



“SMD” SUDDEN-2 **DIRECT** **CONVERSION** **40m RECEIVER**



The “*Original SUDDEN*” Direct Conversion Receiver created by Rev. George Dobbs G3RJV SK), appeared in SPRAT (Autumn 1989) and has been a popular club project ever since. Kanga Products created the Sudden-2 in 2001 this was based closely on the original, and has again become a popular club project.

This “*SMD*” version of the Sudden-2 version is brought to you through a collaboration between Kanga (UK) and John Clements KC9ON of 3rd Planet Solar in the USA. And is another kit in our “*NEW SMD*” range designed to introduce the constructor to SMD kit construction.

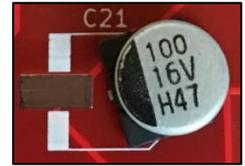
Equipment Needed:

Items that are essential in the construction of this kit are:

- *Low wattage – 60watts (Temp Controlled is useful) soldering iron, with a fine tip (Essential) – Note: a standard Iron can be used with care, hot Air Gun*
- *Thin Solder (60/40) i.e. less than 0.7mm (preferably 0.4mm) (Essential)*
- *Flux-Pen*
- *Magnifying Glass (Either Head or bench) (Essential)*
- *Fine Pointed Tweezers (Essential)*
- *White Tray to place components into whilst Soldering*
- *Multimeter (Essential)*
- *If available – Use of a Receiver, Signal Generator, or Frequency Counter*

Stage 1: Power Supply

We start by assembling and testing the Power Supply. Fit the components in the order listed into their positions marked on the board taking care to not over heat as this may cause damage to them. The Black Edge on the body of the Electrolytic Capacitors must line up with the thick straight silkscreen line printed on the board. When fitting IC1, again take care using as little heat as required. P1 and all other Molex™ Headers must be fitted with the pins facing out from the PCB. (See picture on first page to check orientation)



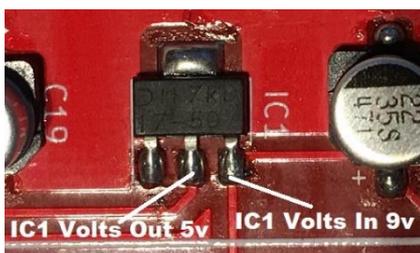
(Now check your work for solder splashes or solder bridges)

X	Part	Value	Markings	Notes
	IC1	5v Reg	Az1117H-5.0	Only fit one way
	R2	10Ω	SMD Chip Cap 100	Oscillator section
	R8	22Ω	SMD Chip Resistor 220	AF Amp section
	C6	100nF	SMD Chip Cap	Oscillator Section
	C12	22μF	SMD 35v Elec	Observe polarity
	C19	22μF	SMD 35v Elec	Observe polarity
	C20	100μF	SMD 16v Elec (AF amplifier section)	Observe polarity
	P1	Header	Molex™ 2 Pin	
	J1	Plug	9 v PP3 Battery connector	

NOTE: If at a later date you wish to fit an On/Off Switch, all you will need to do is cut the Red Wire of the battery cable and insert a small switch of your choosing.

Testing Of Power Supply

Firstly check that you have a 9 volt battery (PP3 Type). Use a good quality one such as Duracell. Connect battery to P1 header on the PCB, Set the Multimeter to read a minimum of 15V DC (exact setting will depend on type of Multimeter but 20V is a common setting). Connect the Multimeter Negative Lead to a "GND" position such as a mounting hole. Switch on the Multimeter and ensure battery is connected to the Sudden-2 PCB. Now measure the voltages as per the chart below, if you do not read any voltages make sure the Battery is connected correctly.



Note: PICTURE OF IC1 SHOWING INPUT/OUTPUT PINS TO TEST

Sudden Voltage Test Chart

	Actual	Example Voltage
		Using PP3 Battery
IC1	Pin In	9 Volts
IC1	Pin Out	5 Volts
IC2	Pin 6	9 Volts
IC3	Pin 8	5 Volts

Stage 2: Audio Stage

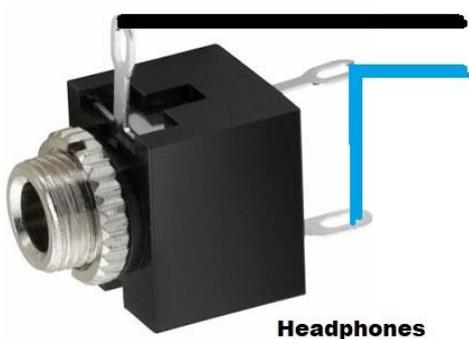
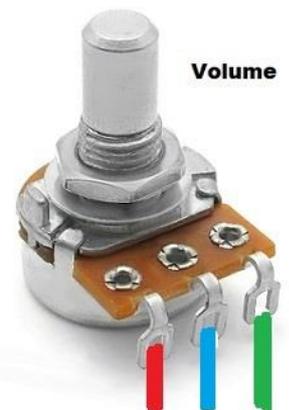
Now solder the components as listed below, again ensuring that you use just enough heat without damaging a component. As in the previous Stage 1, make sure all Molex™ Headers face out from PCB. (*Check your work for Solder splashes and solder bridges*)

Note: The SO-8 IC's have a pin 1 dot and oval pad.

Tick the box after fitting each part

X	Part	Value	Markings	Notes
<input type="checkbox"/>	R4	10Ω	SMD Chip Resistor	100
<input type="checkbox"/>	R7	10KΩ	SMD Chip Resistor	103 or 1002
<input type="checkbox"/>	R10	33KΩ	SMD Chip Resistor	333 or 3302
<input type="checkbox"/>	C13	100nF	SMD Chip Capacitor	
<input type="checkbox"/>	C17	47nF	SMD Chip Capacitor	
<input type="checkbox"/>	C22	10nF	SMD Chip Capacitor	
<input type="checkbox"/>	IC2	LM386	LM386	Note Pin 1
<input type="checkbox"/>	C15	10μF	SMD 16v Elect	Observe Polarity
<input type="checkbox"/>	C16	10μF	SMD 16v Elect	Observe Polarity
<input type="checkbox"/>	C18	10μF	SMD 16v Elect	Observe Polarity
<input type="checkbox"/>	C21	100μF	SMD 16v Elect	Observe Polarity
<input type="checkbox"/>	P2	Header	Molex™ 2 Pin	Picture for Orientation
<input type="checkbox"/>	J2	Plug	With Blue/Black Cable attached	Cut to length – Read Text
<input type="checkbox"/>		Stereo Socket	Three (3) Pin Connection	See Text
<input type="checkbox"/>	P3	Header	Molex™ 3 Pin	Picture for Orientation
<input type="checkbox"/>	J3	Plug	With Red/Blue/Green Cable attached	Cut to Length – Read Text
<input type="checkbox"/>	RV1	10KΩ (Log)	A10K - Volume Control	

Now take the 3 Pin Plug (J3) with three (3) coloured leads attached and cut to length. Now solder the leads to the volume potentiometer as per the picture. Then plug into Header P3. Now prepare the 2 pin Plug (J2) with black/blue lead by cutting to length and soldering to the Stereo Socket as per the picture.



Now connect either a pair of low impedance headphones or small loudspeaker (8Ω)

(IF using headphones *Do not wear* them for this test!!).

Reconnect the battery to the Sudden-2. Turn the spindle of RV1 fully clock wise (maximum volume) and touch "**Blue Wire On Volume Control**" with a fingertip. A low humming sound in the headphones indicates that the amplifier is working. Disconnect the leads.

Stage 3: Tuning Circuit

Solder into place as per the list below, taking care when soldering the "**DIODES**". The Zener diode(s) in this kit act as a tuning device. Only one is required for this 40m version.

<input checked="" type="checkbox"/>	<i>Part</i>	<i>Value</i>	<i>Markings</i>	<i>Notes</i>
<input type="checkbox"/>	R5	1.5K Ω SMD Chip Resistor	152/1501	
<input type="checkbox"/>	R6	100K Ω SMD Chip Resistor	104/1003	
<input type="checkbox"/>	C14	1 μ F SMD Elect 50V		Observe Polarity
<input type="checkbox"/>	D1	7v5 SMD Diode		Fit one way only
<input type="checkbox"/>	D2	Not Used		
<input type="checkbox"/>	P4	Header Molex™ 3 Pin		Picture for Orientation
<input type="checkbox"/>	J4	Plug With Red/Blue/Green Cable attached		Cut to length, See Text
<input type="checkbox"/>	VR2	10K Ω Lin Potentiometer	B10K	

Cut the three (3) colour cable to length and attach as per the picture to the Tuning Pot. –

NOW CHECK YOUR WORK

Connect all the Volume and Tuning controls to the respective Header. Connect the Negative lead of the Multimeter to a ground point on the PCB and connect the battery.

Now place the positive lead of the Multimeter on the left hand side of **R6**. Now turn the spindle of the Tuning Pot anticlockwise, the voltage should read "**0 VOLTS**", now turn the spindle slowly clockwise. The voltage should rise to "**5 VOLTS**" Disconnect the battery and other controls.



NOTES

Stage 4 RF Filter, Oscillator, and Mixer

Now solder into place the parts as per the list below. Again taking care and not using too much heat.

Tick the box after fitting each part

<input checked="" type="checkbox"/>	Part	Value	Markings	Notes
<input type="checkbox"/>	R1	27K Ω SMD Chip Resistor	273 or 2701	
<input type="checkbox"/>	C1	100pF SMD Chip Capacitor		
<input type="checkbox"/>	C2	100pF SMD Chip Capacitor		
<input type="checkbox"/>	C3	8.2pF SMD Chip Capacitor		
<input type="checkbox"/>	C4	100pF SMD Chip Capacitor		
<input type="checkbox"/>	C5	10nF SMD Chip Capacitor		
<input type="checkbox"/>	C7	560pF SMD Chip Capacitor		
<input type="checkbox"/>	C8	560pF SMD Chip Capacitor		
<input type="checkbox"/>	C9	270pF SMD Chip Capacitor		
<input type="checkbox"/>	C11	47pF SMD Chip Capacitor		

Check your Work

Continue to fit the parts as per the list below. Taking care when soldering in place the Canned Inductors and the SA602/612 IC. Note pin 1 in the picture. JP1 can be soldered in either way, there is also a jumper. Place this over JP1, we will explain the purpose of this jumper later.



<input checked="" type="checkbox"/>	Part	Value	Markings	Notes
<input type="checkbox"/>	IC2	SA602		
<input type="checkbox"/>	T1	5U3H Inductor		
<input type="checkbox"/>	T2	5U3H Inductor		
<input type="checkbox"/>	T3	2U6FC Inductor		
<input type="checkbox"/>	JP1	Header 3 Pin		<i>Jumper LO-Z***</i>
<input type="checkbox"/>	P5	Header 2		Antenna
<input type="checkbox"/>	P6	Header Molex 3 Pin (P4)		2 Pin Plug
<input type="checkbox"/>	J6	Plug Red/Blue/Green Cable attach		Cut to length, See Text
<input type="checkbox"/>	RV3	1K Ω Lin Potentiometer	B1K	

Once you have double checked your work and ensured no issues. Take the 3 Pin Plug (J4) with the three (3) colour wire and cut to length and attach to the Tuning Pot as per the picture. Also Fit the 2 Pin Molex™ (P5) as per other stages then take the Yellow/Black Wire (J5) cut to length and attach to a suitable socket and Antenna. This is where you will need to possibly alter the position of the jumper on JP1 header. If you know you have a Hi-Z or Low-Z antenna then you can place the jumper in that position. If not for this part place it in the High-Z position.



Setting up the RF stage involves adjusting the oscillator frequency with T3 and aligning the input filter with T1 and T2. **(DO NOT USE A METAL SCREWDRIVER)** Use another receiver or a signal generator to set the oscillators frequency.

Now connect all the Pots, Antenna, Headphones and lastly a Battery (PP3 Type)

Alignment using another receiver

Switch on the SUDDEN-2 Receiver. Set the tuning control (VR2) fully anticlockwise. Connect a wire to the other receiver's antenna and place it near the SUDDEN-2. Tune the second receiver up and down the 40m (7 MHz) band to find the oscillation from the SUDDEN-2. Use a nylon trimming tool **(DO NOT USE A METAL SCREWDRIVER)**, turn the core of T3 until the oscillator frequency is 7.000MHz. Turn VR2 fully clockwise, find the signal again and note the frequency on the receiver. The turning range should be approximately 7.000 to 7.4xx MHz

Alignment using a signal generator

Switch on the SUDDEN-2 and the signal generator (let the signal generator warm up first). Set the SUDDEN-2's tuning control (VR2) fully anticlockwise. Connect the Antenna Wire (Yellow/Black) (P2) Connect a wire to the signal generator's output and place it near the Blue wire on the RF Pot. Tune the signal generator up and down the band until its signal is heard in the SUDDEN's headphones **(Be careful about the volume in the headphones)**. Now turn the core of T3, **(do not use a Metal screwdriver)** also re-adjust the signal generators frequency until the signal is heard at the anticlockwise end of the tuning control this should be 7.000MHz. Turn VR2 fully clockwise, retune the signal generator until its signal is heard again, and note the frequency. The tuning range should be approximately 7.000 to 7.4xx MHz

Alignment Using a Frequency Counter

If a frequency counter is available build up this section then use the frequency counter to align.

Please Note: This part is best done after you have carried out at least one of the previous stages.

Solder into place the following components, and then check your work.

<input checked="" type="checkbox"/>	Part	Value	Markings	Notes
<input type="checkbox"/>	R3	100K Ω SMD Chip Resistor	104 or 1003	
<input type="checkbox"/>	R9	1K Ω SMD Chip Resistor	102 or 1001	
<input type="checkbox"/>	C10	10 nF SMD Chip Capacitor		
<input type="checkbox"/>	C24	270pF SMD Chip Capacitor		
<input type="checkbox"/>	Q1	MMBT2222 Transistor	1P	
<input type="checkbox"/>	P4	Header Molex 2 Pin		

Connect all cables and battery and ensure the Sudden-2 is working.

Ensure you have setup your Frequency Counter to cover the frequency range of 7 MHz (40m Amateur Band) Connect the ground of the probe to the ground side of the Molex™ Header, and the Probe to the positive side. Now read the frequency – If you have carried out one of the previous setting up procedures, then it should be reading in the region of 7.000 MHz If slight adjustment is needed, then T3 will require a slight tweak to bring it onto frequency.

(DO NOT USE A METAL SCREWDRIVER)

Peaking the input filter

Plug the Yellow/Black wires on to P5 and connect to an antenna (Yellow to antenna, black to ground) and find a signal near the middle of the tuning range. Turn the cores of T1 and T2 until the signal is loudest. Repeat this with a signal near the high-frequency end of the band (VR2 clockwise) and then with a signal near the low-frequency end. Finally adjust the cores again while listening to a signal near the middle of the band. If no signal can be heard on the bands use a signal generator to provide a weak signal. The Sudden-2 is now ready for use. The board may be mounted in a case by screws through the corner mounting holes or by the three potentiometer bushes fitted through 10mm panel holes.

Notes

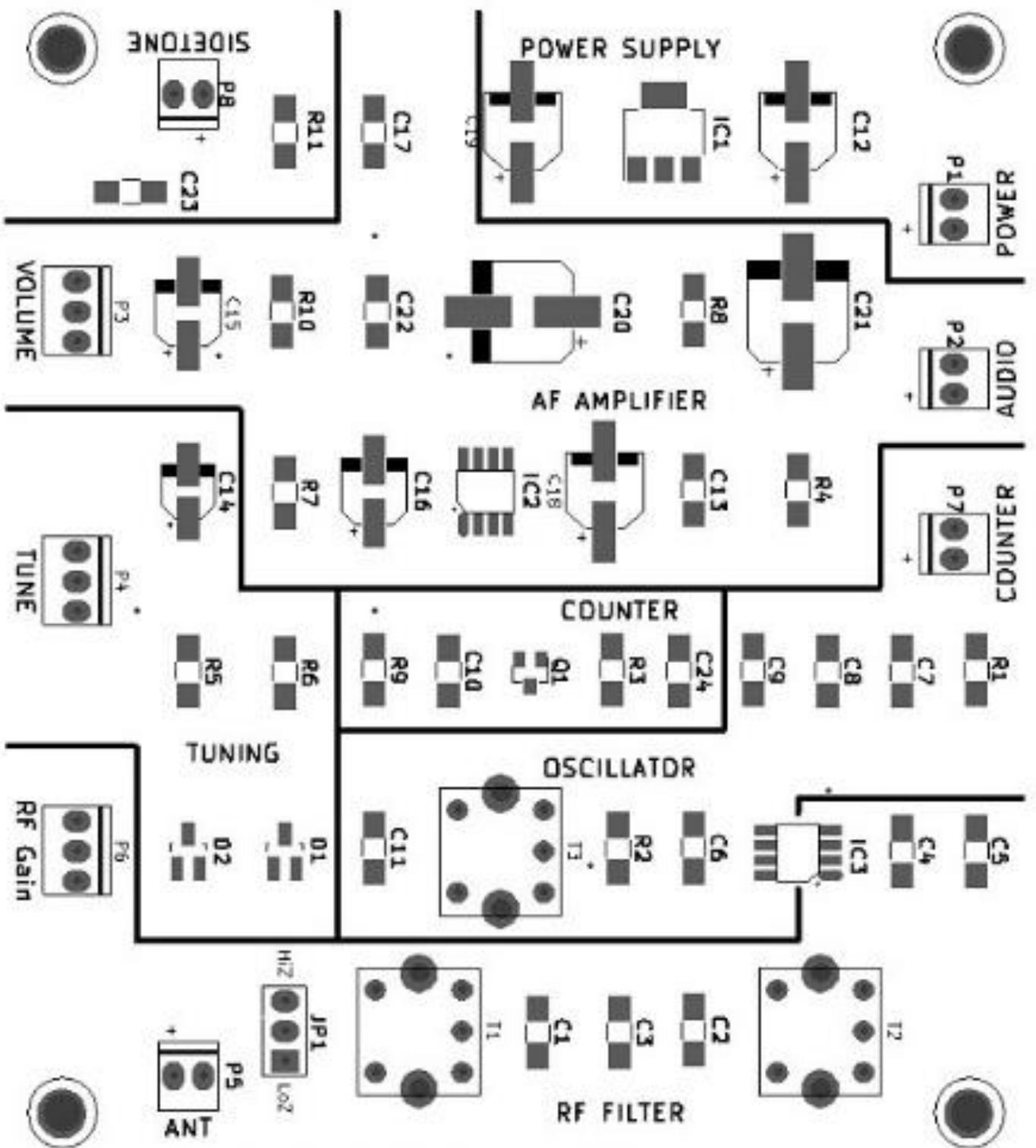
In most cases there may be “steepness” in the tuning range. This can be improved by increasing the value of C14 or, better still, replacing VR2 with high-quality 10k linear cermet potentiometer. For very fine tuning a 10-turn wire wound potentiometer can be used for VR2. The bandwidth of the input filter is quite narrow.

Sidetone – TX

This added piece of circuitry is so that it can be used with a separate Transmitter.

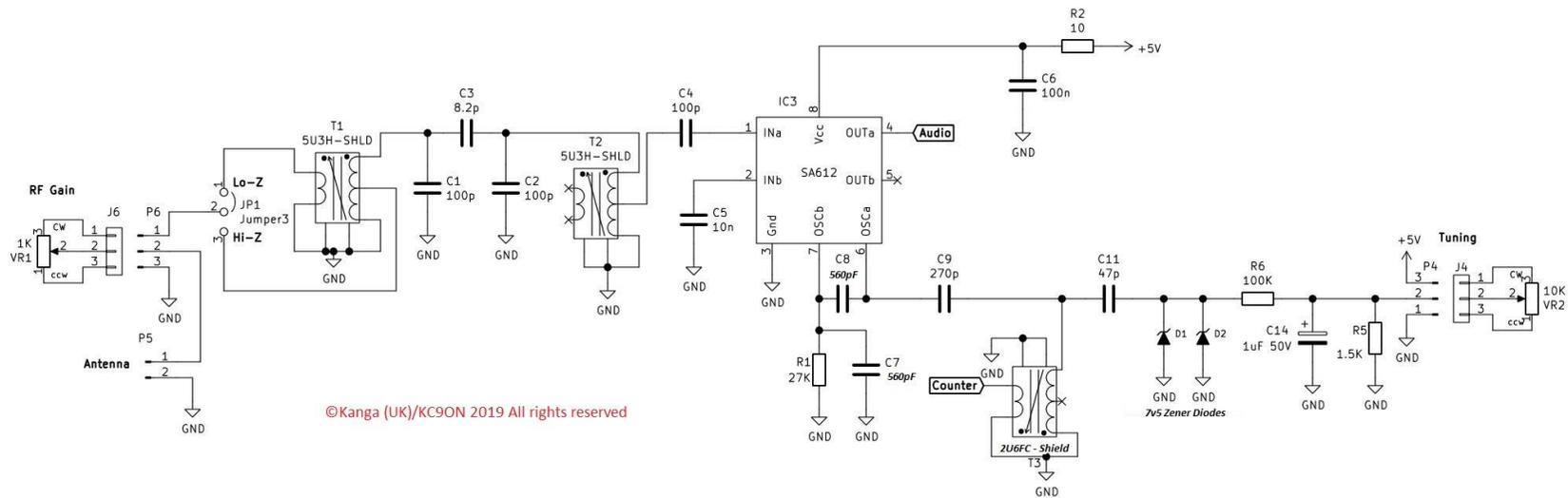
<input checked="" type="checkbox"/>	<i>Part</i>	<i>Value</i>	<i>Markings</i>	<i>Notes</i>
<input type="checkbox"/>	<i>R11</i>	<i>10KΩ</i>	<i>SMD Chip Resistor</i>	
<input type="checkbox"/>	<i>C23</i>	<i>10 nF</i>	<i>SMD Chip Capacitor</i>	
<input type="checkbox"/>	<i>P8</i>	<i>Header</i>	<i>Molex Two Pin</i>	

NOTES

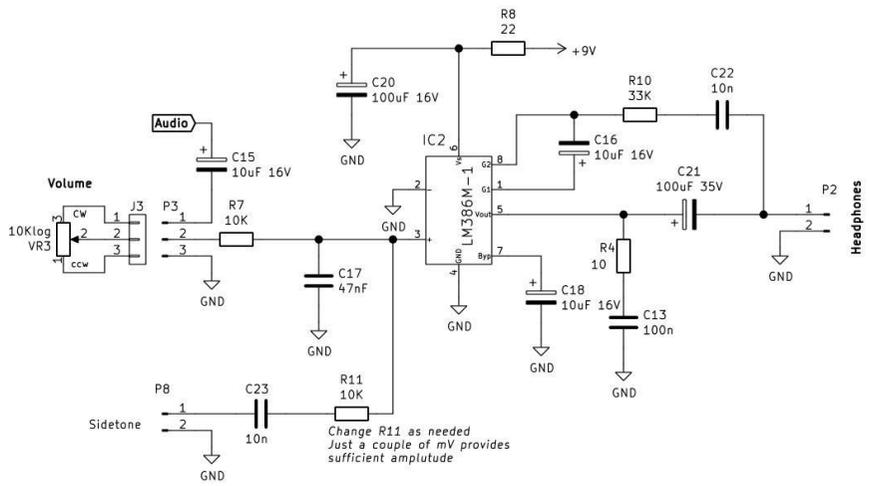


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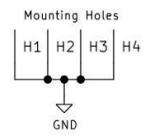
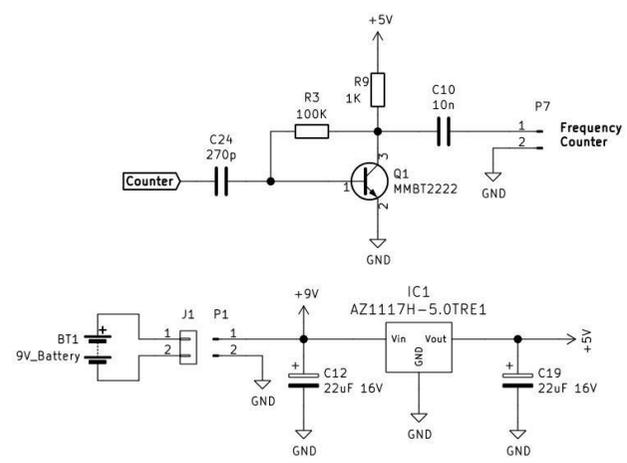
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Change R11 as needed
Just a couple of mV provides
sufficient amplitude



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