Missenden Electronics weekend 24th –26th April 2008

Assembling Kits and electronic devices

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1. Tools required.

a. Soldering Iron

The soldering iron needs to be either an 18 watt (£16.00) or a 25watt (£16.40) Iron, the latter is the best of the two because it is a bit more versatile in that it can reach the temperature for melting lead free solder, I would also select the Iron which has a Silicon

rubber coated lead. My personal taste is for the Antex series of Irons. If you can afford the extra cost the most versatile iron is temperature controlled Iron or Iron station Variable temperature range from 70 to 450 degs centigrade (£45.00(Maplins) to £120 (antex)) these prices are standard but if you keep an eye out they do appear sometimes in a sale.

b. Soldering Iron Bits.

Ideally a range from 1mm, 2.mm and 4 mm tips each one having at least one flat surface is most useful, however the most common one you would use with circuit boards would be 2.5mm, an exception being for surface mount devices where the 1mm would probably be more acceptable.

c. Soldering Iron stand and sponge.

A soldering iron gets very hot and therefore should always be placed in an appropriate stand when not in use, the sponge should be used moist and is an integral part of the stand system and is for cleaning the surplus solder and flux from the tip before use.

d. Soldering and desoldering accessories.

The most economic way of removing solder thus enabling the removal of an incorrect or defective component is using a Desoldering Pump, when primed this tool exerts a vacuum in the area of the nozzle, unfortunately the process is very coarse, for fine work it is better to use Solder Mop £1.45 (0.8*1.5m) £7.69 (2.5mm*10m), this is a copper braid which is impregnated with resin so as to encourage the evacuation of heated solder it comes in contact with.

e. Soldering Iron Bit Cleaner.

A soldering Iron bit must be clean and have a thin layer of solder in order to solder items correctly, most bits are chrome plated and need to he prepared before initial use, or cleaned if they blacken by too much heat without solder, this can be achieved by rubbing the tip on the bit cleaner material.

f. Hand Tools and accessories.

1. A pair of diagonal cutting pliers (Side cutters) about 120 to 150 mm long with a 1.5 to 2mm cutting jaw to cope with the major sizes of component connection.

2 A pair of flat nose pliers about 20mm to150 mm to hold components too small for fingers.

3. A pair of universal tweezers10mm to125mm picks up very small components.

4. A wire-stripping tool. There are many different types on the market its up to personal preference.

5. PCB cleaning eraser, a rubber based cleaner which removes dirt and oxide from printed board tracks as well as being very good for cleaning railway tracks, the one marked by the Kitmaster is about the best around, does not have iron filings in it in the same manner as the PECO track cleaner.

6. Bendy Jig a plastic moulding which enable you to bend the leads on coaxial components to the correct shape to fit into printed circuit boards, saves a lot of time

and possible damage to components such as resistors, diodes, some capacitors and inductors.

g. A magnifying system.

Some form of magnifying glass in order to have a look at the finished work to ensure there is no bridging of the adjacent tracks. This can be covered in many ways dependant on the price you wish to go to, ranging from higher magnification spectacles, standard magnifying glass, eye glass or to the extreme a magnifying lamp system (ranging from £32 to £65 dependant on complexity and magnification factor).

h. A PCB board clamp or holder.

Holds the PCB steady whilst components are being soldered, leaving hands free to control the solder and the iron. A cheap version of an assembly aid is one that has crocodile clips on arms to hold the board but also has a 2.5magnification lens to aid with the soldering. If a board clamp or holder is not available a suitable alternative is a piece of hardboard about 8 inches by 10 inches covered with 1.5cm thick high density foam to rest the PCB on when soldering.

h. Consumable materials.

i. Reel Solder, the original solder used prior to July 2006 is tinmans 60/40 solder (60% lead 40% tin) since that time the use of lead based solders is restricted under the ROHS directive. The replacement is lead free solder of various combinations of copper, tin and silver. The major difference that effects soldering is the normal temperature for solders which for Tinmans 60/40 is 188 degs C (recommended iron temperature 300 degs C) and Lead Free melting point is between 207 and 217 degrees C (recommended iron temperature 310 degs C.

ii. Solder paste, this solder is required when soldering components with very close conductors and surface mount devices, comes in pots or syringes. Solders in the same way as tinmans solder but can be deposited in very small quantities.

2. Preparing the kit.

a. Unpacking the items.

Check the identity of all of the components and ensure there are none missing from the kit.

Resistors: Components up to 3 Watts are tubular and are mainly identified by the colour banding as per the attached TB B2-1 there may be exceptions, above 3 watts the resistance value is normally printed on the upper surface as are surface mount resistors (a high magnification glass is needed to view them)

Capacitors: There are various types of capacitor determined by the internal construction, which will determine the capacitance and working voltage of the device. The main types used in MERG kits are polyester capacitors most of which are small boxed shape or slight variation thereof with the leads coming out to the bottom, in the range of 100n farads up to .47 micro farads and a voltage range 50 volts to 400 volts they are not polarity dependant. For a larger capacitance we use Electrolytic capacitors which are tubular in shape with each lead from opposite ends or both leads from one end, they are polarity dependant and the

component is marked with a + or – to indicate the way to insert them, if they are installed the wrong way round the will explode a short while after switch on.

Diodes: Basically we use four types of diodes, signal diodes which are low voltage low current devices normally used to couple two stages of a circuit. Rectifier diodes, which are used in, power supplies because they can take a larger current. Zener diodes, which can provide a voltage, reference level, when used as the input to a circuit. Schottkey diode, which can be used in applications requiring low voltage drops and high frequencies. The type number is written along the length of the device and the polarity is indicated by a black or silver ring around the negative end of the device.

b. Preparation.

Lay out the components in the sequence in which the components are going to be installed, The smallest in diameter of the height above the PCB when installed and the next tallest next and so on until the tallest is last, e.g. Diodes, Resistors, integrated circuit bases, small capacitors, transistors, Relays, large electrolytic capacitors.

3. Basic Soldering

a. What is soldering.

| Soldering is the method of joining two or more items together using a hot melt lead flux mixture, it is a delicate manual skill which only comes with practice. Remember that your ability to solder effectively will determine directly how well the prototype or product functions during its lifespan. Poor soldering can be a time consuming problem - causing product failure and customer dissatisfaction. At hobbyist level, bad soldering technique can be a cause of major disappointment, which damages your confidence. It needn't be like that: soldering is really easy to learn, and like learning to ride a bike, once mastered is never forgotten!

b. Practical soldering.

What we are concerned with is mainly mounting components onto printed circuit board (PCB). The major criteria are to ensure that all surfaces to be soldered are clean and free from oxidisation and tinned with a thin film of solder.

Cleaning the PCB is achieved by gently running the surface with a PCB/Track cleaning rubber (MERG item 83), try not to finger that side of the board again, the component leads may be cleaned using a very fine emery cloth or wet and dry paper.

The component tails should be bent over 90 degrees using a bendy jig (MERG item 81) or very fine pointed pliers, the tails should be inserted into the appropriate holes in the PC B and the protruding tails should be cut to a protruding length of 4cm then bent to a 45 degree angle along the lay of track of the PCB**.** ***See figure 1***

The ideal soldering iron tip is narrow enough to go across the track and have a flat surface to make full contact with the PCB surface and transfer enough heat to allow solder to run.

The method is to place the flat surface of the tip onto the PCB adjacent to the junction point and apply the solder to that point and not the Tip, lead until the solder creeps up the side of the tail, remove soldering iron and let to set, do not try to artificially cool, the same to the other tails one at a time, do not solder all of the leads of a transistor or diode simultaneously, let each of them cool off before carrying out the next one. When soldered the solder form should be convex shape around the junction, See ***figure 2***

One of the problems when soldering is if the solder adopts a concave shape when set, this may lead to dry joints because a lot of the time the solder has only formed around the component tail rather than completing the junction. ***See figure 3***

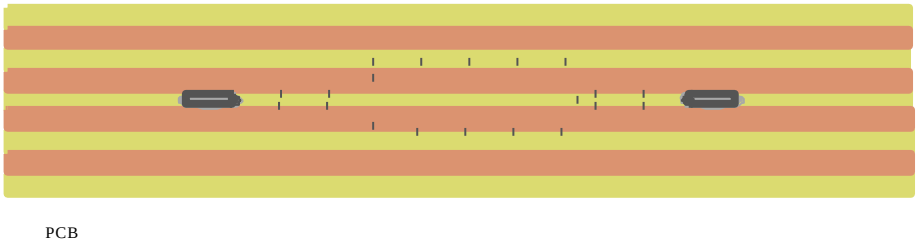

Figure 1 Laying the component tails along lie of track

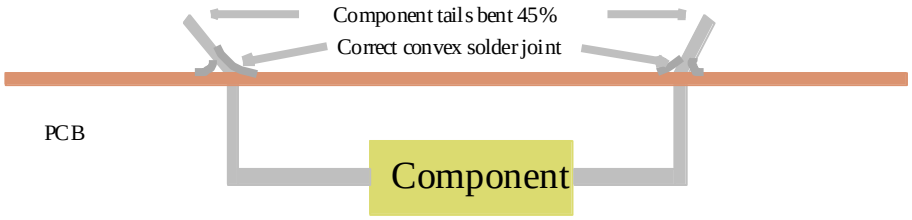

Figure 2 Bending tails and correct soldering

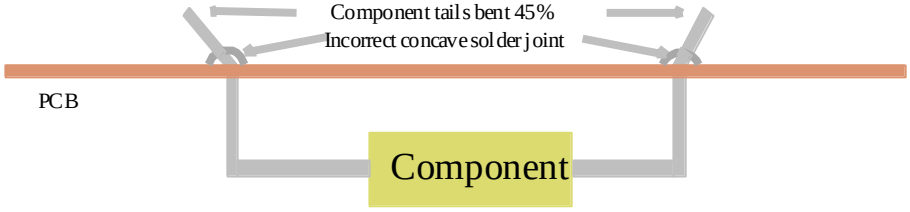

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Figure 3 Incorrect way to solder

4, Sources and prices of recommended tools

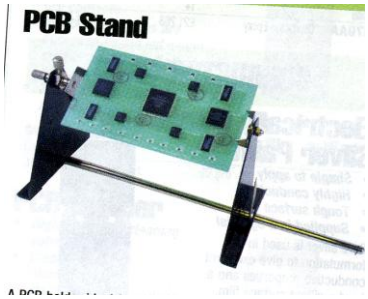
This list is only to give you an idea of the tools and consumables one needs to build kits, it was easy for me to check the two catalogues, however there are other sources of these items. The advantage of purchasing from Maplin is that they are fairly local, they also do mail order, and disadvantage is that they are more expensive in the main. Rapid is a better source in the main they are cheaper and if your order is greater than £25 there is no packing and delivery charge.

a. Soldering Irons.

Ideally a 30 to 40 watt soldering Iron with a 4mm tip complete with a soldering iron stand.

			Cost	+VAT	
Any 1 of					
Maplin	ND94C	Antex SK5 Iron XS Silicone 25W	£15.31	£19.99	
Or	N11BY	Antex 30 Watt	£ 9.99	£ 9.99	
+	BP57M	Soldering Iron Stand	£3.99	£ 3.99	
Rapid	85-0660	IRON 25W 230V + SILICONE CABLE	£ 9.50	£11.17	
Or	85-5602	MAINS SOLDERING IRON - 40W (RC)		£ 8.50	£ 9.95
+	85-0585	ANTEX ST4 SOLDERING IRON STAND (RC		£ 4.05	£ 4.79

b. PCB Stand



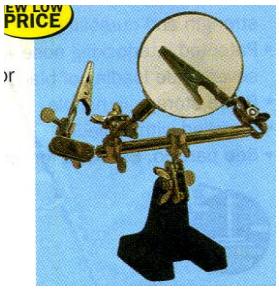


Fig 2a fig 2b

Any 1 of					
Maplin	QE62S	Antex PCB Stand (Fig 2a)		£19.99	£19.90
Rapid	34-3622	PCB STAND (RE) (Fig 2a)	£14.80	£17.39	
Rapid	85-0390	Assembly aid with Magnifier (fig2b)		£ 3.50	£ 4.11

c. Soldering Accessories

Fig 3a **Fig 3b** **Fig 3c**

Maplin	N40CH	De-soldering Pump	(fig3a)	£6.12	£8.99
Rapid	85-0600	De-soldering Tool	(fig3a)	£ 2.90	£3.41

MERG or		PCB and Track cleaning eraser	(Fig 3b)	£ 2.80	£2.80
Maplin or	HX04E	Polishing Block	(Fig 3b)	£3.34	£3.34
Rapid	34.0295	Polifix Block	(Fig 3b)	£1.95	£2.29
MERG		Bendy Jig	(Fig 3c)	£1.00	£1.00

d. Cable Strippers

Fig 3a

Fig 3b

Maplin	MC51F	Universal Cable Stripper	(fig 3a)	£ 8.99	£ 8.99
Rapid	86-0390	KYP731 Automatic wire stripper	(fig 3a)	£ 5.50	£ 6.46
Rapid	86-0365	Economical Wire Stripper	(fig 3b)	£ 4.99	£ 5.86

e. Combination plier sets

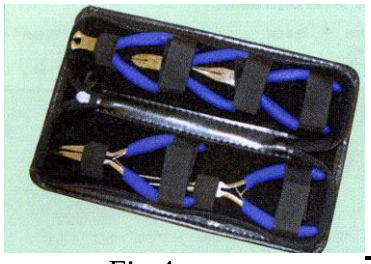


Fig 4a

Fig 4b

Maplin	RQ90X	5 Piece Plier/cutter set	(Fig 4a)	£ 7.99	£ 7.99
Rapid	85-0055	Rapid Zip Wallet Tool kit	(Fig 4b)		£ 11.50 £13.51

f. Wire cutters

Fig 5a

Fig 5b

Maplin	SF09K	ESD Micro Nipper	(Fig 5a)	£7.48	£ 7.48
Rapid	86-0180	BS220/ FINE BLADE CUTTERS (RE))	(Fig 5b)	£ 6.80	£ 7.99

` G. Snipe nosed pliers

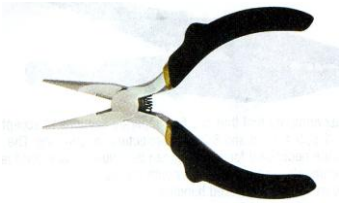


Fig 5a

Fig 5b

Maplin	RL84F	120mm Long Nosed Pliers	(Fig 5a)	£3.29	£ 3.29
Rapid	86-0195	BUGARI 300/PN NEEDLE PLIERS (RE)	(Fig 5b)	£7.50	£ 8.82

g. Anti static band

Maplin	ZT91Y	Anti static wrist band	£ 4.99	£ 4.99
Rapid	87-1282	Velcro Wrist strap with cord	£ 4.95	£ 5.81

h. Consumables

Maplin	JG06G	Tip Tinner Cleaner	£ 4.99	£ 4.99
	H50AW	Lead free Solder	£ 2.69	£ 2.69
	RL94D	Solder Mop 2.5mm*1.5m	£ 3.62	£ 3.92
Rapid	85-0630	Lead Free Soldering Iron tip cleaner	£2.30	£ 2.70
	85-1166	Lead Free 22SWG Solder 100G	£ 2.49	£ 2.92
	85-0875	Solder Mop 2.5mm*1.5m	£ 0.64	£ 0.75