are of the same color. You can mark the "a" -"a1" with a marker pen.

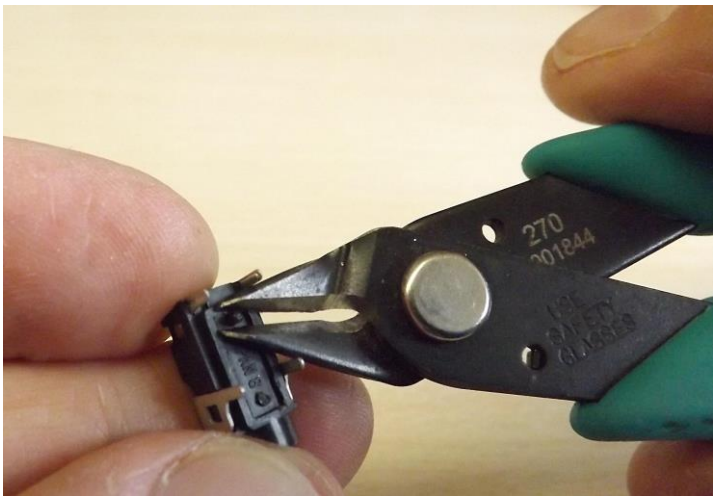
⇨ Rotary Encoder, P5 volume potentiometer P3 Rx attenuator potentiometer, external connections Jacks, (antenna, speaker, phones, power supply) and the Switch

You may prefer to install the jacks, connectors, switches outside the board. Then see the section "WIRING AND CONNECTIONS"

Now mount and solder the Rotary Encoder, the P5 volume potentiometer (marked B10K) and the P3 Rx attenuator potentiometer (marked B1K) in their respective positions. Mount and solder the antenna and power supply jacks, phones and speaker jacks, and the SPK-PHONES switch.

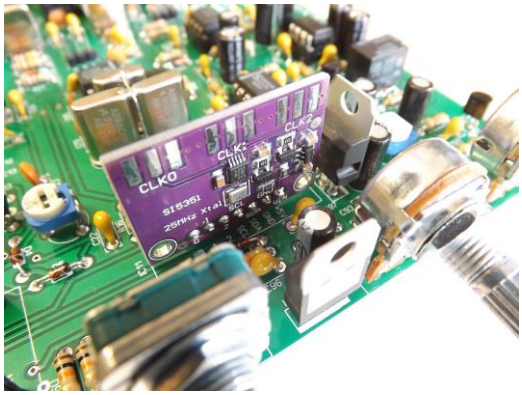
Before mounting the external connection jacks, you should cut the protrusions located at the bottom of these jacks; otherwise you will not be able to solder them in the correct position. See the image.

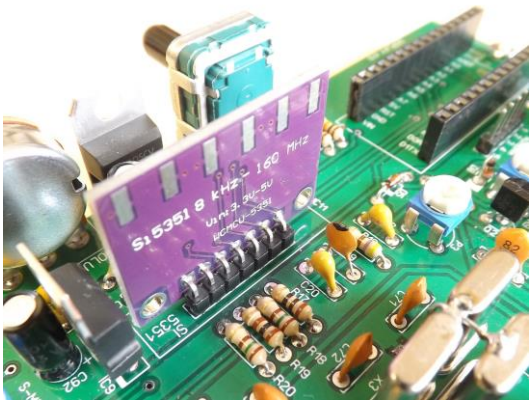
P6 *(B50K RX pass-band potentiometer will connect later (see section "wire the P7 RX pass-band potentiometer).*



⇨ IC11 SI5351

The IC11 is a module that incorporates the SI-5351 frequency generator
Solder the elbow 7-pin strip and solder the module onto the board.
Make sure that the module is vertically with the board as shown in the images.



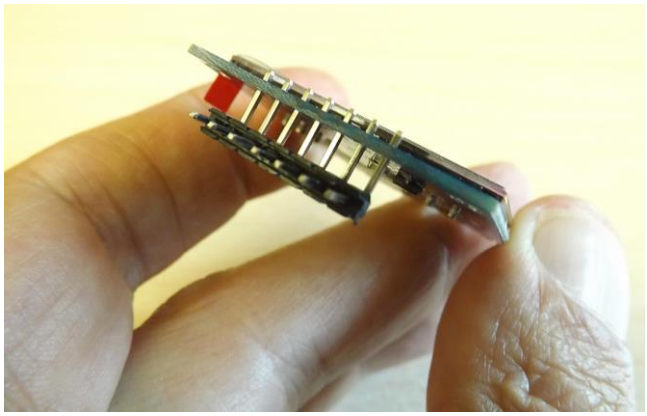


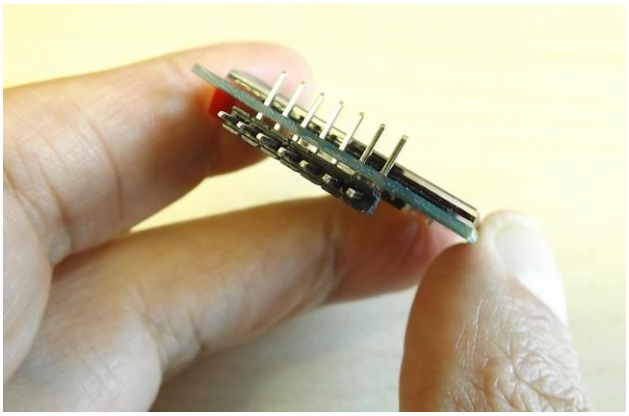
⇨ IC13 OLED 1.3” display

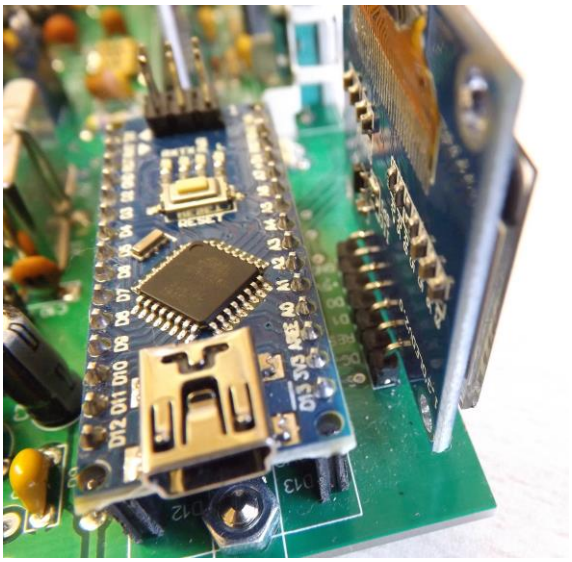
This is the display for the *EGV-2B*. It may be best not to place it to the end.

Before placing it, you must think and be sure how to install the EGV+v2 in your enclosure.

The OLED display use a strip of 7 pins at right angles to solder the module onto the board.
When solder, you can adjust the distance a little to match the front panel of the enclosure



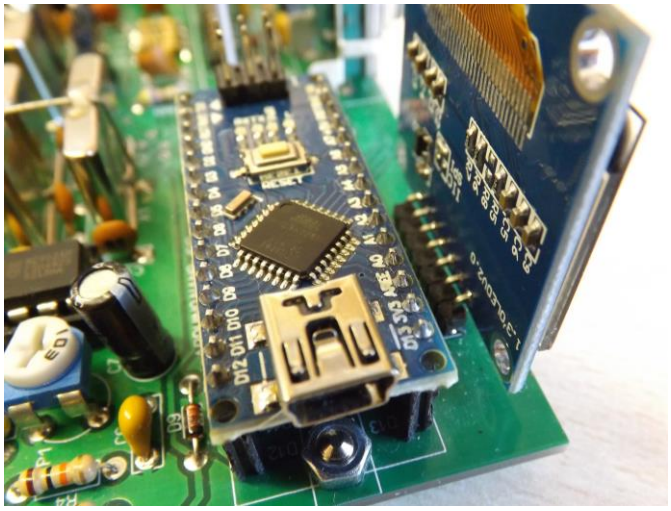


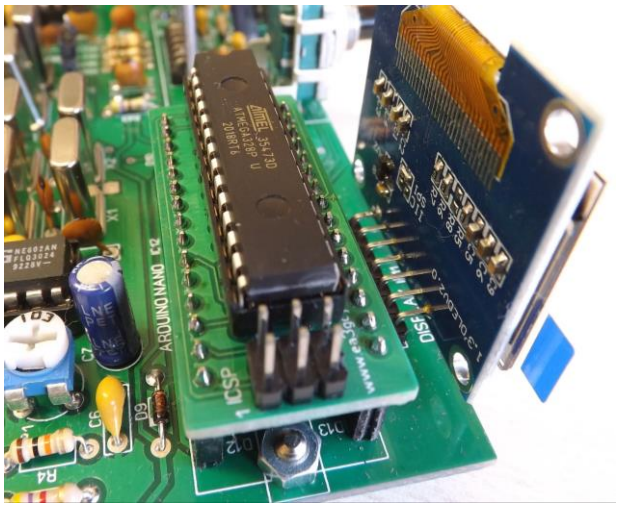


You may prefer to install the OLED display, encoder and potentiometers outside the board. Then see the section "WIRING AND CONNECTIONS"

⇨ IC12 ATMEGA328P module (Arduino NANO compatible)

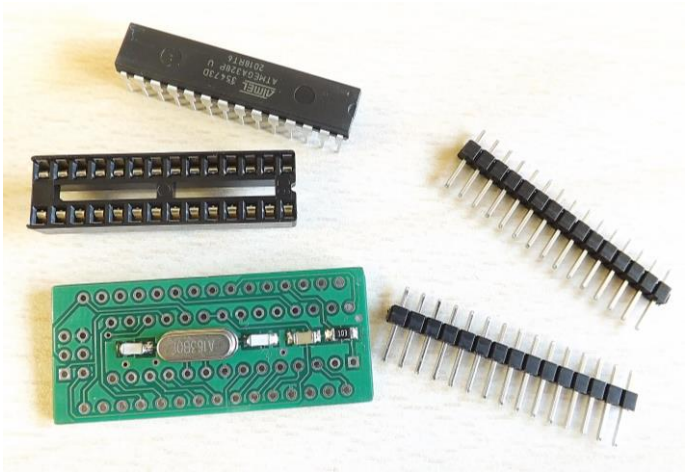
Install the two 15-pin female strips on EGV-3B board to ATMEGA328P or Arduino NANO module as shown in the image.

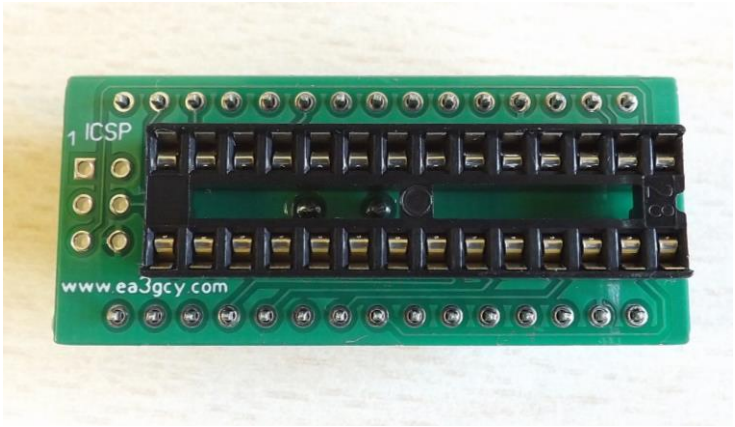


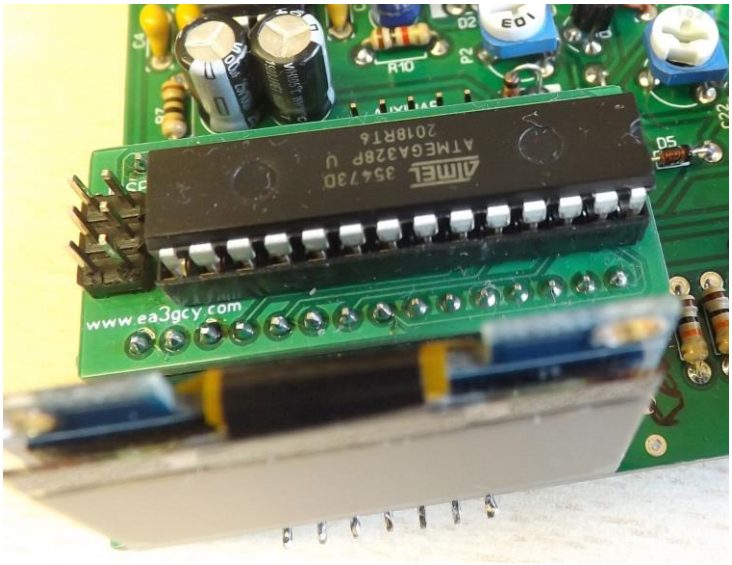


To assemble the ATMEGA328P module follow the following order:

- Solder the 28-pin IC socket. You must make sure to place it in the correct direction according to the silhouette printed on the board.
- Solder the two 15-pin male strips. Make sure that they are vertical.
- Insert the ATMEGA328P chip into the socket. Make sure that you are heading in the right direction.
- Insert the module on EGV+v2 board its **correct position (see pictures).**

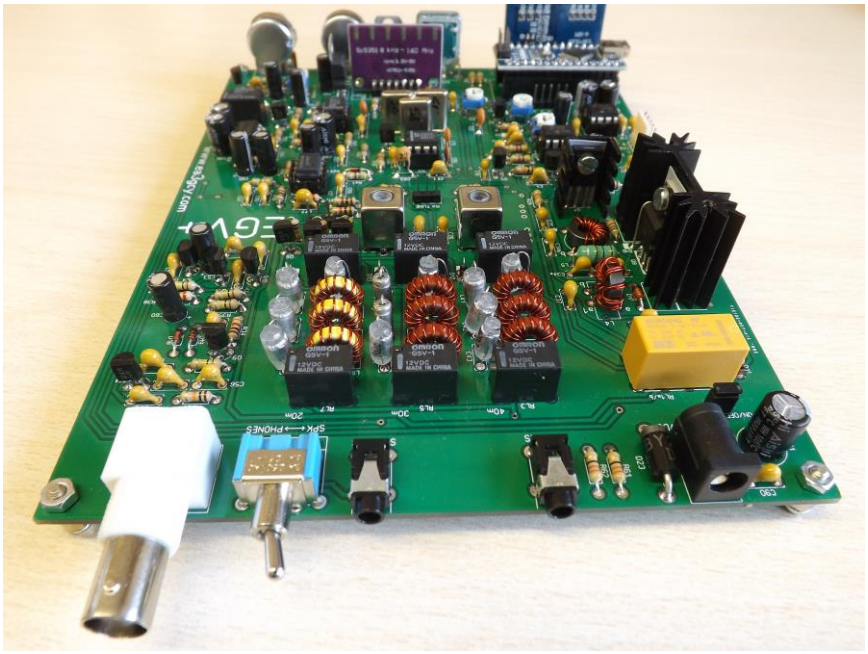






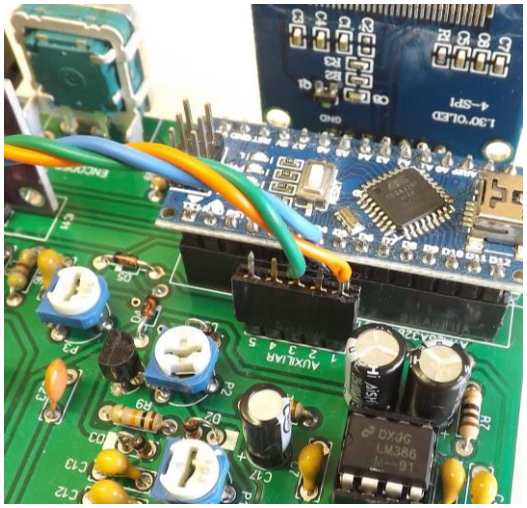
WIRING AND CONNECTIONS

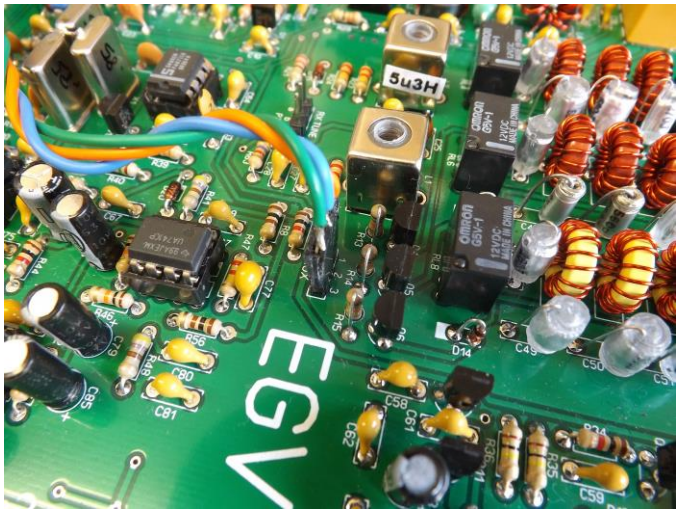
- The EGV+v2 only requires wiring of the paddles, CMD push button, RX pass-band potentiometer.
- The EGV+v2 circuit board incorporates the power, antenna, headphone, and external speaker and headphone jacks and “speaker/headphones” switch.
- Optionally, you can connect an ON/OFF switch instead of jumper J1.



⇨ Wire the LPF control “AUXILIAR” to “AUX” wiring

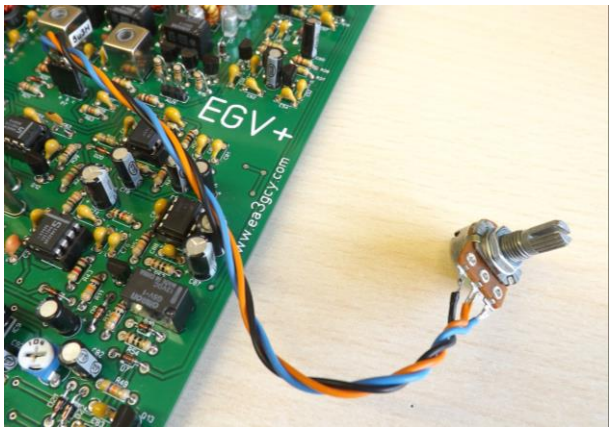
So that the processor can switch the low-pass filters you need to wire the terminals 1-2-3 of the **“AUXILARY**” connectors (next to the processor) to the **“AUX”** in front of Q4, Q5 y Q6. See the pictures.

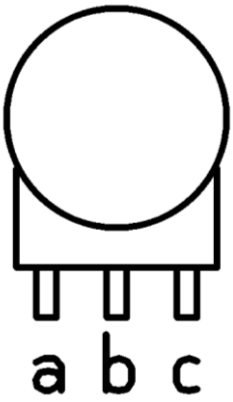




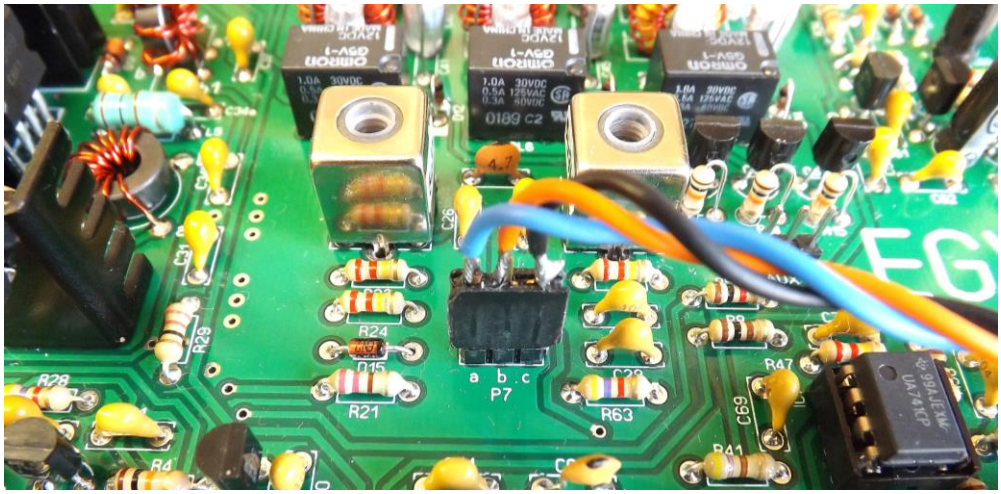
⇨ Wire the P6 RX pass-band potentiometer.

Connect P6 (50K potentiometer) to **"P6 a-b-c"** terminals as shown in the pictures.
This potentiometer will be attached to the front of the EGV+v2 enclosure and is used to adjust the reception to the 40, 30 or 20m bands.





P7 rear view



⇨ Wire paddle connector and “CMD” push-button.

On the EGV+v2 PCB

The paddles and the "CMD" command push-button connector has 5 pins:
“R” (right paddle), **“GND”**, **“L”** (left paddle), **“CMD”** (command push-button) and **“GND”**.

Note: this connector has two “GND” pins*. The two are the same.*

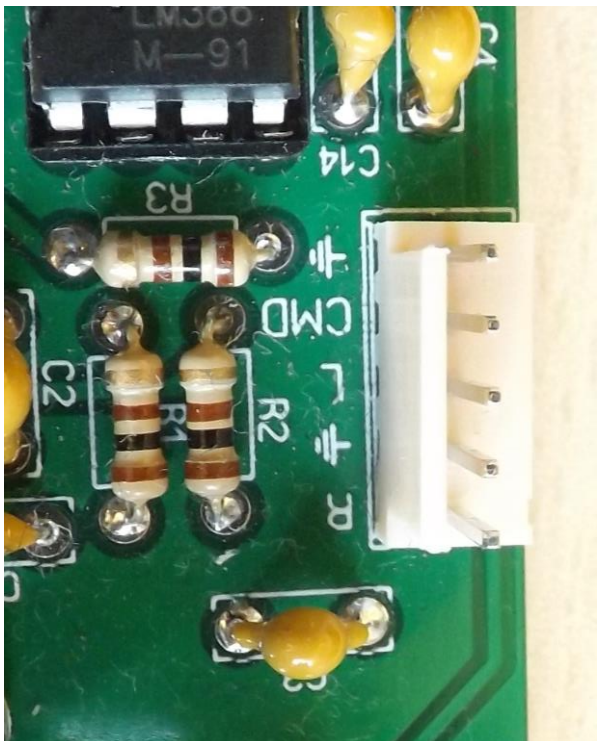
On the small PCB for panel connection

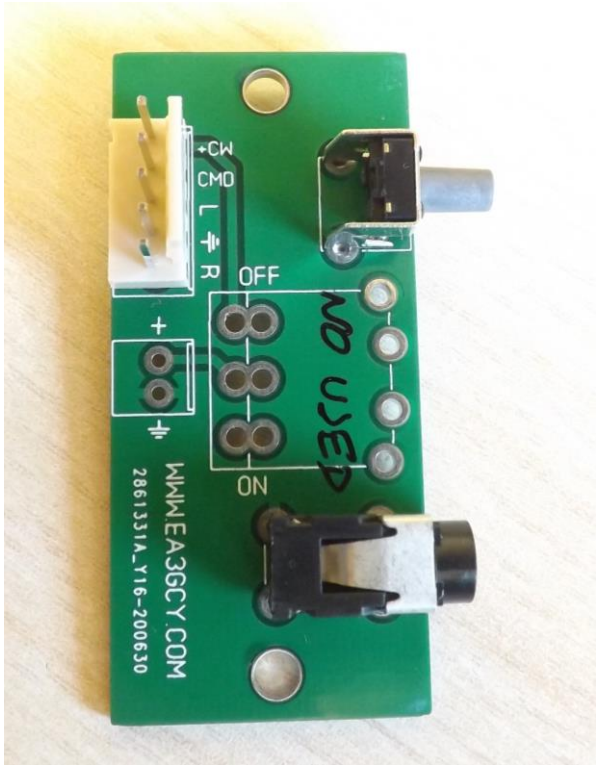
The small PCB incorporates the Jack for the paddles and the “CMD” push button

The **“+ CW”** pin is not used. The **+ and - pins** are not used. The **ON / OFF switch** is not used.

You have to wire the connections "R", "GND", "L" and "CMD"

Notes:
- Remember to cut the protrusions of the Jack socket before soldering it.
- You can use a different connectors system. You can use another Jack socket type and another push-button.





To understand how the KB2 keyer works, download the manual from www.qrphamradiokits.com

⇨ *EGV+v2 enclosure*.

It is highly recommended that suits a metal box for all items that are installed on the board. If you use a plastic box, then make RFI shield with conductive paint or conductive tape (aluminum or copper may be suitable). There is a custom box for the EGV+v2 in www.qrphamradiokits.com

⇨ *Wire the elements off the board*.

However, you can wire the elements off the board with the following considerations in mind:

Rear panel elements.

You may prefer to install the jacks, connectors, switches outside the enclosure. This is not critical, you can wire them. But if the cable to the antenna connector is longer than 1-2cm, then use thin 50ohm coaxial cable (RG174 or equivalent).

Front panel elements.

OLED display, encoder and potentiometers.

This is more critical. The cables to the OLED display and to the rotary encoder should be as short as possible. You can add spurious noises to the reception.

Potentiometers wiring is not as critical.

The EGV+v2 is protected against possible polarity reversal faults by means of diode D23

If your power supply is short-circuit protected or is equipped with a fuse at the output, perfect; if not, build or purchase a cable with a built-in series 2.5 or 3A fuse.

If you make a mistake with the polarity, then the fuse will blow.

SETTINGS AND TESTS

⇨ First checks

- Adjust all adjustable resistors (P1, P2, P4) and P5 (volume potentiometer) to mid-position.
- Adjust P3 (RX potentiometer) to maximum position (clockwise).
- Plug a speaker into the "SPEAKER" jack or headphones into the "PHONES" jack.

IMPORTANT: Use a good quality speaker unit. A bad speaker will spoil the quality of the reception.

- Apply power (remember J1 jumper plugged).
- The screen should light up and show the main menu. See “EGV-3B Settings-User manual”.
- Turn the volume to maximum; you should hear a light background noise.

If everything is okay, you may continue.

If something is not right, you will need to examine it.

⇨ Adjustment of the passband, L1 and L2

For this adjustment you will need an “alignment” tool suitable for this type of coils; if you use a screwdriver, you risk breaking the core of the coil.
Set the potentiometer P6 (50K) to 10% of to the right of the start of its route.

With an antenna connected to the transceiver tune to any frequency in the 40m. Alternately adjust L1 and L2 until obtaining the maximum noise level in the speaker. Now, try to tune in a stable signal within the band and readjust L1 and L2 alternately until you hear it at the highest possible level.

When tune to any frequency in the 30 band adjust P6 about halfway until you get the highest signal level.
When tune to any frequency in the 20 band adjust P6 to maximum (clockwise) until you get the highest signal level.

Note: L1 and L2 are adjusted on one band and should not be re-adjusted on other bands.

If you have access to an RF signal generator, begin injecting a signal of about 5-10uV within the frequency coverage of the receiver and tune it in. Reduce the level of the RF signal generator to the minimum that is still audible with a loudspeaker or headphones, and alternately adjust the coils until obtaining the maximum reception level.

Note: L1 and L2 are adjusted to RX. There is no coil to adjust in TX

Remember: All transmission tests must be done with a 50 ohm load connected to the transmitter output.

⇨ Transmitter.

Connect a power meter with a 50 ohm load to the antenna jack.
Connect a telegraph key to terminals "L", "R" and "GND" and transmit. The power meter will display the power output level. You can expect 5W.

⇨ Adjustment of P1 CW Sidetone monitor level.

Adjust the level you like best.

Normally P1 will be adjusted to mid-position.

⇨ Adjustment of P2 TX to RX decay delay.

Adjust to your liking, based on your CW speed

⇨ Adjustment of P4 S-Meter level

You can use another receiver to compare.
Tune in a stable signal and adjust P6 until the display shows the proper signal level.

Normally P4 will be adjusted to its three quarters.

Note: The displayed signal level is for guidance only. They are not precise levels. It is not a calibrated circuit.

⇨ Settings on firmware menu

Please, download the "EGV+ Settings Manual" from the website:
www.qrphamradiokits.com

IMPORTANT: "BFO" and "CALIBRATE XTAL" settings are essential to suit your assembly.

The "BFO" frequency adjust is used to suit the tolerances of the IF crystal filter for each setup. This adjustment will affect the quality of reception

The "CALIBRATE XTAL" adjust is essential to adapt the SI5351 module to your assembly.
An incorrect setting can cause the EGV+ to not receive

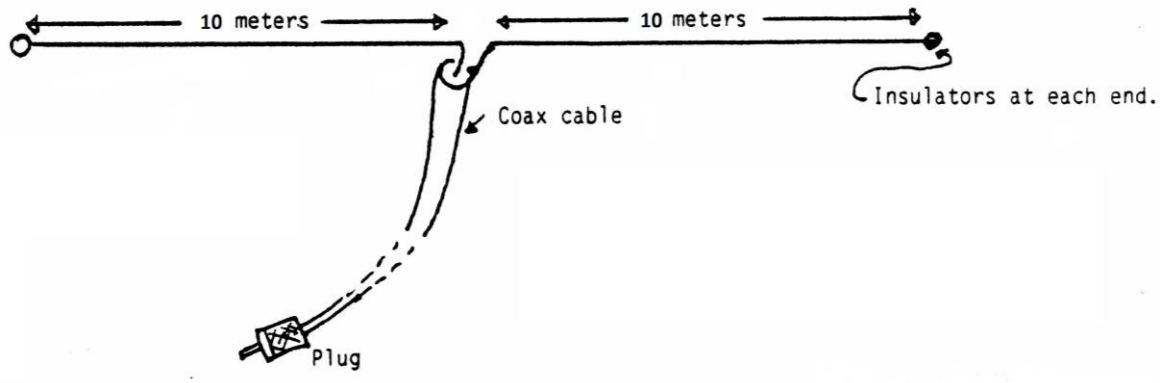
ANNEXES AND TIPS

⇨ KB-2 Electronic KEYER.

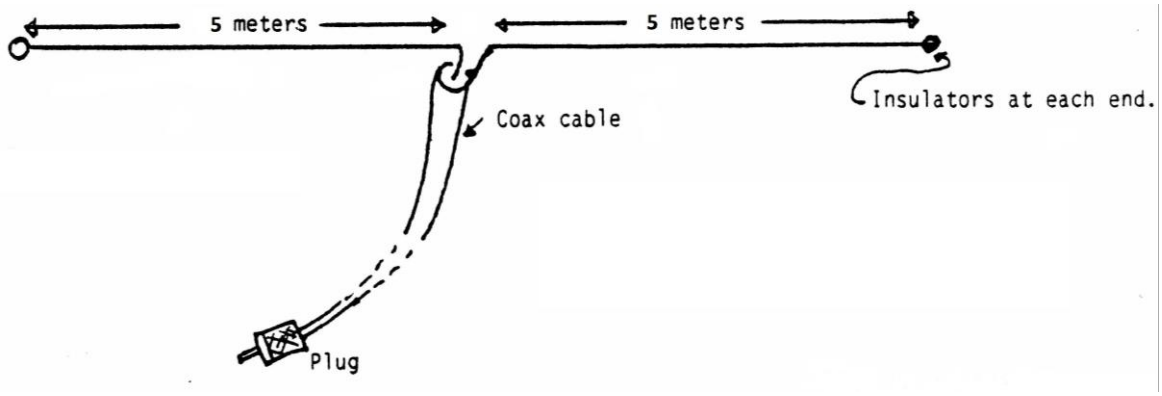
Please, download the "EGV+v2 KB2 User Manual" from the website:
www.qrphamradiokits.com

⇨ 40, 30 and 20 meters Antennas.

To obtain a good performance of the EGV+v2 it is essential to use a specific antenna for the 7Mhz, 10MHz and 14MHz band. You can use a ham radio antennas from factory. Or you can build your own dipoles antennas for very little money and that will give you very good results. You must build a dipole for each band.



40 m dipole antenna



20 m dipole antenna

For the 30m dipole use arms of about 7.5 meters.

For the antenna "arms" you can use any cable strong enough to hold the weight of the coaxial cable hanging. Install the antenna in the highest and clearest position possible.

Very interesting multi-band option are the end fed dipoles that allows working in several bands with a 49: 1 transformer. Look "EndFed antenna" on Google.

⇨ Narrow the IF filter.

The filter bandwidth can be lowered to about 500Hz or less.
Increase the value of the C70, C71 and C72 to 560pF.

To the contrary, if you want to widen the filter you can change C70, C71 and C72 to 180pF.

⇨ Increasing the AGC decay.

The CAG decay time can be increased by changing the values of C60 and R38.
Increase C60 to 2u2F and R38 1M

This modification will depend on your listening habits.
If you are satisfied with the current values, do not make the modification

⇨ Decreased drop delay TX to RX.

You can decrease the value of capacitors C17 and C18.
There should be a minimum delay to avoid noise bumps when returning to RX.

⇨ Increasing audio gain.

You can increase the gain of the audio by changing the R52 resistor to 1ohm or by replacing it with a jumper.
By increasing the audio gain, you will also slightly increase the internal noise of the receiver.

⇨ TX Feedback.

If you observe feedback in TX, change the following resistors:

R28 to 1K
R31 to 220 ohm

This decreases the Q7 and Q8 gain. Will reduce the power slightly to about 4-5W. Adjust P3 to the maximum.

This modification is very useful if you usually work with antennas that are not perfectly adapted.
If you are satisfied with the current values, do not make the modification

IF YOUR KIT DOES NOT WORK AFTER COMPLETING ASSEMBLY

Don't worry, it is not uncommon that a kit doesn't work on the first try; stay calm, as in most cases they are minor problems with a simple fix.
Most faults are due to poorly soldered connections or improperly placed components, incorrectly wound toroids, etc.; it is very rare for one of the supplied components to be defective.
Before taking any measurements with test equipment, check all the connections and carefully inspect your soldering, looking for cold joints, short circuits between traces, sockets not making good contact, or components mounted in the wrong place.
If your kit does not work after final assembly, please follow these steps in order:

- Double-check every step in the assembly manual, the solder connections, and correct component placement.
- If you have access to instrumentation, take measurements and follow the signal path of the circuits to diagnose what is happening and why.
- Request another ham experienced with kits or a radio technician to check your work. Someone taking a fresh look may find things that you overlooked.
-If you decide that technical assistance is needed, you are welcome to send an email to ea3gcy@gmail.com. As a last resource, you may send the kit in for repair; however, I will have to charge for any repairs done, although I will try to keep the cost as moderate as possible (see the “FAQ” page of the EA3GCY kits website).

LIMITED WARRANTY

Please read carefully BEFORE building your kit

All electronic components and hardware supplied with the kit are under warranty in case of any manufacturing defect for the period of one year after purchase. The warranty does not include the transmitter final amplifier transistor.

The original purchaser has the option of examining the kit and manual for 10 days. If, within this period, the buyer decides not to build the kit, he/she may return the entire unassembled kit at their own expense for the shipping expenses. The shipping expenses and sales commissions (i.e. bank, EBay, and PayPal commissions) included in the purchase price will not be returned.
Please, BEFORE returning a product, request instructions by email at: ea3gcy@gmail.com

Javier Solans, EA3GCY, warrants this device to function according to the specifications, provided that it is assembled and adjusted as described in this documentation, and used correctly according to all provided instructions.

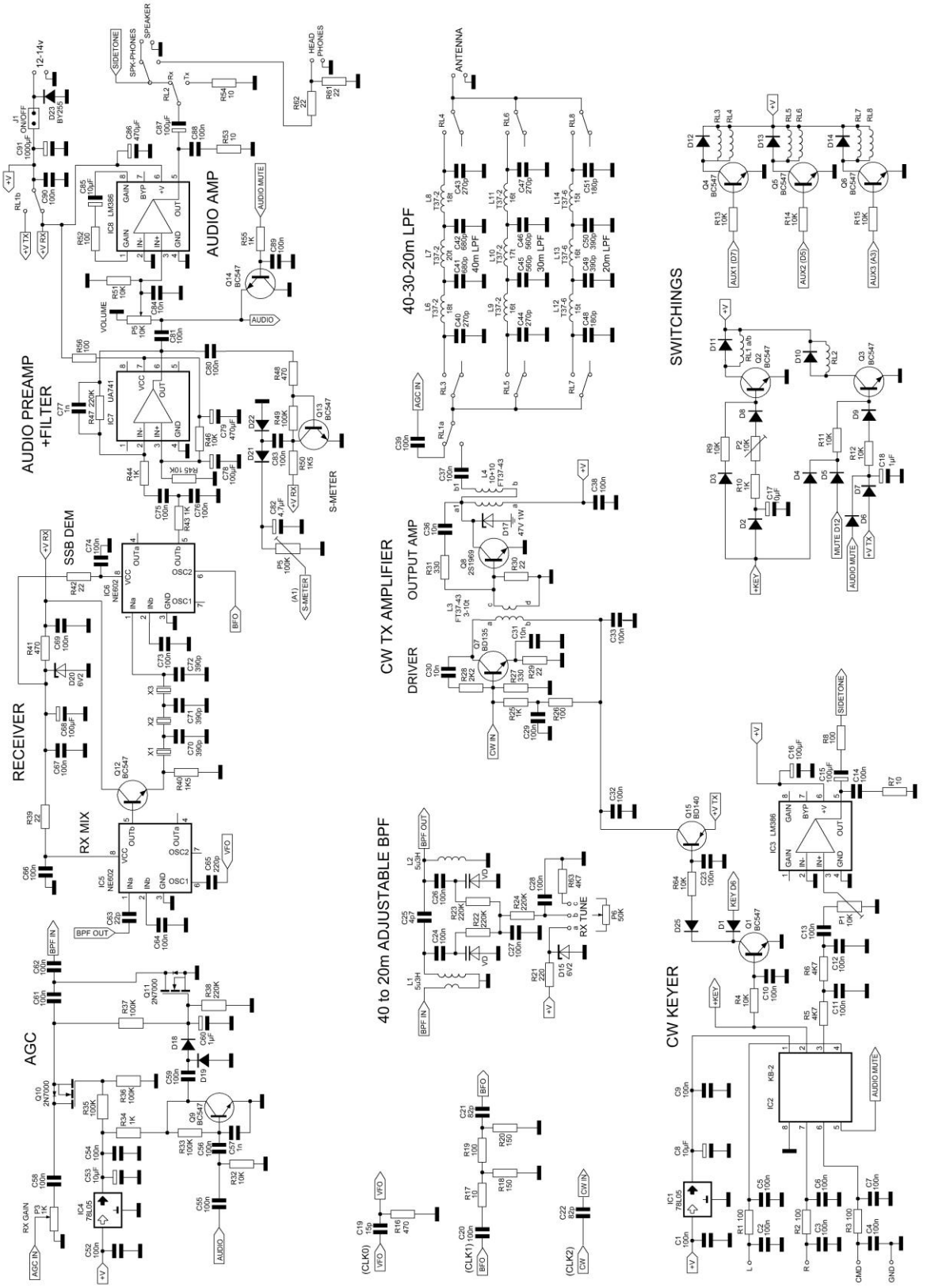
It is your responsibility to follow all the instructions in the manual, to identify all the components correctly, and to use good workmanship and proper tools and instruments in the construction and adjustment of this kit.

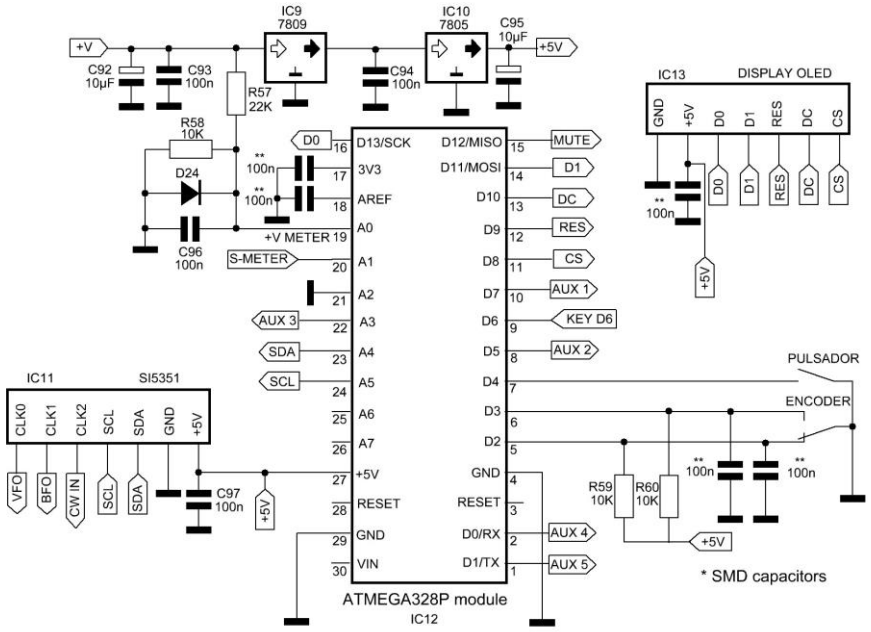
REMEMBER: This kit will not work as a commercially manufactured product; however, it can often give similar results. Do not expect great performance, BUT YOU ARE SURE TO HAVE LOTS OF FUN!

If you believe that there is a missing kit component, please do a thorough inventory of all parts using the parts list in the manual. Check all bags, envelopes and boxes carefully. If needed, you may email me and I will replace any component that you are missing. Even if you can find the exact part locally, please let me know so that we are aware of the problem to help other customers.
I can also supply any part that you have lost, damaged or broken accidently.
If you find any errors in this manual or would like to make a comment, please do not hesitate to contact me at ea3gcy@gmail.com

THANK YOU for building the ***EGV+v2*** Transceiver kit.
Enjoy QRP!
73 Javier Solans, EA3GCY

SCHEMATICS


EGV+v2
RECEIVER
AUDIO PREAMP +FILTER
AUDIO AMP
AGC
SSB DEM
RX MIX
CW TX AMPLIFIER
DRIVER
OUTPUT AMP
40-30-20m LPF
40 to 20m ADJUSTABLE BPF
CW KEYER
SWITCHINGS
S-METER
RX TUNE
ANTENNA
SPEAKER
SIDETONE
SPK-PHONES
HEAD PHONES
12-14v


IC9
7809
IC10
7805
C95
10µF
+V
C92
10µF
C93
100n
R57
22K
C94
100n
+5V
R58
10K
D24
C96
100n
** 100n
** 100n
+V METER
S-METER
D0
D13/SCK
3V3
AREF
A0
A1
A2
A3
A4
A5
A6
A7
+5V
RESET
GND
VIN
D12/MISO
D11/MOSI
D10
D9
D8
D7
D6
D5
D4
D3
D2
GND
RESET
D0/RX
D1/TX
MUTE
D1
DC
RES
CS
AUX 1
KEY D6
AUX 2
AUX 3
SDA
SCL
AUX 4
AUX 5
ATMEGA328P module
IC12
IC13
DISPLAY OLED
GND
+5V
D0
D1
RES
DC
CS
IC11
SI5351
CLK0
CLK1
CLK2
SCL
SDA
GND
+5V
VFO
BFO
CW IN
C97
100n
PULSADOR
ENCODER
R59
10K
R60
10K
* SMD capacitors

SI5351 EGV+