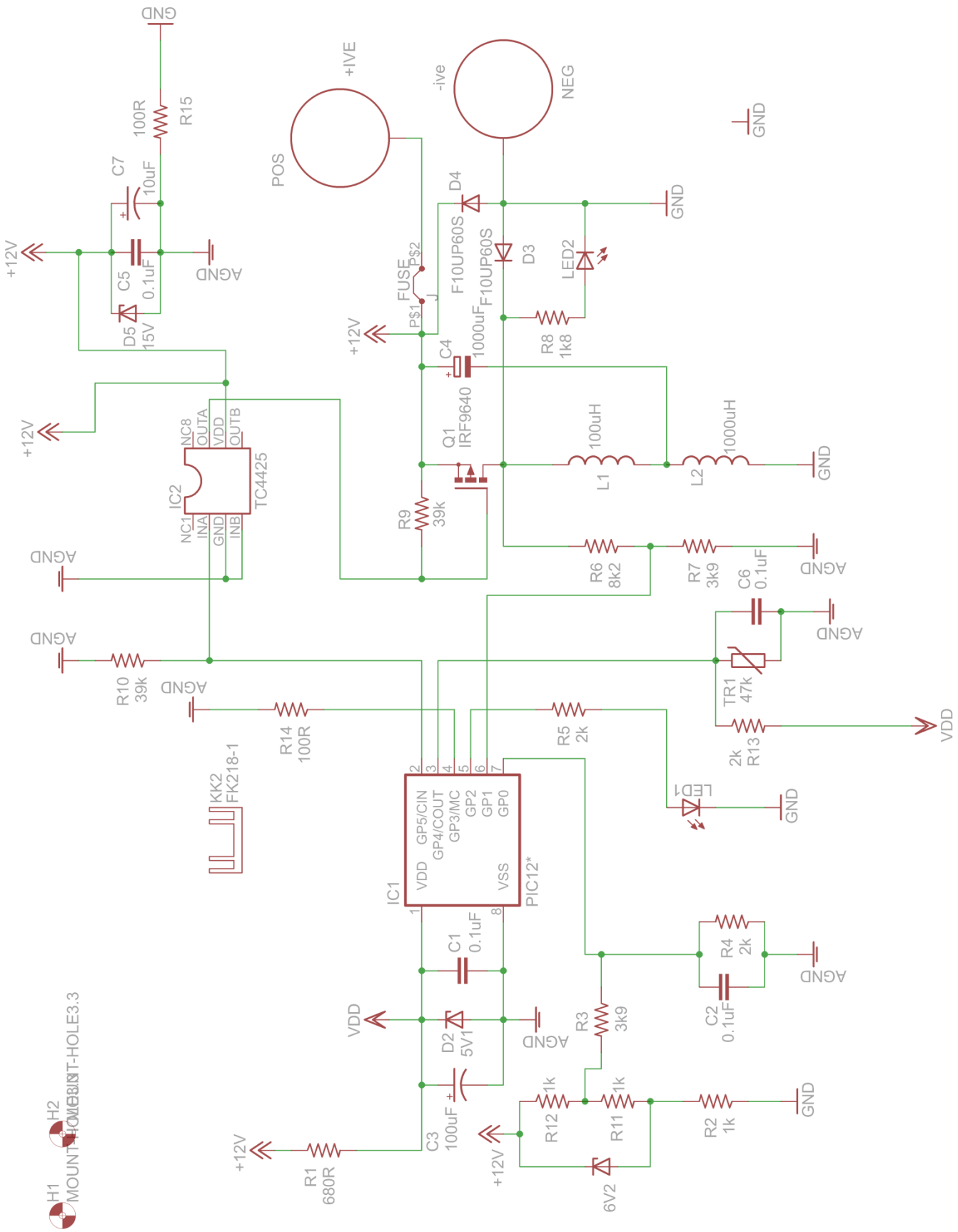
COURTIESTOWN MARINE PIC/ TC4428 DESULPHATOR

Parts List

R1	680R (BlGyBr or BlGyBBBr)	1off
R2, R11 & R12	1k (BrBR or BrBBBr)	3off
R3 & R7	3k9 (OWR or OWBBr)	2off
R4 & R5	2k (RBR or RBBBr)	2off
R6	8k2 (GyRR or GyRBBr)	1off
R8	1k8 (BrGyR or BrGyBBr)	1off
R9 & R10	39k (OWO or OWBR)	2off
R13	4k7 (YPR or YPBBr)	1off
R14 & R15	100R (BrBBr or BrBB)	2off
TR1	50k thermistor (orange with clear band)	1off
C1, C2, C5 & C6	0.1uF	4off
C3	100uF	1off
C4	1000uF/ 50V	1off
C7	10uF	1off
D1	6V2 zener(marked 6V2 or 1N5234B – Strip marked in black)	1off
D2	5V1 zener(marked 5V1 or 1N5231B – Strip marked in red)	1off
D3 & D4	F10UP60S	2off
D5	15V zener	1off
Q1	IRF9640	1off
IC1	PIC12F683	1off
IC2	TC4428	1off
DIL08	8 pin DIL socket	2off
L1	100uH (marked 101L)	1off
L2	1000uH (marked 102L)	1off
LED1	5mm Green LED	1off
LED2	5mm Red LED	1off
KK2	FK218-1 heatsink	1off
	Resettable Fuse (Flat square mustard coloured item)	1off
3mm bolt	Fix D4 to heatsink	1off
3mm nut	Fix D4 to heatsink	1off
4mm bolt	Output posts	2off
4mm nut	Output posts	4off
4mm washer	Output posts	4off
PCB		1off

Resistor Colour Codes

B – black, Br – brown, Gy – Grey, O – orange, P – purple, R – red, Y – yellow, Bl – blue, Gn – green, W - white



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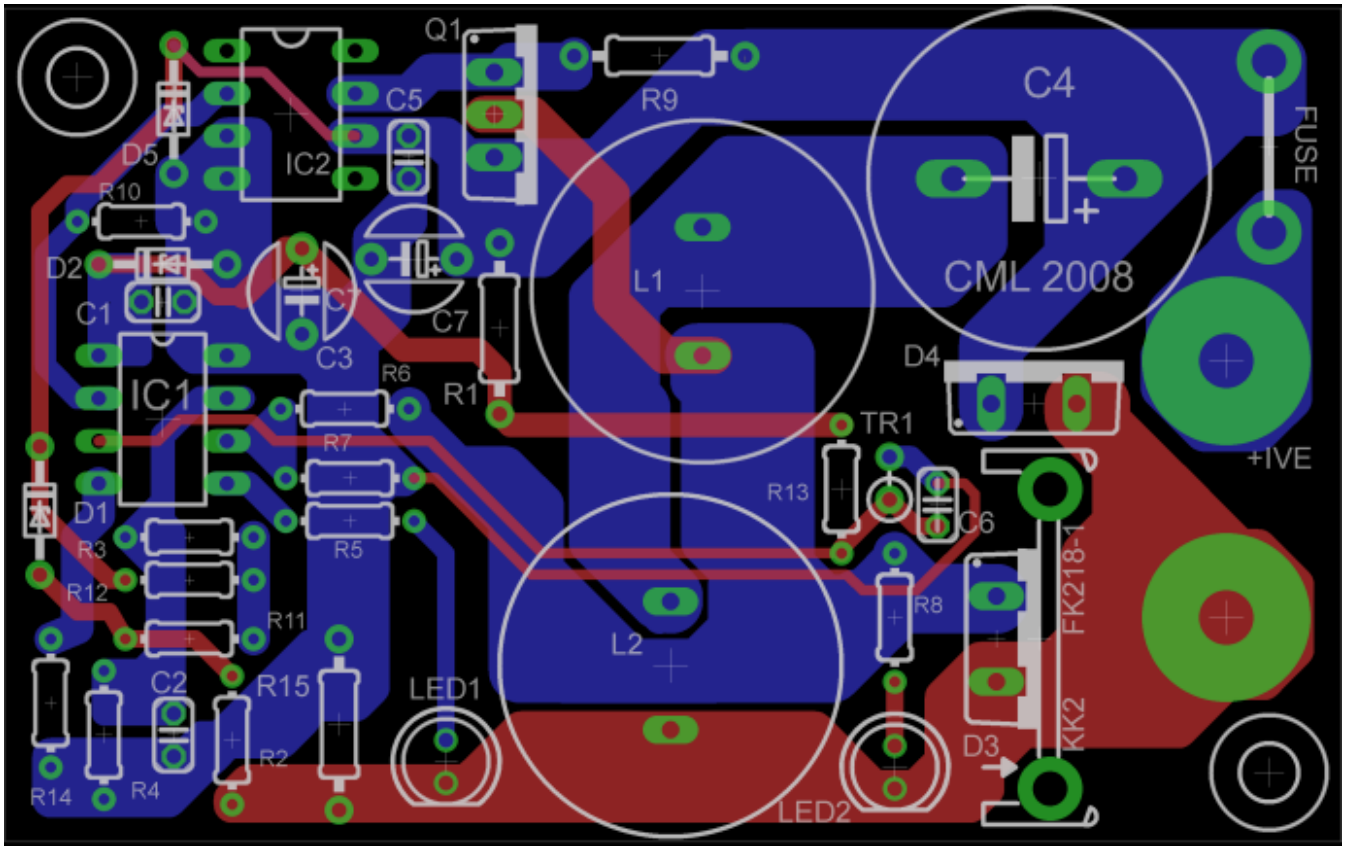

Assembly Instructions

1. Check all component parts as listed above are present. We're assuming you have a reasonable level of electronic competence in having purchased this kit, please make sure you correctly identify each part.

2. Carefully remove both the PIC and TC4428 MOSFET driver from the 8-pin DIL sockets they are shipped in and put them somewhere safe.

3. Our preferred method of attaching cables is by direct soldering to the PCB as this is the most electrically 'sound' way of doing it. Our standard output cable is 10AWG multistrand, we would recommend you go for the very largest cable you can get a hold of.

   Alternatively you can drill out the two 3.3mm holes marked +ve and –ve to 4mm and insert one of the 4mm brass bolts into each and secure tightly with a single nut.

   You then need to solder the brass head to the PCB – this will take a fair amount of heat but the solder will flow eventually. Allow the board to cool down on completion!! The solder ensures a good solid electrical connection.

4. Then attach the two washers and remaining nut to each of the bolts – makes sure you don't lose them. One word of caution these output terminals are somewhat close together so take appropriate precautions if using this method of attachment.

5. Components can then be inserted in size order as is common with most electronic kits, however leave L2 out for now and do not insert the PIC yet either. Please note the holes for L1 & L2 are a tight fit and normally the inductors will fit, however on some inductors the leads have not been cut cleanly by the manufacturer. If the inductor will not readily fit the holes then lightly file the ends of the leads.

6. D3 should be loosely attached to its heatsink (after applying heatsink paste) and then soldered to the board. The bolt can be tightened once the component is soldered to the board.

7. Our personal preference as regards fitting the thermistor is to have it stuck up in the air rather than close mounted to the PCB, this allows it to better absorb the ambient heat. It may be prudent to sleeve the legs in this case.

8. You will need to bend the legs of the resettable fuse to fit across the FUSE position on the PCB.

9. Unlike its predecessor this desulphator doesn't have any user adjustment, the trimmer has been replaced by the voltage divider network of R11/ R12. The end user can experiment with these values if they wish but those used have been deliberately chosen.

10. Thoroughly check the underside of the board prior to connecting up to carry out any testing to ensure no soldering errors.

11. I do not know what level of equipment you will have, I'm assuming a minimum of a DMM.

12. With L2 **NOT** soldered to the PCB and the PIC **NOT INSERTED** connect the device to a 12V battery.

    For testing purposes any old bit of wire will do but I would recommend using at least 12 or 10AWG multi-strand cable with soldered ring terminal connections for the device when functioning with batteries.

    You should see the red LED light up briefly and then slowly go dim, this is C4 charging up and is nothing to worry about.

13. Check you have circa 5.1V across D2 and 6.2V across D1. Then check you have 6.4V at pin 1 of the IC socket and 1.27V at pin 8. This shows voltage is flowing where it should in the circuit.

14. Assuming this bit is OK then if you have an oscilloscope connect the probe to the gate (and the earth to the negative supply) of Q1 (or use the end of R9 nearest Q1 as it is easier to access) and with a jumper wire carefully make a connection from pin 1 to pin 2 of the PIC IC socket and you should see the MOSFET go on. You will also see this with a DMM if you don't have a scope. You should see the indicated voltage drop to around 1.4V as the MOSFET switches.

    This bit shows the MOSFET driver circuitry is OK.

15. Time to get brave now. Solder L2 in to the PCB and then insert the PIC.

16. Re-connect the power. After about 2 seconds the green LED should illuminate and then after a further 3 seconds the red LED should also illuminate and the device should 'burst into life' very audibly.

17. To test the thermistor overheat you'll need a heat shrink gun (or a hair drier), either, used carefully, will cause the device to cut-out and the red LED to flash. Once the thermistor has cooled again the device will just resume pulsing.

If you have any comments regarding these instructions then please feel free to contact us at enquiries@courtiestown.co.uk

SIMPLE PIC PULSER INSTRUCTIONS

DO NOT CONNECT THE DESULPHATOR TO THE BATTERY CHARGER – CONNECT IT TO THE BATTERY & THEN CONNECT THE CHARGER. MAKE SURE THE BATTERY CHARGER IS UNPLUGGED FROM THE MAINS SUPPLY BEFORE CONNECTING/ DISCONNECTING.

TO PREVENT DAMAGE BY SHORTING OUT OF THE PCB PLEASE ENSURE IT IS USED IN SOME FORM OF INSULATING CONTAINER (kits & unboxed pulsers only).

1. Is it working? If the red LED is lit and you can hear a distinct 'buzzing' noise then yes it is.

2. Only slightly less important is ensuring that any battery charging activities are carried out in a reasonably well ventilated environment. This is particularly relevant here as you will both hear and see sparks generated as you connect this desulphator. This is perfectly normal, but possibly 'alarming' to the first time user.

3. The battery to be recovered must measure at least 10.5V 'open circuit'. Any less than this and the cause of the battery's deterioration may well be more than sulphation and this desulphator is unlikely to function as intended i.e. recover a sulphated battery.

4. Ensure that the electrolyte levels are adequate prior to starting, these should be checked regularly whilst the device is in use. It may seem obvious but don't do this with the pulser connected, they don't like water.

5. The desulphator should be used in conjunction with a simple trickle battery charger. **We would caution against using the desulphator in conjunction with more modern intelligent chargers such as those available from Ctek unless:-**

   While the typical unfiltered battery charger is not a problem, some other types of loads, such as inverters, might shunt away some of the desulphator's output. In such a case, place a choke in series with one of the inverter leads to keep the high frequency spikes from travelling further. This can be a simple ferrite toroid with one or two turns through it, or a few ferrite beads placed over the wire.

6. The desulphator can be left connected whilst the trickle charger is connected/ disconnected from the battery. I re-iterate, do not leave the desulphator connected solely to the battery charger.

7. Having said this the desulphator can be used on its own i.e. without a charger until the battery voltage drops to 10.5V i.e. trickle charge the battery in conjunction with the pulser until a peak is reached and then disconnect the charger and let the desulphator 'pull' the battery voltage down. Depending on the state of the battery this could be several days.

8. If you have a voltmeter the simplest indication of the battery improving will be the maximum voltage achieved after charging each time. This should rise noticeably during the first week and then reduce over time.

   The next best reliable indicator is putting a load on it i.e. put it in a vehicle and try starting it – probably the simplest 'load test' around.

9. I cannot emphasise enough the importance of ensuring the voltage level doesn't drop below 10.5V at any time. It is almost certain irreversible battery damage will result.

10. Ready built desulphators have been bench tested prior to despatch.

11. The desulphators are now supplied with reverse polarity protection consisting of a PPTC fuse and a diode. If you connect the device to the battery the wrong way around the internally mounted PPTC type fuse will react. Just remove the desulphator from the battery, allow a short period for the 'fuse' to cool and connect the correct way around.