

# Electronic Hand Soldering

COURSE 7794J





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## Aim

The aim of this course is to acquaint the student with basic soldering techniques, and to teach the student how to:

- Prepare a safe work area.
- Prepare and maintain equipment.
- Identify a correctly formed solder joint.
- Load a printed circuit board.
- Solder a wide range of components and hardware.
- Handle sensitive components.



## Introduction

As electronics becomes more and more high tech, so does the art of soldering. It is now looked upon as a technology in its self, requiring highly skilled operators. The aim of this course is to increase your hand skills, and to give you an understanding of the standards required to meet the changing needs of industry.

The main cause of equipment failure today is the solder joint, electronic soldering is far more important today, than it has ever been.

The introduction of the microchip has seen the greatest changes in the area of hand soldering. These devices combine hundreds of components in a single package, and as the packaging gets smaller so increases the problems associated with soldering these devices.

Although automation has taken over from hand soldering in the majority of applications, the need for highly skilled operators still exists. Hand soldering is still required for such applications as terminal and connector soldering, as well as retouch and repair areas.

In a computer the failure of a single solder joint could cause it to be totally inoperable. This means the ability to solder well and to recognise unsatisfactory solder joints is critical, if we are to maintain reliable operation of today's high tech equipment.

## Safety

### Safety

Safety in the work place is of major concern for everyone. It is important that you are able to identify possible safety hazards and know the procedures for reporting and correcting any problems that might occur.

This applies to both large jobs such as wiring up a power distribution board, where contact with high voltages is a potential danger, to small jobs such as forming a simple solder joint.

Something as simple as soldering two wires together does not seem as if it could present a safety hazard, but the damage a hot soldering iron can cause to skin tissue is horrendous. Every time a soldering iron is left sitting on a bench, instead of being placed back in its holder, the opportunity for such an accident exists.

Remember a large number of potential accidents can be avoided if you, as an individual, follow correct work practices.

### Personal Safety

Personal safety is not just a matter of watching out for safety hazards around the work place, but, in the case of an accident, minimising the chances of injury.

This can be achieved by ensuring that you wear clothing and foot wear which are appropriate to the conditions under which you work.

### Setting up a Work-station

The setting up of a solder work station, so that everything is laid out in a logical and neat manner is one of the best ways of preventing accidents. Not only are accidents prevented, but it enables you to work in a fast and efficient manner.

If tools are placed so that they are easy to reach and are returned to the same position after use, the soldering process will become a natural action. You won't have to be looking for that pair of cutters, every time you have to cut a component lead. You will just naturally reach for the tool you need, knowing it is in the place it should be.

Having the tools in the right place is only part of the process, having the soldering iron to suit you, is just as important. Forever reaching across the other side of the work bench to get the soldering iron, when you are right handed, is an unsatisfactory situation.

Always have the soldering iron positioned so that it is readily accessible and leads are not laying across the work area.

By spending the time to correctly set up a solder work station, will in the end save time and effort, and will help to make it a safe working environment.



## Soldering Process

### Why Solder?

Electronic equipment requires good electrical and mechanical connections for reliable operation, so when choosing connection methods these two requirements must be considered.

Another consideration is the ability of the joint to be reworked, and the cost of the equipment required to carry out the reworking of the connection.

There are several methods by which we can join two metal components. We can use epoxy, welding, mechanical fastening or soft soldering, these are only some of the available methods.

Epoxy type glues will give the mechanical strength required, but will not provide good electrical connection. Epoxies also prove extremely difficult to remove.

Welding gives good mechanical and electrical connections, but the equipment required to make the connection is expensive and the components are difficult to rework.

Mechanical fastenings in the long term can prove unsatisfactory, as they are affected by vibration and other mechanical shock.

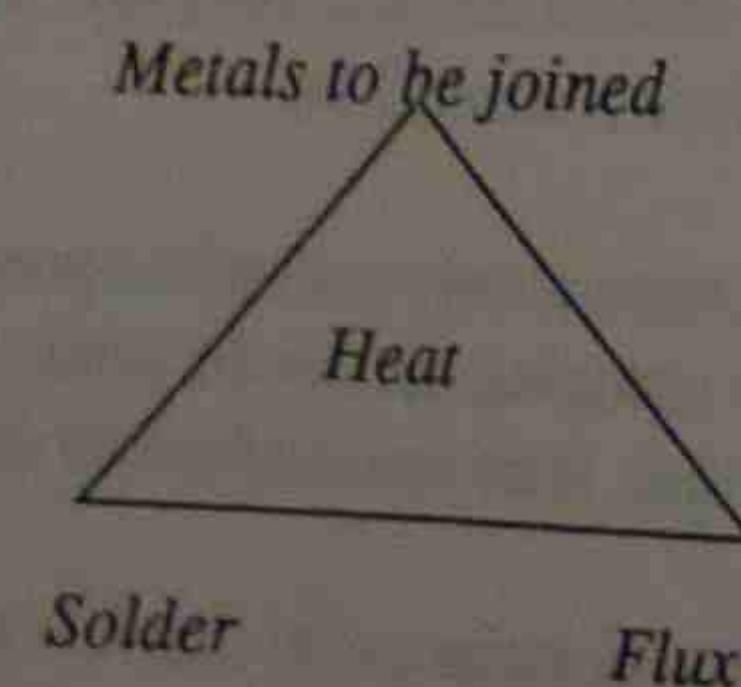
Soft soldering on the other hand provides good mechanical and electrical connection, is easy to rework and the equipment is affordable. There is an added advantage in that soldering also provides protection from corrosion for the connection.

### Soldering

Soldering is the process by which two metals can be joined together to form a solid connection. It is a simple process in which flux, solder alloy and heat are applied to the metals to be joined and are then allowed to cool.

The result is a connection in which the properties of the joint are different from those of the original materials, but it has the mechanical and electrical characteristics we require.

Figure 1 shows the constituents of a solder joint.



### Solder

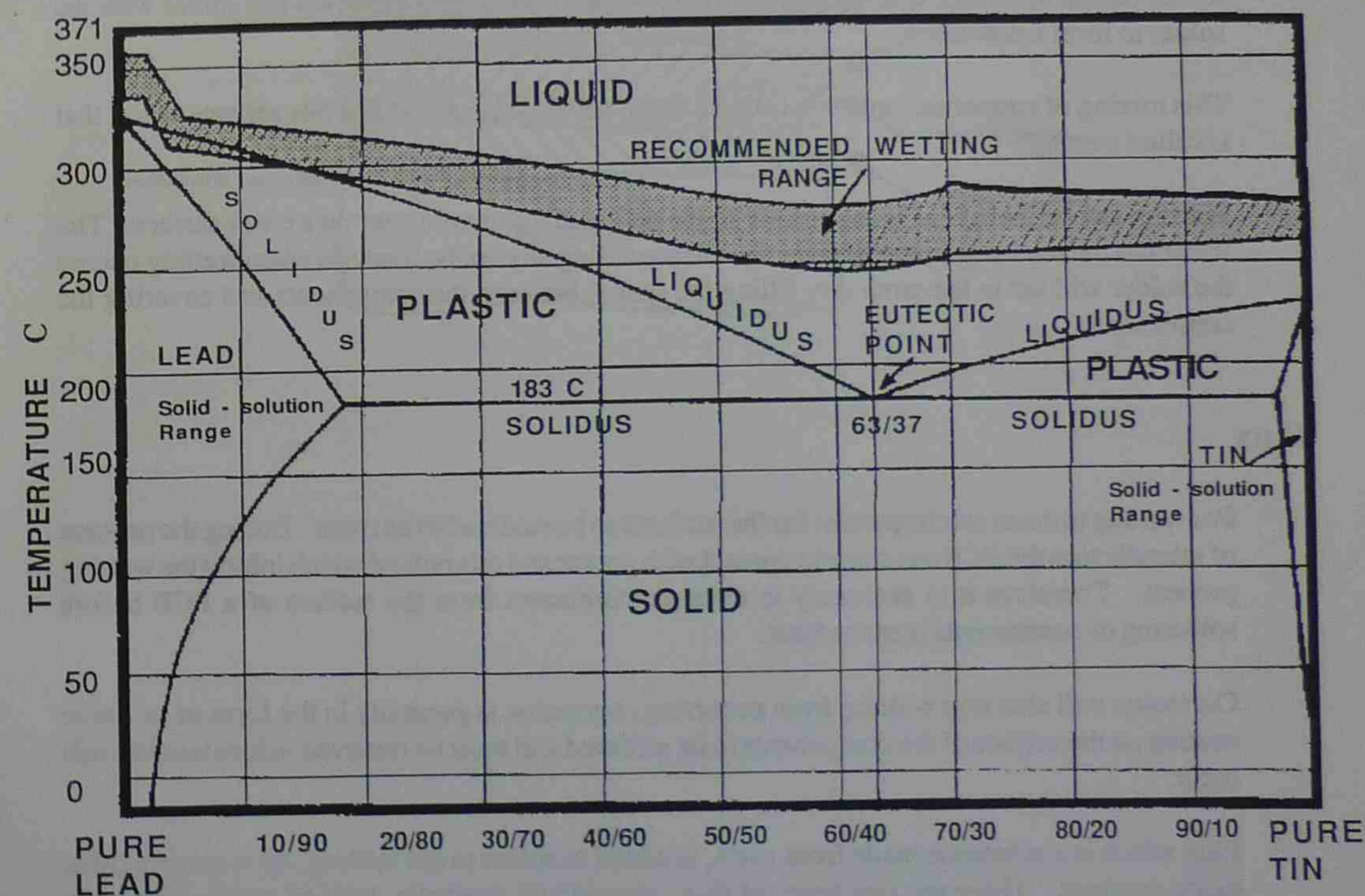
As was mentioned earlier solder is an alloy and an alloy is a mixture of two or more metals. The solder we use for electronics hand soldering is an alloy of tin and lead mixed in a ratio of 60% tin and 40% lead. Although solder is available in other ratios this combination of 60/40 has the characteristics most suitable for electronic soldering.

### Characteristics of Solder

The characteristics of solder are different to that of either lead or tin. To start with pure lead has a melting point of 327 degrees celcius and pure tin melts at 232 degrees celcius, yet 60/40 solder melts at 191 degrees celcius. This is lower than lead and tin.

Figure 2 shows the characteristics for lead and tin as well as the various combinations of the two.

### TIN - LEAD FUSION





The *solid region* shows the temperature at which the various alloys are solid.

The *plastic region* is the range over which the various alloys are workable before they turn into a solid. For instance plumbers' solder is a 30/70 solder and has a large plastic range which allows the plumber to position his pipes correctly before the solder sets.

The *liquid region* is the temperatures at which the various alloys are in a liquid state and will flow freely. <sup>or molten</sup>

The *eutectic composition*, which is 63% tin - 37% lead, is the combination where the plastic region is minimal or non-existent. Eutectic solder is ideally suited to electronic hand soldering, because it changes from solid to liquid almost instantaneously. This reduces the possibility of joint defects due to movement of the components or mechanical shock.

## Wetting

Wetting is the process that occurs when components are soldered together. When the molten solder comes in contact with the copper tracks some of the copper dissolves and mixes with the solder to form a new alloy.

This mixing of copper and solder is called a metal solvent action and it is this solvent action that is called *wetting*.

Wetting can be thought as being similar to the action of a drop of water on a clean surface. The water has the tendency to spread over the surface filling any voids, likewise when wetting occurs the solder will act in the same way filling the spaces between the components and covering the copper track.

## Flux

For wetting to occur it is important for the surfaces to be soldered to be clean. During the process of manufacture the PCB can come in contact with grease and oils both of which inhibit the wetting process. Therefore it is necessary to clean contaminants from the surface of a PCB before soldering of components is carried out.

Corrosion will also stop wetting from occurring, corrosion is generally in the form of an oxide coating on the surface of the components to be soldered and must be removed before wetting will occur.

Flux which is a substance made from rosin, is added to solder to aid wetting, by removing these oxide coatings. There are two types of flux, natural and synthetic, both of which are highly corrosive at the temperature at which solder melts.

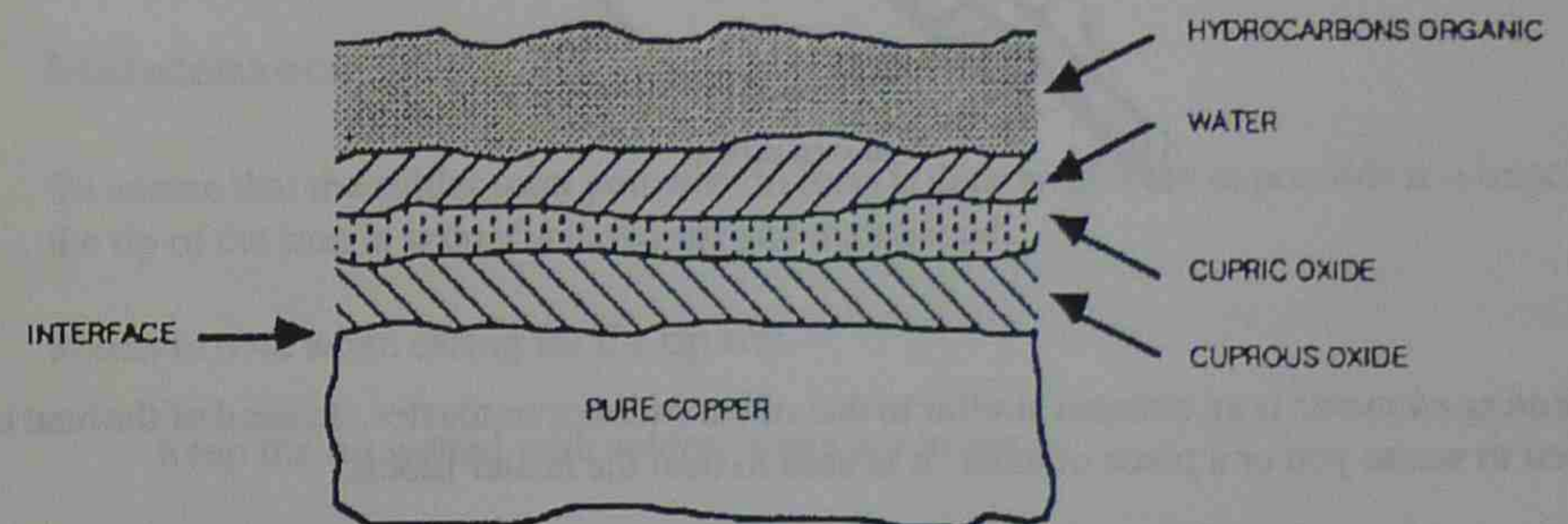
The good thing about flux is that at room temperature it is non-corrosive and therefore it will not damage the components or the PCB.

Flux can be applied to the joint to be soldered from a container or as in most cases it is a part of the solder itself. This is done by placing a core of flux in the middle of the solder, this type of solder is called cored solder.

The result is, as soldering is performed the correct amount of flux is dispensed automatically to the joint. Once the flux is activated by the heat from the soldering iron it removes the oxide coating and prevents a new one from forming.

It should be noted that the temperature at which the flux is activated is lower than the melting point of solder.

Figure 3 shows the layers of oxides and films on an apparently clean copper track.



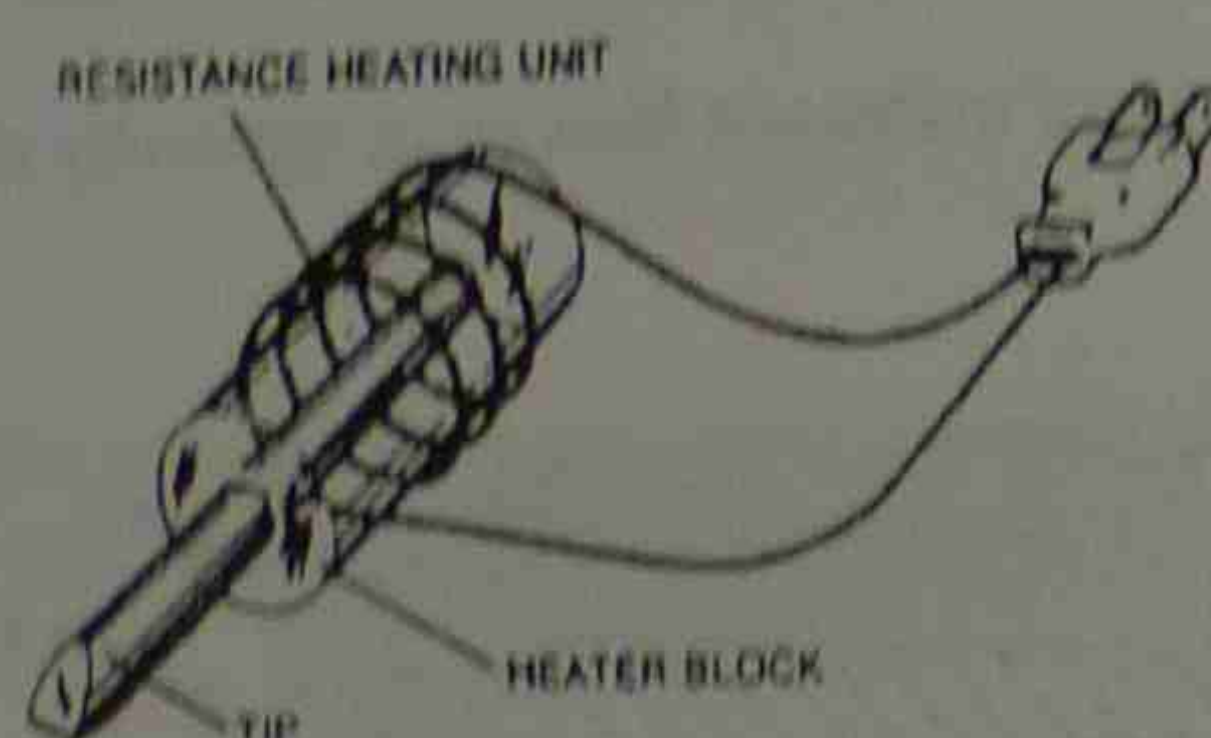


## Soldering Iron

### Construction

We said earlier that in order to form a solder joint one of the requirements was heat, to melt the solder. The soldering iron is the tool used to generate the heat required and the variety of types of soldering irons is endless.

While there may be a wide variety of soldering irons they basically have three things in common. Each has a heating element, a heater block and a tip.



**Heating element:** is an element similar to that of bar radiator or toaster. Instead of the heat being used to warm you or a piece of toast, it is used to heat the heater block.

**Heater Block:** is the storage part of the system, heat from the element is stored in the block, like water in a dam, for use when required. The amount of heat required will depend mainly on the size of the solder joint to be soldered. The larger the joint the more heat required to form that joint.

**Tip:** is the point of transfer, the heat is transferred from the tip to the solder connection. The shape and size of the tip is also determined by the solder joint to be formed.

### Choosing a Soldering Iron

The choice of soldering iron can be a difficult thing. Do I get a hand held iron or one that is part of a work station? What size iron should I get? Do I need a small or large wattage iron? Does it have to be temperature controlled?

Basically the answer to all the above is Yes, but unfortunately the cost of purchasing soldering irons to cover every possible situation would send you broke. The only solution is to purchase a general purpose iron that has a power rating of about 16-25 watts, an iron this size will fill 90% of all your soldering needs.

If you can afford it, a temperature controlled soldering iron, is a valuable tool because it allows you to set the operating temperature of the tip to suit the application. These temperature controlled irons will allow you to solder sensitive semiconductor components, and then turn the temperature up to handle terminations and connections. This allows you to handle a wide variety of situations with a single soldering iron.

The temperature control can be achieved a number of ways, the two most common are:

- a temperature sensor in the tip which controls the power applied to the heating element.

- a system that makes use of the curie effect of some magnetic materials. These materials lose the magnetic properties, once they reach temperature, this loss of magnetism is used to cut the power to the heating element.

Temperature control of the soldering iron tip is kept within a few degrees of the set temperature, ensuring that the components being soldered will not be unduly over heated.

### Maintenance

To ensure that the solder joint you wish to form is done as quickly as possible it is important that the tip of the iron is properly cared for and maintained.

Points to note when caring for the tip are:

- Keep the tip wetted with solder, when not in use.

- Do not leave the tip at high temperatures when not in use. In the case of a hand held iron turn it off, for the temperature controlled irons reduce the operating temperature.

- Periodically remove the tip from the iron to make sure it is not seized in the barrel of the iron.

Tip maintenance is a simple process and should be carried out on a regular basis, to ensure maximum life of the tip.



## The Solder Joint

### Characteristics

The climax of all we have looked at is the solder joint, soldering is not just a matter of melting the solder and applying it to the metals to be joined. It is also knowing what a correctly formed solder joint looks like, its characteristics and the possible defects that might occur when soldering.

The physical characteristics that identify a correctly formed solder joint are:

- . wetting of the joint has occurred, on all the surfaces to be joined.
- . the sides or fillets of the joint are concave in shape.
- . the joint is smooth and shiny.
- . there are no voids or cracks in the joint.

### Making the Joint

Not only are there certain characteristics to be looked for once the joint has been made, but there is also a correct procedure to be followed in order to make the joint.

Steps in making a solder joint.

- . Preparation of the materials to be joined.
- . Application of the flux.
- . Heat and solder are applied.
- . The joint is allowed to cool.
- . Residue flux is removed.

Before we start to make the joint it is important that we prepare both equipment and the materials to be joined. Both must be free from contaminants and damage. Contaminates on the iron may get into the joint during the soldering process and cause a defective joint. Likewise contaminants on the components can cause the same sort of problems.

When making the joint, the soldering iron is tinned with a small amount of solder and is placed on one side of the joint. The solder already on the iron not only makes sure the tip of the iron is clean, but also increases the heat linkage area i.e. the amount of surface contact between the iron and the joint.

The cored solder is now applied to the joint, but on the opposite side to the soldering iron, the heat from the iron activates the flux and the solder starts to melt. It is important that the solder is not applied directly to the tip of the iron as this will cause the flux in the solder to vaporise and make the joint harder to achieve.

As the solder is applied to the joint we start to look for the first signs to the formation of the joint, wetting. Once it is obvious that the solder has wetted the joint and in the case of a PCB the land area is covered by solder the solder and heat should be removed and the joint allowed to cool.

### Inspection

The next step in the soldering process is the inspection of the solder joint. It is important that the joint be free from defects and to check that wetting has taken place. If a faulty joint is discovered steps should be taken to correct the fault. Some of the possible defects that can occur are:

Dry Joint

Disturbed Joint

Overheated Joint

Cold Joint

Insufficient Solder

Excess Solder



## The Stripping and Tinning of Wire

With all electronic equipment we need to be able to connect to the outside world. A PCB with all its high tech IC's and components is useless until we connect the power and the necessary signal lines that are needed to bring the circuitry to life.

Connections inside the equipment are usually made by the use of a harness or loom where the wires are soldered to the PCB. Connections to the equipment itself is by cables and specialised connectors.

The weak link in all these connections is the termination of the wire, if the wire is not prepared correctly or the joint correctly formed, the reliability of the equipment will be affected.

In order for the wire to be soldered to either a connector or a solder terminal it must be prepared correctly. Preparation usually takes the form of *stripping and tinning* of the wire.

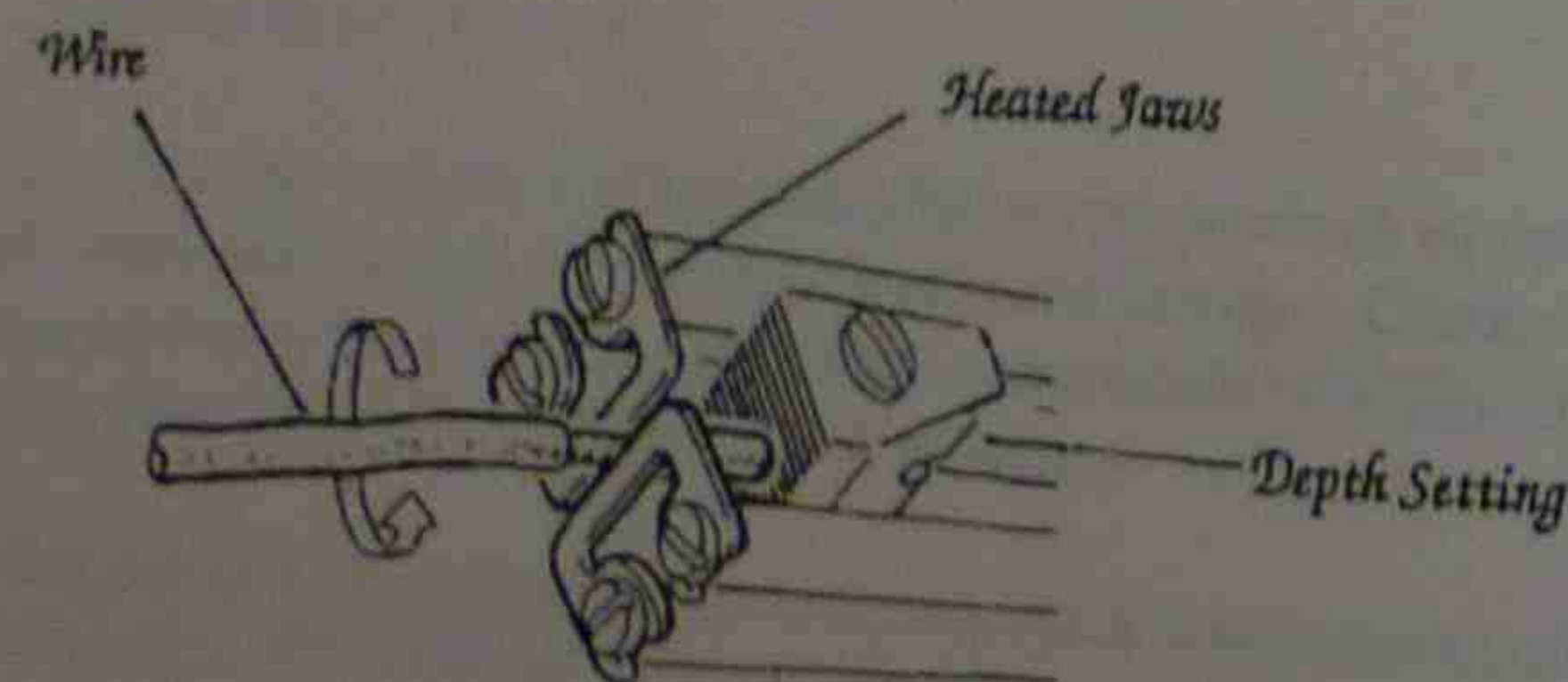
Stripping of the wire involves the removal of the insulation protecting the wire. Tinning is the coating of the wire with a thin layer of solder.

Stripping is usually achieved by cutting through and removing the insulation with wire strippers or cutters. The cutting is either a hot cut in which heated jaws melt through the insulation or a cold cut which the jaws of the cutters cut through the insulation.

The advantage of hot cutting, over cold cutting is the wire is not damaged as much during the stripping process. With cold cutting the possibility exists for the wire to be scored and any damage can reduce the operating life of the wire.

The disadvantage of hot stripping is that a thin layer of insulation material can be left on the bare wire and when soldered can contaminate the solder joint. Cold stripping on the other hand removes all of the insulation leaving a clean working surface.

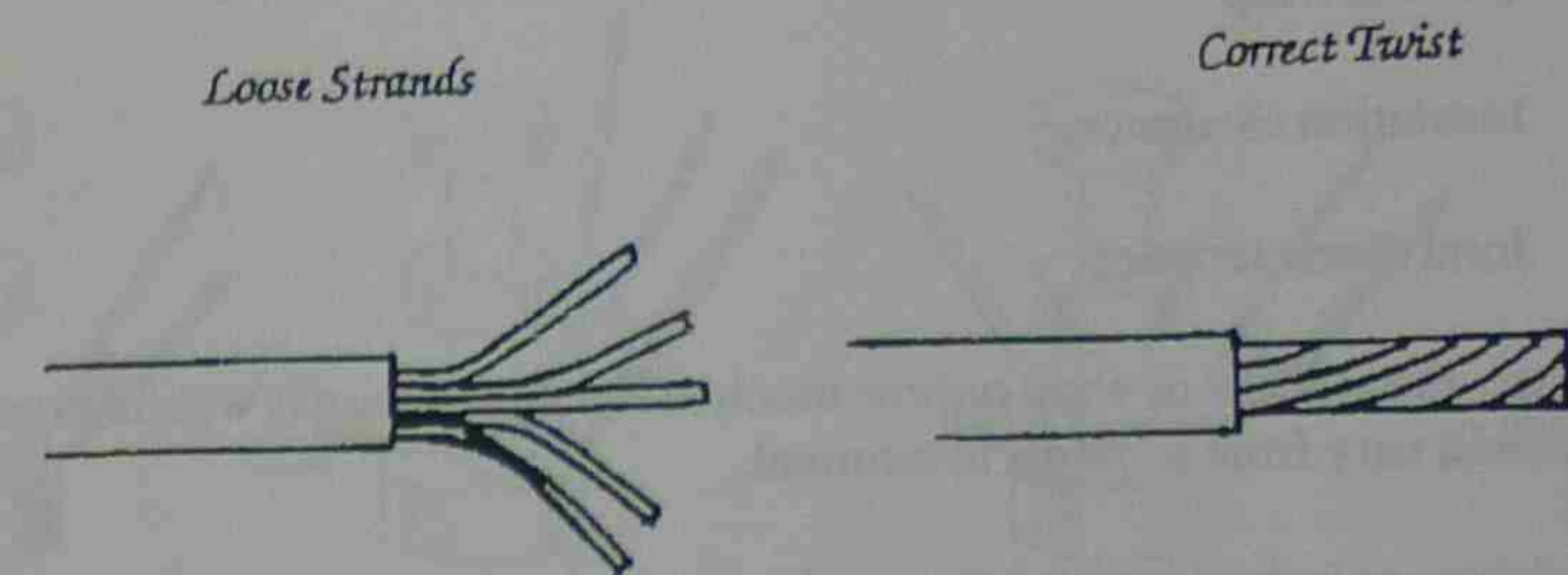
Figure 3 shows the hot strip process.



Once the wire has been stripped the individual strands will tend to separate, so before soldering they must be twisted to form a neat bundle again.

When twisting the strands there are two important things to remember:

1. The twist should follow the natural twist of the wire.
2. The twist is not too tight (2 to 3 turns).



Soldering the wire is not simply a matter of putting a bit of solder on the bare wire. Firstly, the flux and solder must not be allowed to wick up under the insulation.

When we do solder, the profile of the individual wire strands must be visible through the wire and there should not be any obvious insulation damage due to heat.



## Terminals

### Soldering to Terminals

There are a number of characteristics associated with the soldering of wire or components to solder terminals.

These are:

1. Correct wrap
2. Insulation clearance
3. Joint characteristics

**Correct wrap** - the amount of wrap or how much of the tinned wire is wound around the body of the terminal will vary from terminal to terminal.

**Insulation clearance** is the distance between the terminal and the insulation of the tinned wire. As a general rule the clearance should be 1-2 wire diameters.

**Joint characteristics** - the characteristics of the solder joint are basically the same as for the standard solder joint that is

- good wetting
- correct amount of solder
- correct profile

There is one other requirement which is the ability to still see the profile of the wire in the joint, that is, the wire should not be completely hidden by the solder.

There are a number of different types of solder terminals available for use in electronics. These include turret terminals, bifurcated cup, hook, etc.

We will only be looking at the first three of these and discussing the characteristics of each.

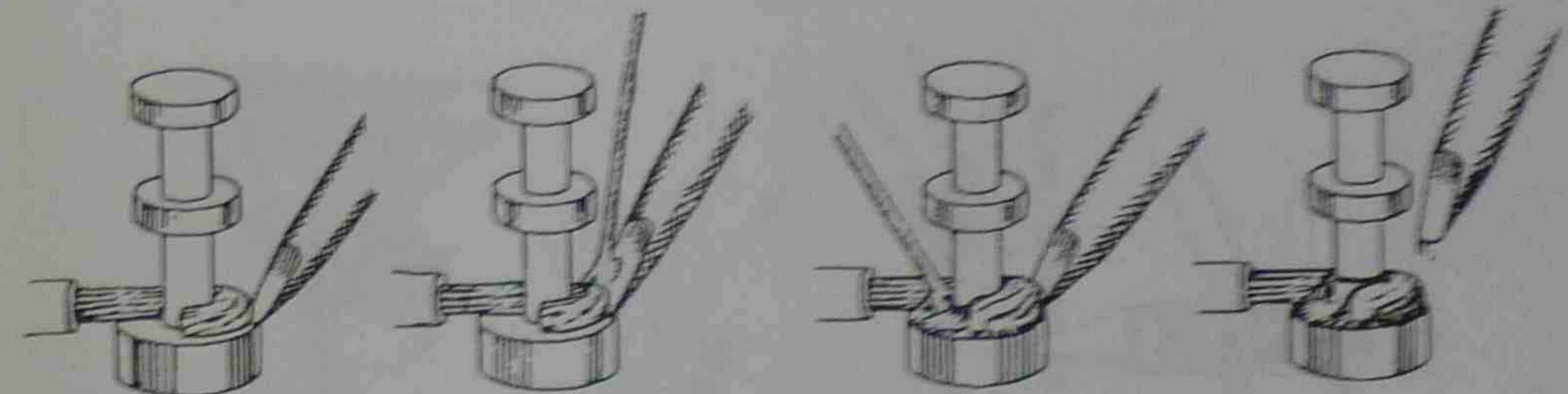
## Turret Terminals

### Characteristics

**Termination:** the wire enters the terminal at 90 degrees, side entry.

**Wrap:** a wrapping angle anywhere between 180 and 360 degrees is acceptable, with the preferred angle being 270 degrees.

#### Termination of a Turret Terminal

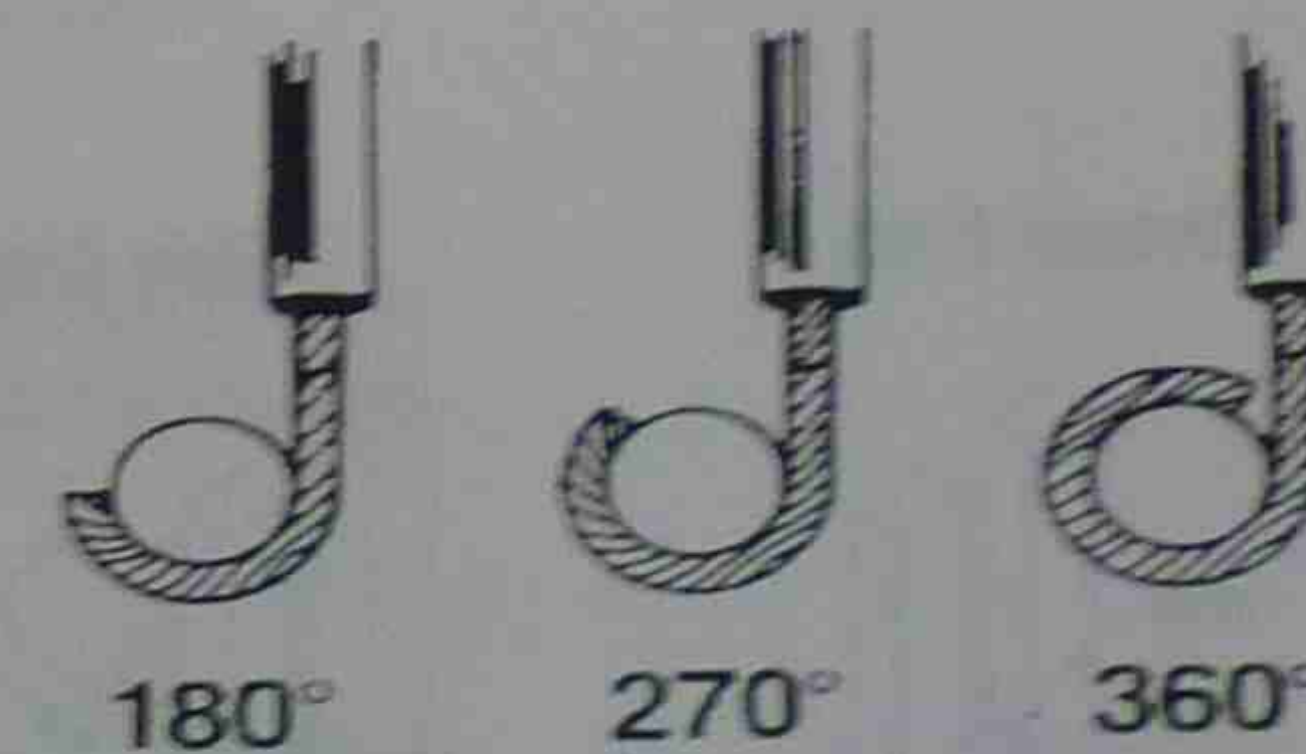


Soldering iron in contact with both wire and terminal.

Apply solder to form heat linkage.

Form the Joint apply solder to opposite side.

Remove iron and allow the joint to cool.



180°

270°

360°



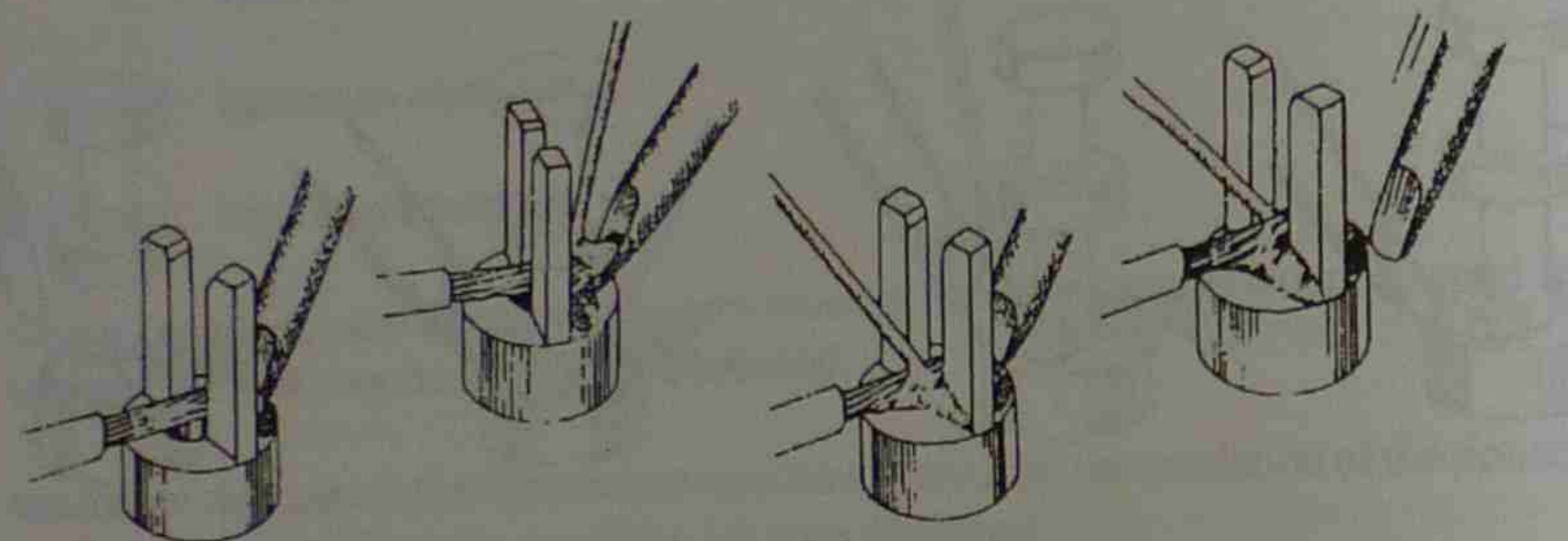
# Bifurcated

## Characteristics

Termination: the wire can enter the terminal as either a top entry, bottom entry or side entry.

Wrap: the wrapping angle for both the side and bottom entry is 90 degrees and at no time should the wire protrude past the body of the terminal.

### Termination of a Bifurcated Terminal



Soldering iron in contact with both wire and terminal.

Apply solder to form heat linkage.

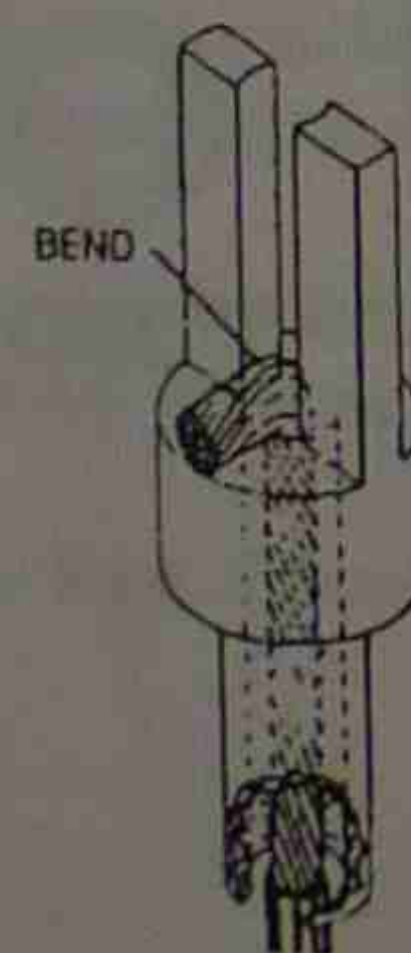
Form the Joint apply solder to opposite side.

Remove iron and allow the joint to cool.

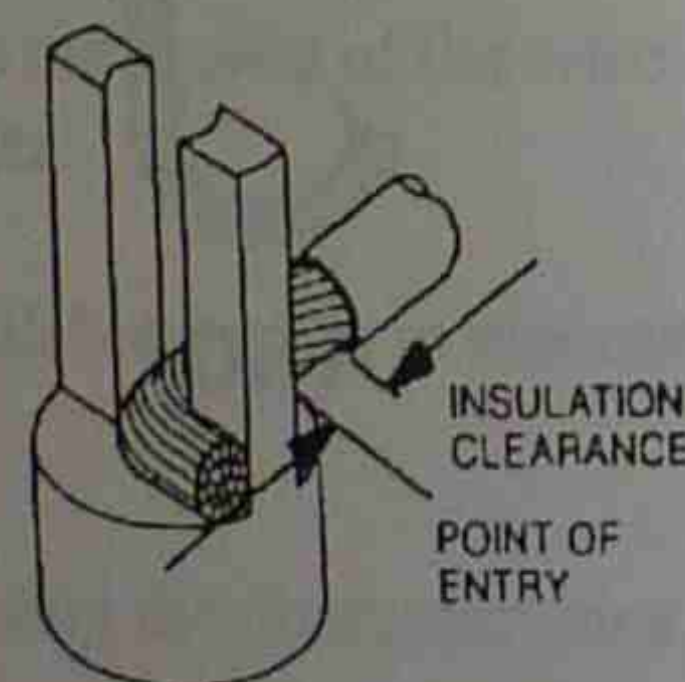
### Top Entry



### Bottom Entry



### Side Entry



# Cup Terminal

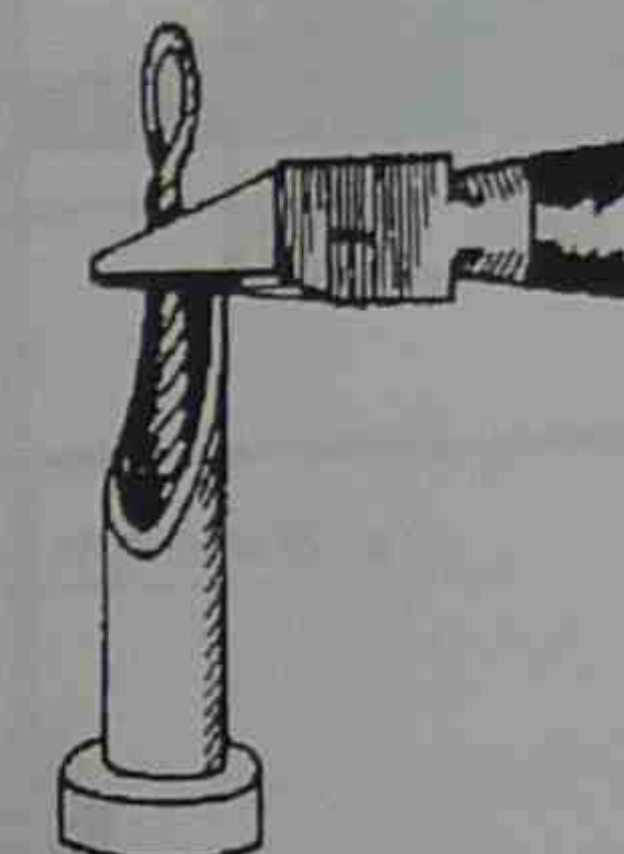
## Characteristics

Termination: entry is from the top.

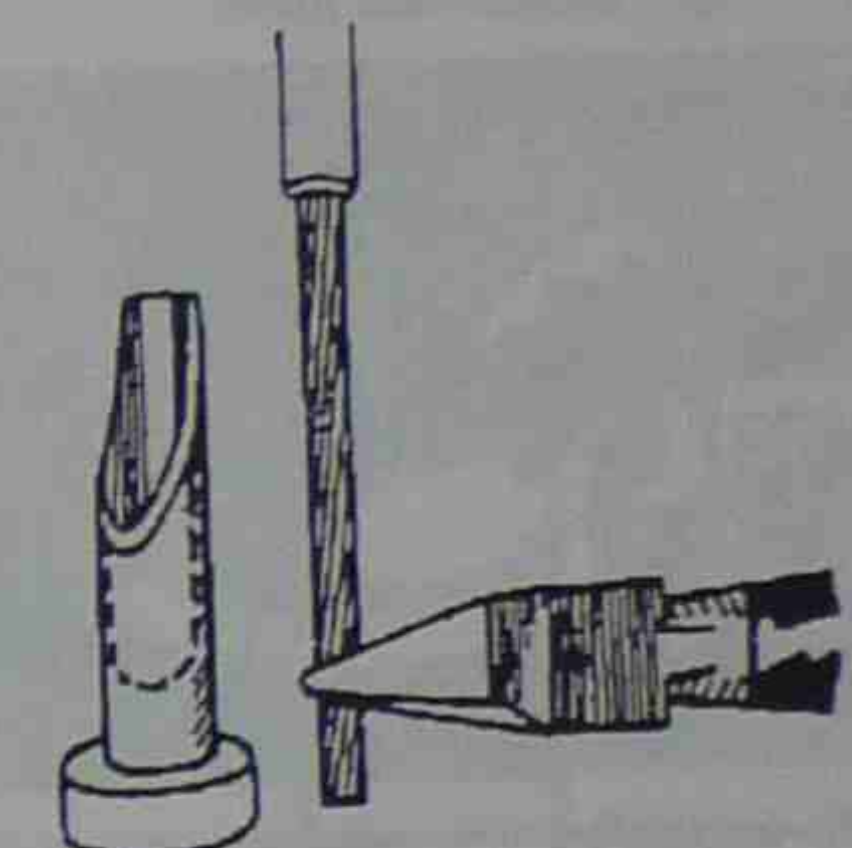
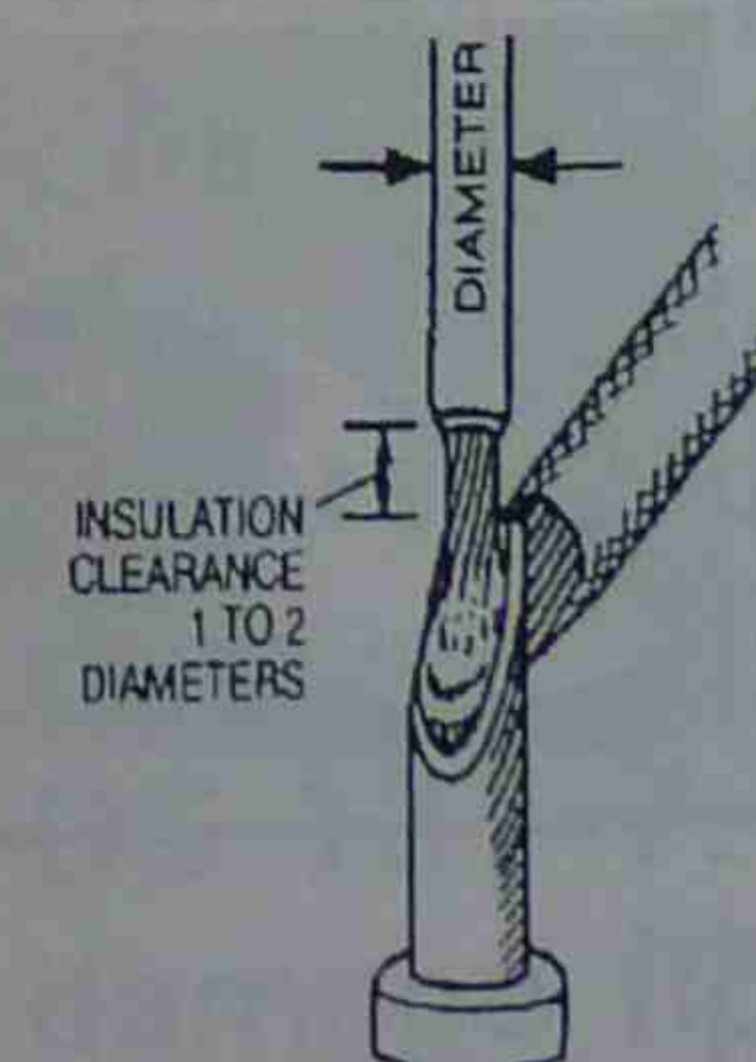
Wrap: Nil.

### Termination of a Cup Terminal

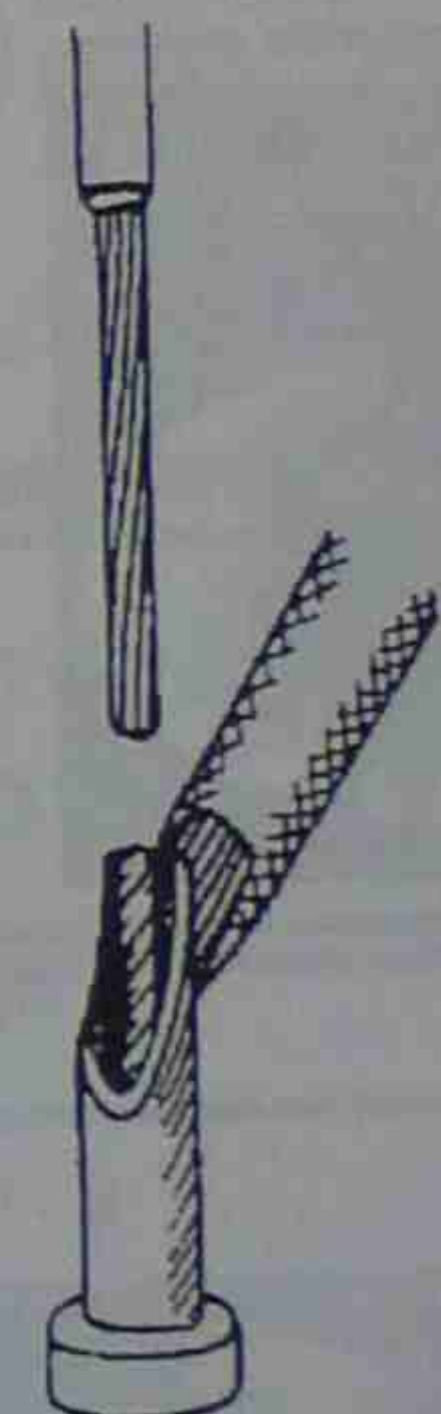
Wire is trimmed to the correct length.



Heat from the iron melts the pre-form.



A solder Pre-form is made and cut to the correct length.



Wire is inserted and joint allowed to cool.



# SOLDERING

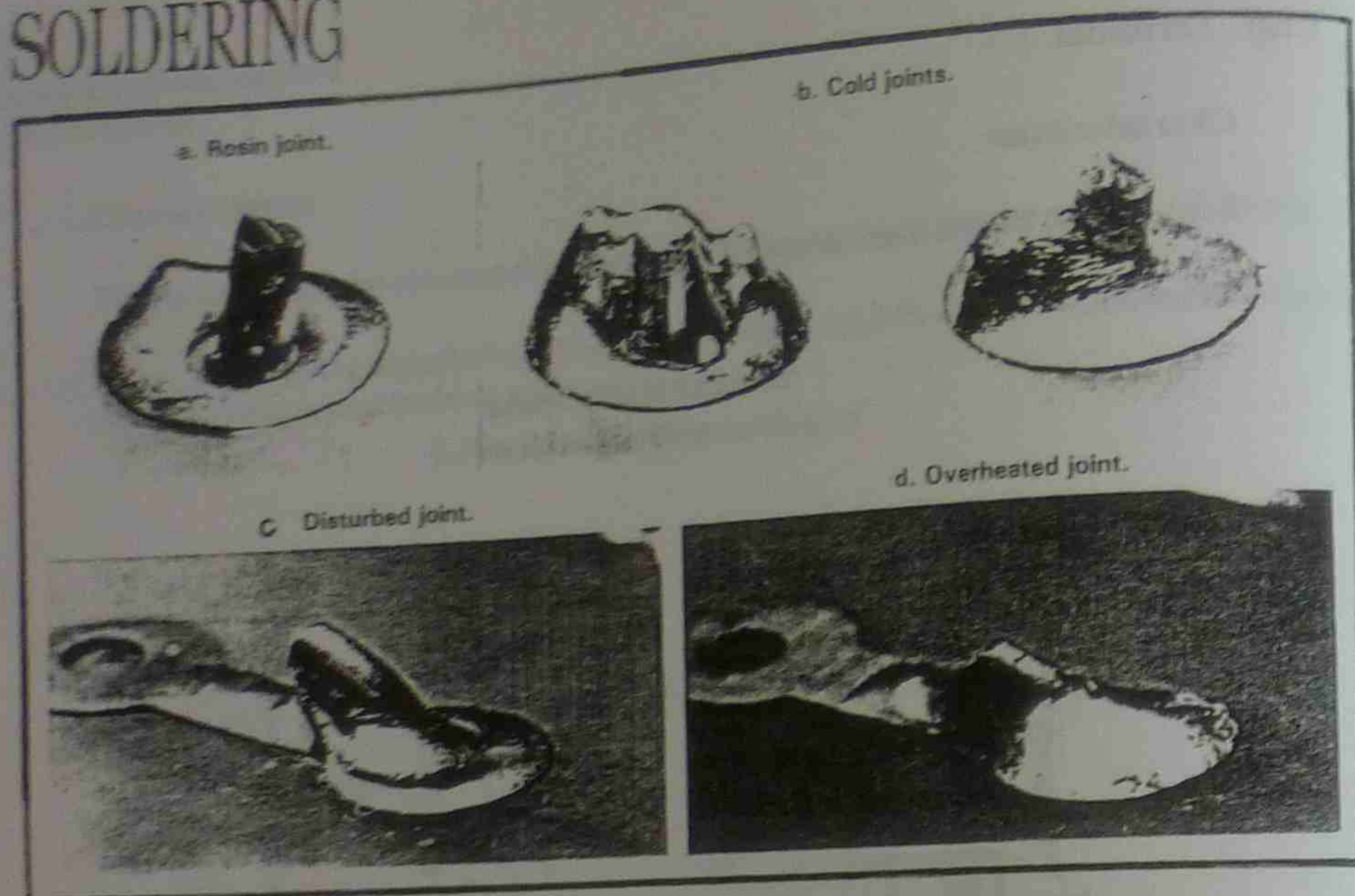


Fig. 10. Unacceptable joints.

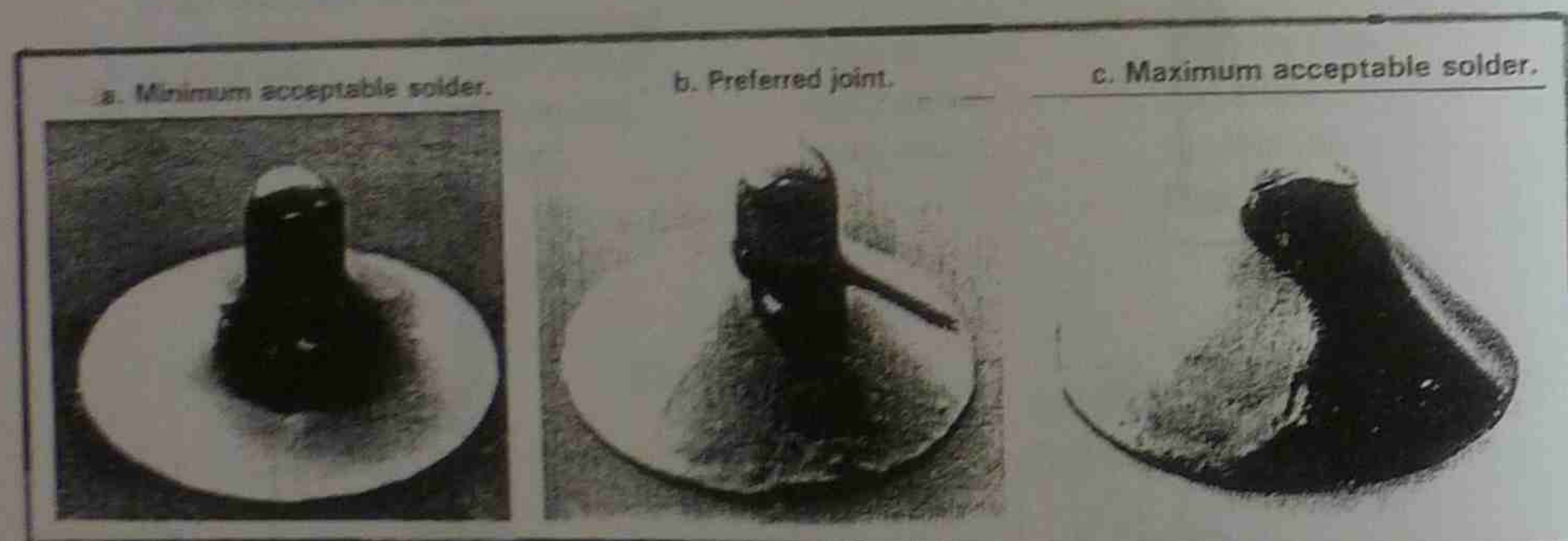


Fig. 11. Axial lead joints, straight-through.

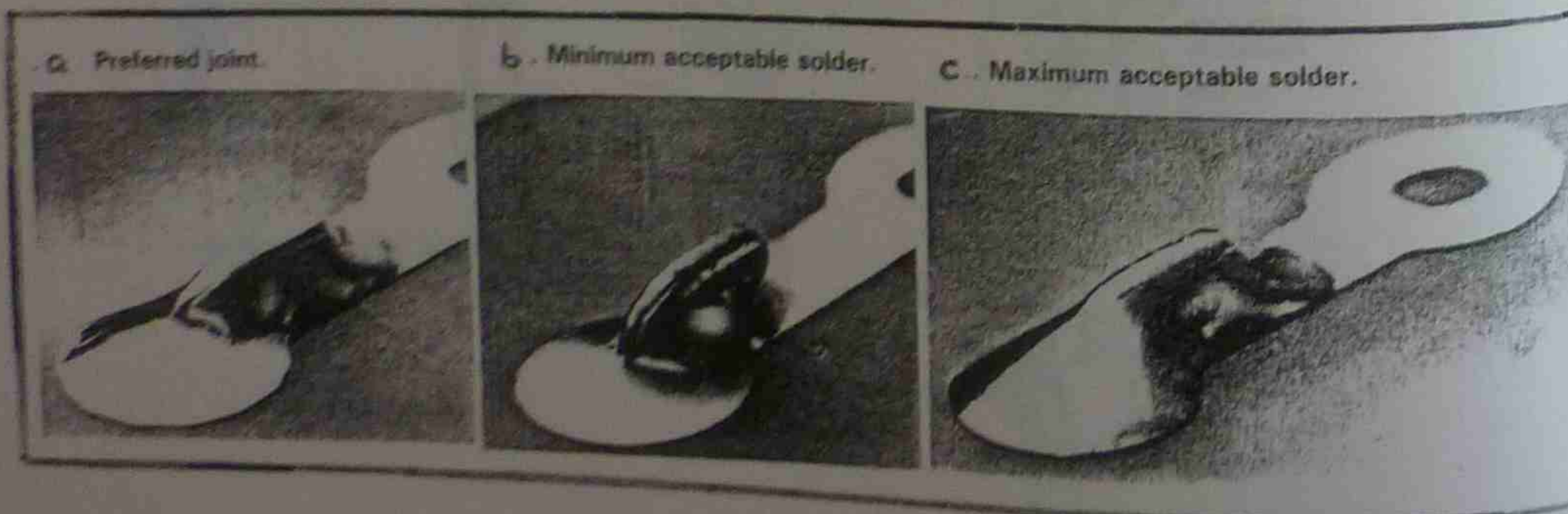
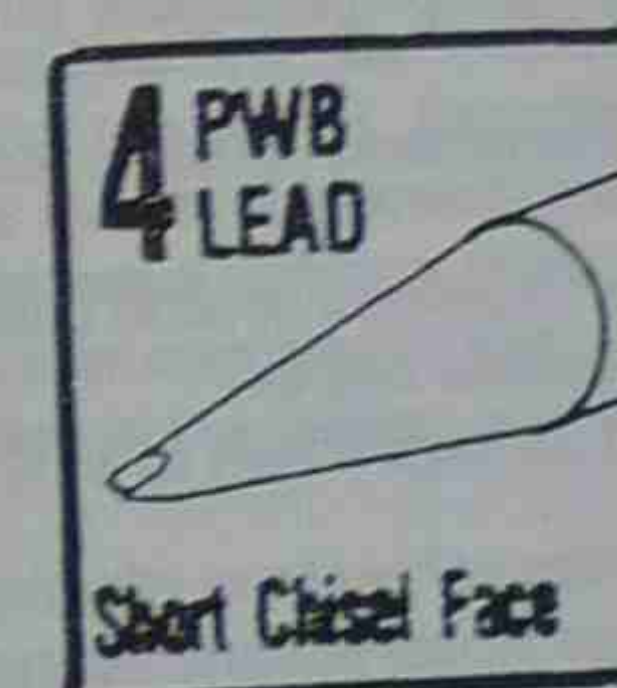
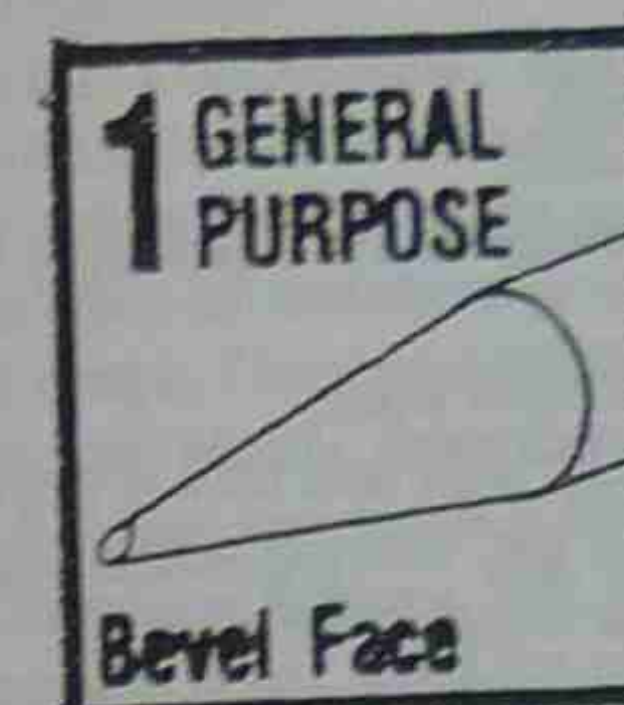


Fig. 12. Axial lead joints, clinched.

## ROYEL ARMCLAD LONG LIFE SOLDERING TIPS



A wide range of tips is available.  
**please Refer to Catalog**

### TIP CARE

Leave excess solder on tip when 'idling'. Use wet wiping sponge immediately before soldering. If 'TINNING' is lost, recover by use of Brass Brush Part No. DS 137-7. Any Other Brush Type may damage tip plating and reduce tip life.



**Ambient temperature:** the temperature of the environment.  
**Artwork:** refers to the accurately scale configuration used to produce the print on the PCB.  
i.e. solder resist artwork, track artwork.

**Baselaminate:** the insulating support holding the print circuit tracks.

**Base material:** the insulating material used to make the baselaminate.

**Blister-Interlaminor:** a void produced under the surface of the baselaminate that makes the layers to separate.

**Blister-Foil:** a separation between the baselaminate and the print circuit track.

**Blow holes:** occur when contamination is trapped in a plated through hole and heat is applied during the soldering process, the heat expansion will force the junction to vent gas, leaving small holes in the joint (s).

**Board thickness:** the overall thickness of the base material plus the conductive material.

**Bond Strength:** a measure in grams per square cm of the force required to separate a layer of conductive material from the adjoining base material by applying a perpendicular pull on the surface of the conductive material.

**Bridging** is the solder bridge or fillet used to joint two or more joints in order to form a conductive path between the conductive areas.

**Bus Wire:** a solid conductor either insulated or non-insulated used to connect two or more terminals.

**Checking:** a surface condition evidenced by fine hairline cracks.

**Clinched Lead:** where a component lead is passed through a hole in a PCB and bent towards the track at an angle equal or greater than  $45^\circ$ .

**Cold Joint:** a solder defect caused by

- Insufficient heat to part to be soldered
- Incorrect temperature control of the iron used
- Insufficient flux
- Surfaces to be soldered are not properly cleaned and free from all oxide coating. In a cold joint, the required metallic lustre is missing and has the appearance of roughly piled up solder with a granulated surface that looks chalky and has a frosty look.

**Cold solder:** very poor wetting due to insufficient heat. The fillet does not blend into the connecting point and the solder has a lumpy appearance.

**Component:** any electrical/electronic device that has distinct electrical characteristics and terminals or lead-outs, which allow them to be connected to form a circuit.

**Component side (Side 1):** the side of the PCB upon which components are mounted.

**Component leads:** the solid uninsulated wires protruding from the body of the component giving conductive connection to the outside world.

**Component part:** electrical/electronic devices, e.g. an integrating circuit (IC), transistor etc.

**Conductive foil:** a form of conductive material that covers both sides of the base material, also known as the etch.

**Conductive pattern:** a pattern of conductors in a conductor layer.

**Conductor side (Side 2)** the side of the PCB that contains the conductors.

**Connection:** the means by which a connection is made to a conductive pattern.

**Corrosive:** a chemically reactive area that has the ability to wear away gradually.

**Crazing:** a condition that exists in the form of connected white spots or crosses on or below the surface of the baselaminate reflecting the separation of fibres in the glass cloth and connecting via interconnections.



**Crystallized solder joint:** caused by movement between the conductor and its connecting point during the soldering activity while the molten solder is solidifying or the joint is reheated. The joint has a dull, heavily pitched surface.

**Cross Latching** is the breaking up of large conductive areas by use of a pattern of voids in the conductive material.

**Delamination:** the separation of layers of PCB material within the laminations.

**Dents:** depressions in the copper foil, which do not significantly decrease the thickness of the copper foil and provided they are not widespread, they are acceptable.

**De-wetting:** the solder initially covers the surface of the base metal before pulling back, leaving a thin solder film with lumps and ridges of solder at random, on the surface. De-wetting looks like patches of water in a greasy surface. The angle at the edge of the ridges is characteristically high. De-wetting is usually caused by contamination in the materials being soldered. In de-wetting, solder appears as droplets or balls withdrawn from previously wet adjacent areas or never wetting them at all.

**Double sided:** a PCB with conductive material on both sides that may not be connected together at various points by plated trough holes.

**Dross:** oxide and other contaminants that form on the surface of molten solder.

**Dry joint:** (non-wetting): where the solder has not wetted the metal surface due to severe contamination of the solder area e.g. infringement of the solder mask into the soldering areas.

**Eutectic Alloy:** an alloy of metals so proportioned that all the metals in the alloy have a specific melting point rather than a range. They possess the characteristic of passing from a liquid cycle to a solid cycle to without an intermediate plastic formation.

**Excessive solder profile:** too much solder has been used but it does not necessarily mean the joint is defective. It does however indicate that the process parameters should be adjusted.

**Fixing Hole** (mounting hole): used for mechanically mounting a component to a PCB or fixing the PCB assembly to a chassis.

**Flux:** a chemically active agent that speeds up the wetting process of metals with molten solder. When heated it removes oxide (but will not remove oil, fingertips or dirt).

**Fractured joint:** a joint where the lead or component has moved while the solder was solidifying. The joint will have a dull granular appearance and may show signs of spiral cracks.

**Granular solder:** solder with a coarse appearance like a grained structure that lacks metallic lustre.

Usually due to the unclean condition of the joining areas, contaminated solder or the molten solder being of an excessive high temperature.

**Hand soldering** is a technique normally confined to rework stations and the insertion of large components. The operator controls the solder profile and the solder volume.

**Icicle:** an undesirable protrusion from a solidified joint.

**Land:** the portion of a PCB used for making electrical connections between the conductor pattern and the components.

**Legend:** the lettering or symbols shown on the PCB indicating part numbers, component locations etc.

**Machine soldering:** a mechanical method of mass soldering PCB assemblies.

**Maximum acceptable solder profile:** maximum amount of solder that would normally be accepted.



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**Flux:** a chemically active agent that speeds up the wetting process of metals with molten solder. When heated it removes oxide (but will not remove oil, fingertips or dirt).

**Fractured joint:** a joint where the lead or component has moved while the solder was solidifying. The joint will have a dull granular appearance and may show signs of spiral cracks.

**Granular solder:** solder with a coarse appearance like a grained structure that lacks metallic lustre. Usually due to the unclean condition of the joining areas, contaminated solder or the molten solder being of an excessive high temperature.

**Hand soldering** is a technique normally confined to rework stations and the insertion of large components. The operator controls the solder profile and the solder volume.

**Iceicle:** an undesirable protrusion from a solidified joint.

**Land:** the portion of a PCB used for making electrical connections between the conductor pattern and the components.

**Legend:** the lettering or symbols shown on the PCB indicating part numbers, component locations etc.

**Machine soldering:** a mechanical method of mass soldering PCB assemblies.

**Maximum acceptable solder profile:** maximum amount of solder that would normally be accepted.

**Measling:** a condition that exists in the form of discrete white spots or crosses on or below the surface of the baselaminate reflecting the separation of fibres in the glass cloth at weave.

**Minimum acceptable solder profile:** minimum amount of solder present to make a successful joint.

**Mounting Hole (fixing hole):** used for mechanically mounting a component to a PCB or fixing the PCB assembly to a chassis.

**Non-wetting (dry joint):** where the solder has not wet the metal surface due to severe contamination of the solder area e.g. infringement of the solder mask into the soldering areas.

**Alternatively poor wetting:** where the solder makes a large contact angle with the conductor, the surface is incontinuous with irregular with irregular non wet areas exposed.

**PCA:** a printed circuit assembly.

**PCB:** a printed circuit board.

**PTH:** a plated through hole.

**Plated-through-hole (PTH):** an interfacial or interlayer connection formed by depositing a conductive material on the side of a hole through the laminate layers.

**Plating** is a process consisting of non-chemical or electrochemical depositing of metal in all or part of the conductive pattern.



**Polarizing slot:** the slot in the edge of the PCB used to ensure proper insertion and location in a mating connector.

**Pinholes:** small holes occurring as imperfections which penetrate into the solder. Providing they are not widespread in a particular PCB they are acceptable.

**Pre-heating:** an immediate heating operation used to raise the temperature of a PCB assembly above room temperature to reduce the thermal shock of an elevated solder temperature.

**Printed Circuit Assembly (PCA):** is a PCB on which separately manufacturing components have been added.

**Printed Circuit Board (PCB):** the board formed by the baselaminate and the print circuit track.

**Printed edge contacts:** patterns extending the edge of the PCB intended for mating with external contacts mostly gold plated either on copper or on nickel plated copper to reduce the cost of gold.

**Reflow:** refers to all the techniques where solder is preplaced on a substrate and heat applied subsequently. The heating methods used are vapour phase, infra red and hot belt. Reflow methods have a tendency to make the joints dull in appearance which is caused by the growth of lead dendrites and is a cosmetic effect which does not influence the integrity of the joint. The profiles tend to be of minimum acceptable solder.

**Residue:** excessive substance(s) remaining after soldering such as flux or oil.

**Resin joint:** where the joint has a layer of solidified flux or dirt between the solder and the surfaces to be soldered which prevents a sound electrical and physical contact. See rosin connection.

**Rosin connection:** a layer of solidified flux between the conductors that has no metallic or electrical continuity. This gives a high resistance joint with no mechanical strength.

**Side 1:** the side of the PCB that contains the components.

**Side 2:** the side of the PCB that contains the conductors.

**Single sided board:** a PCB with conductors on one side only. Side 1 is the component side. Side 2 is the soldered side.

**Solder:** a fusible alloy consisting essentially of tin and lead used for the purpose of joining two or more metals at temperatures below their respective melting points. Solders that melt readily are called soft solders.

**Soldered joint:** a joint where sufficient solder has been applied to form a concave fillet between the terminal pad and each side of the component wire. The contour of the wire should be visible. A concave fillet is unacceptable.

**Solderability:** the property of a metal surface that allows it to be wetted by solder.

**Solder Impurities:** trace metals appearing in a solder bath during usage.

**Solder splashes:** drops of solder in areas that should be free of solder: a most undesired condition.

**Tinning:** is a solder coating of the conductive paths and terminals primarily to minimize in-process oxidation and enhance solderability.

**Twist:** in a PCB, is the bending or curving distortion from a true plane surface, in a direction parallel to the diagonal between two opposite corners of the laminate sheet/PCB assembly.

**Unacceptable solder profile:** none or too little solder.

**Warp:** in a PCB, is the deviation from flatness characterized by a roughly cylindrical or spherical curvature such that if the board is rectangular, its corners or edges are not in the same plane as the major surfaces of the board.

**Wave soldering** is a process where the conductor pads of a PCB are brought into contact with the surface of continuously flowing circulated solder. The joints tend to be bright and with a fuller profile than those produced with reflow. Device orientation with respect to the wave direction of travel can affect the joint profiles. Normally in the leading edge joint the solder is concave and in the trailing edge joint is convex. To prevent voids and bridges in the joints, dual or vibrating wave-soldering equipment is used.

**Wetting** is the coating of the surfaces being soldered by a concave layer of solder correctly adhered at the ideal angle of  $40^\circ$ . Between  $40^\circ$  to  $70^\circ$  the angle is average. Below  $40^\circ$  the angle is good. More than  $70^\circ$  is not acceptable.

## PREPARING AND MAINTAINING THE SOLDERING IRON

### MATERIALS NEEDED:

Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled,  $\frac{1}{8}$ " diameter (3mm)  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Wire stand and cleaning unit  
Small screwdriver

### PROCEDURE:

1. Before plugging in the iron, insert the tip fully into the heating element and tighten the set screw that holds it in place. Next, saturate the sponge of the cleaning unit with water.
2. Tinning the tip: This must be done before the tip reaches operating temperature. Therefore, while it is heating up, hold a piece of cored solder against each face of the tip. In this way the surfaces will be tinned when they reach the lowest temperature at which solder will melt.
3. Cleaning: Before each use, the tip needs to be cleaned of all residues and oxides. Remove the iron from its stand and wipe the tip lightly on the wire brush to remove any charred flux and solder dross that may be on it. Next, touch it lightly and quickly on the wet sponge to shock off the remaining oxides.
4. After use, and before returning the iron to its stand, put a small amount of solder on the surface of the tip.



# Procedure Sheet 2

## SOLDERING TO TURRET TERMINALS

### MATERIALS NEEDED:

Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled, 1/8" diameter (3mm)  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Turret terminals  
Terminal holding block  
Insulated wire, #22, blue  
Insulated wire, #20, red  
Diagonal cutters  
Pliers, round nose  
Solvent  
Cleaning brush

### PROCEDURE:

1. Tinning the wires: Position iron, solder and wire as illustrated in the Handbook. Move the wire across the iron tip, first toward the insulation and then away from it, and off the end. Have the wire end tilting downward so that any excess solder will drain off the wire and onto the tip.
2. With the round nose pliers, form a basic 180° loop on the tinned end of the wire. For this exercise use the 270° wrap and a minimum insulation gap equal to the diameter of the insulated wire when attaching to the terminal.
3. Place the terminal in the terminal holding block and then attach the wire to the terminal.
  - A. Place the wire in the lower guide slot and in full contact with the terminal base and post and wrap the loop to 270°.
  - B. Cut off excess tinned wire.
  - C. Set the loop tightly around the post with long nose pliers for stability.
4. Solder the wire to the terminal using the technique illustrated in the Handbook.
  - A. Apply the clean iron tip to the connection at the point of maximum thermal mass.
  - B. Make a solder bridge between the iron tip and the work.
  - C. Apply solder to a point opposite at which the iron tip contacts; "paint" it on with a light touch and then withdraw the solder.
  - D. Withdraw the iron, using a forward wiping motion.

(continued)

## Procedure Sheet (continued)

5. The wire must not move while cooling, or a disturbed, faulty joint will result. Allow the joint to cool and solidify before moving it, then clean it thoroughly with solvent and brush and wipe dry.
6. Inspect the joint and compare it with those shown in the reference photographs, using the following *Criteria of Acceptance*:
  - A. The surface of the solder is smooth, bright and shiny; there is no evidence of pits, pinholes or porosities.
  - B. The surface is free of any lumps, remaining pockets of flux, or granular appearance.
  - C. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.
  - D. The solder fillets on the terminal are concave.
  - E. The outline of the individual strands of wire can be seen in the joint. The wire is in contact with both the base and post of the terminal.
  - F. There is no copper showing at the end of the wire, and no solder off the edge of the terminal base.



# Procedure Sheet

## SOLDERING TO CUP TERMINALS

### MATERIALS NEEDED:

Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled,  $\frac{1}{8}$ " diameter (3mm)  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Cup terminals  
Terminal holding block  
Insulated wire, #20, red  
Diagonal cutters  
Solvent  
Cleaning brush

### PROCEDURE:

1. Pre-tin the wire; insert it in the cup and measure for the correct lead length; then trim the end to maintain a proper insulation gap.
2. Twist together a short length of solder to make a preform, insert it in the cup and cut it off flush with the top of the terminal.
3. Place the soldering iron at the back of the cup for heating and hold it on until the solder has melted and flux has bubbled to the surface.
4. Insert the pre-cut wire into the molten solder, being sure that the wire bottoms in the cup.
5. Move the wire forward and backward once or twice to allow the solder to flow around the wire and coat the inside walls of the cup, and heat until all flux flows to the surface. Entrapped flux is not permitted.
6. Hold the wire upright and against the back of the cup; then remove heat, allowing the joint to cool. Do not move the wire while the solder is cooling.
7. Clean the connection with solvent and brush, and inspect the joint for quality. Compare it with the joints shown in the reference photographs, using the following *Criteria of Acceptance*:
  - A. All the strands of the wire are in the cup.
  - B. The surface of the solder is smooth, bright and shiny. There is no evidence of pits, pinholes or porosities. (If the cup has been gold-plated, the solder may have a frosty surface from traces of gold.)
  - C. The surface is free of any lumps, remaining pockets of flux, or granular appearance.
  - D. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.

(continued)

## Procedure Sheet (continued)

- E. The solder has flowed out to the edges of the milled faces. (In the case of gold terminals, it is permissible to show a little gold on the outside edges of the face.)
- F. No solder has spilled over and down the sides of the cup, and there are no cracks or voids between the wire and the terminal.
- G. The outline of the wire need not be seen below the point where it enters the terminal.
- H. Proper insulation gap.

Note: An anti-wicking tool may be required by some specifications.



# Procedure Sheet 4

## SOLDERING TO BIFURCATED TERMINALS

### MATERIALS NEEDED:

Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled, 1/8" diameter (3mm)  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Bifurcated terminals  
Terminal holding block  
Insulated wire, #20, red  
Diagonal cutters  
Pliers, long nose  
Solvent  
Cleaning brush

### PROCEDURE:

1. Pre-tin several wires, leaving no excess solder on the outside of the wire.
2. For a side entry put the tinned wire across the terminal to determine the proper insulation gap and bend area—unless otherwise specified the insulation gap should be the diameter of the insulated wire.
3. Using the terminal post as a gage, use the long nose pliers to bend the wire firmly into a 90° bend.
4. Be sure the wire is placed onto the terminal so that it contacts the base and one post of the bifurcated terminal.
5. Cut the waste end of the wire flush with the base of the terminal; there must be no protrusion beyond the terminal base.
6. Center the formed wire so that it lies over the hole in the base of the terminal and is hooked flat to the base and post. Attach a wire-holding device, such as a piece of tape to hold the wire in place during soldering.
7. Place the soldering iron onto the terminal base and slide gently up to the wire. Melt solder at the junction of the iron tip and wire to form the solder bridge and establish good thermal linkage.
8. Move the solder over to the opposite side of the terminal (entry point of wire) and form a fillet of solder on each side of the wire at the base of the terminal.
9. Bridge the hole between the posts with solder.
10. Remove the iron while the solder is still being applied and flowing; this type of terminal has a large enough thermal mass to continue melting the solder after the iron is removed.

(continued)

## Procedure Sheet (continued)

11. For the double-side entry, preform 2 wires exactly the same as steps 2 and 3.
12. Place the wires into the terminal, one on top of the other with each wire end pointing in opposite directions. (One wire will be attached to the left post and the other will be attached to the right post.)
13. Attach the wire-holding device to the wires to hold them in place while soldering, and solder as above.
14. Allow the joint to cool, then clean thoroughly with brush and solvent before inspecting.
15. Compare your joints with the reference photographs. They should meet the following *Criteria of Acceptance*:
  - A. The surface of the solder is smooth, bright and shiny; there is no evidence of pits, porosities or pinholes.
  - B. The surface is free of any lumps, remaining pockets of flux, or granular appearance.
  - C. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.
  - D. The solder fillets are concave; the wire strands are distinguishable within the solder, and the wire end is within the limits of the terminal.
  - E. The hole in the terminal has been bridged over with solder to prevent collection of any contaminants.
  - F. No evidence of bare copper.
  - G. The end of the wire does not protrude beyond the diameter of the base, except in special cases with small diameter wire.



# Procedure Sheet 5

## SOLDERING TO HOOK TERMINALS

### MATERIALS NEEDED:

Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled,  $\frac{1}{16}$ " diameter (3mm)  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Hook terminals  
Terminal holding block  
Insulated wire, 22 ga, blue  
Diagonal cutters  
Pliers, long-nose  
Solvent  
Cleaning brush

### PROCEDURE:

1. Pre-tin several 22 gage wires.
2. Preform one wire to a standard 180° loop, place it around the hook, and then cut off the end of the wire with the diagonal cutters so that the wire protrudes above the hook.
3. Set the wrap tightly with the long nose pliers.
4. If necessary attach a wire-holding device to the insulated part of the wire. Do not use excessive tension or the wire will unbend and fly loose from the terminal.
5. Once the wire is properly positioned in the terminal, place the soldering iron tip at the base of the hook and gently slide the tip up to meet the wire.
6. Apply solder at the junction of the iron tip and the wire to create thermal linkage.
7. Move the solder to the other side of the wire and tin the cut-off end to cover bare copper. This terminal uses the least amount of solder. If controlling the solder quantity is difficult, use a solder of a smaller gage.
8. Pre-form 2 wires to a 180° loop and cut off to the proper length to fit the terminal. Insert one wire from the left side of the terminal and the other wire from the right side of the terminal.
9. Position the wires and hold in place with the wire-holding device; use minimum tension on wires.
10. Slide the soldering iron tip from the base of the terminal upward to lightly contact the wire. Establish thermal linkage and feed a slight amount of solder between the iron tip and the wire.

(continued)

## Procedure Sheet (continued)

11. Move the solder to the opposite side of the terminal and tin the bare copper end of the wire. Allow sufficient cooling time to prevent disturbed connections.
12. Clean and inspect the joints. They should meet the following *Criteria of Acceptance*:
  - A. The surface of the solder is smooth, bright and shiny; there is no evidence of pits, pinholes or porosities.
  - B. The surface is free of any lumps, remaining pockets of flux, or granular appearance.
  - C. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.
  - D. The solder fillets are concave.
  - E. A proper insulation gap exists on the wire, and the individual strands of wire are visible beneath the solder.
  - F. There is no copper showing at the end of the wire, and the end does not protrude beyond the diameter of the terminal.



# 6 Procedure Sheet

## SOLDERING AXIAL LEAD COMPONENTS TO PRINTED CIRCUIT BOARDS

### MATERIALS NEEDED:

Printed circuit board, single sided  
Resistors, 1/2-watt  
Resistors, 1/4-watt  
Soldering iron, 30-watt, pencil-type  
Soldering iron tips, plated, chiseled, 1/8" (3mm) and 1/16" (1.6mm) diameters  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Diagonal cutters  
Pliers, long nose  
Lead forming tool  
Solvent  
Cleaning brush  
Abrasive stick

### PROCEDURE:

1. Clean all resistor leads and circuit pads before attempting to solder. Use the abrasive stick to remove all heavy oxides from the surfaces; then clean with solvent after the abrasive.
2. Using the 1/2 watt resistors first, form the leads with the lead forming tool as illustrated in the Handbook.
  - A. Adjust the tool to span the distance between the holes on the circuit board on the large circuit.
  - B. Place the component body between the forming posts and bend first one lead and then the other to 90°
  - C. Wipe the leads with solvent to remove oil or grease
3. Carefully insert the component leads into the holes of the large circuit until the component body is flush to the board surface.
4. Bend the leads in the direction of the circuit run to an angle of approximately 45° using the long nose pliers. Do not pull up on the lead as this will pull the stress relief of the component lead into the hole on the component side of the board, causing tautness in the lead. This condition is a discrepancy and is known as "rainbowing."
5. Using the diagonal cutters, cut the lead by entering from the side (parallel to the board). DO NOT cut leads with the diagonal cutters pointing down toward the

(continued)

circuit. Finish clinching the lead with a non-metallic tool until the end of the lead is in contact with the circuit. The lead length of a full-clinched lead should be approximately the same as the diameter of the circuit pad. Circuit pads with no circuitry attached should have a lead length approximately equal to the radius of the pad and may be straight-through or semi-clinched.

6. Clean, form and assemble all components to the board to complete a row before soldering. This will provide better continuity in learning these new techniques and will reduce the soldering dwell time to the required 2 seconds or less per connection.

There are 2 rows of circuitry for the components, and assembly will be as follows:

Row 1 — Large circuit: Place a 1/2 w resistor in every space and full clinch the leads to the pads that have circuitry leading to them. Isolated pads will be semi-clinched or straight-through termination.

Row 2 — Small circuit: All leads will be straight-through termination (1/4w resistor).

7. Solder the straight-through leads first. Bring the iron onto the joint from one side and then come in from the other with solder, as illustrated in the Handbook. The tip should always be in contact with both the lead and the pad. Remember, the lead is the principal thermal mass in the joint.

After the solder is "painted" on, remove first the solder and then the iron, sweeping the iron tip over the end of the lead to cover it with solder.

It is most important to develop a "light touch" with the iron, barely touching the pads with no more pressure than would come from the weight of a pencil balanced on its point.

8. Now solder the clinched leads, observing the correct motion of the tip as shown in the illustration. With a clinched lead joint your *workpiece indicator* is the length of the solder flow along the conductor. An excessively long flow indicates too long a heat dwell time, and the possibility of heat damage at the joint or component.

9. Clean all joints thoroughly with solvent and brush, wipe them dry, and then inspect them. A good technique is to "roll" the board around under an overhead light. This directs the light on every spot and quickly reveals any pits or discontinuities on the surface, or flux residue left on the board.

Compare your joints with the reference photographs. They should meet the following *Criteria of Acceptance*.

### FOR ALL JOINTS

- A. The surface of the solder is smooth, bright and shiny; there is no evidence of pits, pinholes or porosities.

(continued)



- B. The surface is free of any lumps, remaining pockets of flux, or granular appearance.
- C. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.
- D. The solder fillets are concave.
- E. The profile of the lead is clearly visible under the solder.

### FOR STRAIGHT-THROUGH LEADS

- F. The lead should protrude above the board a distance at least equal to the radius of the pad, but not exceeding the pad diameter.
- G. The end of the wire should be visible above the solder, and tinned.

### FOR CLINCHED LEADS

- H. With single leads, clinching is done in the direction of the circuitry, with the end of the lead in contact with the pad. The lead should protrude a distance equal to the pad diameter.
- I. When two leads are clinched on the same pad, they should be bent toward each other so that both can be soldered in one operation.
- J. The outline of the lead is visible within the solder.
- K. Solder has flowed along the conductor far enough to cover the end of the wire and leave a concave fillet at the end.

## SOLDERING DUAL INLINE PACKS (DIP'S) TO PRINTED CIRCUIT BOARDS

### MATERIALS NEEDED:

Printed circuit board, double sided  
IC's—dual inline packs  
Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled,  $\frac{1}{16}$ " diameter (1.6mm)  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Pliers, long-nose  
Solvent  
Cleaning brush

### PROCEDURE:

1. Prepare the DIP by first bending each row of leads so that they fit the holes in the board. To make the bend, the body of the component should be carefully held with the fingers, or pliers, and then each row of leads pressed down onto a flat surface, as illustrated in the Handbook. Use no more pressure than necessary to create the correct angle.
2. Mount the DIP on the component side of the board, hold it in with a finger and turn the board over. Semi-clinch the two leads on opposite corners to hold the DIP in place.
3. Solder the leads using a  $\frac{1}{16}$ " iron tip, and progress down the row skipping around so that no two leads next to each other are soldered consecutively. This prevents heat buildup.
4. Apply the iron tip to one side of the joint, being sure it contacts both the lead and pad surfaces, then apply solder to the opposite side.
5. Observe the joint carefully as the solder flows. A mound will build up during the first second or second and a half, and the hole will appear to be full. It is not.
6. Hold the solder and the iron on the joint. The solder pool will drop, indicating that solder has flowed through the hole and wet the pad and lead on the opposite side. (See the illustration in the Handbook.) The solder will then mound up again on top.
7. Remove the iron with an upward wiping motion to cover the end of the lead. Again, practice using the light touch; pads are easily lifted by too much pressure. You should be off the joint within three seconds.

(continued)



## SOLDERING TO-5 TYPE PACKAGES TO PRINTED CIRCUIT BOARDS

### MATERIALS NEEDED:

Printed circuit board, double sided  
IC's—TO-5  
Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled, 1/8" diameter (3mm)  
Solder, rosin-cored, .028" (22 ga) diameter (.8mm)  
Soldering flux  
Pliers, long nose  
Diagonal cutters  
Solvent  
Cleaning brush

### PROCEDURE:

1. Preform the leads: Use a quarter-inch rod (6.5mm), the abrasive stick, or a pen or pencil and force this down between the leads toward the base of the component. This will cause the leads to spread evenly to a 3/4 inch diameter (19.05 mm) at their ends. (See illustrations in the Handbook.)
2. Using the diagonal cutters, cut each lead in the circle so that it is slightly shorter than the one next to it. Then clean the leads with solvent.
3. With the long nose pliers bend the ends of the leads parallel to the body, and insert the component into the holes in the board. Put the longest lead in first and rotate the TO-5 to align and insert each lead in turn. Then cut to the proper length for soldering, a length not greater than the radius of the pad. See Handbook for illustrations. (In actual practice, the component leads may need to be cut much shorter than is shown, allowing the component to be mounted closer to the board.)
4. Solder the leads into place using the same techniques as those in steps (3) and (4) for DIP's (Procedure Sheet No. 7). When the iron is removed, remember to move it *upward* and off, to cover the end of the lead with molten solder.
5. Clean each joint with solvent and brush or spray unit. Using the reference photographs, inspect the joint to insure that it meets the following *Criteria of Acceptance*:
  - A. The surface of the solder is smooth, bright and shiny; there is no evidence of pits, porosities or pinholes.
  - B. The surface is free of any lumps, remaining pockets of flux, or granular appearance.

(continued)

8. Clean the joints and board thoroughly with solvent and brush or spray unit, and inspect them, comparing your results with the joints shown in the reference photographs. They should meet the following *Criteria of Acceptance*:
  - A. The surface of the solder is smooth, bright and shiny; there is no evidence of pits, pinholes or porosities.
  - B. The surface is free of any lumps, remaining pockets of flux, or granular appearance. (With gold-plated leads, the appearance of the solder may be slightly frosty due to gold amalgamation.)
  - C. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.
  - D. Concave fillets exist on both sides of the board. On the component side, the fillet should extend only up to the wider part of the lead.
  - E. On the circuit side of the board the end of the lead is tinned and plainly visible under the solder.



## Procedure Sheet (continued)

- C. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.
- D. Solder fillets are concave, and the end of the wire is tinned.
- E. There is complete flow-thru of solder in all plated-thru holes.
- F. The lead should be visible beneath the solder.

## Procedure Sheet

### SOLDERING PLANAR-MOUNTED COMPONENTS (FLAT PACKS) TO PRINTED CIRCUIT BOARDS

#### MATERIALS NEEDED

Printed circuit board, single sided  
IC's—flatpacks  $\frac{1}{4}$ " x  $\frac{1}{4}$ "  
Flux, liquid  
Soldering iron, 30-watt, pencil-type  
Soldering iron tip, plated, chiseled,  $\frac{1}{16}$ " diameter (1.6mm)  
Solder, rosin-cored, .010" diameter (.25mm)  
Pliers, long nose  
Diagonal cutters  
Solvent  
Cleaning brush  
Abrasive stick  
Scissors  
Tweezers

#### PROCEDURE:

1. Prepare the PC board by cleaning the pad areas with the abrasive stick and washing the board with solvent and disposable tissue.
2. Pre-tin the pads using the soldering iron with  $\frac{1}{16}$ " tip and .010 (.254 mm) diameter solder. This is most easily accomplished by laying the solder down along the total length of the pad, and then melting the solder. After tinning, again clean the pads with solvent to remove used flux.
3. Pre-form the leads as shown in the illustrations, so that the part will rest flat on the board and a  $60^\circ$  angle exists at the heel of the lead where it meets the pad.
4. Cut the leads to the proper length for the pads with scissors, then clean them with solvent. (Note: Under some circumstances, the specifications may require that gold-plated leads be pre-tinned before soldering. This pre-tinning minimizes the gold-solder contamination and establishes the solderability of the surfaces.)
5. Put new flux on the top and bottom of the leads. This is necessary because no additional solder is to be used on the pre-tinned pads.
6. Position the flatpack so that each lead is centered over the circuit; it can be temporarily held in place during soldering with a piece of tape. Insure that each lead is precisely positioned on its pad and does not overhang along the edges. The minimum length that the lead should extend onto the pad is a distance equal to twice the width of the lead.

(continued)



7. Reflow solder the two leads in opposite corners first for proper positioning. When solder melt is observed, wipe the iron tip along the lead, from the component to the end of the lead. Your workpiece indicator is the flow of solder from the pad up onto the surface of the lead. When complete flow is observed, remove the iron, using a wiping motion toward the end of the lead.
8. Reflow solder the remaining leads, skipping around so that no two leads side by side are soldered consecutively. Heat build-up can be minimized by using a piece of wet tissue put over the component body to act as a heat sink, or by placing the tips of the tweezers on the component lead.
9. Carefully clean the joints, using solvent and brush or spray unit, and then inspect them. Compare your results with the Handbook photographs. They should meet the following *Criteria of Acceptance*:
  - A. At the minimum, the leads extend onto the pads for a distance equal to twice the width of the lead. They meet the pad at a  $60^\circ$  angle.
  - B. On the pad, the leads are straight, parallel to the pad, and centered over the circuit. They may lie along the edge of the pad, but they must not overhang the edge.
  - C. The surface of the solder is smooth, bright and shiny; there is no evidence of pits, pinholes or porosities. (With gold-plated leads that were not pre-tinned, there may be a slight frosty appearance.)
  - D. The surface of the solder is free from any lumps, remaining pockets of flux, or granular appearance.
  - E. Good wetting action is evidenced by the feathering out of the solder to all surfaces of the joint.
  - F. Concave solder fillets exist along the side of the lead, at the heel and at the end.
  - G. As shown in Fig. 38c, the fillet existing at the heel of the lead should extend upward for a minimum of one-third the total distance between the pad and the horizontal part of the lead. Solder should not extend above the upper level of the component lead. (See Handbook illustration.)
  - H. The shape of the lead is visible beneath the solder.







# SOLDERING IRONS

## 240V SOLDERING IRONS - STANDARD

### 20/130W SOLDERING IRON STARTER KIT

All the soldering essentials for the hobbyist. This kit represents excellent value, the best in soldering we've seen, anywhere. The sum of the individual parts amount to more than double the price we are selling this kit for.

- Kit contains:
- 240V 20/130W Turbo soldering iron
  - Spare tip
  - Basic stand
  - 1mm solder in dispenser tube
  - Metal solder sucker with spare tip and O-ring



	Cat.	Qty 1+	Qty 3+	Qty 6+
Starter kit	TS-1651	\$24.95	\$22.35	\$19.70

### 20/130W TURBO SOLDERING IRON

Sometimes you need that extra bit of heat in your soldering. Push the little red button on this iron and you get a lot more power - from 20 watts to 130 watts to be precise. Weller-style removable barrel, plated tip and ceramic element.



- Spare tips available:
- TS-1555 - 0.5mm conical tip
  - TS-1556 - 1mm conical tip

	Cat.	Qty 1+	Qty 3+	Qty 6+
Soldering Iron	TS-1554	\$19.95	\$17.70	\$15.70
Spare Tips		Qty 1+	Qty 3+	Qty 6+
0.5mm conical tip	TS-1555	\$4.95	\$4.45	\$3.90
1mm conical tip	TS-1556	\$4.95	\$4.45	\$3.90

### 25 WATT SOLDERING IRON



Ideal for the hobbyist and handy person. Has a stainless steel barrel and orange cool grip, impact resistant handle.

Spare tip available - TS-1466

**DURATECH**

**OUR MOST POPULAR IRON**

	Cat.	Qty 1+	Qty 3+	Qty 6+
Soldering Iron	TS-1465	\$13.95	\$12.35	\$10.95
Spare tip	TS-1466	\$3.95	\$3.45	\$3.15

### SUPER SOLDERING STARTER KIT

After Short Circuits 1, the next two series require you to start soldering components to the printed circuit board. So you'll need a good soldering iron. This Soldering Starter kit is ideal.



- This kit contains:
- 1 x KC-5178 Clifford the Cricket Kit
  - 1 x TH-1886 Precision Cutters
  - 1 x TH-1502 Soldering Stand
  - 1 x TS-1465 240V 25W Soldering Iron
  - 1 x 15g pack 60/40 0.71mm solder

	Cat.	Qty 1+	Qty 3+	Qty 6+
Starter Kit	TS-1655	\$49.95	\$44.90	\$39.90

## 50W TEMPERATURE CONTROLLED SOLDERING IRON

If your budget doesn't extend to a soldering station, you can still have temperature control. This iron is adjustable with a dial on the handle. It has a temperature range of 200 - 450°C, high enough for silver soldering if needed. Plated long-life tip.



- Spare tip available
- TS-1542 - 1mm conical tip

	Cat.	Qty 1+	Qty 3+	Qty 6+
Soldering Iron	TS-1540	\$29.95	\$26.90	\$23.70
	TS-1442	\$19.95	\$17.70	\$15.70

### 40W SOLDERING IRON

Ideal for the hobbyist and handy person. Has a stainless steel barrel and orange cool grip impact-resistant handle. Fully electrically safety approved. Spare tip to suit use Cat. TS-1476



	Cat.	Qty 1+	Qty 3+	Qty 6+
Soldering Iron	TS-1475	\$18.95	\$16.95	\$14.95
Spare tip	TS-1476	\$4.95	\$4.45	\$3.90

## 60W SOLDERING IRON-12VDC

This is a quality 12V soldering iron. It plugs into your car cigarette lighter and with 60 watts it's hot enough to solder terminals, heavy cable etc. 2.5 metre lead length. Supplied with solder as well. Before use, check your car's wiring is enough to carry the current, or else connect direct to battery.

	Cat.	Qty 1+	Qty 3+	Qty 6+
Soldering Iron	TS-1530	\$17.95	\$15.95	\$14.35
Spare Tip	TS-1531	\$6.95	\$6.25	\$5.50

## 60W SMD SOLDERING IRON

Using a conventional soldering iron for surface mount components can be slow and clumsy. These surface mount soldering tweezers will allow easy soldering and desoldering of all surface mount components from small resistors to large 'flat pack' IC's. With tips available from 2mm to 20mm, it is truly a versatile tool. The iron itself is mains powered, and rated at 60 watts. It heats up in just minutes and features rapid heat recovery. It has a 1.8m mains lead and is supplied with 2 x 2mm tips and a metal stand with sponge. Fully electrically safety approved.



Cat. TS-1701 Cat. TS-1702 Cat. TS-1703 Cat. TS-1704

	Cat.	Qty 1+
SMD Soldering Iron	TS-1700	\$79.00
Spare Tips		Qty 1+
Spare Tip 2.0mm (Pkt 2)	TS-1701	\$6.40
Spare Tip 5.0mm (Pkt 2)	TS-1702	\$8.80
Spare Tip 10mm (Pkt 2)	TS-1703	\$8.80
Spare Tip 20mm (Pkt 2)	TS-1704	\$8.80

## 80 WATT

Ideal for the hobbyist and handy person. Has a stainless steel barrel and orange cool grip impact resistant handle. Fully electrically safety approved. Spare tip to suit use Cat. TS-1486



	Cat.	Qty 1+	Qty 3+	Qty 6+
Soldering Iron	TS-1485	\$22.95	\$20.35	\$18.35
Spare tip	TS-1486	\$8.95	\$7.95	\$6.95

## PORTASOL GAS SOLDERING

A leading brand recognised worldwide. Portasol products are designed and manufactured in Ireland, to the highest quality standards. Since commencing operation in 1983, they have forged their way into the market with some of the most rugged and reliable gas powered soldering and heating tools in the world. They utilise catalytic combustion (flame tips excluded), which converts the gas flame into infrared radiation. It is a safe, flameless way of heating the tips evenly and continuously. They all use standard butane gas, and have a variety of tips available to support a wide range of applications.

### PORTASOL SUPER PRO GAS SOLDERING TOOL KIT

Features 90 minute run time, 10 second fill, maximum 1300°C temperature and 40 second heat up. This kit contains a Portasol Super Pro Gas Soldering Iron and the following:

- Quality storage case.
- 2.4mm double flat tip (TS-1322).
- Hot air blow (TS-1324).
- Hot air deflector.
- Cleaning sponge and tray.
- 4.8mm double flat tip (TS-1323).
- Hot knife tip (TS-1325).



	Cat.	Qty 1+	Qty 3+	Qty 6+
	TS-1328	\$159.00	\$142.95	\$126.95

### PORTASOL PRO PIEZO GAS SOLDERING TOOL KIT

This kit contains a Portasol Pro Piezo Gas Soldering Iron and the following:

- Quality storage case.
- 2.4mm double flat tip (TS-1312).
- Hot knife tip (TS-1315).
- Flame tip (TS-1316).
- Cleaning sponge and tray.
- Hot air blow (TS-1314).
- Hot air deflector.



	Cat.	Qty 1+	Qty 3+	Qty 6+
	TS-1318	\$129.00	\$115.95	\$102.95

### PORTASOL SUPER PRO GAS SOLDERING IRON

The Portasol Super Pro is the big brother of all irons in the range. It features adjustable tip temperature up to 580°C, with equivalent electrical power of between 25 and 125W! 125W may seem somewhat excessive to some. You don't need a V8 to drive around town, but it's nice to know that the power is there when it's needed isn't it? Ignition is achieved with the internal Piezo crystal mechanism, and run time is around 2 hours on a 30 second refill. The stainless steel finished gas tank features a viewing window to keep an eye on fuel level, & the protective end cap also acts as a safety cut off for the gas valve control when replaced. With the various tips available & huge power at hand, no job is a match for the Portasol Super Pro.

- 2.4mm tip supplied.
- Specifications:
- Operating Time: 120 min (approx).
  - Refill Time: 30 sec (approx).
  - Ignition: Internal Piezo crystal ignitor.
  - Dimensions: 234(L) x 25(Dia)mm.
  - Weight: 135g without gas.

#### TIPS TO SUIT

1.0mm Chisel	TS-1321	\$24.95
2.4mm Chisel	TS-1322	\$24.95
4.8mm Chisel	TS-1323	\$24.95
Hot Air Blow	TS-1324	\$24.95
Hot Knife	TS-1325	\$24.95



	Cat.	Qty 1+	Qty 3+	Qty 6+
	TS-1320	\$115.00	\$103.95	\$91.95

**portasol**

### PORTASOL PRO PIEZO GAS SOLDERING IRON

The Portasol Pro Piezo is a powerful gas soldering iron featuring an adjustable temperature control allowing soldering tip temperatures up to 580°C. With equivalent electrical power of between 15 and 75 Watts, there is little that's not possible with this beauty. It incorporates a viewing window at the end of the gas tank, to keep an eye on the fuel level. The fuel tank fills in around 20 seconds, and will provide approximately 45 minutes of run time. Ignition is via the built in Piezo crystal mechanism, and the end cap provides safety gas shut off when replaced. The Portasol Pro Piezo is a dream to use, and will not let you down.

- 2.4mm double flat tip supplied.

Specifications:

- Operating Time: 45 min (approx).
- Refill Time: 20 sec (approx).
- Ignition: Internal Piezo crystal ignitor.
- Dimensions: 178(L) x 22(Dia)mm.
- Weight: 75g without gas.

#### TIPS TO SUIT

1.0mm Chisel	TS-1311	\$23.95
2.4mm Chisel	TS-1312	\$23.95
4.8mm Chisel	TS-1313	\$23.95
Hot Air Blow	TS-1314	\$23.95
Hot Knife	TS-1315	\$23.95
Flame	TS-1316	\$23.95



	Cat.	Qty 1+	Qty 3+	Qty 6+
	TS-1310	\$99.00	\$88.95	\$78.95

### PORTASOL TECHNIC GAS SOLDERING IRON

The Portasol Technic combines compact power, and convenient reliability, making it one of the most versatile gas soldering irons available. It offers a run time of around 60 minutes, and tip temperature is adjustable up to 450°C. With equivalent electrical power of between 10 and 60 Watts, it is ready to tackle just about anything. The protective end cap features a built in flint type igniter, and if the gas is left on, it will turn it off when replaced. If a compact, versatile and reliable gas iron is what you're after, then the Portasol Technic is for you.

Specifications:

- Operating Time: 60 min (approx).
- Refill Time: 10 sec (approx).
- Ignition: Flint ignitor in end cap.
- Dimensions: 170(L) x 19(Dia)mm.
- Weight: 60g without gas.

#### TIPS TO SUIT

1.0mm Conical	TS-1306	\$23.95
2.4mm Chisel	TS-1307	\$23.95
4.8mm Chisel	TS-1308	\$23.95



	Cat.	Qty 1+	Qty 3+	Qty 6+
	TS-1305	\$59.95	\$53.95	\$47.90

### PORTASOL 50 GAS SOLDERING IRON

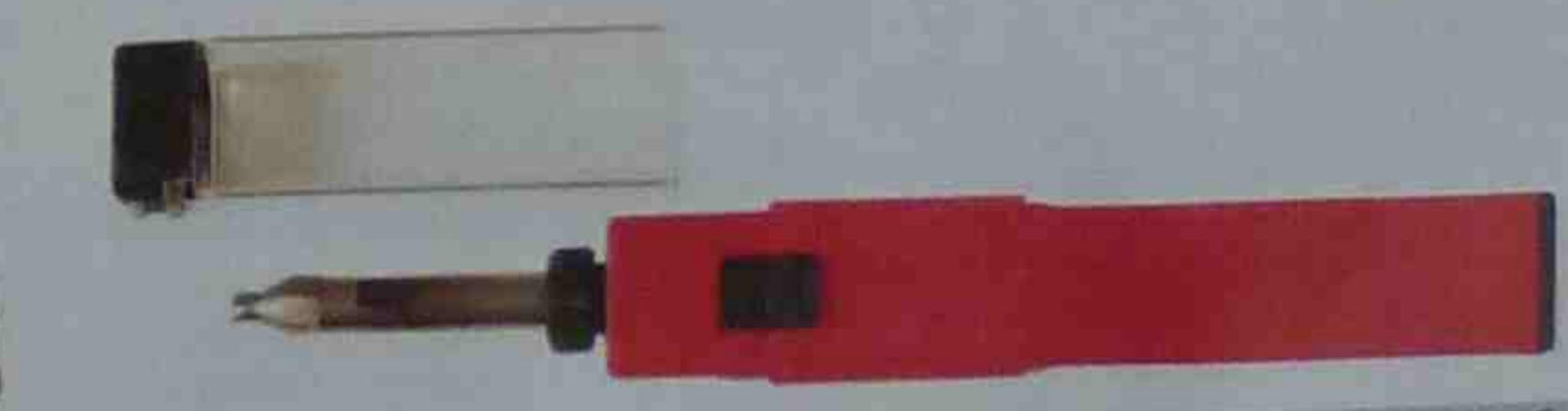
The Portasol 50 is designed specifically with the dedicated DIY enthusiasts in mind. Powered with standard butane gas, it has a run time of around 30 minutes. Ignition is via the flint ignitor in the cap and tip temperature is fixed, reaching an impressive 350°C. With equivalent electrical power of around 35W, it features automatic shut-off when the end cap is replaced and fast refill time. It is a quality tool, sure to give you many years of trouble free operation.

Specifications:

- Operating Time: 30 min (approx).
- Refill Time: 10 sec (approx).
- Ignition: Flint ignitor in end cap.
- Dimensions: 196(L) x 26(W) x 19(D)mm.
- Weight: 60g without gas.

#### TIPS TO SUIT

1.0mm	TS-1301	\$14.95
2.4mm Chisel	TS-1302	\$14.95
4.8mm Chisel	TS-1303	\$14.95



	Cat.	Qty 1+	Qty 3+	Qty 6+
	TS-1300	\$34.95	\$31.45	\$27.90



## Duratech SOLDER

60% TIN / 40% LEAD  
Two sizes available, 1.0mm and 0.71mm diameter  
• 0.71mm is ideal for work with IC's and all fine soldering  
• Both types are resin cored  
• Hobbypacks are supplied in easy to use canisters

1KG REELS	Cat.	Qty 1+	Qty 4+	Qty 10+
0.71mm	NS-3002	\$51.50	\$46.45	\$40.95
1.0mm	NS-3015	\$51.50	\$46.45	\$40.95

200G REELS	Cat.	Qty 1+	Qty 4+	Qty 10+
0.71mm	NS-3005	\$10.95	\$9.75	\$8.75
1.0mm	NS-3010	\$10.95	\$9.75	\$8.75

HOBBYPACK CANISTERS	Cat.	Qty 1+	Qty 4+	Qty 10+
0.71mm	NS-3008	\$1.85	\$1.65	\$1.45
1.0mm	NS-3013	\$1.85	\$1.65	\$1.45

## LEAD-FREE SOLDER

Lead free 15-20 gram plastic pack  
• Diameter 0.71mm  
• Contains 95% Tin, 5% Antimony  
• Melts at 236° - 243°C

LEAD-FREE SOLDER	Cat.	Qty 1+	Qty 4+	Qty 10+
0.71mm	NS-3080	\$6.95	\$6.25	\$5.50

## LEAD-FREE SOLDER

Works just as well as ordinary solder but contains no harmful lead  
• Supplied on a 45gm roll with handy cover  
• Available in two sizes:  
NS-3082: 0.8mm dia.  
NS-3084: 1.0mm dia.  
• Melts at 243°C approx

LEAD-FREE SOLDER	Cat.	Qty 1+	Qty 4+	Qty 10+
0.8mm dia	NS-3082	\$29.95	\$26.90	\$23.70
1.0mm dia	NS-3084	\$29.95	\$26.90	\$23.70

## DESOLDERING BRAID DISPENSER GUN

An integrated desoldering tool for service and production work. Activated by a thumbwheel, it dispenses braid to length and cuts it by trigger action. Solderability and safety are enhanced by eliminating contamination from skin contact. Saves time and money by reducing waste.  
• ESD safe  
• Safer - no more burned fingers  
• Replacement braid: NS-3043

DESOLDERING BRAID DISPENSER GUN	Cat.	Qty 1+	Qty 4+	Qty 10+
Dispenser	NS-3042	\$79.95	\$71.95	\$63.95
Replacement Braid	NS-3043	\$19.95	\$17.70	\$15.70

## ECONOMY DESOLDERING BRAID DISPENSER

Keep your fingers out of harm's way and reduce static risk when desoldering. This dispenser takes 2.4m of 2.4mm Dri-Wick® desoldering braid and is actuated by a thumb-wheel for one-handed operation.  
• ESD safe  
• Disposable, economical

ECONOMY DESOLDERING BRAID DISPENSER	Cat.	Qty 1+	Qty 4+	Qty 10+
Dispenser	NS-3040	\$9.95	\$8.75	\$7.75

## LABORATORY MAGNIFIERS & LAMPS

### DESK MOUNT MAGNIFIER LAMP

This is a high quality, all metal frame construction magnifier which features a 22 watt circular fluoro inside the magnifier head. The magnifier itself is a 3 dioptre lens, with a metal handle mounted on the magnifier head for quick re-positioning. A thumb screw positioned between the two flexible extension arm assemblies allows exact positioning of the lens, and is assisted by a further thumb screw next to the lens head itself. Mounting the magnifier is simple - screw the base onto the side of any desk or workbench (approx. maximum table top thickness 45mm), and slot the magnifier into the bench-mounted receptacle. The fluoro can be turned on or off with a magnifier head-mounted switch, with the tube itself plugged into a mains outlet via a generous 2 metre long cord. A great tool to assist PCB assembly/inspection, jewellers, stamp/coin dealers, etc.

A quality product that will give year after year of reliable service.

- Total extended length 990mm.
- Replacement tube Cat. QM-3523

DESK MOUNT MAGNIFIER LAMP	Cat.	Qty 1+	Qty 2+	Qty 5+
Lamp	QM-3525	\$119.00	\$106.95	\$94.95
Replacement Tube	QM-3523	\$16.95	\$14.95	\$13.35

### BENCH LABORATORY MAGNIFIER LAMP

This magnifier lamp has a 115mm diameter lens that provides 3 dioptre magnification, and a stand that features a quality steel cantilever arm and two swivel joints enabling the magnifier lens to be positioned on almost any angle desired. Features a 22Watt circular fluoro light which is housed under a clear protective screen, a convenient On/off switch positioned on a quality ABS head. Magnifier position is lockable via three lever clamps and the maximum reach of head is over 450mm. The base measuring 200(W) x 280(D) x 40mm(H) and weighing a healthy 3Kgs for increased stability is designed for sitting objects on.

- Lamp is 240VAC operated.
- Replacement fluoro tube Cat. QM-3523

BENCH LABORATORY MAGNIFIER LAMP	Cat.	Qty 1+	Qty 5+	Qty 10+
Lamp	QM-3522	\$149.00	\$133.95	\$118.95

### DESK TOP MAGNIFIER LAMP

The perfect tool for coin/stamp collectors, jewellers etc. This desktop magnifier lamp features a 100mm glass lens that will provide you with 3x magnification. The lamp has a solid base with a bright 12W energy-saving fluorescent lamp with electronic ballast. The lamp also features a swivel joint enabling you to position the lens to suit your needs.

- Base 160mm(dia.)
- Stands 225mm high
- Input: 240VAC
- Replacement tube: QM-3521

DESK TOP MAGNIFIER LAMP	Cat.	Qty 1+	Qty 5+	Qty 10+
Lamp	QM-3529	\$49.95	\$44.90	\$39.90

## ILLUMINATED GOOSENECK MAGNIFIER

The gooseneck magnifier is a valuable accessory for coin/stamp collectors, photography etc. The 2X main lens and 5X insert lens with the bonus of 2 LED lights, is a welcome addition for any hobbyist. The magnifier is clip-on or free standing. Suitable for most flat surfaces or workplace incline up to 38mm thick. The flexible metal arm ensures that you can position the magnifier just where it's needed. This handy magnifier also comes with a soft protective pouch for your lens to protect it from dirt and dust. It also has metal stabilisers to ensure that your magnifier remains stable while working.

- Lens 110mm (dia.) • Stands 225mm high
- Includes protective lens pouch • Requires 3 x AAA batteries

ILLUMINATED GOOSENECK MAGNIFIER	Cat.	Qty 1+	Qty 2+	Qty 5+
	QM-3532	\$36.95	\$33.45	\$29.45

## MAGNIFYING LENS WITH LEDS

Ideal for the elderly or vision-impaired. Keep one in the glovebox for reading the street directory in the dark.

- Big, clear 90mm lens illuminated by two LEDs
- Requires 2 x AAA batteries
- Dual magnification: 3X & 5X
- Case and cleaning cloth included
- Size: 90(Dia) x 160(L)mm

MAGNIFYING LENS WITH LEDS	Cat.	Qty 1+	Qty 2+	Qty 5+
	QM-3537	\$14.95	\$13.35	\$11.70

## LED HEADBAND MAGNIFIER

This magnifying headset leaves both hands free and can be worn over prescription or safety glasses. It also has a built-in LED light that can be rotated up, down or side to side to illuminate your work. There are three lenses that can be used in combinations to give 1.5x, 3x, 8.5x or 10x magnification. The head strap is fully adjustable and locks into position and the lens assembly can be swivelled up out of the way when not in use. A multitude of uses including lapidary, jewellery, model-making, electronics and camera repair.

- Requires 2 x AAA batteries

LED HEADBAND MAGNIFIER	Cat.	Qty 1+	Qty 2+	Qty 5+
	QM-3511	\$39.95	\$35.90	\$31.90

## MAGNIFYING GLASS

This huge 4.5" diameter viewer allows hands free operation. It will fold into a neat and easy to store package.

MAGNIFYING GLASS	Cat.	Qty 1+	Qty 2+	Qty 5+
	QM-3505	\$13.95	\$12.35	\$10.95

## EYE MAGNIFIER

This 3 times magnifier is handy for checking PC boards, looking at stamps or coins, jewellery, etc. etc.  
• Every hobbyist should have one.  
• Size: 28(H) x 22(dia view area) x 40(dia base)mm.

EYE MAGNIFIER	Cat.	Qty 1+	Qty 2+	Qty 5+
	QM-3515	\$8.95	\$7.95	\$6.95

## MICRO MAGNIFIER WITH LED

Having trouble reading or working on your hobby in fading or poor light? This convenient pocket-size magnifier with super bright LEDs allows you to work or read for longer periods. Comes complete with a soft pouch for easy storage. Ideal to take travelling or camping.

- 2 Super bright white LEDs
- 3 X magnification with super 5 X magnifier
- One touch ON/OFF operation
- Measures: 90mm(H) x 58mm(W) x 6mm(D)

MICRO MAGNIFIER WITH LED	Cat.	Qty 1+	Qty 2+	Qty 5+
	QM-3531	\$9.95	\$8.75	\$7.75

## STETHOSCOPE

Listen for mechanical noises in equipment.  
• A very handy diagnostic tool with plenty of non-medical uses

STETHOSCOPE	Cat.	Qty 1+	Qty 3+	Qty 6+
	QM-7255	\$14.95	\$13.35	\$11.70

## DIGITAL MOBILE MICROSCOPES

These portable pocket-sized microscopes are surprisingly powerful with a magnification range of 24x - 90x. They use 3 bright-white LEDs to light up objects and feature an adjustable focus to sharpen images. You can also use image filters in real time. Invert the colour, emboss the image or use greyscale. Great for official inspections, scientific education, dermatology, automotive refinishing, forensics, printing, printed circuit board and integrated circuit analysis, jewellers, kit assembly and much more. It's powered by 3 Ni-MH rechargeable AAA batteries (included) which are easily recharged through your computers USB port or the mains power.

Two versions available:

### DIGITAL MOBILE MICROSCOPE QC-3245

- Adjustable light intensity and LCD brightness
- 1.8" 65,000 colour TFT LCD
- Camera Resolution: 640 x 480 pixels
- Lanyard included
- Includes 3 Ni-MH rechargeable batteries
- Dimensions: 120(L) x 55(W)mm

### DIGITAL MOBILE MICROSCOPE WITH IMAGE CAPTURE QC-3246

Viewed images can be easily transferred to a PC (QC-3246 only) for use in reports, articles, projects etc.

- Adjustable light intensity and LCD brightness
- Split view feature for comparing a saved picture and your current magnification
- Includes software to connect and download images to your PC
- 1.8" 65,000 colour TFT LCD
- Camera Resolution: 640 x 480 pixels
- Capture Resolution: 320 x 240 pixels
- Lanyard included
- Includes 3 Ni-MH rechargeable batteries
- Dimensions: 120(L) x 55(W)mm

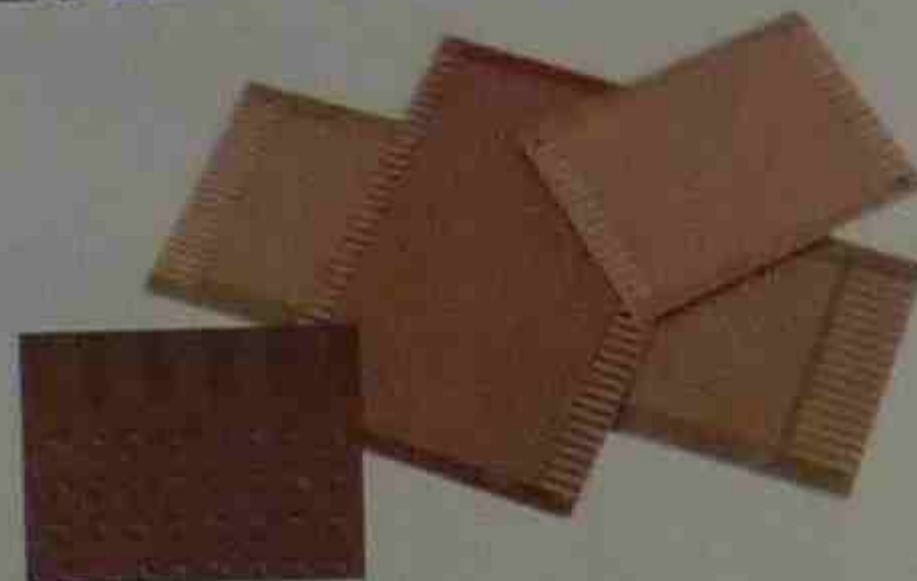
DIGITAL MOBILE MICROSCOPE	Cat.	Qty 1+	Qty 2+	Qty 4+
Digital Mobile Microscope	QC-3245	\$199.00	\$178.95	\$168.95
As above with Image Capture	QC-3246	\$249.00	\$225.00	\$215.00



PC BOARDS -  
VERO TYPE STRIP

Alphanumeric grid,  
pre-drilled 0.9mm,  
2.5mm spacing  
• 95mm wide x 3 handy lengths

Cat.	Qty 1+	Qty 4+	Qty 10+
76mm HP-9540	\$4.50	\$3.95	\$3.60
152mm HP-9542	\$8.50	\$7.50	\$6.75
303mm HP-9544	\$11.50	\$10.35	\$8.95

UNIVERSAL PRE-PUNCHED  
EXPERIMENTER'S BOARDS

CLOSE UP

The low cost way to build prototype or one-off projects. We now stock 3 sizes of phenolic board that has a matrix of punched holes on 0.1" (2.5mm) pitch with 'donut' of tin plated copper around each hole. Finally the non-solder side of the board has an alphanumeric grid printed on it to assist in the component identification board layout.

## SMALL

95 x 72mm, 25 x 30 holes (750) 3.6mm edge pitch.

Cat.	Qty 1+	Qty 4+	Qty 10+
HP-9550	\$4.50	\$3.95	\$3.60

## MEDIUM

140 x 95mm, 29 x 50 holes (1450) 2.5mm edge pitch.

Cat.	Qty 1+	Qty 4+	Qty 10+
HP-9552	\$6.95	\$6.25	\$5.50

## LARGE

210 x 78mm, 24 x 67 holes (1608) 3.6mm edge pitch.

Cat.	Qty 1+	Qty 4+	Qty 10+
HP-9554	\$8.95	\$7.95	\$6.95

## UNCLAD PUNCHED LAMINATE

A single 150(L) x 70(W)mm strip of phenolic punched at 0.1" (2.5mm) grid with NO laminate (copper) on either side.

Cat.	Qty 1+	Qty 4+	Qty 10+
HP-9562	\$5.50	\$4.90	\$4.30

ULTRA MINI  
EXPERIMENTER'S BOARDS

20 holes deep by 16 holes wide with "links" and "strips" (bus rails) every 2 holes. Board measures a compact 65 x 45mm and is extremely versatile. Supplied as a pair, end-to-end. Can be snapped apart to make two boards (dimensions above) or one 130 x 45mm 0.3" wide x 0.1" pitch. • Ideal for DIL ICs in small numbers.

Cat.	Qty 1+	Qty 4+	Qty 10+
HP-9556	\$4.35	\$4.45	\$3.90

## IC EXPERIMENTER'S BOARD

You can fit dozens of DIL ICs on this board. 30 holes deep x 50 holes wide, with a "link"/"strip" (bus rails) pattern enabling alternate V+ and earth rails. Very versatile.

- Alphanumeric markings on grid pattern.
- Size 140 x 95mm.

Cat.	Qty 1+	Qty 4+	Qty 10+
HP-9558	\$6.95	\$6.25	\$5.50

## ALUMINIUM SHEET

18 gauge 295 x 295mm



Cat.	Qty 1+	Qty 4+	Qty 10+
HM-9500	\$13.95	\$12.35	\$10.95

## PERSPEX - RED OR GREY

• 195 x 195mm.  
• 3mm thick.



Cat.	Qty 1+	Qty 4+	Qty 10+
Red HM-9505	\$13.95	\$12.35	\$10.95
Grey HM-9507	\$13.95	\$12.35	\$10.95

THERMAL TRANSFER TAPE  
100 x 100 x 0.5MM -  
PACK 2

When it comes to attaching devices like star LED modules to heatsinks, it's often not easy as they don't have screw "eyes" like a TO220 transistor package. The material is self adhesive and provides good thermal conductivity making it easy for chipsets, LED modules, memory modules etc.

- 2 pcs of 100mm x 100mm sheets supplied. 0.5mm thickness.
- Thermal Conductivity: 1.6 W/m-k
- Flammability Level: UL94V-0.
- Working Temperature Range: -60 to +250°C.
- Insulation Strength: >7,000V/mm

Cat.	Qty 1+	Qty 4+	Qty 10+
NM-2790	\$12.95	\$11.35	\$10.35

COMPONENT LEAD  
FORMING TOOL

Get the hole spacing for your resistors and diodes perfect every time. This handy forming tool provides uniform hole spacing from 10 to 38mm. Suitable for production assembly, education and training. The tool is double sided with one side for use with DO47 outline diodes (eg 1N914) and 1W zener diodes, the other side being suitable for 1/5W resistors, DO41 outline diodes (eg 1N4004). An incredibly handy tool!

Cat.	Qty 1+	Qty 4+	Qty 10+
TH-1810	\$7.95	\$6.95	\$6.25

## MINI BREADBOARD

One terminal strip supplied which gives 30 holes x 10. Total 300 holes.  
• Size 39(W) x 87(L)mm.

Cat.	Qty 1+	Qty 4+	Qty 10+
PB-8832	\$9.95	\$8.75	\$7.75

## BREADBOARD

- 840 tie points.
- 200 distribution holes.
- 640 terminal holes.
- (Simply a combination of 2 x Distribution strip + 1 Terminal strip).
- Size 65(W) x 175(L)mm.

Cat.	Qty 1+	Qty 4+	Qty 10+
PB-8814	\$19.95	\$17.70	\$15.70

## BREADBOARD

- 1680 tie points.
- 400 distribution holes.
- 1280 terminal holes.
- Mounted on a metal plate.
- 3 banana terminals.
- Rubber feet.
- Size 157(W) x 237(H)mm.
- Board size: 130(W) x 175(H)mm.

Cat.	Qty 1+	Qty 4+	Qty 10+
PB-8816	\$44.95	\$40.45	\$35.90

## BREADBOARD JUMPER KIT

This kit consists of 70 pcs of single core sturdy wire which has been stripped on each end and bent at right angles.

- Specifically made for breadboards.
- There are 5 pcs each of 14 different lengths.



Cat.	Qty 1+	Qty 4+	Qty 10+
PB-8850	\$11.95	\$10.70	\$9.50

ECONOMY BREADBOARD  
JUMPER KIT

Solid core hookup cable, which is the ideal size for breadboards. Cut it to whatever lengths you require and strip the ends.

## 2 METRES EACH OF 5 COLOURS

Colours may vary from time to time.



Cat.	Qty 1+	Qty 5+	Qty 10+
Per Pack WH-3032	\$3.45	\$3.05	\$2.70

## PIN EXTRACTOR PRESS

A handy little pin-extractor/inserter press with a 0.8mm punch. Mainly intended for taking links out of watch bands, but endless other uses for jewellery making, modelmaking and hobbies.

- 2 spare pin punches
- Assortment of 12 pins

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2014	\$13.95	\$12.35	\$10.95

RISTON UV/PCB  
DEVELOPING SYSTEM

This is basically blank printed circuit board, with a photo-resist. A photo-resist is a coated chemical that changes composition when exposed to light. The PCB Riston is placed on a flat surface, and your negative artwork is then sandwiched between a sheet of glass and the Riston PCB. You can expose the PCB pattern and board in broad daylight, however a controlled source of UV is recommended. After the recommended exposure time, you remove the PCB pattern. Where the Riston was in shadow the photo-resist will not have changed chemical composition. Where it has been exposed it will. You then apply the Developer (HG-9964) to complete the process. The copper tracks will still have the Riston present, and this must be removed with Stripper CRS-40 (HG-9968).

## RISTON PCB

Blue negative acting, FR4 fibreglass material.  
• Single sided.



## 152 X 152MM

Cat.	Qty 1+	Qty 4+	Qty 10+
HG-9970	\$24.95	\$22.35	\$19.70

## 152 X 305MM

Cat.	Qty 1+	Qty 4+	Qty 10+
HG-9972	\$59.95	\$53.95	\$47.90

RISTON STRIPPER  
& DEVELOPER

Stripper required to clean board before soldering.  
• 600ml bottle.



Cat.	Qty 1+	Qty 4+	Qty 12+
Stripper HG-9968	\$9.95	\$8.75	\$7.75
Developer HG-9964	\$7.95	\$6.95	\$6.25

## PRESS 'N' PEEL FILM



This is by far the easiest way to make Printed Circuit Boards from CAD software or magazine PCB layout artwork. You simply make the PCB image by putting a Press 'N' Peel sheet of transfer film in the paper tray of a photocopier or Laser Printer (The sheet size is almost the same as the A4 paper tray). You then print or copy the PCB track image onto the film. Using a domestic clothes iron you press the image onto a pre-cleaned piece of copper clad PCB. The image transfers to the copper and the image will not etch away. Ammonium persulphate or ferric chloride are both OK. You get 5 sheets of 215 x 280mm transfer film in each pack. Full instructions are supplied.

- 4 Easy Steps:  
1. Print or Copy 2. Iron on 3. Peel off 4. Etch

Cat.	Qty 1+	Qty 4+	Qty 12+
HG-9980	\$35.00	\$31.45	\$27.95

ETCH RESISTANT PEN  
(DALO PEN)

This looks like a normal felt tip pen but it isn't. You simply draw on a clean piece of blank copper clad PCB. The ink from the pen is etch resistant so you have a quick and simple way of making that PCB! The ink will wash off afterwards with metho, turps, etc.

Cat.	Qty 1+	Qty 4+	Qty 10+
TM-3000	\$9.95	\$8.75	\$7.75

## BLANK FIBREGLASS PCB

Pure copper bonded to quality fibreglass base.

- HP-9514, 9512, 9510 are single sided.
- HP-9515 is double sided.

mm	Cat.	Qty 1+	Qty 4+	Qty 10+
150x75	HP-9514	\$5.95	\$5.25	\$4.75
150x150	HP-9512	\$8.95	\$7.95	\$6.95
150x150	HP-9515	\$9.50	\$8.50	\$7.50
300x300	HP-9510	\$19.95	\$17.70	\$15.70

## PCB ETCHING KIT



An ideal kit for anyone needing to etch a circuit board - complete with an assortment of copper boards, etchant, working bath and tweezers. It also includes a positive acting photosensitive PCB and developer.

- Supplied with:
- 1 x Plastic bath to accept PCBs up to 180 x 110mm
  - 1 x Photosensitive single sided PCB
  - 1 x Sachet of positive developer for Riston
  - 1 x 100g sachet of sodium persulphate etchant
  - 1 x Plastic tweezers
  - Assortment of PCB's, Instructions

Cat.	Qty 1+	Qty 4+	Qty 10+
HG-9990	\$27.95	\$24.95	\$22.35

AMMONIUM  
PERSULPHATE -  
400GM

The alternative to ferric chloride. Mix contents (400 grams) with 1.5 litres of hot water to etch copper boards. The contents will treat about 500sq/cm of PCBs.

Cat.	Qty 1+	Qty 4+	Qty 12+
NC-4254	\$12.95	\$11.35	\$10.35

ETCH YOUR OWN PC  
BOARDS BOOKLET

Need just one or two printed circuit boards, for a magazine project or a prototype for your latest design? It's not too hard to etch your own single sided or even double sided boards, especially if you have access to a photocopier or a PC and laser printer. In this tech update we tell you all you need to know.



Cat.	Qty 1+
BI-8212	\$2.00

DEOXT PROGOLD CONTACT  
CLEANER & REJUVENATOR -  
PEN STYLE

Simple cleaners wash away dirt, grime, and dust from your expensive equipment but are often ineffective at cleaning tough oxidation and metal sulphide contamination. This product will not only clean, but it will help restore your equipment to its original condition, improving its performance.

- Kit contains:
- Deoxit Power Booster 7.4ml
- Deoxit Pro Gold Conditioning Treatment 7.4ml
- 2pc Brush Applicator
- 4pc Swabs
- Lint Free Cloth



Cat.	Qty 1+	Qty 4+	Qty 10+
Pen NS-1430	\$19.95	\$17.70	\$15.70
Aerosol NS-1434	\$24.95	\$22.35	\$19.70
Kit NS-1436	\$24.95	\$22.35	\$19.70

PROGOLD CONTACT  
PROTECTOR PEN STYLE

Simple cleaners wash away dirt, grime, and dust from your expensive equipment but are often ineffective at cleaning tough oxidation and metal sulphide contamination. This product will not only clean, but it will help restore your equipment to its original condition, improving its performance.

Cat.	Qty 1+	Qty 4+	Qty 10+
NS-1432	\$18.95	\$16.95	\$14.95

FOR SOLDER, LEAD  
FREE SOLDER, SOLDER  
PASTE AND FLUX SEE  
PAGES 37 - 38.

## SILVER CONDUCTIVE PEN



This is a highly conductive polymer for use in a variety of applications and is an indispensable tool for fixing damaged circuit board tracks. The pen can also be used to draw new tracks on circuit boards, making jumpers, or even designing prototype circuit boards. It is suitable for use on most surfaces and has excellent adhesion and abrasion resistance properties. Tracks can even be soldered after heat curing.

- 1mm track trace width.
- 0.02 Ohm per mm resistivity.

Cat.	Qty 1+	Qty 4+	Qty 10+
NS-3033	\$29.95	\$26.90	\$23.70

SILVER CONDUCTIVE  
VARNISH

This silver conductive varnish adheres well to glass, PCB material, ceramics etc. Repairs printed circuits, window antennas, window alarm loops etc. Very good conducting properties.

- Approximately 0.02 - 0.1 Ohms/cm2.



Cat.	Qty 1+	Qty 4+	Qty 10+
NS-3030	\$9.95	\$8.75	\$7.75







## AEROSOLS

### PTFE DRY LUBRICANT SPRAY

This water displacing PTFE lubricant is formulated to provide a dry, lubricating film that is perfect for use with electronic & mechanical assemblies, chains & sprockets, rollers, runners, & power tools etc. It prevents rusting on ferrous metals and helps loosen stiff or sticking parts. The spray can be used in automotive, marine and household environments.



Cat.	Qty 1+	Qty 4+	Qty 12+
175g NA-1013	\$17.95	\$15.95	\$14.35

### FREEZING SPRAY

Non CFC ozone safe propellant. Instant freeze spray for rapidly cooling components to detect intermittent thermal faults, dry joints and overheating problems.

- Non-flammable.
- 250g size.



Cat.	Qty 1+	Qty 4+	Qty 12+
250g NA-1000	\$17.95	\$15.95	\$14.35

### CONTACT CLEANER LUBRICANT

A blend of non CFC solvents and RF contact treatment oil. Ideal for cleaning and lubricating non-arcng contacts and mechanisms. Can be used for cleaning & lubricating all types of contacts.

- Safe on most plastics.



Cat.	Qty 1+	Qty 4+	Qty 12+
175g NA-1012	\$11.50	\$10.35	\$8.95

### CIRCUIT BOARD LACQUER

Non CFC ozone safe propellant. Premium quality flexible coating to protect printed circuit boards from humidity and environmental attack. Special solder through lacquer so previously coated boards can be soldered.



Cat.	Qty 1+	Qty 4+	Qty 12+
175g NA-1002	\$11.50	\$10.35	\$8.95

### ELECTRONIC CIRCUIT BOARD CLEANER

Non CFC ozone safe propellant. It may not be obvious, but many circuit problems occur when flux and other contaminants (even finger prints) remain on the PCB causing 'leakage' between tracks. If you work with RF, high impedance (i.e. FET Op-Amps etc), isolator or other circuits, PCB cleanliness is a MUST. The electronic circuit board cleaner is a spray that dissolves flux residues & grime leaving the track work and board absolutely clean. We then recommend that you 'tropicalise' the board with circuit board lacquer (NA-1002).



Cat.	Qty 1+	Qty 4+	Qty 12+
175g NA-1008	\$11.50	\$10.35	\$8.95

## WATER DISPLACEMENT & LUBE SPRAY

Multi-use water displacing and rust preventing lubricant specially formulated for use with electronic and mechanical assemblies. Displaces moisture from metal surfaces including: relays, switches, distributors etc. Quickly penetrates rusted and corroded metal parts like nuts and bolts, valves, tools. Also removes grease, chewing gum, adhesives, crayons from most surfaces.

IT'S NOT WD40 BUT WE THINK IT'S JUST AS GOOD



Cat.	Qty 1+	Qty 4+	Qty 12+
175g NA-1025	\$5.95	\$5.25	\$4.75

### SPRAY-ON CONTACT ADHESIVE

This pressure-sensitive contact adhesive is in an aerosol can, and bonds to paper, fabric, leather, rubber, foam, vinyl, concrete, metal, in fact almost any surface! No more spills and dribbles from a tube, or sticky screwdrivers (and plastic applicators) from applying glue to a surface. Great for laying innerbond and speaker carpet in/on speaker cabinets etc.



Cat.	Qty 1+	Qty 4+	Qty 12+
400g NA-1504	\$16.95	\$14.95	\$13.35

### BUTANE GAS

Use it for filling up your gas soldering iron, flame torches, cigarette lighters, etc. Includes five different adaptors, which cover most different gas valves.

- Includes filling instructions.



Cat.	Qty 1+	Qty 4+	Qty 12+
150g NA-1020	\$5.95	\$5.25	\$4.75

### DUST REMOVER

Non CFC. Non flammable gas which allows removal of dust from electronic, electrical and optical devices. It does not leave residues and is non toxic and non conductive.

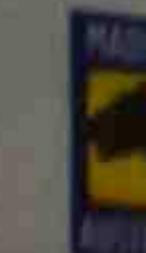
- 250 grams



Cat.	Qty 1+	Qty 4+	Qty 12+
250g NA-1018	\$17.95	\$15.95	\$14.35

### ELECTRONIC CLEANING SOLVENT

Non CFC ozone safe propellant. A highly efficient fast drying solvent of high purity. For use on delicate electronic, electrical & precision mechanical assemblies (i.e. tuners, switches, plugs, sockets, relays, pots, etc).



Cat.	Qty 1+	Qty 4+	Qty 12+
175g NA-1004	\$11.50	\$10.35	\$8.95

## ULTRASONIC DISTANCE METER WITH LASER

Measure distance quickly from a remote position. This ultrasonic measurer also calculates area, sums total readings and stores data for later use in imperial or metric units. Laser pointer for accurate placement of the measurement point.

- Backlit LCD
- Range: 0.6 - 16m (1.6 - 52ft)
- Accuracy:  $\pm 1\%$  of reading
- Response time: 2 seconds
- Auto power-off: 100 seconds
- Backlight time-out: 7 seconds
- Auto or manual power-off
- Case and belt-clip included
- Dimensions: 175(L) x 62(W) x 45(D)mm



Cat.	Qty 1+	Qty 3+	Qty 6+
QP-2295	\$44.95	\$40.45	\$35.90

## LASER LEVEL WITH TAPE MEASURE



Whether you are a keen handy person around the house or a professional, you'll love this laser level with tape measure. Use this tool to hang pictures, paintings or mirrors in your home, install shelving, lay tiles etc. The range of the laser line projects up to 6m indoor and covers an angle arc of 45 and 90 degrees. The unit incorporates a horizontally spread laser to create illuminated guide lines along walls, horizontal and vertical levels. It also includes a handy 2.5m tape measure as well as a ruler on the side with inches on one side and millimetres on the other.

- Size: 158(L) x 57(H) x 27(D)mm
- Indoor Laser Range: 20 ft/6m
- Laser Diodes: red 640 to 660nm wavelength
- Levelling: 2 Bubble Vials
- Power Supply: 2 x "AAA" batteries (not included, use our SB-2426)

Cat.	Qty 1+	Qty 3+	Qty 6+
ST-3113	\$14.95	\$13.35	\$11.70

## CIRCUIT TESTER 90 - 300V

This small circuit tester allows you to test mains voltage for live circuits between 90V to 300V. It also has a pocket clip to prevent it from falling out while getting into those awkward places.

- Internal neon light to indicate a live circuit
- Pocket Clip
- Insulated Casing
- AC/DC indicator



Cat.	Qty 1+	Qty 3+	Qty 6+
QP-2740	\$3.95	\$3.45	\$3.15

## ELECTRICAL SCREWDRIVERS

This range of trade quality insulated screwdrivers is one of the most comfortable screwdrivers we have ever used. The ergonomic handles have a soft rubber coating for a secure, comfortable grip that you can use for hours on end. All are TUV and GS approved and rated up to 1kV.

- A size for any application

### SLOTTED

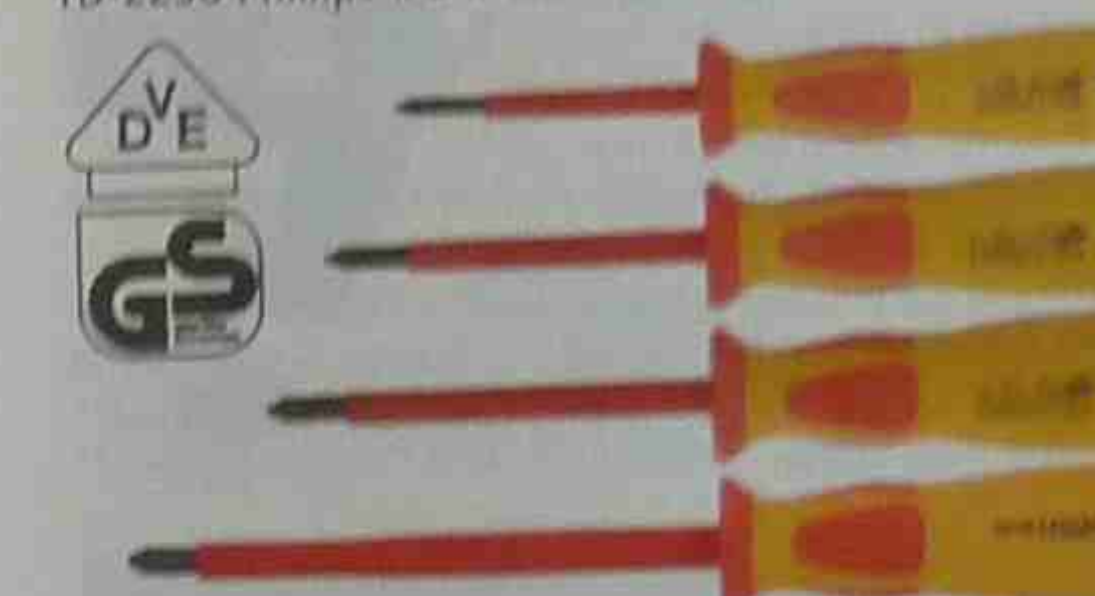
- TD-2230 Flat Blade 2.5 x 75mm
- TD-2231 Flat Blade 3.0 x 100mm
- TD-2232 Flat Blade 5.5 x 125mm
- TD-2233 Flat Blade 6.5 x 150mm
- TD-2234 Flat Blade 8.0 x 175mm



Wmm	Lmm	Cat.	Qty 1+	Qty 3+	Qty 6+
2.4	75	TD-2230	\$4.50	\$3.95	\$3.60
4.0	100	TD-2231	\$4.95	\$4.45	\$3.90
5.5	125	TD-2232	\$5.65	\$4.95	\$4.45
6.5	150	TD-2233	\$6.95	\$6.25	\$5.50
8.0	175	TD-2234	\$7.95	\$6.95	\$6.25

### PHILLIPS

- TD-2235 Phillips #0 x 60mm
- TD-2236 Phillips #1 x 80mm
- TD-2237 Phillips #2 x 100mm
- TD-2238 Phillips #3 x 150mm



Size Blade	Cat.	Qty 1+	Qty 3+	Qty 6+
0 60mm	TD-2235	\$4.95	\$4.45	\$3.90
1 80mm	TD-2236	\$5.65	\$4.95	\$4.45
2 100mm	TD-2237	\$6.95	\$6.25	\$5.50
3 150mm	TD-2238	\$7.45	\$6.50	\$5.75

## 1,000V 7 PIECE SCREWDRIVER SET

A quality set of 7 screwdrivers with storage box that offers reliability & value without compromise. GS & VDE tested & approved to 1000V. With red handles and insulation right to the tip, you will find them amongst your tools quickly & easily.

- DIN EN 60900.



- Drive sizes:
- Flat: 1.2 x 6.5 x 150mm, 1 x 5.5 x 125mm, 0.8 x 4 x 100mm and 0.6 x 3.5 x 75mm
  - Phillips: #2 x 100mm, #1 x 80mm and #0 x 60mm



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2022	\$24.95	\$22.35	\$19.70

## MARINE GRADE STAINLESS STEEL

MADE FROM #316 GRADE MARINE (3CR13) STAINLESS STEEL. EXCELLENT FOR HOSTILE ENVIRONMENTS LIKE SALT WATER, CHEMICALS ETC.

### SCREWDRIVER

- Slotted or Phillips



Size (L)mm	Cat.	Qty 1+	Qty 3+	Qty 6+
Slotted 3mm 75	TD-2340	\$4.95	\$4.45	\$3.90
Slotted 4mm 100	TD-2342	\$5.65	\$4.95	\$4.45
Slotted 5mm 125	TD-2344	\$5.95	\$5.25	\$4.75
Phillips 1 80	TD-2350	\$4.95	\$4.45	\$3.90
Phillips 2 100	TD-2352	\$5.95	\$5.25	\$4.75

## "SMART" TEST SCREWDRIVER



- Capacitor check
- Diode check
- Transistor check
- Globe/relay/fuse/speaker/resistor check
- Locating broken wire
- Picks up static radiation of TV or monitor
- Instantaneously checks AC power
- Earth disconnection check

It allows you to check / test the following safely:

- AC voltages: Contact method from 70 to 250V AC
- Non contact method from 70 to 250V AC

- DC voltage test up to 250V DC
- Continuity check - L = 0 to 5M $\Omega$ , -H = 0 to 2,000 M $\Omega$
- Polarity check 1.5V to 36V DC
- Microwave leak detector greater or equal to 5MW/CM $^2$
- Wrong mains connection check
- Check operating condition of negative ion generators.
- It is also a screwdriver!!!
- Supplied with comprehensive instructions.
- Brightly coloured.
- Batteries included.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2055	\$11.95	\$10.70	\$9.50

## LOW VOLTAGE CIRCUIT TESTER 6, 12, 24 VOLTS



Looks like a neon test screwdriver but instead of a blade on the end this tester has a probe and a 28" lead which clips to ground. Suitable for 6/12/24 volts for use on cars, trucks, boats, etc.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2049	\$3.95	\$3.45	\$3.15

## TOOL MAGNETISER / DEMAGNETISER

Magnetised screwdrivers make life easier. This tool has two slots, one which will magnetise and the other to demagnetise. The holes are large enough for the largest of screwdrivers.

- 50 x 50 x 30mm



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2042	\$6.95	\$6.25	\$5.50

## LED SCREWDRIVERS WITH 10 BITS



LED illuminated bit driver for working in spaces with poor lighting. The handle has four LEDs built in to provide working light. 10 bits are included, but any standard hex bit will fit. Great for fiddling around under the bonnet etc.

- Four LEDs to eliminate blind spots
- Bits included: PH #0, #1, #2, slotted 3, 4, 5mm, T15, M6 pin drive, M4 hex, hex - 1/4" square converter
- Batteries included, plus a spare set

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2091	\$22.95	\$20.35	\$18.35

## 4 IN 1 SCREWDRIVER SET



This handy screwdriver has four different bits and is about the size of a normal pen. The lid can also be used to extend the length of the handle. Encased in a durable plastic case.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1909	\$3.95	\$3.45	\$3.15

## 5 PIECE SCREW EXTRACTOR SET

Also known by the trade name of 'Easypouts', these are the only real way to get a completely stripped or mangled screw, bolt or stud out, even if the head has broken off completely. You simply drill a hole in what remains of the offending fastener, then use the appropriate size screw extractor with a tap wrench. They have an aggressive left-handed thread that bites into the metal, enabling you to unscrew the damaged fastener. This is the kind of tool you need once in a blue moon, but when you need them, they're indispensable.

Sizes: 1/8", 5/32", 3/16", 1/4", 5/16"  
Case size: 120(W) x 120(H) x 15(D)mm

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2079	\$11.95	\$10.70	\$9.50

## 6-IN-1 COMPACT SCREWDRIVER



This innovative compact screwdriver has six of the most needed blades that are stored neatly in the handle until you need them. You rotate the collar on the handle to eject the blade you want. The blades can't completely come out and thus cannot get lost. They slide down to fit within the length of the handle. Compact and robust with hardened blade tips. Shafts made of a very strong, corrosion-resistant alloy of iron, vanadium and molybdenum.

- Slotted: 4, 5, 6mm
- Phillips: #1, #2, #3
- Size Compacted: 128(L) x 30(Dia)mm

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2028	\$18.95	\$16.95	\$14.95



# CUTTERS & PLIERS

TOOLS

## CARBON STEEL TOOLS

### 150MM PRECISION SIDE CUTTERS

These cutters are made from the same High Carbon Steel as our TH1885 long nose pliers and are designed for sharp cutting in precision wiring. They have insulated soft-touch handles and a coil return spring for fatigue free use.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1891	\$44.95	\$40.45	\$35.90

### 125MM PRECISION LONG NOSE PLIERS

These quality pliers are made in Japan from the same High Carbon Steel that is used to make professional chef's knives. The pliers feature serrated jaws and a box joint to provide a precise action and strong grip. The coil spring ensures smooth, fatigue-free use. Insulated soft touch handles.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1885	\$39.95	\$35.90	\$31.90

### FUJIYA 110MM PRECISION SIDE CUTTERS

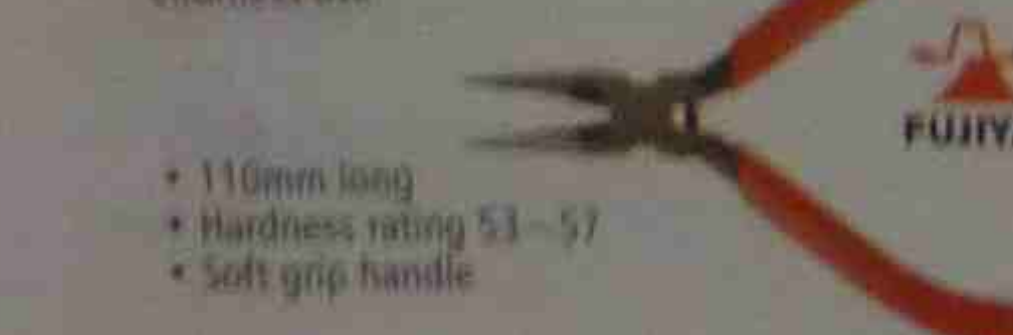
Beautifully engineered side cutters for the discerning tradesman. These cutters feature high quality tool steel construction and are perfect for cutting super fine wire as well as general workshop use. They aren't just good to look at, they are tough as well and can cut steel wire up to 1.6mm without harm. The insulated handles are spring loaded for effortless use.

- 110mm long
- Blade hardness: Rockwell C Scale 57-61
- Soft grip handle

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2332	\$39.95	\$35.90	\$31.90

### FUJIYA 110MM PRECISION LONG NOSE PLIERS

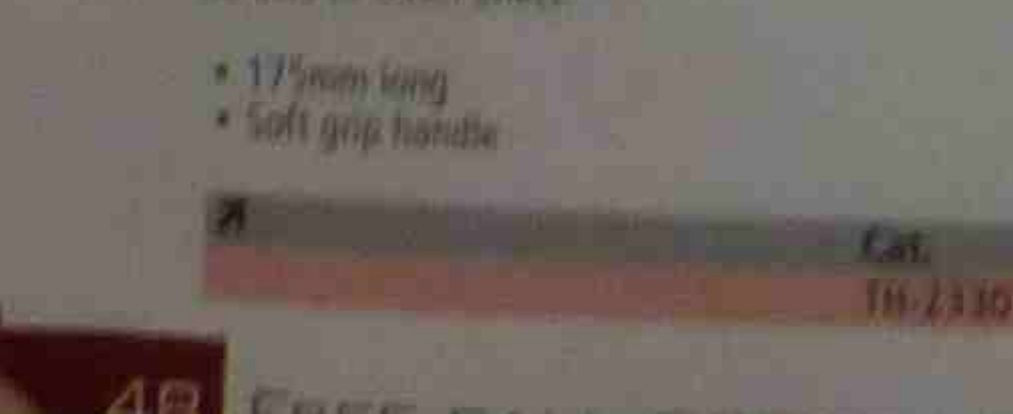
These are the perfect companion for our TH-2332 precision side cutters and are made to the same exacting specifications. The insulated handles are spring loaded for effortless use.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2334	\$39.95	\$35.90	\$31.90

### SCREW REMOVING PLIERS - 175MM

This tool is basically designed to remove, by brute force, a hopelessly stripped out head of any type of small non-countersunk screw. The secret is an oval-shaped serrated hole in the end of the plier. You place the plier over the head of the screw, grip and rotate the plier. This system applies a lot more torque to the head of the screw than a drill bit ever could. It's reminiscent of the plier that a dentist used to extract your tooth!! Its Japanese manufacturer has provided a beautifully made and finished product. Suitable for any screw in the range of 2.0 to 5.0mm or so, although it will work on larger screws to lesser effect.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2330	\$29.95	\$26.90	\$23.70

## WHEN STAINLESS STEEL IS NOT THE BEST

We are big fans of Stainless Steel. We love it in tools, fasteners & many building products. It is not, however, always the best material. Top chefs will tell you, for example that the best knives are not stainless. They are made out of carbon steel. Why? Carbon steel is far harder & tougher than stainless. The problem of course is that carbon steel will rust if not maintained.

In our search for the best hand-tools we have decided to introduce two very high quality Japanese-made products made out of carbon - steel. They are not cheap but they are for the professional user whose time is money. Like carbon steel knives, rust is not a problem if used constantly. They will, however, pay you back every day because they will stand up to heavy wear & tear.

For those who have only occasional use for hand tools, we sincerely recommend stainless steel products.

### 5" STAINLESS STEEL PRECISION CUTTERS

These Precision Cutters are just that - precision! The best cutters and pliers are box joint which these are. A box joint ensures a precise and positive grip and cutting action. They are of course, stainless steel with a polished finish. They have a leaf spring for smooth controlled action, and cut flush. Handles are black with a cushion grip and length is around 125mm (5").

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1886	\$17.95	\$15.95	\$14.35

### 5" STAINLESS STEEL PRECISION LONG NOSE PLIERS

These long nose pliers are made from polished stainless steel and have a box joint which ensures a precise and positive grip and cutting action. Includes a leaf spring and have serrated jaws.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1888	\$17.95	\$15.95	\$14.35

## STAINLESS STEEL SIDE CUTTERS



High quality small side cutters that have thick (2mm) blades and comfort soft plastic handles which are spring loaded.

- 115mm long

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1890	\$13.95	\$12.35	\$10.95

## STAINLESS STEEL LONG NOSE PLIERS



The partner to our TH-1890 stainless steel cutters. These have half round smooth gripping jaws perfect for adjusting and bending components, picking up that dropped nut, etc. Comfortable soft plastic handles which are spring loaded.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1893	\$13.95	\$12.35	\$10.95

## PRECISION 5" ANGLED SIDE CUTTERS



Precision side cutters that are ideal for fine PCB work. They will easily cut leads flush with the board's surface. The cutters are made from quality tool steel and have soft padded handles that are spring loaded for comfortable long term use.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1897	\$11.95	\$10.70	\$9.50

## PRECISION 6" LONG NOSE PLIERS



Precision, slim line long nose pliers that are ideal for working in confined areas. They have serrated jaws so you can get a firm grip on the item you're holding. The pliers are made from quality tool steel and have soft padded handles that are spring loaded for comfortable long term use.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1887	\$11.95	\$10.70	\$9.50

## TOOLS FOR YOUR TRADE

Jaycar is an approved supplier. This joint Australian Federal Government and Australian Apprenticeship Initiative allows qualified participants to an \$800 (including GST) allowance to purchase "Tools for Your Trade". Do you qualify? Find out at [www.toolsforyourtrade.com.au](http://www.toolsforyourtrade.com.au)

## 6" SIDE CUTTERS - INSULATED



This drop forged alloy tool is made to the same standards as our TH-1984 combination pliers. It is just as tough and will also cut piano wire up to 1.6mm. This is a quality tool and designed for dedicated wire cutting. It has comfortable double inset handles.

- 160mm/6" long

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1985	\$17.95	\$15.95	\$14.35

## 6.5" LONG NOSE PLIERS - INSULATED



You can see the quality German design in these strong and attractive pliers. They are drop forged to the same standards as the other tools in the range and have the same cutting capacity - up to 4.0mm electrical wire. A very attractive tool with comfortable handles. The high quality manufacture means they can take the work and last for ages. This could be the last pair of long nose general purpose pliers you need to buy!

- 170mm / 6.5" long

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1986	\$16.95	\$14.95	\$13.35

## 180MM (7") COMBINATION PLIERS



Strong, Tough & Reliable. These high quality drop forged alloy steel pliers are a professional tool and manufactured to the rigid German DIN standards for electrical safety & mechanical strength. They are for serious tradesmen who need a quality tool. These pliers will cut hard (piano wire) wire up to 1.6mm & soft (annealed copper, aluminium silver etc.) up to 4.0mm. Non slip double inset handles are comfortable to hold.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1984	\$19.95	\$17.70	\$15.70

## 4.5" BULL NOSE PLIERS



These high quality miniature combination bull nose pliers are made from hardened carbon steel with a micro-nickel finish. The handles have a matt red vinyl coating. TUV and GS approved. 120mm / 4.5" long.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1889	\$11.95	\$10.70	\$9.50

## MARINE GRADE STAINLESS STEEL HAND TOOLS

### A RANGE OF QUALITY HAND TOOLS IN #316 MARINE GRADE (304/3) STAINLESS STEEL

Even the highest quality carbon steel tool will rust hopelessly in a fishing tackle box. How many times have your pliers seized up with rust? If you need to use tools in a hostile environment like saltwater, chemicals etc. then these tools are for you.

- Marine mechanical service.
- Marine electrical service.
- Swimming pool maintenance.
- Hazardous wet area/ chemical maintenance.
- Professional fishing.
- Outdoor road maintenance.
- Recreational fishing.
- Hydraulic hose repair industry.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1985	\$17.95	\$15.95	\$14.35

### 150MM (6") DIAGONAL CUTTERS

Very strong jaws will enable this tool to last for years. Heavy duty plastic handle. Will cut up to 1.2mm mild steel wire.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2304	\$14.95	\$13.35	\$11.70

### 150MM (6") LONG NOSE PLIERS

Heavy duty plastic handle with wire cutting facility. Bright polished finish.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2300	\$12.95	\$11.35	\$10.35

### 170MM (7") BULL NOSE PLIERS

Always handy. Once again heavy duty plastic moulded handle.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2308	\$14.95	\$13.35	\$11.70

### ADJUSTABLE WRENCH (SHIFTING SPANNER)

A must in every toolbox.

- 200mm (8").



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2312	\$14.95	\$13.35	\$11.70

### ADEL NIBBLING TOOL

The original and best. The Adel nibbling tool has been around for years and for good reason. It's still the best hand nibbler going around and is ideal for chassis-bashing and all sorts of hobby applications. Cut, notch or trim simple or complex shaped holes in plastics, laminates, leather or metal.

- Capacity:
- Mild steel: 1.2mm
- Aluminium: 1.6mm
- Plastics: 2mm
- Spare punch use TH-1767
- Made in USA.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1765	\$69.95	\$62.95	\$55.95
TH-1767	\$44.95	\$40.45	\$35.90

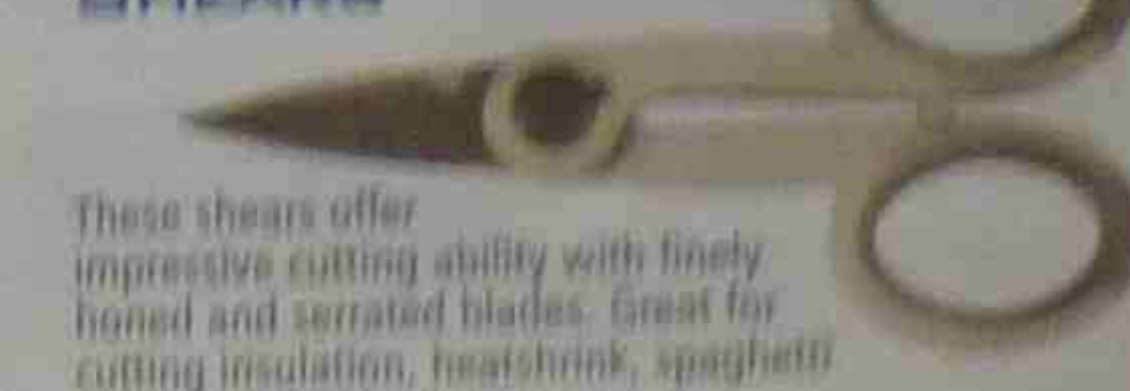
## SHEARS HIGH QUALITY STAINLESS STEEL 7" ELECTRICAL SHEARS



Slice through soft electrical cable with ease. These precision spring loaded stainless steel electrical shears will cut soft wire up to 2.5sqmm and make light work of cable ties, heatshrink, light hook-up wire and cable braid etc. The shears feature insulated handles and a convenient, thumb operated lock to keep them closed when not in use. • Ideal for cutting ribbon cable

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1757	\$7.95	\$6.95	\$6.25

## HIGH QUALITY 5.5" ELECTRICAL SHEARS



These shears offer impressive cutting ability with finely honed and serrated blades. Great for cutting insulation, heatshrink, spaghetti and light duty hook-up wire. These shears feature insulated handles.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1758	\$6.95	\$6.25	\$5.50

## STAINLESS STEEL 6.5" CABLE SHEARS



This set of cutters has a cutting capability of up to 10mm cable. It is constructed from stainless steel and has a hardened long-life cutting edge. For safety and ease of storage, it can be locked in the closed position.

- Stainless Steel
- Lightweight
- Lockable.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1898	\$19.95	\$17.70	\$15.70

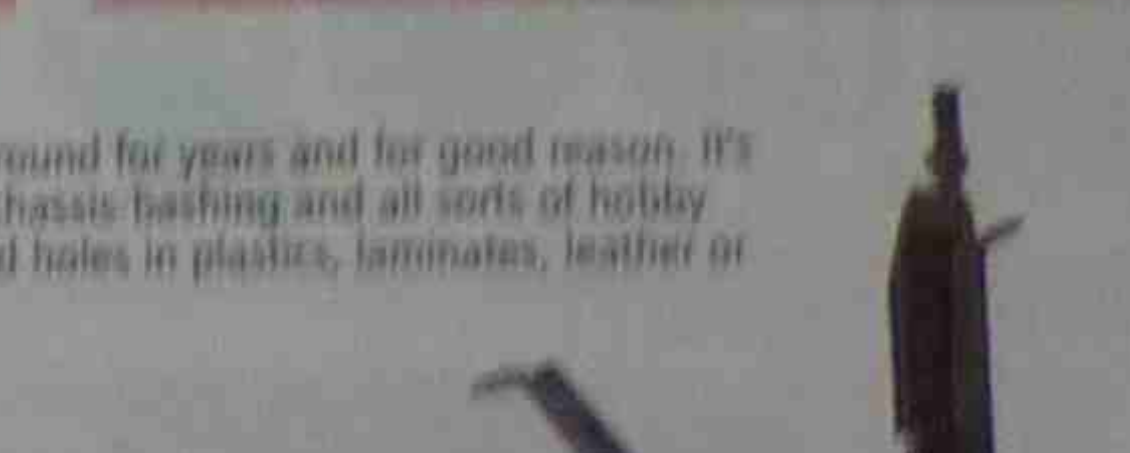
## NIBBLING TOOLS

### NIBBLING TOOL

Will cut any shape out of aluminium, plastic, copper and other unhardened metals up to 18 gauge. Tool is designed to fit into the palm of your hand for easy use, simply drill a 1/4" hole to start.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1768	\$24.95	\$22.35	\$19.70





## PC DRILL PACK

Includes all the common types:  
 • 1 x 3.5mm for PC supports and relays  
 • 2 x 1.2mm for PC pins and hook-up wire  
 • 3 x 1mm for resistors, capacitors, etc.  
 • 4 x 0.8mm for ICs etc.  
 TOTAL - 10 DRILLS

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2400	\$18.50	\$16.35	\$14.70

## MINI DRILLS

Pkt	Cat.	Qty 1+	Qty 3+	Qty 6+
0.8mm ea	TD-2408	\$2.65	\$2.30	\$2.07
0.8mm 10	TD-2420	\$17.95	\$15.95	\$14.35
0.8mm 10	TD-2422	\$17.95	\$15.95	\$14.35
1.0mm ea	TD-2418	\$2.65	\$2.30	\$2.07
1.0mm 10	TD-2421	\$17.95	\$15.95	\$14.35

## HSS ENGINEERING GRADE DRILL BITS

You can buy cheap drill bits from hardware stores but they are almost as soft as cheese. If you want a serious, tradesman quality drill bit you will pay over \$20 for say, a 1/2" bit. We have scoured the world for quality drill bits that won't break the bank! They are less than half the price of comparable quality bits. They are made from the finest quality high-speed steel and we dare you to find them inferior to the Austenitic made bits that are unfortunately so expensive now. (The big ones are made for the 10mm chucks).

Cat.	Qty 1+	Qty 3+	Qty 6+
1/16" TD-2730	\$1.75	\$1.55	\$1.40
3/32" TD-2703	\$1.75	\$1.55	\$1.40
1/8" TD-2706	\$1.75	\$1.55	\$1.40
5/32" TD-2709	\$1.75	\$1.55	\$1.40
3/16" TD-2712	\$1.75	\$1.55	\$1.40
7/32" TD-2715	\$2.45	\$2.15	\$1.95
1/4" TD-2718	\$2.75	\$2.45	\$2.15
5/16" TD-2721	\$4.45	\$3.95	\$3.45
3/8" TD-2724	\$5.45	\$4.90	\$4.30
7/16" TD-2727	\$7.95	\$6.95	\$6.25
1/2" TD-2730	\$11.95	\$10.70	\$9.50
1.0mm TD-2750	\$1.75	\$1.55	\$1.40
1.5mm TD-2752	\$1.75	\$1.55	\$1.40
2.0mm TD-2754	\$1.75	\$1.55	\$1.40
2.5mm TD-2756	\$1.75	\$1.55	\$1.40
3.0mm TD-2758	\$1.75	\$1.55	\$1.40
3.5mm TD-2760	\$1.75	\$1.55	\$1.40
4.0mm TD-2762	\$2.25	\$1.95	\$1.80
5.0mm TD-2764	\$2.65	\$2.30	\$2.07
6.0mm TD-2766	\$2.75	\$2.45	\$2.15
8.0mm TD-2768	\$4.35	\$3.90	\$3.45
9.0mm TD-2770	\$5.45	\$4.90	\$4.30
9.5mm TD-2772	\$6.95	\$6.25	\$5.50
10.0mm TD-2774	\$6.95	\$6.25	\$5.50
11.0mm TD-2776	\$7.95	\$6.95	\$6.25
12.0mm TD-2778	\$9.95	\$8.75	\$7.75
12.5mm TD-2780	\$11.50	\$10.35	\$8.95
13.0mm TD-2782	\$11.95	\$10.70	\$9.50

## PCB DRILL CHUCK

This chuck will allow you to use drill bits from 0.6mm up to 2mm on your normal drill / cordless drill / power screwdriver or screwdriver which accepts standard hex bits.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2070	\$9.95	\$8.75	\$7.75

## ROTARY DRILL PARTS SET



This 400 piece kit will service every bit you will ever need. It also has a base so you can turn your tool into a freehand router and comes housed in a fold-out case so you can see exactly where everything is.

### Contents include:

- Sanding arbours: 2 x 6mm, 2 x 6mm
- Sanding belts (P80): 20 x 12mm, 24 x 6mm
- Collets: 2 x 3/32", 2 x 1/8"
- Drill bits: 2 x 1/16", 2 x 3/32", 2 x 1/8"
- Grinding stones: 2 each of 20 x 4mm wheel, 10 x 4mm wheel, 15 x 10mm cylinder, 12 x 10mm cylinder, 7 x 4mm cylinder, 20 x 10 bullet, 11 x 8mm tapered bullet
- 1 each of: 15 x 6mm cylinder, 15 x 8mm cylinder, 15 x 8mm bull-nose cylinder, 4 x 10mm cylinder
- 10 x 8mm bull-nose cylinder 10 x 10mm inverted cone, 15 x 10mm cone, 10mm ball
- Tungsten carbide burrs: 3mm straight, ball, cone profiles
- Diamond coated burrs: 2 each of 2.5mm straight, 4mm ball, 2mm ball, 2mm fine cone taper
- Polishing wheels: 1 x 25mm, 4 x 12mm, 1 x 15mm bull nose cylinder (mounting shaft included)
- Steel, brass, fibre wire brushes: Wheel, cone and fine brush profiles
- Cutoff wheels: 5 x 30mm
- Grinding wheels: 6 each of P80 20 x 4mm, P120 20 x 4mm (2 x mounting shafts included)
- 1 x P1200 fine grinding stone
- 1 x buffing mop and buffing paste
- 1 x paint-removing wheel
- 1 x 3/8" collet spanner
- 1 x router base
- 1 x grinding wheel dressing stone
- Approx 250 assorted sanding discs
- Case measures: 370(W) x 300(H) x 65(D)mm

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2456	\$69.95	\$62.95	\$55.95

## 3/8" PRECISION KEYLESS DRILL CHUCK

Features an ergonomic design that gives a more powerful locking action and a patented 'Click Lock' system to indicate that the chuck is properly locked. The chuck's unique locking system makes it ideal for use on hammer drills and other high-vibration applications.

- 3/8" - 24UNF mounting thread
- 1/32" - 3/8" (0.8 - 10mm) drill capacity
- Suitable for drills up to 1,200 watts

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2011	\$23.95	\$21.35	\$18.95

## STEPPED DRILL BITS

Drill multiple size holes with the one bit! You can drill through plastics and non-hardened metals (such as aluminium or copper sheeting etc) up to 4mm thick! Made from high speed steel (HSS), they will last for a very long time. Two sizes available.

- 4 - 12mm drill in 1mm steps - TD-2436
- 12 - 20mm drill in 1mm steps - TD-2438

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2436	\$24.50	\$21.95	\$19.35
TD-2438	\$34.50	\$30.95	\$27.45

## 4 PIECE COUNTERSINK SET

The easy way to deburr or countersink. Simply drill hole, insert tool with appropriate bit, and turn for a countersunk angle of 90°. Bits include 12, 16 and 19mm - all hardened carbon steel.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2027	\$13.95	\$12.35	\$10.95

## DEBURRING TOOL

Clean up the edges of a hole. Suitable for steel, plastic, wood etc. Blades are fully ground for safety. SK2 steel blades are hardened to HRC64. Supplied with spare blade. Will deburr virtually anything.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1845	\$9.95	\$8.75	\$7.75

## TAPERED REAMER

This great tool is ideal for enlarging and shaping holes in plastic, thin metal and wood. Tapers from 3mm to 12mm and is made from high quality treated steel.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2130	\$16.50	\$14.70	\$12.95

## FILE SAW

This is a versatile tool that will find many uses around the home or workshop. Great for cutting odd shapes in plaster, PVC pipe, PVC sheeting, leather, plastic and many other soft materials. The tool will trim holes to any radius and get into places where others won't. The blade measures 175mm long and the large, easy grip handle is 120 mm long.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-2127	\$15.95	\$14.35	\$12.70

## M3 & M4 METRIC TAPS

Clean up a cross threaded nut or cut a thread into a chassis or heatsink etc. High quality tool steel. Two sizes available.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2456	\$69.95	\$62.95	\$55.95

Cat.	Qty 1+	Qty 3+	Qty 6+
3mm TD-2440	\$3.75	\$3.30	\$2.95
4mm TD-2442	\$4.45	\$3.95	\$3.45

## T-TYPE TAP WRENCH

Can also be used with twist drills and reamers, etc. Accepts shafts up to 5mm diameter.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2445	\$12.95	\$11.35	\$10.35

## 10 PIECE NEEDLE FILE KIT

Every toolbox should have a set of needle files. This set contains every profile you could ever need. All have integrated plastic handles and come in a handy storage wallet. Each is 162mm long.

- Round • Elliptical
- Half-round • Double half round
- Triangle • Square • Flat
- Flat tapered • Knife
- Flat tapered safe back

Cat.	Qty 1+	Qty 3+	Qty 6+
10 Piece TD-2128	\$15.95	\$14.35	\$12.70

## TOOLS FOR COMPONENTS

### BUDGET SMD VACUUM PICKUP TOOL

This handy workshop SMD component pickup tool fits into your pocket and uses vacuum pressure to pick up your sensitive components without damaging them. An amazingly useful tool!

- Easy to use, one-hand operation.
- Picks up to 20g in weight.
- Supplied with 3 vacuum pads.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1978	\$17.95	\$15.95	\$14.35

### PEARL CATCH

Incredibly handy tool for those moments when you need to pick up small fiddly bits and pieces.

- Will clip to and hold small nuts, bolts, washers, transistors, resistors, etc.
- Metal construction.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1842	\$9.95	\$8.75	\$7.75

### PLCC EXTRACTOR

There's really only one way to remove a PLCC safely - and this is it. Basically a spring assisted clip carrier extractor, specifically designed for the safe and hassle free removal of PLCCs from sockets.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1816	\$11.95	\$10.70	\$9.50

### UNIVERSAL IC PIN STRAIGHTENER

A simple and effective tool to straighten and align bent IC pins. Accommodates standard ICs from 8 to 48 pins.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1814	\$11.95	\$10.70	\$9.50

### PIN EXTRACTION TOOL

Take the frustration out of removing Molex connector pins with these time saving tools. Simply slide the tool over the connector and push the plunger to effortlessly remove the pin. Both male and female pin extractors available.

Cat.	Qty 1+	Qty 3+	Qty 6+
Male Pin Extractor TH-1730	\$17.95	\$15.95	\$14.35
Female Pin Extractor TH-1732	\$17.95	\$15.95	\$14.35

### IC EXTRACTOR

Deceptively simple looking device.

- One piece metal construction.
- 8 - 40 pins.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1818	\$2.95	\$2.60	\$2.30

### COMPONENT LEAD FORMING TOOL

Get the hole spacing for your resistors and diodes perfect every time. This handy forming tool provides uniform hole spacing from 10 to 38mm. Suitable for production assembly, education and training. The tool is double sided with one side for use with D047 outline diodes (eg 1N914) and 1W zener diodes; the other side being suitable for 1/5W resistors, D041 outline diodes (eg 1N4004).

- An incredibly handy tool!
- Made in USA from engineering plastic.
- Size: 138 (L)mm

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1810	\$7.95	\$6.95	\$6.25

### BENCHTOP WORK MAT

Protect your benchtop. This durable A3 size PVC cutting mat is just the thing to protect your work benchtop. You can cut on it, solder, write on it, and not damage your workplace.

- The mat is 3mm thick, and measures 450 x 300mm.

Cat.	Qty 1+	Qty 3+	Qty 6+
HM-8100	\$12.95	\$11.35	\$10.35

## MAGNETS

### LARGE RARE EARTH MAGNETS - PAIR

These rare earth magnets are exceptionally strong. They are made from NdFeB (Neodymium Iron Boron), providing the highest available magnetic energy of any material. Suitable for a wide variety of applications where a very strong magnet is required. In fact, these are the same magnets used in our Faraday shake torches. The nickel casing protects the magnets because the material is very brittle.

- Sold as a pair.
- Dimensions: 19mm dia x 28.2mm long
- Grade: NdFeB, N35
- Coating: Nickel



Cat.	Qty 1+	Qty 3+	Qty 6+
Sold as a pair LM-1652	\$19.95	\$17.70	\$15.70

### RARE EARTH MAGNETS



These magnets feature rare earth compounds combined with ferrite (anisotropic) to produce incredibly strong attraction/repulsion. They are encased in nickel jackets because the material itself is very brittle. We warn you that getting a finger between these could result in a nasty pinch! They are provided with a nickel plated iron "keeper".

Cat.	Qty 1+	Qty 3+	Qty 6+
Small - 10mm dia x 3mm - Pkt 4 LM-1622	\$11.95	\$10.70	\$9.50
Medium - 25mm dia x 5mm - Each LM-1618	\$15.95	\$14.35	\$12.70
Large - 35mm dia x 5mm - Each LM-1620	\$22.95	\$20.35	\$18.35

### MAGNETS



Educational magnets. Ideal for hobbyists & children to learn more about magnetism.

- Each end is marked with "N" or "S".

Cat.	Qty 1+	Qty 3+	Qty 6+
Bar magnet - 70L x 12W x 5Dmm TH-1874	\$1.00	\$0.90	\$0.80
U Shaped - 30mm x 30mm TH-1873	\$1.00	\$0.90	\$0.80

### FERRITE MAGNETS

Ideal for hobby and craftwork, school projects etc. Can be glued to wood, plastic rubber etc.



Cat.	Qty 1+	Qty 3+	Qty 6+
10L x 10W x 4Dmm - Pkt 12 LM-1616	\$6.95	\$6.25	\$5.50
20L x 15W x 5Dmm - Pkt 6 LM-1614	\$6.95	\$6.25	\$5.50

### SUPER STRONG HORSESHOE MAGNET

Have you ever done something stupid like drop your keys overboard while out boating? By having this retrieval magnet, you can alleviate much of the pain by attaching a rope to the handle and dropping it overboard where you lost your keys to collect them. Made from super-strong ceramic magnets, it has a lift capacity of 85kgs and is coated to make it resistant to wear and corrosion from salt water.



Note: Keys not included

Cat.	Qty 1+	Qty 3+	Qty 6+
LM-1654	\$39.95	\$35.90	\$31.90



# MAGNETS & TWEEZERS

## MAGNETS (CONTINUED)

### FLEXIBLE ADHESIVE MAGNETIC RUBBER STRIP

This self adhesive magnetic rubber strip can be cut down to suit an application and makes an ideal fridge magnet for adhering to promotional material such as menus, calendars etc.

- Size: 150mm x 5000mm.
- 2mm thick.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1812	\$5.95	\$5.25	\$4.75

### HANDY MAGNET STRIP

You'll find dozens of uses for this innovative magnetic storage system. Its simplicity itself and can be attached to walls, tables or other surfaces to hold tools, brushes, scissors, key rings or any other object that contains iron.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1824	\$19.95	\$17.70	\$15.70

### MAGNETIC WRIST TRAY

So useful you will wonder why nobody thought of it years ago. This simple yet ingenious wrist tray will hold small screws, washers, nuts, split pins, or other metal items so you won't put them down 'somewhere safe' and lose them. The tray has a Velcro strap and includes 2 x Phillips and 2 x slotted driver bits in their own storage slots. Every handyman should have one.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1871	\$14.95	\$12.35	\$11.70

### TELESCOPIC MAGNETIC PICKUP TOOL WITH LED



Sunday eve, 5 o'clock and you drop the last bolt into the crankcase. No problem - with this handy tool, you can see where it is with the built-in LED torch and retrieve it with the magnetic tip. The torch comes on as soon as you extend it and it has a handy pocket clip so it doesn't get lost. A must for every toolbox.

- Picks up over 100g in weight
- Batteries included
- Extends to 870mm
- 170mm long (closed)

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1877	\$17.95	\$15.95	\$14.35

## SUPER EXTENSION CLAW & MAGNETIC PICKUP

Actually two tools. Tool No. 1 is a 1600mm long flexible spring-action claw gripper similar in operation to a pearl catch. The 4 prong gripper will capture an object up to 15mm in diameter with about 500g of gripping force. It is ideal for retrieving, say, a nut or screws in an engine compartment or piece of equipment. Tool No. 2 is the same thing except that it has a magnet on the end instead of a claw. We sell them as a set because they compliment each other.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1868	\$8.95	\$7.95	\$6.95

### INSPECTION MIRROR

Low cost inspection mirror. Ideal for looking into hard to get places. Length: 160mm, mirror diameter: 24mm.

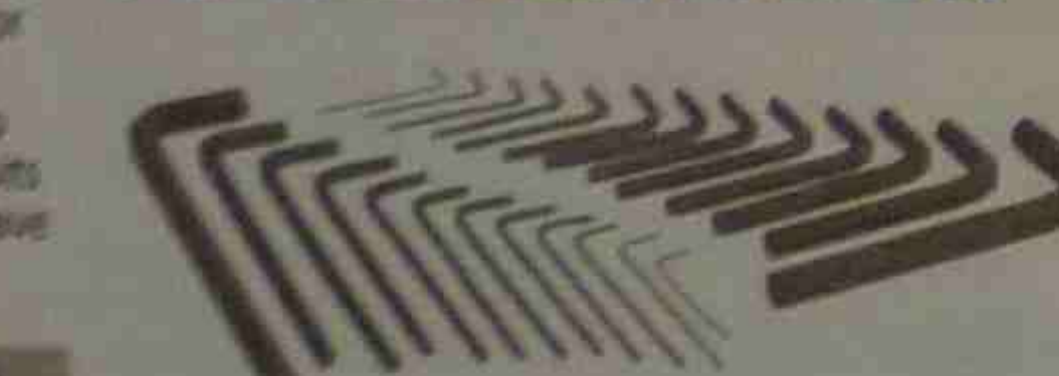
Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1872	\$4.95	\$4.45	\$3.90

### MAGNETIC TELESCOPIC BAR

A VERY HANDY TOOL! This looks a bit like a telescopic TV antenna section with a clip to hold in your pocket. It has 7 extensions, and measures 640mm when extended and 127mm when closed. The tip on the end is a powerful magnet. It's ideal for picking up that dropped nut, screw or component etc from inside a piece of equipment. The magnet is strong, we picked up a screwdriver which weighed 60 grams.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1870	\$8.95	\$7.95	\$6.95

### 25 PIECE ALLEN KEY SET



25 different size Allen keys in a plastic wallet. Both metric and imperial sizes.

- Metric: 1.27, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 8.0, 10.0mm
- Imperial: 3/16, 1/4, 7/32, 3/16, 5/32, 9/64, 1/8, 7/64, 3/32, 5/64, 1/16"

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2052	\$11.95	\$10.70	\$9.50

### SOLDERING HEATSINK & COMPONENT HOLDER



This quality small tool is ideal as a heatsink when soldering to remove some of the heat from the semiconductor/component while soldering. It can also be used to hold small parts while soldering to avoid burnt fingers.

- Supplied with insulated handles, and length is 65mm.

Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2122	\$6.95	\$6.25	\$5.50

## ANTI-MAGNETIC PRECISION TWEEZERS

These are high quality tweezers made from anti-magnetic, anti acid steel. Perfect for handling SMD components, jewels or general electronic components.

- Length 110mm.
- Supplied with protective nylon cap.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1754	\$4.45	\$3.95	\$3.45

## STAINLESS STEEL TWEEZER SET



A set of 4 tweezers, three supplied with vinyl handles, comprising:

- 1 x self closing pointed type
- 1 x long curved pointed type
- 1 x long fine pointed type
- 1 x flat spatula type

Approximate length 115mm.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1752	\$8.95	\$7.95	\$6.95

## FORCEPS (HAEMOSTATS)



These clamps are made of stainless steel and can be locked on to the item they are holding. They are 130mm long, so they are ideal to reach into hard-to-get-at places. Also great for holding components etc., whilst soldering.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1755	\$8.95	\$7.95	\$6.95

## 4 PIECE MINI PICK & HOOK SET



These hook tools have stainless steel heat treated points and are ideal for use on O-rings, springs, snap rings, washers, checking soldering joints, general hobbyist kit building, and probing into things, etc.

- Hooks are:
- straight pick
  - 90° hook
  - full hook
  - small angle hook.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1762	\$15.95	\$14.35	\$12.70

## 10 PIECE ALIGNMENT TOOL SET



Set of 10 low cost plastic alignment tools. One of each pictured is supplied.

- Length 114mm.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1806	\$9.95	\$8.75	\$7.75

## SCRIBER

This pen type tool will scribe on metal, glass, plastic, ceramics and tools. Stylus is made of tungsten steel. Looks like a pen, and has a pocket clip. Length 110mm.



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2120	\$7.95	\$6.95	\$6.25

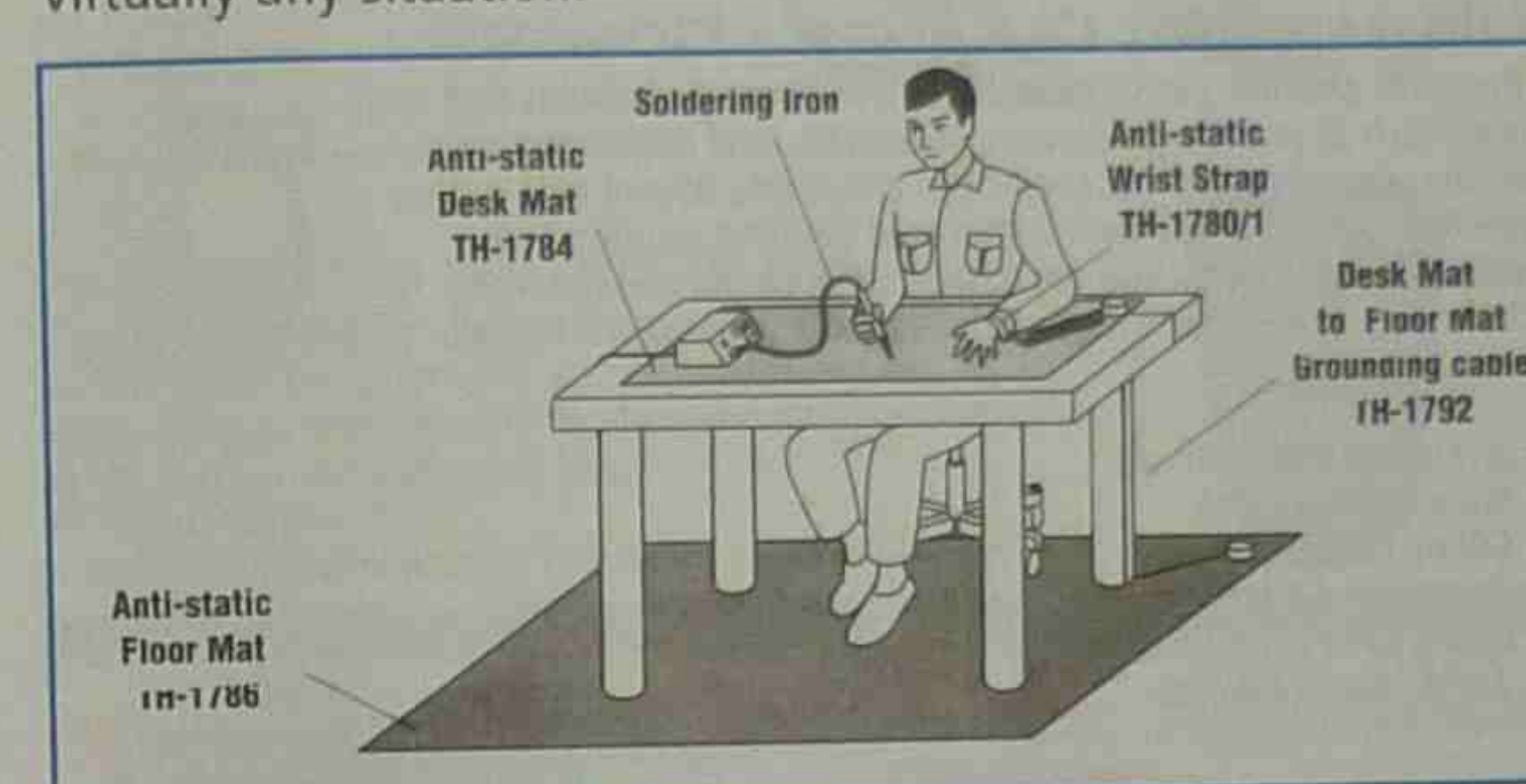
## AUTOMATIC CENTRE PUNCH

This handy tool allows you to make a centre punch mark with one hand. You simply hold the unit against where you would want a centre punch mark, apply downward pressure until the internal hammer mechanism trips. The pressure is adjustable, depending on the hardness of the surface. Sturdy brass body with hardened steel centre punch. • 125 mm long overall.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1770	\$7.95	\$6.95	\$6.25

## ANTI-STATIC PRODUCTS

Static control - both in the workshop/factory and in the field - is becoming increasingly important for reliable manufacture, repair and or installation of large surface mount LSI based boards. We offer a complete line of static control products for virtually any situation.



## CONDUCTIVE BRUSH

This brush looks very much like a toothbrush. The handle is made from conductive plastic, and the comb from conductive nylon.



- Use it to clean anything where static is a problem.
- Resistivity:  $10^4 - 10^6 \Omega$ .
  - Length 178mm.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1775	\$9.95	\$8.75	\$7.75

## ANTI-STATIC WORKPLACE DESK MAT

This anti-static mat measures 555(W) x 290(D)mm and is ideal for anyone who manufactures, repairs or services sensitive electronic equipment. It is about 3mm thick, has a hard wearing face over a dense sponge rubber base. Can also be used as an anti-static base for computer keyboard.

- Top colour is grey.
- See opposite for connecting leads.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1783	\$19.95	\$17.70	\$15.70

## LARGE ANTI-STATIC WORKPLACE DESK MAT

This anti-static dissipative desk mat will cover the whole top of a desk or work station. It measures 1 metre x 0.5 metres x 3mm thick. The mat is grey in colour and made of anti-static foam plastic. The surface of the mat has a slight grain texture, whilst the underside has a checker pattern to prevent slipping on the bench top.

- Resistivity: Anti-static layer  $10^8 - 10^{10} \Omega/\text{inch}$ .
- Conductive layer  $10^4 - 10^6 \Omega/\text{inch}$ .

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1784	\$49.95	\$44.90	\$39.90

## ANTI-STATIC FLOOR MAT

This anti-static floor mat is made from conductive PVC sheet combined with high density PVC foam. The top layer is grey with green fleck in colour, and the bottom is black. Resistivity is:  $10^9 - 10^{11} \Omega/\text{inch}$  for the top layer, and  $10^4 - 10^6 \Omega/\text{inch}$  for the bottom layer.

- Size is 2 metres x 1 metre x 2mm thick.
- See below for grounding leads.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1785	\$199.00	\$178.95	\$158.95

## ANTI-STATIC WRIST STRAP

Use when static electricity is a problem when soldering, changing ICs and installing expansion cards in computers etc. Static charges can destroy ICs instantly. Consists of adjustable Velcro wrist strap, coiled lead and banana plug/alligator clip.

- Expanded lead length about 1.8m.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1780	\$13.95	\$12.35	\$10.95

## ANTI-STATIC WRIST STRAP

Similar to the unit above, this strap has an extra long coiled lead of 3m/10ft extended. This makes it ideal for moving about your workbench without having to unclip yourself to do so. An elasticised wrist strap is also included, along with banana plug/alligator clip.

- Colour may vary.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1781	\$17.95	\$15.95	\$14.35

## DESK GROUNDING CABLE

This lead is to ground workplace desk mats. It clips over the stud fastener on any mat, and has a receptacle for 2 banana plugs. The other end of the lead has a banana plug, and an alligator clip that slips over the banana plug for earth connection. The anti-static wrist strap then plugs into the socket above the stud fastener clip. 2 wrist straps can be plugged in if required.

- Cable length is approximately 3 metres.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1791	\$13.95	\$12.35	\$10.95

## DESK MAT TO FLOOR MAT GROUNDING CABLE

Use this lead if you are using both the floor mat and desk mat. (You will need to have grounded the floor mat). The anti-static wrist strap can then be plugged into this leads double adaptor. Lead has snap connectors both ends - one end with double banana socket (desk mat end).

- Cable length approximately 3 metres.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1792	\$13.95	\$12.35	\$10.95

## ANTI-STATIC FIELD SERVICE MAT/BAG

This mat is ideal for field service people, who need an anti-static work area when on the move. The mat folds out to a work area of approximately 600 x 600mm. At one end there are 2 pouches, and a ground lead and wrist strap are included. A very useful tool.

- Pouch size approx: 200 x 300mm.

Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1776	\$49.95	\$44.90	\$39.90



## TOOL KITS

### TOOL KIT WITH CASE 29 PIECE

DIY minor repairs are a breeze with this 29 piece tool kit and every DIY guy should have at least one of these in easy reach. The tools are held secure in the stylish silver case so they won't get lost.

- 6 inch ratchet driver bit handle with magnetic tip
- Extension bar
- Screwdriver bits include 2 x Phillips, 2 x Posi, 2 Slimed drivers, 3 Torx tips, 1 Adaptor for hex to square drive
- 8 Nut drivers from 5 mm - 17 mm
- Jewellers drivers 2x flat & 1 Phillips
- 2 metre tape measure with lock
- Spring loaded long nose pliers with wire cutter
- Spring loaded side cutters
- Flexible drive shaft
- Retractable knife blade
- Torch requires 2 x AA batteries (not included)
- Case measures 200(L) x 145(W) x 45(H)mm



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-1966	\$34.95	\$31.45	\$27.90

### COMPUTER SERVICE TOOL KIT

- Kit includes:
- IC inserter/extractor
  - Tweezers
  - 1/4" Nutdriver
  - 3/16" Nutdriver
  - Parts tube for storage
  - Pearl Catch
  - Double ended 10/15 torx driver
  - #10 Phillips screwdriver
  - Zipper case
  - #1 Phillips screwdriver
  - 1/8" Slotted screwdriver
  - 3/16" Slotted screwdriver
  - Size 225 x 155 x 38mm



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2540	\$29.95	\$26.90	\$23.70

### 149 PIECE PINK TOOL SET

Everything the handy woman could ever possibly need in one box.

Finished in bright pink, the kit contains a hammer, long nose pliers, multitip, tape measure, screwdrivers, snifting spanner, shears, driver with 20 bits, 6-piece Allen key set, 6 jewellers screwdrivers plus an assortment of nails, screws and other fasteners. Not only has it got the tools, it's got the instructions to go with it! There is an easy-to-follow 27 page instruction booklet on each of the tools and directions for some common household tasks you might use your tools for such as hanging pictures, assembling flat pack furniture and repairing shoes. Just too easy!

- Will turn any girl into a handywoman!
- Case measures: 250(W) x 322(H) x 65(D)mm



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2075	\$49.95	\$44.90	\$39.90

### 23 PIECE PINK MINI TOOL KIT

Who says tools are only for blokes? Introducing our elegant 23 Piece Pink tool kit for the handy female! This tool kit is compact and easy to store, it comes in a trendy carry case and is perfect for doing repairs at home, around the office and for travellers. These are good quality tools with rubberised grips to protect the most delicate hands!

- Tool kit includes:
- Pink Torch
  - Pink Side Cutters
  - Pink Long Nose Pliers
  - Pink Tape Measure
  - Pink Driver Bit Handle with Magnetic Tip
  - Extension Bar
  - 2 Jewellers Screwdrivers
  - Tweezers
  - Screwdriver Bits Set
  - Socket Set

**Pink - just for the ladies!**



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2067	\$24.95	\$22.35	\$19.70

## HEADPHONES

### 120B NOISE-CANCELLING HEADPHONES

These headphones achieve a dramatic external/background noise reduction. This is done by detecting the external noise & inserting it into the line signal 180° out of phase to the wanted signal. This, and the efficient cushion earpads create an astonishing island of quietness in an otherwise noisy environment. Perfect for noisy environments such as airports, construction/demolition zones, shipping docks or train stations. Included is a standard 3.5mm cable for connection to most audio devices and a gig bag for easy transportation. It also has a 3.5mm to 6.5mm converter. Includes replacement earpads.



- Driver units: 40mm
- Impedance: 16Ω ohms +/-20%
- Sensitivity: 110dB/mW
- Frequency response: 20Hz to 20kHz
- Frequency range of active noise attenuation: 40Hz to 1.5kHz
- Maximum noise reduction level: 12dB at 100Hz
- Operating voltage: DC 1.5V AAA battery
- Battery life: up to 24 hours

Cat.	Qty 1+	Qty 4+	Qty 6+
AA-2058	\$99.95	\$89.95	\$79.95

## ULTRASONIC CLEANERS

### ULTRASONIC CLEANER - DOMESTIC

Ultrasonic cleaners produce millions of microscopic bubbles that clean items such as jewellery, dentures, silverware, and depending on the cleaners capacity they can even clean circuit boards and automotive injectors. Simply fill the tank with a mild cleaning solution and water, place the items into the basket, close the lid and press the 'On' button. You will see immediate results. The items will sparkle like new!

- 3 minutes auto shut off
- Stainless steel tank
- 600ml capacity
- Generates 42kHz
- Quiet, solid state circuitry
- 240V mains powered



Cat.	Qty 1+	Qty 3+	Qty 6+
YH-5406	\$115.00	\$103.95	\$91.95

### ULTRASONIC CLEANER - COMMERCIAL

If you've been after an industrial ultrasonic cleaner but have been frightened off by the price, then this is for you! Its massive 100W transducer produces millions of microscopic bubbles that are small enough to penetrate the most microscopic of crevices, cleaning them thoroughly. Use this cleaner for automotive injectors, jewellery, glasses, circuit boards and more! The unit features a large LED display with real time countdown. You can also set the cleaning time in 5 minute increments.

- Power supply: 240VAC 50/60Hz
- Power: 100 Watts
- Tank capacity: 2L
- Tank dimensions: 265 (L) x 160(W) x 235(H)mm (including lid and basket)
- Unit dimensions: 265 (L) x 160(W) x 245 (H) mm (including lid and basket)
- Supplied with: 1 x 1.5m IEC mains lead, 1 x 250(L) x 155 (W) x 90(H)mm stainless steel basket, 1 x stainless steel lid



Cat.	Qty 1+	Qty 3+	Qty 6+
YH-5410	\$399.00	\$359.00	\$319.00

## POWER TOOLS

### 4.8 VOLT TWO SPEED T BAR CORDLESS SCREWDRIVER

You can really pile on the power with this unique T-bar cordless screwdriver. The clever design means that pressure is intrinsically applied along the axis of the screw to minimise slippage or head damage, while the T-bar handle gives you precise control. The power button falls naturally under your thumb and is easily operated for long periods without fatigue. A useful addition to any handyman's toolbox.

- 2 speeds 180 & 800 RPM
- Overall length 200mm
- Forward & reverse
- Mains charger included



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2492	\$29.95	\$26.90	\$23.70

### 4.8 VOLT CORDLESS SCREWDRIVER

There are many cordless screwdrivers on the market, but few of them are as comfortable or easy to use as the little beauty. The driver has a comfortable pistol grip that gives you maximum control and allows your fingers to fall naturally on the forward/reverse control switch. The driver also has a bright LED lamp, a magnetic bit holder, and a handy security strap. There is even a handy LED battery level indicator that tells you how much charge is left in the battery.

- Voltage: 4.8V
- Bit holder size: 6.35mm
- Mains charger included



### POUCH WITH BELT CLIP - SUIT TD-2498

Protect and keep your cordless screwdriver (TD-2498) within reach. This pouch has a strong metal belt clip, a Velcro strap to hold your drill in place and has 6 pockets at the front to store your drill bits.

- Colour: Yellow
- Approximate dimensions: 100(W) x 115(H) x 65(D)mm



	Cat.	Qty 1+	Qty 3+	Qty 6+
Screwdriver	TD-2498	\$23.95	\$21.35	\$18.95
Pouch to suit	TD-2499	\$5.95	\$5.25	\$4.75

### 3.6V CORDLESS DRIVER DRILL WITH CHARGING CRADLE

Everyone should have a spare drill floating around the garage or the toolbox. This one has forward and reverse with a 1/4" hex bit holder instead of a conventional chuck for quick bit changes. It also has a quality 3.6V lithium-ion battery, a desktop charger, charge status LEDs and includes 5 bits: 5mm flat, #2 Phillips, 2, 2.5 & 3mm twist drills plus a general-purpose 1/4" hex bit holder.

- Specifications:
- Speed: 150 RPM
  - Battery: 3.6V Li-ion
  - Charge time: 3 hours approx.
  - Size: 140 x 140mm



Cat.	Qty 1+
TD-2494	\$29.95

### 3.6V CORDLESS SCREWDRIVER WITH PIVOTING HANDLE

Nothing beats the convenience of a cordless screwdriver when you have numerous screws to install or remove from a job. And what makes this cordless screwdriver unique is the pivoting handle, folding from a straight position for easy storage in a toolbox, to an angle position for better grip. This rechargeable screwdriver also features a powerful motor, forward & reverse switch, safety power lock, 6 torque settings and reversible Phillips/Flat Blade bit. Supplied with a plugpack for recharging. Spare battery also available.

- Voltage: 3.6V
- Speed: >230RPM
- Bit holder size: 6.35mm
- Charging duration: 5 - 7hrs
- Weight: 350gm



	Cat.	Qty 1+	Qty 3+	Qty 6+
Screwdriver	TD-2495	\$13.95	\$12.35	\$10.95
Spare Battery	TD-2496	\$6.95	\$6.25	\$5.50

## GLUE GUNS

### LARGE GLUE GUN - 240V

Our mini glue gun was so popular we decided to import its big brother. This gun performs just as well as the smaller version but uses a 40% larger diameter glue stick for bigger jobs. Great for quick and easy low stress repairs to timber, cardboard, paper, and many household materials. Powered by 240VAC and Standards Australia approved. Intermittent use only, not for production use.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1992	\$22.95	\$20.35	\$18.35

### MINI GLUE GUN - 240V

A glue gun is a handy tool to have around the house. Its fast, easy and simple to use with trigger controlled glue feed.

- Toys and models
- Decorations
- Furniture
- Woodwork
- Cardboard etc.

Plugs straight into 240V power point. Standards Australia approved. Use glue sticks with 7.4mm diameter. Intermittent use only, not for production use.



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1990	\$19.95	\$17.70	\$15.70

### PORTASOL GLUE GUN - GAS

A quality, butane powered hot glue gun that can be used almost anywhere. The gun features easy push button electronic ignition so you don't have to fumble with matches, and a translucent fuel tank that lets you see how much gas is left. The glue will bond to most household materials including ceramics, metal, fabric, leather, wood, & plastics.

- 125 Watt equivalent power
- Ready to use in 3 minutes
- 2 hours per refill
- 2 x 11mm dia. Glue sticks included - replacements use TH-1995 or TH-1996
- Weights 200 grams without gas
- Made in Ireland



Cat.	Qty 1+	Qty 3+	Qty 6+
TH-1330	\$69.95	\$62.95	\$55.95

### GLUE STICKS FOR MINI GUN

To suit the mini glue gun. Size 7.4mm dia. x 100mm long.

- Suits TH-1990 mini gun



### FOR LARGE GUN

Size 11mm diameter x 100mm long.

- Suits TH-1330 & TH-1992 guns

Size 11 x 98mm long

- Suits TH-1992 gun

	Cat.	Qty 1+	Qty 3+	Qty 6+
Pkt 6 For Mini Gun	TH-1991	\$3.95	\$3.45	\$3.15
Pkt 6 For Large Gun	TH-1992	\$22.95	\$20.35	\$18.35
Pkt 50 For Mini Gun	TH-1994	\$9.95	\$8.75	\$7.75
Pkt 50 For Large Gun	TH-1995	\$4.95	\$4.45	\$3.90
Pkt 45 approx. For Large Gun	TH-1996	\$17.95	\$15.95	\$14.35

### 5 PIECE GRINDING STONES

Everything from finishing work to light deburring is easy with these grinding stones.

- 1/8th shaft.



Cat.	Qty 1+	Qty 3+	Qty 6+
TD-2435	\$4.95	\$4.45	\$3.90



### LOOKING FOR STORAGE CASES?

Ideal for carrying small components and is an indispensable addition to any tool kit. See through plastic construction enables the contents to be easily identified and the 2 snap action latches secure the lid and keep everything in its rightful place.



See page 206 for the full range.





Cat. BJ-8504 \$13.95

## SHORT CIRCUITS VOLUME II

Once you have mastered the art of assembling a circuit with springs you will want to tackle projects that are more complex. The benefit of spring termination falls away once you get into projects that have over, say, 20 parts. In addition to this, projects that work on radio frequency, or RF for short, don't like springs as they start to act like little antennae all over the place! So it's time to graduate to the heart of modern electronics - the printed circuit board. This simple device fulfils the function of mounting board & circuit wiring in one. The critical element of success in printed circuit board - or PCB for short - assembly is good soldering. Soldering is not for 8 year olds but its fine if you are older or are under adult supervision. In Short Circuits II we teach you how to solder.

We teach you a lot more as well! Such as:

- How to use a Multimeter\*\*
- What tools you will need.
- What sort of workspace is needed.
- How the circuit works (Tech talk).
- What to do next.
- How to make your circuit work in the real world.

Due to author's Copyright, instructions for each project are not included in the component pack. You can purchase the book, or buy a set of instructions separately.

\*\*A MULTIMETER IS JUST THAT. IT ENABLES YOU TO MEASURE ALL SORTS OF ELECTRICAL UNITS, VOLTS, AMPS, OHMS ETC. THEY ARE THE MOST USEFUL PIECE OF TEST EQUIPMENT YOU WILL OWN AND BASE MODELS ARE NOT EXPENSIVE. JAYCAR HAS A GREAT RANGE WHICH STARTS ON PAGE 9. \* ALSO SEE OUR SOLDERING STARTER KIT ON PAGE 72.



A SUITABLE 9V BATTERY FOR ALL PROJECTS IS OUR SB-2423 ON PAGE 227.

## SHORT CIRCUITS IS A LEARNING SYSTEM

A key part of the Short Circuits learning system is that your mind is stimulated into learning electronics by building exciting projects and HAVING FUN AT THE SAME TIME. You will get a real "buzz" from the exciting projects offered - 22 in all. These projects have useful functions in the "real world" and you may choose to keep them for a long time because they are so useful. For example, you can make a Bionic Ear amplifier for a grandparent. Listed below are the projects in the book. They have all been designed by professional engineers and tested to work reliably. Maybe one day you will be an engineer, designing projects for other people.

- Full colour - 148 pages. 205 x 275mm.

### COUNTDOWN TIMER

This neat project enables you to set the time you want to elapse before you want something to happen, say the exposure of a camera shutter or an electrically operated door to stay open. At the end of the timed period (seconds to many minutes) a relay is energized which can switch something on or off.

- PCB and components.
- Requires 9V battery\*

PROJECT #2



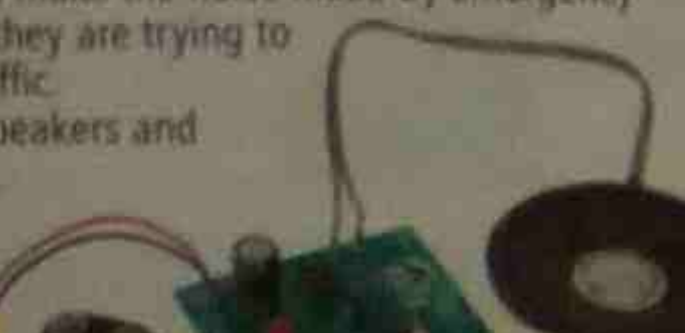
	Qty 1+	Qty 5+
Cat. KJ-8202	\$14.95	\$13.35
Instructions KJ-8203	\$2.50	\$2.45
RECOMMENDED BOX - UB5	Cat. HB-6015	\$2.95 ea

### HEE-HAW SIREN WITH FLASHING LIGHT

This project will make the noise made by emergency vehicles when they are trying to get through traffic.

- PCB, LEDs, speakers and components.
- Requires 9V battery\*

PROJECT #3



	Qty 1+	Qty 5+
Cat. KJ-8204	\$9.95	\$8.75
Instructions KJ-8205	\$2.50	\$2.45
RECOMMENDED BOX - UB5	Cat. HB-6015	\$2.95 ea

### MINI STROBE LIGHT

No, this unit won't fill a disco with blinding white light. Those things are dangerous and run straight off 240V. This one runs off a 9V battery and gives a surprisingly intense white light - especially in darkness.

- Uses state-of-the-art LED.
- PCB and components.
- Requires 9V battery\*

PROJECT #4



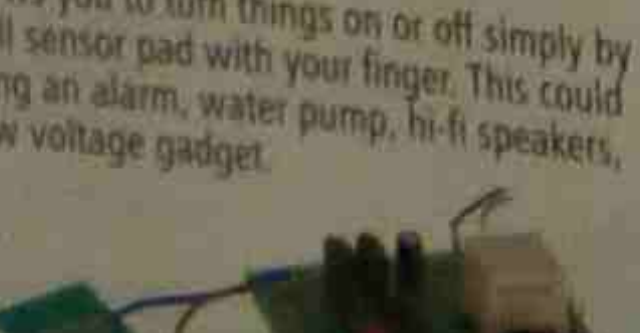
	Qty 1+	Qty 5+
Cat. KJ-8206	\$18.95	\$16.95
Instructions KJ-8207	\$2.50	\$2.45
RECOMMENDED BOX - UB5	Cat. HB-6015	\$2.95 ea

### ON-OFF TOUCH SWITCH

This project allows you to turn things on or off simply by touching a small sensor pad with your finger. This could include operating an alarm, water pump, hi-fi speakers, or any other low voltage gadget.

- PCBs, relay components.
- Requires 9V battery\*

PROJECT #5



	Qty 1+	Qty 5+
Cat. KJ-8208	\$14.95	\$13.35
Instructions KJ-8209	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### DROUGHT ALARM

Well, not really a big drought. This will test the soil moisture of a favourite pot plant and an alarm will sound if the soil gets too dry.

- PCB, speaker & components.
- Requires 9V battery\*

PROJECT #6



	Qty 1+	Qty 5+
Cat. KJ-8210	\$14.95	\$13.35
Instructions KJ-8211	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### LED AUDIO LEVEL DISPLAY

Make your own fancy volume level display you see on DJ mixing desks where the columns of light dance up and down with the music. Connect it to the output of your CD, tape player or radio. Build two of them for displays on your stereo hi-fi system.

- PCB, LEDs and components.
- Requires 9V battery\*

PROJECT #7



	Qty 1+	Qty 5+
Cat. KJ-8212	\$14.95	\$13.35
Instructions KJ-8213	\$2.50	\$2.45
RECOMMENDED BOX - UB5	Cat. HB-6015	\$2.95 ea

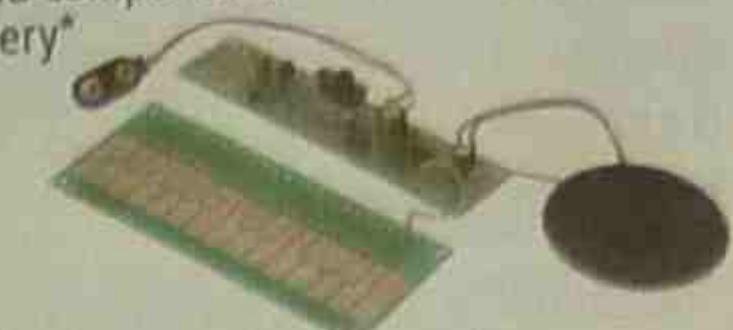
## SHORT CIRCUITS II PROJECTS & KITS

### ELECTRONIC ORGAN

You can play simple tunes easily once you have built this project! The organ 'keyboard' is actually part of the printed circuit board. It even has vibrato for extra realism.

- PCBs, speaker and components.
- Requires 9V battery\*

PROJECT #8



	Qty 1+	Qty 5+
Cat. KJ-8214	\$22.95	\$20.35
Instructions KJ-8215	\$2.50	\$2.45
RECOMMENDED BOX - UB1	Cat. HB-6011	\$4.45 ea

### "NO BRAINER" AMPLIFIER

This amp is so easy to build, it's a no brainer! It will, however, give a powerful output to bring your Discman, sound card, etc alive! Two required for stereo.

- PCB, speaker and components.
- Requires 9V battery\*

PROJECT #9



	Qty 1+	Qty 5+
Cat. KJ-8216	\$14.95	\$13.35
Instructions KJ-8217	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### "BEAM ME UP SCOTTY" SIMPLE INTERCOM

This project enables you to talk (i.e. not shout) between parts of a house, or a house and a garage. You can even leave it on, say in the kitchen to monitor a baby's room.

- PCB, speakers, 6-metres of connecting wire and components.
- Requires 9V battery\*

PROJECT #10



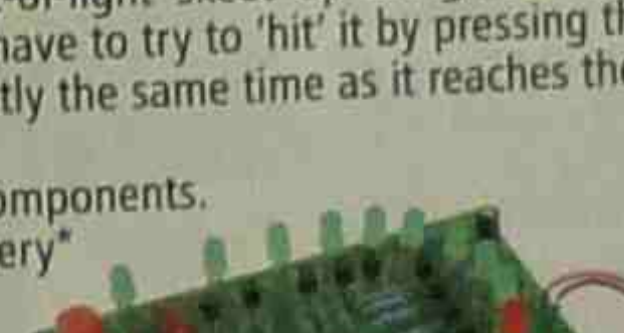
	Qty 1+	Qty 5+
Cat. KJ-8218	\$23.95	\$21.35
Instructions KJ-8219	\$2.50	\$2.45
RECOMMENDED BOX - UB3 x 2	Cat. HB-6013	\$3.95 ea

### SKEET SHOOT GAME

Here's a fun way to test your hand-eye coordination. The game sends a burst-of-light 'skeet' up along a string of ten LEDs, and you have to try to 'hit' it by pressing the FIRE button at exactly the same time as it reaches the red LED at the end.

- PCB, LEDs and components.
- Requires 9V battery\*

PROJECT #11



	Qty 1+	Qty 5+
Cat. KJ-8220	\$17.95	\$15.95
Instructions KJ-8221	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### SIMPLE FM BUG

Small portable FM microphone. Works surprisingly well. Use it as a baby minder/monitor as well.

- PCB and components.
- Requires 9V battery\*

PROJECT #12



	Qty 1+	Qty 5+
Cat. KJ-8230	\$14.95	\$13.35
Instructions KJ-8231	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## METRONOME WITH BEAT LED

This neat little metronome does everything that a traditional metronome does. It produces an adjustable 'tick' sound to help you play your music at just the right tempo. It also flashes a LED once per bar, to help you get the music's rhythm right as well.

- PCB, knobs, speaker and components.
- Requires 9V battery\*

PROJECT #13



	Qty 1+	Qty 5+
Cat. KJ-8232	\$18.95	\$16.95
Instructions KJ-8233	\$2.50	\$2.45
RECOMMENDED BOX - UB1	Cat. HB-6011	\$4.45 ea

### JIMINY! WHAT'S THAT CRICKET NOISE?

This fun project makes the distinct sound of a cricket when triggered by a hidden microphone. Someone walks into a room, says something and the next thing this loud cricket starts to chirp! Hours of fun.

- PCB, mic, speaker and components.
- Requires 9V battery\*

PROJECT #14



	Qty 1+	Qty 5+
Cat. KJ-8224	\$14.95	\$13.35
Instructions KJ-8225	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### BIONIC EAR

This project enables you to listen to a conversation (or a bird in a tree, etc) beyond what you would normally hear. It uses the principle of a directional microphone.

- PCB and components.
- Requires a plastic bowl or similar for the reflector.
- Requires 9V battery\*

PROJECT #15



	Qty 1+	Qty 5+
Cat. KJ-8226	\$17.95	\$15.95
Instructions KJ-8227	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### CASINO! ELECTRONIC DICE

Well dice is really plural and this is just one dice - a die. At the press of a button "roll" 6 light emitting diodes flash briefly and only one stays lit, representing a number between 1 and 6. Truly, truly random and never rolls off the table!

- PCB, LEDs and components.
- Requires 9V battery\*

PROJECT #16



	Qty 1+	Qty 5+
Cat. KJ-8222	\$14.95	\$13.35
Instructions KJ-8223	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### SOUND LIKE A DALEK

This project will change your voice into that metallic sounding robot voice so familiar in the space adventure movies.

- PCB and components.
- Connect it to the No Brainer amp, (Project 9, KJ-8216) and get really scary!
- Requires 9V battery\*

PROJECT #17



	Qty 1+	Qty 5+
Cat. KJ-8228	\$23.95	\$21.35
Instructions KJ-8229	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## KNIGHT RIDER LIGHT SCANNER

Now you can make the light scanner that goes on the bonnet of that famous car. Looks fantastic in all sorts of places!

- PCB, LEDs and components.
- Requires 9V battery\*



PROJECT #18

	Qty 1+	Qty 5+
Cat. KJ-8236	\$19.95	\$17.70
Instructions KJ-8237	\$2.50	\$2.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

### RESISTANCE / CAPACITANCE BRIDGE

Measures the value of resistors and capacitors, by comparing them against 'reference' resistors and capacitors. The measurement is carried out by turning a 'balance' potentiometer to adjust the bridge's balancing ratio, and then listening to the bridge's output with a pair of headphones. As you adjust the balance you can easily tell the value of your component from the setting on the balance potentiometer.

- Measures resistance from 10Ω up to over 1MΩ, and capacitor values from below 10pF up to over 10uF.
- PCB and components.
- Headphones required - use AA-2016
- 9V battery required\*

PROJECT #19



	Qty 1+	Qty 5+
Cat. KJ-8240	\$27.95	\$24.95
Instructions KJ-8241	\$2.50	\$2.45

### EVENT COUNTER 0 - 999

This project demonstrates how 3-digit counters work and can be used for real-world counting jobs, like counting laps on a slot car set, etc. An excellent 'hands on' introduction to electronics.

- PCB, 7 segments LEDs and components.
- Requires 9V battery\*

PROJECT #20



	Qty 1+	Qty 5+
Cat. KJ-8234	\$23.95	\$21.35
Instructions KJ-8235	\$2.50	\$2.45
RECOMMENDED BOX - UB1	Cat. HB-6011	\$4.45 ea

### FM RADIO WITH ELECTRONIC TUNING

This is a true 88-108MHz FM radio with electronic station tuning and powerful amplifier included! It has a voltage-regulated power supply and works really well. Your friends won't believe you built it.

- PCB and components.
- Requires 9V battery\*

PROJECT #21



	Qty 1+	Qty 5+
Cat. KJ-8238	\$34.95	\$31.45
Instructions KJ-8239	\$2.50	\$2.45
RECOMMENDED BOX	Cat. HB-6032	\$7.95 ea

### FM RADIO STATION

This is a Three-Stage radio transmitter that is so stable it could be used as a small radio station. Your audience will be limited to your back yard, however, as there are rules about transmitting power! It includes a microphone but you can transmit other material as well.

- PCB, coils, mic and components.
- Requires 9V battery\*

Instructions included in kit.



PROJECT #22

	Qty 1+	Qty 5+
Cat. KJ-8750	\$23.95	\$21.35
RECOMMENDED BOX - UB5	Cat. HB-6015	\$2.95 ea

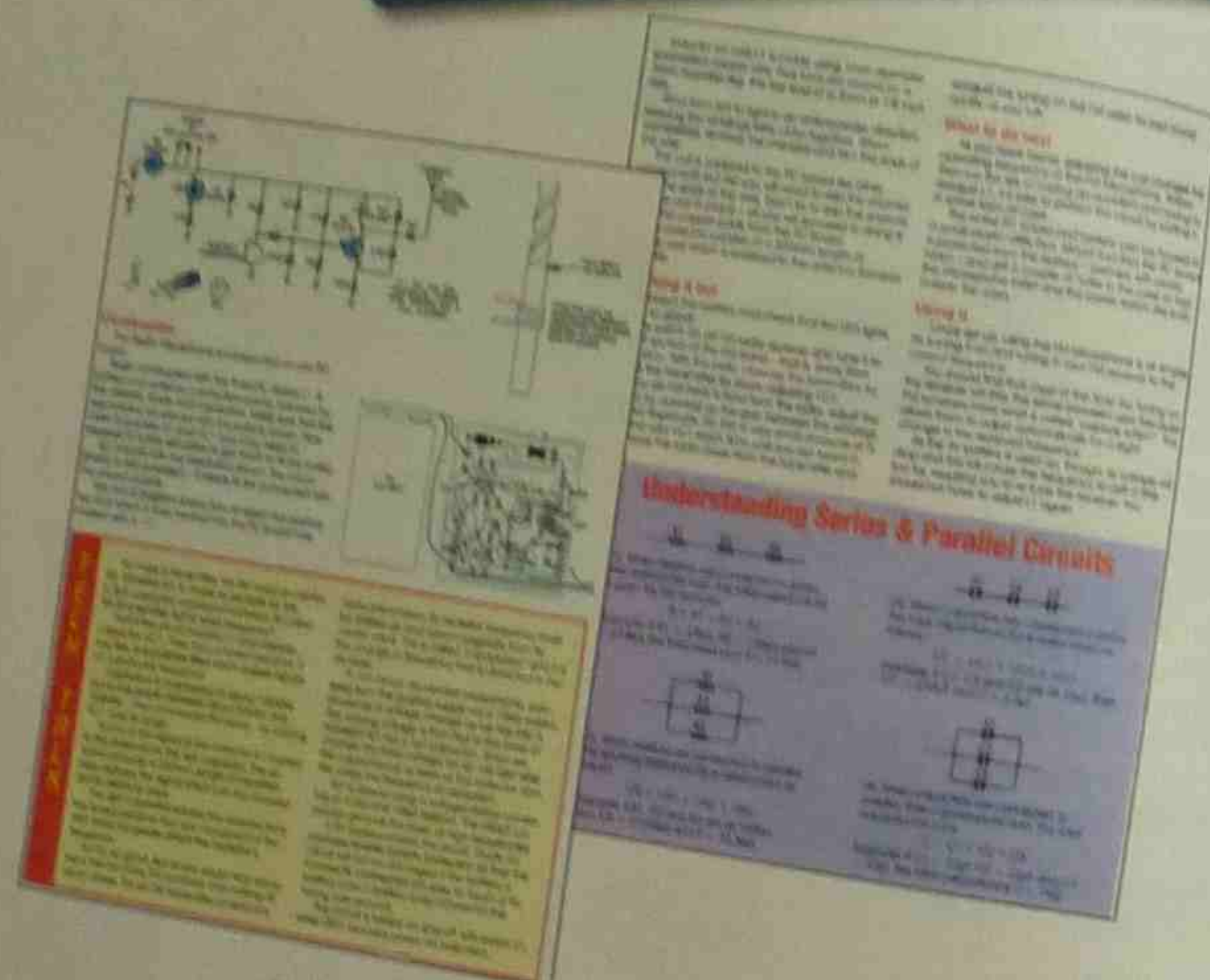


SHORT CIRCUITS  
VOLUME III

Like our Volumes 1 & 2 book, Short Circuits Volume 3 is sold independently to each of the 30-odd projects. Some of the projects you will build include a Guitar Sustain Unit, a Universal Timer, Car Alarm, Two Lamp Flasher plus many more! There's even a project that demonstrates how you can use your computer to interface to the real world

- Book: Cat. BJ-8505, \$19.95
- 128 Pages
- Full Colour, 205x275mm

**NOTE: DUE TO AUTHOR'S COPYRIGHT, INSTRUCTIONS FOR EACH PROJECT ARE NOT INCLUDED IN THE COMPONENT PACK. YOU CAN PURCHASE THE BOOK, OR BUY A SET OF INSTRUCTIONS SEPARATELY.**



- Step by step instructions show you how to assemble each project
- Techtalk explains the operation of each circuit in detail, to help you gain a thorough knowledge of the "Building Blocks" used in circuit design.
- "What To Do Next" shows you how to modify or further improve your project.
- Basic circuit theory is provided to increase your level of understanding.

**\* NOTE: SHORT CIRCUITS 3 KITS DON'T CONTAIN BATTERIES. WE WOULD RATHER SEE YOU USE A FRESH BATTERY ONCE THE PROJECT IS COMPLETED.**

**\* INSTRUCTIONS TO BUILD ALL THE PROJECTS ARE IN THE BOOK - IE, YOU NEED THE BOOK TO BUILD THE PROJECTS IF YOU DON'T BUY THE INSTRUCTIONS SEPARATELY.**

## DASH FLASHER FOR CARS

Deter thieves from breaking into your car with this lamp flasher. It mounts on your car dashboard and starts flashing when the ignition is on.

- PCB, lamp and components.
- 12VDC

PROJECT #1

	Qty 1+	Qty 5+
Cat. KJ-8050	\$9.95	\$8.75
Instructions KJ-8051	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6015	\$2.95 ea

## DING DONG DOOR BELL

Ideal for the front door. This generates the sound of a classic Ding Dong door bell.

- Project includes PCB, speaker and components.
- 12VDC

PROJECT #2

	Qty 1+	Qty 5+
Cat. KJ-8052	\$12.95	\$11.35
Instructions KJ-8053	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## ELECTRONIC EYE

Mount across a path or doorway. When a person or object breaks the beam the loudspeaker will sound.

- PCB, LDR, speaker and components.
- 12VDC

PROJECT #3

	Qty 1+	Qty 5+
Cat. KJ-8054	\$14.95	\$13.35
Instructions KJ-8055	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## SIMPLE FM ALARM

Recover your stolen goods using an FM radio. This project transmits a tone over the FM band so that you can track it down using an FM radio.

- PCB and components.
- 9VDC (use SB-2423 battery)

PROJECT #4

	Qty 1+	Qty 5+
Cat. KJ-8056	\$14.95	\$13.35
Instructions KJ-8057	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## INFRARED REMOTE LINK

This can be used as either a light beam relay or a remote on/off switch. When the invisible infrared light beam is broken the relay will trigger.

- PCBs and components.
- 12VDC (receiver)
- 9VDC (transmitter, use battery SB-2423)

PROJECT #5

	Qty 1+	Qty 5+
Cat. KJ-8058	\$28.95	\$25.95
Instructions KJ-8059	\$3.50	\$3.45
RECOMMENDED BOX - UB3 X2	Cat. HB-6013	\$3.95 ea

## SIMPLE INTRUDER ALARM

This simple design features a normally open and normally closed input, 40 second siren duration and triggered LED indication.

- PCB, buzzer and components.
- 12VDC

PROJECT #6

	Qty 1+	Qty 5+
Cat. KJ-8060	\$14.95	\$13.35
Instructions KJ-8061	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

SHORT CIRCUITS III  
PROJECTS & KITS

## SCREAMER CAR ALARM



PROJECT #7

A more sophisticated alarm including entry/exit delay, flashing deterrent light, soft warning alarm and deafening internal siren. Thieves will make a hasty retreat!

- PCB, siren, lamp and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8062	\$32.95	\$29.45
Instructions KJ-8063	\$3.50	\$3.45
RECOMMENDED BOX - UB2	Cat. HB-6012	\$6.95 ea

## LIGHT CHASER

Dazzling display using 10 LEDs that appear to chase each other. Build for a shop, theater or advertising display.

- PCB, LEDs and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8064	\$12.95	\$11.35
Instructions KJ-8065	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## LIGHT SCANNER / CHASER

An impressive display using 20 LEDs that chase forward and backward - just like scanners seen in space movies.

- PCB, LEDs and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8066	\$16.95	\$14.95
Instructions KJ-8067	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

	Qty 1+	Qty 5+
Cat. KJ-8068	\$24.95	\$22.35
Instructions KJ-8069	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## REALLY BRIGHT FLASHER

Attract attention with this bright halogen light flasher. The flash rate can be adjusted between 0.5 to 3.5 seconds.

- PCB, 12V halogen lamp with base and components.
- 12VAC 2A (use MP-3051).

	Qty 1+	Qty 5+
Cat. KJ-8068	\$24.95	\$22.35
Instructions KJ-8069	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## TWO LAMP FLASHER

Alternate flashing halogen lamps with an adjustable flash rate between 1 to 4 seconds.

- PCB, two halogen lamps with bases and components.
- 12VAC 4A (use MP-3051)

	Qty 1+	Qty 5+
Cat. KJ-8070	\$29.95	\$26.90
Instructions KJ-8071	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## THE CHAMP AMPLIFIER

A cheap and handy amplifier that can improve low-level signal sources so they can be heard on headphones or a speaker.

- PCB, speaker, volume potentiometer and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8072	\$14.95	\$13.35
Instructions KJ-8073	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## UNIVERSAL STEREO PREAMPLIFIER

If the input signal to your amplifier is not sufficient you will need a preamplifier such as this one to boost the signal.

- PCB and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8074	\$14.95	\$13.35
Instructions KJ-8075	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## HIGH POWER 12V AMPLIFIER

This amplifier-on-a-chip can deliver about 13.5-watts into a 4-ohm speaker. That's quite loud!

- PCB, amplifier IC, heatsink and components.
- 12VDC
- Requires speaker

	Qty 1+	Qty 5+
Cat. KJ-8076	\$23.95	\$21.35
Instructions KJ-8077	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## SIMPLE FM MICROPHONE

This FM transmitter has many possible uses including baby room monitor, wireless microphone or spy bug. It can be picked up on any FM radio.

- PCB, electret microphone and components.
- 9VDC - (use SB-2423 battery).

	Qty 1+	Qty 5+
Cat. KJ-8078	\$12.95	\$11.35
Instructions KJ-8079	\$3.50	\$3.45
RECOMMENDED BOX - UB5	Cat. HB-6015	\$2.95 ea

## MINI-MITTER FM TRANSMITTER

Transmit stereo audio from your tape deck or CD player to any FM radio elsewhere in your house. You could even tune in on a portable walkabout radio.

- PCB and components.
- 1.5VDC (use SB-2424 AA battery)

	Qty 1+	Qty 5+
Cat. KJ-8114	\$23.95	\$21.35
Instructions KJ-8115	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## LOW-COST INTERCOM SYSTEM

A low-cost method of communicating between two rooms. The remote unit is hands free so it's also great as a baby monitor.

- PCB, speakers and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8080	\$15.95	\$14.35
Instructions KJ-8081	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

	Qty 1+	Qty 5+
Cat. KJ-8082	\$16.95	\$14.95
Instructions KJ-8083	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## ELECTRONIC BONGOS

Sounds just like two traditional bongo drums. Use with the high power 12V amplifier (KJ-8076) for amazing results.

- PCB and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8082	\$16.95	\$14.95
Instructions KJ-8083	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

	Qty 1+	Qty 5+
Cat. KJ-8084	\$14.95	\$13.35
Instructions KJ-8085	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

## VOX - SOUND SWITCH

This sound-activated switch closes a relay when a loud-enough sound is heard. It switches off when the sound stops. Ideal for radio transmitters or surveillance applications.

- PCB, relay, electret mic and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8084	\$14.95	\$13.35
Instructions KJ-8085	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea

	Qty 1+	Qty 5+
Cat. KJ-8086	\$27.95	\$24.95
Instructions KJ-8087	\$3.50	\$3.45
RECOMMENDED BOX - UB2	Cat. HB-6012	\$6.95 ea

## TRAIN SOUND FX

Authentic sounding train whistle and horn sound effects for your model railway.

- PCB, speaker and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8086	\$27.95	\$24.95
Instructions KJ-8087	\$3.50	\$3.45
RECOMMENDED BOX - UB2	Cat. HB-6012	\$6.95 ea

## WIND &amp; RAIN SFX

Simulates the sound of falling rain or howling wind. Must be connected to an amplifier (use KJ-8072 or KJ-8076).

- PCB and components.
- 12VDC

	Qty 1+	Qty 5+
Cat. KJ-8088	\$19.95	\$17.70
Instructions KJ-8089	\$3.50	\$3.45
RECOMMENDED BOX - UB3	Cat. HB-6013	\$3.95 ea







## 6.35MM (1/4") SHAFT COUPLER

Sturdy solid steel sleeve with black tapered finish, this device connects 2 x shafts together that are closely aligned by the drive set screws.

• 19mm (3/4") long x 12.7mm (1/2") dia

Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2790	\$12.95	\$11.35	\$10.35

## SPIDER COUPLER SET

Connects a motor to a shaft that may be slightly misaligned or under length. You may also need a torsional shock absorbing coupling which this does as well.

- Each hub will accept a 6.35mm (1/4") shaft with set screws anchor.
- The hubs are coupled by a synthetic rubber spider.
- 20mm OD x 30mm long.

Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2762	\$19.95	\$17.70	\$15.70

## ALUMINIUM HUB WITH SET SCREWS

This device will accept a 6.35mm (1/4") shaft, set screw fixed, and connect to the flat face of a gear, typically the flat side of the larger 48 pitch gears shown above.

- Coupling from the gear to the hub by 4 x set screws provided. This enables a motor to be securely fastened to a driving gear.
- Hub 7/8" (22.5mm) dia.

Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2784	\$12.95	\$11.35	\$10.35

## QUALITY GERMAN MADE POWER TRANSMISSION COMPONENTS

These precision engineered components are a delight to play with. They offer solutions to small power transmission problems. We make no apologies for the price because well, they are German but they are magnificent quality.

### SOLID SHAFT COUPLERS (FEMALE)

Machining from solid brass stock - 16mm long, 12mm diameter. Type I will connect 2 shafts on a common axis. Type II will reduce from 6.0 diameter to 4.0 diameter. Shaft fixed with grub screws.

Cat. YG-2600 Type I  
Cat. YG-2602 Type II

Type	Cat.	Qty 1+	Qty 5+	Qty 10+
Type I	YG-2600	\$12.95	\$11.35	\$10.35
Type II	YG-2602	\$12.95	\$11.35	\$10.35

### RIGHT ANGLE SHAFT COUPLERS (MALE)

Basically a right-angle cast housing with 45 degrees nylon bevel gears permanently coupled. One shaft is enclosed with a panel-mount style threaded bush (similar to a potentiometer mount) which is 10mm long. Two mounting nuts and a lock washer are provided. All metal parts are nickel plated. Each shaft is 10mm long.

Type	Shaft	Cat.	Qty 1+	Qty 5+
Type I	2 x 6mm	YG-2610	\$39.95	\$35.95
Type II	2 x 4mm	YG-2612	\$49.95	\$44.90

### SINGLE STAGE CLASSIC STYLE UNIVERSAL JOINT (FEMALE)

This unit consists of 2 nylon moulded fixed coupling pieces with brass ferrules moulded in for extra strength. They will accept 6.0 dia. Shafts and are fixed by grub-screws. The flexible coupling consists of a self-lubricating brass block fixed with hardened pins. Couplers such as these work best when the shafts are not offset and the max. angle is not over 30 degrees.

Cat.	Qty 1+
YG-2606	\$34.95

## DOUBLE STYLE CLASSIC STYLE UNIVERSAL JOINT (FEMALE)

Similar to YG-2606 but with 2 brass couplings set inside a nylon spider. It will couple up to 90 degrees but it will wear quickly at high speed at this angle.

- Works best between 80° and 45°.
- Grub screws fixing 6.0 dia shafts.

Cat.	Qty 1+	Qty 5+
YG-2608	\$49.95	\$44.90

## ALL-METAL UNIVERSAL JOINT (TRUNNION STYLE) FEMALE 6.0 DIA.

This is a low torque coupler that will couple offset shafts by up to 2mm and 15° off-angle. Shafts are clamped by collet-type fixing i.e. a nut compresses a slotted bush compressing it onto the 6.0 dia. shafts.

- Nickel plated.

Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2604	\$24.95	\$22.35	\$19.35

## DRIVE SHAFTS

Plastic shafts, handy for use in drive systems or to use with a coupler to extend the length of a pot shaft. 6mm diameter.

Two lengths available:

YG-2620 60mm long  
YG-2622 120mm long

Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2620	\$8.95	\$7.95	\$6.95
YG-2622	\$9.95	\$8.75	\$7.75

## GEAR SET AND SPUR GEAR SET

Gear set contains one pinion gear and two different sizes of radio gears. Spur gear set contains three different spur gears.

Gear Set	Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2630	YG-2630	\$10.95	\$9.75	\$8.75
Spur Set	YG-2632	\$8.95	\$7.95	\$6.95

## WORM DRIVE SET

This set consists of a worm gear 24mm long x 12mm dia with an 8 turn worm screw. The worm has a 2.8mm axle hole which could probably be carefully drilled out to a larger diameter. The spur gear is 1/4" (6.35 wide) and 1 & 5/8" (41.2mm) diameter with a number of regular pitch concentric 2.8mm holes across the face of the gear including one dead centre. It would be drilled out to accommodate a larger shaft. This gear has 40 teeth. Both are moulded in an engineering grade plastic.

Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2736	\$7.95	\$6.95	\$6.25

## 7 PIECE DRIVE / BELT SET

This set consists of 4 x split pulleys. There are 2 sets of 30(dia.)mm, one has a 2.8mm centre hole, the other 4.0mm. These pulleys have brass & plastic bushing sets as well. The smaller pulley sets are 13.8 (dia.) & 8.0 (dia.)mm respectively. A 70 (dia.)mm rubber drive belt is also included.

Cat.	Qty 1+	Qty 5+	Qty 10+
YG-2640	\$24.95	\$22.35	\$19.70

## Jaycar Electronics

only the best projects that the electronics magazines have generated.

The new kits this year include a new 12/24V DC motor controller (40A), a motorbike capacitor discharge ignition, a new 135W RMS power amp, an upgraded Themin, a fantastic school 40km/hr speed zone alert and several others. So good is the School Speed Zone alert, we think that it may be commercially manufactured.

We are delighted to say that our Short Circuits series continues to do well along with the other ranges of "Science" based learning aids. As learning aids go, we implore you to look at our range of anatomically correct human figures with removable organs, etc. Where the definition of a "kit" begins and ends, we do not know!

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10 12VDC Motor Speed Controller	83	Electrical Crane	64	Battery Zapper MkII	97	Pen Style PIC Logic Probe	99
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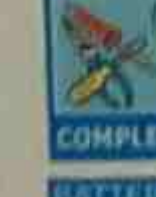
## EXPLANATION OF KIT ICONS



**SIMPLE**



**DETAILED**



**COMPLEX**



**BATTERY INCLUDED**

**Kwik Kit**

A new low cost fast assembly range of kits. Kwik kits are a fully imported range of kits that can be assembled in just one sitting, sometimes only minutes! All printed circuit boards are screened with a component overlay. The instructions assume component knowledge & the ability to follow simple schematic diagrams.

## GUARANTEE ON KITS

Most kits are successfully constructed with few problems. However, we recommend that if a kit builder does not have enough knowledge to diagnose faults, that the project should not be started unless assistance can be obtained. Unfortunately, one small faulty solder joint or wiring mistake can prevent a project from operating, which would take hours to locate and at normal service rates the service charge could well be more than the total cost of the kit. If you believe that you may have difficulty in building a kit (which is simply a complete set of separate parts made up to a list provided by the major electronics magazines) and you cannot get assistance from a friend, we suggest you return the kit to us in its original condition for a refund under our satisfaction guarantee. Unfortunately, kits cannot be replaced under our satisfaction guarantee once construction has been commenced. However, should you find any faulty parts (only), we will gladly replace them under warranty.

As we said last year, if you are a parent or are a brother or sister etc, or just know a bright young person it could be a wonderful thing to make them a gift of one of these products. You could inspire the person to engage in a future career in engineering, science, medicine or some other worthwhile pursuit.

Jaycar kits are now even more superior to our diminishing competitors' products. We put more into them, like metal film (not carbon film) resistors, pre-tested components and I.C. sockets (where technically feasible) and clear, plain English instructions. (Our kits are sold around the world and this is a must!).

You are guaranteed to get a quality well-engineered product that will perform. Trust only Jaycar kits.



## BACK CATALOGUE OF KITS

If you can't find the kit you're looking for, try the Jaycar Kit Back-catalogue.

To keep up with the constant flow of new kits and maintain a contemporary in-store line-up of projects, older and slow moving kits are returned to our central warehouse.

Back-catalogue kits are not available in Jaycar stores. You can only access them on our website. You can order online at [www.jaycar.com.au](http://www.jaycar.com.au) or by calling our Techstore on 1800 022 888 or use the order form on page 433.



AVAILABLE ONLINE

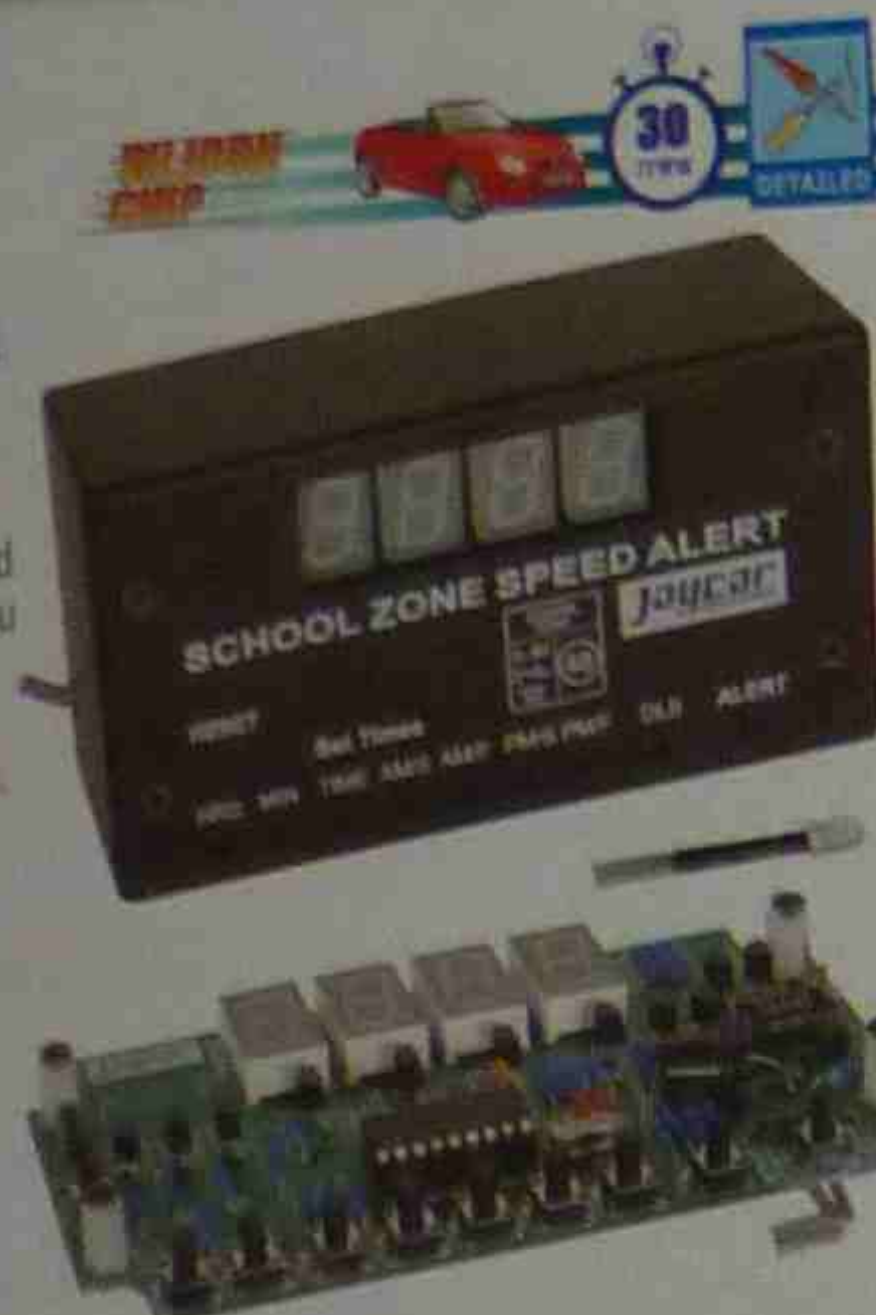


## AUTOMOTIVE KITS

**Pimpin' your ride has never been this easy and affordable. Boost performance? Check. Better monitoring? Check. An annoying-as-hell car alarm? We got that covered too. Whether you're a budding car enthusiast or a diehard DIY tragic, we're sure to have a well-engineered electronic kit to tickle your automotive fancy.**

### SCHOOL ZONE SPEED ALERT KIT

Refer Silicon Chip Magazine April 2009  
Basically a specialised timer that alerts you with a flashing LED when school zone-reduced speeds are in force. The unit will flash for the whole time the restrictions operate in the morning and afternoon. The only visible sign for you is a dashboard flashing LED; all other components can be mounted remotely, including the disable switch.



- PCB, programmed micro, case with machined and screen printed lid and components.
- 12VDC

**new**

Cat.	Qty 1+	Qty 5+
KC-5472	\$49.95	\$44.90

### FUEL CUT DEFEATER

Refer Silicon Chip Magazine February 2007

Many factory turbo fitted cars have a limit to which the boost level can reach before a 'fuel cut' is activated by the vehicle's ECU. This cheap and simple kit enables you to eliminate this factory fuel cut and go beyond the typical 15-17psi factory boost limit. The kit simply intercepts the MAP sensor signal, and trims the signal voltage above 3.9V to avoid the ECU cutting the fuel supply to the engine. No adjustment is required, and with only four wires to connect, installing this kit couldn't be easier. Note: care should be taken to ensure the boost levels and fuel mixture don't reach an unsafe level that will permanently damage your engine.

- PCB and components.
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5439	\$19.95	\$17.70

### MIXTURE DISPLAY KIT FOR FUEL INJECTED CARS - IMPROVED

• Monitor your car's air-fuel ratio in real time.  
Refer Silicon Chip Magazine November 1995 & Electronic Projects for Cars Vol 2 - Silicon Chip  
This very simple kit will allow you to monitor the fuel mixtures being run by your car. This type of sensor is also known as an E.G.O. (exhaust, gas, oxygen) monitor. You can use it as a tuning tool, to help in vehicle modification or simply to see the behaviour of the engine control module. Indication is via 10 LEDs to show mixtures rich, lean and normal. The circuit connects to the EGO sensor mounted in the exhaust manifold and the car's battery. Now features extra circuit protection.

- PCB, LEDs and components.
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5195	\$16.95	\$14.95
HB-6015	\$2.95 ea	

### VARIABLE BOOST KIT FOR TURBOCHARGERS

Refer Silicon Chip Magazine February 2007

Give your turbocharged car more giddyup with this variable boost controller. It's a very simple circuit with only a few components to modify the factory boost levels. It works by intercepting the boost signal from the car's engine management computer and modifying the duty cycle of the solenoid signal. Kit supplied in short form with PCB and overlay, and components.

- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5438	\$19.95	\$17.70

### RECOMMENDED BOX

HB-6065	\$2.65 ea
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### HEADLIGHT REMINDER FOR CARS

- No more flat car batteries

Refer Silicon Chip Magazine August 2001

Nothing is more frustrating than getting into your car early in the morning, only to discover that you had left your headlights on the night before, running your car's battery flat. Features include a modulated alarm, ignition and lights monitoring, optional door switch detection, time-out alarm & a short delay before the alarm sounds. Build and install this hassle-saving kit & enjoy a feature in your car that many luxury vehicle owners have long taken for granted.

- PCB, case with screen printed lid and components.
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5317	\$27.95	\$24.95

### COURTESY INTERIOR LIGHT DELAY Mk II

- Interior light delay like those expensive models

Refer Silicon Chip Magazine June 2004

Many modern cars feature a time delay on the interior light. It still allows you time to buckle up and get organised before the light dims and finally goes out. This kit provides that feature for cars which don't already provide it. It has a soft fade out after a set time has elapsed, and features much simpler universal wiring than previous models we have had.

- PCB and components.
- Suitable for circuits switching ground or V+
- Car & truck with negative chassis.
- 12VDC or 24VDC



Cat.	Qty 1+	Qty 5+
KC-5392	\$19.95	\$17.70

### RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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### DIGITAL FUEL MIXTURE DISPLAY

- Monitor your car's air-fuel ratio in real time.

Refer Silicon Chip Magazine Sept / Oct 2000

This brilliant dashboard mounting unit monitors and displays your car's air-fuel ratio in real time on a 3 digit display and at the same time on the programmable 10-LED bargraph. Indicates ratios between 11.8 - 20.6 for petrol and 12.7 - 21.5 for propane/LPG. Some features: fully lean and fully rich indication, fast 220ms update time for bargraph, 440ms upgrade time for 3 digit display, 0-1V display for setting up adjustment, dot or bar option for bargraph and auto display dimming for night driving. All this in a compact case measuring only 83 x 54 x 31mm. Leaded petrol engines will soon poison an EGO sensor, so it is recommended that this kit be used for tuning purposes on those cars.

- PCBs, black case with laser cut & screen printed front panel, programmed PIC micro, 7 segment displays, red acrylic display panel, hook-up wire and components.
- Requires EGO sensor with 0-1V output.
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5300	\$67.95	\$60.95

### 12-24V HIGH CURRENT MOTOR SPEED CONTROLLER KIT

Refer Silicon Chip Magazine March 2008

Want to control a really big DC motor? This design will control 12 or 24VDC motors at up to 40A continuous. The speed regulation is maintained under load, so the motor speed is maintained even under heavy load. It also features automatic soft-start, fast switch-off, a 4-digit LED 7-segment display to show settings, an overload warning buzzer & a low battery alarm. All control tasks are monitored by a microcontroller, so the functionality is extensive.

- Double sided plated through hole PCBs, programmed micro and components
- 12VDC or 24VDC



Cat.	Qty 1+	Qty 5+
KC-5465	\$89.95	\$80.95

### RECOMMENDED BOX - UB3

HB-6013	\$3.95 ea
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### 10A 12VDC MOTOR SPEED CONTROLLER

Refer Silicon Chip Magazine June 1997

Use this kit for controlling 12V DC motors in cars such as fuel injection pumps, water/air intercoolers and water injection on performance cars. You can also use it for headlight dimming and for running 12V DC motors in 24V vehicles. The circuit incorporates a soft start feature, which is used to reduce inrush currents, particularly if the kit is to control 12V incandescent lamps. As presented, the kit will control loads up to 10 amps, although the addition of an extra MOSFET transistor will double that capacity to an amazing 20 amps.

- PCB and components to build the 10A version.
- Extra MOSFET available separately, ZT-2450 • 12VDC



Cat.	Qty 1+	Qty 5+
KC-5225	\$24.95	\$22.35

### OPTIONAL MOSFET TO SUIT

ZT-2450	\$9.95 ea
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### RECOMMENDED BOX - UB3

HB-6013	\$3.95 ea
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### SPEEDO CORRECTOR MkII

Refer Silicon Chip Magazine December 2006

When you modify your gearbox, diff ratio or change to a large circumference tyre, it may result in an inaccurate speedometer. This project alters the speedometer signal up or down from 0% to 99% of the original signal. With this improved model, the input setup selection can be automatically selected and it also features an LED indicator to show when the input signal is being received.

- PCB, programmed micro and components
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5435	\$54.95	\$49.45

### DIGITAL SPEEDOMETER/ SPEED ALERT

Refer Silicon Chip Magazine November/December 1999

A combined speedometer / speed alert that fits neatly into a small jiffy box (83 x 54 x 31mm) for mounting on your dashboard. This microprocessor based kit features a 3-digit LED display, 0-255km/h range with visual and audible alert & actual speed readout.

- PCBs, black jiffy box with laser cut & screen printed front panel, pre-wound speed sensor bobbin, hookup wire, programmed microprocessor, magnets & all electronic components. Simple aluminum bracket required for speed sensor mounting.
- Beware of inferior kits which do not supply pre-wound bobbin.
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5279	\$67.95	\$60.95

### CAPACITOR DISCHARGE IGNITION KIT FOR MOTOR BIKES

Refer Silicon Chip Magazine May 2008

Many small petrol engines fitted to modern motor bikes use a capacitor discharge ignition (CDI) to improve performance and enhance reliability. The only downside of this is that if the CDI ignition module fails, a replacement can be very expensive. This kit will replace most 1, 2, 3 or 4 cylinder failed factory units and is designed for engines with separate generator & trigger coils and which generate a positive high voltage to charge the capacitor before firing. Most CDI ignitions operate this way, but there are variations. Luckily, this CDI module uses cheap and readily available parts and is worth a try before shelling out lots of hard-earned cash for a genuine replacement module.

- PCB, case and components.
- Some mounting hardware required.



Cat.	Qty 1+	Qty 5+
KC-5466	\$21.95	\$19.70

### PROGRAMMABLE HIGH ENERGY IGNITION SYSTEM

Refer Silicon Chip Magazine March, April 2007

This is Silicon Chip's most advanced and versatile ignition system yet and can be used on both two & four stroke engines. The system can be used simply to intercept and modify the factory ignition timing or turned into a stand alone ignition system with remapped timing, electronic coil control and anti-knock sensing. The unit will trigger from a range of sources including points, Hall effect sensors, optical sensors, or the 5 volt signal from the car's ECU. Timing can be mapped against engine load and RPM and adjusted in step as small as 0.5°.

- Timing retard & advance over a wide range
- Suitable for single coil systems
- Dwell adjustment
- Single or dual mapping ranges
- Two de-bounce settings
- Max & min RPM adjustment
- Suits 1 to 12 cylinder four stroke engines and 1 to 6 cylinder two stroke engines
- Optional knock sensing available
- PCB, programmed micro, components & die cast box with screen printed lid
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5442	\$94.95	\$85.50

### IGNITION COIL DRIVER

Refer Silicon Chip Magazine March, April 2007

Add this ignition coil driver to the KC-5442 Programmable High Energy Ignition System and you have a complete stand-alone ignition system that will trigger from a range of sources including points, Hall effect sensors, optical sensors, or the 5 volt signal from the car's ECU. The kit can be mounted close to the coil to minimise energy loss and the ignition system can be fitted inside the car.

- PCB, case and components.



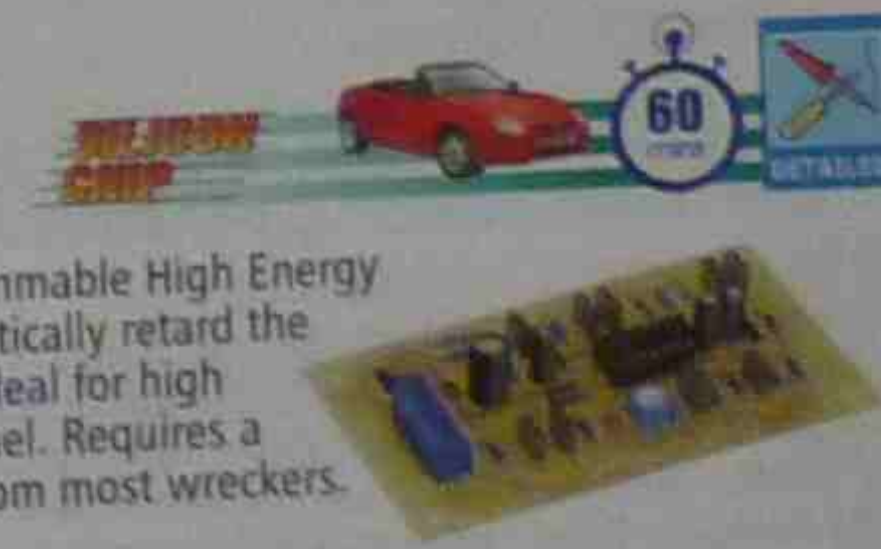
Cat.	Qty 1+	Qty 5+
KC-5443	\$46.95	\$42.45

### KNOCK SENSOR

Refer Silicon Chip Magazine May 2007

Add this option to your KC-5442 Programmable High Energy Ignition system and the unit will automatically retard the ignition timing if knocking is detected. Ideal for high performance cars running high octane fuel. Requires a knock sensor that is cheaply available from most wreckers.

- PCB and components.



Cat.	Qty 1+	Qty 5+
KC-5444	\$18.95	\$16.95

### KIT CONSTRUCTORS MANUAL

A must for amateur constructors. Contains much useful information for the more experienced. Huge amounts of information on construction and identification of parts.

- 8 pages.



Cat.	Qty 1+
BI-8200	\$2.00





## DIGITAL TACHOMETER DISPLAY

Refer Silicon Chip Magazine April 2000.

This PIC based tachometer is housed neatly in a small jiffy box (83 x 54 x 31mm), which mounts nicely on your dashboard. Its amazing features include 4 digit LED display showing up to 9,900rpm in 100rpm increments, 10 LED bargraph with optional dot or bar mode (showing 8 independent rpm thresholds), calibration options for 1-12 cylinder 4-stroke or 1-6 cylinder 2-stroke engines, anti-display flickering feature and automatic night time display dimming.

- PCBs, black case with laser cut & screen printed front panel, programmed micro, 7 segment displays, bargraphs red acrylic display panel, hook-up wire and components.
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5290	\$67.95	\$60.95

## VOLTAGE MONITOR

Refer Silicon Chip Magazine May 2006

This versatile kit will allow you to monitor the battery voltage, the airflow meter or oxygen sensor in your car. The kit features 10 LEDs that illuminate in response to the measured voltage, preset 9-16V, 0-5V or 0-1V ranges, complete with a fast response time, high input impedance and auto dimming for night time driving.

- PCB and components.
- 12VDC



Cat.	Qty 1+	Qty 5+
KC-5424	\$22.95	\$20.35

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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## CAR BATTERY MONITOR

Refer Electronics Australia May 1987

This simple electronic voltmeter lets you monitor the condition of your car's battery so you can act before getting stranded.

- 10 rectangular LEDs tell you your battery's condition.
- PCB and components.
- 12VDC



Cat.	Qty 1+	Qty 5+
KA-1683	\$17.95	\$15.95

RECOMMENDED BOX - UB5

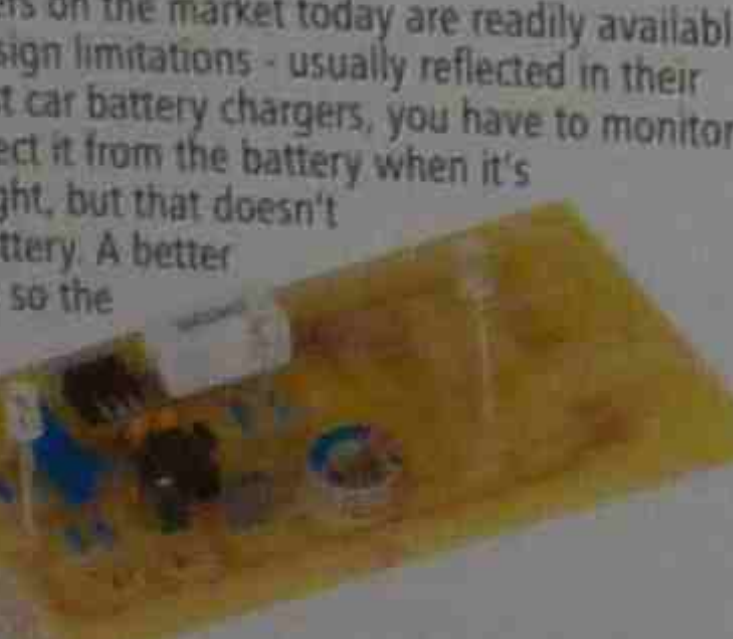
HB-6015	\$2.95 ea
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## ADD-ON REGULATOR FOR 12V BATTERY CHARGERS

Refer Electronics Australia July, 1997

Perhaps the most popular car battery chargers on the market today are readily available from supermarkets, but have substantial design limitations - usually reflected in their low price. When using one of these low-cost car battery chargers, you have to monitor the charge state of the battery and disconnect it from the battery when it's fully charged. Timer switches would be alright, but that doesn't take into account the charge level of the battery. A better (and safer) way is this add-on regulator kit so the charger can be left connected to the battery continuously. The PCB has been specifically designed to slide into an Arlec-brand 4A charger, although it could of course be mounted externally in its own separate case.

- PCB, heatsink sheet and components.
- Suits our MB-3528 battery charger.



Cat.	Qty 1+	Qty 5+
KA-1795	\$27.95	\$24.95

## SCREECHER CAR ALARM MKII - 12 VOLT

Refer Electronics Australia January 1999

Featuring high deterrent capability for a minimum outlay, the Screecher MK II is more effective than its extremely popular predecessor from 1986. Using an ear-piercing piezo siren, this alarm will scare the pants off any would be thief. Unlike conventional car alarms, this unique design calls for the siren to be mounted inside the vehicle, the 'shill' making it impossible for a thief to persist in stealing the vehicle or its contents. This project is easy to construct and features entry delay with a soft warning tone, exit delay and high intensity deterrent LED.

- PCB, siren, components and 2 adhesive warning stickers
- 12VDC



Cat.	Qty 1+	Qty 5+
KA-1813	\$29.95	\$26.90

RECOMMENDED BOX - UB3

HB-6013	\$3.95 ea
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## ULTRASONIC PROXIMITY DETECTOR

Attention motorists! Commercial products that carry out a similar task are, in some cases, worth over \$100. Choose the minimum distance you wish to maintain between your vehicle and objects nearby. Useful at a distance of 10 to 80cm, the kit can also be used to sense animals straying into a particular area or even specific object security protection such as TVs and VCRs. An LED illuminates once an object strays into the detector's sensor range.

- Kit includes Kwik Kit PCB, one pair of ultrasonic sensors plus electronic components. This kit is designed to be used in a garage, not under the bumper bar.
- Sensors not waterproof.
- Suitable waterproof transducers/sensors Cat AU-5550.



Cat.	Qty 1+	Qty 5+
KG-9158	\$29.95	\$26.90

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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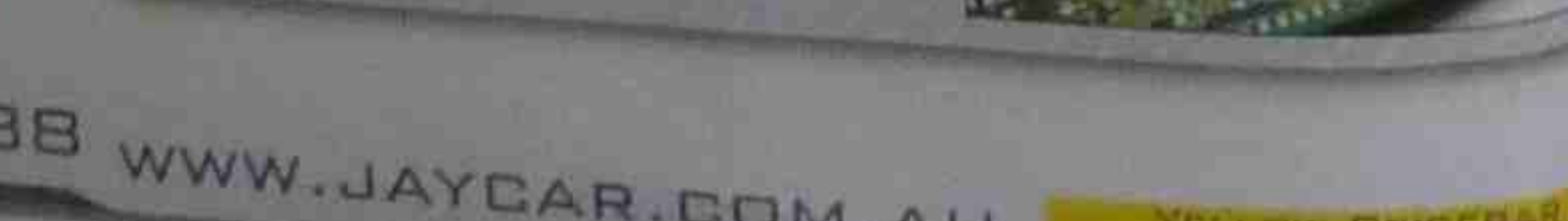
## RADAR SPEED GUN MK2 - NEW REVISED MODEL!

Refer Silicon Chip Magazine Nov-Dec 2006

We have improved and refined this kit since it was published and it is now even more stable and accurate. If you're into any kind of racing like cars, bikes boats or even the horses, this kit is for you. This Doppler radar gun is similar to the units used by the police but at a fraction of the cost. It reads speed in km/h or mph up to 250 km/h or 155 mph. The resolution and accuracy we have obtained from this well priced kit is fabulous and it includes a hold switch so you can freeze the reading. The electronics & display are mounted in the supplied jiffy box and the radar gun assembly is can be made simply with two coffee tins fitted end to end. The circuit needs 12 VDC at only 150mA so you can use a small SLA or rechargeable battery pack. Kit includes PCB with overlay, machined case and all specified components



Cat.	Qty 1+	Qty 5+
KC-5441	\$99.95	\$89.95



DON'T JUST SIT THERE, BUILD SOMETHING!

## ATTENTION ALL CAR ENTHUSIASTS - BUILD YOUR OWN 'BLACK BOXES'

### AUTOMOTIVE HIGH PERFORMANCE - JUST BUILD & INSTALL

Without a doubt this book and the kits described in it have been very popular since their introduction. An absolute gold mine for DIY Car Enthusiasts who want to tweak the performance of their vehicle. The kits allow you to revamp fuel systems after injector upgrade, control turbo boost curves, or simply monitor exhaust gas temperatures. Although some of the projects use sophisticated electronics, both hardware and software, you can build the kits with relatively little electronics knowledge. You need to be able to solder and identify components but even if your skills in this area are a bit rusty, this book has a whole chapter set aside for you to have a refresher.

### PERFORMANCE ELECTRONICS FOR CARS BOOK BY SILICON CHIP PUBLICATIONS

Grab yourself a copy of the Performance Electronics for Cars project book, written by the Silicon Chip Publications team. The 160-page book describes the 16 projects shown on this and the following 2 pages in full detail. Each project includes full construction details, coloured overlays, circuit diagrams, testing, fitting and setup instructions, and even a 'How it Works' explanation. Even though each project will be supplied with a set of black & white instructions, the book is definitely a must-have to help ensure construction success and keep an overall perspective of performance options.

Chapters include:

- Understanding Engine Management
- Other Electronic Systems
- DIY Electronic Modification
- Using a Multimeter
- Coloured overlays & circuit diagrams
- Over 23 chapters of projects and technical information
- Advanced Engine Management
- Modifying Car Electronic Systems
- Building Electronic Project Kits
- Full construction details
- Testing, fitting and setup instructions
- 'How it Works' explanation
- 160 page - full colour

## DIGITAL PULSE ADJUSTER

Take control over any pulsed solenoids in your car

- Create a custom boost curve
- Give better shift firmness in late model transmissions
- Modify action of the idle speed control valve to alter idle speed
- Control an extra fuel injector, water injector or toluene injector
- Modify steering control for better weight on speed-controlled systems

Refer: Performance Electronics for Cars - Silicon Chip Magazine Publications.

This unit is another huge step up in DIY automotive performance upgrades. It allows you to control and tune the operation of any solenoid that is run by the engine management system. This means that you could control turbo boost without an expensive boost controller, or alter automatic transmission line pressures for better shifts. Alternatively, it can be used to drive and control an extra fuel injector. Additional fuel injectors are commonly tapped into the throttle body to stop critical lean out under high load, high boost conditions. You can now add the injector with +/- 127 step mapping at 128 different duty cycle points. This allows superior fuel control, previously achieved only with an expensive fuel management system.

- PCB, machined case with processed panels, 2 programmed micros and components.
- Requires the Hand-held Digital Controller - KC-5386 and connecting cable WC-7502 (25 pin extension cable with all pins connected).

"The Digital Pulse Adjuster literally redefines the way in which car modifications can now be made." - Julian Edgar, Silicon Chip Magazine.



Cat.	Qty 1+	Qty 5+
KC-5384	\$79.95	\$71.95

## HAND CONTROLLER FOR DIGITAL ADJUSTERS

- Used to program the Digital Pulse Adjuster, Digital Fuel Adjuster and Independent Electronic Boost Controller circuits

Refer: Performance Electronics for Cars - Silicon Chip Magazine Publications. This hand controller is used for the mapping/programming of both Digital Adjuster kits. It features a two line LCD, and easy to use pushbuttons. It can be used to program the adjusters then removed, or left permanently connected to display the adjuster's operation. It is designed as an interface and display, and is not required for general adjuster functions after they have been programmed. If you have built and installed multiple adjuster kits, you will only need one controller to program, unless you want permanent displays for each adjuster function.

- PCB silk screened and machined case, LCD, and all electronic components.
- Must have all D25 pins connected.

Cat.	Qty 1+	Qty 5+
KC-5386	\$67.95	\$60.95

D25 MALE TO D25 MALE CABLE - 1.8M WC-7502 \$13.95

## DIGITAL FUEL ADJUSTER

- Modify air/fuel ratios
- Allow air-flow meter or injector swaps
- Change closed-loop running characteristics
- Overcome Boost cuts

Refer: Performance Electronics for Cars - Silicon Chip Magazine Publications.

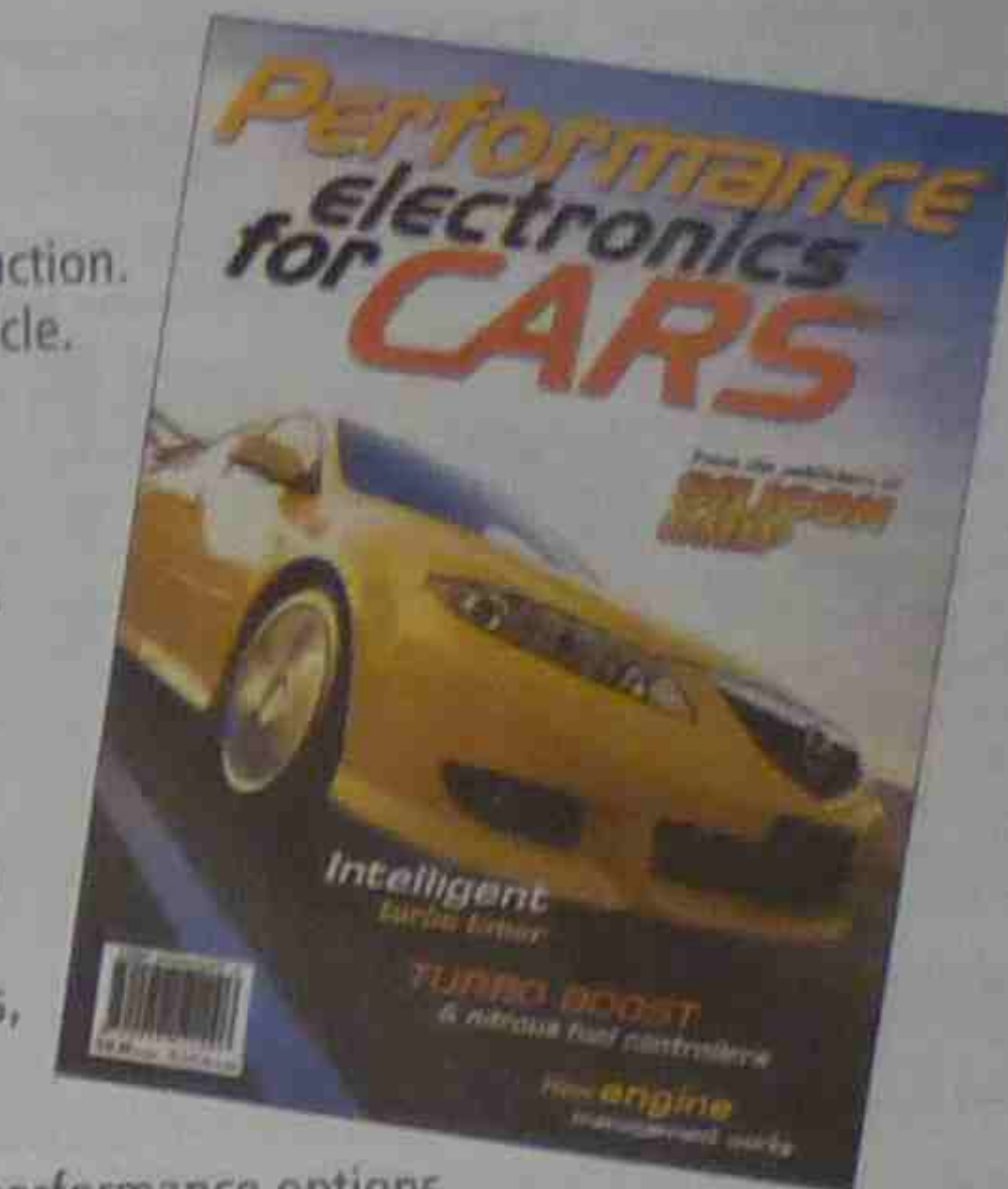
This unit is a huge revolution in DIY automotive performance. It gives you the power to completely tune the air/fuel ratio throughout the entire load range, at 128 load points, providing incredible mapping resolution and brilliant drivability. It uses the Handheld Digital Controller - KC-5386, so there is no need for a laptop, and it supports both static and real-time mapping. It can be used on 0-5V and 0-12V signals, so it is compatible with all voltage output airflow meters and MAP sensors. It can also be set to work with 0-1V signals, allowing modification of EGO sensor signals. This unit has been extensively tested on a wide range of cars including Subaru Impreza WRX & STi, Nissan 200SX, BMW 735i, Lexus LS400, & Nissan Maxima.

- PCB, machined case with processed panels, programmed micro and electronic components.
- Kit requires the Handheld Digital Controller - KC-5386 and connecting cable WC-7502 (25 pin RS-232 extension cable with all pins connected).

"It is absolutely no exaggeration to say that the release of the Digital Fuel Adjuster is going to cause a revolution in budget engine management modification." Julian Edgar, Silicon Chip Magazine.



Cat.	Qty 1+	Qty 5+
KC-5385	\$84.95	\$76.50



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WANT IT FAST? HOW ABOUT NEXT DAY DELIVERY - SEE PAGE 6

JAYCAR ELECTRONICS 2009 85







## 135WRMS ULTRA-LOW DISTORTION AMPLIFIER MODULE

Refer Silicon Chip Magazine August 2008

This ultra low distortion amplifier module uses the new ThermalTrak power transistors and is largely based on the high-performance Class-A amplifier which was featured in SILICON CHIP during 2007. The ThermalTrak transistors are a new version of the premium MLL3281A & MLL302A and have an integral diode for bias compensation. As a result, the circuit has no need for a quiescent current adjustment or a Vbe multiplier transistor and has an exceptionally low distortion figure.

- PCB and components.
- Requires heat sink & power supply (KC-5471)
- Output power: 135WRMS into 8 ohms and 200WRMS into 4 ohms
- Frequency response at 1W: 4Hz to 50kHz
- Input sensitivity: 1.26V RMS
- Input impedance: 12k ohms
- Harmonic distortion: <.008% from 20Hz to 20kHz
- Signal-to-noise ratio: 122dB unweighted (22Hz to 22kHz)
- Damping factor: <170 at 100Hz
- Stability: Unconditional



Cat.	Qty 1+	Qty 5+
KC-5470	\$94.95	\$85.50

## POWER SUPPLY KIT FOR 135W ULTRA-LD MKII AMPLIFIER (KC-5470)

Refer Silicon Chip Magazine September 2008

The amp module (KC-5470) is powered using an unregulated rail only. This power supply kit is specifically designed to provide a balanced +/- 55VDC supply to power this fantastic amp kit. It has two LEDs, which illuminate when power is present on the rails and the assist in slowly discharging the filter caps when power is switched off. It also provides another +/- 15V supply rail for optional powering of a preamplifier. Finally there is a +20V rail to power a speaker protector project (KC-5450).

- Supplied in short form with PCB and components.
- Requires a centre tapped transformer with 40V + 40V windings for the +/-55V rails and 15V + 15V windings for the auxiliaries.



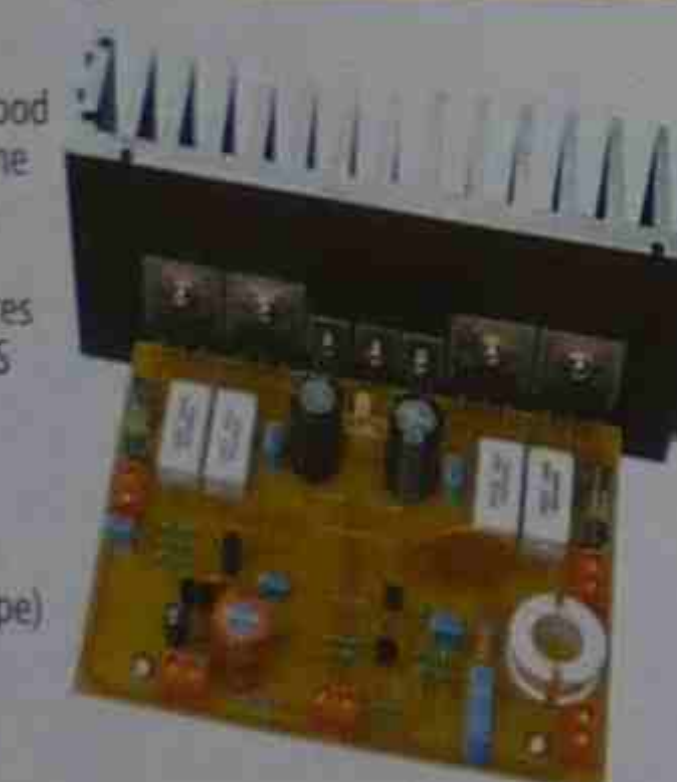
Cat.	Qty 1+	Qty 5+
KC-5471	\$55.95	\$50.50

## 50 WATT AMPLIFIER MODULE SC-480 1 TO-218 VERSION

Refer Silicon Chip Magazine January and February 2003

You may remember the ETI-480 amplifier kits, introduced in December 1976. Silicon Chip have re-designed it, utilising its good features, to create the new SC-480. Some of the new features include less distortion (<0.05% 20Hz - 20kHz), inbuilt polyswitch output protection, and far better Signal to Noise figures than its predecessor. Power output is 50WRMS into 8 Ohms and 70WRMS into 4 Ohms.

- Short form with PCB and components.
- +/-40V (KC-5347, \$17.95)
- Requires Heatsink, use HH-8555 (diecast type)



Cat.	Qty 1+	Qty 5+
KC-5345	\$49.95	\$44.90
HH-8555	\$19.95 ea	

## POWER SUPPLY TO SUIT SC-480

Refer Silicon Chip Magazine January 2003

Supplies +/-40V rails to power the SC-480 amplifier module kits. It also provides another +/-15V supply power to a preamplifier or equalizer etc.

- PCB and components
- +/-28V - (use MM-1095, 56V centre tapped transformer)



Cat.	Qty 1+	Qty 5+
KC-5347	\$17.95	\$15.95
MM-1095	\$42.95 ea	

## 50 WATT AMPLIFIER MODULE

Refer Silicon Chip Magazine March 1994

This 50 watt unit uses a single chip module and provides 50 watts RMS into 8 ohms with very low distortion and extreme quietness.

- PCB size only 84 x 58mm.
- PCB and components
- Requires Heatsink

Specifications:  
Output power: 50WRMS continuous into 8Ω  
Power supply: +/- 37.5VDC  
Signal/Noise ratio: -114dB (A-weighted)  
-106dB (20-20kHz)

Distortion: 0.002% at 40W 1kHz  
IHF power output: 60W @ 1kHz

Power Requirements:  
• +/-35VDC rails @ 80VA per module  
• MT-2114 25 + 25V 160VA toroid x 1  
• 2R-1314 Bridge rectifier x 1  
• RE-6241 2,200/50V electro caps x 2



Cat.	Qty 1+	Qty 5+
KC-5150	\$29.95	\$26.90
HH-8590	\$19.95 ea	

HEATSINK TO SUIT

## 1 WATT AUDIO AMPLIFIER MODULE

This tiny PCB measuring only 28 x 28mm incorporates all the electronics for a 1 Watt amplifier. 4 to 12VDC operating voltage, 50mV input sensitivity, 8 ohm output and 20 to 25000Hz output frequency. Optional connection for a 10k ohm - 100k ohm logarithmic potentiometer (not included) for adjustable volume control.

- PCB and components.
- 9VDC (use MP-3146)



Cat.	Qty 1+	Qty 5+
KG-9032	\$9.95	\$8.75
MP-3146	\$17.95 ea	

9VDC PLUGPACK TO SUIT

## "THE CHAMP" 0.5 WATT AUDIO AMPLIFIER

Refer Silicon Chip Magazine February 1994

This tiny module uses the LM386 audio IC, and will deliver 0.5W into 8 ohms from a 9 volt supply making it ideal for all those basic audio projects. It features variable gain, will happily run from 4-12VDC and is smaller than a 9 volt battery, allowing it to fit into the tightest of spaces.

- PCB and components
- 4-12VDC



Cat.	Qty 1+	Qty 5+
KC-5152	\$7.95	\$6.95
HH-6015	\$2.95 ea	

RECOMMENDED BOX - UB5

## "PRE-CHAMP" VERSATILE PREAMPLIFIER

Refer Silicon Chip Magazine July 1994

This tiny preamp was specifically designed to be used with the "Champ" amplifier KC-5152. Unless you have a signal of sufficient amplitude the "Champ" will not produce its maximum power output. The "Pre-Champ" is the answer with a gain in excess of 40dB, which is more than enough for most applications. You can vary the gain by changing a resistor and there is even provision on the PCB for an electret microphone. (Use AM-4010)

- PCB and components.
- 6-12VDC.
- Can be battery powered.



Cat.	Qty 1+	Qty 5+
KC-5166	\$8.95	\$7.95
AM-4010	\$2.65 ea	
HH-6015	\$2.95 ea	

ELECTRET MICROPHONE TO SUIT

RECOMMENDED BOX - UB5

## BRIDGE MODE ADAPTOR FOR STEREO AMPLIFIERS

Refer Silicon Chip Magazine July 2008

This excellent kit will let you run a stereo amplifier in 'Bridged Mode' to effectively double the power available to drive a single speaker. There are no modifications required on the amplifier and the signal processing is done by the kit before the signals are fed to the stereo amp. The kit is perfect for say, using a stereo amplifier as an occasional PA amplifier for social functions or using an old amplifier to drive a sub-woofer in a home theatre system. It sounds like magic, but is just a clever adaptation of basic electronic principles.

- PCB and components
- +/- 15-60VDC



## STEREO HEADPHONE DISTRIBUTION AMPLIFIER

Refer Silicon Chip Magazine November 2005.

Enables you to drive up to two stereo headphones from any line level (1 volt peak to peak) input. The circuit features a facility to drive headphones with impedances from about 8-600 ohms.

- PCB and components
- PCB size: 134 x 103mm
- +/- 15VDC (use KC-5418)



Cat.	Qty 1+	Qty 5+
KC-5417	\$34.95	\$31.45
HH-6012	\$6.95 ea	

RECOMMENDED BOX - UB2

## HEADPHONE AMPLIFIER POWER SUPPLY FOR (KC-5417)

Refer Silicon Chip Magazine October 2005.

To ensure the best possible performance to the Headphone Amplifier Kit, this will provide regulated +/- 15V and +5 outputs.

- PCB and components
- PCB size: 56.5 x 80mm
- 15-0-15VAC 20VA (use MT-2086)



Cat.	Qty 1+	Qty 5+
KC-5418	\$19.95	\$17.70
HH-6013	\$3.95 ea	

RECOMMENDED BOX - UB3

## UNIVERSAL STEREO PREAMPLIFIER

- Perfect for phono, tape or microphones.

Refer Silicon Chip Magazine April 1994

Based around the low noise LM833 dual op-amp IC, this preamp is designed for use with a magnetic cartridge, cassette deck or dynamic microphone. The performance of this design is far better than most preamps in many stereo amplifiers, making it a worthy replacement if your current preamp falls short of expectation. It features RIAA/IEC equalisation, and is supplied with all components to build either the phono, tape or microphone version.

- Measuring only 80 x 78 x 30mm, it is ideal for incorporating into existing equipment
- PCB and components
- +/- 15VDC
- Use Cat KC-5038 and Cat MM-2007 if power is not available in your equipment.



Cat.	Qty 1+	Qty 5+
KC-5159	\$16.95	\$14.95
KC-5038	\$14.95 ea	
MM-2007	\$8.95 ea	
HH-6011	\$4.45 ea	

POWER SUPPLY KIT TO SUIT  
TRANSFORMER TO SUIT  
RECOMMENDED BOX - UB1

## STEREO VU AND PEAK METER KIT

Refer Silicon Chip Magazine May 2007

Accurately monitor audio signals to prevent signal clipping and ensure optimum recording levels. This unit is very responsive and uses two 16-segment bargraphs to display signal levels and transient peaks in real time. There are a number of display options to select, and both the signal threshold and signal level calibration for each segment are adjustable.

- Accuracy within 1dB for signals above -40dB.
- PCBs, LCD, programmed micro and components.
- 9-15VDC 110mA (use MP-3147)
- Case not included (use HB-6082)



Cat.	Qty 1+	Qty 5+
KC-5447	\$69.95	\$62.95
MP-3147	\$17.95 ea	
HB-6082	\$11.95 ea	

## BALANCED TO UNBALANCED AUDIO CONVERTER

Refer Silicon Chip Magazine June 2008

Using domestic audio equipment in a professional environment is complicated by the fact that standard audio gear does not have the balanced inputs and outputs found in professional systems. This kit overcomes the problem and will adapt an unbalanced input to balanced output and vice versa. This allows domestic equipment to be integrated into a professional installation while maintaining the inherent high immunity to noise pick-up on long cable runs provided by balanced lines.

- PCB and Components
- +/- 9-15VDC or 9-30VDC or 7-12VAC



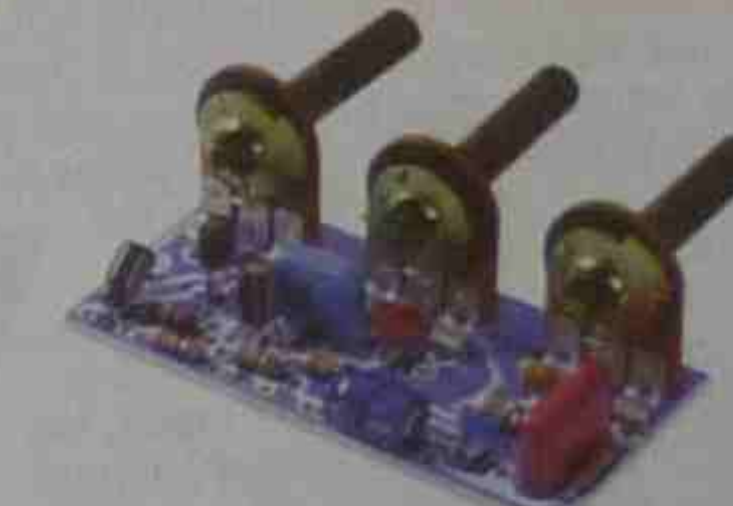
Cat.	Qty 1+	Qty 5+
KC-5468	\$32.95	\$29.45

RECOMMENDED BOX - UB3

## BASS, TREBLE & VOLUME CONTROLLER

This module enables you to add volume and tone control to any line level (IV) amp. The circuit consists of an input buffer, a Baxandall-type bass-treble network and output voltage divider type level control. It will give up to line level out.

- Mono - Two required for stereo.



Cat.	Qty 1+	Qty 5+
KG-9004	\$16.95	\$14.95
HH-6013	\$3.95 ea	

RECOMMENDED BOX - UB3

## PARABOLIC MICROPHONE

- Hear noises or conversations from a distance.

Whether you're James Bond or just an avid animal observer, this kit will allow you to hear noises from a few hundred metres away. Correctly identifying sounds over that distance is near impossible with normal, unaided hearing. With the use of a reflector (a plastic toy ball, for example), the microphone will detect the faintest sounds - then amplify them.

- Powered from 9VDC with an adjustable output for a small speaker or headphones.
- PCB dimensions: 55 x 44mm.
- Kwik Kit PCB, microphone and components.

A suitable reflector must be acquired, although it does not necessarily need to be parabolic. Most 'bargain basement' shops have inexpensive plastic balls that would be quite suitable.



Cat.	Qty 1+	Qty 5+
KG-9024	\$24.95	\$22.35

SEE OUR RANGE OF 433MHZ & 2.4GHZ WIRELESS MODULES ON PAGES 111 & 112



## SUBWOOFER CONTROLLER

Refer Silicon Chip Magazine August 2007  
Refer Silicon Chip August 2007

Adding a subwoofer to your home theatre or Hi-Fi or car sound system is the easiest way to extend its bass response. Using this kit to control your external speaker and sub-amplifier can give you loads of bass without taking up much space. The kit has all the features you could want, including low and high pass filters, parametric equaliser and auto-tune for external equipment. The controller is 12VDC powered and can also be used in automotive applications.

• PCB, case with processed panels and components

Cat.	Qty 1+	Qty 5+
KC-5452	\$99.95	\$89.95

## UNIVERSAL SPEAKER PROTECTION &amp; MUTING MODULE KIT

Refer Silicon Chip Magazine July 2007

The primary function of this versatile project is to protect your expensive speakers against damage in the event of catastrophic amplifier failure such as a shorted output transistor. In addition, the circuit also banishes those annoying thumps that occur when many amplifiers are switched on or off, especially when the volume is set to a high level. The design also incorporates an optional over temperature heat-sensor that will disconnect the speakers if the output stage gets too hot.

• PCB, 24VDC relay and components.  
• 22-70VDC

Cat.	Qty 1+	Qty 5+
KC-5450	\$34.95	\$31.45

## "MINIVOX" VOICE OPERATED RELAY

• Communicate "Hands Free".

Refer Silicon Chip Magazine September 1994

Voice operated relays are often used in "hands free" communication such as mobile radios, amateur transceivers as well as some PA applications. The idea, of course is that instead of pushing a button on the microphone to talk, the sound of the voice activates it instead. This tiny kit measures approx 50 x 50 x 15mm and is designed to fit into the tightest spaces, has almost no turn-on delay, and has 3 second release time.

• PCB, electret mic, and components.  
• 12VDC 35mA

Cat.	Qty 1+	Qty 5+
KC-5172	\$15.95	\$14.35

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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## MAGNETIC CARTRIDGE PREAMP

Refer Silicon Chip Magazine August 2006

This kit is used to amplify the 3-4mV signals from a phono cartridge to line level, so you can use your turntable with the CD or tuner inputs on your Hi-Fi amplifier - most modern amps don't include a phono input any more. Dust off the old LP collection or use it to record your LPs onto CD. The design is suitable for 12" LPs, and also allows for RIAA equalisation of all the really old 78s.

• S/N ratio: -84dB  
• THD at 1kHz: 0.014%  
• RIAA accuracy: within 1dB from 20Hz to 20kHz

Please note that the input sensitivity of this design means it's only suitable for moving-magnet, not moving coil cartridges.

• PCB and components.  
• 12VAC  
• Recommended enclosure HB-5042.

Cat.	Qty 1+	Qty 5+
KC-5433	\$39.95	\$35.90

RECOMMENDED BOX

HB-5042	\$21.95 ea
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## 15DB ANTENNA AMPLIFIER (SINGLE STAGE)

At last! A project for HAMS and anyone into RF. Featuring a strip line-type

high-gain RF transistor, this kit will provide gain up to a respectable 15dB over the bandwidth of 50-1000MHz. This covers all TV, FM, marine and aircraft VHF as well as Police, mobile phone etc. Has saddle clamp in and out to mount coax to lessen VSWR losses. So stable is this amp you can put two in series for extra gain without the amp taking off. Must go in a screened box once built. Duh!

\*Screening must be added to the UB5 box • 6-18V.

Cat.	Qty 1+	Qty 5+
KG-9002	\$24.95	\$22.35
HB-6015	\$2.95 ea	

## 45 SECOND VOICE RECORDER MODULE

Refer Silicon Chip

Magazine December 2007

Here's an improved version of the very popular voice recorder design published by Silicon Chip Magazine in May 2005. This improved version can now be set up easily to record two, four or eight different messages for random-access playback or a single message for 'tape mode' playback. Also, it now provides cleaner and glitch-free line-level audio output suitable for feeding an amplifier or PA system.

• PCB and components  
• 9-12VDC

Cat.	Qty 1+	Qty 5+
KC-5454	\$43.95	\$39.45
HB-6013	\$3.95 ea	

RECOMMENDED BOX - UB3

## THE SUPER EAR

• Hear those noises you normally never hear

Refer Electronics Australia May 1998

This kit assists people who have difficulty in hearing high audio frequencies, or for those who want to hear more than their normal unaided ear. By amplifying these high audio frequencies, not only will conversations be made clearer, you will be able to hear noises not normally heard such as insects or a watch ticking, for example. Built into a small case & powered from a 9V battery makes this kit totally portable. Use it as a hearing aid or for a fun & educational purpose.

• PCB case, processed panels, 9V battery, and components.  
• Headphones required.

Note: Not a replacement for a proper hearing aid.

Cat.	Qty 1+	Qty 5+
KA-1809	\$27.95	\$24.95

## FOG HORN

This kit generates a deep sounding noise similar to fog horns on ships. Use as a unique warning siren or to improve a child's toy.

• Output power up to 5 watts depending on the input voltage used.  
• 4.5-12VDC  
• Requires an 8ohm speaker - use our AS-3000.

Cat.	Qty 1+	Qty 5+
KG-9092	\$12.95	\$11.35

57MM SPEAKER TO SUIT

AS-3000	\$3.50 ea
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RECOMMENDED BOX UB3

HB-6013	\$3.95 ea
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## CLIFFORD THE CRICKET

Refer Silicon Chip Magazine December 1994

Clifford hides in the dark and chirps annoyingly until a light is turned on - just like a real cricket. Clifford is created on a small PCB, measuring just 40 x 35mm and has cute little LED insect eyes that flash as it sings. Just like a real cricket, it waits a few seconds after darkness until it begins chirping, and stops instantly when a light comes back on.

• PCB, piezo buzzer, LDR and components.  
• 9VDC

Cat.	Qty 1+	Qty 5+
KC-5178	\$16.95	\$14.95

## RADIO &amp; FM KITS

Video didn't kill the radio star. Rediscover the magic of radio through one of our three simple radio kits which take next to no time to assemble. But for something a little more challenging and infinitely more rewarding, pick up our popular Micromitter FM Transmitter. Hook it up to a CD or MP3 player and enjoy endless hours of listening to your favourite music or podcasts anywhere in your house through any humble FM radio.

## CRYSTAL RADIO

• A radio without batteries!

Enjoy AM broadcasting without using battery or other power sources. Ideal for entry-level students or hobbyist with little electronics experience.

• Includes circuit explanation.  
• Kit supplied with screen printed PCB (81x53mm), crystal, pre-wound coil, earphone and all components.

Cat.	Qty 1+	Qty 5+
KV-3540	\$12.95	\$11.35

## MICROMITTER STEREO FM TRANSMITTER

• Transmit your favourite music all over the house.

Refer Silicon Chip Magazine December 2002

We took the standard Silicon Chip design and improved it by replacing the original L-C filter components with a GFVB3 encapsulated 3 pin network to provide much better roll-off characteristics and reduce spurious interference outside the FM band. This is the third generation of this kit and is far more stable and compact than the original. You can connect your CD or MP3 player to the Micromitter and listen to your music all over the house through any FM radio. This model is also more stable than previous models and uses a surface mount BH1417F processor. It is crystal locked to a preselected frequency to eliminate frequency drift.

• Revised PCB, case with silk screened lid and components.  
• 6VDC (4 x AAA) or 9-16VDC plug pack

Cat.	Qty 1+	Qty 5+
KC-5341	\$49.95	\$44.90

## MINIATURE FM TRANSMITTER

Refer ETI December 1985

This unit is a two transistor two stage transmitter that has the benefits of being VERY COMPACT.

• PCB with dual overlay, 9V battery and components.  
• PC board size - 45 x 22mm.  
• 9VDC

Cat.	Qty 1+	Qty 5+
KE-4711	\$12.95	\$11.35

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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## 100 - 200MHZ VHF CONVERTER

This simple to build kit makes it feasible to receive, for example, taxis, amateur radio operators, marine radio, television audio carriers, etc. The kit connects in-line with your VHF receiver's antenna avoiding messy installation and receiver modifications. Operating voltage 9V DC Sensitivity up to 0.8uV at 10dB S/N. Expand your knowledge of radio!

Cat.	Qty 1+	Qty 5+
KG-9128	\$29.95	\$26.90

RECOMMENDED BOX

HB-5970	\$8.95 ea
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## VIDEO KITS

For a couple of dollars and a bit of sense, you can get so much more out of your home entertainment system. Extend the range of your remote so you can watch and operate your DVD or Foxtel from other rooms in the house. Or perhaps install a full function programmer for your wafer card. Either way our video kits will certainly enhance your home viewing pleasure.

## IR REMOTE EXTENDER MKII

Refer Silicon Chip Magazine October 2006

Operate your DVD player or digital decoder using its remote control from another room. It picks up the signal from the remote control and sends it via a 2-wire cable to an infrared LED located close to the device. This improved model features fast data transfer, capable of transmitting Foxtel digital remote control signals using the Pace 400 series decoder.

• PCB, case with screen printed panel and components  
• 2-wire cable for extending the IR-Tx lead (use WB-1702).  
• 9VDC 150mA

Cat.	Qty 1+	Qty 5+
KC-5432	\$26.95	\$23.95

9VDC PLUGPACK TO SUIT

MP-3146	\$17.95 ea
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2-WIRE CABLE TO SUIT

WB-1702	\$0.40 ea
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## SMART CARD PROGRAMMER KIT FOR GOLD, SILVER AND EMERALD WAFER CARDS

Refer Silicon Chip Magazine July 2003

This full function programmer allows you to program both the microcontroller and EEPROM in the popular Gold, Silver and Emerald wafer cards. It hooks up to the serial port of your PC and can be operated as a free-standing unit or installed in a PC drive bay. Cards used need to conform to ISO-7816 standards, which includes ones sold by Jaycar.

• Instructions outline requirements for software that are available on the Internet.  
• PCB, wafer card socket and electronic components.  
• PCB measures 141 x 101mm  
• 9-12VDC (battery or use MP-3130)

Jaycar Electronics and Silicon Chip Magazine will not accept responsibility for the operation of this device, its related software, or its potential to be used for unlawful purposes.

Cat.	Qty 1+	Qty 5+
KC-5361	\$54.95	\$49.45

REGULATED PLUGPACK TO SUIT

MP-3130	\$29.95 ea
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## KIT CONSTRUCTORS MANUAL

A must for amateur constructors. Contains much useful information for the more experienced. Huge amounts of information on construction and identification of parts.  
• 8 pages.

Cat.	Qty 1+
BI-8200	\$2.00

## SCHOOLS, UNIVERSITIES, COLLEGES

If your regular kit supplier no longer is in business, please contact us. We are happy to produce even small runs of kits for your students.



## HOUSEHOLD PROJECTS

We're proud of our stable of clever DIY home projects. Last year's water tank level meter and telemetry base station met a growing need for many households and businesses. This year we introduce the Tempmaster MKII - our upgrade of the original electronic thermostat kit; as well as a Remote Switch Kit with a range of up to 200m. Just a couple of the many bright ideas we have for making your life at home just a little easier.

## TEMPMASTER FRIDGE CONTROLLER MK II

Refer Silicon Chip Magazine February 2009

Want to convert an old chest freezer into an energy-efficient fridge or beer keg fridge? Or convert a spare standard fridge into a wine cooler? These are just two of the jobs this low-cost and easy-to-build electronic thermostat kit will do. It can also be used to control 12V fridges or freezers, as well as heaters in hatcheries and fish tanks. It controls the fridge/freezer or heater directly via their power cables, so there's no need to modify the internal wiring.

- Short-form kit contains revised PCB, sensor and components.
- You'll need to add your own 240V GPO, switched IEC socket and case.

Cat.	Qty 1+	Qty 5+
KC-5476	\$32.95	\$29.45

## TEMPMASTER

Refer Silicon Chip Magazine June 2005

Need accurate temperature for a wine cooler or beer brewing heater? This project can be hardwired to turn a regular fridge or freezer into a wine cooler by controlling the temperature to make it suitable for wine storage. Or wire it for heating and encourage fermentation while brewing beer.

- Temperature range: 2.5 to 33°C.
- PCB, Panel mount mains socket and mains lead, machined case with screen printed lid and components.
- 12VDC, 15mA.

Cat.	Qty 1+	Qty 5+
KC-5413	\$42.95	\$38.45

## TEMPERATURE SWITCH

- Ideal for turning fans or heaters on at certain temperatures.

This kit operates a relay when a preset temperature is exceeded and drops-out the relay when temperature drops. The relay included is capable of switching small currents only, so a larger relay or switching device should be employed if switching mains voltages or heavy currents. Ideal as a thermostat, ice alarm, hydroponics applications, etc. A small trimpot is used to adjust the cutout temperatures for the relay in the range of approx -30 to +150° celsius.

- PCB NTC thermocouple and components
- 12VDC, 100mA

Cat.	Qty 1+	Qty 5+
KG-9140	\$24.95	\$22.35

Cat.	Qty 1+	Qty 5+
MP-3147	\$17.95 ea	
HB-6015	\$2.95 ea	

## 433MHZ REMOTE SWITCH KIT

Refer Silicon Chip Magazine January 2009

Suitable for remote control of practically anything up to a range of 200m, for example as a replacement for a dead garage door opener. The receiver has momentary or long output and the momentary period can be adjusted. The receiver can also be used to drive a 12V relay. Up to five receivers can be used in the same vicinity and additional transmitter kits are available.

A versatile kit with endless applications.

- 433MHz • TX PCB and RX PCB and components
- 9-12VDC • Optional enclosures • Extra transmitter kit: KC-5474

Cat.	Qty 1+	Qty 5+
KC-5473	\$44.95	\$40.45
KC-5474	\$22.95	\$20.35

## UHF REMOTE CONTROLLED MAINS SWITCH

Refer Silicon Chip Magazine February 2008

There are many situations where it would be convenient to switch on an appliance remotely rather than switching it on manually. These could include turning on pathway lighting when you arrive home late at night, controlling garden lighting, or pool lighting and pumps etc. Remote switching can also be very convenient for appliances that are difficult to access. Commercial remote control mains switches are available but these are generally limited to a range of less than 20m. This UHF system will operate over a range up to 200m and is perfect for water pump control systems etc. The switch can be activated using the included hand held controller or our KC-5461 water tank level sensor base station for automatic water tank level control.

- 2 PCBs, 2 cases, RF modules, 2 programmed micros and components.

Cat.	Qty 1+	Qty 5+
KC-5462	\$99.95	\$89.95

## PIR CONTROLLED MAINS POWER SWITCH

Refer Silicon Chip Magazine February 2008

You've seen those lights fitted with PIR detectors that turn on when someone approaches. Well now you can do the same thing with just about any mains-powered device you like. You can use it to activate security systems, decorative lighting, fountain pumps or commercial advertising etc. Just about anything that can be plugged into a standard power point can be triggered by people moving in the vicinity of the passive infrared detector. The system uses a standard PIR to safely turn on 240VAC mains device(s) for an adjustable pre-set period. It's compact, easy to build, and will cost you much less than commercial PIR-triggered switches with similar features.

- Machines case with screen printed lid, PCB, mains sockets and components

Cat.	Qty 1+	Qty 5+
KC-5455	\$79.95	\$71.95

## ELECTRONIC FLOW RATE METER WITH LCD

Completely self-contained, this unit only measures 60 x 40mm and includes a full LCD information display. It's supplied with a reed switch and piezo alarm. It operates from 2 x AAA batteries and a battery holder is included. When used in conjunction with the FS-300AH Digital Flowmeter (Cat no. ZD-1202), it will count down (in litres) from a predetermined volume, for example 500 litres. When 500 litres have gone through the flowmeter an alarm will sound. The alarm signal can be used to trigger another slave device. As it goes up to 99,500 litres, it could be used in larger-scale applications such as irrigation or just to let you know when it's time to clean a filter. It also reads flow rate, will remember data and operate in time mode. An unbelievably fantastic product! Full data sheet and instructions included.

Cat.	Qty 1+	Qty 10+	Qty 25+
ZD-1204	\$69.95	\$62.95	\$48.90

- PCB/LCD size: 60(L) x 40(W)mm

## "CLOCKWATCHERS" LED CLOCK

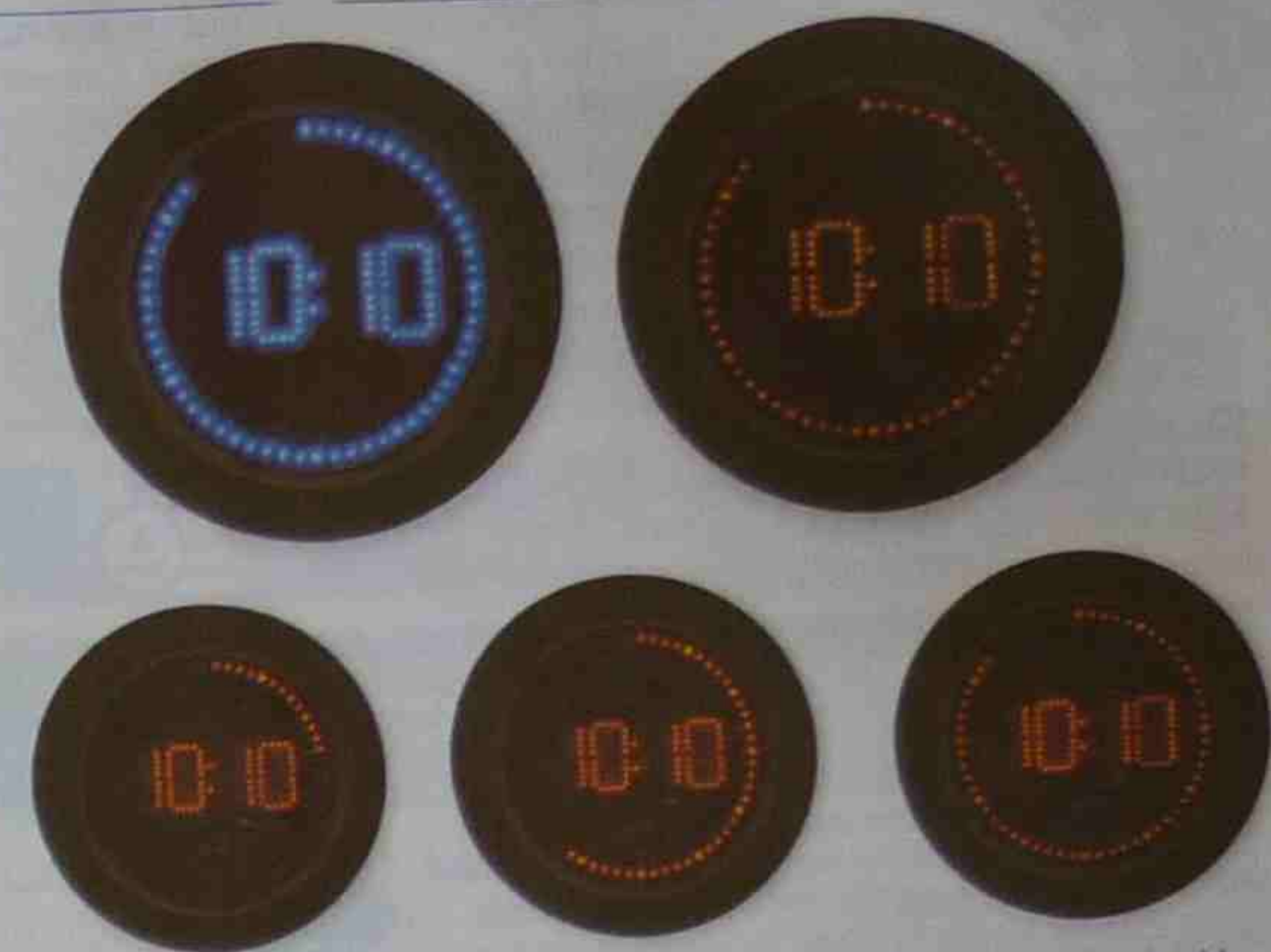
Refer Silicon Chip Magazine June 2005

It consists of a n AVR driven clock circuit, and produces a dazzling display with the 60 blue LEDs around the perimeter. It looks amazing, but can't be properly explained here. We have filmed it in action so you can see for yourself on our website, so check it out! Kit supplied with double sided silk screened plated through hole PCB and all board components as well as the special clock housing

WE HAVE FILMED THIS CLOCK IN ACTION SO YOU CAN SEE FOR YOURSELF ON OUR WEBSITE, SO CHECK IT OUT!

See page 419 for our built unit (Note: it's not quite the same).

	Cat.	Qty 1+	Qty 5+
RED	KC-5404	\$129.00	\$115.95
BLUE	KC-5416	\$189.00	\$169.95
12VAC POWER SUPPLY	MP-3020	\$18.95 ea	



Photos show clock with red filter fitted (supplied). For a full dynamic demonstration see our website, keyword search on KC-5404 and then follow the prompts.

## FLEXITIMER/INTERVAL TIMER

Refer Silicon Chip Magazine June 2008

Here's a new and completely updated version of a very popular project: an easily programmed low cost electronic timer. It operates from 12VDC, with low current drain: <50mA when relay is on, <5mA when relay is off. It is link programmed for either a single ON timing period, or continuous ON/OFF cycling and can be link programmed for any of 48 different time periods, separately for ON time and OFF time. Selectable periods are 1/2/3/4/5/6/7/8/10/20/30/40/50/60/70/80 seconds, minutes and hours. It may be restarted at any time simply by pressing reset pushbutton.

- PCB, programmed micro, relay and components. • 12VDC 50mA



Cat.	Qty 1+	Qty 5+
KC-5464	\$34.95	\$31.45

## THE FLEXITIMER

- Handy timer from a few seconds to an entire day.

Refer Electronics Australia March 1991

This simple timer kit may be used as a parking meter reminder, or the basis of a full blown watering system. This kit uses just a handful of components to accurately time intervals from a few seconds to a whole day. It can switch a number of different output devices.

- Jaycar revised the circuit and PCB to allow selection of one shot or interval (50% duty cycle) mode via a jumper
- The time period is set with another jumper and increases/decreases by power of 2
- PCB and components!
- 12-15VDC



	Cat.	Qty 1+	Qty 5+
12VDC PLUGPACK TO SUIT	KA-1732	\$19.95	\$17.70
RECOMMENDED BOX - UB3	MP-3147	\$17.95 ea	
	HB-6013	\$3.95 ea	

## LIQUID LEVEL SENSOR

When two contacts are shorted by liquid, an LED will illuminate. Use in applications such as an overflow alarm and rain detector. Connect Relay Card KG-9142 for a relay output to operate lights, sirens or other warning devices.

- PCB size: 45 x 17mm.
- Kwik Kit PCB and components.
- 9VDC



	Cat.	Qty 1+	Qty 5+
RECOMMENDED BOX - UB5	KG-9138	\$9.95	\$8.75
	HB-6015	\$2.95 ea	

## PIC BASED WATER TANK LEVEL METER KIT

Refer Silicon Chip Magazine November 2007

Looking for a water tank level meter that's easy to install, accurate and doesn't need a complicated in-tank sensor? This PIC-based unit uses a pressure sensor to monitor water level and display tank level via an RGB LED at the press of a button. The kit can be expanded to include an optional wireless remote display panel that can monitor up to ten separate tanks (KC-5461) or you can add a wireless remote controlled mains power switch (KC-5462) to control remote water pumps.

- Basic tank monitor kit includes electronic components, case, PCB and pressure sensor.
- Some fitting may be required to suit your particular tank.



Cat.	Qty 1+	Qty 5+
KC-5460	\$109.00	\$97.95

## TELEMETRY BASE STATION FOR WATER TANK LEVEL METER

Refer Silicon Chip Magazine January 2008

The ability to monitor water tank levels from a remote location can be very useful, especially if you have several water tanks or if the tanks are hard to access. This Base Station is intended for use with the telemetry version of the KC-5460 water tank level meter and can handle data transmissions from up to 10 level meters and display the results on a 2-line 32-character LCD module. In bargraph mode, it can show up to 10 tank levels simultaneously, while the digital readout mode shows individual tank levels to 1%. As a bonus, it also includes an option for electric pump control.

- PCB, electronic components, receiver module and the RF transmitter upgrade for one tank level meter.
- Requires transmitter module to control KC-5462 remote switch.
- 9-12VDC 100mA.



Cat.	Qty 1+	Qty 5+
KC-5461	\$84.95	\$76.50

## LED WATER LEVEL INDICATOR MKII KIT

Refer Silicon Chip Magazine July 2007

This clever circuit illuminates a string of LEDs to indicate the water level in a rainwater tank. The more LEDs that illuminate, the higher the water level inside the tank. The input signal is provided by ten sensors that are connected to the indicator unit via light duty figure-8 cable.

- Requires: 20mm PVC hose/pipe (length required depending on depth of tank)
- 12-18V AC or DC plugpack 500mA
- PCB case with machined and screen printed lid and components



Cat.	Qty 1+	Qty 5+
KC-5449	\$39.95	\$35.90



## SECURITY PROJECTS

There's more to security than just deterring would-be intruders with wailing sirens and flashing lights. Our infrared security kits serve many household and commercial purposes, including detecting and alerting you of customers entering your shopfront, cars or vans entering your driveway, blockages in your assembly line and even whether or not your IR remote control is working.

### ROLLING CODE INFRARED KEYLESS ENTRY SYSTEM

Refer Silicon Chip Magazine October 2007

Features two independent door strike outputs and will recognise up to 16 separate key fobs. The transmitter uses a fixed algorithm to calculate and transmit a different code each time the button is pressed. The receiver uses the same algorithm to compare the received code with the expected code and if they match, the door will open. The system incorporates an auto match facility that keeps the coded key fobs synchronised to the receiver and compensates for random button presses while the fobs are out of range.

- PCBs, two programmed micros, battery & electronic components.
- The receiver requires a 12VDC 1.5A power supply. Some SMD soldering is required.

Cat.	Qty 1+	Qty 5+
KC-5458	\$64.95	\$58.50

### 5 METRE IR LIGHT BEAM

With a range of about 5 metres, this kit will indicate using an LED when a person or object interrupts the infrared light beam. Use it across a doorway or across an assembly line. Connect a relay or use the Relay Card KG-9142 for a relay output.

- PCB dimensions: 58 x 45mm.
- Kit supplied with solder masked PCB with overlay, infrared transmitter/receiver diodes, and all electronic components.
- 12VDC 100mA - (use plugpack MP-3011)

Cat.	Qty 1+	Qty 5+
KG-9094	\$14.95	\$13.35
MP-3011	\$19.95 ea	
HB-6013	\$3.95 ea	

### 50M IR LIGHT BARRIER

Covering a distance of up to 50 metres this light beam relay is ideal for protecting areas that have wide entrances, including driveways, shops, offices and storerooms, etc. Once the beam is broken the relay will trigger an onboard LED which will illuminate.

- TX 9VDC (use MP-3130) RX 12VDC (use MP-3011)
- PCB, infrared transmitter diodes, receiver transistor, magnifying lens and components.
- PCB: Receiver 56 x 45mm, Transmitter 17 x 55mm

Cat.	Qty 1+	Qty 5+
KG-9196	\$49.95	\$44.90
MP-3011	\$19.95 ea	
MP-3130	\$29.95 ea	

### INFRARED FLOODLIGHT

Let your CCD camera see in the dark! This infrared light is powered from any 12-14VDC 300mA source and uses 32 x infrared LEDs to illuminate an area of up to 5-metres (will vary with light conditions). The PCB measures 56 x 75mm and draws a current of about 300mA.

- Screen printed/gold-plated/solder-masked PCB, 32 x infrared LEDs and all electronic components.
- Use our plugpack supply: MP-3147.

Cat.	Qty 1+	Qty 5+
KG-9068	\$29.95	\$26.90
HB-6013	\$3.95	

### INFRARED DETECTOR

This kit will switch on LED when it detects infrared light from sources such as IR remote controls. Connect it to the Relay Card KG-9142 to make an infrared remote controlled relay. Project requires 9VDC.

- PCB dimensions: 55 x 15mm
- Can be battery powered.
- Kwik Kit PCB, infrared receiver and all electronic components.
- Use to test if your remote control is working.

Cat.	Qty 1+	Qty 5+
KG-9086	\$9.95	\$8.75
HB-6015	\$2.95 ea	

## LIGHTING PROJECTS

We offer several lighting projects which include smart solutions for your stage lighting, party lighting and outdoor home lighting needs. We even have a full-sized basketball electronic scoreboard - perfect for schools, sporting clubs and crazy b-ball fanatics who just need to practice those heart-stopping buzzer-beaters over and over again.

### EMERGENCY 12V LIGHTING CONTROLLER

Refer Silicon Chip Magazine January 2008

This easy-to-build project is designed to automatically supply power for 12V emergency lighting during a blackout. The system has its own 7.5Ah SLA battery which is maintained via an external smart charger. The system includes a manual override switch and automatic protection to prevent over-discharge of the battery. Build your own emergency lighting system so you won't have to search for candles or your torch in the event of a blackout.

- PCB, case with screen printed panel and components
- Charger, SLA battery and lights available separately.

Cat.	Qty 1+	Qty 5+
KC-5456	\$69.95	\$62.95

### 12V LIGHT OPERATED RELAY

This kit can operate as a twilight on/off switch or as a light trigger relay. Operated from 12 volts, this versatile project triggers a 6 amp relay when the light intensity falls below an adjustable threshold. Turn lights on around the house when it goes dark or trigger an alarm when a light is switched on.

- Kwik Kit PCB, relay and all electronic components.
- 12VDC required - use plugpack MP-3147.

Cat.	Qty 1+	Qty 5+
KG-9090	\$24.95	\$22.35
MP-3147	\$17.95 ea	

### FLICKERING FLAME LIGHTING

Great for the stage or unique lighting effects at home.

Refer Silicon Chip Magazine October, 1997

Theatrical productions often call for flaming torches and similar real flame lighting effects. The problem is that for obvious safety reasons, most theatres and halls have strict rules regarding the use of naked flames. Enter The Flickering Flame kit. This lighting effect uses a single 20W halogen lamp (the same as those used for domestic down lights) to mimic its' namesake. Fitted to a compact PCB, it operates from 12V DC and uses just a handful of readily available components.

- PCB, 20W halogen lamp, ceramic base socket, and components.
- 12VDC 2A

Cat.	Qty 1+	Qty 5+
KC-5234	\$16.95	\$14.95
HB-6015	\$2.95 ea	

### NEON TUBE SOUND DISPLAY

Make your neon light flash to the music.

Refer Silicon Chip Magazine November 2001

Following the tremendous success of the original 1997 Sound Mod kit, this latest version overcomes some of the original's limitations. With this latest kit you can now use any output from your car stereo - it is not limited to being exclusively driven by a subwoofer output, unlike its predecessor. This kit drives any colour neon tube in the Jaycar range (see website) and has the option of turning the tube either on or off to the beat of the music.

- PCB and components.
- 12VDC

Cat.	Qty 1+	Qty 5+
KC-5322	\$19.95	\$17.70
HB-6015	\$2.95 ea	

### DMX CONTROLLER USB INTERFACE

Add computer control to your DJ or stage show. The DMX protocol was developed with the purpose of controlling dimmers, scanners, moving heads and other lighting devices with simple wiring. It is mainly used in theatres and discos, but you can use it in any place where a central or automated lighting is needed. Use this kit to control DMX fixtures such as spotlights using a PC and USB interface. A comprehensive kit that includes software, USB cable and enclosure. There's also a DLL provided so you can write your own software if you like. It can also be operated in stand-alone mode that outputs all 512 channels at the same time (9V battery required for stand-alone mode).

- Test software and DMX Light Player software included
- 512 DMX channels with 256 levels each
- 3 pin XLR-DMX output connector
- Windows 98SE or higher compatible
- Optional 9V battery needed for stand alone test mode
- Dimensions: 106(L) x 100(W) x 44(H)mm

Cat.	Qty 1+	Qty 5+
KV-3610	\$149.00	\$133.95

### DMX RELAY CONTROL KIT

Control a relay with the DMX512 protocol. It is actually a bus-controlled power driver. The relay will be activated when the DMX value of the set channel equals 140 or more and turns off when the value is 120 or less. Team it with KC-5482 to make a computer-controlled automation system. Short form kit contains DMX-512, XLR plug, PCB and all specified components.

- 512 unique addresses, DIP switch settable
- LED indication for power supply, relay output & error status
- Relay Hold function in case of DMX signal loss
- Switching capacity: 8A
- Supply voltage: 12VDC
- Power consumption: max. 100mA

Cat.	Qty 1+	Qty 5+
KV-3612	\$49.95	\$44.90

### DMX CONTROL DIMMER KIT

This kit allows you to control a lamp or group of lamps through a DMX signal. You can use the USB Controlled DMX Interface kit (Cat No. KC-5480) or any other control console compliant with the DMX-512 protocol as a controller. It will drive resistive loads like incandescent lamps and mains voltage halogen lighting. Short form kit contains XLR socket, PCB and all specified components.

- 512 unique addresses, selectable with DIP switch
- Status LED for power and error detection
- Toroidal filtering for low noise
- Stand alone mode for testing
- Load capacity: 1000 W @ 230V (5A) or 500W @ 115V
- Power Input: 115/230 VAC
- Dimensions: 150(L) x 60(W) x 45(H)mm

Cat.	Qty 1+	Qty 5+
KV-3614	\$79.95	\$71.95

### MAKE YOUR OWN BASKETBALL SCOREBOARD

This kit enables you to make a full-sized electronic scoreboard, in particular for basketball but also adaptable for netball and other games.

Refer Silicon Chip Magazine March, April, May, August 2005.

It can be built for a fraction of the cost of commercial equivalents but has the fantastic feature of a completely wireless scoring console. You can mount the scoreboard high up in a court and all you need is a convenient 240V power point (115V available on request). You can then control the scoreboard from a table courtside with no messy wiring.

The scoreboard will operate under NBA, FIBA, & NCAA time rules. It features Home/Away team scores 0 to 199, Game period, and Countdown time which reverts to 1/10 second readout when there is one minute left in the quarter.

- All scoreboard functions are on the console with a safety feature of not being able to reset the game unless certain deliberate keyboard protocols are done.
- The console and the scoreboard operate from safe 12V AC adaptors. They can even be operated from a 12 volt car battery!
- The Jaycar kit comes complete with all pre-cut scoreboard woodwork, screen printed face, display filters, mounting plates, pre-programmed microcontroller, printed circuit boards, 2.4GHz transmitters and receivers, pre-punched control console with special piezo end-of-game/quarter sounder, all PCB components, connectors, instructions, solder, etc.

#### NEW UPGRADED MODEL WITH FOUL SCORING



SCOREBOARD CONSOLE

"HOME TEAM" AND "AWAY TEAM" GRAPHICS FOR ILLUSTRATION ONLY. ACTUAL TEAM NAMES AND SIZE OF NAME ARE UP TO THE CONSTRUCTOR

#### COMPLETE SCOREBOARD & CONSOLE KIT

Cat.	Qty 1+	Qty 5+
KC-5408	\$799.00	\$719.00

#### EXTRA SCOREBOARD

Cat.	Qty 1+	Qty 5+
KC-5409	\$649.00	\$585.00

### LASER LIGHT SHOW

Generate a dazzling laser display using our new laser module Cat. ST-3115 and ST-3117. Using two speed adjustable motors that are fitted with mirrors, patterns similar to a spirograph toy can be projected onto a wall. Great for parties!

- Operating voltage is 6VDC.
- PCB size 100 x 74mm.
- Kit supplied with screen printed gold-plated PCB, 2 motors and mirrors plus all electronic components.
- Laser not included.

SEE PAGE 118 FOR OUR LASER MODULES.

Cat.	Qty 1+	Qty 5+
KG-9098	\$39.95	\$35.90
ST-3115	\$17.95 ea	
ST-3117	\$99.95 ea	

### LUXEON STAR LED DRIVER

Refer Silicon Chip Magazine May 2004

Luxeon high power LEDs are some of the brightest LEDs available in the world. This kit allows you to power one or two 1W or 3W Stars, or a single 5W Star, from 12VDC, efficiently for minimum battery drain. It even features a low battery cutout, making it perfect for the car, boat or caravan.

- PCB and components.
- 12VDC 1A (use MP-3210)

SEE PAGE 116 FOR OUR STAR LED RANGE

Cat.	Qty 1+	Qty 5+
KC-5389	\$29.95	\$26.90
MP-3210	\$36.95 ea	
HB-6013	\$3.95 ea	



- The scoreboard measures 900 x 600mm and is approx. 70mm deep.
- The console measures 185(W) x 130(D) x 55(H)mm at rear x 30(H)mm at front.
- The console can control more than one scoreboard simultaneously.

Shipping weight - ask for a quote if ordering through Tech Store.



## COMPUTER KITS

Don't chuck out that obsolete piece of junk just yet. Whether at home or at the office, we have a range of clever little computer kits that can extend the capabilities of your PC or Mac. Use your computer as an infrared transceiver to transfer files from your PDA or digital camera; or remotely control your electrical appliances at home via SMS or through your printer port! And for you musos, drag your PC into the garage/studio and turn it into a sophisticated audio test instrument to measure and monitor any sound.

### AVR ISP SERIAL PROGRAMMER

Refer Silicon Chip Magazine October 2002  
Program, erase and rewrite the program and data memory in your AVR microprocessor without even removing it from the application circuit. This kit connects to the computer serial port, uses royalty-free software available on the Internet and allows you to program a multitude of micros in the AVR 8-bit RISC family, including: ATtiny12, ATtiny15, AT90S1200, AT90S2313, AT90S2323, AT90S2343, AT90S4414, AT90S4433, AT90S8515, AT90S8535, ATmega83, ATmega103, ATmega161, ATmega163.

- PCB, case with screen printed lid and components.
- Can be used with KC-5421

Cat.	Qty 1+	Qty 5+
KC-5340	\$44.95	\$40.45

### AVR ADAPTOR BOARD KIT (TO SUIT KC-5340)

Refer Silicon Chip Magazine March 2006  
A low cost method of stand-alone programming for when the application board is unavailable or doesn't include an ISP (or JTAG) header. Program, erase and rewrite the program and data memory in your AVR microprocessor with this socket board. Kit includes everything you need to support in-system programming.

- PCB, IC sockets and components
- In conjunction with KC-5340 AVR ISP Serial Programmer Ref. (Silicon Chip October 2002) • 12VDC 150mA.

Cat.	Qty 1+	Qty 5+
KC-5421	\$34.95	\$31.45

12VDC PLUGPACK TO SUIT	MP-3147	\$17.95 ea
RECOMMENDED BOX - UB2	HB-6012	\$6.95 ea

### USB EXPERIMENTER'S INTERFACE

Interface your computer to the real world with this sophisticated USB Kit. There are five digital inputs to monitor the state of external switches or controls and two variable gain analogue inputs that can be connected to sensors and used for measuring temperature, humidity, voltage, current, & other variable parameters. Eight digital and two analogue outputs are available for controlling external equipment. The kit is supplied with all components, silk screened PCB, assembly manual, and software.

- PCB measures 145 x 87mm.
- 5 Digital inputs
- 2 Analogue inputs with variable gain
- Analogue input range 0 to 5VDC
- 8 Open collector digital outputs
- 2 Analogue outputs PWM or 0 to 5VDC
- On-board test buttons for inputs & LED
- USB powered
- Win98SE or above (Not NT)

Cat.	Qty 1+	Qty 5+
KV-3600	\$89.95	\$62.95

RECOMMENDED BOX - UB2	HB-6012	\$6.95 ea
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### SMS CONTROLLER FOR NOKIA PHONES

- Control appliances or receive alerts from anywhere!

Refer Silicon Chip November 2004.

Would you like to be alerted via SMS when your burglar alarm has been activated, and which sectors too? How about being able to also reset the alarm if you are confident all is fine? It may seem futuristic, but it is all possible with the SMS controller module. By sending plain text messages, you can control up to eight devices. At the same time, it can also monitor four digital inputs. It works with old Nokia handsets such as the 5110, 6110, 3210, and 3310, which can be bought quite cheap if you do not already own one.

- Requires a Nokia data cable which can be found in mobile phone accessory stores.
- PCB, programmed microcontroller and components
- 12VDC 500mA.

Cat.	Qty 1+	Qty 5+
KC-5400	\$57.95	\$51.95

### PC LINK FOR AUTOMATIC CONTROL

- Automate your house and show your friends how clever you are! By using our parallel port controller, you can switch up to eight separate devices on or off via your computer's printer port. Could be used for model trains etc. Each SPDT relay can handle 10 amps and has an LED indication to show whether it is on or off.
- Basic software is provided on a 3.5" disk.
- Kit includes PCB, relays, software, and all electronic components.
- 8 - 12VDC power required - use plug pack MP-3136
- Put an old out of service machine back to work!
- Windows 95, 98, 2000 and XP compatible
- Requires direct port access

Cat.	Qty 1+	Qty 5+
KV-3590	\$69.95	\$62.95

9VDC PLUGPACK TO SUIT	MP-3484	\$21.95 ea
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### TEST INSTRUMENT INTERFACE FOR PC SOUND CARDS

- Turn your computer into an oscilloscope, audio monitor or spectrum analyser!

Refer Electronics Australia August 1998

Plug the kit into your computer's soundcard and by using software available over the Internet, measure or monitor just about any audio signal. Most PC sound card inputs have a limited dynamic range, relatively low input impedance and poor overload protection - this kit will eliminate these limitations and allow tiny signals, like those from op-amps, to be measured without degradation. Or use it for amplifying a high quality microphone for sampling. Power is derived from the soundcard's D15 Joystick output socket.

- PCB, case with screen printed lid, and components.
- Optional CRO probe to suit - use our QC-1902.

Cat.	Qty 1+	Qty 5+
KA-1811	\$29.95	\$26.95

CRO PROBE TO SUIT	QC-1902	\$39.95 ea
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### PC INFRARED TRANSCIVER

- For IRDA connection to your mobile phone etc.

Refer Silicon Chip Magazine December 2001

Did you know that most Pentium-class motherboards include infrared support right out of the box? This quick and easy kit plugs into your motherboard to provide IR support for external devices such as notebook computers, PDAs, digital cameras, data samplers - and the list goes on!

- PCB, wire, and components.

Cat.	Qty 1+	Qty 5+
KC-5323	\$21.95	\$19.70

### GET YOUR SILICON CHIP AT JAYCAR

Silicon Chip is Australia's world-class magazine for the electronics enthusiast. As well as a great range of fun DIY kits, SILICON CHIP has interesting features articles and popular columns such as "Serviceman's Log" and "Circuit Notebook" etc. Jaycar gets its stock of SILICON CHIP straight off the printing press, so we usually have it a couple of days earlier than the newsagents. Don't forget to call in to a Jaycar store for the latest issue hot off the press.

Cat.	Qty 1+
BE-5025	\$8.50

## POWER KITS

This year we introduce an upgrade to the handy universal motor speed controller kit, enabling you to vary the motor speed of your power tools and other 240V motors. Our neat range of power kits also includes DC relay cards and switches, battery voltage indicators and chargers, and voltage adaptors, regulators and converters.

### UNIVERSAL DRILL / MOTOR SPEED CONTROLLER KIT

Refer Silicon Chip Magazine February 2009

Drill speed controllers are nothing new, and in spite of the availability of variable speed power tools, there is still a need for a stand-alone motor speed controller. Apart from power tools, it's often handy to be able to control the speed of other 240V motors. Suitable for brush motors up to 10A, the circuit is a revised version of the popular 5A speed controller from October 2002.

- You'll need a garden-variety IEC lead as well.
- PCB, case with screen printed lid and components

Cat.	Qty 1+	Qty 5+
KC-5477	\$64.95	\$58.50

### 240V 10A DELUXE MOTOR SPEED CONTROLLER KIT

Refer Silicon Chip Magazine April 2009

Another motor speed controller? This one is a little bit different and offers boutique performance in the world of speed controllers. While the simpler circuit of our other motor controller kit (KC-5477) will control a motor's speed fairly well, it can't provide maximum speed as the output voltage is limited to about 160VAC maximum. It also doesn't provide great speed regulation and torque at low speeds. The deluxe kit addresses all these issues and provides full speed control from near zero to maximum RPM, good speed regulation under load, very smooth low speed operation and is rated for devices up to 2300W. It also has soft-start to eliminate the "kick" from larger power tools and has interference suppression filtering, fuse protection and over-current protection with limiting. This kit really is the duck's guts for motor speed control. The case has the tricky cutouts pre-machined, but a little bit of extra drilling is required to complete the project.

- Overlay PCB and all components.
- Machined case included

Photo shown is our prototype only

Cat.	Qty 1+	Qty 5+
KC-5478	\$99.95	\$89.95

### PC CONTROLLED STEPPING MOTOR DRIVER

This kit will enable you to control the supplied stepper motor manually, or via your computer's parallel port with the software provided. You can accurately control the motors direction, speed and number of rotations. This kit has many uses and is only limited by your imagination. Use it to experiment in robotics, for camera panning, a radio antenna rotator or even to open the curtains in the morning.

- Kit supplied with PCB, stepper motor, software and all electronic components.
- Computer cable required Cat WC-7502.
- Windows 95, 98 or XP recommended
- Requires direct port access

Cat.	Qty 1+	Qty 5+
KV-3594	\$49.95	\$44.90

COMPUTER CABLE TO SUIT	WC-7502	\$13.95 ea
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Have you seen our new **SCHOOL 40km/hr AUTOMATIC WARNING ALERT** (ref. Silicon Chip April '09)? It includes all components & silkscreen printed front panel. Check it out on Page 82.

## BATTERY ZAPPER KIT MK II NEW & IMPROVED PROJECT!

Refer Silicon Chip

Magazine May 2006

We received such a great response from satisfied customers of our lead acid battery zapper kit, we've gone one further and given it a great improvement! Like the project from Silicon Chip in July 2005, this kit attacks a common cause of failure in wet lead acid cell batteries: sulphation. Sulphation leads to an early death to your batteries but this is one treatment that thousands of our customers last year gave the thumbs up to. What the circuit does is to produce short bursts of high levels of energy to reverse the sulphation effect. Going a few steps further this year, we've added the new feature of battery health checking to give you an indication of the battery's level of health, added new circuit protection against badly sulphated batteries, test points for a DMM, and connection for a battery charger.

- PCB, machined case with printed lid and components.
- 6, 12 or 24VDC.

Cat.	Qty 1+	Qty 5+
KC-5427	\$109.00	\$97.95

### LOW VOLTAGE BATTERY WARNING

This circuit monitors any battery voltage between 3-15 volts once set. Whenever the voltage falls below a predetermined value a red LED lamp lights up. It does not, however, automatically disconnect the battery. Uses a tiny amount of power from the battery being monitored. Could save you embarrassment or a fortune by avoiding battery damage.

- Kwik kit PCB and components

Cat.	Qty 1+	Qty 5+
KG-9000	\$9.95	\$8.75

RECOMMENDED BOX - UB5	HB-6015	\$2.95 ea
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### LED BATTERY VOLTAGE INDICATOR

- Quick battery condition indication.

Refer Electronics Australia Sept 1995

This tiny circuit measures just 25mm x 25mm and will provide power indication and low voltage indication using a bi-colour LED, and can be used in just about any piece of battery operated equipment. The circuit is suitable for equipment powered from about 6-30VDC. With a simple circuit change, the bi-colour LED will produce a red glow to indicate that the voltage has EXCEEDED a preset value.

- PCB, bi-colour LED and components
- 6-10VDC 3-8mA

Cat.	Qty 1+	Qty 5+
KA-1778	\$9.95	\$8.75

RECOMMENDED BOX - UB5	HB-6015	\$2.95 ea
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### KIT POWERTOOL BATTERY CHARGER CONTROLLER

Refer Silicon Chip Magazine

December 2006

Normal power tool battery chargers are just plain hopeless and do nothing to prolong the life of the batteries in the battery pack. Now you can enhance the performance of the charger supplied with your power tool with this controller. It incorporates charge timeout, min and max temperature monitoring, Delta charge detection, power and charge LED indicator, adjustable Delta V, temperature settings, and optional adjustable trickle charge. Suits both Ni-Cd and Ni-MH cells.

- PCB, case with screen printed lid and components.

Cat.	Qty 1+	Qty 5+
KC-5436	\$39.95	\$35.90

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## POWER KITS (CONTINUED)

### IMPROVED LOW VOLTAGE REGULATOR

Refer Silicon Chip Magazine May 2008  
Need to operate a CD, DVD or MP3 player from the cigarette lighter socket in your car? Or perhaps run some powered speakers from the power supply inside your PC? The odds are you'll need this little adaptor to step the voltage down. It has a push-on jumper shunt to select one of six common output voltages 3V, 5V, 6V, 9V, 12V or 15V and, when used with an appropriate input voltage and heatsink, with a thermal resistance of 1.4°C per Watt, can deliver up to four amps at the selected output voltage.

- PCB and components.
- Input voltage 3VDC above the output voltage is required.



Cat.	Qty 1+	Qty 5+
KC-5463	\$17.95	\$15.95

### VOLTAGE REGULATOR KIT

Refer Silicon Chip Magazine May 2007  
This handy voltage regulator can provide up to 1,000mA at any voltage from 1.3 to 22VDC. Ideal for experimental projects or as a mini bench power supply.

- PCB and components
- Heatsink may be required depending on input voltage and output current



Cat.	Qty 1+	Qty 5+
KC-5446	\$16.95	\$14.95

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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### VERSATILE REGULATED VOLTAGE ADAPTOR

Refer Electronics Australia August, 1997

This kit is a low-powered DC converter for many applications, for example, where you need a reliable voltage source for a portable CD player or similar battery-powered device. Another use for this adaptor is for a peripheral computer power supply to power external Zip drives, powered speakers, modems, music/MIDI keyboards, etc. Just plug its input into your PC's internal power supply cable and get selectable regulated voltage out from 3 to 15VDC. Output current capability is around 1.5 amps (depending on the size of heatsink used - not included, available separately).

- PCB and components
- Input voltage 3VDC above output voltage



Cat.	Qty 1+	Qty 5+
KA-1797	\$7.95	\$6.95

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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### 3V TO 9V DC - DC CONVERTER

Refer Silicon Chip Magazine March 2004  
9V batteries are a great source of portable power, but let's face it - they don't last long if you want more than a few milliamps, & they are not real cheap either.

This nifty converter allows you to use regular Ni-Cd or Ni-MH 1.2V rechargeables, or Alkaline 1.5V cells for 9V applications. It can run from AA, C or D cells, deliver up to 90mA output at 9V. Output can be set from 4.5-20VDC.

- 12VDC plugpack input, optional trickle charge for rechargeable batteries.
- PCB and components.
- The required holder for the batteries depends on the supply cells used.



Cat.	Qty 1+	Qty 5+
KC-5391	\$15.95	\$14.35

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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### FAST NI-MH BATTERY CHARGER KIT

Refer Silicon Chip Magazine September 2007

A truly versatile charger, capable of handling up to 15 of the same type of Ni-MH or Ni-Cd cells. Build it to suit any size cells or cell capacity and set your own fast or trickle charge rate. It also has overcharge protection including temperature sensing. Ideal for R/C enthusiasts who burn through a lot of batteries.

- PCB, programmed micro and components.
- Case, heatsink and battery holder not included.



Cat.	Qty 1+	Qty 5+
KC-5453	\$42.95	\$38.45

### SUPER SIMPLE 12VDC-240VAC INVERTER

This circuit is ideal if you need 240V for a small appliance away from mains. It says it will drive up to 70W peak but we would rate it at 30W RMS max. (Not really RMS as it is square wave). In addition to this kit you will need 2 x Heatsinks such as HH-8560 (page 158) and a step-up transformer such as the MM-2015 or, better MM-2016.  
Tip: If you have a big 12-0-12/240 transformer in your junk box this will end up a cheap inverter.



Cat.	Qty 1+	Qty 5+
KG-9006	\$19.95	\$17.70

### 12VDC RELAY CARD

• Add a relay output to your equipment.  
This kit will close a relay's contacts with as little as 5mA to trigger the circuit. Literally any kit you see on these pages that uses an LED as a trip-condition indicator, can be used with this nifty project. Use the relay to sound buzzers, switch on lights, operate solenoids, trigger alarms, etc.  
Operation: common ground - output LED to ground

- Kit includes Kwik Kit PCB, relay plus electronic components.
- LED cathode must be connected to ground.



Cat.	Qty 1+	Qty 5+
KG-9142	\$9.95	\$8.75

### DC RELAY SWITCH

Refer Silicon Chip Magazine November 2006

An extremely useful and versatile kit that enables you to use a tiny trigger current - as low as 400µA at 12V to switch up to 30A at 50VDC. It has an isolated input, and is suitable for a variety of triggering options, including an AC or oscillating signal. It also has a relay-on LED indicator.

- PCB, relay and components.
- 12VDC 150mA.
- Recommended enclosure HB-6015



Cat.	Qty 1+	Qty 5+
KC-5434	\$16.95	\$14.95

RECOMMENDED BOX - UB5

HB-6015	\$2.95 ea
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### 4 CHANNEL RELAY BOARD WITH IP CONTROL

This 4 input switcher can be given an IP address which allows you to switch up to 4 devices. Turn on your security cameras and view what's going on at your premises by switching your cameras on from anywhere in the world! TVs, air conditioners, lighting, or other home appliances can be switched on or off by utilising this module.

- Polarity protection
- 4 Inputs
- Supports: HTTP, IPDDNS, and DHCP
- Embedded Web Server
- Password protection



Cat.	Qty 1+	Qty 5+
KV-3595	\$99.95	\$89.95

### UNIVERSAL +/- 15V POWER SUPPLY

Refer Silicon Chip Magazine August 1988

This small kit enables you to obtain +15V, -15V or ±15V DC from a number of different transformer and rectifier combinations.

- Obtain ±15V rails from 12V AC plugpack, or 2851 transformer (MM-2006)
- Obtain ±15V rails from 30V AC centre tapped (MM-2007) transformer
- Revised PCB and components to build one of the options listed above.



Cat.	Qty 1+	Qty 5+
KC-5038	\$14.95	\$13.35

TRANSFORMER TO SUIT

RECOMMENDED BOX - UB5

CT TRANSFORMER TO SUIT

MM-2006	\$7.95 ea
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HB-6015	\$2.95 ea
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MM-2007	\$8.95 ea
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## TEST EQUIPMENT

Testing equipment need not cost you an arm and a leg. We have a nifty range of test kits for the hobby enthusiasts, learning tradesperson or simply for those looking for a cost-effective solution for simple testing instruments.

### SERIAL PROGRAMMER KIT FOR DSPIC30F SERIES PIC MICROCONTROLLERS

Refer Silicon Chip Magazine May 2008

The dsPIC30F series of micro-controllers are extremely useful but some older PIC programmers cannot program them due to pinning incompatibilities and other issues. This very affordable programmer kit can handle all the dsPIC30F family and almost all of the regular PICs available in a DIP package. It uses freely available software for PCs and is easy to build. It will work with any RS232 serial port and most USB-RS232 converters. If you have ever wanted to experiment with DSPs, the dsPIC30F series is a good starting point. Microchip offers a lot of free documentation and source code on their website, so getting started should be a breeze.

- Double sided plated through hole PCBs, 2 x 40 pin tip sockets and components
- 16VDC 400mA



Cat.	Qty 1+	Qty 5+
KC-5467	\$74.95	\$67.50

### DIGITAL MULTIMETER KIT

Learn everything there is to know about component recognition and basic electronics with this comprehensive kit. From test leads to solder, everything you need for the construction of this meter is included together with a detailed manual. With test questions and schematic supplied in the manual, the kit can be geared to an individual or class learning environment, making it an excellent choice for first year trade apprentices. Kit includes DMM case, LCD, solder, battery, test leads, PCB, comprehensive 18 page learning manual and electronic components.

All you'll need is a soldering iron.

- Meter dimensions: 67(W) x 123(H) x 25(D)mm



Cat.	Qty 1+	Qty 5+
KG-9250	\$24.95	\$22.35

### PIC LOGIC PROBE KIT

Refer Silicon Chip Magazine October 2007

Most logic probes are designed to operate on the 5V rails that have been around in logic circuits for years. This design operates on a wide voltage range down to 2.8V so it's suitable for use on the most modern circuits. It's also extremely compact with SMT devices on a PCB only 5mm wide, so it will fit inside a very slim case. It's capable of picking up a pulse only 50mS long and will also detect and hold infrequent pulses when in latch mode.

- You'll need to add your own case and probe - a clear ballpoint pen and a darning needle work well
- Double sided plated through hole PCB
- programmed, micro, LEDs and components
- 2.8-15VDC



Cat.	Qty 1+	Qty 5+
KC-5457	\$16.95	\$14.95

### ELECTRONIC TEST BENCH MAGAZINE SILICON CHIP

This book contains plans and instructions regarding a selection of the best test equipment kits from the pages of Silicon Chip magazine. Includes details explaining 18 kits, from a low-cost dual tracking power supply, to a compact pink noise generator.

- Softcover, 205 x 275mm. • 128 pages.



Cat.	Qty 1+
BS-5070	\$10.95

## IN CIRCUIT TRANSISTOR TESTER

- Test the suspect transistor without having to desolder it.

Refer Electronics Australia September 1983

Have you ever unsoldered a suspect transistor only to find that it checks OK? Troubleshooting exercises are often hindered by this type of false alarm. You can avoid these hassles with the "In-Circuit Transistor, SCR and Diode Tester".

The kit does just that, test drives WITHOUT the need to unsolder them from the circuit! VERY HANDY!

- Revised PCB, 9V battery, components & case with screen printed panel showing truth table for device checking.
- Revised PCB by Jaycar!
- No more messy wiring. Easy assembly!
- 9VDC



Cat.	Qty 1+	Qty 5+
KA-1119	\$27.95	\$24.95

### 50MHz FREQUENCY METER MK 2

Refer Silicon Chip Magazine February 2007

An invaluable service tool, this frequency meter kit features an 8-digit LCD, automatic indication of units (Hz, kHz, MHz or GHz) and prescaler.

- PCB, LCD, components and case with machined and screen printed lid.
- Input sensitivity: <20mV RMS from 1Hz to 100kHz, 50mV at 20MHz and 85mV at 50MHz.
- Input Imped: 1.1MW in parallel with about 10pF
- Frequency range: 0.1Hz to 50MHz or better
- Untrimmed accuracy: ±20ppm equivalent to 1000Hz at 50MHz
- Trimmed accuracy: ±10ppm from -20°C to 70°C
- High Resolution Mode: 0.1Hz from 0.1-150Hz; 1Hz from 150Hz-16MHz; 10Hz from 16-50MHz. Low Resolution Mode: 1Hz from 1-999Hz; 10Hz from 1kHz-50MHz
- Update time (approx.): 200ms for 10Hz resolution; 1s for 1Hz resolution; 1s for 0.1Hz resolution to 10Hz, 10s at 0.1Hz
- Display units: Hz from 0.1-999Hz; kHz from 1-999.999kHz; MHz from 1-50MHz
- 7.5-12VDC 65mA



Cat.	Qty 1+	Qty 5+
KC-5440	\$69.95	\$62.95

## SCI-FI EFFECTS

George Lucas eat your heart out. Whether you're a budding sci-fi movie producer or simply wanting to impress your infrequent intergalactic visitors, our Galactic Voice Kit and Jacob's Ladder MkII are sure to impress even the most discerning Klingon or Dalek.

### GALACTIC VOICE KIT

Refer Silicon Chip Magazine September 06.

Be the envy of everyone at the next Interplanetary Conference for Evil Beings with this galactic voice simulator kit. Effect and depth controls allow you to vary the effect to simulate everything from the metallic-challenged C-3PO, to the hysterical ranting of Daleks hell-bent on exterminating anything not nailed down. For those who really need to get out of the house a lot more. Take me to your leader....

- PCB, enclosure, panels and components.
- 9VDC (battery)



Cat.	Qty 1+	Qty 5+
KC-5431	\$45.95	\$41.45

### JACOB'S LADDER HIGH VOLTAGE DISPLAY KIT MK2

Refer Silicon Chip Magazine April 2007

With this kit and the purchase of a 12V ignition coil (available from auto stores and parts recyclers), create an awesome rising ladder of noisy sparks that emits the distinct smell of ozone. This improved circuit is suited to modern high power ignition coils and will deliver a spectacular visual display. Inspired by the good doctor's laboratory in the Frankenstein movie, use this kit for theatre special effects or just to impress your friends.

- PCB, pre-cut wire/ladder and components.
- Requires 12VDC
- 12V automotive ignition coil (Holden VN commodore equivalent)
- 12V 7Ah battery or 12VDC > 5A power supply

Warning: The Jacobs Ladder Kit uses potentially dangerous voltage.



Cat.	Qty 1+	Qty 5+
KC-5445	\$42.95	\$38.45







- ① How do you understand Project management?
- ② What are the steps in development of Project life cycle?
- ③ What are included in technical meaning of Project management?
- ④ Sketch the overview diagram of Project management.
- ⑤ Explain the strategy in Project management with outline diagram
- ⑥ What are the indicators of Success & failure of Project?
- ⑦ How will you begin the Project Planning?
- ⑧ Sketch the overview diagram of Project Planning.
- ⑨ If there are many steps & activities in the Project, how will you manage to handle?



## EO91 Test (1)

- (1) What are the aspects of electrical contracting?
- (2) Write down any ten questions related to sale and marketing aspect before proceeding to electrical contract.
- (3) As an electrical contractor, you are required to provide the specification for 11kV, 2900 cross arm structure on pole with pin insulators.
- You need to refer the appropriate technical documents and perform the followings
- (a) Sketch the design diagram
  - (b) Indicate the dimensions
  - (c) Prepare the material list
  - (d) Provide the specifications.
  - (e) Indicate appropriate Australian standard.
  - (f) Include safety aspect.
- (4) What are the steps for purchasing?
- (5) How will you manage to keep the tools in your work place?



## Theory Test (1)

### E001

- (1) What is occupational health & safety?
- (2) What is the responsibility of employer for work place safety of employees?
- (3) What is the responsibility of employee for work place safety?
- (4) What is the responsibility of government authorities for work place safety?
- (5) Can electric fire be extinguished with water?
- (6) If you have to lift a heavy weight, what will you do?
- (7) Write down the dangers given by industrial chemicals.
- (8) Is possession of electrician licence alone enough for working underground?
- (9) How can excessive heat, noise and vibration give disadvantage to human body and how can you protect them?
- (10) What will you check before using electrical equipments in work place?
- (11) What is danger tagging?
- (12) What is D R A B C?