

## バッテリー照明装置 製造研修

期 間 2014年10月6日(月)～2014年10月10日(土)

受講者 Francis Oundo

日 程 全5日 1回2時間

場 所 再生バッテリーオフィス

## スケジュール

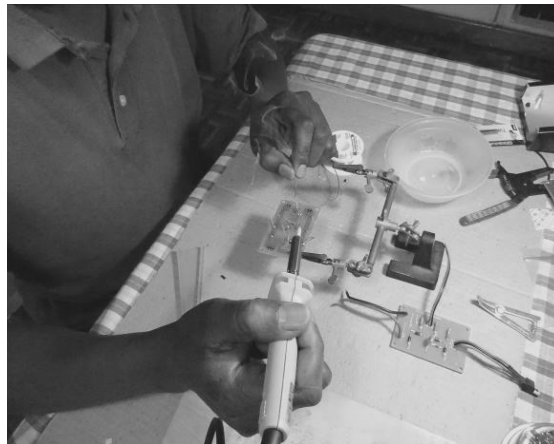
	前半	後半
10月6日 (月)	<ul style="list-style-type: none"> <li>電子部品とハンダ付けの注意点</li> <li>ハンダ付け作業おさらい(実技)</li> <li>半田ごてコントローラーの作成</li> </ul>	<ul style="list-style-type: none"> <li>半田ごてコントローラーの作成</li> <li>完成</li> <li>完成検査</li> </ul>
10月7日 (火)	バッテリーマネージメント装置の製作 <ul style="list-style-type: none"> <li>基板本体作製</li> </ul>	<ul style="list-style-type: none"> <li>基板本体作製</li> </ul>
10月8日 (水)	バッテリーマネージメント装置の製作 <ul style="list-style-type: none"> <li>USBアダプタの製作</li> <li>基板本体製作</li> </ul>	<ul style="list-style-type: none"> <li>ケース組み込み</li> <li>検査、調整</li> <li>完成</li> </ul>
10月10日 (金)	LED電球の製作	LED電球の製作
10月11日 (土)	<ul style="list-style-type: none"> <li>バッテリー照明装置の製作</li> </ul>	<ul style="list-style-type: none"> <li>バッテリー照明装置の製作</li> <li>講評</li> <li>修了</li> </ul>

## 研修 1 日目

半田ごての温度を適正に管理する、温度コントローラーを作製する。

確実にきれいなハンダ付けをするためには必需品。

見本を見ながら慎重にハンダ付けをする Francis。彼は既にハンダ付け研修を修了している。



半田ごてコントローラーの完成。これが彼のビジネスの強力な武器となる。



## 研修 2 日目

バッテリー照明システムの心臓部、バッテリーマネージメントの基板部分を作製する。

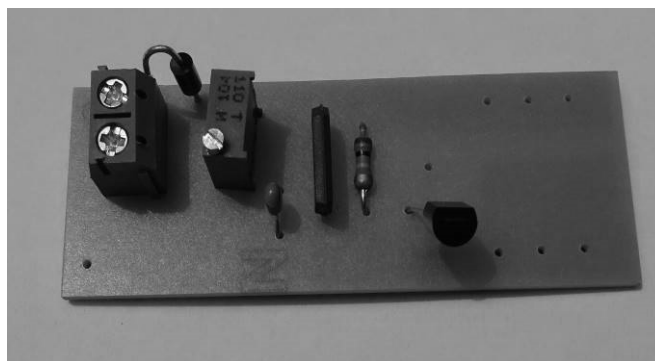
1 日目で作製した半田ごてコントローラーを使って半田付け作業を行う。



トランジスタやICといった熱に弱い部品もあるので、放熱対策をしながら半田付けをする。



基板の完成

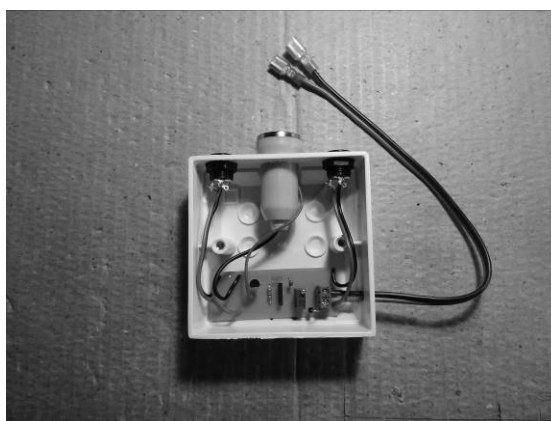


### 研修3日目

製作した基板をケースに組み込む。



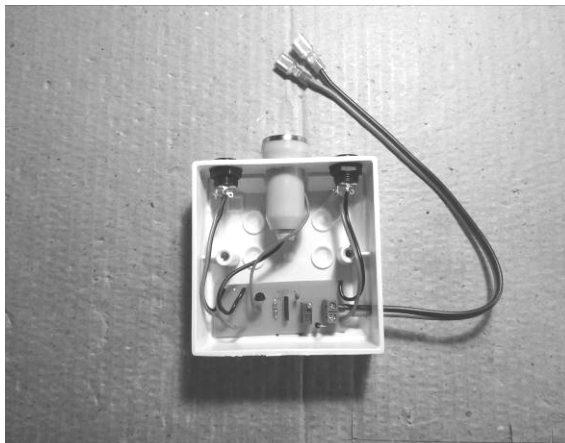
バッテリー接続ケーブルをつけて完成。



バッテリー充電警告電圧の設定。



完成。後はカバーをして出来上がり。

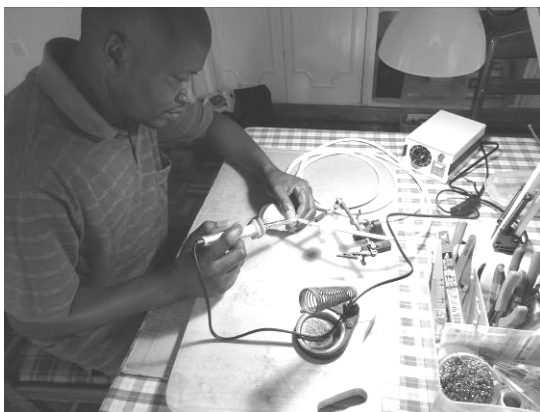


#### 研修4日目

LED ランプの製作。

研修も4日目になると、製造の勘所が少しずつわかってくる。

完成。



#### 研修5日目

最初から一人で製作。早く作ることより丁寧に作ることをモットーにしている。



実際にバッテリーをつないで見て、動作を確認。研修終了。これで、自力で作れるようになる。



研修後。

自分の工場でこつこつと作り始める。手始めの工具類、部品類。



バッテリーマネジメント装置製作マニュアル

Assembly Manual of Battery Management Device

First Edition (10 October 2014)

## 1. How to use a soldering bit and a temperature controller



### Left on the picture: Temperature controller for a soldering bit

This device is used to adjust the temperature of a soldering bit. Connect it to power and a soldering bit before turning on the power switch. The ideal temperature for soldering ranges from 240 to 250 degree Celsius. If solder (alloy of tin and lead) is not welded well, slightly turn the dial clockwise.

### Right on the picture: Soldering bit

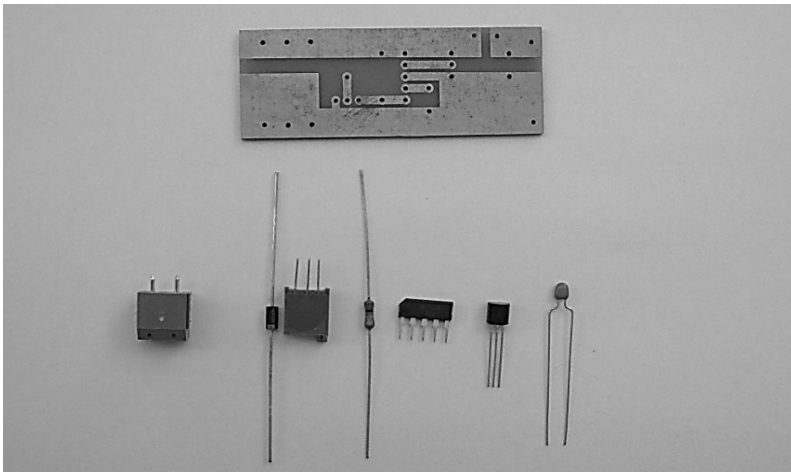
This device is used to weld the parts of a battery management device on a printed circuit board. Before using it, wait for the soldering bit to get hot (i.e. about three minutes after turning on the temperature controller). Hold the blue plastic part when you use it. Do not touch the metal part of the soldering bit to avoid corrosion or injury. Clean the metal part through a sponge attached on the soldering bit holder. Make the sponge slightly wet, but do not get it soak in water.

### **!!!Safety precaution!!!**

The metal part of soldering bit and its stand is extremely hot during and after the use. Do not touch the metal part until it becomes room temperature (i.e. at least 30 minutes after turning off the temperature controller). Also make sure that the temperature controller, soldering bit and its holder are placed on a stable table.

## 2. Assembly of battery management device components on a printed circuit board

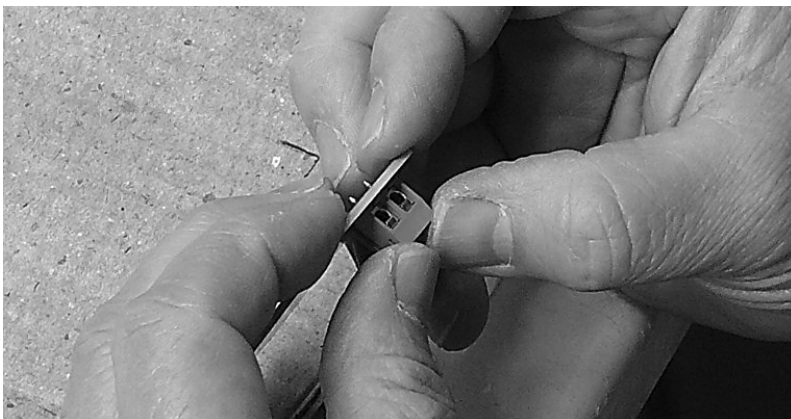
(1) Familiarize yourself with the name of each component.



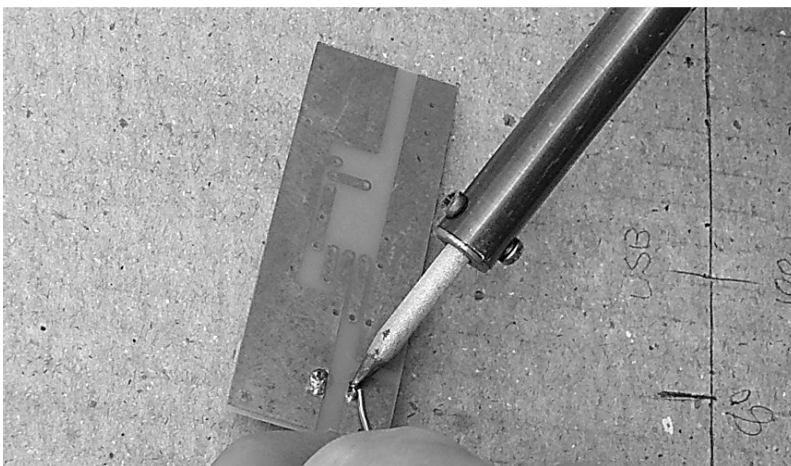
Top: Printed Circuit Board (PCB).

Bottom (from left to right): Terminal block, diode, trimming potentiometer, resistance, Integrated Circuit (IC), transistor and condenser.

(2) Assemble the terminal block on the PCB. Avoid a reverse connection: the two holes on the side for electric cables should face to the outside.

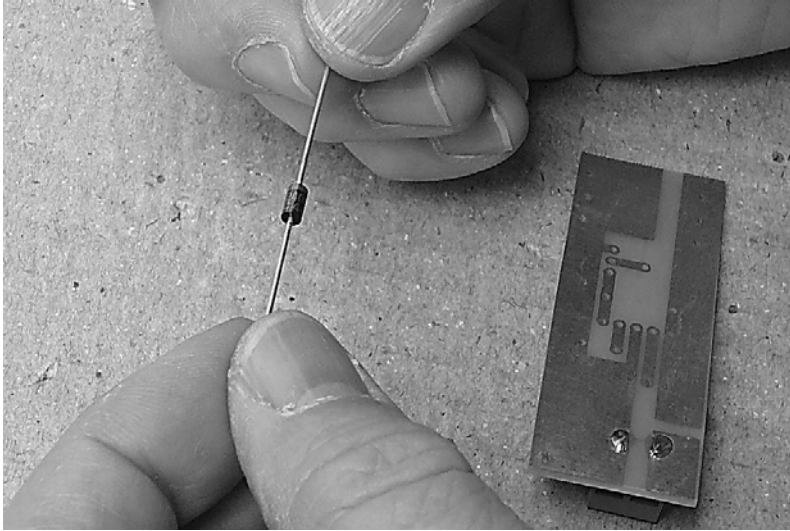


Get the terminal block soldered on the rear side of the PCB. Cut the wires of the terminal block by nipper at 2 mm from the welded solder.

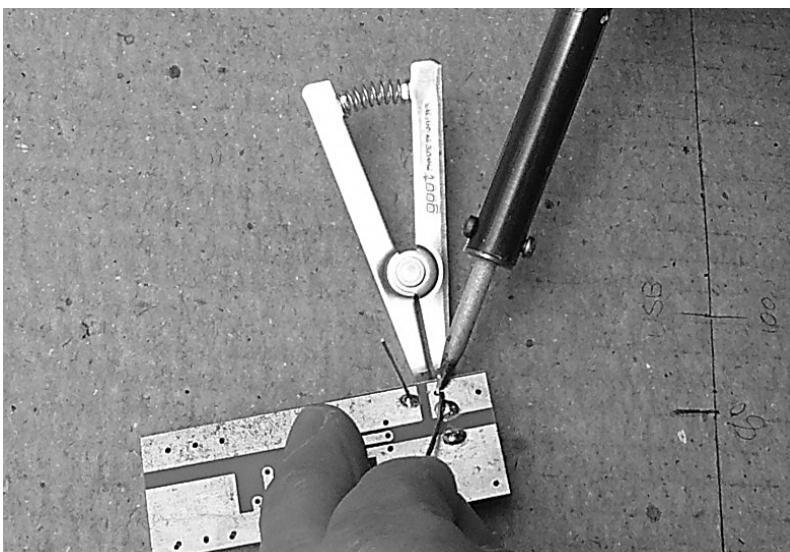




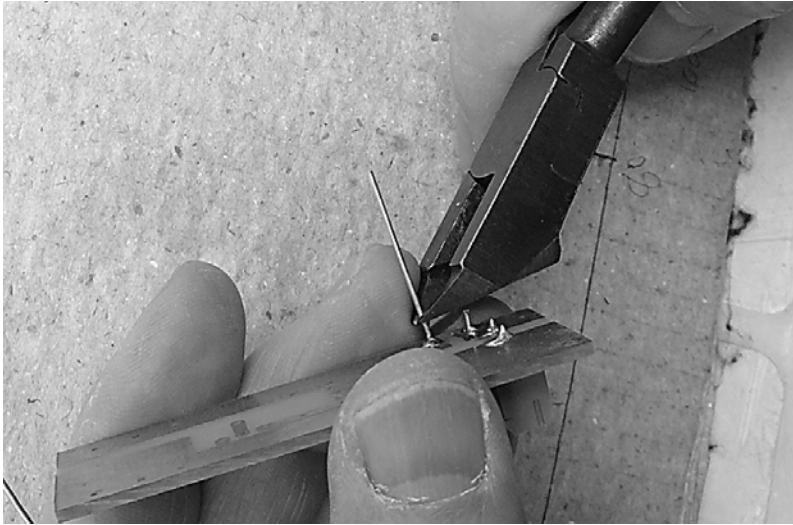
(3) Place a diode on the PCB. Avoid a reverse connection: the grey band of the diode should face the surface of the PCB.



Before soldering, put a heat clip between the diode and the PCB to avoid any damage to the diode, which is sensitive against the heat.



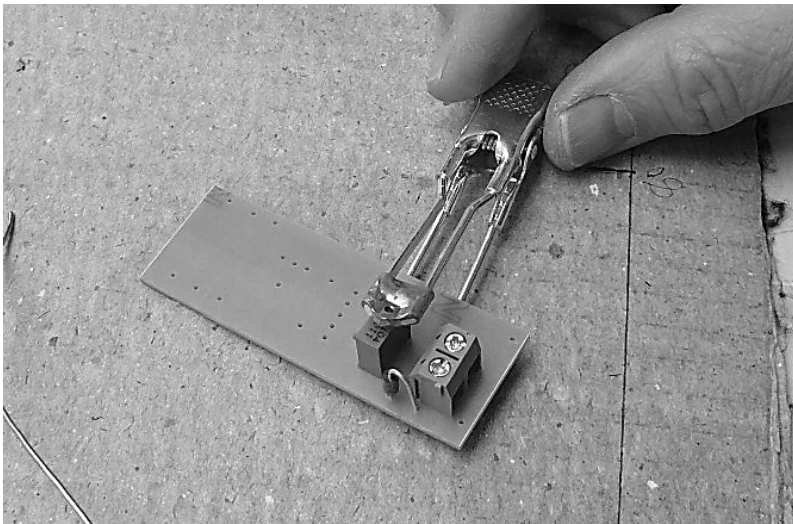
Cut the wire of the diode by nipper at 2 mm from the welded solder.

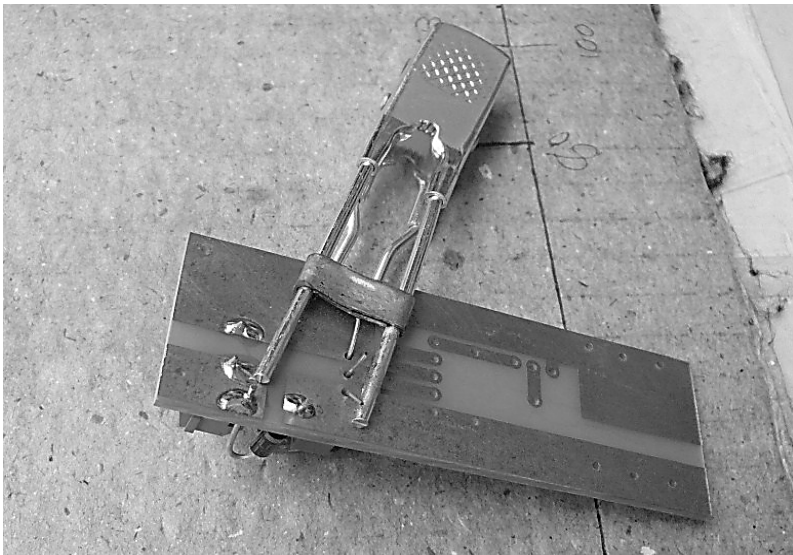


(4) Attach the trimming potentiometer on the PCB.

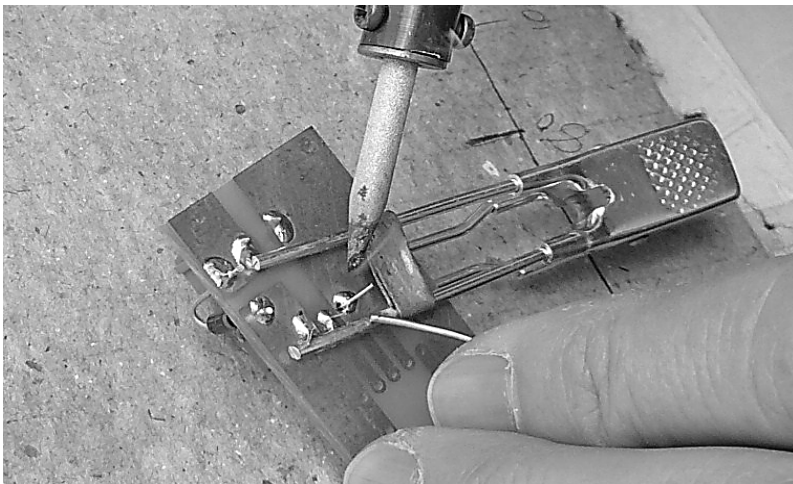


Fix the trimming potentiometer on the PCB with a metal clip.

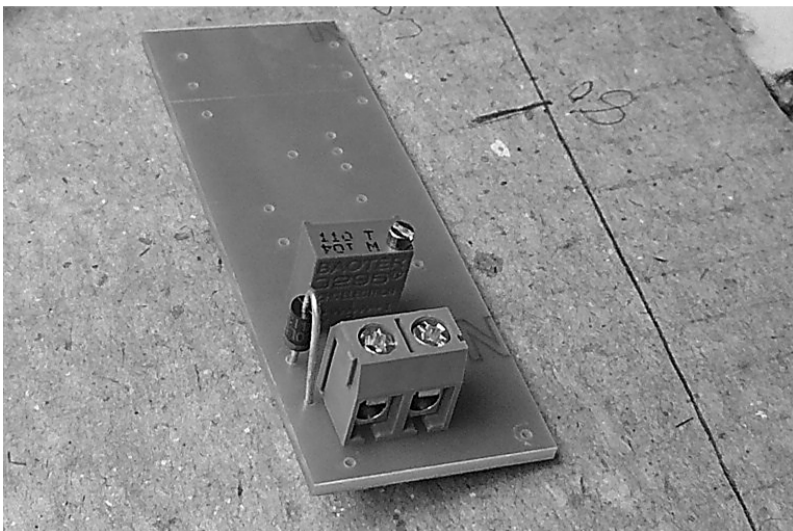




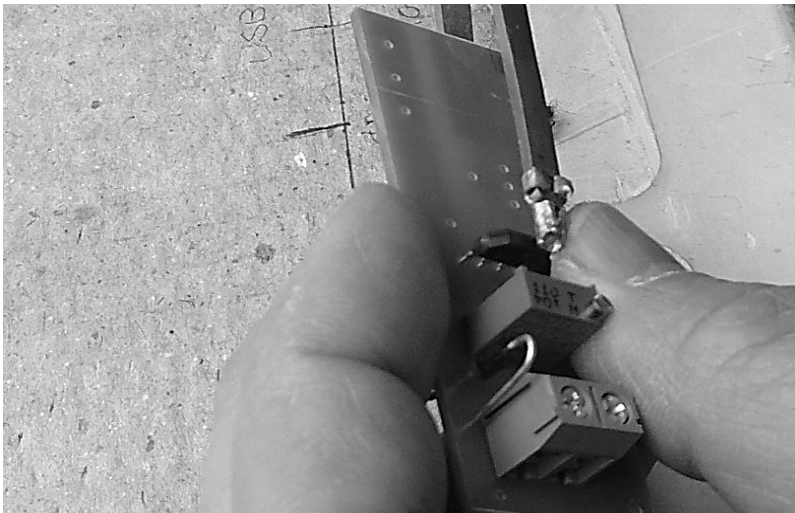
Get the trimming potentiometer soldered on the rear side of the PCB. Cut the wires of the trimming potentiometer by nipper at 2 mm from the welded solder.



Your PCB should now look like the image below.



(5) Assemble the IC on the PCB. Avoid a reverse connection: the oblique side should match with the side where the diode was assembled. Hold the IC on the PCB with a pair of tweezers.



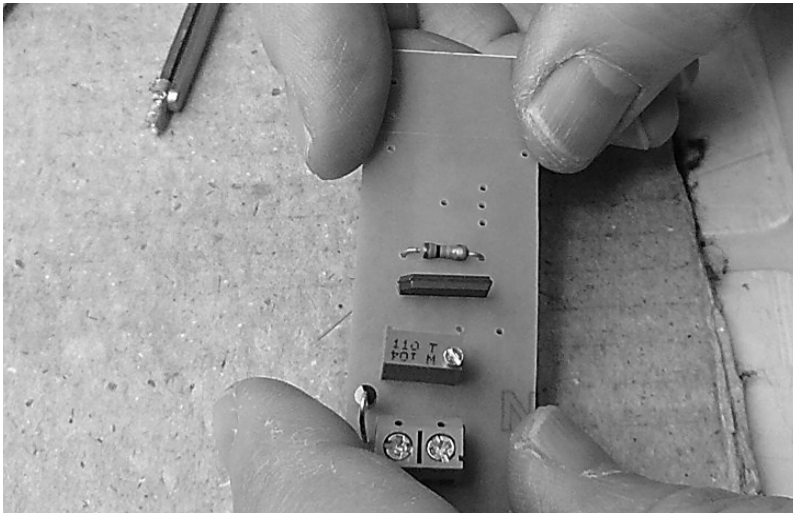
Solder the IC on the rear side of the PCB quickly because IC is sensitive against the heat. Ensure that each solder is placed exactly on each of the five copper laminas, but not connected each other. Cut the wires of the IC by nipper at 2 mm from the solder.



Your PCB should now look like the image below.

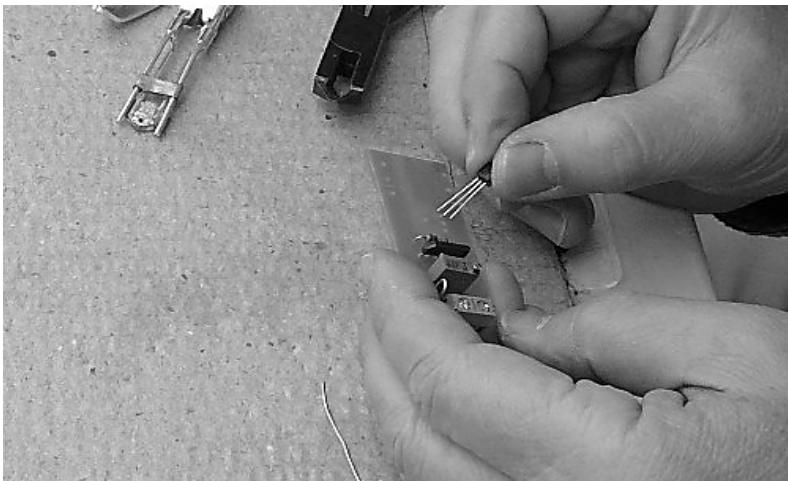


(6) Place a resistance on the PCB.

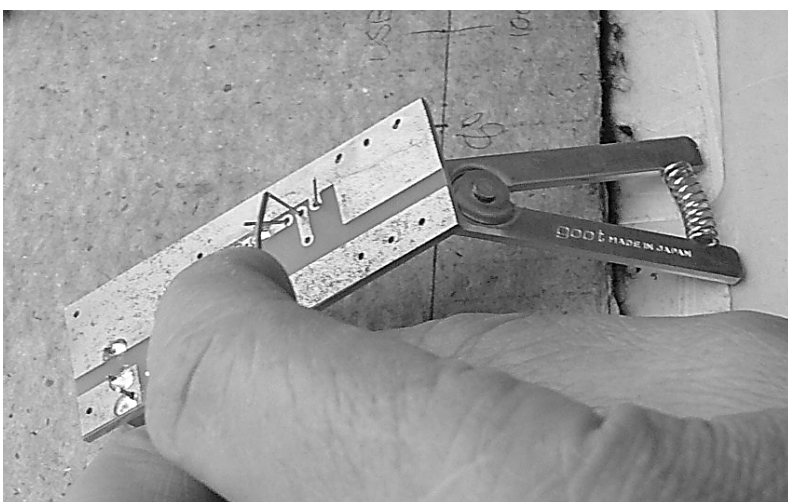


Get the resistance soldered on the PCB. Cut the wires of the resistance by nipper at 2 mm from the welded solder.

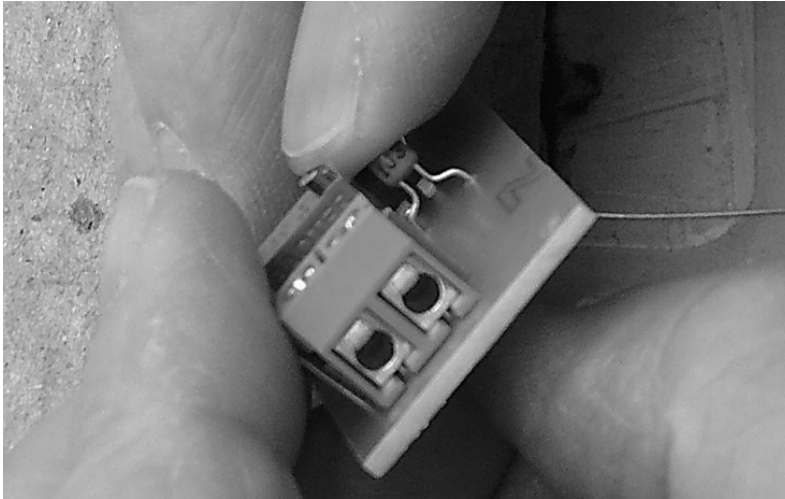
(7) Assemble the transistor on the PCB. Avoid a reverse connection: the hemicycle side of the transistor should face to the outside.



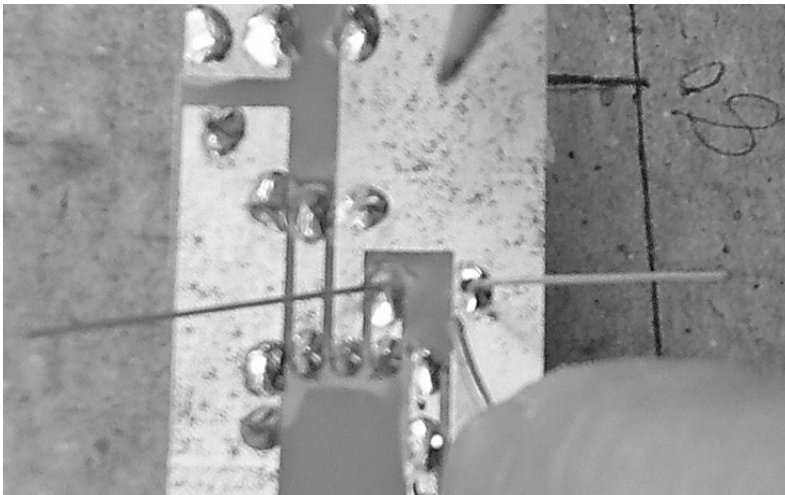
Before soldering, put a heat clip between the transistor and the PCB to avoid any damage to the transistor, which is sensitive against the heat.



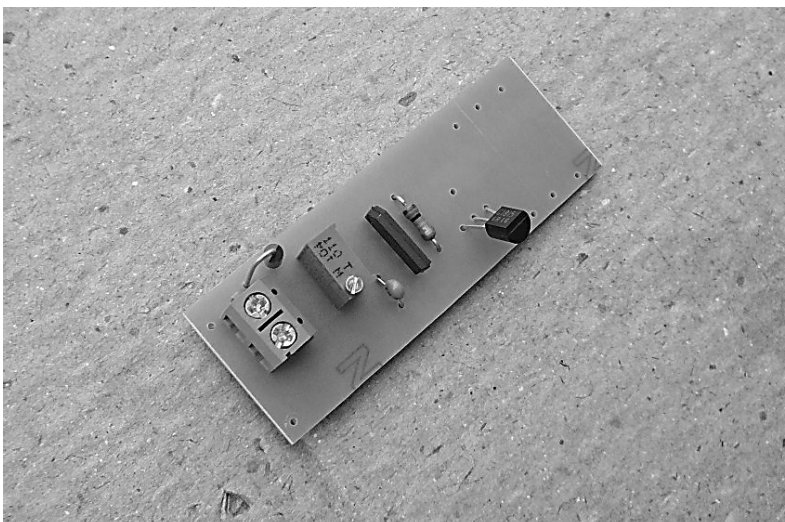
(8) Place a condenser on the PCB.



Get the condenser soldered on the PCB. Cut the wires of the condenser by nipper at 2 mm from the welded solder.

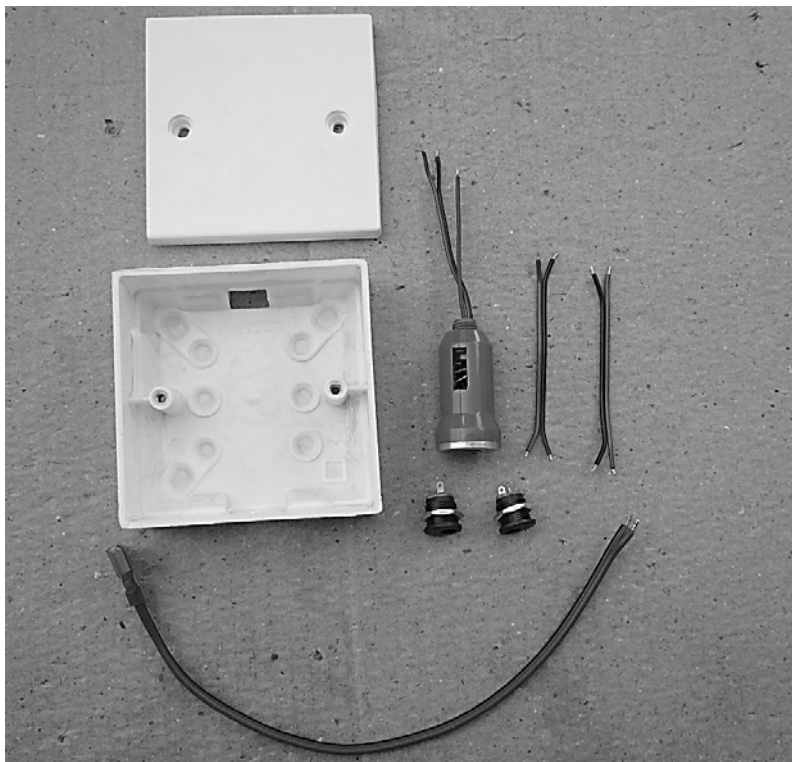


This is the end of the PCB assembly. Your PCB should now look like the image below.



3. Assembly of a battery management device (Building in the completed PCB into a plastic case).

(1) Familiarize yourself with the name of each component.

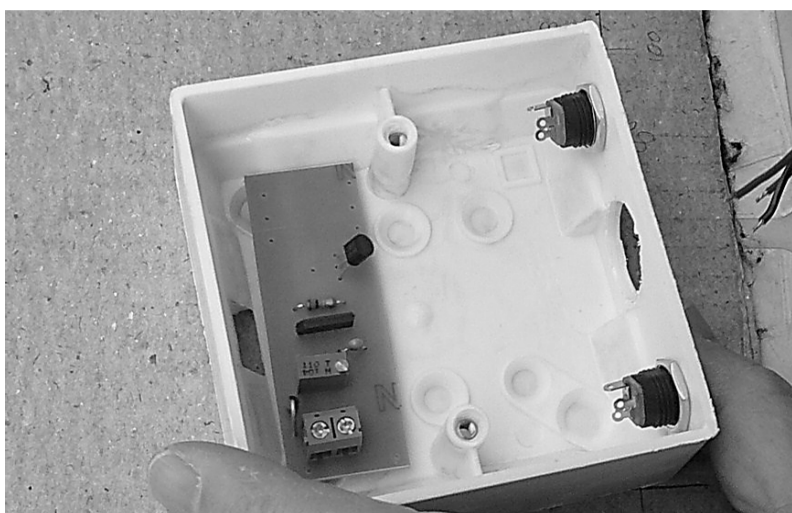


Top: Lid of the plastic case (battery management box).

Middle (from left to right): Plastic case, Universal Serial Bass (USB) adaptor, two Direct Current (DC) jacks, two 8-cm electrical leads

Bottom: Leader line (a line that connects a battery and a battery management device)

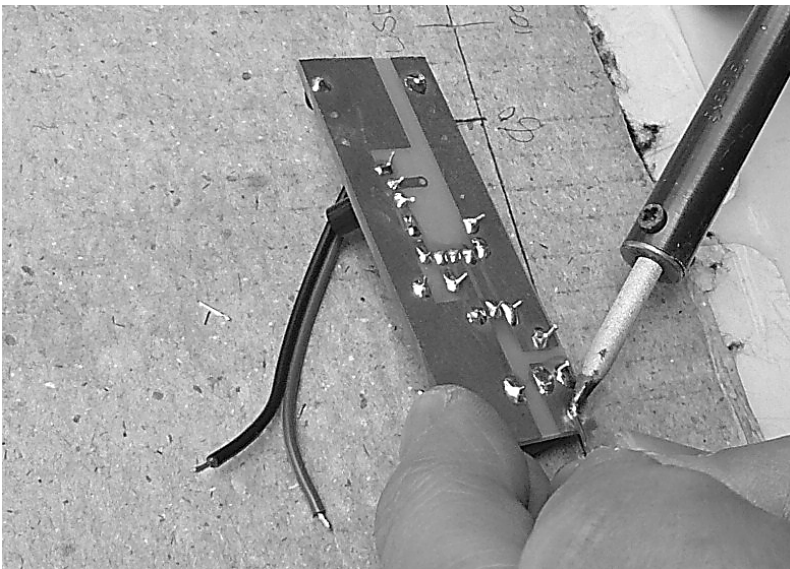
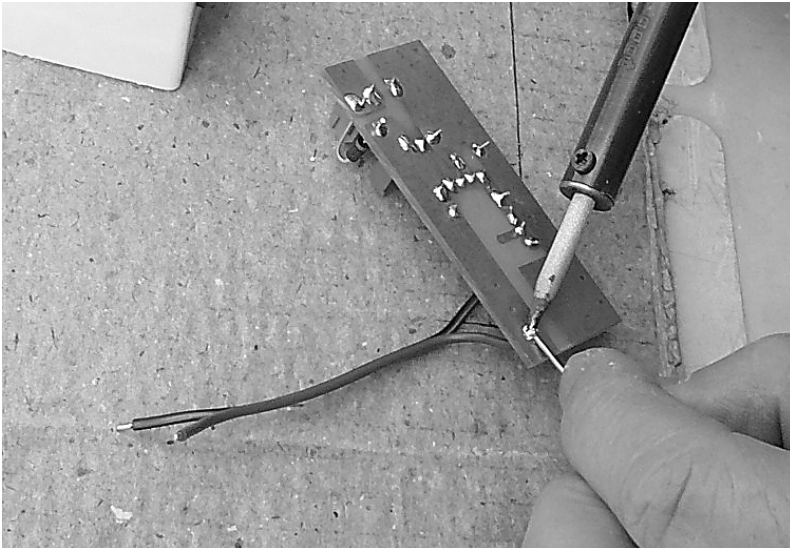
(2) Build the DC jacks in the plastic case. Do not fasten the hexagon nuts too tight as they are fragile.



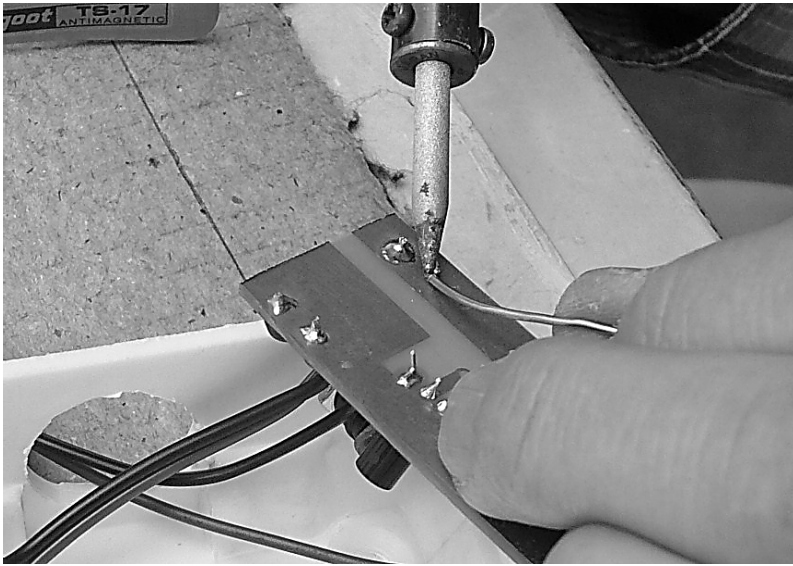
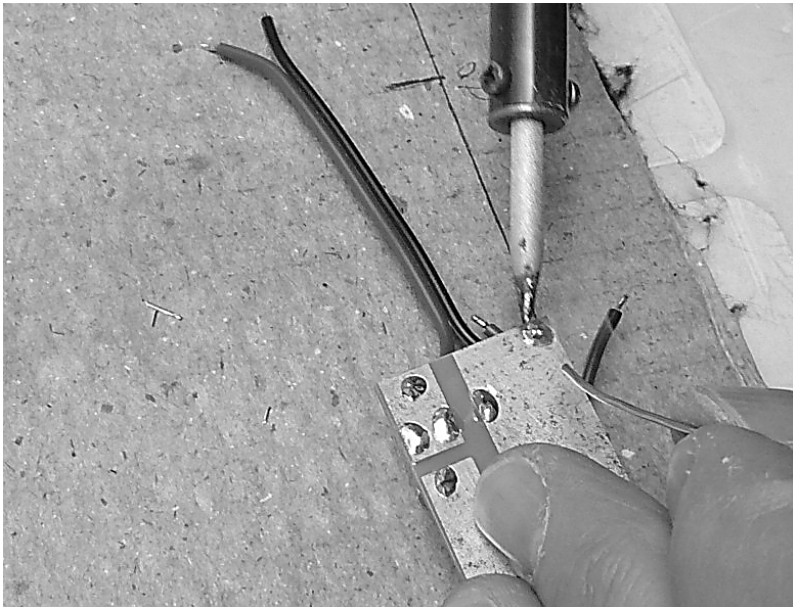
(3) Place the electrical leads on the PCB.



Get the electrical leads soldered on the PCB.







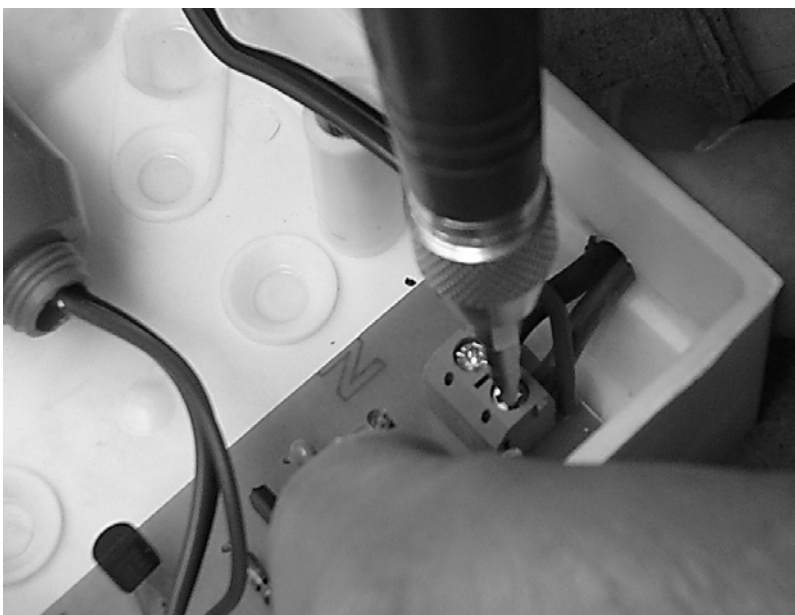
(4) Build the USB adaptor in the plastic case.



(5) Connect a DC jack and the PCB through the electrical lead by soldering.



(6) Fix the leader line into the block terminal by screwdriver.



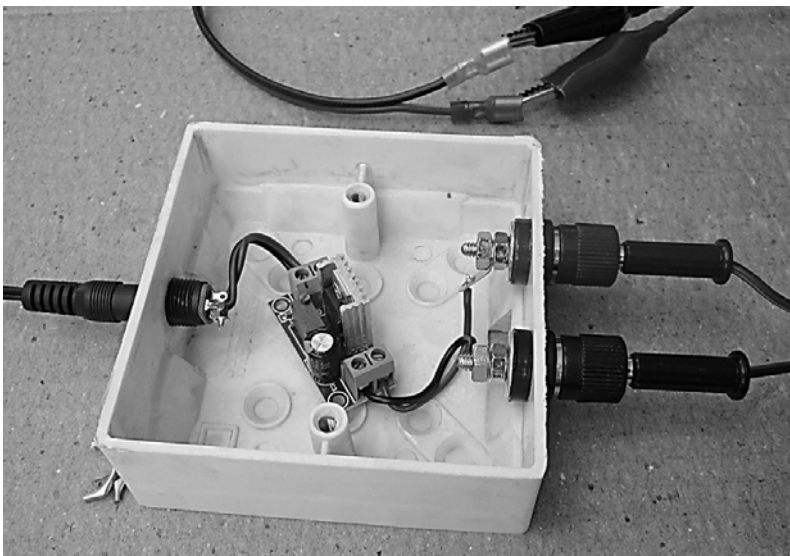
(7) Your battery management device should now look like the image below.



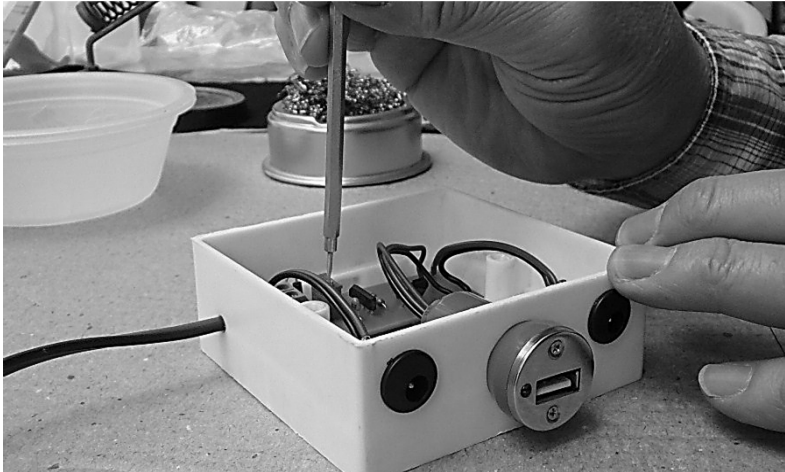
#### 4. Adjustment of a threshold value of voltage for battery charging

Adjust the threshold value of voltage for the caution-advisory indicator on the USB adaptor. The threshold value is to be set for 10.8 V.

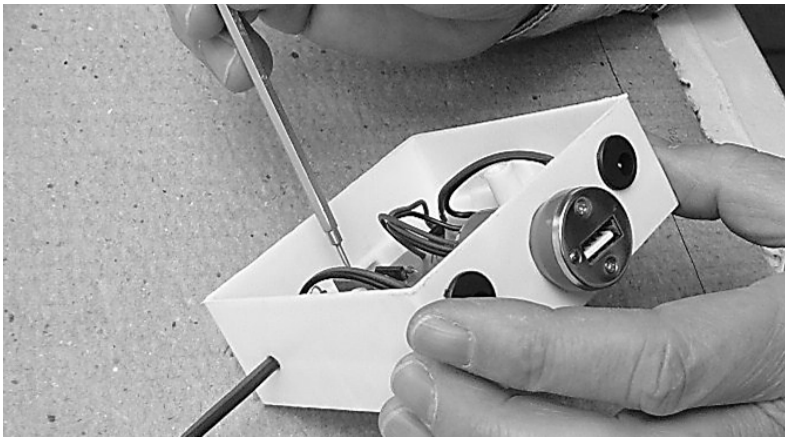
(1) Connect the reference voltage generator to your battery management device. The reference voltage generator is already set for 10.8 V.



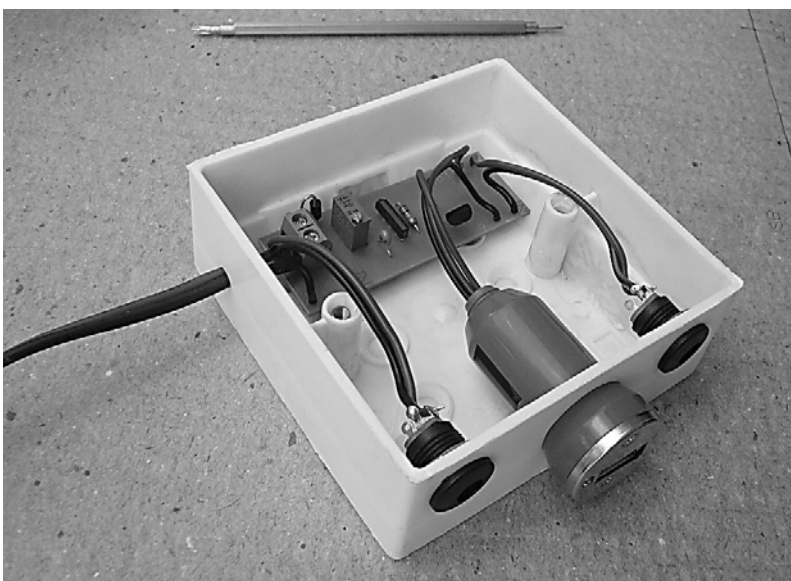
(2) Turn the screw on the trimming potentiometer.



Stop screwing when the caution advisory indicator on the USB adaptor lights up (in red).



(3) Adjustment is completed. Confirm that the red light of the caution- advisory indicator is still on after the adjustment.



Cover the plastic case with the lid. This is the end of the assembly process.

