

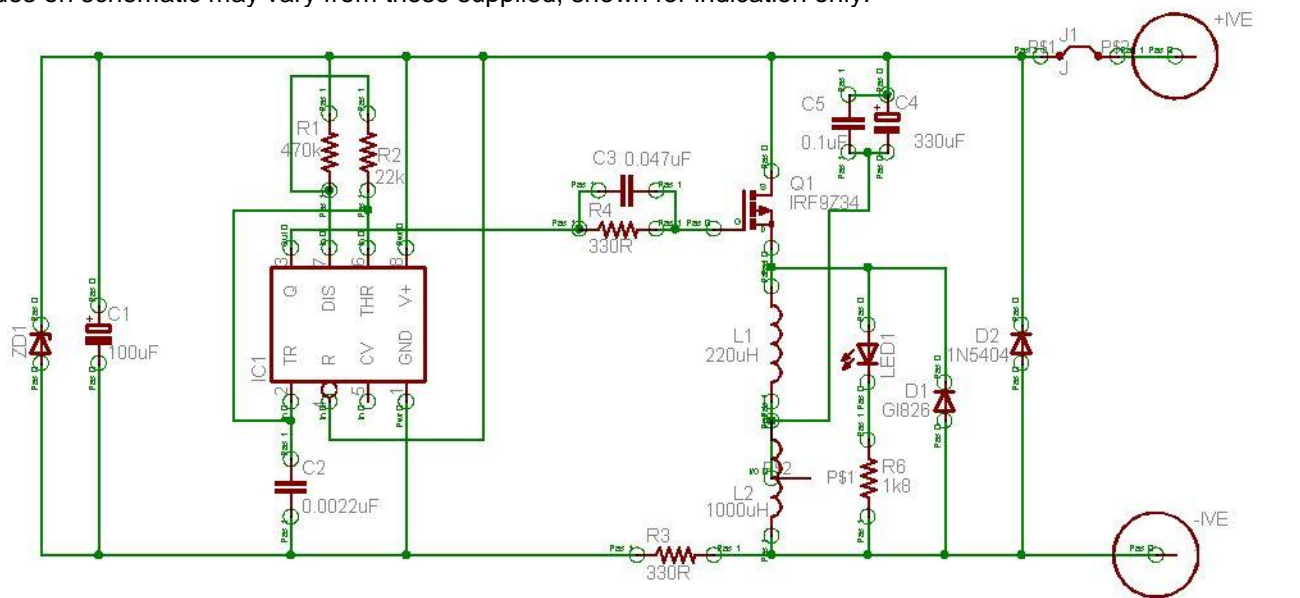
## 12V BASIC PULSER KIT (RESETTABLE FUSE) ASSEMBLY INSTRUCTIONS

### Basic Pulser Kit

R1	470k (YPY or YPBO)	1 off
R2	22k (RRO or RRBR)	1 off
R3/4	330R (OOBr or OOBB)	2 off
R6	1k8 (BrGyR or BGYBBR)	1 off
C1	100uF	1 off
C2	0.0022uF/ 2.2nF (small yellow – marked 2n2)	1 off
C3	0.047uF/ 47nF (small blue thing – marked 473)	1 off
C4	330 or 470uF/ 25V	1 off
C5	0.1uF (small blue thing – marked 104)	1 off
LED		1 off
D1	MUR460	1 off
D2	1N5408	1 off
Q1	IRF9Z34N	1 off
IC1	555	1 off
	8 pin DIL socket	1 off
ZD1	15V	1 off
L1	220uH inductor (larger marked 4590R or Panasonic 221)	1 off
L2	1000uH inductor (smaller marked 102)	1 off
	4mm bolt	2 off
	4mm nut	4 off
	4mm washer	4 off
	Resettable fuse (mustard coloured disc marked R60)	1 off
	PCB	1 off

Resistor Colour Codes: B – black, Br – brown, Gy – Grey, O – orange, P – purple, R – red, Y – yellow

Values on schematic may vary from those supplied, shown for indication only.



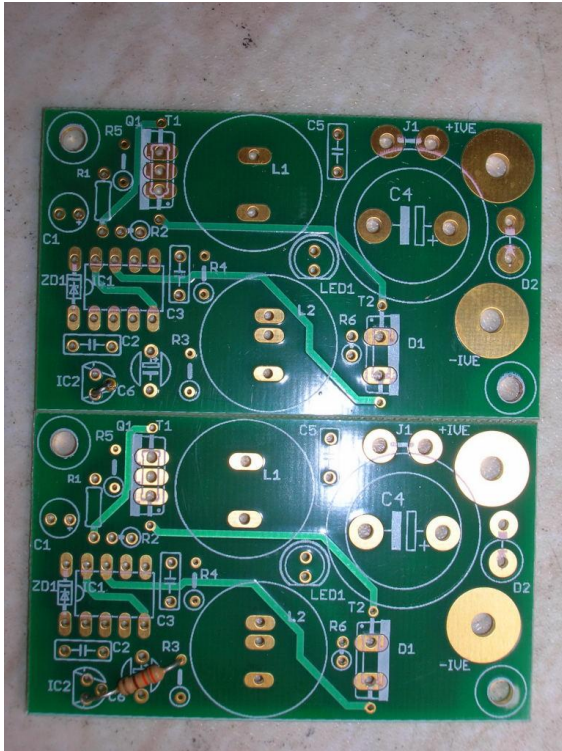
**DO NOT CONNECT THE PULSER TO THE BATTERY CHARGER – CONNECT IT TO THE BATTERY & THEN CONNECT THE CHARGER. MAKE SURE THE BATTERY CHARGER IS UNPLUGGED FROM THE MAINS SUPPLY BEFORE CONNECTING/ DISCONNECTING**

1. Check all components/ parts as listed above are present.
2. Carefully remove the 555 chip from its DIL socket, do not insert until after all soldering of both the socket and immediately adjacent components is complete. Please note that the IC should be inserted with the dot (indentation) on the device nearest to C2 on the PCB.
3. You can choose to solder the 4mm bolts to the PCB or solder your output cables direct. To solder the 4mm nuts and bolts to the PCB you will need to drill out the two 3.3mm holes marked –ve and +ve to 4mm. Then place a bolt through each hole and secure tightly with a nut. The bolts take a fair bit of heating but the solder will take eventually. As you will see from the pictures on the web site the solder mask does bubble to reflect the amount of heat being used at this point.
4. Components can then be inserted in any order, obviously excessive heat should be avoided.

I'm assuming you are aware that the band on an electrolytic capacitor indicates the negative!! In the case of C4 the banded side should be closest to the C5 position.

The MOSFET should be soldered in last though and should not be 'overly' handled. In my opinion they are not as sensitive to static as some might have you believe.

5. The output diode D1 should be mounted with the banded end towards C4 (the kit is supplied with the device inserted the correct way around!!). D2, the reverse polarity diode, should be mounted with the band towards the +ive output terminal.
6. The LED positive is the longer lead. The long lead should also be mounted nearest C4.
7. You will need to insert a wire link across the lower two holes of component IC2 thus ensuring continuity between the end of R3 and pin 1 of IC1. The PCB is 24V capable but you will need to use a 1k resistor in place of R3, a voltage regulator, another capacitor at C6 and different sized L1. The picture below shows the two options



You can either insert a link across the two pins of IC2 or wire R3 as shown.

8. C5 supposedly allows the high frequency bits to pass more readily than through C4.

What will produce a greater gain would be fitting a larger C4, up to 6,800uF/ 25V has been recommended. It certainly provides a greater store of energy. If you go this route you'd be advised to fit a pot. in place of R2 to allow you to adjust the pulse if necessary i.e. the inductors or MOSFET start getting hot.

9. There is not a great deal of clearance between the output lead of D2 and the +ive terminal especially if you use the 4mm bolt option. The gap is adequate but I would suggest that you solder the end nearest the -ive terminal first then crimp the output lead to the body of the diode with a pair of suitably sized pliers prior to soldering it.
10. The resettable fuse is the mustard coloured small disc marked R60 – this should be soldered across the points marked J1 with the leads as short as possible.
11. If you use the 4mm bolt output terminal option I would strongly suggest you solder the ring terminals to the output cables, do not just crimp. Every poor connection is losing energy. I would advise using leads of at least 10 or 12AWG for the output. These may seem OTT but they do seem to make a difference.

There is no point after this just using crocodile clips to connect to the battery. Use proper battery terminal connectors and a soldered ring terminal and do the connections up properly. To give you an idea of what you lose here on a 'high power' pulser fitted with a peak detector I was losing 20V through crocodile clips against a proper battery terminal clamp.

12. On completion check and double check that the right components are in the right place, and that there are no solder bridges.
13. Connect the negative lead from the pulser to the battery negative terminal first. Then briefly touch the positive lead to the positive terminal i.e. 1-2 seconds and note:-
  - a) low level sparks as the lead contacts the battery terminal
  - b) the LED should illuminate
  - c) you should hear a distinct circa 1kHz tone from the PCB.

If you get all three then connect the pulser for progressively longer periods and monitor the coils/ MOSFET and diode for excessive heat. Once you have got to a minute it is fairly safe to assume that all is well.

If you get only some or none of the above then clearly something is wrong. Re-check the components are in the right place and adequately soldered and that there are no bridges or dry joints.

This device consumes in the region of 40-50mA so will obviously drain the battery if it is not charged.

I would suggest that you connect both the device and a trickle charger to the battery undergoing recovery (having first checked that the electrolyte level is OK) and leave the pulser to do its thing.

The voltage to which the battery will charge should increase over a period of 10-14 days, a really large battery may take longer. If you do not see this improvement then it is likely that the cause of the batteries poor performance is other than sulphation or that it is already too bad and the sulphation has bridged plates internally.

I can be contacted at [enquiries@courtiestown.co.uk](mailto:enquiries@courtiestown.co.uk) or on 0146 483 1490. With regard to the latter option be aware I work offshore for half my life and that my wife may not be able to offer that much assistance and also that calls should be made at a civilised hour i.e. before 2100.

## **SIMPLE PULSER INSTRUCTIONS**

**DO NOT CONNECT THE PULSER 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).**

**CONNECT YOUR NEGATIVE CABLE TO THE BOLTED TERMINAL MARKED –VE AND THE POSITIVE CABLE TO THE TOP OF THE INSULATED SPACER AT THE POSITION MARKED +VE. DO NOT DISCONNECT OR CHANGE THE DIODE OR FUSE CONNECTIONS, PLEASE REFER TO WEBSITE FOR PICTURES IF BUILDING A KIT FOR CORRECT CONNECTIONS (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 device. 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 device 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 device should be used in conjunction with a simple trickle battery charger. The device itself consumes circa 40-90mA.
6. The pulser can be left connected whilst the trickle charger is connected/disconnected from the battery. I re-iterate, do not leave the pulser connected solely to the battery charger.
7. Having said this the device 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 pulser '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 pulsers have been bench tested prior to despatch.
11. The devices are now supplied with reverse polarity protection consisting of a fuse and a diode. In the event you have the misfortune to connect the device the wrong way around the fuse will blow. The device will be supplied with a 5 x 20mm quick blow fuse with a rating of between 2 – 5A.

I would suggest you get a stock of these in as we have all made the mistake of connecting these devices the wrong way round; the advantage now is that you only blow the fuse and not the whole device!!