

UK.D-I-Y FAQ

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Caution: Some information is out of date

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UK.D-I-Y FAQ

Everything you wanted to know about DIY but

were afraid to ask...

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UK Do It Yourself - Frequently Asked Questions (FAQ)

What is uk.d-i-y?

UK.D-I-Y is a [usenet](#) "newsgroup". It was created at the end of 1994, and since then has grown into a very popular group which typically receives in excess of 6,000 postings per month! Some may be unfamiliar with newsgroups, and usenet in general. They have existed on the internet for many many years, and even predate the creation of the world wide web itself. Although some web sites have been created that allow access to usenet, it is generally at its best when accessed using dedicated news reader software.

DIY stands for "Do It Yourself", Plumbing, wiring, building, decorating, furniture making, and in fact anything and everything to do with maintaining, running, and improving your home, from putting up shelves to building a

- Can I advertise on
[uk.d-i-y?](#)

- Copyright

- Disclaimer

house. Doing the job yourself saves the expense of employing somebody else, and often gives better results (you have to live with them after all!). It can be both enjoyable to do, and provide a great deal of satisfaction.

UK stands for United Kingdom (England, Scotland, Wales and Northern Ireland), and is very relevant because so many aspects of DIY, such as practices, regulations, and where to get particular products, are country-specific. Questions are welcomed from elsewhere around the globe, of course, but the advice given may not be applicable to those areas.

So what is this web site all about?

This web site contains a compendium of Frequently Asked Questions from the newsgroup and some of the better answers that have been posted to them. It also contains links to the more recently introduced DIY WIKI project (a DIY, DIY FAQ if you like - like other wiki projects, anyone can edit the WIKI - not just a formal administrator or maintainer).

Questions about motor vehicles are not in the scope of this group. You'll find appropriate forums in the [uk.rec.cars.maintenance](#) hierarchy. The [uk.telecom](#) hierarchy is more appropriate for questions about phones. The very popular [uk.rec.gardening](#) newsgroup discusses all matters to do with gardening in the UK. It overlaps with [uk.d-i-y](#) in matters such as hard landscaping and the construction of sheds, ponds and pools.

How do I join in?

See the [newsgroup access tips](#) to learn more and find out how you can participate.

Who "owns" the newsgroup?

Nobody owns it, and anyone is free to post. It is also unmoderated. The FAQ maintainer has no privileges compared with anyone else. That is why it is in everybody's interest to try to preserve order by attempting to follow basic netiquette guidelines and to adhere to the guidelines published here.

The [Google website](#) archives all postings made to uk.d-i-y (and indeed any other usenet group), unless their authors have specifically marked them otherwise. The archive can be searched by newsgroup, author and/or subject and can thus reveal both the record and reputation of a contributor, and allow previous discussions to be referenced.

Purpose of this Document

This document is written with the help of the regular contributors to the [uk.d-i-y](#) usenet newsgroup. Please read it before posting to the uk.d-i-y newsgroup. This document also acts in lieu of a formal "charter" for the [uk.d-i-y](#) newsgroup. It explains what the group is for, gives guidelines on what is and what isn't considered acceptable practice in this newsgroup, and tells you where you can find answers to many DIY problems.

Can I advertise on this website?

Sorry, but no. This may come as a surprise, but this web site is a non commercial site. It has no product to sell. That also means that if you sell web site search optimisation services, we really have no need to hear from you!

Can I advertise in the uk.d-i-y newsgroup?

COMMERCIAL ADVERTISING IS FORBIDDEN ON UK.D-I-Y. It is an interactive forum, and the good "signal to noise ratio" of uk.d-i-y will be spoilt by those who selfishly exploit it. If you want to advertise, go to news:uk.adverts.. (etc) or start an appropriate newsgroup (see <http://www.usenet.org.uk>).

Company representatives (who are often valued experts) are welcome to suggest their products where a genuine question has been asked on the subject, but only if they answer the questions put. Company representatives may mention their products, services or websites in the signature of their replies to questions. (please keep signatures to under five 75-character lines).

The Reference parts of the FAQs contain listings of companies useful to the DIYer, these generally only included on recommendations from regulars. However if you have a product or service that you feel is of particular interest to the DIY community, then please add a link to the [suppliers](#) page on the wiki.

Private individuals wishing to sell (or give away!) relevant items can use this group to advertise them, within reason, so long as they post a follow-up when what is for sale is no longer available.

To uk.d-i-y-ers: Please complain strongly to Internet Service Providers about advertising in this newsgroup if it transgresses the above guidelines: a small amount of effort on your part will help to keep the group usable. The more complaints ISPs receive, the more likely they are to act.

Copyright Information

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Disclaimer

Although contributors to the uk.d-i-y newsgroup have an impressive depth of knowledge, they cannot be held liable for any consequences whatsoever of the information or advice they provide, either on the uk.d-i-y newsgroup, in the uk.d-i-y FAQ, or in the uk.d-i-y Wiki.

DIY can go wrong, with expensive or even dangerous consequences, and it therefore must be stressed that nothing should be attempted without applying common sense, and only if you are confident in your ability to carry out the job with safety (both your own and others') and successfully. You cannot expect answers to your questions to include a complete list of possible pitfalls, although people will very frequently remind you of some of them. Remember that the advice has been given to you in good faith, free of charge. While most posters will try to give their best advice, neither its accuracy nor legality can be relied upon.

If you are unsure about anything then do please ask - it is much less embarrassing than blowing yourself up or

having your house collapsing around your ears.

Finally, postings from company email addresses are personal to the poster, and do not necessarily represent the views of the company supplying the Internet connection.

Happy DIY-ing!

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UK.D-I-Y FAQ

Using the uk.d-i-y FAQ site

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Background information

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Where are the answers?!

You will find a multitude of DIY related questions and answers, plus detailed articles on DIY subjects. Some are contained in this FAQ site. It's menu driven and easy to navigate. In addition many additional detailed articles are held on the uk.d-i-y [wiki pages](#). The wiki is search based site that you can also contribute to yourself. If you have seen wikipedia, then you will be familiar with the concept.

Use the links at the top of the page to view the questions and answers (FAQs), or to jump over to the wiki site.

The FAQs are currently maintained by John Rumm (editor@diyfaq.org.uk). You are strongly encouraged to send suggestions and new contributions to him by email. Note that the FAQ is not the work of just one person - your valuable contributions make it what it is!

Do not expect the FAQ maintainer to answer all your DIY questions!

If you have a question and can't find the answer in the FAQs (and, let's face it, if all the answers were here then there would be no need for the uk.d-i-y newsgroup!) check the [Google](#) archive by doing a "[Advanced Groups Search](#)" at the website. Fill in the boxes there, click "Google Search" and be prepared for

somewhere between zero and n million articles to appear! If you want to widen your search beyond discussions on uk.d-i-y then delete uk.d-i-y from the Newsgroup box. Also, the date range searched can be narrowed by specifying dates in the "Return messages posted between" boxes. *Note that google search for usenet groups has been somewhat broken of late - even simple changes like asking for results in date order may change the number of reported hits.*

How do I ask a question?

If the answer is still eluding you then there's a good chance that someone with extensive knowledge will respond to a courteous question posted in the uk.d-i-y newsgroup. Since their reply will be made in the newsgroup their words of wisdom will be shared with a large audience and will therefore benefit more people.

For detailed information on access to the newsgroup, see this [article](#)

There are also several web-based newsgroup sites, some of which are geared towards searching the groups. Google is a popular one. To use it for posting go to [/groups.google.com/groups?q=uk.d-i-y](https://groups.google.com/groups?q=uk.d-i-y) and click on "Post a new message to uk.d-i-y".

But first...

Please make sure that however you post to the newsgroup, you do so in plain text, and not using HTML (web-based) message formats. Do not use any special effects; not even bold or coloured fonts. These will not come out on the posted message, and may even be illegible.

If you want to include an 'ASCII' diagram, use a fixed width font such as Courier, otherwise it will not come out right for other readers. It's a good idea to prefix such diagrams with a note to your reader to tell them to 'switch to a fixed width font', too.

Any guidelines about posting?

You should aim to follow "netiquette" guidelines when posting to newsgroups. Some useful ones for this newsgroup can be found [here](#). Best tip of all, lurk (i.e. read the postings of other contributors) for a couple of weeks first, to get a feel for the culture of uk.d-i-y, the way it operates and individuals interact, and to ensure that your questions have not been asked umpteen times in the last few days before you dive in!

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HEATING SYSTEMS

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- [Gas Boiler valves - Why does the pilot light keep going out?](#)

Note: Some useful information on the different types of Central Heating system can be found on this commercial website:

<http://www.gasman.fsbusiness.co.uk/>

CONVENTIONAL BOILERS

By Dave Williams, a.k.a. "Trollard", 21/5/96 edited by Matthew Marks

This comprises a boiler and a hot water storage cylinder having a capacity of typically 25-40 gallons. The water in the cylinder is heated by an internal coiled tube fed from the boiler. Circulation between them is either gravity (relying on convection to produce circulation) or pumped. The cylinder will be fed from a cold water storage/expansion cistern with a capacity equal to or greater than it. This is supplemented by a separate cistern, typically 10 gallons, which acts as a feed and expansion vessel for the boiler circuit and space heating system. The water in the boiler and radiators is thus kept separate from the domestic hot water, reducing problems of scale build-up or corrosion from dissolved air or impurities, and allowing corrosion inhibitor to be added.

Gravity systems usually have no control specific to the hot water, and use the pump as control for the heating system. This means that the cylinder is heated whenever the boiler is on, leading to very hot water when heating is required, and it is also possible for

some radiators to heat up when the pump is off, due to convection. Control can be provided by mechanical means (valve on return to boiler, sensing return water temperature) or electrical (cylinder thermostat operating motorised valve). In any case, the boiler always (except in very special cases such as Agas) has its own thermostat to limit the temperature of the water passing through it.

Pumped systems usually have a three-port motorised valve (q.v.), which can supply for the cylinder, for heating or for both. The valve, pump and boiler are controlled by the timer and room and cylinder stats. More complicated arrangements can include extra two-port valves for different heating zones.

There are variations on this theme. "Un-vented" systems (as opposed to "open" systems) exist that do away with the need for a cold water storage cistern. These are fed direct from the mains water supply and are supplied as a packaged unit comprising all necessary controls and safety devices. It is important to note that this type of system comes under the jurisdiction of Building Regulations and appropriate approval should be sought. The system can only be installed by a competent person i.e. the holder of a Registered Operative Identity Card.

Another type of hot water storage cylinder is known as a Primatic. This differs from a conventional cylinder in that the heating water from the boiler is not contained within a coil (indirect system) but is instead contained within a dome which separates the two water systems by an air bubble. The advantage of this system is that the need for two separate tanks is done away with and a single tank provides cold water storage only, with the air bubble providing expansion capacity for the heating system, and allowing it to be topped up from the hot water supply. Additives cannot be placed in a heating system with this type of cylinder. Its use is not advised, and often prohibited, by most boiler manufacturers.

Combination Boilers

[Click here for the FAQ on Combination Boilers](#)

Recommendations as to choice of system

This will vary depending on individual circumstances, but generally the following will act as a guideline:

Combi boilers are best suited to flats, small properties and/or families, low/infrequent hot water consumption.

Storage hot water systems are best suited to large properties and/or families, high/frequent hot water consumption

Can I attach a power (pumped) shower to my combi boiler?

By Ian Smith

No. A power shower needs to draw its supply, both hot and cold, from tanks so that it is not subject to problems with mains pressure variations. Since a combi effectively gives you mains hot water it is incompatible with a power shower.

CONDENSING BOILERS

By Dave Williams, a.k.a. "Trollard"

Review of Conventional Boilers

Before describing a condensing boiler it is important to understand how a "conventional" boiler works.

A conventional boiler comprises a burner and heat exchanger to transfer the heat to the water. Typically the heat exchanger is cast iron or tinned copper (the latter particularly popular on wall mounted boilers). These 2 simple components are supplemented by

equally simple controls, a boiler thermostat and gas valve. The thermostat controls the temperature of hot water generated (typically 82C) by switching the gas valve.

There are variations on this theme e.g. conventional flue/balanced flue/fanned flue, on/off and modulating control but all operate with the same basic principles.

Of the heat put into the boiler 70-80% is passed to the water (including some heat loss to the boiler's surroundings) and the remaining 20-30% goes out of the flue. (The efficiency of the boiler is dependent on the age of its design.) On this type of boiler the flue temperature is typically 220C. An important criterion on these boilers is that the return water temperature should not fall below 55-60C (on a normal system the return would be 71C). If the water falls below that temperature then condensation will occur in the flue. This is bad news because the condensation will contain weak acids that will lead to premature failure of the heat exchanger. In fact, it can halve the boiler's life.

Additions in a Condensing Boiler

A condensing boiler attempts to recover the 20-30% heat loss through the flue by deliberately inducing condensation. This is why condensing boilers operate most efficiently with return water temperatures below 55-60C. This is achieved by adding a second heat exchanger on the flue and because of the acids (typical pH3.6 - similar to tomato juice) the material used tends to be stainless steel or aluminium. This second heat exchanger is the main reason why condensing boilers tend to be bigger and certainly more expensive (typically double the cost) than a conventional boiler. The introduction of the second heat exchanger means that the higher resistance for flue gases often necessitates the use of a fan. This does have the added advantage that siting of the boiler is more flexible as longer flues are allowed. In all other respects a condensing boiler works on the same principle as a "conventional" boiler.

The efficiency of a condensing boiler is from 86% upwards (some industrial boilers achieve 99%) although better than 90% can only be achieved by reducing the return water temperature below 60C. The heat emission from the boiler casing is negligible on

condensing boilers due to the addition of insulation. Typically a condensing boiler will take 3-7 years to recover the additional capital outlay.

Considerations when Installing a Condensing Boiler

With all the extra heat being squeezed out of the flue gases the temperature is far lower, typically 50-60C, and results in considerable plumbing (steam) from the flue. Condensing boilers are best suited to gas as oil and solid fuel fumes have higher acidity levels and lower moisture content. A condensing boiler requires a drain to be installed on the flue to remove the condensation, but because of the low temperatures this can be run in plastic. It should not be routed externally due to the risk of freezing.

Condensing boilers do introduce some special design considerations. Thermostatic radiator valves will reduce boiler efficiency as by shutting down they raise the return water temperature. Outside weather compensation control systems are recommended although impractical for most domestic installations as a separate pumped circuit is then required for domestic hot water. If lower water temperatures are used then a greater surface area of radiators will be required. Condensing boilers can only be used with fully pumped systems.

THERMAL STORES

By Rick Hughes 25/9/1997

These are open vented hot water cylinders, not unlike a domestic hot water cylinder. The big difference is the internal heat transfer tubing, and the way the hot water take off occurs.

In a conventional DHW tank, the transfer coil is connected to the boiler, and the boiler is also connected to the central heating pipe

feed and return. The hot water is run off from the DHW cylinder, being replaced by the cold water cistern, and this is heated by the transfer coil. The coil has to transfer all the boiler heat and this is the weak point, resulting in long warm up times and long recovery periods.

The Thermal Store differs in that the boiler is connected directly to the cylinder, circulating the whole cylinder contents. This direct transfer means faster response (mass of hot water = thermal store).

The transfer coils are typically much larger in surface area than in typical DHW tanks and are 10's of metres long, coiled up and usually finned. There are two of these transfer coils. The one at the lower part of the tank feeds the heating system and is typically set to be around 60 degrees C. The upper transfer loop has one end connected to the incoming mains water supply, and its other end is the domestic hot water feed.

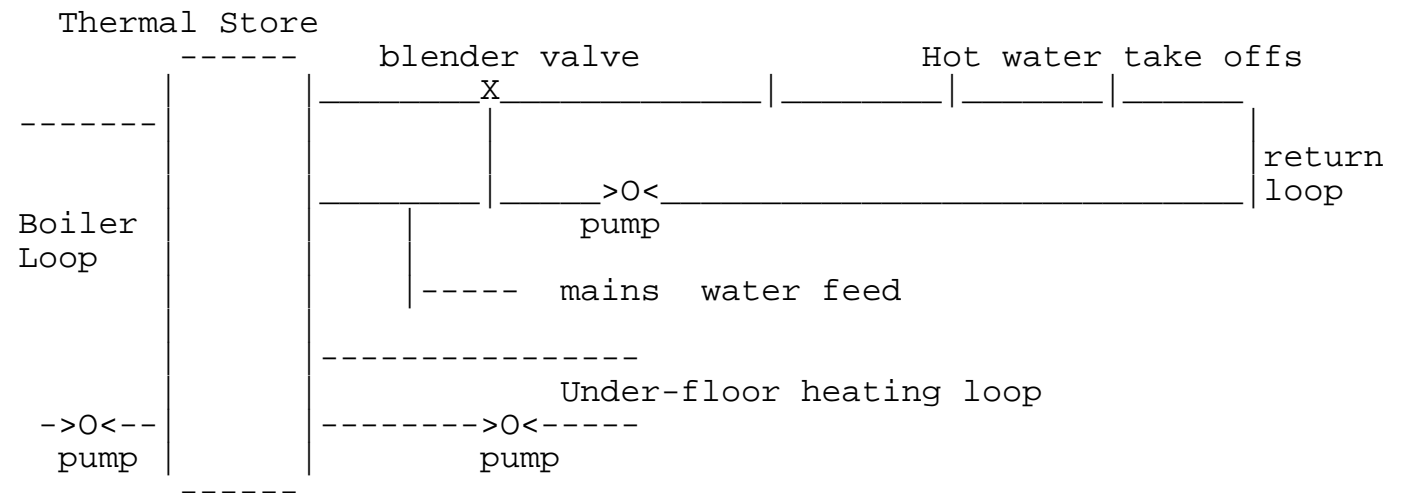
The upper part of the tank is set to run at around 75 degrees, the large store of hot water in the tank allowing you to run the cold water through the coil at 5 or more gallons per minute. Note, however, that this will only be the case if your rising main can supply it! (See section 5.2). Some even include a return loop and water pump to give instantaneous hot water at mains pressure, as in hotels. So you get mains pressure hot water, which is one big benefit of this system.

The other big benefit is that there is a large thermal mass of hot water in the cylinder. This means that the boiler can run for a long efficient burn, rather than the repeated small cycles that are inherent with a traditional coil connection.

Thermal stores can be used with any wet heating system, and are almost mandatory in Under-floor heating systems: the store provides the thermal mass at a LOW temperature that makes it ideal for use with such a system. Otherwise, the small volume of water in the UFH pipes would cause repeated cycling of the boiler. The temperature differential in the taller cylinder with a lower and upper stat also means they can be used effectively with condensing boilers, which otherwise present a problem for under floor heating.

For further information, get a specification sheet off one of the Thermal Store manufacturers, such as Nu-Heat (01395 578482).

I'll attempt ASCII art but not my strongest subject :-



CORROSION IN CENTRAL HEATING SYSTEMS

By Matthew Marks 7/11/1996

Corrosion in central heating systems is usually caused by air getting in. This may happen directly, or it may be via oxygenated water.

Direct entry of air

Air can get in directly if part of the system goes below atmospheric pressure. This will happen if the following combination of circumstances occurs:

- The speed of the pump is sufficient (more speed gives more head)
- The flow resistance round the circuit is great enough (more resistance gives more head)
- The head provided by the feed/expansion cistern is insufficient (vented system - as used with most conventional boiler installations) or the pressure vessel pressure is insufficient (sealed system - as used in most combi boiler installations [q.v.])
- The pressure reference point (the feed/expansion cistern or pressure vessel connection) is in the wrong place (i.e. near the outlet of the pump, so that the pump subtracts from rather than adds to the pressure).

Air can enter via compression fittings, valve stems or the vent pipe, and it is often very hard to find where this is occurring, because when the pump is switched off, water will not necessarily leak from the entry points. It is therefore a good idea for none of the system to be below atmospheric pressure, and this can be achieved by making sure that not all of the above conditions are satisfied. Moving a feed/expansion connection or a vent arbitrarily is not a good idea, however, because it may pose a safety risk if the boiler overheats, and may lead to pumping over (described later). One advantage of a sealed system is that air entry via the vent pipe and pumping over cannot occur. The pre-charge pressure (normally 1 atmosphere: equivalent to 10m) is also usually greater than the feed/expansion head, although this will slightly increase the risk of leaks.

Air dissolved in water

Fresh water from the mains contains a lot of air, which is why it is not fed through your radiators or conventional boiler, and is one reason why the hot water cylinder has a vent - the air is expelled when the water is heated. (Another advantage of having an isolated body of water in the central heating system is that there will not be much scaling in hard water areas.) After filling a drained system, it can take weeks for all the air to be expelled, because if it is not caught by vents when the water is hot, it may re-dissolve, and most vents don't function effectively with the pump operating, as bubbles are swept past them in the water flow. (Centrifugal and other types of vent which actually have the flow passing through them rather than being teed off, ought to be better in this respect.) Although

intuitively it would appear that a radiator would make an ideal air trap, this doesn't seem to happen either!

So apart from not draining the system every other week, leaks should be avoided, as these cause more dissolved air to be introduced as the system is topped up. Leaks are much easier to detect than air entry, but can often go unnoticed if they are in obscure places or are slight. Another advantage of a sealed system is that leaks are not topped up (or not topped up indefinitely), so that not only is the damage caused by a catastrophic leak minimised, but minor leaks will make themselves known by the reading on the pressure gauge dropping. Of course, if regular checks are not made on the system pressure, the leaks will not be noticed until the system is in danger of running dry, which is why sealed system boilers need overheat thermostats.

A small amount of dissolved air will be introduced to a conventional system via the open feed/expansion cistern, if there is enough thermal contraction to draw water all the way from the cistern to the primary circuit when the system cools. Far more air will be dissolved if pumping over occurs - the pump forces water through the vent pipe and into the expansion cistern, becoming thoroughly oxygenated, circulating the already-oxygenated water in the cistern around the system, losing heat and introducing fresh water as clouds of steam are emitted, and for good measure causing mildew or dry rot in the roof timbers as the steam condenses on them. As you can see, pumping over is not A Good Thing (TM). It is caused by a similar set of circumstances to parts of the system being below atmospheric pressure, but laying out the feed and vent positioned to avoid one problem makes it more susceptible to the other.

Have you got corrosion?

If corrosion has progressed to the point where radiators are starting to pinhole, it's pretty bad.

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Central Heating Controls, Motorised Valves

and Wiring

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CENTRAL HEATING CONTROLS, MOTORIZED VALVES AND WIRING

Originally written by [Ed Sirett](#) 20/11/1996. Modified/added to by Matthew Marks: 29/10/1998. Modified/added to by Ian Clowes: 26/10/2000, hacked about and linked to the wiki 18/01/12 by John Rumm.

Introduction

Conventional central heating (CH) systems that also have an indirect hot water (HW) storage cylinder usually have a control system comprised of the following parts:

- How the Mid-Position Three Port Valve works

1) A programmable time-switch

2) Valve(s) (frequently motorized) to control separately the CH and HW

3) Room and/or cylinder thermostats.

If you have a direct HW cylinder then what follows won't be right for you, unless you intend changing that cylinder. Direct means the water in the cylinder is heated by actually passing through the boiler. The cylinder is simply a store of hot water. With an indirect cylinder there is a coil of pipe in the cylinder, and this acts like a CH radiator to transfer heat from the boiler to the water in the cylinder, so the cylinder is where the heating actually takes place as well as being a storage vessel. Indirect cylinders have a cold water feed into the bottom, and supply HW to the house from the top. The coil in connection is about half way up the tank and the coil out near the base.

Its important to realise that the level of control you have over your heating and hot water is due to a combination of the plumbing system and the programmer. If you have a simple programmer you may need to change it and the plumbing to get a more flexible system. However, you may be lucky and just need to pop a new programmer in place if a full set of valves is in place.

The Time-Switch

The time-switch may be electromechanical or fully electronic. Electromechanical means you'll see a timer wheel turning and pushing against contacts, whereas with fully electronic there'll be a digital time display. A surprising

range of electromechanical time-switches are still available, and they can be easier to understand/program for certain elements of the population.

A programmer that has a single switched output is commonly called a time-switch. A programmer that has two switched outputs but only allows CH to be selected if HW is selected is often called a mini-programmer. A programmer that allows you to turn on HW and CH independently is simply termed a programmer.

You may see these names in manufactures literature and merchants catalogues. In conversation you'll find the terms bandied around in a more casual, non-specific way, just like we do in the rest of this document!

Note that a programmer may allow you to select HW and CH independently (i.e. none, any one or both on), but the timing may be 'common' or 'independent'. With a common time base if both are set to come on/go off they do so at the same time. With an independent timebase you really do have full flexibility.

Some systems (because of limitations in the installation) can't have CH independently from the HW, and this is usually reflected in the control, so that as you move the CH control to off then the HW control also moves. This is usually referred to as "ten" mode, because there are ten different valid combinations available of "off, twice, once, on" for heating and water. It may also be described as "gravity" mode, referring to gravity-operated circulation to the hot water cylinder (convection). The fully-independent configuration is thus "16" or "pumped" mode. The actual number of these modes that you can select is limited by your programmer.

A programmer can have different settings for each day of the week, and is called a 7-day programmer. A programmer that allows you to specify one schedule for Mon-Fri and a different one for Sat-Sun is called a 5/2

programmer. Simple programmers use the same timings every day and are called 24-hour programmers.

Almost all programmers can have at least two separate ON periods for each 24 hours. Some have three or more.

You may find an arrangement where there is a time-switch and an additional, external switch (maybe like a light switch) in the time-switched circuit that you flick to get CH when the timer is on. The switch may be in a place pretty remote from the time-switch. This arrangement is effectively the same as a mini-programmer.

In some instances you may wish to run different parts of the building's central heating on different timings. If you only need three circuits (HW/CH1/CH2) then three channel programmers are available to do this, although you may prefer to use programmable thermostats in each zone. If you want even more zones (say a Granny flat, garage and attic room) then adding additional, remote time-switches or programmable thermostats is probably the way to go. Once again, you'll also need an appropriate plumbing arrangement to be able to isolate the zones with valves.

The programmer produces signals which say 'I want HW' or 'I want CH'. An ON signal in this context is a wire which is connected to the 230V mains supply. For fully independent control using a 3-port valve, an additional 'I don't want HW' signal is needed.

The Valves

On some very basic installations there might simply be a hand valve which when opened lets the CH radiators

become warm. Such installations will have a simple time-switch to control the boiler and pump. The user opens the CH valve for winter and closes it for summer (hence providing HW only). Most installations have at least one motorized valve, which will enable the CH to be switched automatically whilst still allowing the system to produce HW.

Motorized valves come in two flavours: 2-port, known as 'zone valves' (a simple open/closed piece of pipe), and 3-port (a fully controlled T-junction).

There are two varieties of 3-port valve, mid-position and diverter. With a mid-position valve the middle port is connected to flow from the boiler and the water is directed to port 'A', 'A and B' or 'B' as requested. With a diverter the boiler flow goes to either 'A' or 'B', but never both. Alternative names for these valves are (respectively) 'Y-plan' and 'W-plan', after the names Honeywell give to them under their Sundial Plan system.

If the idea of heating different areas of the house in different ways interests you then you'll need to look at 2-port valves for each zone. Doing this sort of thing with 3-port valves gets very complicated.

Valves generally come in two parts: a plumbing part and a removable motorized head. On some early models it is not possible to replace the head independently from the rest, and the system has to be drained down to replace them. The electrical part is a _relatively_ unreliable component, hence the desirability of a 'replaceable head'.

Valves generally have a lever that can be latched in a position to allow water to flow. This is necessary when filling or draining the system, and can be used to permit heat to circulate if the motor fails. The latched lever should automatically unlatch once the motor operates.

Whilst colour coding of the wiring may vary from one model and manufacturer to the next most models seem to follow a consistent scheme. Have a look at the [mid position valve](#) article, or at the [motorised valves](#) **(WIKI)** article to see how it is configured in a complete system.

Some 2-port valves don't have a white wire. The 2-port valve reverts to closed when there is no electrical input.

There are some older two-port valves of a different type (large plastic head) which are not mechanically interchangeable with the modern valve bodies, and may be electrically incompatible too.

Thermostats and TRVs

Wall thermostats, when fitted, are in series with the CH signal from the time-switch. Some have a built in resistor ("accelerator heater") to reduce the hysteresis, i.e. the "backlash" in temperature between switching on and switching off. When the thermostat is on, the resistor supplies a minute amount of heat, which makes the thermostat think that the room is slightly warmer than it is, and therefore makes it switch off again earlier. The room temperature will thus fluctuate less. Such thermostats require 3 cores and earth: live, switched output and neutral for the resistor. If live and switched output are interchanged, the resistor will be powered constantly and the advantage will be lost. Simpler/older thermostats only need 2 cores and earth, so if you're replacing a thermostat you might want to check the wiring beforehand to see if you can use this feature.

Wireless thermostats are available, which use radio waves to communicate with the rest of the system. These can be convenient if you wouldn't otherwise be able to site the thermostat in a sensible place because of the

wiring. Such devices are battery powered, and this will need replacing periodically. One potential advantage of wireless thermostats is that you can move it around the house with you, ensuring the room you're occupying is the one you're using to determine whether heat is needed.

Some room thermostats are available with timers in that allow different target temperatures to be set for different times of the day or week. 6 different temperatures over a 24-hour period is not unusual, so these give a much greater degree of control over the heating system. An 'optimisation' version is usually available. This will predict when the heating needs to be turned on in order to achieve the target temperature. For example, if you program a desired temperature of 21deg for 7am the thermostat might decide it needs to turn the heating on at 6.30am on one day, but at 6am on another (colder) day.

Unfortunately, room thermostats effectively control the whole CH system by monitoring a single point in the house, and so TRVs (Thermostatic Radiator Valves) are an advantage since they control each radiator. Earlier models tend to have the habit of sticking on or off and have given TRVs a bad name. For some valves it is important that they are installed with regard to the direction of water flow. Some valves don't have this restriction. Some angled valves can be fitted with the head vertical or horizontal, so you can always get the correct flow direction through them.

If all radiators have TRVs, some sort of bypass arrangement must be made, to prevent circulation through the boiler ceasing if all valves close down. The bathroom radiator/heated towel rail may not have a TRV (reasoning being that the heat is needed to dry towels even if the room is warm enough), or there may be a separate bypass loop, controlled by a gate valve, and some distance from the boiler so that there is a reasonable volume

of water (and hence a reasonable heat sink) circulating. You may also find a 'pressure detecting' valve that will open up as the TRVs close down.

The cylinder thermostat (tank-stat) is an effective device which switches off the HW when the storage cylinder is fully heated. They can only be used on systems which can CH independently from the HW. (On other systems, a thermostatic valve can be fitted, taking note of the bypass arrangements detailed above - in this case the bathroom radiator may be plumbed in to operate all the time.)

Installation Types

Installations generally fall into one of four categories:

A) Gravity HW and optional pumped CH

B) Fully pumped system with a 2-port valve for optional CH

C) Full control by two 2-port valves

D) Full control by a 3-port valve

There are several variations on (A) to add valves and thermostats, hence giving more control to a gravity HW system, one of which is called C-Plan **(WIKI)** by Honeywell.

The following table shows some common names for (C) and (D). Note that the table gives names for (D) with a

mid-position valve. With a diverter valve Honeywell call this W-Plan.

Manufacturer	Type C	Type D
Honeywell	S-plan	Y-plan
Danfoss Randall	Heatplan	Heatshare
ACL Drayton	TwinZone	BiFlow
Landis & Staefa	ZoneMinder	FlowMinder

For detailed diagrams of system layout and wiring using the Honeywell nomenclature and controls, see this [document](#), or the [wiring](#)

Although any installation may be the right one for you the following notes may help you choose a particular one, if you have the choice.

With gravity systems you may find some of your radiators getting warm even when the CH is off unless there is a valve to prevent the water finding a route into the CH circuit.

Pumped circuits get heat from the boiler to the cylinder more quickly, reducing the time taken to reheat the

cylinder.

W-plan systems can leave you without CH for some time since they can provide heat to only one of HW or CH at any given moment. Usually HW is given priority, so if you run a bath all heat will be diverted to the HW for as long as it takes to reheat the water. If several people have fresh baths or showers (particularly power showers) in succession you may be without CH for an hour or more. This effect can be reduced by fitting a fast recovery cylinder (which has a more efficient heat exchanger and therefore heats up much quicker). People have been known to be so dissatisfied with a W-plan installation that they have had it converted to Y-plan.

Mid-position valves have 'worse' failure modes than 2-port valves. However, a single mid-position valve is cheaper than a pair of 2-ports.

Wiring

Manufacturers produce 'wiring centres' to help get all the wiring done correctly. Some of these are simply 10- or 12-way connector blocks, with suitable notes on which colour wires go to which numbered connector.

Other wiring centres work on the principle of having a separate terminal block for each component (boiler, pump, valves, thermostats, etc) mounted on a PCB. You wire each component to the correct terminal block, and then cut some link wires on the PCB to create the installation you actually require. This type is arguably easier to use, but has the limitation that you can only easily implement certain common arrangements, usually (C) and (D) from above, plus some variation on (A).

For details of how each type of plan is wired, see this article on [zoning](#) (*WIKI*)

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WATER SOFTENERS

By [Matthew Marks](#)

A water softener is a device which removes the chemicals in hard water areas which cause scaling: calcium and magnesium carbonate. It should not be confused with chemical/electrolytic/magnetic DESCALERS which merely attempt to prevent these chemicals depositing themselves inside pipes, tanks and shower heads. Nor should it be confused with a water FILTER, which removes bacteria, chlorine, pesticide residues etc. The chemicals which cause water hardness are actually removed by a water softener, but the resulting "softened" water is not the same as that in soft water areas, because it contains sodium compounds, as explained below.

Advantages of Softened Water

- [More pleasant to wash with: feels smoother; no soap scum; fewer skin problems \(from wet shaving, for example\)](#)

- No scaling of pipes, kettles, tanks, baths, showers etc.
- Less washing powder, washing-up liquid, cleaning materials etc. required * Tea tastes better and concentrated soft drinks can be diluted more

Disadvantages of Softened Water

- It is not recommended that softened water is consumed by those on a low sodium diet, and for this reason the cold tap in the kitchen is usually connected to the un-softened supply, or a third tap is fitted. There is a long-running debate about the pros and cons of drinking softened water, but sodium carbonate is not a dangerous substance. Softened water should not be used on pot plants either.
- Some people do not like washing with soft/softened water because it is harder to rinse off soap.

Requirements of Water Softeners

Water softeners are fairly bulky, occupying most of a 60cm base unit if they are installed in the kitchen.

Manufacturers seem to have put a good deal of effort into minimising the amount of room occupied, however, and there are many different formats. Access is required to add salt, and if a fault occurs (although I am not aware of any routine maintenance being required).

Most softeners require a (low current) electricity supply to operate valves and timers. Kinetico softeners operate entirely by water power.

Softeners require an overflow, with a free fall to the outside, and a drain, which can be a 15mm pipe and doesn't have to have a free fall as it is pressurised. The rising main needs to have a "pi" section of three valves (including a bypass) and a non-return valve to keep the water authorities happy. The softener itself is connected by flexible hoses, and these can restrict the flow rate if they are long.

Kinetico make a unit where the salt cabinet is separate from the rest of the softener. As the salt cabinet needs the overflow and access for filling, and the softener needs the drain and the rising main, this can ease installation in awkward situations.

Softeners do increase your water consumption by a significant degree: the figure for the Kinetico is that it uses 9 gallons for regeneration, after softening between 40 and 70 gallons: a 13-22% increase for a fairly efficient unit. This is in addition to the salt, which goes down the drain in one form or another. If you are worried on environmental grounds you should think carefully (bearing in mind that fewer cleaning materials will be used) if your water is metered you should think very carefully! If you can put up with scale in the toilet bowl, toilets can be plumbed to the un-softened supply. There is no point in feeding outside taps with softened water.

How It Works

Water softeners work on an "ion exchange" basis. The hard water is passed through a resin bed, where the

calcium and magnesium ions are removed and replaced with sodium ions. The water will thus contain sodium carbonate. Periodically, the resin must be "regenerated" by flushing with brine. The salt dissolved in brine is sodium chloride, and during regeneration the sodium ions are removed and replaced with the magnesium and calcium ions from the resin bed. The waste water from this operation is flushed down the drain, as is that from "backwashing" which is performed to remove excess brine from the filter. The salt for regeneration is especially made for the purpose and is usually bought in 25kg bags which cost about 7UKP. How long the salt lasts depends on the hardness of the water and the efficiency of the water softener.

The Differences Between Water Softeners

The main differences between water softeners occur in how they go about the process of regeneration. This takes the order of 20 minutes, and during this time the resin bed is unable to be used for soft water. There are two main solutions, which are described below with their variants. To my knowledge there is no softener which actually senses when the resin is exhausted they all either meter the water (having previously been set to the expected level of hardness) or regenerate at a preset interval.

a) Timed Regeneration. The idea behind this is to regenerate while nobody wants to use water (normally in the middle of the night). If the softener only feeds a header tank then so much the better. The cheapest ones simply have an electromechanical timer which initiates regeneration at fixed intervals (Wickes being an example at 399UKP) others (e.g. Aqua Dial) have a microprocessor which estimates by metering the water over a period of days when the filter isn't going to last another day and initiate regeneration that night. Some (Aqua Dial included) also have a "proportional dosing" system whereby they only use as much salt as is calculated to be needed for

the state of the filter. This should further improve efficiency.

b) Dual Resin Beds. Water usage is metered, and when one bed is exhausted, the other one is substituted and the first is regenerated. As this can happen at any time, the softener's efficiency is not dependent on the pattern of water usage.

There are also two types of salt: block and tablet. Some softeners can use both. Block salt is easier to handle and is claimed to be more efficient on machines which control the amount of brine to be used for regeneration by a change in level in the brine tank (which I presume does not include machines with proportional dosing). This is because the volume of water for a given change in level depends on how packed together and dissolved the salt tablets are, and is set to the worst-case scenario, therefore usually using an excessive amount of brine for each regeneration. Salt blocks, however, sit on a platform with only their bases in the water, so the volume of the brine tank does not vary.

Also, as previously mentioned, not all softeners require an electricity supply.

WATER CONDITIONERS

By Adrian Godwin 23/4/1996

Which? magazine has looked at these a couple of times over the last ten years or so - look them up in your local library for the full details. The conclusion they seem to have arrived at is that some units work for some people, other units work for no-one, but no units work for everyone. They haven't done particularly exhaustive research

into why, and they recommend that you don't buy one without a money-back guarantee.

SOLDERING DRIPPING PIPES

By Andrew Mawson 20/6/1996)

A trick I was told about by a tradesman for use when you cannot stop that last little drip of water in a pipe that needs soldering is to take some very fresh bread, form a tight ball from it, and force it into the pipe upstream of the drip using a long rod. When the joint is made and the water turned back on, the bread softens and can be flushed out through a tap.

STOPPING UP 22mm PIPES

By CliveE 7/5/1996

The other day I used one of those wine-saver thingies - a cam-operated bung - to temporarily stop-up a 22mm pipe. Actually this was the first time I ever found a use for it - I never leave half-empty bottles! It worked perfectly.

SHOWERS

Matthew Marks 2/9/1998

There are three basic types of shower available.

1 Conventional Showers

A conventional shower is just a means of mixing hot and cold water, and spraying it at you. It is simple and cheap, but its performance is highly dependent on the water supplies to it.

If upstairs in a house with a conventional cistern-fed hot water supply, there will be very little pressure, and hence the shower may be very poor. By reducing the restriction of the shower head as much as possible, you may be able to get quite a lot of water pouring out from the large reservoir of the cistern, but with little force. This is an example of low pressure, but high flow rate. There may also be temperature fluctuations caused by water being drawn off elsewhere, and a thermostatic valve can be used to compensate for this.

If the hot water is at high pressure, such as from a combination boiler (q.v.) or multipoint or a Megaflo (q.v.), then the shower will be better, but may still be limited by the resistance of the incoming rising main. A thermostatic valve is recommended for combi boilers, because they sometimes produce rapid fluctuations in water temperature.

Conventional showers must be fed with hot and cold water of the same pressure, with the exception of a special valve which uses low pressure hot and high pressure cold. This also claims to boost the flow rate of the hot water by taking advantage of the pressure of the cold water.

2 Electric/Instantaneous Showers

These are available with built-in pumps for low pressure stored supplies, but normally they take high pressure

cold water only, and heat it up instantaneously with an electric element. They are simple to install plumbing-wise, and allow you to take showers continuously, because they require no hot water supply. In the simpler devices, water temperature is controlled by a choice of two powers (plus no heat at all!), and by varying the flow rate. On the snazzier models there is electronic control of the heating element, giving variable output.

The main disadvantage with instantaneous electric showers is the power output. The largest I have seen is 10kW, which not only requires hefty cable from a separate fuse-way in the consumer unit, but is also less than half the power of even a low-end combination boiler: if you want a decent temperature, especially in the winter when the incoming water is colder, the flow rate will be quite low. They may also be quite expensive to run, as they are electrically operated and won't be on at cheap rate unless you shower in the small hours. However, this may be offset by not having to store hot water with consequent losses.

A characteristic of these showers is small but strong jets. This is an example of high pressure, but low flow rate. The shower head is designed in conjunction with the flow rate adjuster, and so the head supplied should be used.

3 Pumped/"Power" Showers

The second word is in quotes because it is misleading: one could argue that category (2) is a power shower as it uses electricity, and it is also being abused by the marketers because "power shower" seems to imply "excellent shower" in the minds of the public. What we are talking about here is a shower containing an electric pump, to boost the pressure, and therefore, if the supply is capable of it, the flow rate. Power showers are easier to wire than type (2) because they only need a low current supply for the motor, which consumes perhaps 500W or less.

Pumped showers MUST be fed from a cistern - i.e. you cannot use them with combination boilers, Megaflos, multi-points, etc. Quite apart from the fact that it is against water regulations to pump from the water main, you are unlikely to achieve much by trying to do this, because of its resistance. Pumped showers are usually only really needed when a cistern is employed anyway.

Pumped showers are less likely to suffer from temperature variations than conventional showers. They can produce copious amounts of water with a lot of force: high pressure, and high flow rate. They often come with shower heads that can produce varying spray patterns and mix air with the water. They can be extremely wasteful: it is drummed into one that a shower takes less water than a bath, and it is possible to be blissfully unaware that this may no longer be the case with such a beast!

The simplest pumped shower is a device which you screw to the wall and connect between your existing mixer and shower head with flexible hoses. It has an on/off switch, and the shower will still function with it switched off, as the pump chamber does not present much resistance.

More sophisticated models include a mixer within the case, and are plumbed permanently into low pressure hot and cold supplies. They usually have a combined on-off switch and mechanical flow rate control, and may vary the speed of the motor.

More sophisticated still are the separate pumps. The cheap ones connect to the mixed water the expensive ones have two chambers which connect to the hot and cold supplies. They may be used with manual or thermostatic valves.

Cavitation and air in pumped showers

The nearer the pump is to the supplies, the better it will operate (and obviously a two-chamber pump can be put nearer to the supply). This is because a pump may be capable of producing a very high pressure, but can only "suck" at one atmosphere before a vacuum is created and performance will not increase. Even before this, "cavitation" (tiny vacuum or dissolved air bubbles) will start at the impeller blades, and this is very bad for the pump. Water from the rising main contains dissolved air, and heating it up encourages it to liberate this. It is therefore a good idea to connect a shower pump to a hot water cylinder with a "Surrey flange" or an "Essex flange", which has a short dip-tube to avoid trapping the liberated air rolling up the sides of the cylinder. (A Surrey flange fits into the top of the cylinder and has an additional output for the existing connections an Essex flange is a dip-tube only and goes into a new hole made in the cylinder.) Surrey/Essex flanges will also help to avoid interaction between the pump and other hot water consumers.

A shower pump should not be installed at a high point in the system: trapped air will be difficult to expel, and, in a worst case, the pump may not operate at all as it is not self-priming: i.e. it cannot pump air.

Switching of separate pumps

Separate pumps have automatic switches to operate them. Positive head pumps are used where there is still some flow when the pump is off, i.e. when the bottom of the cistern (this is used as the datum, as it is a worst case) is significantly above the level of the shower head. The flow switch(es) activate the pump as soon as the

valve is opened and water starts to flow, and deactivates it as soon as the valve is closed and flow ceases.

Another reason to keep air out of a shower pump is that it might cause these switches to oscillate, in the following manner:

- 1) a sudden increase in pressure (such as water hammer from a valve being closed quickly) pushes water through the pump as it compresses an air bubble in the system
- 2) the water flow switches on the pump, causing more water to flow as the bubble is compressed further
- 3) the air pressure reaches the pump pressure, the water stops, and the pump switches off
- 4) the air bubble pushes the water back again
- 5) the momentum of the water causes the air to expand beyond equilibrium
- 6) the water eventually stops, and then flows back again, as the air pressure is lower than it, and the cycle starts again.

Negative head pumps allow a shower head to be higher than the bottom of the supply cistern, and are useful in flats and for bathrooms in loft conversions. These require pressure vessels, non-return valves and pressure switches, and are therefore rather more expensive than positive head pumps. The pressure vessels are on the outlets of the pump, and are monitored by the pressure switches. They contain an air chamber and a diaphragm, rather like for a sealed heating system (q.v.), and allow a significant amount of water, which is essentially incompressible, to flow in or out for a given change in pressure.

The pressure switches are normally closed, causing the pump to charge the pressure vessels. This will open the switches, the pump will stop, and the non-return valves will ensure that the vessels remain charged. There will now be enough pressure in the system to allow water to flow out of the shower, and as soon as this happens, the pump will operate. Leaking shower valves will be obvious by the annoying intermittent operation of the pump that they cause!

Other considerations with pumped showers

Pumped showers can be noisy. There is not much that can be done about this in the case of the ones mounted in the showering area, but separate pumps should be supplied with flexible couplings to reduce the amount of vibration being transmitted around the house through the pipework, and they can be supported on rubber mats to reduce noise transmission through the house structure.

Pumped showers may require more sophisticated measures to avoid water escaping from the showering area: some screens, etc., are not recommended for use with them.

Some shower pumps operate from Safety Extra Low Voltage (SELV), e.g. 24V, and are supplied with separate transformers which are installed well away from the water. This, in theory, reduces the risk of an electric shock from them. My opinion is that approved mains pumps will have been rigorously designed and tested to be very safe, and ***if installed properly*** will be as safe as SELV pumps. Naturally, pumped and instantaneous electric showers should be connected via an RCD (q.v.), and should only be installed by those who are confident in their

abilities to produce safe electrical installations.

WASHING MACHINE PROBLEMS

By Tim Downie 29/1/1997, added to by Matthew Marks 22/10/1998

Given time, all washing machines leak. If the leak appears on the floor, creeping out from under the front of the machine, the likelihood is that it is the door seal that needs replacing. If the puddle seems to be emerging from the back of the machine, it's probably the pump. Pump leaks tend to be small and you only usually find them when you happen to pull the washing machine out of its cosy hole under the worktop.

Door Seals

Have a good look all around the inside of the door seal. The hole can be quite unobtrusive and need not be at the bottom of the seal. If you find a hole then pop along to your friendly neighbourhood washing machine parts supplier with your full washing machine name and model number and get a replacement.

Pull your washing machine out of the dusty hole where it usually resides and unplug it. Open the door and pull the edge of the door seal off the lip round the door on the front of the cabinet. Fingernails usually suffice for this. Having done this, insert your fingers through the gap outside the door seal and have a feel around the edge of the drum where the inner edge of the door seal is attached. If your machine is anything like mine then you will feel a slim metal "jubilee clip" type retaining wire holding the door seal tightly to the drum. Remove the top of your washing machine. This will expose lots of wires and switches all at mains voltages. If you haven't already

done so, make sure that your machine really is unplugged. Look down the front and see if you can spot the clip holding the door seal. It's usually quite a long way down and relatively inaccessible so a long screwdriver or 1/4 inch drive socket set with extension is required. Slacken the screw/bolt and then simply pull the door seal off the drum.

The new door seal will look like a floppy tube with no apparent correct orientation. Look carefully around the rim that attaches to the drum and you may find an edge with holes in it. This point should be lowermost, as it is there to allow water in the bottom of the door seal to drain back into the drum. If you fit it the wrong way up, your new door seal will fail prematurely.

Now comes the tricky part. Take the retaining clip and fit it loosely to the inner door seal lip. Make sure that the retaining clip screw is orientated in such a direction that you will be able to tighten it from above. Wiggle the door seal onto the lip on the drum, making sure that the holes (if any), are at the bottom. When you think you've got it on fully, go to the top of the machine and tighten the clip. Now you can stretch the outer lip of the door seal over the lip around the door on the cabinet, making sure that there is no axial twist in the seal making it wrinkled.

Wrinkled seals die young. If you can't seem to get rid of a wrinkle then this means that there is a slight misalignment twixt drum and door. A common cause of this is breakage or detachment of one of the springs that hold the drum centred. They can be a bugger to reattach but it's worth doing as misalignment is another cause of early door seal death.

Put the top back on and congratulate yourself on a job well done.

If anyone has come across a door seal fitting that differs enormously from this plan, feel free to amend it.

Pump Leaks

The pump on your washing machine is an uncomplaining little thing, and rarely gives rise to serious problems. With age however, the seal around the motor shaft can start to leak and the only remedy (as far as I'm aware) is pump replacement.

Unplug you machine, whip the back off and have a good look with a torch if necessary to see if there are tell tale signs of water leaking past the pump shaft seal. (If you're not familiar with these things, the pump is the small motor near the bottom of the machine with a small fan attached to one end of it and a pump chamber with two hoses attached to the other.) If it is leaking, take your washing machine name and model number around your local parts supplier. There's a good chance that they'll have to order it so you might prefer to do this bit by phone.

When you get your pump, don't be too surprised if it doesn't look the same as the old one. Many of the metal components will probably have been replaced with plastic ones, but as long as the mounting screw holes and hose positions are the same, don't worry about it. Removal of the old pump and replacement with the new is usually very straightforward.

Machine won't spin, empty, or overflows

A very common cause of these problems is blockage of the line to the water level switch. Near the bottom of the drum is a connection to a small tube which rises to well above water level, where it is connected to the switch.

As the water level rises, the pressure of the air in the tube increases, and compresses a diaphragm inside the pressure switch, causing two or three sets of contacts to change over at different water levels. It is very common, especially in hard water areas and when the hottest wash is not used, for limescale-based gunge to block this tube and prevent the air pressure switch from operating at all, or operating quickly enough. This may make the machine think that it is empty when it is full (and will thus overflow), or full when it is empty (and will thus refuse to spin).

On Hoover and possibly other machines, the connection to the drum is via a small plastic bottle, which often gets full of gunge. It seems to me that this bottle is either to damp the pressure switch (preventing it changing over as the washing sloshes about) or to allow more gunge to collect before it is rendered inoperative.

Pressure switches are easy to test: they are sensitive enough to operate by blowing into them, whereupon you should clearly hear the click of the contacts. With all the wires disconnected, an ohm meter can be used to check the electrical integrity of the switches - a bit of experimentation should establish which contact is which of the changeover mechanisms.

Pipe Bending

These documents give instructions on how to mark out accurate bends and offsets using either a bending machine or springs:

-
- [BillP's Pipe Bending Notes \(PDF file\)](#)

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EARTHING AND EQUI-POTENTIAL BONDING

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By [Geoff Rowlands](#)

Why Earth?

One side of the electricity supply (the neutral) is firmly connected to earth at the substation to prevent the supply 'floating' relative to earth for safety reasons.

Many electrically operated devices (e.g. washing machines, heaters and some lighting fittings) have exposed metalwork which could become live if a fault occurred. Anyone touching it could then receive a shock or even be killed depending on the current flowing through them to earth. To prevent this, an earthing conductor should be provided to all socket outlets, lighting circuits and any fixed appliances to which exposed metal parts are then connected. The earth connection limits the voltage which can appear on the exposed metal parts under fault conditions to a safe value until the fuse blows or the MCB or RCD trips. Note that earthing does not necessarily prevent anyone receiving a shock, but together with the time/current characteristics of the protective device (fuse, MCB or RCD) it should ensure that it is not lethal. It is desirable to make the impedance (resistance) of the earth wiring as low as practicable. (1000A flowing through 0.1 ohm drops 100V!)

Note that exposed metalwork cannot be protected by connection to the neutral because current flowing will cause a voltage drop between the metalwork and true earth. Also, if the neutral connection breaks or the appliance is plugged into a socket with line and neutral reversed (!), the metalwork will be at full mains voltage.

trip MCBs?

- Two-way switching

- Is the UK on 240V or 230V?

- Cables in contact with polystyrene

- Final testing of a ring circuit

- Earthing Plastic Pipes

Appliances with an earth connection are called Class I (one): Class II or 'double insulated' appliances incorporate additional insulation to prevent exposed metalwork becoming live, and do not require an earth connection. This means that a 2-core mains lead can be used and internal earth connections are not needed.

A fundamental principle of electrical safety is that no single fault condition should cause a hazardous situation. This is why some of the regulations may appear to be rather stringent: it is better to be safe than sorry.

Who Supplies the Earth?

The earth connection will usually be supplied by one of the following methods:

a). By the electricity company. Either through the armouring of the supply cable or through a combined neutral and earth conductor. The latter method is termed PME (protective multiple earthing) and requires some special attention (see below). There will usually be a label near the meter indicating a PME system.

b). Through an earth electrode; usually a rod or plate driven into the ground. This method is found where the electricity company cannot easily supply or guarantee an adequate earth conductor; for example, where the supply comes on a pair of overhead wires. The user is generally responsible for the adequacy of the earth electrode.

The method of earthing can normally be found out by tracing the wiring from the meter/consumer unit. It is usually fairly obvious.

IMPORTANT! - It is no longer permitted to use a water or gas pipe for the main or only earthing connection. There may, however be earth bonding wires connected onto the water and gas pipes for 'equi-potential bonding' (see below). If there is no electricity company earth or dedicated separate earth electrode, then one must be provided. Contact the electricity company if in any doubt.

How Good Should the Earth Be?

This is a difficult question to answer; in general the impedance of the earth connection must be low enough to ensure that sufficient current can flow through the protective device so that it disconnects the supply quickly (< 0.4 second) and that voltage on the earth connection does not rise more than 50V. RCDs operate at much lower fault currents than fuses and so can provide much better protection against shock. RCDs are therefore recommended whatever the method of earthing but where the electricity company cannot supply an effective earth and a local earth electrode is used, an RCD (30 mA trip) must be used. Measuring the resistance of an earth electrode is not easy and is really outside the scope of most d-i-y'ers.

Earthing of Electrical Installation

Each circuit requires an earth conductor to accompany (but kept separate from) the line and neutral conductors throughout the distribution. Where the distribution is in the form of a ring, the earth connection must also complete the ring.

The bare tails of earth conductors must be insulated with green/yellow sleeving from the exit from the cable sheath to the earth terminal.

All metal boxes should be connected to the earth; either through a short tail covered with green/yellow sleeving to the socket earth terminal or directly by the earth conductor for a switch box.

Equi-potential Bonding

As mentioned elsewhere, a fault current flowing in the earth wiring will cause the voltage on that wiring to rise relative to true earth potential. This could cause a shock to someone touching, for instance, the case of a faulty washing machine and a water tap at the same time. In order to minimise this risk, an 'equi-potential zone' is created by connecting the services to the main earthing point. Such services are:

-
- [Water Pipes](#)
 - [Gas Pipes](#)

- Oil Pipes
 - Central Heating
 - Metallic Ventilation Trunking
 - Exposed Parts of Building Structure
 - Lightning Conductor
 - Any other Metallic Service
-

The equi-potential bonding reduces the voltage difference which could exist between the metalwork of these services if an earth fault occurred to any one of them. It does not necessarily reduce the voltage to true earth. For this reason, metal window frames or patio doors should not be included in the bonding system - it could lead, for instance, to a window cleaner receiving a shock if an earth fault occurred inside the building.

The equi-potential bonding connections for incoming services should be made close to where the service enters the building on the consumer's side of the meter, stop cock etc. It is convenient to use purpose-made bonding clips (obtainable from most d-i-y stores) which include a label "SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE". The connections must, of course, be made to metal pipes - not plastic. The bonding conductors back to the main earthing block should be 6 sq mm minimum with green/yellow insulation (but see 'PME.' if applicable).

Bathrooms require special attention: The aim is to create a local equi-potential zone, so all extraneous metalwork should be bonded together. This could include:

- Hot & Cold water pipes to sink, bath, shower
- Waste pipes (metal)

- Central heating pipes, radiator, towel rail
- Electric towel rail, radiant or convector heater

Shaver sockets incorporate special isolating transformers which provide an earth-free output. The primary (input) side requires an earth which is connected internally to the transformer core.

Protective Multiple Earthing (PME.)

With PME, the neutral and earth conductors of the supply are combined. The supply company connects the neutral solidly to earth frequently throughout the distribution network. At the customer's connection point the company supplies an 'earth' (which is actually connected to the neutral) to which all the installation earths and equi-potential bonding are connected. Note that within the installation, the earth and equi-potential bonding are kept separate from the neutral in the usual way.

With PME, there is a potential danger in that if the combined neutral/earth conductor of the supply became broken (very unlikely but nevertheless possible), the voltage on the earth conductors could rise towards the full supply voltage. It is most important therefore that equi-potential bonding is rigorously applied in installations supplied by PME. The minimum size of main bonding conductor is 10 sq mm but may need to be up to 25 sq mm depending on the size of the incoming neutral/earth conductor: the supply company will advise you.

Electricity System Earthing Arrangements

By Andrew Gabriel 27/4/1998

Mains electricity systems are categorised in the UK according to how the earthing is implemented. The common ones are TN-S, TN-C-S and TT. You will sometimes see these referred to in questions and answers about mains wiring.

Note that in these descriptions, 'system' includes both the supply and the installation, and 'live parts' includes the neutral conductor.

First letter:

T The live parts in the system have one or more direct connections to earth.

I The live parts in the system have no connection to earth, or are connected only through a high impedance.

Second letter:

T All exposed conductive parts are connected via your earth conductors to a local ground connection.

N All exposed conductive parts are connected via your earth conductors to the earth provided by the supplier.

Remaining letter(s):

C Combined neutral and protective earth functions (same conductor).

S Separate neutral and protective earth functions (separate conductors).

Valid system types in the 16th Edition IEE regulations:

TN-C No separate earth conductors anywhere - neutral used as earth throughout supply and installation (never seen this).

TN-S Probably most common, with supplier providing a separate earth conductor back to the substation.

TN-C-S [Protective Multiple Earthing] Supply combines neutral and earth, but they are separated out in the installation.

TT No earth provided by supplier; installation requires own earth rod (common with overhead supply lines).

IT Supply is e.g. portable generator with no earth connection, installation supplies own earth rod.

Inside or nearby your consumer unit (fuse box) will be your main earthing terminal where all the earth conductors from your final sub-circuits and service bonding are joined. This is then connected via the 'earthing conductor' to a real earth somehow...

TN-S The earthing conductor is connected to separate earth provided by the electricity supplier. This is most commonly done by having an earthing clamp connected to the sheath of the supply cable.

TN-C-S The earthing conductor is connected to the supplier's neutral. This shows up as the earthing conductor going onto the connection block with the neutral conductor of the supplier's meter tails. Often you will see a label warning about "Protective Multiple Earthing Installation - Do Not Interfere with Earth Connections" but this is not always present.

TT The earthing conductor goes to (one or more) earth rods, one of them possibly via an old Voltage Operated ELCB (which are no longer used on new supplies).

There are probably other arrangements for these systems too. Also, a system may have been converted, e.g. an old TT system might have been converted to TN-S or TN-C-S but the old earth rod was not disconnected.

IEE WIRING REGULATIONS 16TH EDITION

By Andrew Gabriel 2/3/1998

Amendment 2 edition (1997) has a yellow cover (original 16th edition has a red cover; amendment 1 (1994) has a green cover). Also known as "Requirements for Electrical Installations" and "BS 7671:1992 Incorporating second amendment"

<http://www.iee.org.uk/publish/books/wireregs.html#wireregs>

290pp., 297 x 210mm, Soft covers version, ISBN 0 85296 927 9, 1997 UKP 42 / US\$ 84

Ring-bound version, ISBN 0 85296 842 6, 1994 UKP 55 / US\$ 110

Updates are available to bring a first amendment version up to the second amendment:

For soft covers version, ISBN 0 85296 926 0, 1997 UKP 12 / US\$ 24

For ring-bound version, ISBN 0 85296 938 4, 1997 UKP 12 / US\$ 24

Any bookshop should be able to order these if they don't stock them, or you can order from the IEE's web page above.

INSTALLING CABLE IN CONDUIT

By Richard Gethin 25/11/1996

Tie a small piece of cloth to a piece of string and use a vacuum to suck this through the pipe. If the pipe is small you won't need the cloth tied to the end. Then use the string to pull the cable through.

DROPPING WIRES THROUGH CAVITIES

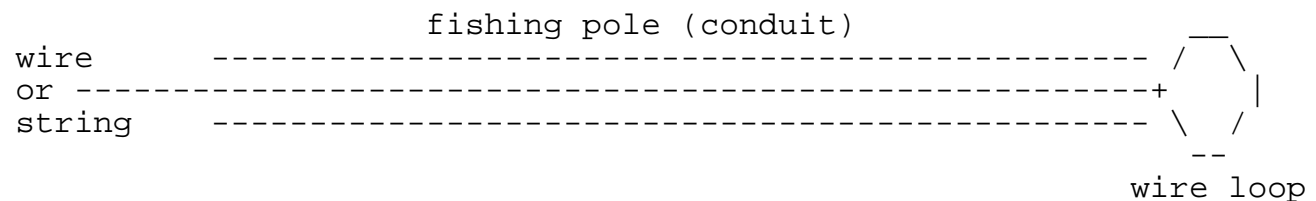
(Can't remember author of next paragraph:

Please identify yourself to claim credit! Matthew Marks 7/5/1996)

It can be very difficult to drop a cable down a cavity wall and retrieve it through a small hole into the cavity. Make the hole large enough to feed a loop of old steel measuring tape through it. As you push the tape into the hole, it will expand into a loop along the sides of the cavity. When you dangle the cable approximately above the hole, it will go through the loop, and pulling the tape out will then retrieve the cable.

By John Stumbles 13/5/1996

I'd add that you may be better off going for something easier to manipulate than the cable you want pulled through eventually. I find the sort of plastic-covered springy net curtain rail stuff quite useful for this. Once you've got that through you can use it to pull the cable itself or, if the cable is heavy and/or there's a lot of resistance in the run, pull some strong string or light rope through first. I got some 4 or 5mm polypropylene rope from a camping and climbing shop, and it's quite smooth, strong and moderately stiff. It can help when pulling electrical cable through to lubricate it with something like KY jelly or Vaseline. Other tricks for getting cables through various spaces in buildings (e.g. under floorboards) include 'fishing' with lengths of electrical conduit: this is about 3/4" diameter, comes in 3 metre lengths and is quite flexible. I have a variety of lengths I use for this sort of work. You can feed it into the space under a floor where you have removed one board, and use it to get a string or light rope (e.g. your 4mm polywotsit rope) to another access point. Where you don't have large holes at each end of the run - I recently had to wire under a chipboard floor, and had to cut out one piece of board to get any access at all and didn't want to do that all over the place - then you can get away with one main hole, ideally large enough to stick your head into to see what you are doing, and holes just 6 or 10 mm dia at the other ends. Thread some thin wire or string through the 'fishing' pole with a loop of thin wire at the end:



Dangle some wire (or your 4mm poly cord stuff) down the hole at the other end of the run and fish for it with the pole. A good torch to see under the floor, a light above the small hole, and an assistant to dangle the cord are useful/essential. When you've got the cord through the loop then pull the string/wire at your end of the fishing pole to snare it and you should be able to draw back the pole and cord - then you have a draw-wire to pull cables though with. If keep some thin wire or string tacked up at either end of the run then you'll be able to pull further cables through in future: when you want to pull a new wire through use the keeper string to pull through a stronger drawstring (yer 4mm stuff again) and use that to pull through the new cable and at the same time pull the keeper string back for another day.

When, in a previous job, we had to install wires in the voids above suspended ceilings, over runs many metres long, we sometimes used a crossbow to fire a nylon line down the void, to save having to lift umpteen ceiling tiles along the way. Finding someone to catch the bolt at the other end wasn't easy though ;-)

By Jim Mortimer 16/5/1997

I find that curtain wire, of the type used to hang net curtains on is ideal for this kind of job, as well as a drawstring for running cables or hoses through any complicated route as it's so bendy.

By Richard Gethin 19/11/1998

The lid from 16mm mini trunking is very good for pushing along voids/hooks cables in voids.

By Mungo Henning 16/5/1997

Buy a small length of ferrous chain (like the stuff which would be used in the dog-lead of a small mutt) of about three or four inches long (or long enough to be 'sufficiently' weighty: depends on the quality of the links) and tie it to a bobbin of twine. Drop this down the cavity, having inserted a magnet at the place where you wish to retrieve the cable. With a strong enough magnet, the chain will stick and you will be able to pull the twine through.

I now have an old 35mm-film container which contains the chain connected to the twine, and a separate magnet attached to an old telescopic aerial (neat for the tool-case). Works a treat so long as you don't drop the chain onto Live and Earth!

Another idea is to connect a Lilliput bulb via bulb holder onto some co-ax cable (of the same diameter). Connect the other end to a suitable

battery. This helps when you need to see into a cavity hole. The light has been worth its weight in gold over the last few years.

LOW-ENERGY LAMPS AND TIMER/DUSK-DAWN/PIR SWITCHES

By Matthew Marks 20/1/1997

There is often confusion as to whether low-energy light bulbs (fluorescent lamps designed to replace ordinary incandescent lamps) are compatible with devices such as timer switches, dusk-dawn switches or passive infrared (PIR) movement detectors. The problem occurs because these types of switches require a small operating current even when they are not activating the lamp. Ideally, there is a neutral connection so that the operating current can flow from live to neutral. However, some of these devices are designed to replace a conventional light switch, where there is no neutral present. They thus have to pass their operating current through the lamp.

A normal light bulb is quite happy to pass very small currents without protestation. However, low-energy light bulbs (both electronic and non- electronic, and old-style fluorescent lamps too) are highly non-linear, and will not pass any current at all unless a certain voltage is across them. This will result either in the switch malfunctioning, and/or (in the case of electronic lamps) the lamp periodically flickering when it is supposed to be off, as its internal smoothing capacitor is charged by the small current.

If the switch explicitly requires a neutral connection, or will operate without a load (plug-in timer switches, both electronic and electromechanical), it should be happy to run a low-energy lamp. However, devices which have a built- in load (such as PIR switches with lamps) may possibly still pass the operating current through the load, but gain no advantage from this, so are badly designed!

If you wire a conventional bulb in parallel with an energy-saving one, the switch should operate, but of course this compromises the energy efficiency of the set-up. A resistor could also be used, but it is difficult to give advice on this, because its value and power rating would

depend on the switch.

WHY DO LIGHT BULBS ALWAYS BLOW WHEN YOU SWITCH THEM ON, AND WHY DO THEY BLOW FUSES?

By [Matthew Marks](#) and [Andrew Gabriel](#) 12/1/1998

An ordinary incandescent "light bulb" consists of a thin tungsten filament in a glass envelope containing an inert gas. The filament has a relatively high resistance, and thus gets hot - hot enough to give out useful amounts of light as well as lots of heat - when current is flowing through it. The inert gas prevents the hot tungsten rapidly oxidising, as it would in air, or rapidly evaporating, as it would in a vacuum. It does, however, reduce efficiency, by conducting heat away from the filament. (Different gases and pressures are selected for different applications: for example, krypton and xenon are advantageous because they convect less and prevent evaporation better than argon/nitrogen, and therefore allow a hotter, more efficient, filament to be used while maintaining lamp life. Note that quartz halogen bulbs are different again: here, evaporated tungsten is re-deposited on the filament, thus allowing it to be hotter still while maintaining its life.)

Tungsten, being a metal, has a resistivity which increases as its temperature rises. Therefore, when you switch on a lamp, it presents a much lower resistance than normal to the passage of electricity, and so your beefy electricity supply will drive through a great deal more current than normal while the filament heats up, putting it under thermal stress as it expands. This on its own encourages the filament to give up and break, but it is exacerbated by the fact that any thinned section will incur extra stress, as it will heat up more quickly than the rest of the filament (being thinner), present a higher resistance, and thus dissipate even more than its fair share of the (increased) power. This will tend to thin it further, rapidly, and hence lead to a point of failure.

How do you deal with it? Well, using a rotary on/off dimmer, where you always have to switch on the lamp at its lowest brightness, will help a lot. A dimmer will reduce the maximum available light output slightly. You can also fit negative temperature coefficient thermistors in

series with the bulb. These have a resistance/temperature characteristic with the opposite slope to that of the filament, so give a "soft start"

until they themselves warm up. Again, you will lose a little brightness, and waste a little energy in the hot thermistors. I am not aware of any "off the shelf" products containing thermistors, probably because they need to be selected for the wattage of lamp required.

It should be noted, however, that it is probably counterproductive to try to keep a light bulb alive for too long. This is because the thinned filament will be taking less current, so the light output will be reduced, and the tungsten that has evaporated from it will be deposited on the inside of the glass, reducing efficiency by blocking some of the light.

As regards blowing the fuse, this is never directly due to a broken filament falling onto the lead-out wires, and thus presenting a much lower resistance, but is due to the gas or vaporised filament in the bulb becoming ionised. The high temperature and large electric field (full mains voltage across a very small gap) which occurs when the filament breaks can cause the gas to go into a conducting state, and the plasma will "spread" until it shorts out the lead-out wires, because it presents a much lower resistance than the filament. This causes a "pop" due to rapid heating, and has been known to cause the envelope to explode. Light bulbs usually have built-in fuses to deal with this, but as they are built down to a price, they aren't always effective.

If you plug in a new light bulb and it only lasts a few seconds, leaving a white pattern on the glass, this is because it has cracked at some point, letting air in. When energised, the filament has oxidised to white tungsten oxide, which condenses on the glass in a pattern corresponding to the flow of air inside as the lamp is switched on.

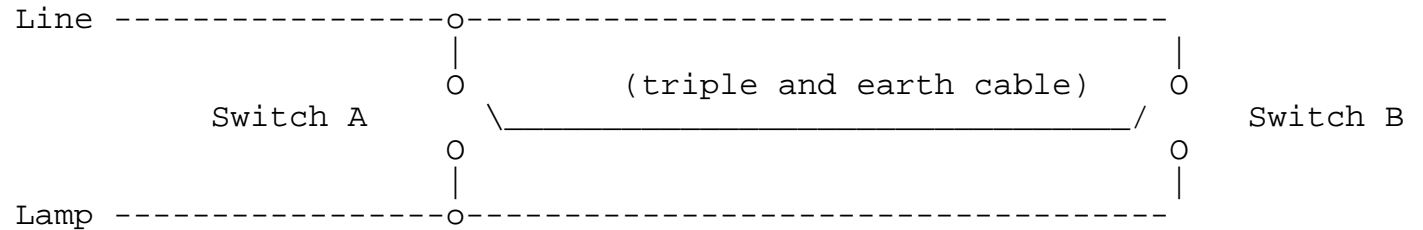
Oh, by the way, "extra-long life" bulbs seem to be a con. They just run at a lower temperature than normal bulbs, thus lasting longer, but being a lot less efficient. There is no justification for the extortionate prices charged for them.

TWO-WAY SWITCHING

By Matthew Marks 15/9/1998

Many people have learnt the wiring of a two-way switch at school. How it is done in practice, though, is slightly different, to avoid having to

put a connector block inside a switch box. This is the layout:



All connections between cables are made at switch contacts. The colour coding of the triple and earth is arbitrary, although I connect red to line (as the incoming core will be red), yellow to the switch commons (as it is the "middle" colour) and blue to the lamp (as it is nearest in colour to the outgoing black core).

Adding more switches is easily done: use a special "intermediate switch" which has four terminals. This breaks into the red and blue cores (if following the suggested colour code) and either connects them as normal, or connects incoming red to outgoing blue, and vice versa. With care, the yellow core can be left untouched, so a connector block does not need to be used here either.

As many intermediate switches as you desire can be fitted, although as far as I am aware, they are not available as doubles or triples on the same wall-plate.

A few tips:

- Arrange the wiring so that the lamp is off if all switches are up. This makes it easy to be sure that the lampholder is not live when changing bulbs
- As with all wiring, use green and yellow sleeving around bare earth conductors
- As with all wiring, put a ring of red tape around exposed cable cores which are not red, but are nevertheless live: yellow and blue cores of triple and earth cable, and black cores of twin and earth switch feeds. (Twin and earth with two red cores is also available, but with a

price premium.)

IS THE UK ON 240V OR 230V?

By Andrew Gabriel & Matthew Marks 30/9/1998

Traditionally, the UK has had a 240V (+/-6%) electrical supply since the 1960s, when the various local supply voltages (ranging from 200V to 250V) were all brought into line with each other. Continental Europe had a 220V, and Ireland a 230V, supply.

As part of European harmonisation effort to ensure electrical appliances manufactured for use in the EU can be used in any of the countries, a common nominal voltage for the whole EU has been set at 230V. The transition is a two stage process:

* On 1 Jan 1995: UK became 230V +10% -6%, and Continental Europe became 230V +6% -10%;

* On 1 Jan 2003: the whole EU becomes 230V +/-10%.

For most consumers, their measured mains voltage has and will not actually change, because it already falls into these ranges: this was intentional.

The transitions shift the burden of responsibility from the electricity suppliers to the appliance manufacturers, to increase the tolerance to supply variation of their products. However, they will benefit by only needing to supply one model (apart from the type of plug fitted, but that is another story!) for all countries. Generally speaking, modern technology allows devices to remain affordable while being more tolerant to supply variations anyway. The heavy engineering of electricity supply is less amenable to tightening up on performance.

So, you may well still find that your supply is 240V, but it is now magically 230V compatible!

Cables in contact with polystyrene

By Andrew Gabriel

Do not let electrical cables come into contact with polystyrene. It slowly leaches the plasticiser out of the PVC, so that it becomes stiff and brittle. Sometimes it looks like the PVC has melted and run a little.

Final testing of a ring circuit

By Andy Wade

A fairly rigorous method for testing the continuity of ring final circuits is given in the IEE On-Site Guide. It's really aimed at situations where the testing is done by someone other than the installer, and will catch out attempts at 'cheating' -- e.g. a small ring with an excessive number of spurs, or a patched-up broken ring. Arguably, this is OTT for DIY, when you've put the cables in yourself, but anyway, here goes:

The ring should be complete, except for the connection of all six wire ends at the consumer unit or distribution board. You need a low resistance ohm-meter with good resolution, say a range of 0 - 2 ohms with divisions of 0.05 ohm. At the board, start by measuring the loop resistance of each conductor (L1-L2, N1-N2, E1-E2, where the 1's and 2's represent the two ends of the ring) and record the values. The L-L and N-N readings should be the same and, with 2.5mm² twin & earth cable the E-E value should be a factor of 1.67 times higher. Now for a cunning stunt, cross-connect the L and N ends -- L1 to N2 and L2 to N1. This makes a 2-turn loop right round the ring. Now, with meter connected to the L and N pins of a 13A plug, work round every socket on the circuit. Lo and behold, every socket on the ring will (should) give the same resistance reading, equal to half of the L1-L2 reading. Any sockets on spurs will read higher by the combined L+N resistance of the spur cable, and so are easily identified (except for very short spurs). Now repeat the previous step with L and E cross-connected (L1 to E2, L2 to E1) and with the meter between the L and E pins of the plug. The readings now will not be constant (unless the CPC is the same size as the live conductors) but will increase toward the middle of the ring, and on spurs. This step effectively checks that the earth is connected at each socket. The highest reading obtained represents the contribution of the circuit to the overall earth fault loop impedance (used for ensuring compliance with 0.4s disconnection time in the event of an earth fault). The highest non-spur reading

obtained should equal one-quarter of the sum of the initial L1-L2 and E1-E2 readings. If all is well, remove cross-connections and connect the ends to the supply.

Earthing Plastic Pipes

There is an excellent article about earthing and plastic plumbing on the [Hepworth Plumbing Products](#) website, written by Paul Cook of the Institute of Electrical Engineers.

Quoting from the opening paragraphs:

"You do not have to earth plastic pipes. Plastic pipes make for a safer electrical installation and reduce the need for earthing. Festooning an installation that has been plumbed in plastic pipe with green and yellow earth wire is not necessary and is likely to reduce the level of electrical safety of the property, not increase it."

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USING SILICONE SEALANT

By John Laird; edited by Matthew Marks; additional material from Rick Hughes

You should be able to remove old sealant with a sharp razor blade and some care. Run the blade down the wall and along the bath to release the edges, and with a bit of luck the strip should come out in one go - good stuff has more of an affinity for itself than the surrounding material. If it has squeezed down into a crack, it may be easier to cut through the strip and leave the rest behind - if it's well stuck, I'd figure you may as well leave it. Then make sure there's no residual dust and that the surfaces are completely dry. Meths has been suggested as an aid to remove old sealant, and certainly cleans the surfaces.

As for mould resistance, I've never had any problem with the more expensive, high-silicone varieties. Whatever you do, don't buy cheap stuff ! You should be able to tell the difference from the pack - if "silicone" doesn't appear, or if it doesn't tell you that a vinegar smell is released during curing, leave well alone. Wickes charge about 4-5 pounds for a 310ml tube. Get a sealant "gun" as well. Cheaper sealants are acrylic-based and much less durable.

- Sealing gaps between floorboards

- Removing lead paint

- Removing Painted Wallpaper

-

1. Cut the nozzle to the right size. Easily said, of course, but in fact too small an aperture is just as difficult to deal with as too large.
2. Try to squeeze the stuff out *all in one go*. Don't squeeze the gun too hard, and you should be able to go round a whole bath in just a few minutes. This leaves you free to get on with the smoothing without worrying about the gun oozing all round - release the trigger pressure when you've done and lay it down somewhere you won't stand on it.
3. Find a smoothing implement with the right curvature. Whatever you do, don't try to use a wet finger. Attempt no 1 at our bath went wrong this way, or rather it failed the "spouse test" despite being serviceable! (Nos. 2 and 3 were cheap sealants, no 4 was back to silicone.) I eventually found an old, rounded kitchen knife had just the right shape.
4. Keep the knife (or whatever) wet at all times, and clean it frequently with copious quantities of kitchen towel, re-wetting it before moving on. (this stuff is *sticky*).
5. With care, it is possible to go over the strip a couple of times, the first pass getting rid of excess sealant (as well as squeezing it into the gap), with the second pass putting a smooth finish on. Try to "cut" through the excess sealant on both surfaces with the edge of your knife. Then leave it all alone for a couple of days.
6. Finally, remove the excess strip outside your "cut" edge, with a sharp blade. If there's only a small amount, you

may even find you can rub it off with a dry finger. This is easier than trying to produce a perfect finish when the sealant is still wet - invariably you poke something into the beautifully curved corner and wreck it. Alternatively, you can lay down two strips of masking tape either side of the join. Once a skin begins to form, pull off the tape at an angle.

Et voila ! Easy really, after 3 or 4 goes :-)

CliveE 24-10-99, on removing silicone sealant:

I use a scalpel blade to remove as much of the silicone sealant as possible and then apply some Silicone Sealant Remover. This is available in small tubes which fit in your sealant gun, usually on the same shelves as the sealant itself. It costs around £6 for a 150ml tube. Follow the manufacturer's instructions which will normally be to apply a layer of the stuff, leave for 2-3 hours and then scrape the dissolved silicone off with a spatula. Repeat if necessary, and then clean up with methylated spirits.

Ian White wrote:

Try this method - it came from a full-time bath installer, and it does work. First lay down two parallel strips of masking tape, taking lots of care to get them straight and evenly spaced. Apply a bead of sealant, rather more than you're going to need. Never mind about the ripples, so long as it doesn't go too thin anywhere. Smooth down the bead using a finger that has been well soaked in a very strong solution of washing-up liquid (50-50). This prevents the sealant from sticking to your finger, far better than water alone. If any does stick, it just means

that you haven't soaked that finger thoroughly enough yet, so just rub the sealant off in the soap solution. Push the excess sealant out on to the masking tape, and smooth both edges of the bead right down to the thickness of the tape. Then very carefully peel away the masking tape, and just run your soapy finger along each exposed edge of the fillet to remove the roughness. It produces a very professional-looking job. This obviously works best for long, straight runs like the edge of a bath. For curves you have to trim the masking tape first with a craft knife [or scalpel].

Update: See more detail on the [modern tools](#) available for smoothing **(WIKI)**

PAINTING TILES

By Steve Barnes 23/4/1996

1. Clean the tiles with a weak detergent, and remove any blemishes.
2. Clean with cellulose thinners to make sure there is no grease on the tiles. Be sure not to touch the tiles after you do this!
3. Paint with a plaster primer and allow to dry for 24-48 hours.
4. Apply your finishing coat (liquid gloss recommended).

MM: Tile paint is also now available!

REMOVING ARTEX

By Matthew Marks 23/4/1996

As this crops up so often in the newsgroup, there must be an awful lot of people who hate the stuff :-). Anyway, the consensus seems to be NOT to sand it - not only does this produce a horrendous amount of dust but early Artex contained asbestos fibres - but to remove with a steam wallpaper stripper. Failing that, you can always skim plaster over it.

REMOVING SCRATCHES FROM PLASTIC

By Donald Gray 10/5/1996

You can do a great job re-polishing plastics, especially harder plastics like Perspex. It depends on the depth of scratch on which technique to use.

Deepish scratches:-

1. Start off with "Wet & Dry" paper (say grade 600) using a soapy water as a lubricant. (The water is vital to keep the paper grains free.) Gently "grind" away at the area until you cannot see the original scratches. (The area will go like frosted glass, but don't worry at this just yet!);

2. Change grade of Wet & Dry to 600 and do the same,

3. Change to grade 1200 wet & dry. do same grinding... (The basic principle behind this is to substitute deep scratches with shallower and shallower ones.);

4. Once you have got through the 1200 grade process, thoroughly clean & dry the area;

5. Use "Duraglit" or "Brasso" BRASS polish to remove the "frosted" effect;

6. Once this looks nice and shiny, use a SILVER polish to give a final finish.

For fine scratches, start at 4) above.

SECRET: Take time; don't rush it. Even when you think the scratches have gone, give the process a bit longer.

There are NO short cuts to polishing, but it can be done in less time that one thinks....

Most DIY or car maintenance stores now stock the finer grades of "Wet & Dry" papers. (Tip: I keep a penknife razor sharp using 600 & 800 grade!) Don't forget: Soapy water is ESSENTIAL.

REMOVING SCRATCHES FROM GLASS

By Colin Bignell 06/10/1999

Try one of the motor accessory shops, which should have kits for dealing with windscreen scratches.

By Kev 06/10/1999

You have two options - one as Colin suggests involves basically filling the scratch in with a resin having the same refractive index as the glass, so it doesn't show, and the second is polishing the scratch out. This involves much hard work and elbow grease. DON'T use any abrasives such as Duraglit - and definitely no abrasive papers of any kind, or you'll finish up with a scratch surrounded by a nice opaque patch. The professionals use Ceria (cerium oxide) or Jeweller's rouge (iron oxide). [NB both of these are very fine abrasives.] Ceria can be obtained from good craft shops, as it is used in gemstone tumblers. Use it as a paste (mix with water) on a soft cloth, and just keep on rubbing!

I should emphasise that household abrasive cream cleaners are all unsuitable as they either won't have any effect, or they'll scratch the surrounding glass depending on how much abrasive is in them.

DRILLING SMOOTH HOLES

By Ken Clark 20/6/1996

For those who like me, have limited facilities and have difficulty drilling largish holes in sheet metal, there is a simple way of ensuring that you end up with a smooth hole without burrs. Position and secure the work as usual. Drill a small pilot hole as a matter of good practice. Take a piece of thin cloth about 3 x 3 inches and fold it twice to make a small pad. Place the pad over the small hole and bring the large drill down so that it takes the spinning cloth through the hole as the large drill makes it's way through the metal. If you practice on a couple of pieces first you'll rapidly see what is expected - it's easy, safe and it does make a beautifully smooth, round hole instead

of the octagonal horrors I always used to make. Oh, and it doesn't matter too much about the colour of the cloth!

SEALING GAPS BETWEEN FLOORBOARDS

By Matthew Marks

People often ask how to prevent icy draughts coming up through gaps between shrunken floorboards. The boards can, of course, be removed and re-layed properly butted (and tools are available to ensure this), but this is a major job. Also, floor coverings will stop the air movement. Besides that, people have come up with various suggestions:-

-
- papier mache, sanded afterwards
 - narrow strips/wedges of wood
 - silicone sealant, if it will stay put while it sets (NB you can't paint/ varnish this)
 - if tongue and groove, varnish will seal many gaps
 - if access to the underside of the floor is possible, polystyrene tiles wedged between the joists, or polythene sheet stapled to them (Note: do not allow electrical cables to come into contact with expanded polystyrene, as it leaches the plasticiser out of the cables. Protect with polythene sheet, etc.)
 - wax, but only if re-applied regularly

REMOVING LEAD PAINT

By Chris French 15/4/1998)

Buildings built in the 1960's or earlier are likely to contain lead. While sound paint surfaces present no risk, particles or flakes of lead paint present a risk to health, especially to children if ingested.

Lead paint can be removed safely as long as some simple precautions are taken. The main aim is to avoid producing any dust containing lead or lead fumes which can be released if the paint is burnt.

Removal

Don't burn off with a blowtorch, as this produces lead fumes.

Don't rub down dry, especially with a power sander, as this produces lead rich dust, which will spread around the house.

Use a hot air gun (but don't burn paint), chemical paint stripper, or rub down wet, using "wet or dry" paper.

Disposal

Dispose of all paint debris in a sealed plastic bag in dustbin. Don't use a normal domestic vacuum to clean up, as the filters are not normally fine enough to trap the lead dust: hire an high efficiency industrial one instead.

After Work

Wash hands etc. thoroughly before eating and after finishing work

This information was taken from a leaflet published by the

Paintmakers' Association,
James House
Bridge Street
Leatherhead
Surrey
KT22 7EP

Tel. 01372 360660

Fax. 01372 376069

REMOVING PAINTED WALLPAPER

By Mike Dean 15/9/1998

Painted or vinyl wallpaper can be hard to remove, as the paint/plastic stops the water you apply getting to the dried paste behind. You therefore have to score it with a special tool, or some nails hammered through a piece of wood. After this, apply the same technique as for ordinary wallpaper: use the hottest water you can stand, and put some washing-up liquid in it to encourage it to adhere to the paper. Most importantly: give it time to work.

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Security

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- [Planting for security](#)

By [Nightjar](#)

General

It is impossible to stop the determined thief who wants to break into your property. The only function of security is to make the average thief decide that it is easier to steal from someone else than from you. Therefore, beyond a certain minimum level, the degree of security you need depends on what your neighbours have.

The most important thing about security is to use it. 'Walk-in' thefts, where the thief gains entry through an unlocked door are probably the most common single type of theft.

Simple ideas, like leaving a radio on while out and having internal lights (NOT the hall light) on at night, or on a timer, are surprisingly effective deterrents.

It is also a good idea to ensure that, if you are out, the thief cannot simply open a door and walk out. A thief who has to climb out through a window is not only more likely to attract attention, he (usually) will often also be able to carry less. So, fit at least one lock which needs a key to open it to all doors and don't leave the keys either in the locks or near to hand.

- Alarms

-

Door Classification

External Doors

External doors are, obviously, the doors to the outside of the property. Less obviously, perhaps, is that any door which leads to an area which cannot be made secure, such as most attached garages, must be treated as an external door, even if it is actually inside the building.

Final Exit Door

It will be impossible to lock at least one door from inside when leaving the property - usually the front door. This is known as the final exit door. In some cases it may be convenient to treat two or more doors as final exit doors.

Internal Doors

Unless made to external door specifications, internal doors should not be considered secure doors. They are best left unlocked to avoid unnecessary damage.

French Doors and Patio Doors

French Doors should be treated as glazed external doors. Patio doors should be fitted with multi-point (preferably four point) locks and anti-lift blocks.

Garage Doors

Hinged garage doors, especially if to the standards of external doors above, are the easiest to make secure. Up and over doors are much more difficult to secure. If buying new, choose a door with two, or preferably four point locking.

Locks, Bolts etc.

British Standard Locks

The strongest locks are made to British Standard 3621/80. Not all types of lock are described in the standard, so it is possible for a very good lock to be unable to carry the BS kite mark. It is usual for insurance companies to specify at least one BS lock, normally on the front door.

Buying Locks and Bolts

The best place to buy locks and bolts is a qualified locksmith. You will get expert advice and may be guided to locks of which you were not even aware. If you know broadly what you want, a 'Security Centre' is a good alternative, but many do not have adequately qualified staff and recommendations are likely to be restricted to lines which are stocked. DIY centres do carry a wide range of locks and bolts, but you do need to know exactly what you want and they only have limited stocks of such items as Euro-profile locks.

Lock Types

There are two main types of lock: the mortise lock, which fits into a slot in the edge of the door, and the rim lock, which fits on one face of the door. The mortise lock is generally more secure, but the convenience of the cylinder rim lock makes it probably the most widely used front door lock. Either is acceptable if kite marked to BS3621/80, although rim locks should not be used on outward opening doors.

Mortise locks can be supplied as either deadlocks, with a single rectangular bolt, or as sash locks, with a second spring loaded bolt. The latter can be used with ordinary door handles and will hold the door shut even when not locked. Mortise locks should always have a minimum of 5 levers or, if cylinder operated, 6 pins. They should never be fitted where there is a joint in the door i.e. at the height of a horizontal rail.

Cylinder rim locks should be capable of being deadlocked, which may be done automatically or may be done using the key. The handle inside should also be lockable if there is glass in or by the door. Deadlocking prevents the spring loaded bolt from being pushed back by inserting a flexible tool (TV crooks usually use a credit card) into the door edge. Automatic deadlocks work by having a small tongue which detects when the bolt is engaged into the striking plate. Key deadlocking usually needs an extra turn of the key.

One special type of mortise lock is the espagnolette, which, in addition to the main bolt, also has bolts near the top and bottom of the door and sometimes also in the top and bottom edges. The last is a very good bolt for French windows. These are fitted as high security locks in several new doors, but, as they are not covered by BS3621/80, may not meet insurance requirements.

Cylinders, Levers and Wards

Locks will often be described as cylinder locks, lever locks or warded locks. Simple warded locks have no security value and should be ignored.

Cylinder locks use a cylinder which is kept from rotating by 5 or more pins. When the key pushes these pins back the correct amount, the cylinder is free to turn. Cylinder lock keys are generally flat pieces of metal, often with grooves on either side. When used as Europrofile or oval cylinders, they can be used with mortise locks and then have the advantage that 'changing the locks' only involves fitting new cylinders. BS locks will have 7 pin cylinders.

Lever locks work by the key lifting 3 or more levers a pre-set amount to allow the lock to turn. They use a traditional 'key' shaped key. The minimum number of levers for any security application should be five.

Common Keys, Master Keys and Restricted Profiles

A common key system is one in which all the locks use the same key. This is a considerable simplification in a property with a number of locks. If you want to include padlocks on the common key, it will be necessary to use a cylinder lock system. Do not confuse this with the system used for some key switches in which the same key is supplied to all buyers, also known as common key. This is obviously much less secure.

A Master key system also allows one key, the master key, to unlock all the locks. However, it also allows other keys to be made which only open some of the locks. This can be useful if you want to carry only one key yourself

but to give limited access to other people. For example, the person who feeds the cat while you are on holiday could get into an outhouse or a gardener could be let into a garage or tool store without either having access to the main house or even to the area the other can enter.

Restricted profile keys are cylinder lock keys supplied by a particular locksmith. Only keys with that particular cross-section will fit your locks and their main advantage is that copies cannot easily be made.

Bolts

There is a bewildering variety of bolts available, but only a few need to be covered here. To see the full variety, visit an architectural ironmonger.

The most common type is the simple tower bolt. These are generally unattractive and of little use except to hold a gate or a shed door. Similar in operation are slide bolts, which are generally more attractive and better suited for indoor use. Bolts of this type are not usually accepted by insurance companies as adequate security by themselves, since they simply pull open. They are, however, very useful on the front door for extra security at night.

Much more secure are rack mortise bolts. These are recessed into the edge of a door or window and need a key with a gear wheel type profile to move the bolt. In many cases insurance companies will accept these as a 'key operated lock' when used in addition to the main door lock or on a window. Like mortise locks, these can weaken the door or window if fitted into a joint.

Another very useful bolt is a recessed bolt. These are let into the edge, both top and bottom, of the first closing leaf of a double door or French window. They can only be operated when the second leaf is open and are therefore, very secure.

For sheds and gates there is a variety of tower bolt which has 'ears' fitted to take a padlock. These are adequate to stop the casual thief and greater security is rarely justified unless the shed is built of brick and fitted with a solidly boarded roof. Unlike a house, the door of the shed may not be its weakest point. Many sheds, including even some pre-fabricated concrete types, will yield to a good hard kick in the walls (ouch!).

The only other bolt which is of interest for security purposes is the hinge bolt. These are solid rods, usually fitted 75mm (3") below the top hinge and above the bottom hinge, in an external door. When the door is closed they enter holes in the door frame and prevent the door from being opened by removing the hinges. They are essential on outward opening doors unless special hinges are fitted.

Window Locks

The number of different types of window locks is huge. Covering each one in detail is beyond the scope of this FAQ. The best advice is to consult a locksmith or a security centre.

Recommendations for Particular Applications

External Doors

The police recommendations for the construction of external doors are:

-
- They should be not less than 44mm (1 3/4") thick
 - They should be of solid construction (i.e. not hollow)
 - Any panels should be not less than 9mm (3/8") thick
 - They should be hung from three 100mm (4") steel (not cast) or brass hinges
 - Any glass in or immediately next to the door should be laminated. Outward opening doors should be fitted with hinge bolts.
-

Any external door to NHBC standard will meet the first two requirements. Hinges are traditionally fitted 150mm (6") from the top, at the centre height and 225mm (9") from the bottom.

Final Exit Door

The front door is usually a final exit door although there may be more than one. If you are going to fit only one BS 3621/80 lock, this is the door to fit it to. The door should have two locks - one at 1/3 the height from the bottom and the other at 1/3 the height from the top. The lower one should be a BS 3621/80 mortise deadlock. The upper is often a cylinder rim lock. If preferred, it could be a mortise sashlock and it could be as low as the centre height of the door.

Other police recommendations are that, if there is no side window, a door viewer should be fitted and, in any case, a door chain should also be fitted. Make sure that the chain is really substantial - many are of little value. If possible, also try to fit it so that any attempt to force the door does not simply pull the screws straight out.

Fire Exit Door

At least one door should be viewed as a fire exit door, which can be opened from inside without a key. This should have one slide bolt at the bottom and a second not more than 1200mm (4ft) high. These are normally fitted to a final exit door with a cylinder rim lock as the upper lock, although some mortise locks can be fitted with turn handles to open them from inside.

Other External Doors

External doors which can only be locked from inside usually need no more than a single mortise lock at or near the centre height with a rack mortise bolt at each top and bottom. If money allows, use a BS 3621/80 lock.

French Doors and Patio Doors

French doors and hinged patio doors can be treated as double external doors. Fit recessed bolts into the leaf which closes first. The second closing leaf can have either a good espagnolette lock or a mortise sashlock and two mortise rack bolts. In this case the rack mortise bolts should be fitted into the top and bottom of the leaf and engage into the outer frame.

Modern sliding patio doors should be fitted with multi-point locks and anti-lift blocks as standard. Older ones may only have a single point lock. Special patio door locks are available for these and two should be fitted - one each at top and bottom.

Garage Doors

Hinged garage doors can be treated as for French doors. As garages cannot be considered to be particularly secure, tower bolts or monkey tail bolts may be used on the inside of the doors instead of the recessed bolts and rack mortise bolts. (Monkey tail bolts are simply tower bolts with extended handles to make them easier to reach without bending or stretching. The name comes from the shape of the handle.)

Up and over doors are particularly vulnerable, especially those with only a single point lock. Special garage door locks are sold which can be fitted on either side at the bottom of the door. As an alternative, a padlock bolt or hasp can be fitted either side at the bottom and the door can then be padlocked shut.

If electric power is available to the garage, a good DIY alternative is to fit electromagnetic locks to either side at the bottom. They are particularly useful where an automatic door opener is fitted as they can be switched off by the operating signal. A disadvantage is that they need a standby power supply to work during a power cut (they fail to OFF). Magnetic locks are remarkably expensive but electromagnets sold as holding magnets are considerably cheaper and can easily be adapted. A 6.2W 50mm diameter holding magnet will give up to 720N of holding force.

Windows

All accessible windows should be fitted with a key operated lock. Large windows may need two locks. This includes not only ground floor windows but also windows opening onto a flat roof and windows adjacent to the soil pipe leading from a WC. Soil pipes provide a fairly safe climbing route and are usually near a window.

Lighting

Lighting is the cheapest form of security. A bulkhead light with two 9W energy saving bulbs, fitted with a photocell, can light up the whole side of a house from dusk to dawn and only use about 90 units of electricity in a year - particularly good value for those on off-peak tariffs. Alternatively a light with a movement detector (PIR) can be used which involves a higher initial cost but may produce lower overall running costs.

If fitting a single light, put it over the main entrance. Other outside doors will, however, also benefit from a light above.

Planting for Security

Thorny plants are a good deterrent and may be used either as hedges or at specific risk points. A climbing rose will not only cover an unsightly soil pipe, it will also reduce the risk of a thief climbing it. The best plants to use depend on the soil and your area, but many police crime prevention units can give advice for your locality.

Alarms

There are two schools of thought about alarms. Some people believe that an alarm will deter the casual thief, while others think that it will suggest that you have something worth stealing. This is an area where it is worth looking at what the neighbours have. It is probably a bad idea to be either the first or the last in the area to have an alarm.

It certainly is a waste to fit an alarm unless you already have a secure property. Good locks are your first line of defence.

Fitting an alarm system is easily tackled by a competent DIY-er. Some insurers give a discount for a NACOSS maintained alarm system. Most NACOSS installers will approve and maintain a DIY fitted system provided that it meets with their installation guidelines, which generally rules out the cheaper DIY systems. As a (very) rough guide, you are unlikely to have problems with a system which can replay the last 100 events.

Alarm system technology is constantly changing. Because of the rate of change, the best advice has to be to visit a local alarm system specialist to see what is currently available. You can, for example, now get systems which do not need to be hard wired into separate protection areas but are fully programmable from the keypad.

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Washing Machine FAQ

By [Ian Tilley](#) (Shrek)

Version 1.5, 8th March 2002

Introduction

This introductory text to Washing Machine repair assumes reasonable DIY mechanical and electrical competence. It does not attempt to explain how to open up the machine to access the innards, because they are virtually all different in how they come apart. It is hoped to add a generic guide later, covering this. The Haynes “The Washing Machine Manual” by Graham Dixon, ISBN 085429 6905, gives more detailed advice than we have room for here, together with photos that show you what to expect.

For more specific help try posting a question to either the [uk.d-i-y](#) newsgroup or to the “[appliance-repair](#)” Yahoo! group.

Before you start

The first thing to do is to unplug the machine. While the machine has an unknown fault there is always a possibility that the case may have become live, though proper earthing should protect against this. Quite often the machine will be plugged into a socket which is inaccessible until the machine is pulled forward (see [how it should be done](#) below). In this case turn off at the consumer unit first. Do not attempt to move the appliance, or fault-find while the power is still connected.

If you need to move the washer, make sure the pipes are long enough to pull it out without breaking or stretching, because water at mains pressure has a curious knack of getting everywhere that you don't want it to go. Turn off water isolation valves if fitted. If disconnecting the hoses, place the open ends in a container to collect the water they contain. Once most water is drained, a plastic bag over the open end held in place with an elastic band will collect any remaining dribbles.

Why won't my washer do anything at all?

A fault on a dead washer is actually quite easy to trace. First eliminate the fuse in the plug, or a faulty mains socket. Next check the door switch and the wires leading to it, because all the power goes through the door switch. Then check for a faulty on/off switch or a burned set of spade connectors on the timer. This involves a visual inspection of where the wires attach to the timer. Burned plastic at the base of the connectors usually indicates an internal problem with the timer. The appropriate repair for this is to replace the timer.

My washer is leaking, why?

There are several reasons for a washer leaking, it could be a broken door seal, pump or pipe. These require a visual inspection of where the leak is coming from, and usually a replacement of the offending part. Sometimes it might just be the union where the pipe needs tightening, but again a visual inspection is the only answer.

Tell tale signs that the pump is leaking, is usually a white residue around the pump mountings where the soapy water has evaporated and left a trail of dried soap. The door seal performs two functions, it stops water from getting out through the hole where the clothes are placed into the drum, and it also bridges the gap between the front of the cabinet and the wash tub. A leak in the door seal might drip water just behind the front face of the machine, and this is usually caused by a hole in the seal which must be replaced. A leak down the front panel could be caused by an ineffective seal between the rubber and the door glass, which might be solved by simply cleaning any soap residue away from the glass, and a smear of washing up liquid around the edge of the door seal might be enough to restore a good seal. Should this not work then a replacement seal would be necessary.

The seals are universal in their fitting methods and require removing from the front panel first, then access can be made to where the door seal fits to the tub.

Another cause of a leak is overfilling, which could be caused by the water level sensor being faulty. This consists of a pressure barrel which can be located at the bottom of the tub, or on one of the pipes leading to the pump, this forces air up a pipe as the water level is increased. The pipe leads to a pressure chamber which activates the level switch, or switches, depending on how many levels of water are detected by your model of washing

machine. Common failure points here are a blocked pressure chamber (soap residue), a split pipe, detached pipe or broken pressure switch. The pressure switch (Pressostat) can be tested by removing the pipe and blowing into it, you should hear distinct clicks for each water level.

Why won't my washer spin?

There are several reasons for this fault. First a washer will not spin if there is water in the tub. If this is the case, then check “Why won't my washer empty?”. Even though the washer might have emptied the water, the machine might be misled into 'thinking' there is still water left in the machine due to a blocked pressure barrel (see “My washer is leaking, why?”). If the belt has become detached or loose, the drum will not spin, nor will it spin if you have a faulty motor, module or timer. Usually a motor will have carbon brushes which slowly wear away. There needs to be enough material left to touch the commutator and have enough spring left in them to make sure there is a good contact. If the brushes in the motor are OK then you need to check the circuit across the terminals on the motor, because there is a thermal overload switch inside which may have tripped. Should the motor be OK, or be the type that doesn't have brushes (induction), then the chances are you need to test the speed control module. This is a circuit board that directly controls the speed of the motor. It may be found on or near the timer, or sometimes at the base of the machine, and usually requires specialist equipment to determine its worthiness.

Why won't my washer empty?

Before examining the fault, it is usually worth trying to empty the machine manually, this can be done by

removing the outlet pipe and lowering it into a bucket, when gravity should allow the water to empty from the machine. This method will not work with certain German made machines where the mounting for the outlet hose is too high to allow a gravity discharge.

Often the reason for non-emptying is a blockage. This usually involves removing the pipe connecting the bottom of the tub to the pump, but be careful because dirty water will gush out. The blockage could be due to a lost item of underwear or a broken-up soap ball. The soap ball is supposed to make the machine more efficient by keeping the soap in the tub, but it frequently jams and causes machine emptying problems. If there is no obvious blockage then you need to check the pump, which you can do by putting the machine on an empty cycle and listening to see if the pump is turning. However, even if the pump is rotating it is possible that the rotor has come loose or has broken vanes, so you really need to check that it can generate water flow. If the pump is not turning then check for an obstruction directly in the pump, such as a coin or bra-wire. If the pump is working fine, then the trickiest problem of all could be a coin in the outlet pipe. This is a hard one to diagnose because this kind of item is very difficult to find. The best cure for this is to have a pole which is close to the internal diameter of the pipe and shove it from one end to another.

Why is my washer banging?

A banging washer can be caused by an unbalanced load, which is caused more by an under loaded machine than an overloaded machine. If the machine is constantly banging then one of the following may be the cause.

An unregulated motor

The module that controls the motor needs adjusting or replacing or the motor needs calibrating, because the speed is finely regulated to balance the wash load when the machine goes into spin. After the machine has tumbled it goes into distribution mode, and this is where most of the problems occur. The drum has to build its speed from tumble (35-55 rpm) to distribution speed (83 rpm). If this does not happen gradually, the clothes will gather at one side of the drum and create an out of balance load. Hotpoint and Servis (older carbon brush) motors can be adjusted by turning the brass calibrating ring on the tachometer assembly attached to the back of the motor. Otherwise you need to take the control board to be repaired, re-calibrated or replaced.

Faulty suspension

There are two common types of suspension, a spring and friction plate type and a shock absorber type. The first one suffers from the friction plates becoming shiny and not gripping properly. This can be cured by either replacing the friction pads, or simply sanding down the surfaces of the pads to roughen them.

The shock absorber type can suffer from broken legs, or loss of oil in the dampers. Either case would cause the tub of the washer to be loose and free to move around inside the cabinet.

Loose components

Any component from the motor to the concrete block at the top or bottom of the machine can become loose and cause banging. This requires visual inspection and repair.

Drum Bearings or mountings

Bearing faults are usually indicated by a rumbling sound which gets louder with time. Drum mountings are signified by a loose drum relative to the outer tub.

As far as repairing these faults go, they are quite involved and also quite different from machine to machine, but they all require a complete strip down and rebuild.

Motor bearings

Motor bearing faults are quite rare, but can be identified by removing the belt and manually turning the motor. Faulty bearings will make the motor harder to turn or noisy when it is turned. Usually this is caused by over tightening the belt, and the cure depends on which make of machine. Some machines have replaceable bearings, some need the armature replacing, and a few need to have the motor replaced as a whole unit.

Why is my washer sticking mid-cycle?

The washer can stick mid-cycle because the timer is usually waiting for a condition, such as the water filling up to the level, or the water heating to the correct temperature. These are fairly obvious to resolve, by either replacing the water valve or heater element. However, there is one fault which is tricky to resolve and that is the siphoning effect. This happens when the drain hose gets pushed too far down the standpipe and the water siphons out as fast as it is taken in, hence it never gets filled up, so the timer continually waits.

Why won't my washer door open?

The most common type of door interlock is a heater operated delay lock, which is why some machines take a time for the door to release. So make sure you have waited a minimum of 2 minutes before you open these or conclude that they are faulty. This type of interlock cannot be repaired and quite simply have to be broken loose from behind the front cabinet, and replaced. With the power isolated you need to remove the top cover and put your hand down behind the front panel to where the door lock is located (directly behind the hole where the door catch enters the cabinet). The door catch then has to be prised away from the front of the cabinet until the door opens or the interlock breaks.

Some machines will not let you open the door if the machine has water in it, or the drum is turning, so first make sure the water has been emptied from the drum, then check the mechanism which detects the motion of the drum. This motion detector can be attached to the motor or the drum pulley, and is a mechanically operated lever attached to the door lock by a cable.

If there is resistance to the cable being shortened then the door will open, however if the cable offers no resistance the door will not open. The mechanism on the motor or drum pulley consist of a lever with a pecker assembly at the end. The lever is pulled towards the belt when you try to open the door. The pecker at the end of the lever is at right angles to the belt and is what provides the resistance to the cable, but if the belt is moving the pecker gets pushed to one side and the cable has a fuller range of movement, hence offers no resistance for the door to open. Sometimes the pecker assembly can break and needs to be replaced, otherwise it is just a matter of adjusting so there is a miniscule gap between it and the belt.

Why is there always softener left in the tray when the programme has finished?

The softener is emptied using a siphon method, the water is sprayed into the softener compartment and it siphons out through a tube in the middle of the tray. The pipe is probably blocked and the solid pipe needs to be removed and cleaned out.

It stopped with water still in it, and I opened the door!! I should not have been able to do that, should I?

Unfortunately with some machines it is quite possible to open the door with water still above the door line, because they rely on a time delay only, whereas others actually check that the water has been drained. See “Why won't my washer door open”.

I want to put in a socket for my machine, do you have any hints for this?

The usual cheap bodge is to put a single socket on the wall under the worktop in the machine space. This has

two major disadvantages.

-
- It obstructs the machine so it cannot be pushed fully against the wall, causing it to protrude beyond the worktop. If in a corner situation this can prevent adjacent drawers or doors from being opened.
 - The machine cannot be electrically isolated, except by turning off the mains at the consumer unit. This is at best an inconvenience and at worst a danger should a serious fault, like a flood or fire, develop.
-

The proper way to do it is to fit the socket outlet to the left or right of the under-worktop space, in the dead space behind an adjacent floor unit. You will need to cut an access hole in the rear of the adjacent unit's side panel, large enough to reach a hand through, holding a 13A plug. A 3" or 4" square hole should do it.

The socket should be the un-switched variety, with a separate isolation switch fitted above the worktop in a convenient position.

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The Power Tools FAQ

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- [Normal / Hammer Drills](#)
- [SDS Hammer / Chisel Drills](#)
- [Impact Driver](#)

By John Rumm ([Internode Ltd](#)) March 2005 with thanks to all those who commented on the drafts.

Summary

This FAQ is all about portable power tools; what types there are, and what they do. How to choose the right tool to buy, and sort the good, from the bad or just plain ugly. If you are a novice to DIY then start reading here with the introductory sections for some background, and then move onto the categories section to understand about the different ranges available. More experienced users may prefer to jump straight in with the Buying Policies or the individual tool types.

Introduction

One question you need to ask before buying any power tool is: What do you mean by DIY? This is not as daft a questions as you may think! Since it will have a big impact on the tools you will consider “suitable” and “appropriate”. For some people DIY will be about saving money, for others it may be a relaxing hobby. It can be as simple as putting up a shelf, or as elaborate as building a house.

- Jigsaw
- Mitre Saw
- Nailers and Staplers
- Oscilating Tools
- Planer
- Reciprocating Saw
- Router
- Sander
- Wall Chaser

For many, DIY is a means to an end, since it is often the only way to get some jobs done (finding good trades people willing to actually quote or turn up for work is getting increasingly difficult! (particularly in the south east of England)).

In addition to the DIY-er described above we have the hobbyists. These are woodworkers who often regard the things they make as pieces of beautiful furniture to be carefully crafted, or DIY-ers, who do DIY for the satisfaction of knowing that they can, and don't want the risk of a getting in a contractor who may cut corners and not do it quite as they would.

A tool purchased for occasional use may well be very different to one you expect to make extensive use of every day. So before deciding on much else, it is advisable to decide what you are planning to do with the tool, and the level of use you anticipate making of it.

Power Tool Categories and Brands

Buying Policies

Cordless Tools, Advantages & Disadvantages

If you are in the market for a new tool, have a look a look at the menu to the left for specific advice.

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UK.D-I-Y FAQ

Power Tools FAQ — Power Tool Categories

and Brands

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There are many power tools available from the general purpose to the highly specialised. Almost every DIY shop will not only stock a selection of well known brands, they will often offer their own range of “own brand” tools, and prices for a similar looking tool may vary by a factor of ten (or more). The choice is bewildering.

Understanding the way in which these different ranges of tools are marketed and distributed can go a long way to help understanding this large range.

Different brands

Some examples of tools from the different categories:

Budget tools

- [NuTool](#)
- [Budget](#)
- [Kinzo](#)
- [Challenge](#)
- [JCB](#)
- [Many DIY shop “own brand tools”](#)
- [Power Devil](#)
- [Ferm](#)

Mid-range tools

- [Bosch \(green bodied\)](#)
- [Wolf \(new\)](#)
- [Rexon](#)
- [Axminster \(white range\)](#)
- [Dremel](#)
- [Black & Decker](#)
- [Skil](#)
- [Wicks own brand \(grey bodied\)](#)
- [Freud](#)
- [PPPro \(B&Q\)](#)
- [Ryobi](#)

High-end tools

- [Makita](#)
- [Trend](#)
- [Bosch \(blue bodied\)](#)
- [Hitachi](#)
- [Festool](#)
- [Fein](#)
- [Lamello](#)
- [Freud](#)
- [Elu](#)
- [Metabo](#)
- [DeWalt](#)

- [Atlas-Copco/Milwaukee](#)
- [Panasonic](#)

What to expect

Badge engineering

Some brands of tool you will find are just that, "brands". Typically manufactured in the far-east and then "branded" for the eventual retailer. This also explains why you can find exactly the same tool available under several different "brands" where the only difference is the label, and the colour of the plastic.

With badged tools of this type, getting spares or any kind of after sales service can be difficult or impossible.

The budget tool

Examples of all the popular tools can be found in a budget form, typically costing £30 or less. These include some brands that specialise in this market (see above), and many DIY shop own-brands. Almost exclusively, these tools will be of the "badge engineered" type.

To compensate for the lack of spares or after sales service the retailer will often offer extended warranty terms and operate a blanket replacement policy. So, if a tool breaks during its warranty period, then the retailer will simply replace it. If it breaks after this time you bin it.

Although a long warranty may seem attractive, remember that you may need to factor in the cost of your time should a trip to the shop be needed to acquire a warranty replacement. Note, also, that it does not help if all you want is a spare part, and not a whole tool.

If you find you are frequently needing a warranty replacement for a tool, it might indicate that you are demanding more from the tool than it was designed to give.

Mid-range tools

The mid-range is the most confusing area since it can encompass tools from the "edges" of both the budget and high-end categories – often with the range of tools available under one brand spanning a good proportion quality and price range available. It is also an area with a large number of suppliers, sellers, and advertisers, each competing for your money. Mid-range tools will probably be nicer to use, last longer, and do a better job. Spares are usually available as may be a repair service.

High-end tools

At the high-end, tools are often built and assembled in factories owned by the brand maker, or built for them by OEMs to the brands own specification and quality standards. There will be a service and support network that will enable tools to be repaired, and spare parts obtained. The quality and endurance of the tool will be high since these tools are designed to satisfy the needs of the professional who will expect continuous use, day in and day out. Needless to say, this quality and the backup and support network has to be paid for in higher tool prices.

How do I tell?

Identifying which of the above groups a tool belongs to is not always straight forward. Many people will not even agree which is which. Some brands may make tools in several distinct categories. For example Bosch make mid-range and high-end tools. They typically indicate which is which, not only in their numbering, but also by producing all mid-range tools with green cases, and the high-end tools with blue cases. They also own the mid-range brand Skil.

In recent years many of the big name makers have acquired smaller brands so as to be able to compete in several different ranges without confusing their customers as to which market they are aiming for. So, for example, B&D make a vast range of mid-range tools, but also own the high-end marques Elu and DeWalt. High-end tool maker Makita also sell some mid-range tools under the Maktec brand.

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UK.D-I-Y FAQ

Power Tools FAQ — Buying policies

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- [Cordless Tools, Advantages & Disadvantages](#)

Often a cause for vigorous debate, the following policies each have merits and devoted champions. Decide for yourself which best fits your mindset and state of pocket!

The disposable tool

This is an easy one! Sometimes a tool is needed for a specific job and then that is it. You may never use it again. Often hiring a tool is a good way to meet this need, but that will not always be cost effective or practical if you are going to need it on an ad hoc basis spread over several weeks.

In this category, tools from the cheaper end of the market can be ideal, since if it gets the job done “well enough” that is what matters. If it lasts longer and comes in handy later, then that is a bonus.

Almost any DIY shop will have a suitable supply of tools. The down side it that the quality of the bought tool compared to a hired one may be inferior since the hire shops will typically buy top end tools, so as to get the best life out of them. Then again at least you know that the tool is new, and won't have been abused by a ham fisted Muppet the week before. The bought tool may also be less comfortable to use, achieve lower standard of results, and take longer. Finally, you need to either store or otherwise dispose of the tool when the job is done.

The second-hand tool

Don't dismiss this often overlooked option. Second hand tools are often cheaper than new budget ones. Quality will vary but there is a fair chance you can pick up products from all the categories described here.

Prime buying sources include car boot sales, the tip, local papers, and sometimes second-hand or charity shops, and the modern day equivalent of pawn shops. Obviously one needs to take care with some sources to ensure the tools are not stolen property.

Be wary of very old tools since they may be lacking critical safety features that are standard on current ones. Read the specific guidance on these issues in the [Tool Types](#) section.

Sometimes places like hire shops will sell off surplus tools. If you can find one that has not been hammered to the edge of its useful life this can be a way of picking up a top quality tool for not much money.

The buy to try approach

If you are not sure how much actual use you will make of a particular tool, you can buy one from the budget or mid-range, to see how you get on with it. You may find that your purchase satisfies your need, or it may be a stepping stone to something better. It also means when you do buy "something better" you have a much clearer understanding of what features to look for and which ones can be dismissed as "fluff".

The “buy several” approach

The budget tool may not offer the reliability and performance of a mid range or better tool. However the price is often such that you can buy more than one of each tool, often for the less than the price of a single better tool. Should a tool fail, you simply discard it and switch to it's replacement, and carry on working. The same policy can actually be applied to any type of tool, in any price range, if it is important that you can carry on working in the event of a break-down.

You can have several tools “on the go at once”. With things like drills this may allow faster work since you will not need to stop to swap between say a drill bit and a screwdriver bit; instead just pick up a different tool.

You need to balance this with the fact that the money spent on two tools may buy one of better quality, which may outlast the two cheaper ones, give better results, and be nicer to use. Also you will need more storage space if you have several of each!.

The mid-range “buy to keep” approach

This is the hardest range to purchase from, because there is a huge choice, and it is not possible to make blanket purchasing decisions based on brand, for example. Each brand will have good and not so good products in this class. Buying from this range is often what the ad-men call an “aspirational purchase” (i.e. you would like something better, but budget dictates you buy something similar but cheaper!).

Mid-range tools are often well suited to the less intensive user and are often more than adequate for many DIY-

ers. The results and quality of work that can be produced will often be higher than with lower-end tools, and some after sales service and support should be available. This is often true where the manufacturer sells tools in several ranges (like B&D or Bosch for example).

While typically better than the budget tools, you may still find that the quality, comfort of use, and speed etc., may be lacking.

The “top quality” approach

Sometimes only the best will do. If the work you want to do demands the highest quality of finish, or you want the utmost comfort^[1] and ease of use from your tools then this might be the approach for you. You can expect tools in this category to stand up to intensive every day use, even for “trade” purposes. Reliability should also be better than the other groups, and spares and after sales service should be readily available. They are ideally suited to the serious DIY-er, the tradesman and the craftsman. You will be getting the smoothest operation, resulting in good finish and low operator fatigue, with good finesse of control.

If you have a habit of being a bit “heavy handed” with your tools then remember these were designed to be used and abused on building sites!

These tools are going to be more expensive, and are more likely to be stolen if not carefully looked after! Note, also, that although repair services are available there will be down time while the repair is carried out. Also the general falling price of tools can render a top quality tool beyond economic repair simply because the “new model” is half the price.

Sometimes there is just the satisfaction of using and owning “the best”

[1] “Comfort” in this case meaning a tool which has: Good dust collection; lack of vibration; handles placed just where you need them; and controls falling right under your fingertips; Actions happening smoothly, and without jerks; Lock nuts being winged or knurled and not requiring tools; a noise level that while perhaps not quiet, is not all rattle, squeak and screech; Not needing to use excess force and so on...

Where should I buy from?

Many tools are available from a wide range of sources including the big name DIY shops and catalogue shops like Argos, to the specialised independent tool supplier. A growing market sector is the dedicated “online” seller.

For easy availability of budget and mid-range tools, it is hard to beat the big DIY shops. If you want the best and most knowledgeable advice, and after sales service, you will need usually need to seek out a dedicated tool merchant.

If you are looking for the best possible price, the online shop will often give it to you, although it always pays to shop around.

There are cases where an average quality tool, purchased from an above average retailer, will offer some of the benefits and after sales care that usually only comes with much higher price tools.

The purchasing factors

Once you have bought and used a few tools, it often becomes apparent that there are several non-obvious factors that ought to be considered when purchasing, rather than just features of the product and its price.

For any given purchase you will need to weigh up these factors, since they may often be different for each tool you buy. Experienced DIY-ers will probably include at least the following:

-
- Tool features
 - Purchase price
 - Availability of spares and support
 - Tool quality (and quality of results achievable with it)
 - Total cost of ownership (factoring in your time to buy and maintain the tool, cost of spares etc)
 - Comfort of use (not only ergonomic design, but also factors like weight, noise, vibration, effective dust collection)
 - Speed of operation
 - Availability of suppliers (and service where applicable)
 - How much you anticipate the tool will be used
 - How long you need it to last

- [Brand image](#)

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UK.D-I-Y FAQ

Power Tools FAQ — Mains or Cordless

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Over recent years the number of cordless (i.e. battery powered) tools available has grown enormously. In many cases mains power is but an extension lead away, and so you may not “need” a cordless tool. There are some items (notably drills and powered screwdrivers) for which the cordless tool is desirable and in class of its own - often in addition to a mains equivalent.

If in doubt as to whether to go cordless (for things other than drills) you are probably better sticking to mains.

The golden rules of cordless tools :-

- They cost more
- They will deliver less power than a similar price / size mains tool
- If you don't use them often, then they may well be flat when you want to use them!

There is also a huge difference between the best and the worst examples. The worst cordless tools are virtually useless. The best can be used as non- stop work horses.

- Cordless Tools, Advantages &

Disadvantages

The cordless jigsaw I was once given is a nice example. Cost was about £14 from a large DIY shop. In theory it will run on a full charge for 10 minutes, the reality is 30 seconds of full power, followed by ever decreasing speed and power for the next 5 minutes, with the remaining battery capacity being in effect unusable. Recharging then takes 14 hours. The one job I tried with it (a 9" cut in 1/2" ply) was completed.... just. Then that was it for the day!

Batteries and chargers

The biggest influence on the quality and usability of a cordless tool are its batteries and the charger. It is simply not possible to purchase good quality rechargeable cells at very low cost. Many budget cordless tools are sold at a price that is less than the wholesale cost of a decent set of batteries, so something has to give! The quality of the batteries will affect how long it runs, and the power or torque available. The quality of the charger will affect how long the batteries take to charge, and more importantly, how many times you can recharge them and still get useful performance from the tool. Batteries will need replacement eventually. With a budget tool this will usually be a non economic exercise, whilst with a higher end tool it may well be more expensive than you anticipate.

Battery capacity, or where bigger really is better!

A number you will see banded around with respect to batteries is the Amp Hour (AH) rating. This number tells you how much charge a battery can hold. The more charge it holds, the more work you can get out of it between recharges (but the longer it will take to charge). Battery quality tends to rise with capacity, so batteries with bigger capacities also tend to be better in other respects.

Higher capacity batteries need to be matched with better and faster chargers, otherwise you will be waiting longer for them to charge.

A good quality battery pack should take recharging many hundreds of times before it no longer holding enough charge. Some of the poorer ones may only last for a hundred or fewer charges. Good ones will hold their charge longer when left unused, whilst a poor ones will be flat within a week. With batteries it is very much a case that you get what you pay for.

Battery Chemistry

The lowest capacity batteries are typically constructed from Nickel Cadmium cells with 1.2 or 1.3Ah capacity. Mid-range NiCd cells will usually have 1.8 to 2.2Ah capacity. Nickel Metal Hydride (NiMH) cells found in top-end tools will have capacities heading toward 3Ah. The latest tools will often come with Lithium Ion battery packs, with capacities of over 4Ah in some cases.

NiCd cells are being phased out (mainly due to the toxicity of cadmium which makes safe disposal difficult).

Are more “Volts” better?

In the quest for more power, performance and speed from battery operated tools, there has been a slide upwards in battery voltage. This suits the marketers well since there is a nice “number” to use as a sales hook.

The bigger the number the better right? Err, no not always. The more volts, the more cells, the bigger and

heavier the tool will be. If you want a nimble easy to use drill/driver this is not a “good thing”. Then we come down to quality of batteries again: a top end 14.4V drill will out perform an 18V or 24V budget tool for just this reason, while being smaller and lighter into the bargain.

What about “Watts”?

Watts (W or kW) is the power consumption rating we are used to seeing on mains powered tools, but this quantity is not usually mentioned on cordless tools. This is because cordless tools are designed to be highly efficient so as to keep the electrical power consumption low to conserve battery life, whilst providing an adequate mechanical output power. This, however, makes for a small “Watts” figure that is not much use as a marketing hook! The most powerful top end professional cordless tools may consume some 400W, but most are less powerful and consume far less.

With all mains equipment, including power tools, the Watt figure stated is the input power, but the mechanical output power is rarely given. By the time you have accounted for all the heat and noise generated, the useful output power may be much less. Thus a well designed tool with good speed control and a well made gearbox may produce the same usable power at the sharp end as a less well made tool with twice the input power.

You can make a stab at estimating the actual power of your cordless tool by studying its performance. Say it runs for 15 minutes at full power, and has a battery capacity of 2Ah (Amp-hours). This tells you that the battery can delivery 2 amps for one hour, 4 amps for 30 minutes, or 8 amps for 15 minutes. We can therefore deduce from the time the battery lasts, and the capacity of the battery, that this tool is drawing about 8 amps from it.

Multiplying the voltage of the battery by the current drawn gives the power consumption (Watts = Volts x Amps).

So if this tool has an 18V battery we would get $18V \times 8A = 144W$.

Other factors

Another influence on performance, is the quality of the motor and speed controller. A good speed controller will deliver lots of torque and control, even at low speeds. The poorer ones will only deliver torque at high speeds which is far less useful.

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-

Sharpening Chisels and Planes

CliveE: Chisels and planes need to be extremely sharp in order to work properly. They are both sharpened in the same way (but for a plane you'll need to turn the blade at an angle if it is wider than your oilstone so that the whole width is sharpened each pass.)

The business end of chisel blades usually have two angles - a ground angle of 25deg finished off with a honed angle of 30deg at the very tip. If a blade has been abused and has chunks missing it will first have to be reground on a grinding wheel before any attempt is made to hone it. If you don't have your own grinder then a tool shop may be able to do this for you. Another alternative is to use a small electric grinding machine or a drill attachment which can usually also hone the blade by swapping the grinding stone for a honing one. (Some can also make a rough attempt to sharpen a limited range of twist drill bits.) Note: it is very important to keep the blade cool. It's rather easy to overheat the steel thus ruining the temper.

Chisels should be re-honed before every job. Final honing is best done by hand, using a honing guide and a fine grade oilstone (or water or diamond whetstone) before every job. Decent honing guides are available for less than a tenner and have wide wheels which do not damage the stone. Oil the oilstone. Insert the chisel into the

guide, set for a 30deg angle. Pull the blade over the stone several times until a burr is raised on the top side. Remove the chisel from the guide, turn it over and lay it flat on the stone. Rub it from side to side until the burr has gone. Finally, protect yourself and your chisels by keeping them in a soft leather tool roll (costs less than a fiver!).

Tip from Nick Nelson

from the "Chisel Sharpening" thread of September 1999.

Personally, I prefer silicon carbide wet and dry paper for sharpening chisels. Find something really flat, a 6" square of plate glass is ideal but an off-cut from a kitchen worktop works surprisingly well too. Clamp the chisel in the honing guide and start working it on fairly coarse (say 180 grit) paper. If there are bad chips or nicks in the edge which means you need take a lot of metal off consider starting with something even coarser. Work through finer and finer grades of abrasive until it is as sharp as you need (at least 600 grit). I sometimes go as fine as 1200. The most important thing is to make sure that you lap (flatten) the back of the chisel with as much care as you hone the bevel (front edge). If the back is not flat and finely polished you wont get or keep a decent edge.

Tip from Piers

from the "Chisel Sharpening" thread of September 1999.

I've got the Stanley sharpening guide which is used in conjunction with an oilstone to sharpen chisels and plane blades. I find it reasonably easy and I'm not particularly well endowed with practical ability.

First you must restore the primary bevel which if I recall correctly tends to be about 20 degrees. First use the coarse side of the stone and grind until you have a perfect bevel, then turn the chisel over and lightly remove the burr. Then repeat the process with the fine side of the stone, just removing enough material to get a fine finish. Once the primary bevel is OK you grind a secondary edge at 30 degrees. Use only the fine side of the stone. Remove the burr.

The result is a chisel which is plenty sharp enough for me. Fanatics will insist that back and bevel need to be mirror polished but they obviously need sharper tools than I do. [Note: Piers is using a two-sided "combination" oilstone here].

Sharpening Drills

CliveE This article is distilled from the "Chisel Sharpening" thread of September 1999.

Twist drills which are past their best are anathema to any good DIYer but it seems such a waste to just bin them. In reality, the smaller sizes are difficult to sharpen but they're cheap and so not really worth attempting by the beginner. But how do you sharpen the bigger ones?

By Dave Plowman

You could kill two birds etc. Martek and Plastiplug both do electric grinding machines which will be fine to true up a chisel *before* final sharpening by hand, and will sharpen larger drills. Small ones [drill bits] are so cheap they're not worth bothering with. These are by no means professional tools which is reflected in the price, but can with a bit of practice be OK for DIY.

By nightjar

You can buy attachments for portable drills to sharpen drills. I would not think they are much use below about 1/4" diameter though and you should consider how many new drills you could buy for the same price.

By Steve

Or you could learn to do it by hand with a grinding wheel and save a packet. When you really need to follow a centre spot, you need to be able to sharpen your drills first. New drills quite often come with eccentric points.

By Bignell Surgical Instruments

Given that the poster was having difficulty holding a chisel guide flat on a whetstone, I doubt this is currently a practical proposition.

By Tony Williams

Absolutely correct. I have a Martek drill sharpener, it produces apparently superb results, at first glance. The trouble is.....that nice and shiny "re-sharpened" drill may have a completely incorrect backing-off, and such drills are worse than useless. With the Martek, it takes a *lot* of skill and practice to get a good backing-off on a drill. I find that a light skim on the bench grinder is just as effective.

By John

Get a good school metalwork or Engineers handbook and learn first of all about the required angles for cutting, clearing swarf etc and methodology employed to sharpen metal cutting tools. I've seen some absolute abortions produced by otherwise quite intelligent people when they decide to "sharpen" a drill etc. Somehow it never

seems to occur to them to look at a new drill before ending up with something like a needle point and wondering why it won't cut anymore.

By Bignell Surgical Instruments

Dormer and Osborne both do very good little booklets on angles, speeds, feeds etc for drills, mills etc. although they do not always agree with each other. I suggest getting one of those and including the details [of the books] in the FAQ. [Editor's note 2002, see Dormer Tools site under Regrinding menu for online data].

By Tony Williams

All cutting blades need a backing-off (or clearance), lathes, drills, etc.

Take a drill bit, hold it at a fixed angle to the grindstone, and rotate it. It will produce a nice conical pointy bit, and a nice cutting edge..... BUT, at that instant the metal behind the cutting edge is parallel to it, [] there is no clearance. Try to use that drill and it will just rub and overheat. The backing-off behind the cutting edges has to be carefully put in as a separate grinding operation.

A fine backing-off (A is small) produces a drill that cuts clean holes, with minimum chatter, but with a tendency to overheat if pushed too hard. It needs patience to use.

A coarse backing-off gets a drill that cuts fast, but with a tendency to grab and chatter... oversize rough holes.

You have to judge what to do according to the material being drilled... for example, brass grabs and snags, so anything less than minimum backing-off is lethal. Indeed, it is even quite useful for brass to slightly blunt the

cutting edge with a slip-stone.

In the larger drill sizes it is quite handy to have a varying backing-off.... almost nil near the point, so that it remains steady, increasing near the edges.

By Steve

I was taught to back off the drill by first setting the cutting edge, then sweeping the edge up the wheel whilst turning it about 30 degrees. Easy to do but very hard to narrate...

By Rick Hughes

Backing off ... hmm difficult to explain.

If you took a drill and held it at angle X to a rotating grindstone, and then keeping the angle the same turned the drill. You would have a lovely spear point on the drill but it would not cut anything ... it might burn through wood.

What you need is that the leading edge of the cutting face of the bit higher than the trailing edge, that way the leading edge cuts into the material, and the part of the drill immediately behind it is not in contact with the material, allowing swarf to come away and avoiding friction.

There are jigs that change the angle of the drill as you rotate them, which is the professional way to do it. Unfortunately not many people have these.

Most fitters will do this by eye, first rotate to get a smooth clean face all round at the correct angle, then one face at a time line up the cutting edge to just be touching the grindstone, then rotate, altering the angle of the drill to

grind away a clearance. Only needs a degree or so on hand drill sizes.

As to the angle - like the drill point angle itself this depends on the material you are going through and the thickness of it. i.e. if you were to drill soft thin sheet, you need a flat drill bit angle with little clearance - otherwise it will corkscrew into the work when it breaks the other side. For thicker and harder material, points can be more acute and also more clearance.

By Charles (Joe) Stahelin

Unless sharpening techniques have changed since 1941 when I deserted an engineering apprenticeship for other things I think the business of drill sharpening is something that can only be learned by demonstration combined with explanation. There is a bit of turn and swing involved rather than just grinding a simple angled face. I have tried to do it in recent years but I have lost the 'touch' and get less than perfect results.

By Dave Plowman

I agree, Charles. I've never been able to make a satisfactory job of it, and I guess few will. One of those 10 quid add-on-to-your-drill-thingies is well worth it for the larger sizes, but even they need *some* practice.

By Elron Hoover (aka "Dave")

I agree, 'tis a bugger to get right, but the results are worth it once you do.... I always had good results on those large, slow, water bath grinding wheels; the fast bench grinders are ok but you have to go for the finest grade of wheel.

By CliveE

I'd be interested to know the kind of angles you'd expect to find on set of HSS jobber twist drills.

By Andy Wade

The angles I was taught for O-level metalwork many years ago are:

- point angle 118deg. (59deg. between drill axis and cutting edge)
- clearance (behind cutting edge) 12deg.

Rake angle is predetermined by the flutes and can't be changed. Freehand grinding is quite easy to learn - practice on the larger sizes first so you can see what you're doing. It's very important to make sure that the two cutting edges are equal in length, otherwise oversized holes will be drilled.

By M D J Foreman

In fact I was told some years ago that if you wanted drills sharpened in a 'good' engineering works, you were asked by the toolmaker (sharpener?) how many thou oversize you wanted the hole to be!

Roger Chapman wrote

Would it not be much easier to direct interested parties to the Dormer Handbook or, with their permission, lift the section on drill the sharpening part? *[Roger quoted the angles in the news posting but they are not reproduced here for reasons of copyright]* The Dormer book also has illustrations. And in all honesty I have to say that despite all this guidance I rarely get a good result. Drill sharpening is a knack which some of us may never learn.

By Elron Hoover (aka "Dave")

Yep,,, that's the way to do it...after a few, or many, attempts at it, it finally comes right,,, and you wonder what all the fuss was about. :)

To which Dave Plowman replied:

True. And all those 1 in long drills are very useful for tight spaces. ;-)

Paul McCann's Sharpening Experiences

My sharpening experience would be in the field of wood-working tools (chisels, plane blades etc.) as well as domestic knives , scissors, hedge clippers etc.

The first tool I learned to sharpen was a scythe. (We used to use them to clear thistles from meadow fields) This was done dry with what we called a sharpening stone . (A carborundum stone about 12" long , oval in section and tapering to each end. Posh ones had a wooden handle). The scythe was sharpened by alternate strokes to each side of the blade and could be got alarmingly sharp. A similar tool and method was/is commonly used to sharpen domestic knives though I've known people to use a sandstone window sill or threshold stone. The sharpening stone was quite coarse so presumably left the edge a bit ragged (microscopically speaking). I presume this suited the slicing type cut used with scythes, sickles , knives etc., a point validly made by Donald [see below].

Axes and hatchets were also touched up with a sharpening stone. A file or rasp would have been used to remove any nicks , and establish the basic angles.

Regarding wet systems there basically two. One is oil based and the other is water based. Stones designed for use in the oil based systems are just that, designed and made to be used with oil. This is why they are known as oil stones! Years ago when hand tools were more in use in workshops all the old timers had their own favourite oil stones and recipes for lubricants. All claimed almost miraculous properties for their own favourites and some made a big thing about secrecy regarding their own lubricant recipe. There would be mention of paraffin oil, engine oil cut with paraffin oil, neat's-foot oil (*a light yellow oil obtained from the feet and shinbones of cattle, used chiefly to dress leather*) with some type of thinner, cutting oil obtained from machine shops etc. etc. Every protagonist was convinced that he and he alone had the "right " system. It was a sure way of brightening up the tea break if the apprentice asked for advice !

Water stones are similarly designed and manufactured to be used with water. (While I have known people like carpet fitters to sharpen their "Stanley" blades with a small slip stone and a bit of spit I always put this down to convenience and the desire not to soil the carpet with oil.)

The structure of the two stones is fundamentally different to allow for the differing fluids being used.

Japanese water stones are relatively soft so that in their usage they wear easily and are constantly exposing fresh grit. They are soaked fully in water prior to use and the surface is further flooded with water before sharpening commences and kept flooded. In use, being so soft, they wear rapidly, and this wear means that a fresh cutting surface is constantly being exposed while the copious amounts of water wash the old particles away. This makes them very fast cutting.

Man made oil stones differ in that they are designed to allow the oil lay more on the surface thus keeping the microscopic particles being ground off in suspension, and the stone free cutting. Water alone used on these stones would be too thin and run off the surface. They should be cleaned after use and stored in a box to ward off dust etc. They really only become clogged up if abused.

(There is now a belief that the fluid only slows down the sharpening process and that India type stones can be effectively used dry, but only if they have been used dry from new. If oil has once been used then it will be necessary to continue using it, I have never tried this myself.)

Relative newcomers to this market are Diamond stones (used either dry or with water depending on which manufacturer's advice you take). Very effective and quick but also quite expensive.

Ceramic stones, which are used dry are another newcomer. Reports I've read place them between Oil stones and Diamond based products as regards effectiveness. They would also fall between these two in their price.

I keep a small diamond hone for use on router bits which are made from tungsten carbide. I also have a larger Diamond based tool which is basically a handle which takes different grades of diamond faced steel plates and holds them magnetically. I use it as an alternative to a rasp or file for very coarse work (Lawnmower blades etc.)

Japanese water stones are currently my favourites for chisels and plane blades and kitchen knives.

"Scary Sharp" is a much touted American system of using waterproof wet and dry automotive paper. Starting with a coarse grade of paper, fixed to a very flat surface (a piece of plate glass is ideal, and I have found the

paper will adhere simply via suction after wetting the glass and conditioning the paper in a container of water for a short time). You can go as fine as you want with the paper grades depending on the application. It is very effective.

Easily available machine based systems would be the ubiquitous bench grinder and the various water wheel devices such as Tormek. The bench grinders are not too expensive but really need to be used with care as their high speed means they can "Blue" a blade frighteningly fast. (Blueing occurs when the blade is allowed to overheat and thus have its temper drawn. The only cure is grinding back beyond the blued section, which will not hold an edge effectively, and starting anew.) The water wheel systems use a grinding stone which runs in a water bath. They revolve quite slowly and obviously run no risk of over heating the tool edge. Some such as the Tormek can have various accessories affixed them to facilitate differing sharpening operations. Regrettably price raises its ugly head here as they can be quite dear. I have a Tormek which I use no where near as much as I thought I might, only using it when a blade needs its primary bevel renewed. Between times the secondary bevel is formed with a Japanese water stone.

With regard to sharpening chisels, plane blades etc., the objective is to get two perfectly flat surfaces meeting at the required angle. The first step would be to flatten the back of the blade and progressively polish it by going through the grades of stones available, or wet and dry silicon carbide paper if following "Scary Sharp" methods. Only when this is achieved can one start on the other side. A primary bevel of 25 to 30 degrees should be established and then a secondary bevel of about 2 1/2 degrees more can be formed. This secondary bevel can be re-established easily many times before the primary bevel would need re done. There are many proprietary aids to this process, each having there own strengths and weaknesses. This is a very brief description. The

appended web site addresses or a good book such as Jim Kingshott's "Sharpening, The complete Guide" published by the Guild of Master Craftsmen should satisfy those needing a more in depth approach.

If asked, my advice for a neophyte would be a double sided ("combination" - two grit grades) India stone as a starter. It will do all the average user will require, if a little slowly. If more is desired then a double sided Japanese water stone, with the addition of a very fine stone later, if the ultimate edge is wanted, will serve admirably.

Scary Sharp (TM) <http://www.shavings.net/SCARY.htm>

Sharpening Plane Blades <http://www.hocktools.com/sharpen.htm>

Leather Honing <http://www.handamerican.com/>

Dealing With 'Dull Carbide' <http://home.insightbb.com/~jpaquay/carbide.txt>

Knife Sharpening FAQ of the rec.knives newsgroup <http://www.bladeforums.com/features/fagsharp.html>

CliveE: I use an oilstone to keep my chisels sharp and use the conventional method of pouring thin oil onto it just before sharpening. The following article offers an interesting variation on the theme:

Donald Gray's Alternative Approach

Never ever use oil on an 'oilstone'.

Use strongish solution of liquid washing up detergent and water (say at a strength equivalent to one table spoon of detergent to 1 cup of water) - rinse stone in fresh water after use. (Even spit is better than oil!)

This stops the pores of the stone from becoming clogged with a congealed amalgam of crushed stone, metal swarf and dried out oil. It will keep the stone in tip-top condition and will remain 'sharp' for its entire life!

(If you have a clogged stone, soak it over night in a strong hot solution of CLOTHES BIOLOGICAL washing detergent. You might have to repeat this a couple of times. Then never use oil on it again!)

This is contentious suggestion, especially to craftsmen with years of experience in oiling an oilstone. But please try it. It really does make a vast difference - I have used both methods and will never use oil again!

ALL oils will eventually dry out, dragging in the crushed stone & swarf into the stones pores. Thin oils could be worse in as much as they are more volatile and will dry out quicker.

If you use detergent/water solution as a lubricant all you need to do is a quick rinse in water and then put it away. They can dry out completely and no special needs to keep it 'wetted' with oil!

I have several carborundum stones which were my dad's and have seen well over 50 years of service. Each one cuts metal as good as the day they were made. (Do you remember the delightful way a new stone 'bites' the metal - my 50 year old stone is like a new one every time!)

I use the same solutions on my 'India' stones that I use as a hone for chisels. It even keeps the slip stones 'clean' that I use for polishing small surfaces.

For your information, the 'wet and dry' paper that most DIY/car factors supply can be used as a 'sharpening

stone'. (After all, it is carborundum powder of various grit sizes glued to paper with waterproof goo!)

Place about quarter of a sheet of wet and dry on a very flat & clean surface and wet it with soapy water and sharpen the chisel or knife as if it were a proper stone! Use 240 grade to shape a very blunt/worn/damaged edge then sharpen with 400 grade. (scalpels can be honed with 600~800 grade). It is pointless to use finer grade than 800 because in theory the edge of the blade is more perfectly formed, it will not 'cut' as well as an edge that has very slight imperfections. (The imperfections act like the teeth on a saw)

I always have a sheet of 400 grade in my desk draw with a small block of Formica covered ply. If I need to sharpen my pen knives, I use them with a goodly dollop of spit - instant sharpener!

Last modified: 22 October, 2019 8:25 PM

UK.D-I-Y FAQ Maintainer: [John Rumm \(editor@diyfaq.org.uk\)](mailto:editor@diyfaq.org.uk) © [Copyright](#) 2019

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From uk.d-i-y

Many thanks to Andrew Gabriel for compiling this PDF of the many many responses to the sad news of Andy's death....

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The Andy Hall of fame...

Excuse the bad pun, but Andy was never adverse to one of those!. This page is really a tribute to one of UK.D-I-Y's most prolific and respected posters. Although sadly no longer with us, his sage and detailed advice lives on in the archives of approaching 30,000 posts!

Nov 4 2003, 4:38 pm

Newsgroups: uk.d-i-y

From: Andy Hall <an...@hall.nospam>

Date: Tue, 04 Nov 2003 15:38:33 +0000

Local: Tues, Nov 4 2003 4:38 pm

Subject: Re: Adding inhibitor to CH system without draining

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On Tue, 04 Nov 2003 14:23:28 +0000, PoP <E--140...@anyoldtripe.co.uk>

wrote:

>On Tue, 04 Nov 2003 09:37:19 +0000, Andy Hall <an...@hall.nospam>

>wrote:

>>I doubt whether there would be any reaction between different brands

>>of chemical, but personally I would flush the lot and start again,

>>simply to have a known situation.

>I have the same thoughts on this.

>I know there is a recommended minimum level of inhibitor for a CH

>system, but is it feasible that there might be a maximum level? So if

>you've got inhibitor in there already and don't flush it out the

>system could overdose on inhibitor?

>Might sound implausible I suppose, but I expect heat transfer

>constants in water and in inhibitor to be different, so if you get the

>mix wrong.....

>PoP

I'm not sure that overdosing (like double) with products like MB-1 is

a particular problem - Fernox recommend a 4% dosing but don't warn

about higher levels.

I did use some of their Alphi-11 product, which is a combined antifreeze and inhibitor for my garage workshop circuit, which is separate to the main house. While the pipework is well insulated, I thought that there could be circumstances such as pump or other failure where freezing could occur. With this product, there is a maximum dosing level of 40%, which is good to -22 degrees, although I used 30% which is good to -15 so a pretty safe bet.

ALphi-11 is glycol based and distinctly more viscous than water.

The circuit in question is sealed, and since this is a liquid product rather than gel, it was necessary to come up with a means of delivery.

Fernox sells an injector product, which is, in effect, a modified pumped garden sprayer. I bought a cheap sprayer from a DIY shed and modified it with suitable pipework to have an adaptor to fit onto a filling connection point. I was able to add the inhibitor (4 containers of it) quite easily this way and then added water to fill and pressurise it in the same way. To begin with, the two liquids didn't mix very well and there were circulation problems through the radiators - one getting hot, the rest not. Judicious operating of

valves forced flow and mixing in the end, but it illustrates that additives can have an effect. I've kept the injection machine in case I have to do any work on the circuit. Since Alphi-11 is fairly expensive, I can part drain the circuit into a large container and the re-use the liquid. With some hard pumping, I can get 2 bar out of the sprayer to pressurise the system.

Sep 25 2002, 6:21 pm

Newsgroups: uk.d-i-y

From: Andy Hall <an...@hall.gl>

Date: Wed, 25 Sep 2002 18:21:48 +0100

Local: Wed, Sep 25 2002 6:21 pm

Subject: Re: flushing out central heating systems

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On Wed, 25 Sep 2002 16:55:17 +0100, Roger <nos...@here.net> wrote:

>richard newbery wrote:

>> Has any one used central heating flushing machines for their own heating

>> systems, are they effective, are they easy to use, do they pressure the

>> system to an extent that you have leaks forming after use. Do they

>> improve the efficiency of the system.

- >If you have dual entry valves you need to take the rads outside and
- >flush them individually. My system was "powerflushed" but BG decided to
- >flush a couple of the rads individually, and LOTS of muck came out.

I think it's worth doing this anyway rather than powerflushing.

I recently did a system refurbishment and took radiators outside one by one and hose them through with a pressure washer. While each was off the wall, I flushed the pipes through gently with mains water.

Overall, this part of the job took me a couple of hours. There was little in the way of rusty material since the system has been run with inhibitor since new, although a little brownish water was flushed from the radiators. From the pipework there were a few bits of old copper swarf.

After completion, refill with water, bleed air out and add corrosion inhibitor.

.andy

[More...](#)

There were countless threads were Andy gave detailed advice, or argued his point of view with passion consistency and above all, good humour. If you want to highlight any particular threads in Google Groups, the please post a link on the [extra links](#) page of the wiki.

Last modified: 25 December, 2020 1:27 AM

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WASP BYKES (A.K.A. NESTS OR BIKES)

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By [Barrie Walker](#) 29/7/1997

Disclaimer

This is all derived from the postings to this group, or possibly discussions with friends, who would have been posting had they access. I myself have no extraneous knowledge of the subject.

Background

Wasps seem to come to life in the spring and die off in late autumn. Unlike bees, they build new bykes each year. They never use an old byke and the presence of an old one doesn't, of itself, encourage them to use that place again, but what encouraged them to build there in the first place (e.g. proximity of fruit trees) may well still be present. You may have to address this for a complete solution.

The size of the bykes can vary wildly from that of a golf-ball to that of a football. The larger ones can house tens of thousands of wasps. During the winter, the byke will be empty - the queen away hibernating somewhere warm and the workers all dead - so dealing with that [old] byke achieves nothing - indeed, some say that they make very good insulation.

- Oil on Paving

On the other hand, sealing the hole they were getting in by will give that place one less tick in the 'Which Byke?' guide. Note that, if the hole is needed for ventilation, some suitably-sized mesh could be used.

In Defence of Wasps

You should think twice before getting rid of a byke unnecessarily as the wasps are hard working gardener's assistants, eating insects, caterpillars and other nasties. You may be well to actually encourage at least one byke about the garden (though not in the house) as they do a fine job of culling greenfly and the like.

Dealing with Them

There follows various ways of dealing with bykes once found. In the DIY section, inclusion does not suggest suitability.

Non-DIY

1. Professional Exterminators

Typically they will come and remove the byke and spray powder insecticide around. This may cost up to UKP 50 +.

2. The Local Council

Phone the council pest control people and they'll send someone to deal with it. Cost varies from place to place, with some places even doing it free of charge (which sounds like a very good deal to me if it's on offer) but this is getting rarer.

3. Your local Angling Club

Contact the secretary of your local club. They use wasps as bait and will often come and remove the byke for you free of charge.

DIY

4. Laisser Faire

If it's late enough in the season and you can stand it, just leave them be. Once the season is over (no more wasps), block the entrance hole (see above) and hope for the best - it worked for me. However, some people are allergic to wasp stings, so this may not be a valid option. For the other methods you need to be able to see the byke, and you need to be active when the wasps aren't, i.e. when it's cold and/or after dark. Some claim to have done this often without once getting stung! But be careful, protect all areas of skin especially the face. Multiple stings can be potentially life-threatening. Whatever you do, don't be a hero!

5. Obtain (the only product mentioned by name in the postings) a powder by Bio called Wasp Nest Destroyer costing (then) UKP 2.65. Bearing in mind the precautions above, puff the powder on the entry to the bykes. One application should suffice. An ant-killer powder may be just about as effective.

6. You should be able to get an aerosol spray or non-aerosol liquid jet (c. UKP 5) from your local garden centre. Bearing in mind the precautions above, spray the concoction on the byke itself. With the liquid jet you may not have to get any closer than 15ft depending on your ability to aim.

7. Obtain a 200ml tin of lighter-fluid (contact poison for wasps) and a 350ml spray can of clear acrylic spray (e.g. a Holts touch-up can!). After dusk, when they're drowsy, coat anything that flies in the acrylic. Once everything's quiet, drench the byke in lighter fluid. Later, when there's no more buzzing, remove the byke and, preferably, burn it. Note that lighter fluid is basically

petrol and is highly volatile and inflammable.

8. You can also get an aerosol that emits a freezing blast and literally freezes and stops them in mid flight. You can direct the same product into the byke too. You've still got to kill them but it may give you a breathing space and allow you to do the deed during daylight.

Peddalling the `Byke' Word

Andy Dingley enlightened (some of) us: "Etymology is unknown, and although it originally applied to wild bees (not a hive or skep of cultivated bees), it also has a long pedigree of application to nests or swarms of wasps, hornets and even flies."

WOODWORM TREATMENT

By Matthew Marks 1/4/1998

People often wonder if holes in items of furniture etc are a new or an old attack. If they are new, the holes will be clean (new-looking wood visible inside), and there will be little piles of woody dust below them, if the item hasn't been moved. If old, the holes will be dirty.

It is recommended to treat with dedicated woodworm fluid, rather than general purpose timber treatment. Follow instructions on the can.

FIXING BLOWN PLASTER

By Stuart Grant 21/9/1998; edited by Matthew Marks

Sometimes plastered solid walls become "blown", i.e. the basecoat becomes separated from the wall behind. This can be detected by tapping the plaster: it will sound hollow where it is blown. It could stay like that for many years without trouble or it could crumble away and fall at the next shock wave from a heavy lorry passing. If it falls off in 3 years you'll have no comeback on today's plasterer.

A simple fix is to glue the loose areas back to the masonry with PVA bonding. Drill a 1/4inch hole sloping 45deg down near the top of the loose area and work a six inch length of 1/4" neoprene tubing into the hole. Seal around with Blutack. Attach the other end of the tube to a washing up liquid bottle with the bottom cut off to form a funnel and securely tape it to the wall above. Fill the funnel with PVA watered down to the consistency of full milk and leave it to flow slowly into the hollow behind the loose plaster. Pressing the loose area gently in and out will help the flow and spread the bonding. A second hole at the bottom of the area will tell you when the bonding has got there. Don't try and hurry things with a squeeze bottle or you could push the plaster off and break it. It should be fixed and dry in 24 hours.

PVA can also be used to fix sagging lath and plaster ceilings: prop the sagging plaster back into place, and apply watered-down PVA from above.

LIME PLASTER

By [Rick Hughes](#) 3/12/1999

For those who want some mainly historic details on Lime ... are we sitting comfortably, then I'll begin.

Ordinary Portland Cement invented in 1824 is what is used in almost all new buildings, but lime has it's uses especially in the renovation of old properties.

Lime mortar consists of a mixture of sand and lime.

Lime is produced by the burning of limestone (chalk) in a kiln for a period of around 4 days at between 900 and 1000 degrees C. This is known as Calcining, and the resultant substance usually in lump form, or crushed to a powder is known as 'Quicklime.' Chemically it is Calcium Oxide. There was a whole industry associated with this, and the guys involved were called Lime Burners.

Traditionally, lime was taken in this form to a site, a pit dug, the Quicklime put in it and then a quantity of water added. This results in a VERY vigorous exothermic chemical reaction which gives off a vast amount of heat and expands considerably. If the water quantity was accurate the lime expands, it disintegrates and falls into a powder. However normally excess water is added to produce a paste known as 'Lime Putty'.

The above action is chemically termed hydration and historically the process is known as 'Slaking'. It is very important that full thorough slaking occurs, otherwise any unslaked lime would on the addition of water to the mortar continue slaking in the wall ... causing expansion, cracking and weakness. If Quicklime is left exposed to the atmosphere it will eventually 'Air slake'.

Nowadays lime is usually purchased in bags of scientifically prepared 'Slaked Lime' this is made by a fast continuous process, making it cheaper. Either by controlled burning or by a pure chemical process.

It has advantages :

-
- It is consistent
 - It is fully burnt and thoroughly hydrated
 - It can be stored longer without deterioration

- 'usually' better results than lump lime

However its has a MAJOR disadvantage that it suffers from blowing ... this is the expansion of small lumps of lime causing fractures in finished work.

There are different classes of LIME

-
- High calcium lime
 - Semi-Hydraulic lime
 - Hydraulic or Eminently Hydraulic Lime
-

High calcium lime

Is also known as 'White lime' or 'Fat lime' and is classed as quick slaking due to being almost pure calcium. It has outstanding handling characteristics and is very plastic, a joy to work with.

Semi-Hydraulic lime

Is also known as 'Grey Lime' has a lower Calcium content and higher level of impurities, and is less plastic.

Hydraulic or Eminently Hydraulic Lime

Also known as 'Lias' contains a greater proportion of impurities, making it more difficult to work. Often referred to as 'Learn'

lime.

Impurities in Lime is not always a bad thing, and in fact for brickwork is often desirable as it increases strength of the finished mortar. There are many known impurities, such as magnesium, such 'Magnesium Limes' are used because they have greatly increased hardening properties compared to High Calcium limes.

Settling of Lime

Settling is the action that occurs after slaking and depends on the slaked lime absorbing CO₂ from the atmosphere. This changes the soft particles of slaked lime are converted to comparatively hard crystals of Calcium Carbonate.

The sequence is thus:

Calcium Carbonate...burnt...Calcium Oxide...water added (slaked)...Calcium Hydroxide...absorption of CO₂ from atmosphere...

Calcium Carbonate

- more or less back to what is started as but all the crystals are aligned by cohesion. The addition of sand in correct proportions induces crystallisation and gives 'adherence qualities' It also gives it bulk, reduces shrinkage and saves on costs. Mortar MUST be kept moist during this crystallisation alignment process, and dry bricks should be dunked in water before laying to avoid sucking the moisture away before the process has completed.

Excess moisture then evaporates away by exposure to the atmosphere.

Hydraulic limes have unusual peculiarity of setting without exposure to air, and are thus very suitable for damp conditions.

SAND

Sand is very important, the properties seriously affect handling characteristics and finished strength.

Builders sand is a 'soft sand' and totally unsuitable. What is needed is a well graded clean free from impurities 'sharp sand' i.e. with angular edges, with proportionate sized grains, neither too fine or too coarse, to give the necessary texture and lock the mortar together.

Sharp sand is usually pit sand. Dredged sea-sand has rounded grains and is known as soft sand.

Mix Proportions

These were specified in the Ministry of Health Model Byelaws Series IV (buildings) and the typical proportions were :

-
- High Calcium Lime (lime putty) 3 or 4 parts sand : 1 part lime
 - Magnesian Limes 2 or 3 parts sand : 1 part lime
 - Hydraulic Lime 3 or 4 parts sand : 1 part lime
 - Eminently Hydraulic Lime 2 or 4 parts sand : 1 part lime
-

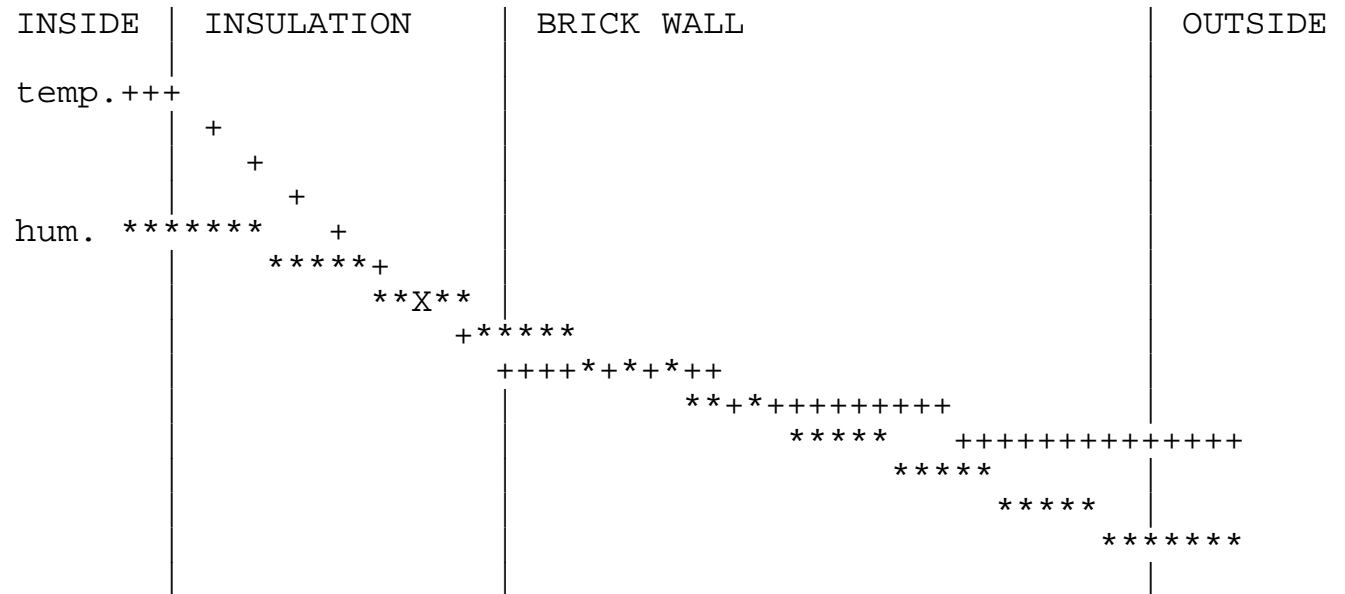
INSULATION AND CONDENSATION

By Matthew Marks 17/5/1999

The Problem

In our eagerness to slap up insulation everywhere, the potential problem of condensation is sometimes overlooked. Air can hold a certain amount of water vapour, and the higher its temperature, the more vapour it can contain. Air in houses in winter often contains more moisture (from breathing, washing, cooking, etc) than the cold air outside can hold.

Thus, if you insulate a surface but do nothing to stop vapour penetration (and things like plaster, wood, brick, concrete, mineral wool, and even expanded polystyrene allow vapour to penetrate easily), you may get a problem. This is what happens:



The above attempt at ASCII art (if it *really* doesn't make sense change to viewing in a 'fixed width' font such as Courier) shows a cross section through an insulated wall, with temperature and absolute humidity graphs superimposed. The temperature and humidity each side of the wall are those of the atmosphere on each side. Although the temperature inside is higher than outside, the humidity line is below the temperature line at each point, representing less than 100% relative humidity - i.e. humidity relative to the maximum amount of water vapour the air can hold at a particular temperature.

The insulation retards heat transfer better than the wall behind, so the temperature drops much more quickly within the

The Solution

```

INSIDE # INSULATION BRICK WALL OUTSIDE
#
temp.+++++
# +
# +
# +
hum.***      +
*            +
*           +
*          +
*         +
*        +
*       ++++
*      +++++
*     ++++++
*    +++++++
*   ++++++++
**+*****+
#                *****
#                *****
#                *****

```

The step change in humidity caused by the vapour barrier (symbol #) has made sure that the relative humidity is well below

100% throughout the wall. The vapour barrier is not assumed to be perfect (it will have joins, nail holes, etc), so the absolute humidity just behind the vapour barrier is still a little higher than outside, but an imperfect vapour barrier is usually good enough in most circumstances.

Note that the position of the vapour barrier is very important: it has to be on the warm side of the major insulating element. If it is on the cold side, it will make matters worse by maintaining higher humidity through the insulation.

As has been mentioned, the problem of condensation is worse if there isn't good ventilation to blow away the vapour when conditions allow it to evaporate, such as in insulated walls, where a vapour barrier is essential. However, you can usually get away with insulating the floor of the loft if there is good eaves ventilation and the insulation is baked regularly when the sun shines. But if the loft is boarded, any condensation will take much longer to evaporate. It is thus a good idea to place a vapour barrier underneath loft insulation in these circumstances, especially over humid areas such as bathrooms. Foil backed plasterboard is ideal, but strips of polythene between the rafters will do some good. Don't loop it over the rafters or it will be on the cold side of the insulation at some points. If the loft becomes a heated habitable room, the problem is transferred to the insulation above, because that is where the temperature gradient occurs. For the same reason, condensation between floors isn't usually a problem, and it is rare to have air bricks to allow ventilation. (Air bricks below ground floor level are to allow damp rising from the ground, as well as humidity from above, to be dispersed.)

REPAIRING LATH AND PLASTER CEILINGS

By Matthew Marks 18/5/1999, with input from Stuart Grant

Ceilings and stud partition (i.e. not solid) walls were made out of lath and plaster before plasterboard was invented. Laths are thin strips of wood which are nailed between supporting timbers, separated by small gaps. When the laths are plastered, the

plaster is squeezed between the laths and the resulting "nibs" hold the plaster in position.

Over the years, these nibs can break off (due to movement of the ceiling or disturbance from above), and the ceiling can start to sag. It is also possible that the laths become detached from the supporting timbers (usually due to the nails rusting if the structure has been damp).

If a ceiling is bulging due to nibs breaking off, it can be repaired, if you have access from above. Hoover out any debris from between the laths and the sagging plaster (which may be easier if you cut out a lath), then carefully prop the plaster back into position with a large board, so that the load is evenly spread, and find some way of maintaining the board in position. Apply PVA glue liberally from above, diluted one part glue to three parts water, and remove the props 24 hours later.

It is also possible to glue laths back to joints using liberal amounts of undiluted PVA glue between laths and joists before propping the ceiling back into position. Nailing the laths is likely to damage the plaster too much.

If the ceiling is particularly bad, you can either remove it and start again, or plasterboard over it. Removing ceilings is a horribly messy job and, if you remove the laths too, you will have to take away any loft insulation first; but you will not lose any height when you install the new ceiling, and it may be better if you have coving.

It is best to screw rather than nail the new plasterboard in place. Nailing is less reliable, causes more disturbance (to the house as well as its occupants!), and is not much easier if you have access to an electric screwdriver. Special plasterboard screws are designed to hold the board firmly, if you take care to tighten them flush but not to break through the paper surface. They are available long enough to pass through an existing ceiling. It goes without saying that the fixings should be into the joists, not the laths!

Plasterboard is available in taper-edged form, where a small area along the long edges is thinner. If the fixings are in this

thinner section, then the joints can be taped (with plasterboard tape, which prevents cracking of the skim coat) and the area filled with a skim (top) coat of plaster to give a good finish. The short edges are parallel with the joists, and the board is cut to coincide with them, preventing any movement here, although making finishing to a high standard tricky.

Alternatively, standard plasterboard can be used, the joints taped, and the whole ceiling skimmed. It is a good idea to use foil backed plasterboard in upstairs bathrooms, to reduce the possibility of condensation in the roof space. Ordinary plasterboard should be mounted with the "bad" side (where the joins between front and back paper are) downwards if it is intended to skim the whole surface, because plaster sticks to this side better.

Most DIY-ers are of the opinion that plastering large areas is best left to the professional.

Editors note: Also try an advanced Google search. Click on this link to search [uk.d-i-y for ceiling and \(cracked or repair or repair or sagging or loose\) excluding \(artexing or fan or stipple\)](#). Note that Google allows a maximum of 10 items in the search fields.

CAT FLAPS IN DOUBLE GLAZED DOORS

By CliveE 27/8/1999, summarising several uk.d-i-y articles from various authors.

The problem:

It is generally easy enough to install a cat flap in a panel of a solid wood door but how do you do it if the panel is double glazed?

- The bad news: the glass is very likely to be toughened (it should have an indication of such etched into one corner) and so

there will be no chance of cutting it. The panel should not be replaced with non-safety glass which can shatter into

extremely dangerous daggers.

- Double glazed panels are usually only cut for a cat flap at the time of door manufacture. However, you may be able to get a new double glazed panel professionally made up with a hole in it, to replace the existing panel.
- If you have a double glazed door that has two separate glass sections, one top and one bottom, you could replace the bottom one with an opaque plastic panel of the same thickness, available from a plastics warehouse or a double glazing firm. The standard construction is two hard plastic sheets with a foam fill inside, and easy to cut a hole in with a jigsaw. Larger plastic panels may be reinforced with an internal steel sheet and consequently more difficult to cut.
- Some cat flaps are designed to fit into round holes, specifically for fitting through glass, but choice may be restricted to non-electronic types only. Flaps with square holes are generally for fitting in wooden or plastic doors. Some of those with "U" shaped flaps can fit square holes or large round holes.
- Cats don't mind jumping a reasonable height to get in and out, and it may be easier to replace the glass in an adjacent small window than in the door.
- Consider putting the flap into the garage back door or wall, or into the garden shed.
- Make a cat tunnel through an adjacent wall, possibly under a work surface.

General Tips:

- For security reasons, make sure any cat flap is well away from door or window catches.
- The cat flap should be well draught-proofed.

- A magnetic or electronic cat flap may help prevent other cats getting in and nicking food or marking their territory. This may mean your cat has to wear a chunky magnet on its collar but it will get used to that.
- Steel doors or steel reinforced doors should only be modified at the time of manufacture.
- Fit a small dog flap for big cats!
- Whatever type of cat flap you buy, make sure it is suitable for the thickness of the panel you are mounting it in.
- If making a cat tunnel, make it 5cm taller than the opening of the cat flap (with the extra at the bottom), to avoid forcing the cat to crawl through it or getting its paws caught. The hole in the wall must be lined to avoid contact with thermal insulation and to avoid heat-sapping draughts in the cavity. Stitch drill out bricks and use quarry tiles, varnished WBP ply, terracotta flue liner, or aluminium sheet to form a wipe-clean tunnel. Fit flap on simple frame externally with portcullis arrangement internally.

Tunnel Tips from Nightjar:

One thing to watch out for is that the idea of a cavity wall, even if filled with insulation, is to isolate the inside skin from the outside skin, to keep the rain from penetrating. It would be a good idea to put an waterproof covering, like bitumen damp proof course material, over the tunnel where it passes through the outer leaf and carry that through the cavity, turning it up inside the inner leaf for about 150mm (6"). If you can make it wider than the hole for the tunnel, carrying it out about 50mm (2") either side of the hole in a mortar bed, and hang it out of the wall about 13-15mm (1/2" - 5/8") to make a drip edge, so much the better. For similar reasons, it is better to slope the tunnel floor down by a few degrees as it passes through the outside leaf. A piece of rubber mat glued to the floor of the tunnel should make it easier for the cat to get a grip.

Tunnel Tips from geoff:

I built a cat flap into a wall which is 9" (i.e. one brick width) square and runs through two courses and the void. I would suggest one cat flap would be better than two - apart from the price, the cat won't feel trapped inside a box, and it will be easier to train it to use the flap - once it nudges the door in either direction it can see the outside world. I put a piece of mineral damp course immediately above the cat flap housing to add a bit of protection against rain. I built the tunnel out of plywood to which the cat flap is attached, and mortared it into the wall. I actually built the wall and integrated the cat flap into it.

Tunnel Tips from Phil Addison:

I just measured the height of my cat and made tunnel to suit. OK, he had to stoop a bit! There was an additional complication in our set up - no free outside wall space. I solved this by putting the tunnel right through one of the fitted cupboards as well as the wall. This entailed a second cat flap let into the cupboard door. Moggie needed the usual training of passing through it with the doors tied open for a few times before she could manage the closed flap. There was one snag I hadn't thought of: we have a couple of steps down from the kitchen door, and the kitchen units have a 6" plinth, so moggie emerged [outside] about 3' above ground level. No problem getting out but she couldn't get the hang of taking a flying leap at the closed flap 3' up the wall to get back in. I fixed a shelf just below the flap for her to jump onto.

The electronic type of flap has one nuisance problem: if the cat lingers near the flap the mechanism can go into oscillation and make an objectionable repetitive clicking. What happens is the cat slowly approaches and the solenoid activates with a 'click'. That startles puss who pulls back and the solenoid deactivates making another click. Puss then leans forward for another attempt and the cycle repeats. This can go on for 1/2 min. or more while puss makes up its mind to come in or not. The electronics really needs a delay circuit to prevent this.

Another thing I found in the investigation is that the cheaper ones are battery operated, and I suspect drain fairly quick. Mine is transformer operated. There are also magnetic versions that have no electronics. I tried one and was unimpressed with its effectiveness.

By the way, check if your door panel has a thin metal sheet sandwiched in it - many have. It reduces the sensitivity (a lot) to the magnet, and Staywell say it's 'not recommended'. Nevertheless, we got one to work OK by moving the receiving coil to the extreme outboard of the housing.

OIL ON PAVING

Cormaic: The only sure way is to replace the blocks. My web pages illustrate how to do it (see <http://www.pavingexpert.com/>)
Take an old block to a builders merchant to get a match.

There are special oil patch removers on the market - none is particularly effective unless it's a very recent oil spillage, but their performance is improved if washed with a power washer after each bout of cleaning.

If this is likely to be a recurring problem, you may wish to consider one of the better acrylic sealants, which 'varnish' the driveway, protecting it from oil and the like, but imparting a glossy finish. Again, there is more about these sealants on the above web-site.

Other suggestions from various authors:

-
- Liquid detergent and water.
 - Paint brush cleaner. (Richard Gethin)

- Soak-up using cat litter on it, cover it to keep it dry, leave it for a few weeks, shovel it up. (Tony Williams)
 - Sprinkle dishwasher powder (or crumbled tablets) over it , damp it down with a watering can then leave it for the rain to wash away. (Stuart Grant)
 - Or even normal (clothes) washing powder and a bit of hot water. (Graham Anstey)
 - Make up a paste of bleach and Fuller's Earth, and butter it on. For getting stains out of a badly-sealed stone kitchen worktop, it was pure magic. (Mike Barnes)
 - I've had some success on brick with Gunk followed by a high pressure washer with detergent. (Peter Parry)
 - Use Jizer! Brush on, let it soak in, then wash off. Whilst it's wet, sprinkle washing powder on it. (Dave Goulbourne)
 - Pour laundry detergent on the stain, followed by gasoline, and scrub it with a hard bristle brush. Then wash it down. (Steph Greenberg)
 - Unless your son has dumped a whole sump full of oil onto the driveway, I would not bother to do anything about it. Most driveways have the odd oil stain. They are almost inevitable and are nothing to be ashamed about. (Colin Bignell)
-

Last modified: 22 October, 2019 8:25 PM

UK.D-I-Y FAQ Maintainer: [John Rumm \(editor@diyfaq.org.uk\)](mailto:editor@diyfaq.org.uk) © Copyright 2019

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- [The Complete Manual of Practical House](#)

Building

- [How to restore and improve your Victorian](#)

House

This part of the FAQ is a list of DIY Manuals recommended by regular contributors to the uk.d-i-y newsgroup.

Submissions are accepted at the discretion of the References FAQ maintainer. Please send suggestions and comments to him at the address below.

You may find certain titles are out-of-print. They have been left in the list in case you can track a copy down via your library, or one of the out-of-print search organisations.

Update 2011: Since many of these titles have been updated or superceded, we have included a current set of Amazon links to equivalent versions of these books where there is still a version in print as of today. See the selection carousels below.

Usual caveat emptor disclaimers apply.

Title:

Collins Complete DIY Manual

- The 1996/7 Housebuilders Bible

- The British Gypsum pocket book 3rd edition

- Brickwork for Apprentices

- Building Techniques vol.1 Structure

- The Building Regulations Explained & Illustrated

- The Construction of Houses

- Fine Woodworking

-

Author: Albert Jackson and David Day

Publisher: HarperCollins, London

Approx Cost UKP 25.00 (often discounted)

ISBN No.: 000 412894X

Pages/published: 528pp/Oct 1993

Contents: Containing (as it says on the cover): * All you need to know about practically every DIY job you can tackle * Easy-to-follow step-by-step instructions on what to do and how to do it safely * Over 3000 illustrations and photographs, all in colour * The very latest DIY techniques, materials, and products * Current regulations for wiring, plumbing, and planning permission * The best advice from the country's leading experts, Albert Jackson and David Day * Updated colour-coding and cross-referencing - so you can find what you want at a glance * Additional features include: Security lighting, Conservatories, Power showers, Telephone extensions

Comments: Not revised since 1993, but still very good. Packs a lot into a small space.

Details last reviewed: 08-Sep-00 [Top](#)

Title: **Readers Digest Complete DIY Manual**

Author:	
Publisher:	The Readers Digest Association Ltd
Approx Cost	UKP 20 (often discounted)
ISBN No.:	0 276 42354 2 (First Ed 1994. Amended 1997)
Pages/published:	512pp/Jan 1998
Contents:	Descriptions, ideas, techniques and tips.
Comments:	<p>Good value for money. Covers topics to a depth adequate for the majority of DIY tasks.</p> <p>Includes plumbing, central heating and electrics as well as the usual decorating and repairs.</p> <p>Some basic building fundamentals are omitted but those would need a more specialised text.</p>
Details last reviewed:	08-Sep-00 Top

Title:	The Complete Woodworking Course
Author:	Chris Simpson
Publisher:	Quarto (1994)
Approx Cost	Out of print

ISBN No.:	0-7134-7648-6
Pages/published:	175pp
Contents:	Detail on about mastering woodworking tools and skills through progressively challenging furniture projects - small table through to an 'easy chair'.
Comments:	Recommended
Details last reviewed:	08-Sep-00 Top

Title:	The Construction of Buildings
Author:	R. Barry
Publisher:	BSP Professional Books
Approx Cost	UKP 6 (soft back) ea of 5 volumes
ISBN No.:	0 632 05261 9 (vol 1)
Pages/published:	Various/Fairly recent

Contents:	<p>Vol 1: Foundations and over-site concrete - walls - floors - roofs</p> <p>Vol 2: Windows - doors - fires, stoves and chimneys - stairs - internal finishing and external rendering</p> <p>Vol 3: Lattice truss, beam, portal frame and flat roof construction - roof and wall sheeting and decking - roof lights - shell structures - diaphragm and fin wall construction - thermal insulation - flat roofs</p> <p>Vol 4: Foundations and substructures - structural steel frames - concrete - concrete structural frames - external walls of framed buildings</p> <p>Vol 5: Water supply - sanitary appliances - sanitary pipework - foul drainage - roof and surface water drainage - electrical supply - gas supply - refuse storage</p>
Comments:	<p>These books are A4 format soft back and only slim (very concise). I would not be without Vol 1 for doing any building work. No use for inspiration though, no examples, only how it should be done.</p>
Details last reviewed:	08-Sep-00 Top

Title:	The Which? Book of Wiring and Lighting
Author:	Mike Lawrence

Publisher:	Which? Books (April 2000)
Approx Cost	UKP 16.99
ISBN No.:	0-85202-817-2
Pages/published:	159pp/Apr 2000
Contents:	'Basics', 'Wiring Techniques', 'Wiring Jobs' 'Rewiring a House', 'Glossary', 'Useful Addresses'.
Comments:	Hardback. "The cover says "If you don't see how to do it here don't do it", and I agree. Very useful."
Details last reviewed:	08-Sep-00 Top

Title:	The Complete Manual of Practical House Building
Author:	Robert Matthews
Publisher:	J M Dent Ltd. Orion Publishing, 5 Upper St Martins Lane, London WC2 9EA
Approx Cost	UKP 14.99 (Out of print)
ISBN No.:	0-460-86170-0
Pages/published:	191pp

Contents:	A4 format. A wealth of information on how-to-do-things, from setting out with profile boards and ranging lines to sharpening chisels. Covers conventional construction, not timber frame.
Comments:	There are line drawings in abundance which are clear and uncomplicated. Not much information on planning or managing a self-build. A lot of useful addresses also given for suppliers.
Details last reviewed:	08-Sep-00 Top

Title:	How to restore and improve your Victorian House
Author:	Alan Johnson
Publisher:	David and Charles
Approx Cost:	UKP 16.99 (Out of print)
ISBN No.:	0-7153-9955-1
Pages/published:	1991

Contents:	<p>First published 1984, revised edition 1991.</p> <p>Chapters on Foundations, Basements, External walls, Roofs, Internal Floors, Internal walls, Staircases, Windows and Glazing, Outside the House, Services and Fittings, Alterations and Improvements. Also has a Directory of Restoration products and Services and list of Related Reading.</p>
Comments:	<p>Excellent book for anyone intending to do major renovation or simple maintenance on houses built between 1820 and about 1920. It is particularly good in that it suggests ways of adding modern requirements, bathrooms, central heating etc and using modern materials whilst keeping the Victorian character of the house. Good technical detail and illustrations/diagrams. It contains very little about finishes, decoration etc.</p> <p>The same author has another book 'Converting Old Buildings', the review of which looks good as well.</p>
Details last reviewed:	08-Sep-00 Top

Title:	The Housebuilders Bible Millennium Edition
Author:	Mark Brinkley

Publisher:	Rodelia Ltd., PO Box 853, Weston Colville, Cambridge CB1 5NZ
Approx Cost	UKP 18.00
ISBN No.:	0-9524852-3-0
Pages/published:	240pp/Nov 1999
Contents:	Tables which allow you to work out the material and labour costs for just about every individual task involved with building a house. For example: The cost per light fitting to the charge per linear metre for scaffolding.
Comments:	[Comments on earlier 96/97 edition] This title may mislead you to think this is a practical book, it isn't. However it is an excellent book. There is a fair amount of background detail to various stages of the build and to who does what and how to organise things. With plenty of examples of the various methods of achieving the results i.e. dry-lining costs and plastering costs are detailed. It does take some getting used to - you need to look at the front example, find the relevant chapter, look at the breakdown and then find the relevant table to see the full breakdown of material & labour costs.
Details last reviewed:	08-Sep-00 Top

Title:	The British Gypsum pocket book 3rd edition
Author:	
Publisher:	British Gypsum Head Office, 15 Marylebone Rd, London NW1 5JE
Approx Cost	Free
ISBN No.:	
Pages/published:	280pp
Contents:	Everything you ever wanted to know about plaster, plastering and dry lining.
Comments:	Probably well into reprint by now, an excellent FREE source book. This is a real gem of a book, showed me how to set out all my plaster-boarding, nail sizes, board types, plaster types and mixes etc.
Details last reviewed:	16-05-97 Top

Title:	Brickwork for Apprentices
Author:	J C Hodge
Publisher:	Butterworth-Henemann

Approx Cost	UKP 16.99
ISBN No.:	0-3405-5641-2
Pages/published:	256pp/Nov 1993
Contents:	A hundred questions that you needed to know about bricklaying answered and a thousand you didn't even know could be asked.
Comments:	This was set course reading for all bricklaying apprentices. Very detailed and very practical.
Details last reviewed:	08-Sep-00 Top

Title:	Building Techniques vol.1 Structure
Author:	H King / D Nield
Publisher:	Taylor & Francis
Approx Cost	Out of print.
ISBN No.:	0-412-21330-3
Pages/published:	
Contents:	Incredible detail on everything regarding construction of a house.

Comments: "This is the book that almost built my house for me. It is a set work for building courses in colleges and I have no reservations about recommending this book".

Details last reviewed: 08-Sep-00 [Top](#)

Title: **The Building Regulations Explained & Illustrated**

Author: Vincent Powell-Smith and M J Billington

Publisher: Blackwell Scientific Publications Ltd

Approx Cost: UKP 29.50

ISBN No.: 0-632-05069-1

Pages/published: 752pp/June 1999

Contents: Title says it all.

Comments: Soft back (1.5 inches thick). Considering the subject matter clear and concise. Available from libraries.

Details last reviewed: 08-Sep-00 [Top](#)

Title:	The Construction of Houses
Author:	Duncan Marshall & Derek Worthing
Publisher:	The Estates Gazette Ltd (Part of Reed Business Publications)
Approx Cost	out of print
ISBN No.:	0-7282-0260-3
Pages/published:	317pp/Dec 1995
Contents:	Covers all those types of building work that you're likely to encounter in UK domestic housing; from early-Victoriana to modern insulation systems.
Comments:	"If you're buying a house, building one, or simply don't know your pargetting from your parapets, then this book is for you. It's thin enough that you can read it, yet the large format allows for several line drawings on every page. Reading this book taught me more than any other pile of textbooks about how houses were put together, how they fall apart and how to put them back again. It's a paragon of clear and legible writing. No longer need you be baffled by batts or fail to understand a U value. Highly recommended, and the best bargain anyone buying a house more than 10 years old could find."
Details last reviewed:	08-Sep-00 Top

Title:	Fine Woodworking on--[titles below]
Author:	Various, John Kelsey, ed.
Publisher:	The Taunton Press Inc., 63 South Main St, Box 355, Newtown, Connecticut 06470, USA
Approx Cost	About UKP 6.00 from www.amazon.co.uk or Stobart Davies Ltd, 2 Priory Street, Hertford, SG14 1RN. Tel: 01992 501508, Fax 01992 501519
ISBN No.:	see individual titles below
Pages/published:	Approx 100pp (varies)
Contents:	Various

Comments:

Paperback, text a little small, illustrations and photographs absolutely excellent. Collected articles from Fine Woodworking forming a "Masterclass". Sometimes a little US specific, but plenty of first rate information, some by world-recognised experts in their field. Stunning quality of work very evident. Recommended for the dedicated and improving woodworker.

Fine Woodworking on Boxes, Carcases and Drawers, ISBN 0-918804-26-4: 41 articles on hand and machine making, including dovetails.

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UK.D-I-Y FAQ

Humourous Tales from UK.D-I-Y

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Welcome to this little archive of humorous anecdotes from the uk.d-i-y newsgroup. I hope you enjoy them!

Peter Parry wrote (on the Subject of the Saniflo)

Warning: people of a sensitive disposition might care to venture no further.

Angus asked:

My recently installed Saniflo does not behave as described in the user manual. On flushing the WC it's supposed to run continuously for about 15 seconds, mine pulses on-off 3 or 4 times for about 2-3 seconds duration. Any ideas?

Peter replied:

Sell the house, failing that give it away, if that doesn't work pay someone to take it or burn it down. To give you a clue - these ghastly instruments of the Devil are French. Add the French and lavatorial engineering - now see why I say get out while you can. Moreover this particular Frenchman was a lunatic with strong Anglophobic

tendencies and a bad case of corrodible.

I am quite sure the designer was also an ex-submariner Frenchman who missed the strangled screams of seamen who had got the valve sequence wrong in the submarines toilet and just been rinsed down with a few gallons of seawater (and the recently donated contents of the bowl).

They break down at the slightest opportunity. The only thing you can actually guarantee about them is that they will break down - very frequently. Basically the only way of maintaining the slightest semblance of serviceability is to impose on pain of repair the same rules as for a small yachts sea toilet - if it hasn't passed through you it doesn't go in the bowl.

They have an interesting design. The motor has poor starting torque and the macerator lots of tiny teeth. Ergo anything that has strands in it catches on the teeth and stops the motor from starting. Things with strands include anything with cotton wool (including cotton wool buds) and anything with cloth. Females in particular must not be allowed anywhere near these devices. If you were unfortunate enough to have the added misery of a sink (oh dear - you were warned) then add hair, strands from woolly pullovers and almost anything else that's at all fibrous.

When they break (which they will - that's an absolute certainty) their endearing characteristic is that you are left with a bowl full of whatever which you have to empty back the way it came and more importantly many feet of 40mm pipe still full of minced whatever. When you disconnect the pipe I'll give you one guess where its going to go. Repairing or unblocking them is the most thoroughly revolting job.

Now to get to specifics - the pulsing is a fault in either installation or the pressure switch. Does it pulse with just the cold water tap running from the sink? The way they work is a low pressure trip switch switches on the motor when the small holding tank is full. This tank remains partially full all the time. If its pulsing either the switch has too low a hysteresis or water isn't getting into it fast enough. The motor should remain on for a few seconds after everything has emptied so that pulsing you are seeing shouldn't be happening.

As the failure rate of these diabolical things is worse than that of a F104 Starfighter I'd suggest you get the installer back (preferably to remove it forever). If it was installed by yourself then self flagellation with a few lengths of barbed wire and a call to the Saniflo people might be in order.

Angus asked:

Also, my system is a Sanitop with the outflow from a washbasin going into the top of the unit. I find that running the tap for a few seconds activates the Saniflo. Is there any way of adjusting the sensitivity of it so that it will only run when a reasonable amount of water has gone into the unit?

To which Peter replied:

No, but if it's oversensitive this might be related to the pulsing you are seeing.

Angus:

I don't see why the washbasin water cant just bypass the cutter/pump internally.

Peter:

Because these horrors are designed to be installed pumping upwards - the raving idiot who designed them thought it would be pretty neat to have something you could stick in a downstairs cloakroom and run the pipe upwards to join the soil stack in the bathroom. If that's how your installation goes cut out the selling the house bit - just burn it now. When it fails there is 10ft of pressurised whatsit just waiting for that final turn on the drainpipe.

The other reason the sink must go through the pump is that the outlet of the thing is at some pressure. Connect the sink a bit downstream and every time you pull the chain the contents of the loo make a pretty little fountain out of the sink plughole (I've seen one plumbed like that - the owner kept a sandbag in the sink on top of the plug).

Some models have an interesting feature - on the top is a reset switch, under the top cover is a screwdriver slot on the top of the motor drive shaft to allow you to clear the (frequent) blockages. However to get the top cover open to get at the drive shaft to free it - you've guessed - you have to disconnect the drain pipe.

How they can be called Saniflow when they are anything but sanitary (as you will soon find out) and rarely flow is beyond me.

As I said - sell the house.

Peter Parry.

Peter Parry wrote on the Subject of the Expanding Foam

A friend of mine once built a canoe. He spent a long time on it and it was a work of art.

Almost the final phase was to fill both ends with polyurethane expanding foam.

He duly ordered the bits from Mr Glasplies (an excellent purveyor of all things fibreglass) and it arrived in two packs covered with appropriately dire warnings about expansion ratios and some very good notes on how to use it.

Unfortunately he had a degree, worse still two of them. One was in Chemistry, so the instructions got thrown away and the other in something mathematical because in a few minutes he was merrily calculating the volume of his craft to many decimal places and the guidelines got binned as well.

He propped the canoe up on one end, got a huge tin, carefully measured the calculated amounts of glop, mixed them and quickly poured the mixture in the end of the canoe (The two pack expands very rapidly).

I arrived as he was completing this and I looked in to see the end chamber over half full of something Cawdors Witches would have been proud of. Two thing occurred to me, one was the label which said in big letters: "Caution - expansion ratio 50:1" (or something similar) and the other that the now empty tins said "approximately enough for 20 small craft"

Any comment was drowned out by a sea of yellow-brown foam suddenly pouring out of the middle of the canoe and the end of the canoe bursting open. My friend screamed and leapt at his pride and joy which was knocked to the ground as he started trying to bale handfuls of this stuff out with his hands.

Knocking the craft over allowed the still liquid and not yet fully expanded foam to flow to the other end of the canoe where it expanded and shattered that end as well.

A few seconds later and we had a canoe with two exploded ends, a mountain of solid foam about 4ft high growing out of the middle, and a chemist firmly embedded up to his armpits in it.

At this stage he discovered the reaction was exothermic and his hands and arms were getting very hot indeed. Running about in small circles in a confined space while glued to the remains of a fairly large canoe proved ineffective so he resorted to screaming a bit instead.

Fortunately a Kukri was to hand so I attacked the foam around his hands with some enthusiasm. The process was hindered by the noise he was making and the fact he was trying to escape while still attached to the canoe.

Eventually I managed to hack out a lump of foam still including most of his arms and hands. Unfortunately my tears of laughter were not helping as they accelerated the foam setting.

Seeking medical help was obviously out of the question, the embarrassment of having to explain his occupation (Chief Research Chemist at a major petrochemical organisation) would simply never have been lived down.

Several hours and much acrimony later we had removed sufficient foam (and much hair) to allow him to move again. However he still looked something like a failed audition for Quasimodo with red burns on his arms and

expanded blobs of foam sticking everywhere. My comment that the scalding simple made the hairs the foam was sticking to come out easier was not met with the enthusiasm I felt it deserved.

I forgot to add that in retrospect rather unwisely he had set out to do this deed in the hallway of his house (the only place he later explained with sufficient headroom for the canoe - achieved by poking it up the stairwell.

Having extricated him we now were faced with the problem of a canoe construction kit embedded in a still gurgling block of foam which was now irrevocably bonded to the hall and stairs carpet as well as several banister rails and quite a lot of wallpaper.

At this point his wife and her mother came back from shopping.....

Oh yes - and he had been wearing the pullover Mum in law had knitted him for his birthday the week before.

Peter Parry.

The Self-Uninstalling Gas Water Heater

By Andrew Gabriel

On Wednesday, my trusty Main Medina multipoint gas water heater decided it was time to depart from this world. Age unknown, but I guess at some 20-25 years old, it's filled a fair few baths and handled many showers in its time. Anyway, my Wednesday morning's bath was to be its last. As usual, it did a great job of providing a nice

hot bath of water. However, it seems that it had a momentary lapse of concentration, that is, it failed to notice I turned off the bath tap and that the flow of water through it had stopped. Merrily, it continued to pump 33kW of heat into the pint or so of stationary water in its heat exchanger. Well, it didn't stay either stationary or water for longer than a few seconds. What with senility having set in far enough that it had forgotten what its role in life was, and with having found that it could make steam at a rate and at a temperature that Stephenson and Watt would have been truly proud of, it duly embarked on its final mission, to uninstall itself.

Steam production only within the confines of its own pipework was never going to be very satisfying exercise by itself - it would be much more exciting to involve all the household plumbing. There's the little matter of the flow restrictor valve on the water inlet which could limit the rate steam can be pumped out, but since that's only got a plastic centre, suitably hot steam can just melt it out of the way, so that problem is easily overcome. So now let's see how far back up the water main we can blow steam - quite some way it seems, certainly far enough that a very respectable jet can be ejected from any cold tap which someone might happen to turn on. This gets boring after a while - have to find something else to do. Ah yes, get the steam hot enough and under enough pressure, and the solder in all the pipe joins/elbows can be melted and the joints blown apart - now there's a good laugh.

Well, by this stage I'd realised the house plumbing was having a fight with something, and the water heater was starting to let off a bit of a hot smell, so I quickly turned it off, just before any joints had completely separated. This was followed by cold water coming back into the hot pipes, which reset all the solder joints (not how they were before). It then picked up the molten guts of the flow restrictor valve and transferred it back into the water heater, leaving it to solidify in the flow detector pipe constriction, thereby completely blocking the water path

through the heater.

Anyway, after a minute or two of surveying the situation and realising I had no further hot water (in fact, not any water out of the hot taps because the heater water path blocked), I decided to go and make the most of the last hot bath I might be getting for a while, which I'd just finished running.

Upon emerging from the bath, a post mortem of the heater and pipework ensued. It was decided against any resuscitation attempts, and death was pronounced.

The pipe bending spring

>Would anyone be able to explain and provide tips on how to use one to get
>the desired effect for a first timer?

1. Buy tool.
2. Discover it has no instructions.
3. Buy DIY book on heating.
4. Read instructions.
5. Rip up old bedcover to make bending pads.
6. Lightly oil spring.
7. Discover it won't go into the pipe you cut with your nice new pipe cutter, you have to use a hacksaw.
8. Insert in pipe.
9. Wipe up blood from cut caused by raw end of pipe using the flux rag.

10. Discover the flux really is acidic, scream a bit.
11. Bend as instructed.
12. Dislocate kneecap.
13. Push kneecap back in place.
14. Remember to bend a little too far and bend back a touch to ease tension on spring.
15. Insert tool to rotate spring to remove it.
16. Pull on spring.
17. Knock over cup of tea, stand in flux tin.
18. Swear several times.
19. Tell (without moving teeth apart) wife/partner/neighbour/children you know what you are doing.
20. Smash knuckles on wall as hand slips from pulling device.
21. Bang pipe on floor several times.
22. Saw off bent bit of pipe. Use vice, angle grinder, several mole grips and welding torch to recover pipe bender.
23. Repeat steps 6 to 22 until the pain and loss of blood gets too much or you run out of pipe.
24. Throw away now mangled pipe spring (or use as garden gate closer).
25. Buy a proper bending tool.

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UK.D-I-Y FAQ

Netiquette Guidelines and Acronyms

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These guidelines are meant to help you to get the most from uk.d-i-y and from newsgroups in general. There may seem rather a lot of points but many of them are just common sense. There should be enough here to keep you on the straight and narrow but for more background reading take a look at the [RFCs](#), the [Internet RFC/STD/FYI/BCP archives](#), and in particular, at [RFC 1855](#), and everything to do with usenet in the UK at <http://www.usenet.org.uk/>

UK.D-I-Y Posting Guidelines

1. COMMERCIAL ADVERTISING IS FORBIDDEN ON UK.D-I-Y.

Please read "[Can I advertise on uk.d-i-y?](#)" in the Introduction to see the reasons behind our policy on advertising.

2. Before posting anything to the uk.d-i-y newsgroup you should lurk for a couple of weeks first to get a feel for the culture of the newsgroup, the way it operates and individuals interact, and to ensure that your questions have not been asked umpteen times in the last few days before you dive in!

3. Sometimes people ask for an email response to their questions. This is generally frowned upon because there is sure to be someone else who finds the topic of interest. It is only really appropriate if a person has problems

reaching newsgroups or web archives (e.g. [Google](#)) - in that case, responses should be made to uk.d-i-y and copied by email. Note that some people will only respond publicly, and by preferring email responses, the poster is missing out on all the rest that is on offer!

4. We welcome ASCII art in uk.d-i-y: a picture is worth a thousand words, and many people produce masterpieces from standard keyboard characters in order to illustrate their postings. However, do make sure you use spaces rather than tab characters, because the latter can be expanded to differing numbers of spaces, and so ruin the diagram. Oh, and if you can never make sense of ASCII art, it is because your newsreader is using a proportionately-spaced, rather than a fixed spacing, font (like Courier).
5. Do not post "binaries" (encoded files such as HTML or images) to uk.d-i-y. It is forbidden across the whole uk.* hierarchy. Post plain text only: if your newsreader can post in HTML, switch this option off. If you need to illustrate a point with a diagram or photo and ASCII art is inadequate then pop it onto a website and provide a pointer to it in your posting.
6. Please do not post "test" messages to uk.d-i-y. There are newsgroups such as [news.uk.test](#) specifically for testing purposes.
7. If you're looking for goods or services, or if you are a private DIY-er trying to dispose of some relevant item or

material, please indicate where you are. It seems obvious, but people often don't.

8. It is quite dispiriting for anyone who sits down and spends half an hour crafting and researching a reply only to receive no acknowledgement of his effort. Send a "thank you" by email! Or enter into the spirit of newsgroups - if replies are helpful then tell us in what way they've helped - if replies have not helped then explain why! But only reply to uk.d-i-y if you can add something to the thread otherwise you are wasting bandwidth.
9. DIY is very diverse so use appropriate subject titles to avoid people downloading stuff they are not interested in. If a thread is changing tack then rename it if it would be useful to others. In that case, use the form: "New subject (was Old subject)".
10. Please do not cross-post your questions to uk.d-i-y and multiple other newsgroups as our cultures may be completely incompatible. If you must address disparate newsgroups, send individual messages to each. Cross-posting a question on paths, sheds, walls, ponds etc to news:uk.rec.gardening is a reasonable exception.

Some More General Posting Guidelines

1. Please try to give enough background information to allow people to answer your questions correctly and without wasting their time speculating about information you have not given.
2. Please only quote the minimum amount of material in your follow-ups to give context, and delete the rest. It is usually most effective to break quoted material up into bite-sized chunks: quoting a paragraph, replying to it,

quoting another paragraph, replying, and so on. Delete the excess but take care that any quoted material is correctly attributed to their authors .

3. Include a signature at the bottom of your message. This will guarantee that any newsreaders which strip header information will not delete the only reference in the message of how people may reach you. Signatures should be of the form:

--

*No more than four lines, each a maximum of
75 characters long, of name, email address,
web address, icq# number, disclaimer,
company services, or amusing anecdotes etc.*

Note that the "-- " should actually be dash, dash, space.

4. Save bandwidth! YOU might have a free internet feed but the majority of us have to pay to receive our news and it's more than annoying if half of it is junk, irrelevant or unnecessarily repetitious!
5. Consider that a large audience will see your posts, possibly including your present or your future employers.

Take care in what you write. Remember that newsgroups are archived on News Servers, and that your words

- may be stored for eternity and very visibly.
6. Assume that individuals speak for themselves, and what they say does not represent their organisation (unless stated explicitly).
 7. Remember that news takes system resources (e.g. memory and bandwidth). Pay attention to any specific rules covering their uses your organisation may have.
 8. Messages and articles should be brief and to the point. Don't wander off-topic, don't ramble and don't send mail or post humourless messages solely to point out other people's errors in typing or spelling.
 9. Forgeries and spoofing ("sporging") are to be abhorred.
 10. Since newsgroups proliferate by distributing the postings from one host to another, it is possible to see a response to a message before seeing the original. If you've posted something and don't see it immediately, don't assume it's failed and re-post it. It will most likely eventually appear in its own sweet time or when any network blockage has cleared.
 11. Be careful when you reply to postings. You may accidentally send a personal response to a great many people, embarrassing all involved. If you find a personal message has gone to a newsgroup, send an apology to the person and a brief one to the group.

12. Avoid posting articles which are no more than gratuitous replies to replies or "Me too" messages.
13. Don't send large files to newsgroups unless the group is specifically for "binaries". Otherwise put them on a website and point readers to them.
14. Don't get involved in flame wars. Just walk away from them.
15. If you are caught in an argument, keep the discussion focused on issues rather than the personalities involved.

The world is full of jumped-up, arrogant little upstarts but you will earn greater respect, live longer, be happier and be more prosperous by sticking dispassionately to the facts!
16. If you should find yourself in a disagreement with one person, make your responses to each other via mail rather than continue to send messages to the list or the group. If you are debating a point on which the group might have some interest, you may summarise for them later.
17. Use emoticons such as : -) ; -) : - o etc. particularly to indicate humour. See [below](#).
18. If you redirect replies to other newsgroups using "Follow-up-To:" in the header of your posting, warn readers! It is normally assumed that a message posted to a specific group will have its follows sent to that group.
19. Content of a follow-up post should ideally exceed quoted content. Similarly, avoid posting "what a load of old codswallop" messages unless you can substantiate your claim with reasoned arguments. Without such arguments you will be regarded with as much contempt as any Troll who gets his kicks from trying to start fights.

20. Send mail when an answer to a question is for one person only. The whole world is probably NOT interested in a personal response.
21. Consider using Reference sources (Computer Manuals, Newspapers, help files) before posting a question. But asking a Newsgroup where answers are readily available elsewhere often generates grumpy "RTFM". See [below](#).

Acronyms

Acronyms are words formed from the first letters of words in common phrases. Here are a few examples in everyday use:

- AFAIK As far as I know
- AKA Also known as
- BAK Back at keyboard
- BTDT Been there done that
- BFN Bye for now
- [bg] Big Grin
- BTW By the way
- IMHO In my humble (honest) opinion
- IOW In other words
- IYSWIM If you see what I mean
- LOL Lots of laughs or Laugh out loud
- OIC Oh I see
- OTOH On the other hand
- PITA Pain in the arse

- DAMHIK Don't ask me how I know
 - FWIW For what it's worth
 - FYI For your information
 - [g] Grin
 - GMTA Great minds think alike
 - HTH Hope this helps
 - IAE In any event
 - IANAL I am not a lawyer (but ...)
 - IIRC If I recall correctly
 - IMO In my opinion
 - ROTFL Rolling on the floor laughing
 - RTFM read the flipping manual
 - SWIM See what I mean
 - THX Thanks
 - TIA Thanks in advance
 - TLA Three lettered acronym
 - TTFN Ta-ta for now
 - [vbg] Very Big Grin
 - WRT With regards/respect to
-

Emoticons

Emoticons are shorthand symbols used in email and newsgroup postings to illustrate mood / tone / humour (hence emotion icon) in what would otherwise be a 'cold' medium. Use them or your true meaning may be misconstrued!

Here are a few of the more useful ones:

:)
smiley
or : -)
;-) wink /not serious
:(or :-
frown
(
:\ or :-\ Smirk
:-@ Swearing / distasteful
:O or :-
Surprise / Realisation / Yelling (depends on context)
o
>- | Frown / displeased
:- | No feelings/don't care / so what? (some people use this for frown)
<:-) Feeling stupid; asking beginners question (wearing dunces hat); or wizard
O:-) Feeling superior; making innocent remark (halo above head)
:-P Poking tongue out
:-] Not impressed

: - [Disappointed

> : -) Bad / naughty / devilish

: - ? licking lips

: - x Kiss OR Not Telling (make sure you know which!)

<grin>

Grin!

or <g>

(- : Smile (user is left-handed or Australian)

: - * Kiss

: - > Very happy

: - < Terribly sad

: ' - (Crying

: - / Thinking

: - D

Big smile

or : -))

8 -) Glasses (boggle eyed)

B –) Sunglasses (dazzled)

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UK.D-I-Y FAQ

The Drill-bits and Drilling FAQ

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This update (31st. Aug 2005) is by John Rumm. It is based largely on the original work of John Schmitt and Clive E, with the piece on metal drilling from Dave.

This FAQ is not about [Electric Hand-held Drills](#), but is about different types of drill-bits and the actual process of drilling.

A few words on safety

The most important thing about a drill for DIY is to be aware that it is a power tool, and as such, if used carelessly it can result in injury to yourself or others.

It is also important to be sure that you will not drill into any services (gas, water, electricity, phone lines, etc). While you have to assume that wires and pipes may be buried anywhere in a wall (very true in older houses), you should pay particular attention when drilling holes either vertically or horizontally in line with any electrical fitting like a light switch or socket, since this is a very likely place for the cable to run. Also be aware that the 150mm strip of wall beside any corner, and adjacent to the ceiling are also allowable zones for buried wiring in the UK wiring regulations (BS7671).

Stud and pipe finders are available at most DIY outlets (look at the Zircon range for ones that actually work!).

Drilling can be very loud and create loads of dust, so ear defenders and a mask are sometimes essential.

Different drill-bits and the jobs they do

After you buy a drill, you will need drill-bits. These come in a variety of types, and it is important to use the right drill-bit for the job.

Drilling Masonry

This is done with masonry drill-bits. These are designed for drilling into hard, brittle materials such as stone, brick and concrete. They are the only drill-bits that hammer action should be used with, and unless you are drilling into a tile, the hammer action should always be used, as it crushes the material in front of the bit, and the rotary action sweeps the fragments out of the hole. Often the dust does not clear out of the hole fast enough and the bit tends to "choke". This wastes the power of the drill, and can result with the bit stuck down the hole, or worse still snapped off in the hole. For this reason, particularly on downward holes, a "pumping" action should be used. Sometimes enough dust/debris is left in the hole to prevent you inserting a wall plug fully home. In this case a 'bendy' straw can be inserted in the hole to blow out the dust, but take care to keep your face out of the line of the blown out dust.

A helper holding a vacuum cleaner hose in a strategic position to catch as much of the dust as possible makes

cleanup easy. You may wish to buy a second-hand wreck of a vac for this job, as the abrasive dust may make your nice vacuum cleaner wear out before its time.

A useful trick if drilling holes in walls indoors is to tape an envelope to the wall just beneath the hole you are drilling. It will catch all the dust falling from the hole and save you a cleanup job.

WARNING particularly with masonry, the drill-bit can become **VERY HOT**, so be careful not to burn yourself.

Masonry drills work fine in most masonry even when they are blunt. It is only the hardest of materials that require a sharp one. The tip of these drills is made of tungsten carbide, and needs special sharpening equipment, so when the drill does become too blunt to use it is probably best to buy a new one. Most masonry drilling is done with a limited range of drill-bit sizes, namely 5mm, 6mm, 7mm, and 8mm matching common wall plug sizes.

Masonry bits come in three main types: Standard, SDS, and Multi-material. The standard ones can be used in any drill, although if used in an SDS drill they require the use of the "normal" drill chuck which usually prevents use of the hammer action, thus defeating the object, and rendering them far less useful in SDS drills. SDS bits only fit SDS drills, and will outperform and outlast ordinary drill-bits by a good margin. Multi-material drills are a new design of "universal bit" that does a good job of drilling masonry (with hammer action), but can also be used in most other materials (without hammer) such as wood, steel, plastic etc.

Drilling Metal

Drilling metals is a complex subject and this section of the FAQ only touches on some aspects!

Before attempting to drill a hole in metal first scribe two perpendicular lines intersecting to mark the required hole centre, and make a deep centre-punch mark there to stop the drill point from skating around. Do this in three stages; first make a light centre-punch mark exactly where the lines intersect. Next scrutinise the mark, and you will invariably find that it is slightly off from where you intended it to be. Don't worry; you can move the punch mark to where it should be by driving it across the surface with light hammer blows applied to an angled centre punch. When you are satisfied the mark is correctly positioned, set the centre-punch vertical and give it a good whack to make a nice deep indentation.

Take care if drilling through thin sheets of metal. Make sure the sheet it is well fixed in position, otherwise it is quite easy for the drill-bit to snatch the work as it breaks through. This can result in a nasty cut if a metal sheet spins out of your grip, so do not hold it in bare hands, but clamp it firmly to the bench! Drilling sheet metal into a block of scrap wood (MDF is ideal) will result in a cleaner exit hole and less chance of the metal "climbing" up the flutes of the drill-bit immediately after breakthrough. For best results sandwich thin sheet between two pieces of wood.

For drilling larger holes it is best to do them in stages. Start with a smaller drill-bit, and then work up to the final size using progressively larger drill-bits. This will reduce the strain and wear on the drill and drill-bit, and reduce the chance of you ending up with a triangular shaped hole!

Many metals need to be drilled at relatively low speeds in the 300 - 900 rpm range, so many standard mains

drills are too fast, resulting in an overheated drill bit. A workaround for this is to drill for 10 to 20 seconds, then rest to allow cooling, and then repeat.

Materials like stainless steel require low speeds with very high drill pressures to prevent the drill from simply "polishing" the hole. To get best performance with hard metals it is often helpful to put the pressure on before starting the drill. When you want to stop drilling, keep the speed up and quickly remove the drill-bit from the work. A cutting oil is required for larger drilling jobs to lubricate and cool the work.

Soft metals such as pure aluminium are an exception to the slow speed rule, because these build up swarf that sticks to the drill-bit's cutting edge. A fast rotation speed reduces this problem, if used with a slow feed rate.

In general, the best rotation speeds for various drill sizes and feed rates depends very much on what is being drilled and by what tool. For example when drilling very hard steel, it is necessary to apply lots of pressure to the twist drill. On the other hand, aluminium, copper and brass are better drilled at a slower feed rate, but quite a fast rotational speed. Just to complicate things, twist drills usually come ground with angles suitable for drilling mild steel, so the angle of the cutting edge may need to be re-ground for soft metals.

Metals are often best drilled using a fixed* machine drill (such as a pillar drill or a lathe), with the work clamped into a drill vice or similar. If a fixed machine is not available then a conventional hand held drill mounted in a drill stand would be the next best alternative.

* By a fixed machine drill we mean those that have a feed handle to lower the drill-bit, a base plate to place the drilled item on, and a variable speed of rotation. These drill slightly differently to a hand-held power drill. The use

of a cutting fluid will change the rules again - it's a complex topic, is metal drilling.

In engineering applications it is common practice to drill a hole very slightly undersize, and then open it out to the required diameter using a reamer-bit rather than a drill-bit. This gives a high accuracy of diameter, roundness and finish to the hole.

Different Metal drills and their applications

Drill-bit Type	Comments
High Speed Steel (HSS)	Designed for metal and most plastics, these bits work
Twist Bits:	reasonably well in wood, and if you are on a budget, these are the ones to buy. Most metals and plastics form swarf well, (swarf is the curl of metal or plastic that spirals off during machining) and this travel up the flutes (the helical grooves up the side) of the drill-bit fairly freely. Wood, on the other hand forms sawdust, and this tends to "choke" the drill. Hence, it is necessary to use a pumping action with these drill-bits in wood.

This is particularly important with the smaller sizes as not only are they easier to snap, but more inclined to choke. If you are drilling metal, the swarf may be very sharp, and the hole edges may be too, so watch your fingers. Drilled holes in metal should have the sharp edges deburred using a larger hand-held drill-bit or a special deburring tool.

Coated HSS Drills

For those of you intending to do a lot of metal drilling, drill-bits coated with Titanium Aluminium Nitride (TiAlN) can be a worthwhile investment. This is a golden colour (but beware, some of the super-cheap ones are simply flash-plated gold, or even painted gold!)

The coating is applied by vapour deposition and is hard, tough and has a low coefficient of friction. Normally high speed steel drill-bits do not drill aluminium gracefully (it tends to weld itself to the drill-bit, resulting in poor swarf clearance and a badly tolerated hole, either oversize, out-of-round or both). With TiAlN the low coefficient of friction eliminates this, and most

metals can be drilled without coolant/lubricant. On top of this, faster cutting speeds can be employed and the tool life is about 10 times that of HSS. Obviously the price is higher, but industry seems to find it cost-effective, including less interruption for changing the bit.

Cobalt Drill-bits

Another variation on the metal drilling theme. Cobalt drill-bits are the next step up the hardness scale from HSS drill-bits. They are designed to drill very hard materials, and will cope better with metals like stainless steel (although will still be blunted by some types). One useful DIY application is drilling out the remains of other broken drill-bits, although other harder bits may be better still.

C1150

The next harder step up is called a C1150. This has short flutes and a longer shank than normal. After this in hardness comes a D200 twist drill-bit.

D200

This looks quite a lot like a HSS twist drill-bit, so you have to look at the packet it comes in. It is quite a good drill-bit to have for stainless steel.

Solid Carbide Drill-bit

Now this is a beast. It will drill and cut into a screw and stud extractor (also known as an "easy out") — an extractor tool for a broken stud/bolt, and these are made from quite hard steel in their own right.

There is also a fair chance that it could cut into any of the above drill-bits, if you could keep it on centre.

Cone Drill-bit / Step Drill-bit

Cone shaped drill-bits (either a continuous cone, or a series of "steps" in diameter). This is a useful solution for drilling holes in thin sheet. It is far less likely to "grab" the work than a normal drill, and you only need one drill to cover a range of sizes. The depth that you drill to dictates the diameter of the hole. It is ideal for making panel cut-outs.

Wood Drilling

For 9 out of 10 wood drilling jobs a HSS twist drill-bit will suffice. However, for larger or more accurate holes you will need a wood drilling bit which is specially designed for the purpose. There are several basic types:

Drill-bit Type

Comments

Lip and Spur, or Dowel-bits

These are like twist drill-bits but have a single sharp centre point and two outer cutting spurs. The point means they can be positioned very accurately, and the spurs give a clean hole. They are especially useful for doweling where precision is essential, and are available in sizes from 3mm up to 30mm diameter, but the big sizes are extremely expensive.

These drill wood faster and with less effort than standard twist drill-bits, so are recommended for cordless use. And, really, for most wood drilling applications.

The smaller sizes often come in kits with dowels, and have an adjustable collar so that the hole depth can be easily gauged. The dowelling sets also may come with metal plugs to aid alignment of the mating pieces. The alignment plug is a short rod of dowel diameter, with sharp points at each end, and a thin collar in the middle. After the dowel hole is drilled in one piece, insert the plug into the hole, offer up the mating piece and knock the two together. The indentations in the other piece

allows you to drill an accurately matched hole for its dowel.

Great care is needed to ensure that the dowel holes are perpendicular to the surface, so a drill stand is advisable.

Flat Bits, or Spade Bits

These have a central point but a flat cutting edge and look a little like a small spade. A sharp flat bit will rapidly cut a pretty hole and it is possible to re-sharpen with a file or on a bench grinder after a little practice. Because of their simple construction they are relatively cheap. They are available in sizes of 6mm up to 38mm. They have a tendency to wander when drilling thick timber and a pumping action is needed to remove the waste sawdust.

They are suited to drilling large holes, where other bit types get expensive. They cannot be used to widen existing holes.

It is possible to get a nice neat hole with flat bits - but the exit is usually messy. This can be avoided by using a backing block or by drilling from the other side once the spike breaks through.

The kind of flat-bit we refer to above are individual one-piece bits with a decent cutting edge ground on them. There are also

very cheap packs of multi-size bits where there is one slotted spindle, and a number of flat blades that can be screwed into it. These do work, but are much less durable and not at all sharp so produce much more ragged holes. A set of these can be a useful starter kit if you are on a tight budget.

Some flat bits have a screw thread instead of the centre point and this helps the drill pull itself through the timber.

Expansive Bits

This are somewhat like flat bits in appearance but tend to have a much more substantial construction. They allow the actual hole diameter to be set by virtue of an adjustable cutting edge. They have an auger point to pull the bit into the work, and the single cutting flute has a spur on the tip to scribe the circumference of the hole. The rest of the cutting edge is slightly raked to scoop out the wood in the path of the drill.

Difficult to use and requiring very powerful high torque drills, they are however one of the few ways of drilling deep wide holes into solid wood. One example use would be drilling a 2" diameter hole into a newel post base to accept the spigot on the

base of a turned newel post. With some materials it is advisable to drill a small pilot hole first to prevent the auger tip from pulling the bit into the work too hard (and stalling the drill, or twisting your wrists off!)

Auger Bits

Auger Bits look a bit like corkscrews. They have a wide chisel-like cutting edge which lifts the waste from the work piece, and one outer spur which cuts into the timber just in front of the main cutting edge to produce a very clean hole. The deep spiral groove means that waste is removed quickly and the centre screw thread helps the drill to pull itself into the material. They are generally slower than Flat Bits but produce a much cleaner hole, and the length of the spiral means that the hole is more accurate. They are available in standard lengths of at least 100mm, 150mm, 200mm, 300mm and 450mm, with diameters of 4mm up to 30mm. Short augers are especially useful for drilling in awkward positions - like drilling holes in joists. Again,

these bits can usually be re-sharpened with a file and a bit of practice.

Forstner Bits

These are a little like a cross between a flat bit and an auger with a bit of lip and spur thrown in for good measure! They are good for drilling wide flat bottomed holes, and also drill easily into most materials. They also work well in man made boards. A typical application would be drilling the main mounting hole for modern kitchen unit style hinges.

Note, that since these bits are expensive they should always be protected in a purpose made drill case or by storing them in a soft leather tool roll.

Glass Drilling

There are specialist glass drill-bits for this, but they are fairly tricky to use. They tend to look like spear headed bits - i.e. same as some tile bits (in fact they often are the same). Also grit edged bits can work. You could also use a carborundum grinder head of suitable diameter.

if you are buying a mirror, it is better to have the holes done by the supplier, and if they crack the mirror it is their problem. Drilling of glass or mirrors is often best done with the drill-bit immersed in water or oil (paraffin also works). Water can be applied with a spray, and it or other liquids can be kept in a "pool" by building a small "dam" with Plasticine that can be filled. The liquid will stop the glass heating and cracking. Use slow to medium speed with firm pressure. The drill-bits tend to skate out of position on the glass and this can be minimised by drilling through a piece of adhesive tape placed on the glass.

Another glass drilling technique is using a copper tube of the correct diameter, in a pool of abrasive (like 60 grit carborundum powder - available from lapidary suppliers). A pumping action is also important as the abrasive tends to ooze back up the hole.

Tile Drilling

Note that a variable speed drill is very useful for this task. Many "ordinary" (i.e. glazed pottery style) tiles can be drilled with a masonry bit. Basic dedicated tile drill-bits, have a flat spear shaped head, and a plane shank with no flutes.

Start drilling by placing the point of the drill against the tile and pushing hard. You should hear a slight crackling sound as you puncture the glaze at the point of the drill-bit (if the whole tile cracks then that is an indication that it was not "bedded onto" the tile adhesive correctly!). Now start the drill and use a slow speed with more pressure than usual. The drill-bit should cut through the glaze and into the tile backing. Once through the glaze you can speed up the drill. (Don't use hammer action until you are through the tile and into the wall). If you are using a special tile drill-bit, then it is better to swap to a more appropriate type of drill for the material behind the tiles.

Don't use the expensive tile drill-bit for drilling the masonry or whatever material is behind the tile!

Some tiles (especially porcelain ones) are very hard, and consequently very hard to drill. If you try to drill one of these using the above method you will have a very hot and useless drill-bit before you are even through the glaze on the first hole. Water cooling is essential. Either use the dam technique described in the section above on glass drilling, or use a water spray (the "pump up" garden variety is good for this. You can also get sprays designed for the purpose that have a collar fitted to the spray head to mount on the nose spigot of many drills.

For the hardest tiles you may need to invest in a professional tile drill-bit with a solid carbide tip. These typically cost over £20 each and may only last for 15 holes! They must be used with high pressure (25kg of weight behind the drill is common), with water cooling, and with a closely controlled speed - often between 700 and 900 rpm. Read the manufactures instructions carefully since you are paying over £1 a hole even if you look after the bit so that it enjoys a long and productive life!

If that all sounds like too much trouble then consider using a diamond disc in a small angle grinder to cut around the thing you were planning to drill a hole for!

Hole Saws

There are two types of hole saw.

Professional hole saws are constructed as a hollow cylinder with one end closed and with fittings for an attachment to a common arbour. They are made from substantial steel, with a section of saw-tooth profile on the

leading edge. These solid beasts are quite serious bits of kit and will cut a hole through all sorts of material. They are like core borers although not as deep, and will pass right through the hole they have made. The arbour they mount on may take a range of saw sizes from 20mm to 180mm diameter.

The arbour also holds a pilot drill-bit which cuts ahead of the main saw and keeps it centred and cutting inline. For this reason the hole must have a centre for the pilot - you cannot use a hole saw to widen an existing hole unless you provide something for the pilot to drill into!

A hole saw does not remove the bulk of the material as it drills, it only cuts a line round the perimeter of the hole, hence they can only be used to cut holes right through the material, and not to make a partial or blind hole (unless you are prepared to remove the central material by some other means).

Hole saws usually have a HSS cutting edge and so will cut wood, metal and plastic. They should only be used with a drill that has a torque limiter or safety clutch because they can snag in the work. For a masonry version of the hole saw refer to the Core Drill section below.

Then there are those you find in DIY sheds. these are thin bendy spring steel things that do not quite form a complete circle, and you get a whole set of them mounted on a single wide arbour. These thin floppy ones can cut holes readily through sheet materials, and they can drill thicker wood, e.g. solid doors, but one must treat them as somewhat fragile. If you push hard, they buckle and break. A slow speed is essential as is frequent removal of the blade to clear sawdust and allow it to cool. Don't expect them to last long on thick material.

The arbour is always bigger than the cutter so you can drill no deeper than the exposed depth of the blade, or

twice that if you cut from both sides. The set comes with all the blades mounted on the arbour, but in use they should all be removed except the one required, remembering to do the securing grub-screw up tight.

Core Drills

These consist of a long, hollow cylinder with one end closed made from very substantial steel, and with fittings for an attachment to a common arbour. They have a number of bronze-diamond or TCT teeth welded around the periphery. They can rapidly cut large diameter holes through brick, block and concrete etc. They look like individual hole saws, though much more robust, and go up to quite large (150mm) diameters. Some are designed to work "dry", and some need a water feed down the middle for cooling and debris removal. Normally these would be hired complete with a suitable drill. It is essential that any drill used with core drill-bits has some form of safety clutch to cope with the situation when the drill-bit snags and jams. On some machines that use a conventional chuck, the chuck will slip if the drill-bit jams (in this case it is a "good thing"). With an SDS drill (where drill-bit to chuck slippage is impossible) it is essential that the drill machine itself has a clutch or a torque limiter. Note that on some of the budget drills this vital component is omitted, and they should be avoided. The lack of a clutch can result in a broken wrist, or very rapid decent from a ladder if you are particularly unlucky!

Core drill-bits have a drilling depth limited by the internal depth of the drill-bit itself, a depth of 6" being common. this means that when drilling though thick solid walls the "core" may need to be broken out several times with a bolster chisel (or chisel in an SDS drill) to allow more depth to be drilled. Drilling from both sides after piloting right through may be easier.

The narrow core drill-bits usually have the same depth as the wider ones, depending on brand. They should be deep enough to at least drill a bricks depth (say 4") in one hit, since breaking out the core from solid masonry is much harder than when you have reached a cavity (or the mortar between adjacent leaves on a solid wall).

There are also some accessories which fit drills:

Drill-bits with Hex shanks:

These are a real time and energy savers because the bits can be swapped over by just pulling it out and pushing the new one in. A hex counter-sink bit is also available. A hex adaptor for the drill is needed. High torque must be avoided, otherwise the round drill-bit is liable to come adrift from the hex end.

Wire brushes:

OK for light work, but drills are not really designed for off-axis loads, and the wire brush can snatch, so make sure you are out of it's likely path. Eye protection is **ESSENTIAL** with powered wire-brushing. If you intend to do a lot of wire-brushing use an angle grinder with an appropriate brush, or get a wire-brushing tool. Makita do one such tool, and probably other manufacturers.

A Wire brush can be particularly handy when combined with a flexible shaft for your drill. This can let you remove rust in otherwise very hard to reach places. However, never let the flexible shaft form more than a 90 degree

bend, otherwise it will wind round itself, and be destroyed. A flexi shaft with a 90 degree turn on the end like an angle grinder would be even better if you find such a thing... (like a man sized dentists drill).

Safety

Both earphone cables and long hair can become tangled in rotating wire brush. A few years ago a young lady at a certain educational establishment removed half her scalp in this manner.

On any machine with a (fast) turning action, long hair should be securely held under a snood ("a small netlike cap worn by workers to keep the hair in place"), whilst ties, bows, jewellery, etc should be left behind, along with any idea of using machinery whilst tired, drugged, inebriated, or hung-over.

Other dangers include distractions caused by a nagging spouse, kids (technology teachers have to be carefully trained not to move their concentration in response to endless "please sirs"), and being responsible for anything or anyone else at the same time as operating machinery.

Sanding discs:

Most of the comments about wire brushes apply, including the fact that there are specialized power tools for the job. It is almost impossible to avoid making gouges with these discs. See the [sanders](#) section for more details.

Polishing bonnet:

Good for work on car paintwork, especially for T-cutting a car that has gone dull.

Paint stirrers and mortar mixers:

These can be very tough on a small drill, but one of the bigger ones is fine for the job. If you plan on retaining any of what you are mixing in the bucket then either a very slow fixed speed or a variable speed drill is essential!

Dedicated "mixing drills" are also available with extra low geared outputs and additional handles and grips to make holding the tool more comfortable.

What do I do if my drill-bits are blunt?

Sharp drill-bits will need significantly less power and effort to drill with, and this is especially important with cordless drills as it will prolong battery life.

Some new bits are so badly ground they won't cut, and all bits lose their edge over time. Blunt and broken bits can be re-ground if you pay sufficient attention to the angles, but the general consensus is that sharpening drill-bits is a difficult art to learn, so the best thing is to buy new ones (although for those determined to try sharpening bits, there is some useful information [here](#)). Once the art is learned, re-grinding attachments are not needed, and indeed the cheap ones available in DIY stores are not that helpful.

If you want drill-bits for wood and plastic use only, grinding them with sharper steeper angles will make them perform much better. Just don't use those to drill steel.

If you don't succeed at sharpening bits, and not everyone does, it is very easy to grind a flattened point on them. They will then work again, though the performance won't be as good as a properly sharpened twist drill.

Drill-bits can be much cheaper from ironmongers than the DIY stores.

How do I stop my drill-bit from slipping in the chuck?

First of all, try using less pressure.

You could get an SDS drill. This is a system where the bit just pushes into the chuck and clicks into place. The torque is transmitted by splines, so slippage simply cannot happen. However SDS drill-bits are appreciably more

expensive than standard ones, and SDS units are also heavier.

For a normal (non-SDS) chuck, put the bit into the chuck, and tighten it finger tight. Then use the chuck key in all three holes in turn tightening firmly, and then go round again in all three holes to be sure it is as tight as you can get it.

The extra vibration from the hammer action makes chucks much more likely to back off.

You may have seen a "professional" simply grip the chuck and switch the drill on to grip a drill-bit, but that is because he dropped the chuck key off his horse. If there is not a keeper for the chuck key built in to the drill, you can buy one from a tool shop, or keep the key in the chuck, or better still, tie it to the mains flex some 18" from the drill.

Are there any other tips?

Holding the Drill: Use two hands on my drill, one on the trigger handle to take the weight and (try to) keep the drill-bit vertical, and the other hand at the back of the drill to apply pressure in line with the drill axis. Take care not to cover the ventilation slots with your hands.

DON'T force the drill: For a 10mm diameter drill-bit you should use about 15lbs (7kg) of force and let the drill do the work. For smaller drill-bits, reduce this greatly, for a 2mm drill-bit, under a kilo may be appropriate. Using too much force will greatly shorten the life of the drill, so don't brace yourself against the ceiling and put your full body-weight on the poor thing. Remember the more force you apply, the worse will be the accident should something give way. If you lean on it and it still won't cut the drill-bit must be blunt - get a new one (after

checking the drill is not in reverse!). Also, the torque limiter on your SDS does not limit when drilling in reverse!

Withdrawing the Drill-bit: Drill bits should normally be removed from the hole while still being spun clockwise (except for augers). However, if the drill-bit has dug right in and stalled the drill the only way out then is in reverse. Sometimes it is necessary to loosen the chuck, and wind the drill-bit out in reverse using a mole wrench.

Lubrication: Drilling in metal needs lubrication of the drill-bit, ideally with proper lubricating fluid, but failing that 3-in1 oil or cooking oil is a lot better than nothing. No, it won't just make the drill-bit slip!

Drill Intermittent?: If your drill has been used a lot, it may become intermittent, work only in some orientations, or give up completely. In this case, it is quite possible that the flex has developed a broken conductor. Almost certainly this will be in the last 12" or so of cable where it enters the drill, often at the end of the strain relief. Cutting off the last foot of cable and rewiring the drill could save you the price of a new drill (do unplug it first!). If the flex has been abused to the point it has a broken conductor it might be worth chopping off the last 12" at the other end too, as that could have a similar problem developing.

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UK.D-I-Y FAQ

Threaded Fasteners FAQ

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Threaded Fasteners FAQ version 7.2

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Written by [Andy Pugh](#)

The aim of this FAQ is to give some guidance to various tactics for dealing with seized and/or damaged threaded fasteners.

In places where American and British usage differ the American usage follows in parentheses.

Bolts and Screws - an Introduction.

Bolts and screws are in essence a wedge wrapped around a cylinder. A screw is a fastener where the thread covers the entire shank of the fastener, a bolt has a threaded portion only at the end (generally the threaded length is 2.5 diameters). Bolts are used where some level of location perpendicular to the bolt axis is required. Fasteners are specified by diameter and pitch, where the pitch is the distance from the peak of one thread to the next measured in either mm or threads per inch. Note that many threads on Japanese motorcycles are finer than standard. For a given tightening torque a fine pitch will clamp parts more tightly than a coarse one, but will also strip more readily because of this increased force. Fine threads are also more susceptible to damage by foreign

objects or corrosion. There are numerous different standards for fasteners, and many have different thread forms. This means that even fasteners with the same diameter and thread pitch may not fit in the same hole for example Whitworth and BSF have a different thread form than UNC and UNF, attempts to use one in the hole of another will lead to unsatisfactory contact between the thread mating surfaces, and as the core sizes are different may not even fit in at all.

Occasionally one comes across left handed threads. Generally these are only found on rotating parts, non-breathable gases and turnbuckles. Often the left-handedness of the thread is indicated by little nicks in the centres of the corners of the nut or the bolt head periphery.

It is important always to use the most nearly correct tool available for dealing with fasteners.

A wide variety of head forms may be encountered including:-

Hex head. The normal heads found on the majority of bolts and nearly all nuts.

The best tool is a 6 sided wall drive socket. There seems little point in 12 point sockets when most people use ratchets with their socket sets. Wall drive sockets have curved sides and bear on the flanks of the bolt heads rather than the corners. They are especially good on rounded, mangled or corroded heads. There may also be a tendency for such drivers to spread the nut, rather than compress it as would appear to be the case with a 12 point socket.

The next best tool is a ring spanner (wrench) followed by a good quality open ended spanner.

When buying spanners check that openings where the bolts fit for a smooth machined finish, if the manufacturer has relied on the casting process to get the size right the opening size is likely to not be as good a fit on the bolt.. If you must use an adjustable spanner (crescent wrench) make sure that the movable jaw is in the side of the spanner being pushed, this places the contact point of the head nearer the base of the sliding jaw, which is the stiffer arrangement.

Star head. These heads are found only very rarely, mainly on aerospace fittings or big end bolts. They may be either an inverted Torx (q.v.) or designed to fit a standard 12-point socket.

Cross head screws. These come in two varieties, Phillips and Posidrive.

The differences lie in the way that the drivers are machined. The Phillips driver has 4 simple slots cut out of it, whereas in the case of the Posidrive each slot is the result of two machining processes at right angles. The result of this is that the arms of the cross are parallel sided in the case of Posidrive, and tapered in the case of Phillips. Posidrive is less likely to slip out because of this, but as there are small protrusions left in the bottoms of the grooves a posidrive driver will not fit a Phillips screw correctly. Both varieties come in a range of sizes. The case screws on Japanese bikes are universally Phillips.

Hex socket head. Also known as 'Allen Screws'

These are generally manufactured of high tensile steel and are much superior to the original screws used on Japanese bikes. It is recommended that they are fitted in place of any cross-head or slot-head screws which need replacing.

TORX: TORX heads exist in both internal and external variants.

They look like a hex with hollowed out flanks. In extremis it is often possible to loosen them using a tool designed for a plain hex head, though the correct tool is obviously preferred.

Over-tight or seized fasteners.

If you find that a fastener is tighter than expected it is wise to pause and assess the situation before proceeding. Any use of excessive force is likely to cause damage, and damaging the head is certain to make the job harder. Penetrating lubricants are very useful, in fact it is a good idea to pre-emptively lubricate any bolts you expect to have difficulty with the night before and leave them to soak. If time is no problem it does no harm to persist with penetrating oil for a few days, many seemingly immovable bolts will succumb to this treatment alone. It often helps initially to turn the fastener in the tightening direction, it helps free them and should the tool slip any damage will be to the less important faces of the head. Heat can often help. If there is no danger of damage to surrounding components a blow-torch can be used on the component through which the bolt goes, the aim being to expand the component to enlarge the hole into which the bolt screws. Alternatively liquid nitrogen or dry ice could be used to shrink the clamped components and reduce the axial clamping load. In the case of large bolts the use of brute force may be the correct next step. Spanners and socket drivers can be extended by the use of tubes and pipes. A ring spanner or socket extension can be pressed in to service to extend an Allen key. Application of a hammer (preferably rawhide or lead) or the heel of the hand to a spanner can often shock things loose. A trip to a garage to have them apply an air impact wrench to the offending article can also be useful. Be very cautious extending ratchets, they can be easily damaged. For high torque applications a simple T bar is much stronger (and cheaper). In the case of cross head screws the use of an impact driver is strongly

recommended. Make sure you have the correct head of the correct size fitted, and give it an initial tap in the tighten direction. If unfamiliar with the driver using it on a piece of scrap wood will indicate which direction it is set to work in. In the absence of an impact driver it can help to give the offending screw a sharp tap with a punch to loosen it. A T-handle screwdriver can exert a usefully greater torque, as can a spanner on the shank of the screwdriver if it is square or has a hexagonal portion for this purpose. Cross head bits can also be obtained which can be driven by socket set paraphernalia. With all these measures the risk of stripping the head is also increased. Axial force is important. By pushing hard you make the driver less likely to slip out and unload the threads reducing friction. In many cases a G clamp may be used to achieve usefully higher forces. Bear in mind though that you will have to slacken off the clamp in order for the screw to come out. In the case of seized nuts a cold chisel can be used to split the nut off. An assistant to hold a large inertial mass on the opposing flat of the nut can be useful. Hold the cold chisel in the centre of one flat with the blade parallel with the nut axis and belabour it with a large hammer. If done properly it is possible to remove a nut this way without damaging the thread of the bolt. A similar tactic with a blunt drift can sometimes expand the nut enough for it to be unscrewed. Specialized nut splitters are available, they take the form of a very sturdy C clamp with sharpened jaws. In extremis the head or nut can be ground off with a disc grinder or occasionally cut off with a hacksaw. In many cases once the tension in the fastener is released it can be removed quite easily.

Damaged Fasteners

A common problem in motorcycle contexts is a cross-head screw with a stripped head. If the head is not too

badly stripped it is normally possible to tap the material back into place with a ball pein hammer or a punch. The

head can then be reformed by tapping an impact screwdriver bit into the head. An impact screwdriver may well then remove it easily. In cases where the head is stripped beyond redemption it is often possible to cut a slot using a hacksaw or Dremel tool and use a flat bladed screwdriver. My favourite way to deal with badly stripped heads is (after the usual penetrating oil and sharp tap with a hammer) to use a dot punch (a slightly more steeply angled version of a centre punch) to make an indentation near the periphery of the head. If you then angle the punch so as to impart a tangential force on the screw head you can usually get it to come free. This technique with a flat bladed cold chisel can also be effective on Allen screws and hex-head bolts. If you must resort to this kind of butchery though, please replace the fastener with a new one:-)

If the above methods fail it may be necessary to drill off the head.

Start by centre punching the centre of the head (this is, of course, not necessary with cross-head or socket head fasteners). Alternatively, one way to align a drill with the centre of a bolt head is to use a tightly fitted socket and a nut of the right size. Place the nut in the socket, place the socket on the bolt head and drill through the square drive hole and nut into the offending fastener. Work through successively larger drills until you get to one just bigger than the shank size of the fastener, once this hole gets through the head the remaining portion of the head will simply pop off. Once the head has been removed it is generally possible to remove the components, revealing a length of shank which may be gripped with Mole (Vise) Grips or slotted with a saw to use a flat bladed screwdriver. You may even be able to use an eccentric cam stud extractor or Stilsons (pipe wrench).

In cases where the fastener has sheared off in the hole, or there is insufficient protrusion to work with a number of alternative methods are available. It may be possible to weld a length of rod to the fastener (just allowing an arc welding rod to stick may do the trick). The tangential dot punch mentioned above may also work if the thread is not too badly seized in the hole.

Screw-extractors (EZ-outs) are sold specifically for this purpose, though I know of few people for whom they have proved successful. The idea is to drill a hole in the end of the offending shank and then screw in a left-hand threaded hardened steel widget. These can work well if used in the portion of the fastener protruding above the surface, but if the break is flush with or below the surface they can actually make things worse as their action tends to expand the shank and make it a tighter fit. Screw extractors should be used with a tap-wrench and caution, they snap easily and are hard enough to be practically impossible to drill. Some people prefer to hammer a sharpened hexagon key into a hole drilled in the end of the fastener, if ground flat at the end they have a lesser tendency to spread the head.

If these methods fail there may be no alternative but to drill out the screw. The method is the same as drilling off a head, centre punch the exact middle of the fastener and then drill down the screw axis with successively larger drills culminating with one the same size as the core size of the thread. In an ideal world this will leave a thin spiral of thread which may be picked out with a pointed stick. The use of left-handed drills (available from specialist engineering tool suppliers) and a reversible drill for this job is highly recommended. Fasteners often come loose during the drilling process and it is much better for them to come spiralling out than to screw themselves into the deepest recesses of the hole. The initial hole may be centred by refitting the component

which was previously held on by the fastener and starting the drilling process with a drill which fits the clearance hole exactly. The conical indentation made by this drill (don't drill too far) can be used to start a smaller drill. If machining facilities (or suitable piece of tubing) are available the hole sleeved down guide core-sized or smaller drill.

Brake cylinder bleed nipples are especially amenable to drilling out as they have an axial hole pre-drilled. This axial hole is also the reason they need drilling out so frequently, as water gets down them into the thread. This problem is much reduced if rubber dust caps are fitted. The hole is also useful to get penetrating lubricant into the other side of the threads, though it is likely that the hole will need to be cleaned out with a drill first.

Stripped threads.

There are few things in bike maintenance as demoralising as feeling the thread in a tapped hole let go. If the thread is a nut or a bolt then the solution is trivial, replace it. If it is a tapped hole in a casting then things are less straightforward. If the hole is longer than required it may be possible to use a longer bolt (perhaps after tapping to a greater depth) or to fit a nut to the back.

Where these solutions are not practicable the simplest solution is the use of a thread repair kit (Heli-coil, Time-Sert etc).

The stripped hole is bored out oversize and tapped with a bastard tap (same pitch as the original hole, but larger diameter) and a stainless steel wire spiral is wound in using a special tool (or needle-nosed pliers). This technique is mechanically superior to the original tapped hole, and in some applications is standard for all tapped

holes in soft alloy castings. If the tap and drill are greased this procedure can be carried out in-situ on such places as sump-drain plugs and spark plug holes. A related technique is to use a threaded insert, which is similar but thicker and may well use a standard diameter and pitch for the outer thread. Both these techniques allow you to reuse the original fastener which may be an advantage, especially if it is unusual or pretty.

For those with less equipment it is possible to drill and tap the hole oversize and either use an oversize fastener or screw in a length of bolt pre-sawn to shear off flush with the surface and then drill and tap this. Aluminium bolts are especially useful for this (and in my humble opinion for very little else)

Another alternative is to fill the hole with weld (a tame TIG welder is useful if the component is aluminium) and then drill and tap.

Threads can also cause problems by partially stripping. If the thread is pulled out such that it stands proud of the mating surface it can interfere with sealing and after a period of fretting might lead to parts coming loose. It is wise to examine nuts to see that they are not suffering from this malaise and replace them if they are. If threaded holes suffer this problem they should be filed flat or slightly counter-bored.

Broken off drills, taps and stud extractors.

All the above are (generally) too hard to drill, though the use of carbide, cobalt or even diamond tooling may be worth trying. In the case of taps a three or four fingered extractor may be made or obtained to fit down the flutes.

A two-fingered one may well work for drills. It may be possible to shatter the offending item with a punch (this certainly works with taps, which are generally micro-cracked by the shock of the initial fracture). Again a Dremel tool may allow a slot to be ground in the end, or with patience and a tiny wee abrasive burr the whole thing could be ground away. If all else fails it is time to check the yellow pages for spark-eroders (also known as electric discharge machining or EDM). Spark erosion can cut through any conductive material irrespective of its hardness and such people specialise in just this kind of problem.

Prevention.

One of the best investments to prevent problems with fasteners is a torque wrench. If one uses the manufacturers recommended torques one should never strip a thread again, unless it is already damaged to the extent of unservicability. Care should be taken, however, that the correct torque value is used. Dialling in a torque specified in Newton meters onto a foot-pounds scale will cause over-tightening by a factor of almost two. Another potential pitfall with 'click' type torque wrenches is to use them in the wrong direction; most are reversible, but they only click in one direction. There is generally an arrow somewhere on the body to make it clear which way it should be used. When working on vehicles it is good practice, and saves a lot of future trouble, to lubricate bolts and screws to ease later removal. Copper grease works well, as do some molybdenum compounds. The use of lubricants is especially valuable where steel bolts go into aluminium components. The lubricant helps to prevent galling of the threads on assembly, helps to prevent galvanic corrosion in service and helps with removal too. Various thread locking compounds (Loctite make a large range) can help to prevent corrosion and galling of threads. If you know that a thread locking compound has been used and the fastener will

not budge heating to above 100 degrees C will denature most Loctite compounds.

Bear in mind though that torques are specified for clean dry threads, by lubricating the threads you increase axial force a given torque, paradoxically making it more likely thread will strip.

(This FAQ compiled by Andy Pugh. Contributions from 'Ric Davis, Alan W Frame, Tim Naylor and Trevor Dennis)

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Balancing Central Heating Radiators

By [Phil Addison](#)

This is a topic covered in the uk.d-i-y FAQ, but I offer this article as an alternative slant on the subject. I should say I have no professional knowledge, and this is just what I've figured out for myself. I hope it's helpful to other DIYers. Comments and questions welcome.

EQUIPMENT

To do the job properly you will need a means of measuring a change of 1 degree C or better on a temperature of about 80C. I actually use the Fahrenheit scale on my digital thermometer because 1 degree F is about 1/2 a degree C and hence twice as sensitive as the Centigrade scale (my meter will not display decimal points). I use a thermocouple digital thermometer* (e.g. from Maplins) with the sensor bead pressed onto the chrome valve body with a soft clean dry cloth to get good thermal contact and to insulate the probe from the air temperature.

* Since writing the above I have obtained a non-contact (infra-red) thermometer and this makes the task VERY much easier and quicker. As the reading from this type of instrument depends on the emissivity of the surface being measured, the reading will vary slightly depending on whether it is pointed at a dark copper pipe, chrome fittings or white radiator paint. I found the easiest way to overcome this was to fix a piece of black PVC tape on each of the points I wanted to measure. That gave me consistent

results which agreed well with my old thermo-couple thermometer. The instrument I have is a model IR-88 Pocket InfraRed Thermometer obtained from [CPC](#) for £35, part number IN02293.

I have doubts that the job can be achieved with clamp-on dial thermometers because of (a) the usual lack of a suitable location to fix them to the radiator connections, (b) the poor thermal contact and large radiation area gives inaccurate low readings, (c) the slow thermal response, and finally (d) the sheer inconvenience of attaching and detaching them at each measurement.

PRINCIPLES

The general idea is to reduce the flow to the hotter radiators so that more water flow is available for the cooler ones. The system is "balanced" when all radiators get a good flow through them and have the same temperature drop across them. In practice it does not matter if some have a smaller drop (hence a higher flow) so long as there is enough flow to get them all good and hot. However, a low temperature drop indicates that you may be able to reduce the pump speed (which will increase the drop). The important thing is that the return water coming out of each radiator is good and hot. If it's only warm you need to open its Lock Shield Valve (LSV) some more, or if it's already wide open you have to close the LSVs on the hottest radiators instead. The LSVs are the ones with a cover preventing you from adjusting them until the cover is removed (hence the term).

As you close down the LSVs on the hot radiators you might find the boiler starts cutting out. This could mean the pump is not powerful enough (assuming the pipes are not clogged up) so check if it has an adjustable speed and try a faster setting. Radiators are designed to give their rated output with a mean water temperature of about 80 deg C. It doesn't matter whether you have that value or not when you balance as it can be adjusted by the boiler thermostat according to the heat you actually need. Similarly the oft quoted 11 deg C drop across the radiators is really nothing to do with the radiators! It is the temperature gradient the *boiler* is designed to produce when it is going flat out *and* the pump is producing the specified flow rate. So if you have less than 11C drop it just means that either you have too high a water circulation rate or/and the radiators are not large enough to extract the full

rating from the boiler. This need not be a problem; it may be that the boiler is oversized for the house, and the converse of course follows.

PROCEDURE

1. Make a chart similar to the following to suit the location/number of your radiators, to record the flow and return temperatures and LSV settings over several rounds of adjustment. This is a tedious, time consuming and back-breaking job (up and down to your knees many times) and you won't remember where you are without writing it down - trust me, I'm a know-all.

The chart needs to be long enough for several trial runs, say five or six.

		LSV Knob Position/Temperature										
Run		Kitchen	Hall	Lounge	B1	B2	B3	Bathrm	Boiler	Max	Min	Diff
1	LSV											
	Flow											

	Return											
	Drop											
...												
6	Etc											

2. Decide on some way to record LSV positions. I use "0" for fully closed and count in 1/4 turns when opening. Some valves have several turns and some open fully in one turn or less.
3. Record initial LSV positions in case you want to return the system to what it was.
4. Open all radiator Control Valves fully. The Control Valves are the ones with adjustable knobs. Usually a knob taken off a control valve will fit the LSV. Take off the LSV covers and open all those as well.
5. Turn off the domestic hot water heating circuit, turn off the boiler, and let the system cool.
6. When cooled, turn on the boiler, if necessary turning up the room stat to make it fire up.

7. While the system is warming up, go round all the radiators and feel the flow and return connections.
8. Establish which is flow and return (flow gets warm first).
9. Find which radiators are heating up quickest and which are hardly getting warm. Check at both flow and return connections.
The flow gets hot first, then the radiator body and finally the return pipe.
10. While still warming up, try to turn down the LSVs of the hottest radiators so that the cooler ones "catch up". This will give a rough balance (and may be all that was done when the system was installed, if even that).
11. Go round with a thermometer and fill out a 'Run' of the table.
12. Work out the temperature drop of each radiator and boiler.
13. Go round again adjusting the LSVs, closing a little those on the radiators with the smallest drop and opening the coolest a little. The coolest, or biggest temperature drop, radiator LSV should be left wide open otherwise the pump will finish up working harder than needed.
14. Make sure you have written down the data.
15. Repeat 11 - 14 until you are satisfied that all the radiators are fully hot all over and the differentials are as close as you can get them.
16. Restore covers to LSVs.
17. If necessary, adjust control valves to reduce room temperatures. This should only be necessary if a radiator is oversized and is thus over-heating that room, and does not apply if a thermostatic valve is fitted.

18. Reset any thermostatic valves and the room thermostat to give desired room temperatures.

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JOE'S KITCHEN DESIGN FAQ

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- [Buy or Build ?](#)
- [Floor Considerations](#)
- [The Worktop Corner](#)
- [Wall and Worktop Considerations](#)
- [Relationship of Vertical Faces](#)

Written by Charles (Joe) Stahelin [Pronounced "Stay-lin"!]

Introduction

These notes are based on experience in military and educational establishments as the manager responsible for overseeing catering, including the planning and oversight of major and minor kitchen modifications, the complete refurbishment of one kitchen and, finally, the d-i-y installation of a domestic kitchen. Cost has always forced compromise.

The kitchen (arguably in competition with the bathroom) is the most functional room in the house. The first consideration should, therefore, be suitability for the tasks to be performed and not appearance as so often seems to be the case. Time should be spent working out, in detail, the way in which the room and the facilities contained or to be installed in it will be used in the face of the constraints imposed by the locations of entrances and exits, water and drainage, gas, electrics, lighting, ventilation, and such like. Some will be adjustable, some may be too difficult or too costly to adjust. All will be affected, and the whole matter is likely to be complicated,

• The Kitchen Sink

• The Structure

• Drawers and Doors

• Finish

• Items to be Thought About

• Hardware

•

avoidably, by the modern modular cabinet.

Safety must be a prime consideration, particular attention being given to the activities and antics of children of all ages, the top of the hob and items that might be on it, and to the conflicting uses of space in proximity to exits and entrances.

No design decision should be made without careful consideration of its impact on both day-to-day (which really means moment-to-moment) and long term care and maintenance. Kitchen cleaning is an ongoing and essential task which can be made more bearable by thoughtful design and furnishing.

The final arrangement must be generally acceptable to reasonable people so that, in the longer term, potential buyers of the property are not discouraged.

Buy or Build ?

Except in the ultra-expensive world, buying means acceptance of the currently fashionable modular 'cabinet' system which is probably the easiest solution but is rarely entirely satisfactory because of the limitations imposed by the building, and because of personal preferences. The cabinets are one part of the deal and the fronts are another. A view, not based on research, and perhaps rather jaundiced, is that there are two or three manufacturers of cabinets, all of similar quality, which are taken up by kitchen retailers who design their own range of fronts and pile on the price to make what profit they can having due regard to the fashion of the moment. A major disadvantage of this modular 'cabinet' system is inadequate drawer capacity; even purpose designed cutlery drawers tending to be too small and, in particular too shallow, for their intended purpose. The

resultant concentration on cabinets rather than drawers results in some drawbacks in use. When mother (or house-father) is at home and in the kitchen, children may be more conveniently supervised or educated, or both, whilst 'helping' mother: ask the willing child to get something out of a cabinet and the result in early years is that, whilst the child grasps the required item in its hand, it clears the shelf with the elbow it has not yet learned to control. Pregnant mum needs to avoid the often complicated contortions involved in extracting this and that, including heavy stacks of plates, from the back of the low shelf in the cupboard. The author, in common with most older people, is not at his best scrabbling in the bottom of a cupboard.

Consider the changed situation if easy-running drawers are used instead of cabinets: a child can see and extract the required article; both pregnant mum and grandmother can lift heavy items directly to the worktop without undue stretching and twisting.

Building from scratch offers a greater degree freedom in design and layout, and allows the inclusion of some tricks that may not be done as easily with standard modular cabinets. It is probably cheaper as, apart from timber and board, the items to be purchased are drawer slides, possibly a pull-out larder unit, a carousel fitting if a corner is involved, and material for the worktop itself.

Floor Considerations

Common problems are wood rot at floor level or the intrusion of wet and dirt along the line where the cabinet fronts and sides join the floor. This can be prevented by laying on the floor a concrete plinth just sufficient in height to hold back the depth of water that may be expected to lie on the floor during cleaning - say half an inch,

with other dimensions to suit the structure which is to stand upon it. This will avoid both wood rot and the need for any floor cleaning within the area covered by the cabinets. Ideally a similar plinth will be provided for all stationary items standing on the kitchen floor, e.g. refrigerator, washing machine. If conditions permit (which is not often the case), the continuation of this low plinth across doorways will isolate the kitchen floor from the rest of the house and will ease wet cleaning of the kitchen floor. An alternative to a plinth would be to fit waterproof coving to the floor so that equipment could be stood within it; but this might turn out in use to be rather fragile.

A better solution is to start off by laying the kitchen floor with a fall to a drain so that all water poured on the floor makes its way to the drain and the whole character of floor cleaning is changed. The amount of water used in cleaning will be greater and a higher plinth is required to ensure no overflow and doorways need special consideration (easy if all are on the high sides of the floor). This plinth should be about 1.75in above the floor at its closest point to the floor in order to leave space for a brush to get under edges and into the corners during washing down..

The floor covering can be either square edged tiles laid tight together as in swimming pools with coving tiles along the edges, or good quality synthetic floor-sheeting, coved at the edges, and welded at all joints.

The Worktop Corner

If the worktop extends on both sides of a corner the space is usually best utilised by fitting a "Carousel" which has two circular shelves and which can be revolved under the worktop to bring the required portion of the shelf out into the corner opening.

Wall and Worktop Considerations

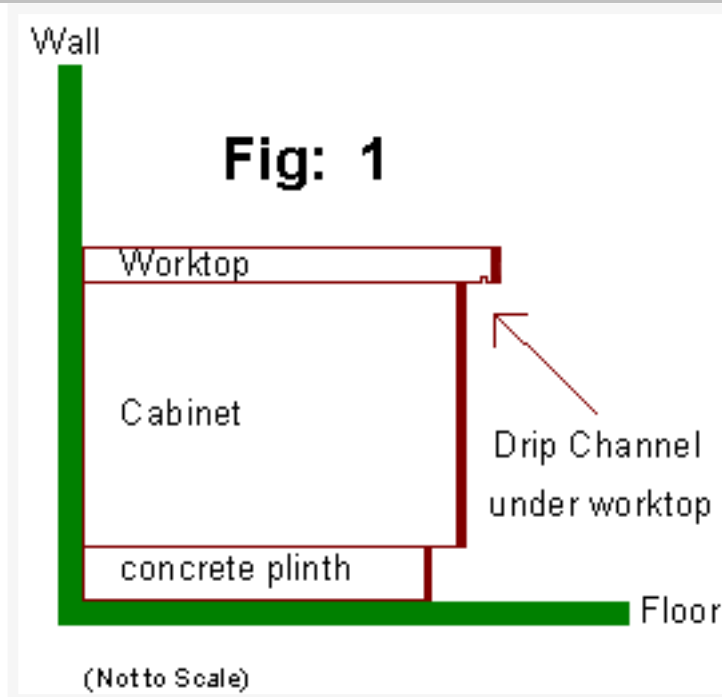
It is essential that wall surfaces adjacent to working areas are 'easy-clean'. Ceramic tiling is probably the easiest and most common solution. Stainless steel sheet is a sound solution if its appearance is acceptable.

The joint between worktops and adjacent walls must be watertight. Steel sink tops usually have integral upstands along their back edge but not along the sides. If the sink edge butts onto a wall the best solution is an integral upstand along that edge of the sink: this may be difficult to find although, cost permitting, it should be possible to arrange for one to be added (Try your friendly local Steel Fabricator if the supplier is unable to help - the friendly one might even build a sink for you to suit, exactly, your design need in every respect. The source of these friends is Yellow Pages or pub gossip and the like).

Tiled tops can be coved at the edges and the tiling can be continued up the wall. Coving pieces are usually available to match worktops made out of wood products. Metal joining strips are available for use when joining pieces of worktop and their use will ensure that joints are sound.

Relationship of Vertical Faces

To take full advantage of the easy clean floor the worktop should overhang the front of the cabinet, and then the cabinet should overhang the front of the plinth, so that anything falling off the worktop falls directly to the floor



without making a mess on the front of the cabinets.

(See Fig: 1)

The Kitchen Sink

The component which perhaps has the greatest influence over the final design is the sink unit.

However, once the self-build decision has been taken many of the constraints disappear as the builder is free to choose its precise position in the run. Draining boards do not affect the nature of the

cabinets below them, but space must be provided under the worktop for the sink bowl(s).

Decisions have to be made: one or two bowls; the size of the bowl(s); one or two draining boards; the overall size of the sink unit; and whether or not to fit a destructor unit under an outlet (drain hole).

Some degree of choice is available regarding the depth of the sink bowl: the advantage of having a deeper than normal sink should be considered provided that it will not conflict with the installation of a waste disposal unit if this is intended. There should not be any problem but the dimensions of disposal units may vary and attention needs to be paid to the vertical dimensions of the disposal unit and the relative positions of the sink outlet and the connection to the drain. An additional item that may be appreciated is a small pump action soap dispenser which can be fitted into the sink unit close to the tap base. Taps come as separate items.

It is best to find a sink specialist by searching Yellow Pages, asking friendly plumbers or builders, and so on. In Leeds there is such a firm going under the name Northern Sinks Ltd. It is their business to know in detail just what is available on the market, they have manufacturers catalogues to refer to, and know all the little wrinkles about disposal units (which need enlarged drain holes in the sink base), soap pumps and the like. They are trade outlets and may be expected to discount the retail price.

Think five times before selecting one of those pretty little multi-bowl sinks that currently seem so popular, and then think again about large Sunday lunches and defective washing machines. Once the sink has been selected the remainder of the design can be completed allowing for drawers, cupboards, ovens, hobs or whatever.

The Structure

The method

used by the

author was

to fix three

timbers

along the full

length of the

proposed

run with cut-

outs to

accept

frames to

support

drawer

runners and

the worktop,

a fourth

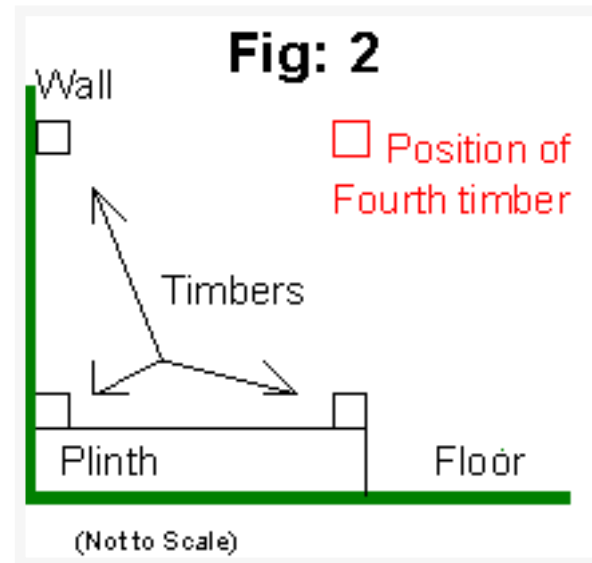
length with

matching

jointing

arrangements

was



prepared

ready for

fitting and

fixing as the

frames were

put in

position.

(See Figs 2

and 3).

Prior to

assembly the

vertical

timbers were

router-

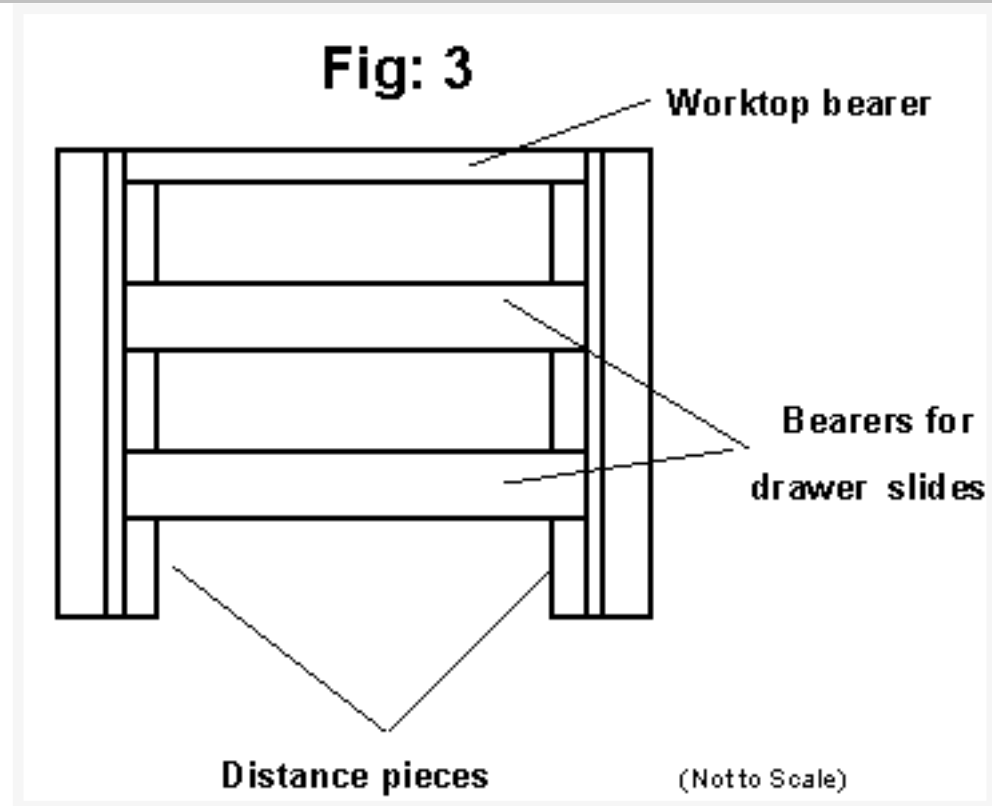
grooved

along the

length of
their inner
faces. The
drawer
supports
were
tenoned to fit
into the
grooves and
distance
pieces were
fixed into the
grooves so
that there
was solid
ground

support and
counter-
rotational
support for
the drawer
slide
supports.

The whole
thing worked
out well. The
frames were
topped with
19mm WPB
(Waterproof
bond) ply
and that in



turn was
tiled. The
front edge
was finished
in oak
except along
the sink front
where the
oak was
continued
below, and
flush with,
the front lip
of the sink.

It was not thought necessary to fit wall panels between the compartments and they remain that way. At the time

of construction it was thought that there might be advantages in fitting a false floor flush with the tops of the base timbers and preparation for this was made by fitting cross timbers between the long timbers on the plinth and by cutting rebates suitable for 4mm ply on the inner edges of the squares. Plywood has since been fitted in order to improve appearance.

If the run includes a corner care should be taken to set the long timbers at an exact right angle in order to avoid the complication of peculiar angles within the individual compartments. Any deviation from a right angle is taken up by packing the timbers out from the wall itself, where necessary, and by shaping (scribing) the work top to fit snug to the wall.

Drawers and Doors

The drawers were solidly made with dovetails at the four corners and a piece of 9mm ply grooved in all round as the base. The slides used provided for the fitting of independent drawer fronts which were made of medium density fibre board (MDF) edged with a standard hockey-stick moulding to provide some relief on the fronts themselves. 0.75in MDF was used but 0.5in would probably do as well. Strips of the same MDF were fitted to the frame timber with sufficient left clear to be overlapped by the drawer fronts and to provide something for them to close onto. In order to keep the general appearance tidy, in some cases inner drawers without fronts were set above the main drawers. This works well: as an instance, the cutlery drawer has been treated in this way so that day-to-day stuff is seen when the main drawer is opened, that for high days and holidays being kept in the upper inner drawer which can be pulled out over the lower drawer whenever necessary. The height of the whole thing provides room for three good sized drawers to be set one above each other: the only limit on width is the need to

stay within sensible load limits. It really is a return to good old fashioned kitchen drawers - but drawers which can be opened with one finger !

There are no cupboards in the set-up but the doors for the carousel and the pull-out larder follow the style of the drawers and are fronted with the same material. Two sizeable pull-out slides have been fitted immediately below the work top and above the drawers. They take up little space and are much used on busy occasions.

Finish

The fronts were dyed with Colron wood dye and finished with BourneSeal Natural which is an oleo-resinous seal much used as a seal for wooden floors. In nine years these have required no attention beyond a one-coat 'wipe over' with a much thinned-out coat of BourneSeal. There have been no breakdowns or problems.

Items to be Thought About

- Broom and utility cupboards. Should be well ventilated to cope with drying mops, etc..
- Storage of non-food items - cleaning materials, etc, etc.
- Under-worktop sockets for gas igniter and disposal unit, if any.
- Over-worktop sockets for mixers and other power tools including kettles.
- Cooker hood with or without fan.
- Kitchen extractor fan(s)

- Kitchen waste bin. ? give it a drawer of its own - it works well if there is space for it. It has got to stand somewhere so why not tuck it away in a convenient place - like beside the sink.
 - Magnetic knife racks - 2 set parallel one above the other will be safe for large and small knives.
 - High level cupboards and shelves
 - Wall or ceiling hooks. Wall hooks are an easy and very convenient way of providing easy access to frequently used equipment such as long spoons and ladles, tongs, scissors, this, that and the other, but not forgetting the steel which should be used frequently.
 - Changing the back door of the kitchen into a stable door so that the top half can be opened independently for ventilation whilst the bottom controls both infants and pets merits consideration. It is good for cleaning on whilst looking at the view or chatting-up the milkman - or for seeing what the children are doing in the garden. It does provide a more friendly touch than a wholly closed door whilst still demarcating the inside and the outside of the house.
 - Is there space for a lavatory ? There is something in the regulations about loo doors not opening into food handling areas.
 - Telephone extension for mum ?
 - Etc.
-

Hardware

All the hardware came from Woodfit Ltd, Kem Mill, Whittle le Woods, Chorley, Lancashire, PR6 7EA. Tel: 01257 266421; Fax: 01257 264271. [See [DIY Web Sites \(WIKI\)](#) for possible other suppliers]

The items used were as follows:

UB241	Bottom mounting 450mm 20Kg Shelf Runner
UB251	Ditto 500mm
UB741	Bottom Mounting 450mm 30Kg Runner with Bracket for High Front
UB 751	Ditto 500mm
JT911	Pull-out Larder Unit 300mm w x 1750mm h complete with 6 baskets
KC721	Corner Carousel Unit fits height range 667 - 713mm
GA279	Knobs for drawers and doors

Notes:

1. Diagrams: The diagrams are intended to be informative as against detailed drawings.
2. Variations on the floor drain and plinth concept set out above merit consideration for bathrooms, lavatories, and utility rooms of all sorts.
3. The author is not connected with Woodfit Ltd., or with any commercial concern except in the role of customer.

Addenda

If the worktop is to include a corner it is essential to ensure that the front edge of the concrete plinth forms an exact right angle, and that the wall timbers are packed out as may be necessary to ensure that they, also, join at right angles to each other. Failure to get this right is liable to cause problems with the fitting of drawers, and with the joining of worktops.

If adjustments are made in the setting of the wall timbers the back(s) of the worktop(s) will also need adjustment.

C.A. Stahelin

Written 16/5/1997

Last modified: 22 October, 2019 8:25 PM

UK.D-I-Y FAQ Maintainer: [John Rumm \(editor@diyfaq.org.uk\)](mailto:editor@diyfaq.org.uk) © [Copyright](#) 2019

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JOE'S FLOOR CLEANING FAQ

Jump to

-
- Introduction
- General
- If the floor is porous
- If the floor is non-porous
- Maintenance
- Warning

Written by Charles (Joe) Stahelin [Pronounced "Stay-lin"!]

1 Introduction.

The following notes were written in 1990 on the basis of hands - on experience before my retirement in 1987. In the seventies and early eighties there had been a great deal of development covering, effectively, three generations of floor dressings - a term used to describe the modern liquid floor polishes: this resulted in the once established habit of stripping off all polish at regular intervals being abandoned and replaced by more effective systems of floor maintenance. Money was getting tight and it could be clearly seen that it would get tighter yet. The producers of floor cleaning products had to compete for sales on the basis of price both in the tin and on the floor, as well as appearance. It was a period of rapid and important development but I have to admit to not being fully conversant with developments that have arrived on the scene since 1987.. I recommend investigation, and where possible practical testing, before anyone commits themselves, finally, to the use of a particular process or product. If access to schools or similar institutions is possible a look around the floors in the middle of term, looking *into* the edges and corners and doing the *Finger Test* (described in para 6), is worthwhile: if all is well

- Buffing Systems

- Floor Polishes etc

- The application of polishes and dressings

- General application

-

try to get into friendly conversation with the caretaker who, as he is not in a position to sell, may be regarded as an independent adviser.

2 General

There is no real difference in the processes for hard floors whatever equipment is selected for use. At the outset it is essential that all trace of any cleaning agent or dressing that may have been applied previously has been removed, and that there is no residual alkalinity (some detergents and all polish stripping solutions being alkaline). It is also essential that the floor is dust-free: this can be achieved by the use of a vacuum or by damp mopping, preferably the former in order to avoid any possibility of raising the grain of the timber. To sum up, the floor should be as nearly as ***possible as new***.

3 If the floor is porous (unglazed tiles, some compositions:, but see para 11 below for wood, cork and similar).

It is advisable to start off by applying a *Water-Based Floor Seal* which will fill the pores and make a good base for the floor dressing. Seals are similar to the top dressing but contain a high proportion of ***solids***. If a floor seal is not used on a porous floor it may be necessary to apply substantially more coats of dressing to achieve a ***surface*** than would otherwise be the case. Floor seal is usually less costly than the dressing and its use when indicated will save time and effort.

4 If the floor is non-porous (or after sealing as in para 3).

Apply *thin and even* coats of polish allowing each coat to dry before applying the next. The first coat is applied over the whole floor, right up to the walls: the second coat stops between three and six inches away from skirting boards, and all subsequent coats stop about nine inches, but not less than six inches away from skirtings. On a 'new' floor three *thin* coats are advised as a minimum. In any case continue applying coats until a 'surface' is achieved: the situation can best be judged by looking at the floor obliquely against a light source, natural or artificial. When a surface has been achieved it is beneficial to apply further *thin coats* to heavy wear areas such as doorways (roughly in a fan shape narrowing towards the door), on the treads of staircases, in areas where walkers change direction, and below work areas where feet are likely to be shuffled about..

Note:

If the means is available, the buffing of the floor between coats, between alternative coats, or whenever time permits, is recommended as it hardens the finish and is understood to improve its wearing properties.

5 Maintenance.

On a day-to-day basis: unless the floor is subjected to heavy wear, it should be necessary only to remove surface dirt by brushing, by vacuuming, or by damp/wet mopping, or by a combination of these - different methods being used on different parts of the floor according to need. A final vacuum over the whole of the floor is always worthwhile. *Periodically*, in order to restore the floor to *as new*, or daily in heavy wear areas, the floor will need to be buffed with a cleaning/polishing pad under some sort of appliance. It is, however, important that *sticky messes* are first spot-cleaned by mopping or washing. Provided that the floor has an adequate

covering of polish the buffing process will both convert normal dirt to loose dust and work the polish on the floor making good *fair wear and tear* including shallow scratches without the application of new polish.. This buffing process is improved with the application of a *very fine* spray of water containing a small quantity of *neutral detergent*: this can be dispensed conveniently from a trigger bottle. The detergent acts as a *wetting agent* reducing the surface tension of the water in the spray and does not act as a specific cleaning agent in this application. The water spray should be almost invisible: if too much is applied the floor and the buffing pad get wet, the polish on the floor re-emulsifies, and everything becomes difficult, time consuming, and therefore expensive.

It should be noted that, in the processes so far described, there has been no application of polish apart from that applied in setting-up the floor from 'new'. The use of a dilute polish solution when *Spray Cleaning* (the recognised term for the process described in the previous paragraph) is recommended by most people in the business on the basis that as well as making it easier to restore the surface it also deposits a sufficient quantity of floor dressing to extend the period of use between re-applications of polish. Personally I do not support this on the grounds that the emulsifier and plasticisers in the sprayed polish soften that already on the floor resulting in polish from the floor's high spots being swaged over dirt particles lying in low spots (e.g. the bottom of scratches) and thus enclosing them within a layer of polish. This needs further investigation - I tend to wonder whether this idea arose from the need of the manufacturers to increase throughput when the general practice of stripping polish from floors as a matter of routine was abandoned.

Further applications of polish must be made at intervals in order to maintain a useful layer of polish all over the floor surface, edges excepted. It is probably better to undertake this as and when convenient

opportunities occur rather than to wait until the failure of ordinary maintenance processes indicates the need for it to be done. Small areas of the floor can be treated in isolation provided that they are properly prepared and provided that polish is not applied to areas that have not been prepared: this implies including in the prepared area a *buffer zone* of about six inches which extends beyond the worn area onto floor that still bears a useful polish film.

Proper preparation before applying polish is vital. Essentially it is the same as for preparing a new floor except that the floor does not have to be *bottomed*: to do so is to waste a good foundation of expensive polish. The existing polish surface must be cleaned thoroughly, all embedded grit, etc, being removed. This is best done by using the appropriate pad under a machine or *bumper*. Failing a suitable appliance hands and knees work with a scouring pad seems indicated but it would be worthwhile trying out some ad hoc arrangement with an old broom and a suitable scourer - fairly fine steel wool (Grade 0) is very suitable. Scouring finished, remove all dust by vacuum, damp mop or similar, then apply polish as for a *new* floor.

6 Warning.

Buffing is a dusty process and throws up particles which, being warm, moist and sticky, will adhere to the floor surface as they dry: most of the particles consist of dirt, the rest is broken down polish. All-in-all it is a dirt making process and this fact has to be coped with both on and above the floor. Firstly, at the end of every cleaning operation, just before finally taking up the dust, it is essential that all particles that have become stuck to the floor are broken loose so that they can be collected. The existence of these particles can be verified by *The Finger*

Test. The problem arises mainly at the edges of the floor and shows up in the form of a sandpaper-like texture being felt as the finger is drawn over the floor surface from about eight inches from the floor edge up to the skirting board. The roughness is dirt and, if not removed, will remain through successive cleaning and re-polishing processes until, suddenly, it appears in the form of dark patches on the floor. The only recourse then is the stripping-off of all the polish and starting again as if with a *new* floor. Expensive in both time and material. A simple way to loosen adhering particles is to push a buffing-pad along the edges of the room under a broom. If a buffing machine is used it will only re-activate the problem. It might be worthwhile establishing whether or not a vacuum with a revolving brush would be effective for this task.

7 Frequencies.

The frequency at which the various maintenance tasks have to be performed depends on the use to which the floor is subjected, the success achieved in finding the right material and in establishing effective maintenance procedures. If the floor is treated with reasonable respect it may be possible to get by with a quick pass with a brush, or, preferably, a vacuum cleaner for several days before it becomes necessary to use a buffer. It might be worthwhile setting out with a trial based on one or two buffing sessions each week. The full polishing process should be much less frequent. A detailed inspection of the floor after four weeks is suggested: it could then be decided whether to part-polish, or to go another four weeks, or whatever. To gain full benefit of changing to the system outlined it is necessary to test the result to the full (and on more than just one occasion) so that the more extensive (and expensive) processes are only being carried out when *necessary* rather than on some sentimental assessment

8 Buffing Systems. (Apart from the old established business of doing it on hands and knees)

The Army and other large institutions used to use *The Bumper* which is a heavy board of about 12 x 6 inches to which is affixed a pad of bristles. The board is weighted and attached to its handle by a joint which provides for the handle to move through nearly 180 degrees in one plane. This allows it to be used in a manner similar to that in which an upright vacuum is used, but with much more effort because of the friction between it and the floor. If the bristles are too rough a soft cloth can be folded and put underneath them.

The most successful means of buffing is the use of single disc polishers as used in most large establishments. These have the advantage of dealing with a swathe of between 12 and 20 inches, according to size, and of applying a beneficial amount of weight to the business. The initial cost is high but they are built to stand up to several hours of work each day. Their expectation of life is a minimum of ten years in industrial conditions. The real cost over ten years, including servicing and the provision of cleaning pads, is between two and three times the initial cost (not allowing for inflation). Even for the most expensive machines this works out at a weekly cost of something approximating to the cost of two hours of unskilled labour (Note that these calculations were made some years ago and may have varied since then). The machines are sold as separate items and it will often be necessary to purchase a *Driving Disc* (which positions and supports the cleaning pad) as another separate item. Some machines have integral vacuums to collect the dust they create: it is worth paying extra for this facility provided that the machine can still get right into the floor edges and is not held off the skirting board by the vacuum hood.

Smaller two or three-pad machines are made, mostly for the domestic market but some for industrial use. These are handier in small areas but suffer, generally, from lack of weight and are at a disadvantage when it come to thorough cleaning before the re-application of polish. However care must be taken to select a machine of a size that can be handled in the areas in which it is intended to be used.. Driving discs and a set of pads may be included in the price of the machine but this is not always so. Some have integral vacuums.

Floor Cleaning Pads. Brushes seem to be outdated and modern cleaning agents, etc, are formulated for use with pads. These have the advantage of being available in sizes to fit the various machines and in a variety of grades to suit different tasks: they are also easily washable (a trick that ***does*** need to be performed from time to time). There are several brands on the market but, up to the time of my retirement, the best by far were those made by 3M. Some of the other brands had a tendency to tear if they were thumped against a chair leg or took a dislike to the surround of a floor trap. Once torn they do not sit happily under a driving disc and are only really useful as hand pads. Pads are expensive but last a long time if looked after. The recommendation is that 3M pads be used, and that if the cost can be managed, their ***51 Line*** (or any up-to-date replacement) should be used. These are more open in the mesh than other lines and pick up and hold quite a lot of dirt and dust that can be shaken out of them outside the building or within the effective zone of a vacuum. They are worth the money.

Pads are colour coded and the 3M 51 Line is described below to illustrate the system generally used.

-
- Black (or is it green?)

Hard scouring pad used when stripping all polish off floor, or when floor has been very badly treated.

- Blue

Cleaning pad used for cleaning a dirty floor which does not respond to a red pad. Also used for thorough cleaning before re-application of polish.

- Red

Standard polishing pad used for the polishing of floors in fair condition. This is the pad to use when spray cleaning and in preference to any other pad unless the floor does not respond to it.

- White

A super-polish pad for upgrading the finish obtained with a red pad. (Luxury business.)

3M also make a brown pad known as a *Burp Pad* (Build-up removal pad). See para 10 below for a reference to build-up.

9 Floor Polishes, Etc.

Whilst traditional wax polishes give the most pleasing result on wood they are not, in present day terms, sustainable due to inadequate wearing quality and relative difficulty of maintenance. The modern trend is to use *Emulsion Polishes* with a water base. The proper description of these is *Water Based Emulsion Polishes* sometimes termed *Water Based Floor Dressings*. These can be classified as follows:-

- Buffable

Soft polish which responds readily to buffing and takes a high sheen *but* which marks easily and is not suitable for areas subjected to anything other than very light wear.

- Semi-Buffable

This is the workhorse of the range. It resists marking in use and can be restored relatively easily by machine buffing. It is generally less shiny than the Buffable or Dry Bright varieties.

- Dry-Bright

Akin to a varnish in that, when properly applied, it dries to a high sheen. The surface is not, however, repairable by buffing. The only effective recourse is the re-application of polish after due preparation.

In addition to the term *Water Based Emulsion*, terms such as *Metalised* and *High Solids* may be encountered. These relate to developments which took place in the eighties. Metalised polishes are desirable as they have increased resistance to marking and improved wearing qualities. High solids deposit more material on the floor surface but may be inclined to produce excessive quantities of dust during maintenance sessions if the application techniques are not absolutely correct. Based on experience prior to 1987, the use of a metalised polish is recommended: the use of a high solids polish is not recommended.

10 The application of polishes and dressings in general.

The need to avoid the excessive application of polish at floor edges should always be remembered as the edges do not normally suffer wear.

The fastest and most effective way to apply polish and other floor dressings is by way of a flat "Kentucky" mop. These are available in a variety of weights rising in two ounce steps from about 12 ounces to 20 ounces. 16 oz is a reasonable size for most people to use. A clean mop should be soaked in water and then squeezed as dry as possible (the purpose of this is to prevent it absorbing and so wasting excessive quantities of the liquid in use): the mop-head should then be laid on the floor with the tail stretched out and polish should be poured onto its head close to the handle. The polish is spread onto the floor by dragging the tail of the mop over the floor surface with the head of the mop an inch or so above it: provided that the mop has not been overloaded with polish this results in a thin and even film of polish being deposited on the floor. As and when necessary further doses of polish are poured onto the head of the mop. The *Wet-Edge* principle should be followed and polish, once laid, should not be touched again by the mop unless it is still very wet, or is completely dry. Touching polish

in a partly -dried state will cause it to *pull* and will inhibit its self-levelling properties. These self-levelling properties are such that properly applied polish dries evenly to a sheen and does not have to be buffed if it is not convenient to do so: however, both appearance and life will be improved by buffing before the floor is subjected to use.

Note:

The technique of using the Kentucky Mop has to be practised but when learned provides a satisfactory and fast means of applying and picking-up liquids. One moves backwards step by step swinging the mop across the body at each step. The width of the sweep should be limited so that it does not exceed the *comfortable and balanced* reach of the user. The head of the mop is kept at an even distance above the floor so that the wide tail of the mop spreads out on the floor. When the sideways limit of movement is reached the mop handle is turned in the hands so that the tail of the mop follows round staying open and ready to cover the floor on the return swing across the body. Moving backwards the handle of the mop is rotated clockwise at the right-hand extremity of the swing across the body and anticlockwise at the left extremity. The strip covered on each backward run will depend on the physique of the individual but will probably be nearer 4 feet than 5 feet. Using the mop in this manner, a lot of ground can be covered quickly and without undue fatigue.

11 General application of the system described.

This system works in the case of all the *Hard Floorings* with the following exceptions:-

Wood, Cork.

The Water Based Acrylic Floor Seals are to some extent effective but in order to achieve a durable result wood and cork floors should be prepared by sanding (by and large by a professional) followed by sealing. Lever Industrial Ltd's *BourneSeal Natural* is well known and effective. Polyurethane is good in the right circumstances but has potential disadvantages. There are other modern mineral seals which are good but possibly not for DIY use. Whatever any sales person may say, I have yet to see a seal which retains its appearance in use without the application of polish to function as a *barrier and wearing surface* between the sole of the shoe and the surface of the floor seal.

Vinyls

A floor seal is not required unless the material has been severely scratched or is badly worn - in which case a *Water Based Acrylic Floor Seal* is likely to be more effective , quicker and cheaper, than building up a surface with multiple coats of ordinary *water based floor emulsion*.

Floors which are maintained properly should not need stripping off for a fresh start. Modern water based emulsions do not discolour with age: discoloration is inevitably caused by repetitive trapping of dirt between polish layers as a result of taking short cuts when cleaning. *Build-Up*, a term much used by those who should know better, to describe dark patches of trapped dirt which appear at floor edges, results from applying polish right up to the skirting boards, and in other places where it is not subjected to wear. (See Note a.) Provided good cleaning practices are observed the most likely result of build-up is excessive dust production during cleaning due to polish breakdown over a long period.

Note a: Accumulations of dirt and old polish commonly occur at door edges, round the feet of tables and heavy furniture, and in places not easily reached by machines. All corners and angles create problems as the disc of the polishing machine cannot reach the apex of the angle. It is in these areas that the quality of work done is immediately obvious. *The only remedy involves extensive periods of exhausting work on hands and knees.* It is better to keep up-to-date with it by dealing carefully with such areas during routine maintenance.

Note b: The shine on a well polished floor has no bearing on its slip factor. All reputable modern polishes are slip-resistant and the slip-factor is sometimes quoted on the container. If it is not to be found on the container it will certainly be found in the technical blurb. Many decorative floor surfaces become very slippery when wet: this is the case with emulsions and due care should be taken.

C.A. Stahelin

Originated: Aug 90

Latest revision: Sep 96

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UK.D-I-Y FAQ Maintainer: [John Rumm \(editor@diyfaq.org.uk\)](mailto:editor@diyfaq.org.uk) © [Copyright](#) 2019

UK.D-I-Y FAQ

Recent Changes and FAQ History

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Recent Changes

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10-Dec-2014	Replaced old Atomz search with google search. Search now indexes FAQ and wiki content in one place.
13-Jan-2012	Udated mid position valve article to correct so errors in the text. Many thanks to Stuart for the heads up.
20-Jun-2011	Changed entry page to go straight to contents, rather than the about page.
13-Jun-2011	Links page for various paper catalogues has now been removed since it was both out of date, and the content was in effect duplicated in the DIY website (WIKI) links article.
10-Jun-2011	New hosting arrangements. We would like to express our sincere thanks to former uk.d-i-y regular Grunff, who's company Symworks have provided free hosting services for both this site and the wiki pages for many years. Responsibility will now be taken up by the very excellent Internode Ltd (yeah ok I am biased). So now when anything breaks it really is the editor's fault!
6-Aug-2010	Changed banner for our corporate sponsor.
28-Apr-2010	Relocated links section to wiki to enable more open maintenance and additions.
	Added the Andy Hall of Fame page

- 02-Mar-2009 In a drive to make future maintenance of the web site a little more efficient, we have switched to a new look and feel. This version of the site does away many of the "hard coded" elements of previous versions, and employs more modern page layout techniques that make use of Cascaded Style Sheets to control the appearance.
- There may still be a few bugs with this version - particularly with older versions of Internet Explorer. Please report any problems to the maintainer (link at foot of page).
- 29-Apr-2009 First of a series of updates to better integrate the FAQ and Wiki resources. Expect more integration work over the coming weeks.
- 28-Apr-2009 With great thanks and appreciation to Phil Addison for years of hard work on the FAQ, maintenance of the site has now passed to me; John Rumm. So if it all goes pear shaped from now on, don't blame Phil!
- 24-Sep-2005 More additions to John Rumm's [Power Tools FAQ](#)
- John Schmitt's [Drill-bits and Drilling FAQ](#) incorporated in the main uk.d-i-y FAQ
- Thanks are due to all that contributed comments and suggestions to both these FAQs.
- Also made an editing pass over most (but not all!) pages to make the layouts a bit more consistent.
- 22-Apr-2005 Washing Machine FAQ by Ian Tilley (Shrek) added under Electrical Appliances.
- 20-Apr-2005 All email addresses have been coded to reduce the possibility of harvesting by spam-bots.
- 16-Apr-2005 [Power Tools](#) FAQ contribution from John Rumm added.

08-Nov-2004	Added Pipe Bending section to Plumbing pages.
19-Oct-2004	Several defunct links deleted and others updated.
24-Sep-2004	Obsolete section on 'Balancing Central Heating Systems' (on Heating And Plumbing Page 1) replaced by the 'Balancing Central Heating Radiators FAQ'
05-Feb-2003	Screwfix catalogue/website details updated.
03-Feb-2003	Lost link 'Sharpening Carbide Tips' restored as 'Dealing With Dull Carbide'
17-Dec-2002	CMT / Woodcut deleted from DIY Catalogues. They seem to have gone out of business.
30-Nov-2002	Added links to Ed Sirett's Sealed Heating System FAQ and Gas Fitting FAQ.
18-Sep-2002	The FAQ web site hosting is now sponsored by Clare Associates giving us a throughput up to 2.5GB/month, which should eliminate bandwidth problems for some time to come.
9-Sep-2002	Removed the 'Download the FAQ' facility to save on traffic bandwidth.
5-Sep-2002	The FAQ web site traffic is increasing rapidly. It exceeded the 500MB/month sponsor's limit by 96MB in August, with 750MB being predicted for September. Some site re-organisation to reduce individual file sizes is urgently needed, otherwise the site may have to be closed for the later part of the month when 500MB is reached.
16-Jul-2002	The FAQ web site hosting is now sponsored by Cyberprog New Media . ABC Group were unable to continue sponsorship.

3-Mar-2002	www.diyfaq.org.uk DIY FAQ web site hosting sponsored by ABC Group.
5-Nov-2001	FAQ moved down to diyfaq folder to make room for London Meet photos alongside.
11-Oct-2001	<ul style="list-style-type: none">• New revision published, linked from www.diyfaq.org.uk.• Many broken links fixed, but still a few more to track down.• Spelling/typos fixed - and new ones probably introduced!• Otherwise pretty much as laid out by CliveE• (There are more additions in the pipeline)
6-July-2001	<ul style="list-style-type: none">• Phil Addison takes over from Andrew Gabriel as FAQ Maintainer. All pages updated to show Phil as maintainer
9-Jan-2001	<ul style="list-style-type: none">• Andrew Gabriel took over from CliveE as FAQ Maintainer. All pages updated to show Andrew as maintainer
29-Dec-2000	<ul style="list-style-type: none">• Andrew Gabriel's Self-Uninstalling Gas Water Heater added to the Humour page• John Stumble's DIY Archive URL updated• plus other minor updates
30-Nov-2000	<ul style="list-style-type: none">• The FAQ on Combination Boilers was added
14-Nov-2000	<ul style="list-style-type: none">• Update "named anchors" by removing spaces, to correct bugs in site navigation

- | | |
|--------------|---|
| 1-Nov-2000 | <ul style="list-style-type: none">• Search facilities added to Contents and Websites pages• Add Rutlands to Catalogues and Websites pages.• Phil Addison's FAQ on Balancing CH Radiators now hosted.• Minor update to Andy Pugh's FAQ on Damaged Threaded Fasteners. |
| 28-Oct-2000 | <ul style="list-style-type: none">• All pages now show "UK.D-I-Y FAQ Maintainer" contact address rather than Compiler and/or HTML author. Last Updated dates not changed.• New "Website News" page (this page!).• Andy Pugh's FAQ on Damaged Threaded Fasteners now hosted.• Page 2 of the plumbing FAQs "Central Heating Controls, Motorised Valves and Wiring" has been revised by Ian Clowes. <p>Navigation links have been added to each section within Page 2. Consequently Plumbing Pages 1 & 3 and the Contents page have also had to be updated.</p> |
| 07-Oct-2000 | <ul style="list-style-type: none">• New "Tool Sharpening" page. |
| 20-Sept-2000 | <ul style="list-style-type: none">• New Netiquette Guidelines and Acronyms page. |
| 20-Sept-2000 | <ul style="list-style-type: none">• Major rewrite of Introduction page. |
| 8-Sept-2000 | <ul style="list-style-type: none">• Details on the Manuals page have been verified by Ian Clowes |
| 18-Nov-1999 | <ul style="list-style-type: none">• New "Humour" page. |

- Oct 1999 • CliveE took over from Matthew Marks as FAQ Maintainer
- 17-Aug-1999 • New Web-based FAQ announced, produced by CliveE

Early History of the FAQs

These web pages are largely derived from the work of [Matthew Marks](#), who originated the uk.d-i-y FAQs in 1996 and maintained them until 1999. In the early years the FAQs were text-based pages which Matthew regularly posted to the uk.d-i-y newsgroup. He gathered useful articles from newsgroup discussions and, with the author's consent, edited them before adding them to the FAQs with an acknowledgement of their source. He also wrote articles himself and the quality of much of the material here is a result of his careful and dedicated effort.

As the content grew, the FAQs were divided into five broad categories to keep related topics together, to make them more manageable and to keep downloads small. In 1997 CliveE compiled a section of References (DIY manuals, catalogues and websites) which became a FAQ in their own right and were added to Matthew's regular postings. John Schmitt soon realised that the FAQs would be even more useful if they resided on the web in a permanent location and if there was some interaction between them to aid navigation. In 1997 he took a snapshot of the FAQs, converted them to HTML web pages and hosted them on his local server. This worked for a while but pressure of work and the rapid evolution of material at that time meant that the web-based FAQs lagged the newsgroup postings. John was also at that time developing his own excellent FAQs (see links on [Contents](#) page).

In 1999 Clive took another snapshot of Matthew's regularly posted FAQs, converted them to HTML and placed them on the [eidosnet](#) website under ~ukdiy. This host originally had the advantage that uploads could be made from other ISPs (e.g. using one's employer's network connection ;-)) but that mechanism was withdrawn very soon after. Clive reorganised the content somewhat to keep page sizes small in an attempt to keep download times short. Links were added to aid navigation within the pages and between pages so that anyone arriving in the middle of the site would be able to navigate the whole site. For a while the web pages and the regular newsgroup postings ran side by side but keeping the content in synchronism was a major effort so it was eventually decided to move almost entirely to the web. One newsgroup posting remained: for the benefit of newcomers, Matthew still automatically sent out the FAQ Introduction page to the newsgroup every ten days.

Up until 1999 Matthew was the "FAQ Maintainer", having the last word on what was and was not included. In October 1999 he handed over that

responsibility to CliveE. The history from that date is detailed in the table above.

TestRegion

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UK.D-I-Y FAQ Maintainer: [John Rumm \(editor@diyfaq.org.uk\)](mailto:editor@diyfaq.org.uk) © [Copyright](#) 2019

Gas boiler valves - why does the pilot light keep going out?

By Matthew Marks 26/3/1998 with subsequent updates

Many gas boilers have a pilot light. The pilot light performs one function or two. On boilers without automatic ignition, it will be lit permanently, and provides the means to light the main burner when required. On all boilers with one, the pilot light provides a safe way of lighting the main burner quickly, preventing a build up of gas which might detonate explosively if the only means of ignition were a spark. (Boilers with a modulating burner can be lit safely without using a pilot light, because the main burner can be started at a low level.)

Simple systems with a permanently lit pilot light

A permanently lit pilot light wastes gas, and needs user intervention to re-light it if it blows out or if the gas fails. However, it can be quite useful in a combination boiler, as it keeps the water warmish, thus reducing the delay in the production of hot water when it is required after a long period of standing.

The gas valve has a means of shutting off the pilot light, and the main burner, if the pilot should fail. The presence of the pilot light is sensed by a simple system: a thermocouple. A thermocouple is any junction of dissimilar metals. A small voltage is generated at the junction, proportional to its temperature. If the dissimilar-metal leads from a thermocouple are joined together, current will flow, but only if the two junctions are at different temperatures, because otherwise the voltages generated at each will cancel out.

In a gas boiler, the "hot" junction is in the pilot flame, and the "cold" junction is in the gas valve. Thus, if the pilot is lit, a current will flow round the circuit. This passes through an electromagnet, which holds the gas valve open. The current is far too small to pull in an electromagnet, so the clever bit is that the user does this by pressing in the button on the gas valve. There will also be some sort of interlock to prevent the main burner activating while the button is pressed in.

If the pilot is then lit (either with a match, a manual piezoelectric spark or an electronic spark generator), after a few seconds the hot junction will be hot enough for the electromagnet to hold the valve open against a spring. If the pilot goes out for any reason, after a few seconds the hot junction will cool and the electromagnet will release, closing the valve until it is manually opened again.

If there is an ignition system and it does not produce sparks, it may be faulty, its high tension connection to the electrode may be breaking down (the return path is always through the body of the boiler), or the electrodes may be too far apart (due to being interfered with or corroding away). If there are sparks and the pilot will not light, the electrode positioning or the pilot adjustment may be wrong, or the pilot jet may be blocked, resulting in no gas

getting near the sparks. No gas can also result from a faulty gas valve, or air in the pipes. (With my old combi, the only way to re-light it was to fool it into thinking that the pilot was lit, and activate the main burner for a couple of seconds to purge air.)

The thermocouple is rather confusing in that it looks like a capillary, as used in thermostats. The hot junction is a probe which sits in the flame, and a thin flexible copper tube, acting as one conductor and containing the other, leads back to a fitting on the gas valve secured with a small back nut. Thermocouples do fail, and are cheap to replace at about a fiver, but before this is done it is worth making sure that the probe is correctly positioned in the flame, and the flame is the right size (as specified in the boiler manual). Pilot jets can get blocked, and there will be a pilot adjustment on the gas valve. Sometimes there is a deflector to direct part of the pilot flame towards the thermocouple, and part towards the main burner.

If the pilot flame is correctly adjusted but the gas valve will not stay open at all, the thermocouple (or the gas valve, but unlikely) is open or short circuited. Sometimes thermocouples may fail intermittently, leading to the confusing symptom of the boiler working for a while and then giving up, as the heat of the main burner causes the thermocouple to expire temporarily. However, this may also be caused by strong air currents due to heating by the main burner blowing out the pilot. The pilot needs to be watched, to see if it goes out before or just after the characteristic click of the gas valve releasing.

"Potterton Netaheat Electronic" with non-permanent pilot light

These use an electronic spark generator (a capacitor, charged repeatedly, and then discharged rapidly into a step-up transformer) to light the pilot whenever the main burner is required. Once the pilot is lit, the main burner is activated. As part of the electronics required to achieve this, the presence of the pilot is detected not with a thermocouple, but by electrodes in the flame - a flame looks like a resistive diode. (It is unsafe merely to check for conductivity, as many faults could cause this.) On some boilers these electrodes are the same ones from which the spark jumps to light the pilot in the first place: between sparks, they are monitored.

These boilers have a gas valve containing two mains or low voltage solenoid valves, for pilot and main burner. The ignition sequence of the Potterton Netaheat is given, as an example of how the system functions:

- 1) Thermostat calls for heat, supplying mains power to the electronics
- 2) The fan starts - this boiler has a fan-assisted flue;
- 3) A pressure switch detects that air is flowing through the boiler. (In some boilers a air flow is detected by the change in resistance of a thermistor, which is heated by current flowing through it, caused by the moving air cooling it down.)
- 4) Ignition is delayed for a "purge period", to remove any unburnt gas in the boiler
- 5) The pilot valve is opened (first irritating loud click), and the spark generator is activated
- 6) Pilot ignites and is detected by ignition electrodes

7) Spark generator is de-activated, the main valve is opened (second irritating loud click) and the main burner is ignited by the pilot flame.

The pilot flame and the air flow are continuously monitored.

Failure in this type of system can be harder to diagnose, but can be localised by seeing at which point the ignition sequence sticks. If the relevant input or output device is functioning correctly, the electronics is at fault. Pilot adjustment and electrode positioning (as opposed to thermocouple positioning) are just as important for this type of boiler.

Safety notes

(15/4/1998)

It should go without saying that the safety devices incorporated in gas boilers must not be overridden, or there is a possibility of boiling water, fire, gas explosion or carbon monoxide poisoning.

Suppressors can be fitted to boilers to prevent radio interference when they switch on and off. These usually consist of an encapsulated series connected resistor and capacitor. These will perform their function if connected across the gas valve or the thermostat, but they should **not** be connected across the thermostat because if they were to fail short circuit, they would activate the valve permanently. A shorted suppressor across the gas valve will merely blow the fuse in the supply to the boiler, closing it down.

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Combi Boilers

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Introduction to Combination Boilers

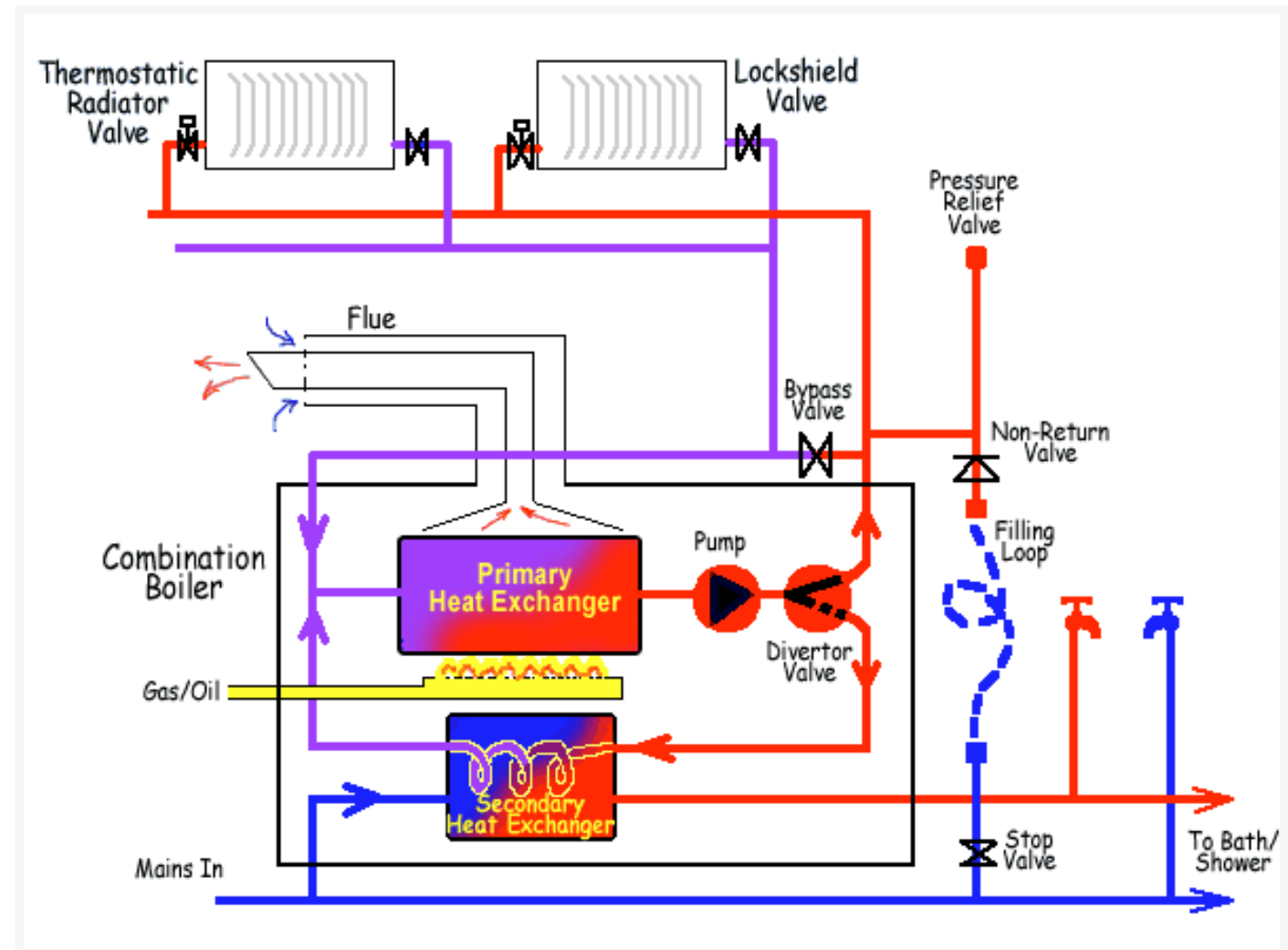
By CliveE, with guidance from [Ed Sirret](#)

This FAQ was put first together in November 2000 following much debate in the uk.d-i-y newsgroup on the topic of Combination boilers, their strengths and weaknesses, how to chose them, and the latest trends in design. This introduction is written by a non-expert in an attempt to cut the hype and to distil the discussions into just the pertinent points.

Combination boilers or "Combis" are a particularly attractive form of heating because they dispense with the need for the hot water cylinder in the airing cupboard, and also the large cold water cistern ("tank") plus small header cistern in the loft which are otherwise needed in conventional vented heating systems. All the major components are housed in one unit which makes them very convenient to the installer. They are especially suitable for smaller households with undemanding lifestyles. They are less suited to larger households although the very latest models seem more capable than their recent predecessors.

The diagram below shows a simplified typical combi installation. Unlike more conventional boilers, the casing normally houses the pump and water/heating timer. Because it is a sealed system, Central Heating (CH) water expansion/contraction has to be accommodated in a pressure vessel (not shown) which is also within the casing. Instead of an open safety-vent pipe looping over the expansion cistern in the loft there will be a pressure-relief valve. There must also be an overheat cut-out within the casing to prevent boiling should the boiler's internal thermostat fail. A gauge is often provided to indicate that the CH pipework is under pressure and not admitting air. It will need occasional re-pressurising

from the mains water supply so a facility for a filling loop (flexible braided pipe) is provided. To comply with the water regulations the loop must be physically removed upon completion. However, some recent models have the CH circuit filling components internal to the boiler and the regulations are observed by removing a large (hand sized!) plastic key.



When Hot Water (HW) is demanded, a HW-priority diverter valve is used to direct the output from the boiler away from the CH circuit into the small secondary heat exchanger where it heats the Domestic Hot Water (DHW). The valve is generally not motorized and a variety of mechanisms are used to operate it, e.g. wax pellet expansion, water flow venturi etc. Often the temperature of the primary heat exchanger is

also increased when DHW is demanded.

The secondary DHW exchanger is less likely to form lime scale hot spots because it is heated by hot water rather than very hot gases, and is much smaller than the primary because it is a liquid-liquid heat transfer rather than gas-liquid.

It must be emphasised that not all combis operate identically. For example there are some which have two independent gas-fired heat exchangers rather than one primary and one secondary and this type dispenses with the Diverter valve.

Water to the hot taps/shower comes out at mains pressure although it has to pass through the boiler slowly for it to be heated sufficiently. The flow rate is therefore limited for a given temperature rise. The high pressure / low flow is perfect for showers. It dispenses with the need for power shower pumps which might be necessary in a conventional system with a low pressure head (vertical distance between shower head and outlet of the cistern).

It is generally the power needed to heat the tap/shower water which determines the specification of a combi boiler, not the power needed for the CH.

Some points to think about:

-
- Combis are easy to install because they eliminate the need for both an expansion tank in the loft and a hot water cylinder in an airing cupboard. The pump and maybe the timer are also placed within the boiler casing which makes a combi easier to install but more difficult to maintain.
 - If the heat dissipated by a HW cylinder in a conventional system cannot be used usefully then a combi system, with little or negligible stored hot water, may be cheaper to run given identical heat-exchanger efficiencies.
 - Combis generates hot water as and when it is needed, avoiding running out of it. The hot water is at mains pressure, which is an advantage for showers.

- Standard combis take 40 seconds to heat water and this is a considerable wastage of water. However, slightly more sophisticated combis have a device which restricts the flow of water until it is hot enough to use. Others (storage combis) keep a small reservoir of water permanently hot.
- Standard combis provide maximum pressure through only one tap at a time. If you have two taps running the flow rate diminishes. This can be partly overcome with a high power or a storage combi.
- If gas-powered, very large combis or multiple combis impose a huge demand on the gas supply pipework within the house. If two combis are running simultaneously the installation has to be good enough that a gas hob etc does not go out and then fill the room with gas when the boilers shut off. It generally means separate gas feeds taken from as near as possible to the gas meter. Seek professional advice for pipe sizing.
- The flow rate for *all* the appliances in the house is limited by the capacity of the rising main. Flushing a toilet may thus lead to the hot water temperature fluctuating, or even going cold. Do not install a combination boiler unless your rising main is sufficiently good - flow rate may not be adequate for washing machines/dishwashers that require a hot feed.
- An airing cupboard is a godsend to some people for the final drying/storage of clothes. A combi dispenses with the cylinder and hence the space needed for it. However, if an airing cupboard is available, it may be possible to keep it warm by installing the boiler within it. The usual trick of putting a small radiator on the boiler's bypass circuit is not really adequate because, unlike other types of boiler, heat will only be available when the central heating system is needed, but not when only hot water is demanded.
- An immersion heater cannot be used as an emergency backup in case of the boiler failing as there is no cylinder for it to go in. An instantaneous electric shower could be used although it would need its own water supply as it cannot be put in series with the combi's output. It certainly won't be as cheap as adding an immersion element to a normal cylinder and will need a beefier electricity supply.
- If the system is getting a bit sludgy due to poor installation, poor maintenance or abuse, then some diverter valves on some models can

show problems with lack of CH or DHW.

- When hot water is being used no heating is available (although this would only be significant if the radiators are not already hot when hot water is required)
- Pressure variations within a sealed system are quite high, which can encourage leaks from radiator valves, etc.

When comparing flow rates of different combis make sure that they are specified for identical temperature rises. They are commonly specified at either 35°C or 30°C rises, the lower the rise the greater the flow. However, the temperature rise required in practice is often a good deal higher than either of these figures. If the mains water temperature is 10°C (which it was at 21:00, on 20th November, 2000 in Reading) then with the boiler's output set to 57°C the required thermal rise across the boiler is 47°C. It would therefore be more realistic but less persuasive if boilers were specified at higher temperature rises.

Be aware that a boiler with a flow rate of 14 litres a minute for a 30°C temperature rise may have half that for a rise of 55°C (required in winter when mains temperatures are not far from zero).

A combi's output temperature is set by a temperature control on the boiler and, once set, is nominally constant (although early combis fluctuate badly). The setting should be a few degrees higher than the maximum tap temperature to allow for thermal losses from pipework. At outlets requiring lower water temperatures, cold water needs to be mixed in.

Some ball park figures:

Washing up and shaving require the hottest water temperature of 55°C.

A bath typically contains 120 litres of water at 42°C.

An average shower uses 50 litres of water in 5 minutes with a temperature of 12°C at the showerhead.

A modern 100,000 BTU/h (29.0kW) combi can typically provide 14 litres/min at 30°C, 12.5 litres/min at 35°C, and 7 litres/min at 55°C rise.

Calculating for a bath:

I calculate that if the cold tap is 10°C and the hot tap is 55°C, then you'll need 35 litres of cold and 85 litres of hot for 42°C bath water. The 100kBTU combi above is specified at 9.5 litres a minute for a 47°C rise (allowing 2°C loss in pipework, 55+2-10) and this will take 9 minutes to fill. If the bath is iron then you'll need less cold, more hot and more time. If the combi is older and less capable then times can double or even treble.

Calculating for a shower:

I calculate that from a cold feed at 10°C you'll need 2 litres/min and from a hot feed at 55°C you'll need 5 litres/minute. A combi specified at 9.5 litres a minute for a 47°C rise is therefore easily capable of this throughput.

As a comparison to all this, I can run a good bath in one and a quarter minutes from my unvented Megaflo cylinder, heated with a Potterton Envoy condensing boiler. Showers are also at mains pressure. Of course, this comes at a price and with its own merits and demerits.

Pros and Cons of Combination Boilers

By Ed Sirret 14/11/2000

If you shell out enough for the better models (not the stuff you invariably see installed) there are essentially only a few drawbacks:

1) Scaling of the DHW heat exchanger in hard water areas (i.e. the bulk of our water), the replacement part is not a negotiable price - either you buy it at the price requested by the manufacturer or you replace the boiler. However, I hear that the latest models are designed to reduce scaling. Also you could run softened water through them but you'd probably invalidate the warranty. Although a HW cylinder also scales up this is less of a problem in practice.

2) There is no possibility of an electric immersion heater as a backup should the boiler fail. However, an electric shower and kettle will do for a while. A back-up electric instantaneous shower does not necessitate a header tank and benefits from a reasonable supply pressure (not usually available from a tank).

3) Although installation is relatively simple you might find that you need to upgrade the gas supply pipe diameter, at least to comply with regulations if not in practice.

In practice, in terms of what actually is installed in most places I actually see, the cheaper models dominate. For cheaper models without stored hot water then you **might** also add the following drawbacks:

4) Modest flow rate of hot water good for a shower but possibly tedious for a bath.

5) Increased delay before hot water comes through - irritating for small quantities e.g.. hand basin.

A number of benefits claimed for combis are actually benefits that all modern boilers have - sealed pressurized CH circuit, all major components integrated into system box (is this an advantage?).

The real benefits are:

- 1) No tanks and cylinders - but no warmth in airing cupboard
- 2) Mains pressure hot and cold at all outlets.

For instant hot water in a large house a combi could be put to good use by either supplying HW to a nearby kitchen tap and also supplying HW and CH with a conventional boiler, avoiding the delay of HW on a long pipe run to the kitchen. Or perhaps in another arrangement a combi might provide the HW for a shower only (giving all the benefits of a good shower but without a noisy and expensive pump).

About Water Pressure and Water Flow

David Shepherd 15-11-2000

Water pressure and flow rate which, though interdependent, are not the same. It's a common misunderstanding, and something I initially struggled to get my head round when I did my fluid mechanics many moons ago.

The flow rate is proportional to the resistance to flow and to the pressure. This means that:

- (a) for a given pressure, the flow rate is dependent on the resistance to flow.
- (b) for a given resistance to flow, the flow rate is dependent on the pressure.

The explanation detailed below is based upon simple combi boilers. Modern combis of modest power output and many older combis would fall into this category. As detailed elsewhere in this FAQ, higher powered combis and more sophisticated combis are now available which have performance characteristics much closer to those of a conventional boiler, and thus the differences outlined below will be far less noticeable. I have used simple combi system for the purposes of this explanation since it is with these systems that the differences are most exaggerated.

To compare hot and cold water for the same system, we need to refer to point (a).

In a combi system, both the hot and cold water will be fed from the mains and will be at mains pressure. However the resistance to flow in the hot and cold supplies is different. The resistance due to the pipework will be more or less the same for both. But the boiler itself restricts the flow rate of hot water so that the water remains in the boiler long enough to be heated to the correct temperature. Therefore, although the pressure at the hot and cold taps is the same, the flow rate from the hot tap will be less than from the cold tap. That is the difference you notice.

In a conventional system with a hot water cylinder fed from the cold water tank in the attic, the pressure will again be the same at the hot and cold taps. The resistance to flow will be similar in both the hot and cold system and thus the flow rates will be more or less the same. The pressure of the water in this case will be due to the difference in height between the cold water tank and the tap you are using. This pressure will be considerably less than mains pressure, an important point when it comes to showers and baths (see below).

You will get a better shower with a combi than from a conventional system.

To compare a shower fed by a combi boiler with one fed by a hot water cylinder, we need to consider point (b) above.

The shower head will provide a large resistance to flow. With a combi boiler the hot water is at mains pressure so the flow rate to the shower will be good (but will never be higher than the boiler itself will allow). With a hot water cylinder, the pressure is significantly lower than mains pressure so the flow rate will be comparatively low.

To compare a bath fed by a combi boiler with one fed by a hot water cylinder we need to refer to both (a) and (b).

Bath taps do not give a huge restriction to flow. Therefore from a hot water cylinder we get a reasonable flow rate despite the low pressure. However, with a combi boiler, although the pressure is higher, the flow resistance (due to the boiler) is also much higher, and this more than offsets the higher pressure. The flow rate is therefore much lower.

To sum up:

Combi systems

1. High (mains) pressure hot water
2. Good flow rate for showers
3. Poor flow rate for baths

Conventional systems

1. Low pressure hot water
2. Poor flow rate for showers (can be improved with a pump)
3. Good flow rate for baths

Note that I have assumed a simple basic combi boiler; a simple hot water tank in an upstairs airing cupboard with cold water tank in the attic; decent mains water pressure; houses that are not 10 stories high!!! All those parameters can vary (e.g. you have a fairly high powered combi) and as such the differences I've outlined will be more marked in some situations than others.

To come back (finally!!) to the original topic....

As far as the choice between boiler types goes, it's a question of personal priorities. Someone (like myself) who takes mostly showers and only uses the bath for a long leisurely soak now and then, might consider the high pressure shower a considerable benefit and the slow filling bath no more than a minor irritation at most, and therefore be swayed towards a combi system. On the other hand someone who has few showers (or maybe has a high powered electric shower already) and for whom a slow filling bath is a major irritation, might be swayed towards a conventional system.

There are, however, several other factors to consider, and again, much of it boils down to personal preference.

Living with a Combination Boiler: (1) by Colin 14/11/2000

I don't think I would go for a cheap one. I fitted a 95,000BTU Ariston combi very recently, and am very happy with it. Comes with built in bypass, filling loop, frost protection, fully modulating, clock (although Mickey mouse), pump, etc - and one of the smallest dimensions you will find.

The hot water comes through quickly with the Ariston set on comfort mode - which keeps the water in the heat exchanger warm. Many combis have this feature now. I don't use it in this mode personally, as once water has been drawn the first time in the morning, the water is generally still warm in the pipes / heat exchanger. I don't see the point in the boiler cycling 24 hours a day just to keep the heat exchanger hot.

Filling a bath takes 10-15 minutes with the Ariston. Not a problem in our household, showers (which are excellent) being used most often.

In addition to Ed's comments (above) I would add:

Drawback: No stored cold water for mains failure (although this could be catered for) [\[6\]](#)

Advantage: unlimited supply of hot water

I fitted the combi in the same airing cupboard that I removed the hot water tank from (on the back wall) - cupboard is still as warm, with more space than before.

One thing I would add is if you are going for a combi powered shower, get a thermostatic mixer. They aren't cheap (c. 150-200+ quid) - but will prevent the fluctuations when a toilet is flushed / hot is drawn elsewhere. [\[7\]](#)

A few more advantages / disadvantages -

Advantages:

1. No need for any cold water in loft (unless kept for emergency supply)[\[6\]](#). No risk of water freezing in loft and more continuous insulation possible (no need for the gap previously under tanks)
2. Ease of flushing system under mains pressure - less sludge build up. [\[2\]](#)
3. Excellent shower
4. Drinking water available at all taps [\[3\]](#)

Disadvantages:

1. Higher system pressure [may seek out leaks] (not a problem in my view)
2. WC ball-cocks need changed to high pressure ones, or steps taken to reduce pressure to WC cisterns
3. Condensation on WC cisterns. I have found this with mains feed in my last two installations. Better ventilation would help, obviously. [\[1\]](#)[\[5\]](#)
4. Fluctuations in shower temperature. Can be alleviated by careful plumbing and draw-off, or thermostatic mixer.
5. Standard Low Pressure mixer showers cannot handle mains pressure [\[4\]](#) Mine's a Mira (obviously Low Pressure) mixer. It makes a very strange noise when turned on, and takes a lot of force to switch off - so much so, that my girlfriend can't switch it off herself... I am waiting for the control to come away in my hand when switching it off one of these days... - need to get a High Pressure thermostatic fitted. It worked ok (although pathetic) when fed from the attic tanks.
6. Likely requirement to change tap washers / re-seat taps due to increased pressure (in old installations) - in two installations I have had

dripping taps once converted to mains pressure.

[1] (John Schmitt) This hinges to a great degree on whether the WC is in a separate room from the bath/shower. Bathing and showering are two very humidity-intensive activities.

[2] (Ed Sirett) Not strictly an advantage of a combi boiler but of sealed circuit boilers in general. Ideally sludge should not build up to begin with by following sound installation and maintenance.

[3] (Ed Sirett) You don't have to use tank fed cold taps just because the hot is fed from a tank but it does help with (especially manual) mixer taps.

[4] (Ed Sirett) On Standard Low Pressure mixer showers if both feeds are at mains pressure then there is usually not too much of a problem.

[5] (CliveE) This feature is not a consequence of having a combi boiler but rather one of the consequences of mains-fed WC cisterns in general. It's just the fact that fresh water entering the cistern is colder if the water is coming directly from the mains, causing water vapour in the air to condense on it. If it comes from the cistern (tank) in the loft it should be a bit warmer because the thermal insulation beneath the cistern should have been removed to keep the water from freezing in winter.

[6] (CliveE) Someone's advantage of having no cold water cistern in the loft is another's disadvantage of having no water when the water supply goes off. This "disadvantage" has to be balanced against the usually small risk of the water mains failing.

[7] (Adam) Fluctuations can be greatly minimized: 1) Split the cold water supply to cold taps from the cold water combi supply. As the mains enter the house go straight to the combi inlet. As it enters the house, tee off a feed to all the cold taps. You could put a gate valve where the cold line tees off using this to restrict the whole cold supply line. 2) Put in-line restrictors at cold taps (about £3 each). Basin taps and toilets don't need high flow rates so throttle them back. 3) Throttle back hot taps too that don't require great flow, if the combi is operating on a water flow detector as the Ariston and Ferroli do. Few hot taps require great flow. The shower and bath tap are about the only ones that do. People

tend to over turn the taps. Just restrict it.

Living with a Combination Boiler: (2) by Chris French 14/11/2000

We have a 3 bed semi (2 adults and a baby on the way, with a 100,000 BTU combi - the minimum size I reckon for HW supply (I can't remember the listed flow rates off hand).

The only downside for me really is that if you run some hot water, then stop, then run a bit more, you get a slug of cold in the middle. Yes baths do fill a bit slower, but it's not that slow, and we are shower people here mostly, baths being the occasional good long soak so it's not an issue.

As for speed of HW arriving, I don't think it takes a great deal longer than it took for the HW to get from the cylinder to the kitchen sink.

I don't have any problem with the dish/clothes washers - a lot of the time they use the cold fill anyway. I keep meaning to just use a cold fill anyway, by the time the combi has heated some water they have stopped filling.

The shower is of course great (thermostatic), and even if the toilet is flushed, or the dishwasher kicks in, the flow rate drops a bit but it's still ok. The HW never runs out, and we don't have the waste of space of an airing cupboard.

Combis and Showers

By CliveE

If a high pressure shower is required then this can be achieved with :

-
- a combi,
 - or an unvented cylinder (like a Megaflo),

- or with a single-sided pump to boost the water after the mixer,
- or more commonly with a dual pump to boost both the H & C supplies before they reach the mixer.

Such pumps can work with a head of as little as 150mm. There are also pumps available to work with negative heads - often used in loft rooms when the shower head is higher than the cistern.

- or with an instantaneous electric heater fed from the mains water, although the flow is usually quite limited.

A well designed shower with short, direct runs of 22mm pipes off a conventional vented system can also give extremely good results. It will tend to be high flow/lower pressure, but a good pressure can be simultaneously achieved if the outlet of the cistern (tank in the loft) is at least 1.5 metres above the shower head. Remember that high flow showers cost more to run due to the extra volume of water heated (and consumed if on a water meter).

High pressure, low flow showers produce jets which are like needles on the skin and can be uncomfortable. Ideally shower heads should be matched to the likely pressure and flow for best results.

Colin

I am having problems with my original low pressure mixer now it is on the combi - so don't assume you can fit a combi without replacing / uprating existing low pressure mixer showers...

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How the Mid-Position Three Port Valve works

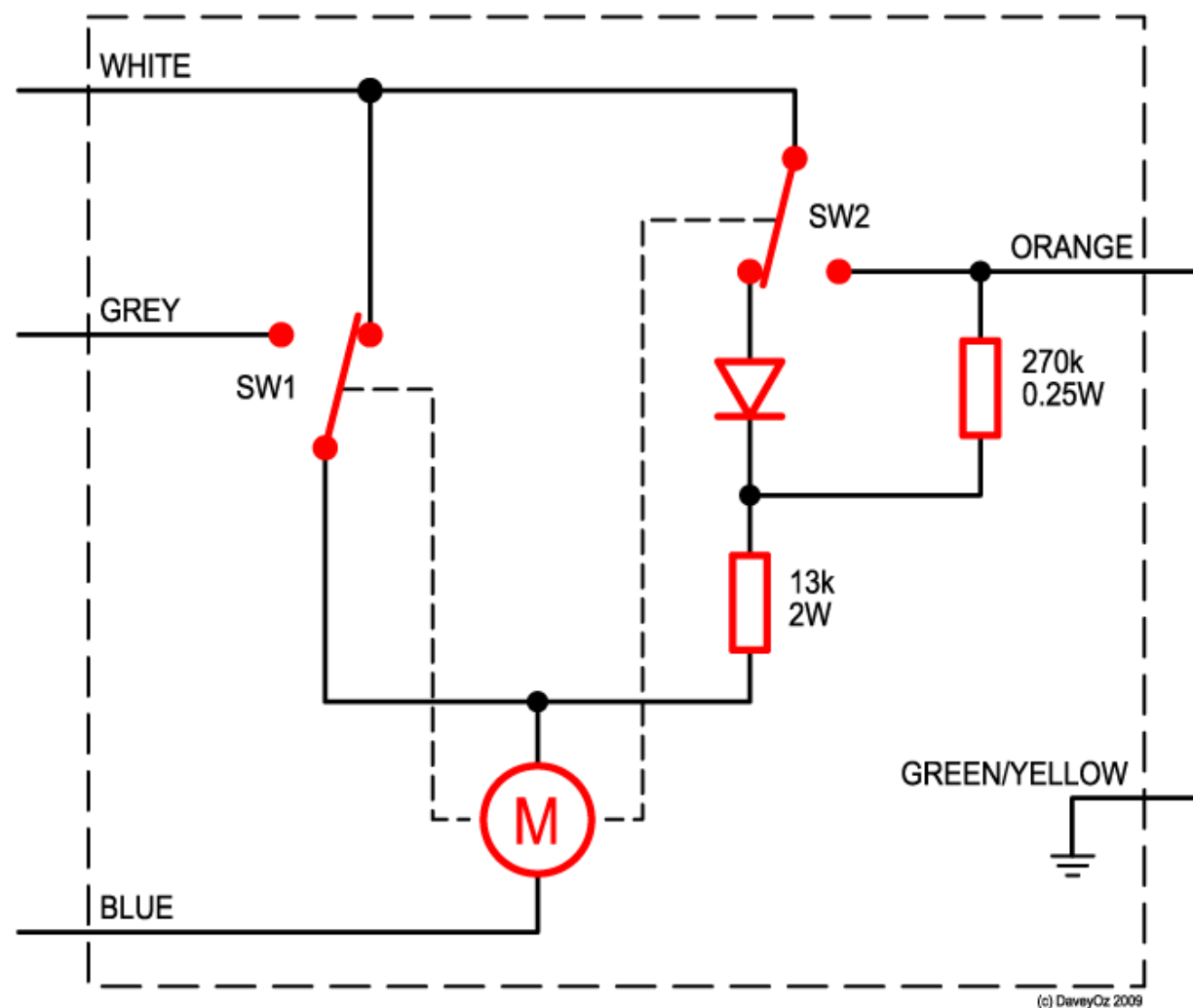
By Matthew Marks with thanks to [Geoff Drage](#) for data

The three port valve is a masterpiece of clever engineering, in that it manages to move to one of three positions using only a cheap non-reversible AC motor, a spring, a couple of micro-switches, a resistor and a diode, and act as a relay for the boiler into the bargain! However, it has obviously required quite a bit of lateral thinking to conjure up, and its operation is thus not easy to understand. Here's how it works.

The spring pulls the valve to open the flow through port B (traditionally connected to the hot water cylinder's heating coil), while the motor winds it towards opening port A (feeding the radiator circuit). If the motor is left continuously powered, it will stall in with port A open, but if it is fed with DC (produced with the resistor and the diode), then it will stall in any position. Two micro-switches, operating just either side of the 'A+B' point, are used to define this position.

This is the circuit diagram of the innards of the valve:

HONEYWELL MID-POSITION VALVE INTERNAL SCHEMATIC



The switches SW1 and SW2 are shown in the valve rest position (port B open). As the valve moves over towards the A position, SW1 changes over just before the A+B point, and SW2 just after. The white and grey wires are the control inputs, the orange is the output to the boiler for port A open, and blue is neutral.

In the central heating and hot water "both off" state, the system wiring results in grey being live. If the valve happens to be in the A+B or A port open position, SW1 will have been operated, the motor will be fed with AC, and the valve will wind to open port A and stay there (although the orange boiler output will not be live). This is a fly in the ointment for this valve configuration: the motor can be left consuming power and wearing out its hot windings unnecessarily (the spec says the valve consumes 6W). This will not happen in the summer though, when heating is never selected: SW1 will be at rest, and the valve will sit un-energised with port B open .

The 270K resistor supplies a small AC current to de-magnetise the motor from the effects of the rectified DC that is used to hold it in the mid-position. Without this, there is some risk that the return spring will not be able to overcome the residual magnetic stiction to return it to the end position.

In the "water only" state, neither grey nor white are energised. The spring will therefore pull the valve back to open port B, where it will sit.

In the "water and heating" state, white is energised. If the valve has port B open, the motor will wind it until A+B, whereupon SW1 changes over, DC is applied to the motor via SW2, and it will stall. If it overshoots, or if it port A was open, SW2 will be operated as well, removing all power from the motor, and allowing the spring to pull the valve back to A+B. It is fun to watch this happening: as the spring pulls the valve back from A open to A+B, the motor acquires quite a momentum and overshoots. It then winds forward a little, and stops in the correct position.

In the "heating only" state, both white and grey are energised (hence the need for a changeover tank stat, and a "hot water not required" output from the programmer). Regardless of the position of either switch, AC will be supplied to the motor, and it will wind to open port A. In addition, SW2 will connect white to orange, switching on the boiler. (The boiler is switched externally to the valve in the other situations.)

As has already been mentioned, a common failure mode is the motor burning out: hence the provision of replaceable heads. In this case, the valve will sit in port B open position and the motor will be cold. The valve can also stiffen up, if water gets in between the two O-rings that seal the actuating shaft. This will manifest itself as the valve sitting in a random position, or in position B but with a hot motor. Applying silicone grease to the operating shaft can cure this: the heating will need to be drained, the valve head and cover removed, and a cir-clip taken off the shaft. The actual valve consists of a freely-rotating rubber ball which is swung on an arm between the two ports.

For more on central heating valves for all sorts, and full schematics of how they are included in complete systems, please see the [Central Heating Controls & Zoning](#) article [\(WIKI\)](#).

Last modified: 22 October, 2019 8:25 PM

UK.D-I-Y FAQ Maintainer: [John Rumm \(editor@diyfaq.org.uk\)](mailto:editor@diyfaq.org.uk) © [Copyright](#) 2019

10 December, 2014 1:54 PM

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Honeywell[®] Sundial[™] Plans

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Domestic Central Heating Pipework Schemas

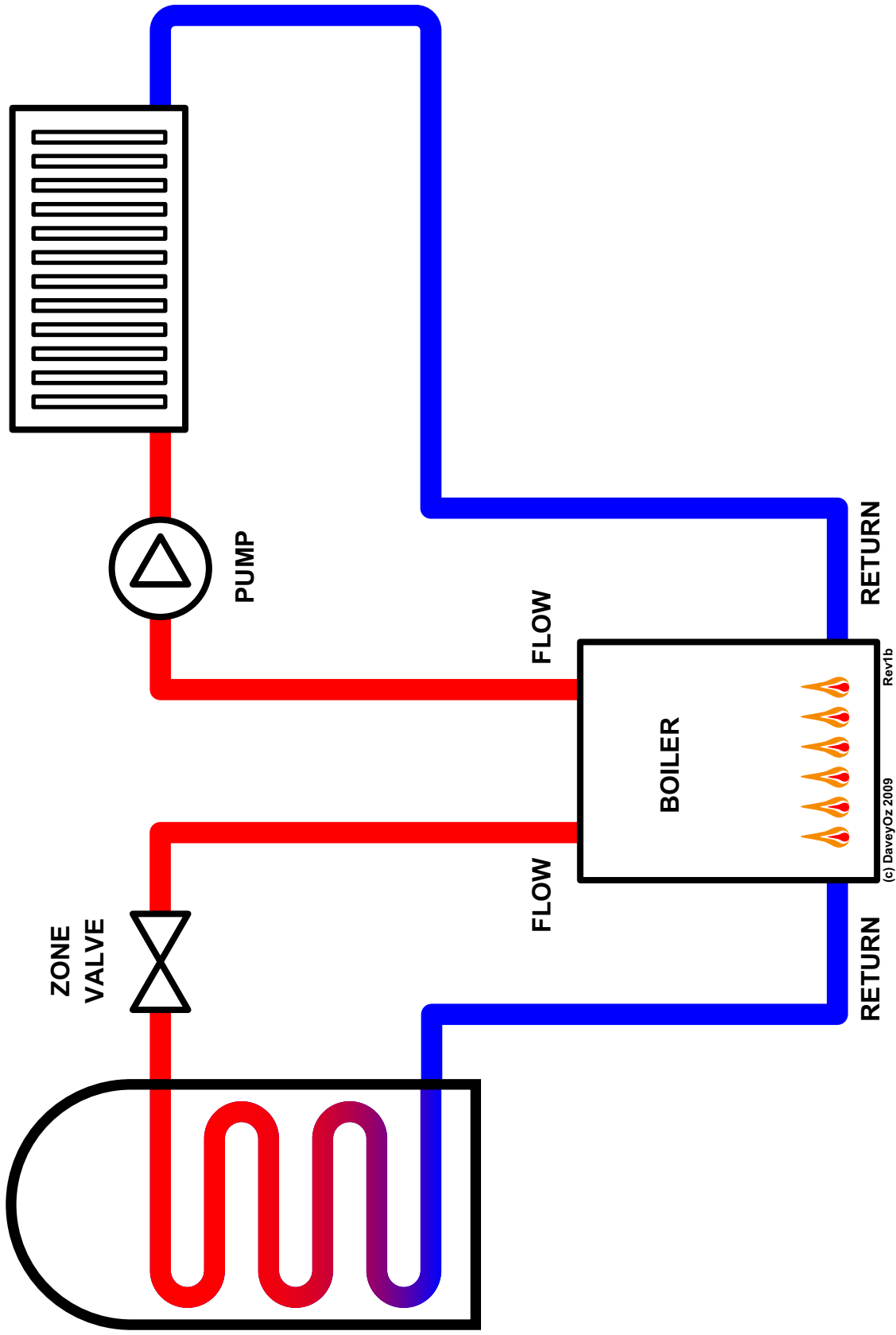
**1st Edition
10 Dec 09**

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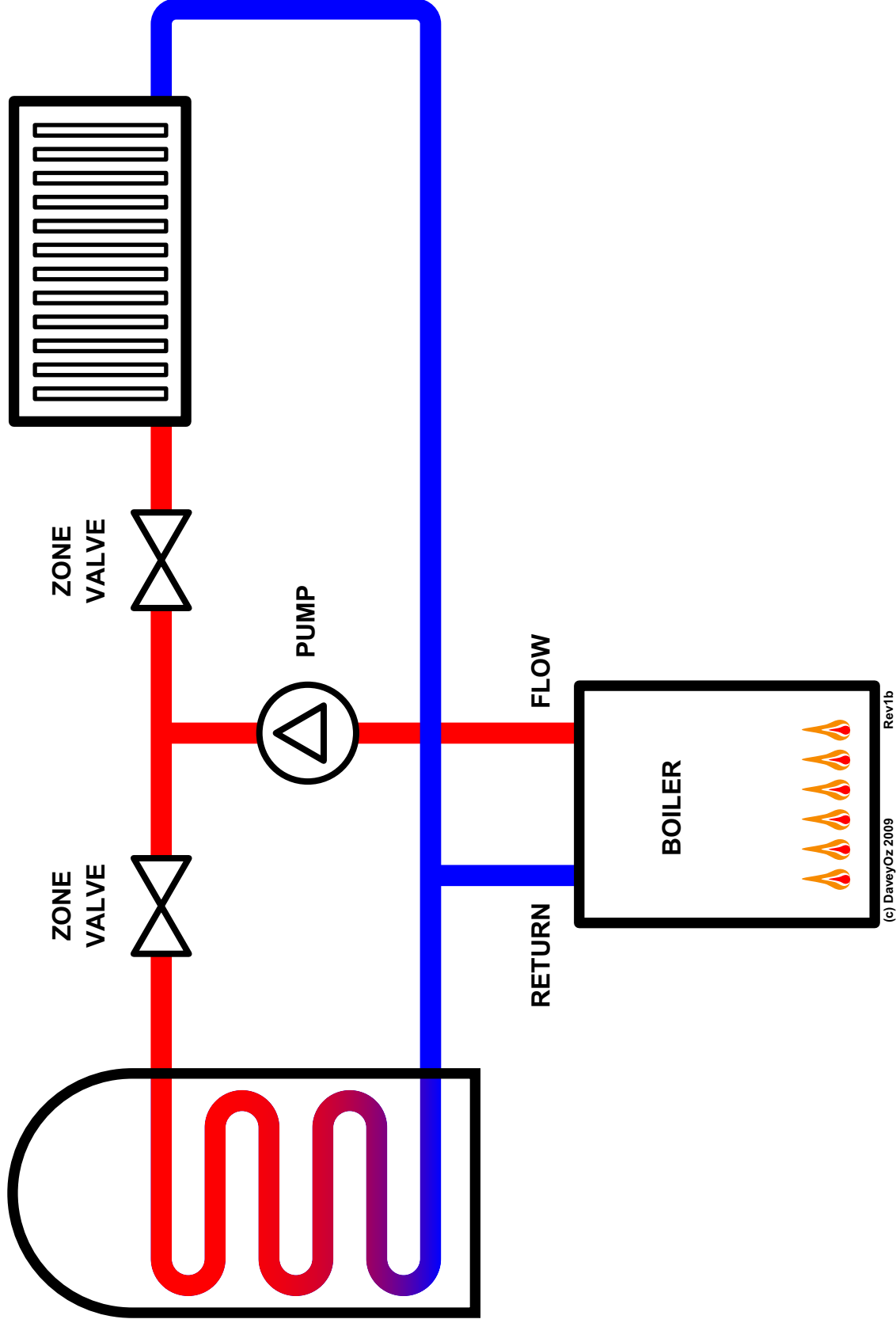
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Artwork (c) DaveyOz 2009

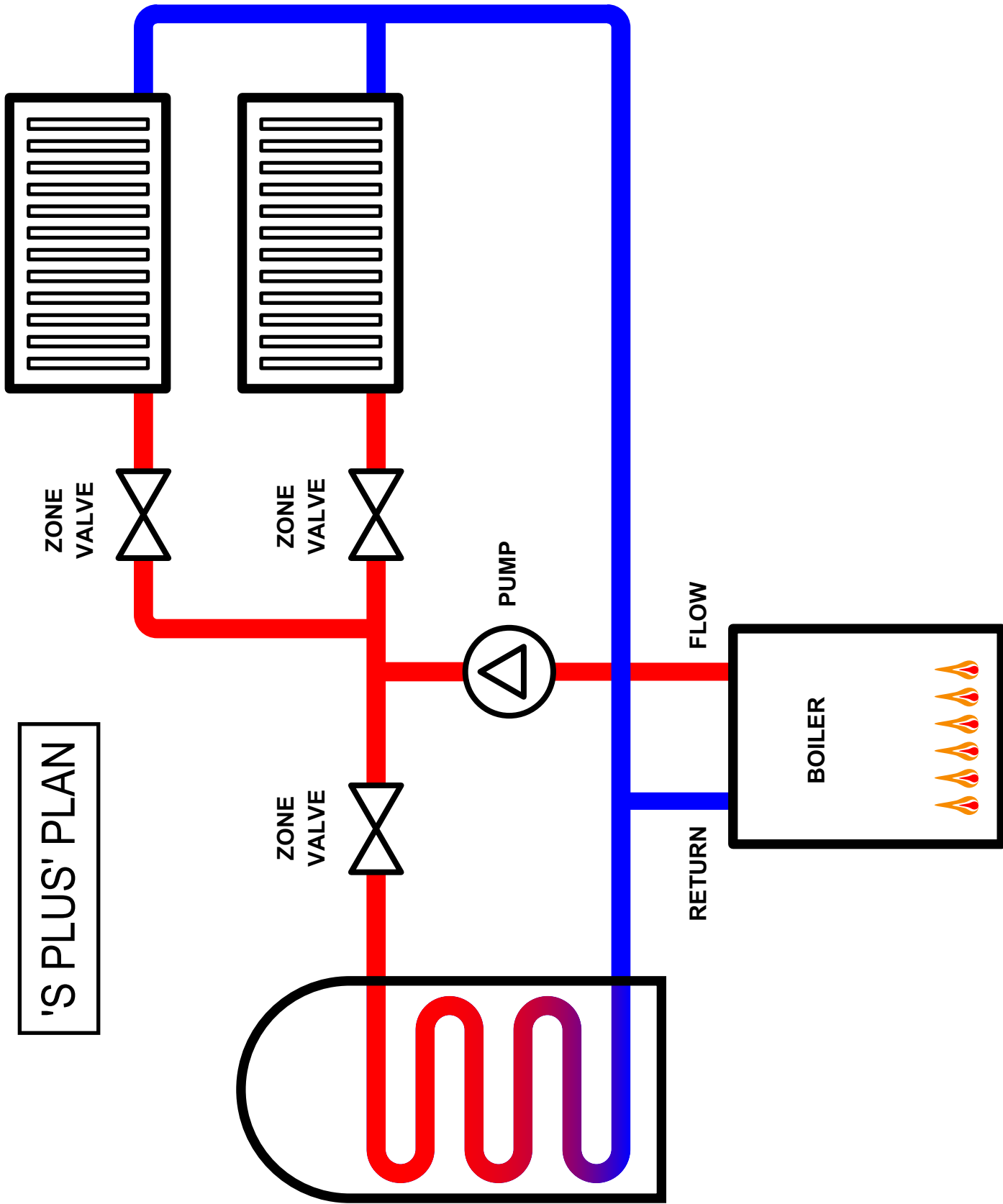
'C' PLAN



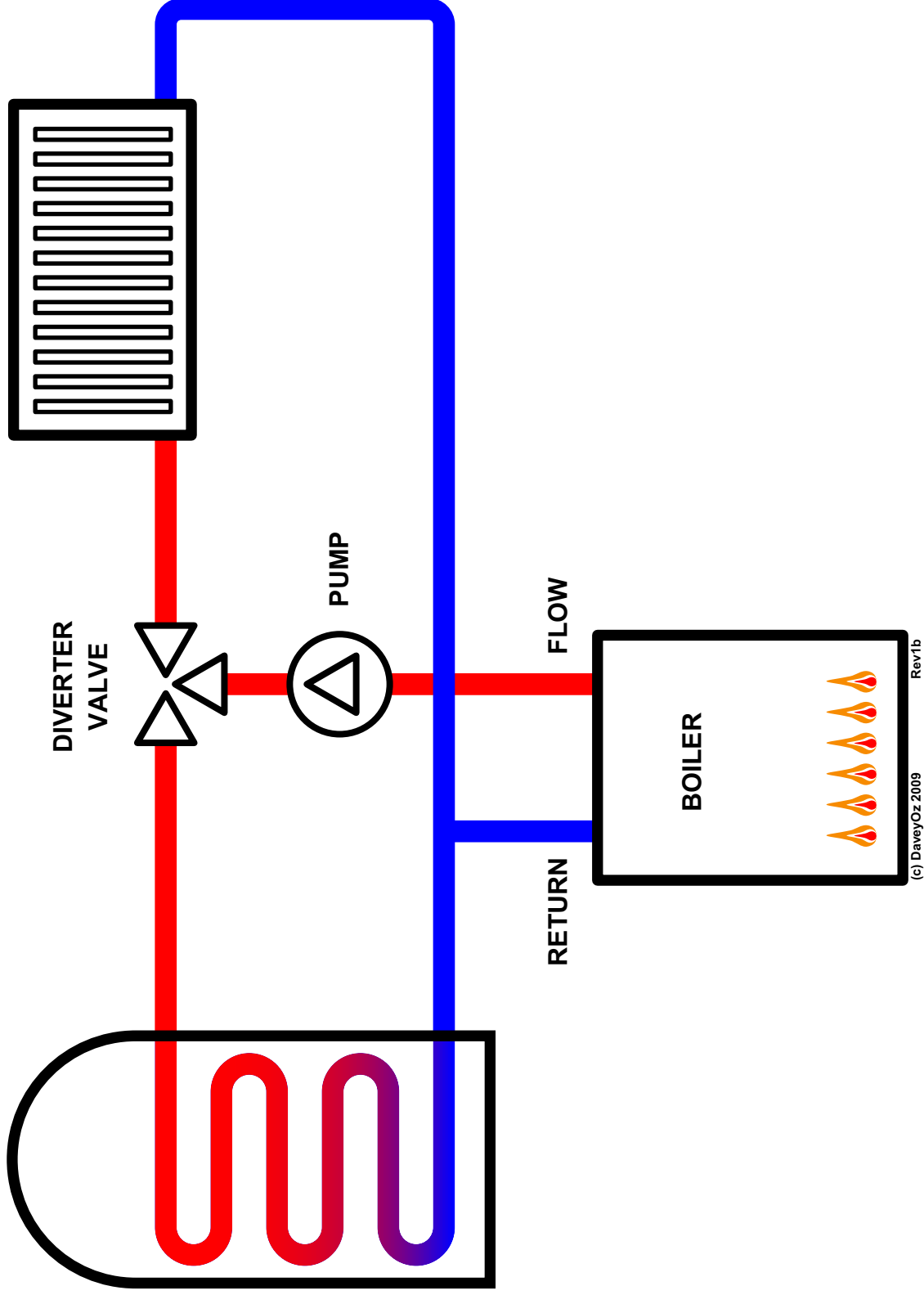
'S' PLAN



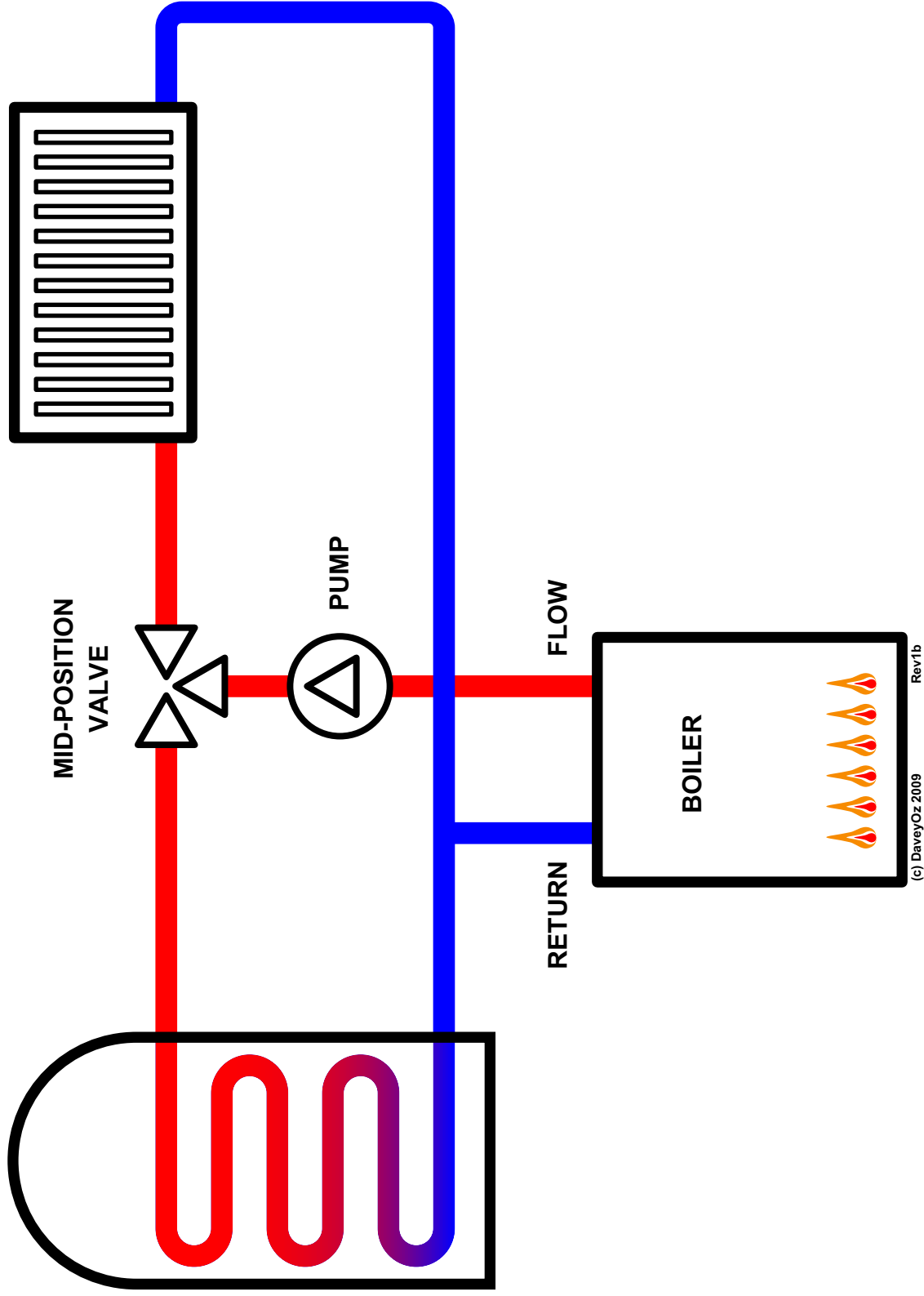
'S PLUS' PLAN



'W' PLAN



'Y' PLAN



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Honeywell[®] Sundial[™]

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Domestic Central Heating Wiring Diagrams with Supplementary Drawings

**Rev 1d
2nd Edition**

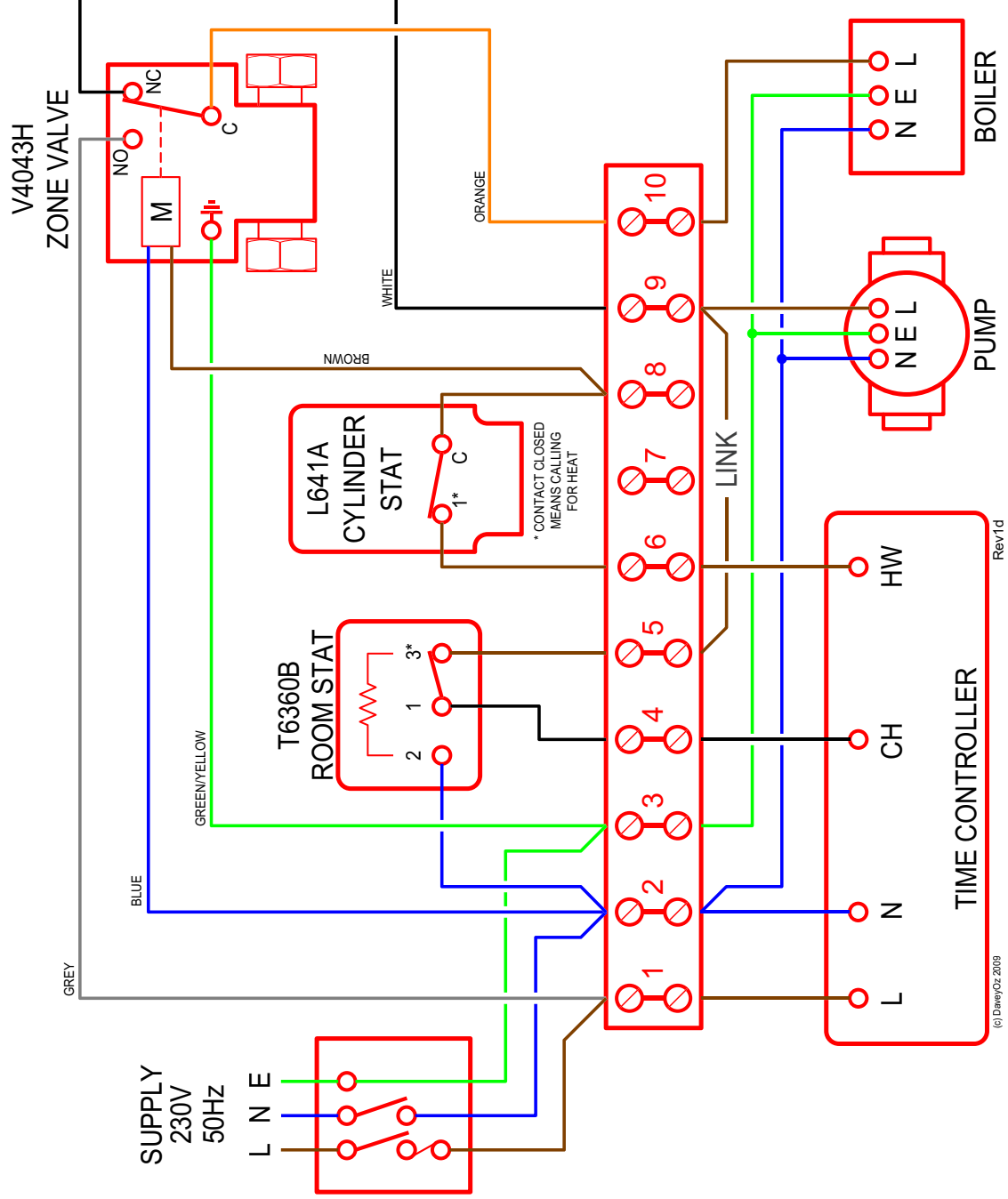
Revision History		
8 AUG 09	1b	Original Issue
26 NOV 09	1c	Amend Y-Plan wiring diagram to show correct terminal arrangement for cylinder thermostat. General cleanup of wiring diagrams.
10 DEC 09	1d	Remove references to 28mm valves

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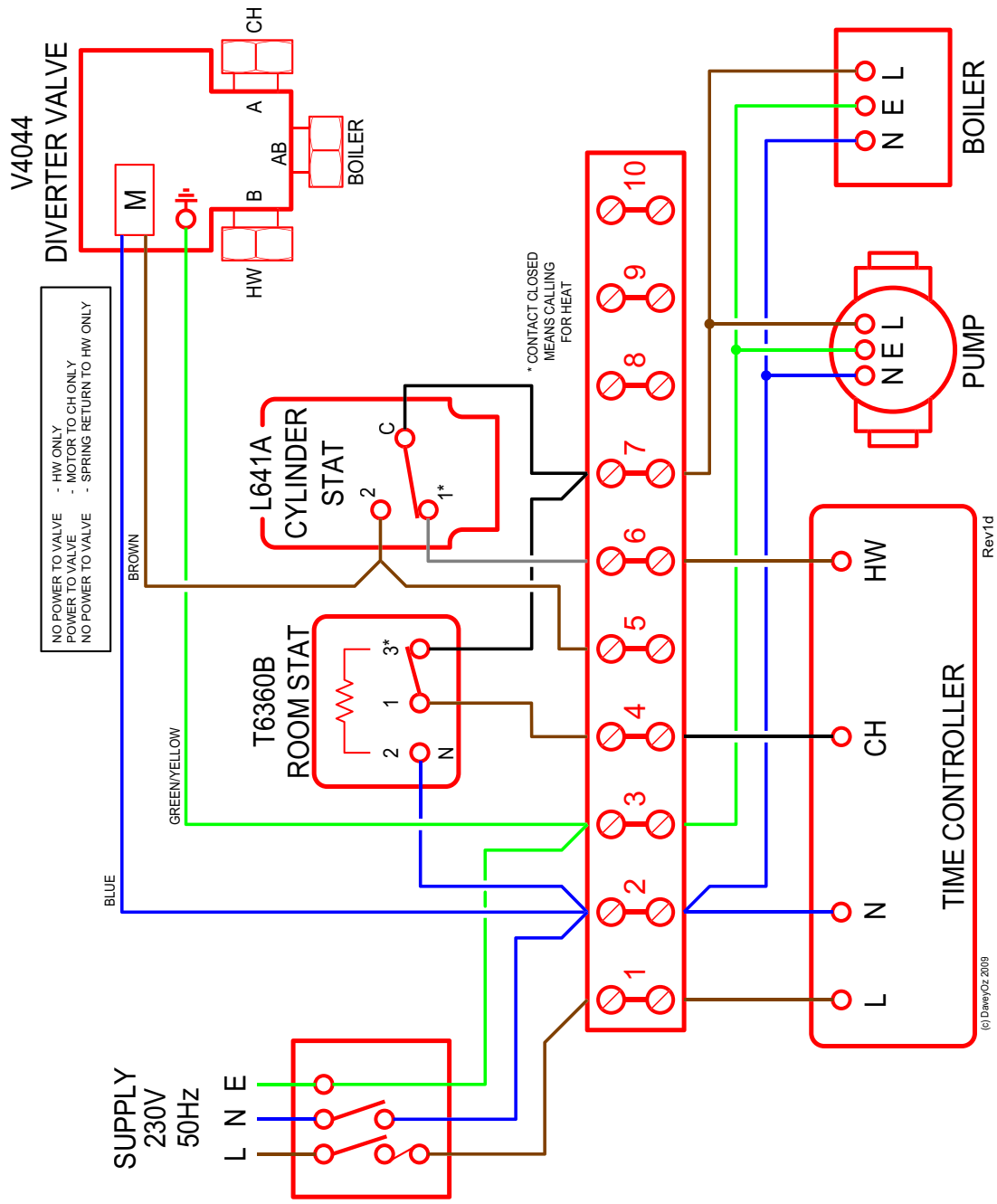
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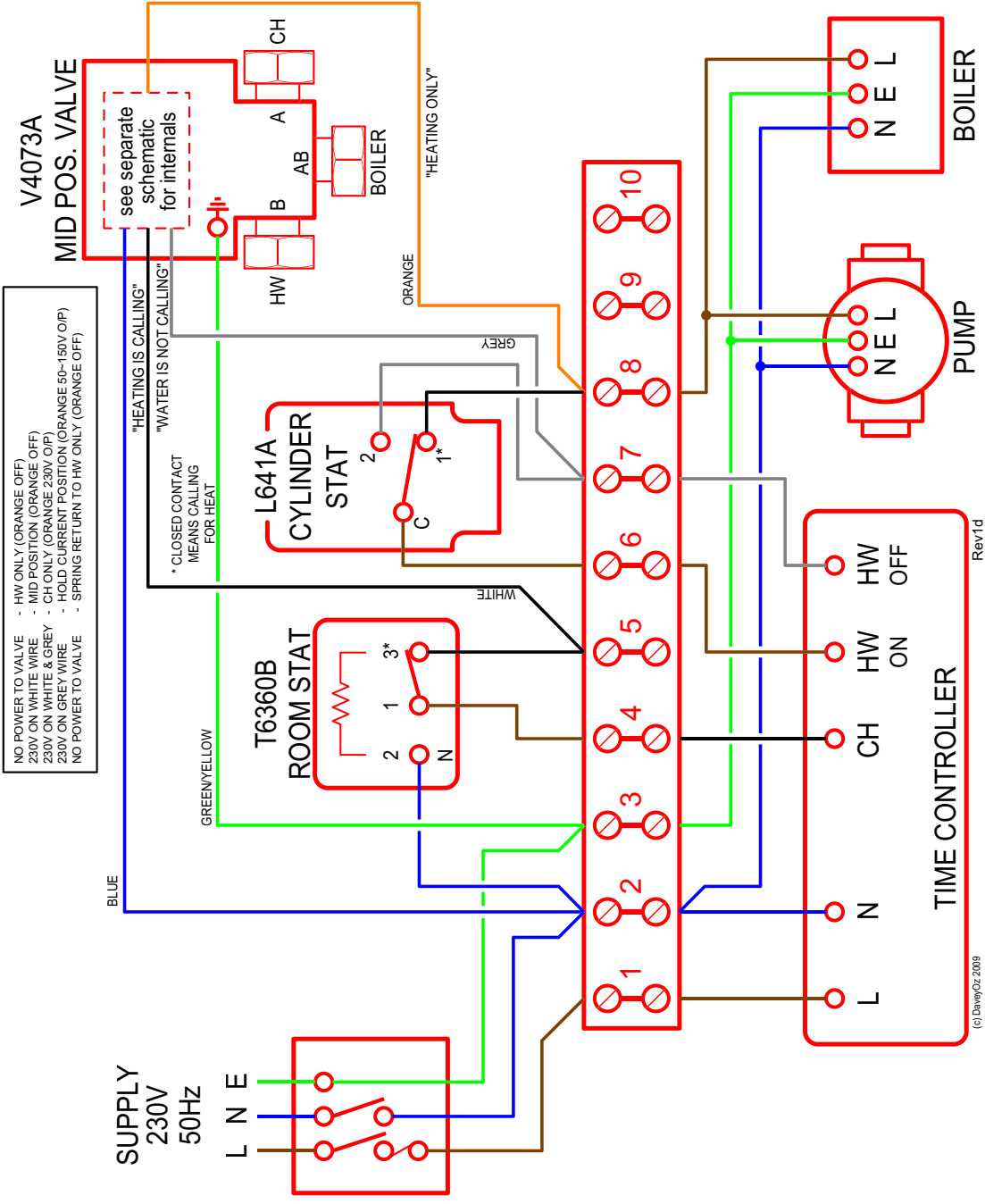
'C' PLAN



'W' PLAN

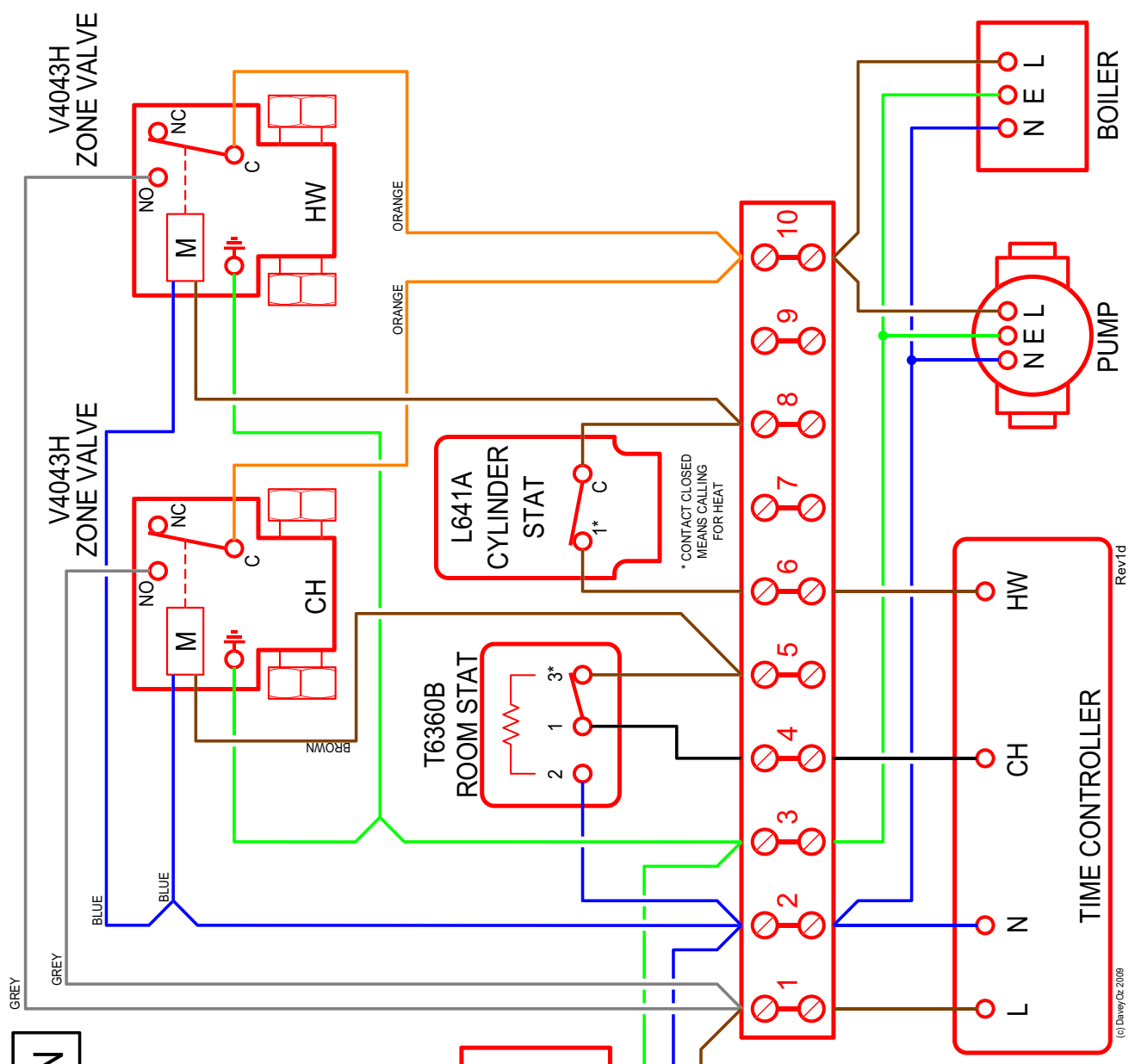
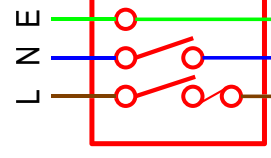


'Y' PLAN



'S' PLAN

SUPPLY
230V
50Hz

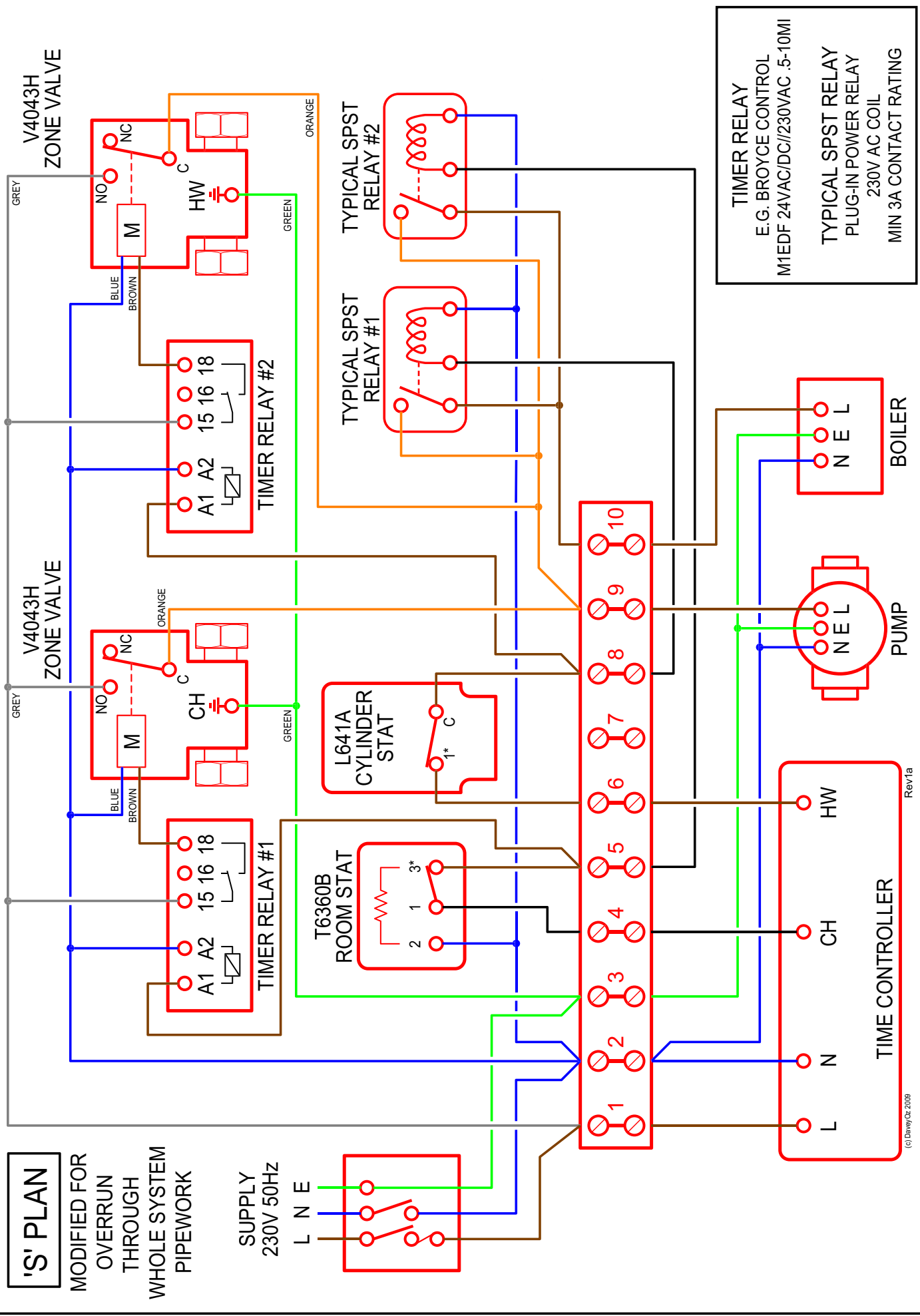


'S' PLAN

MODIFIED FOR
OVERRUN
THROUGH
WHOLE SYSTEM
PIPEWORK

SUPPLY
230V 50Hz

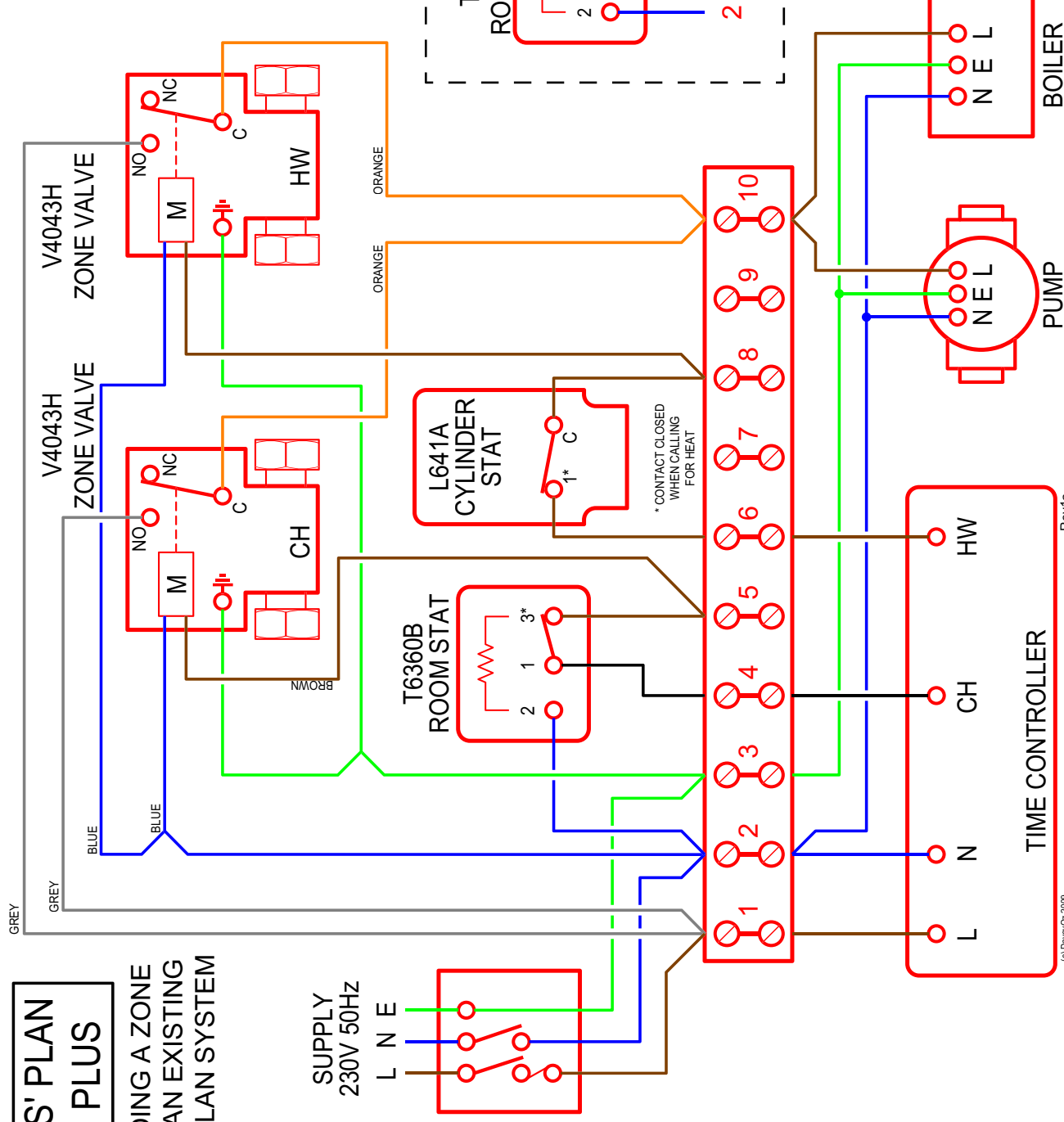
L N E



'S' PLAN PLUS

ADDING A ZONE
TO AN EXISTING
'S' PLAN SYSTEM

SUPPLY
230V 50Hz
L N E

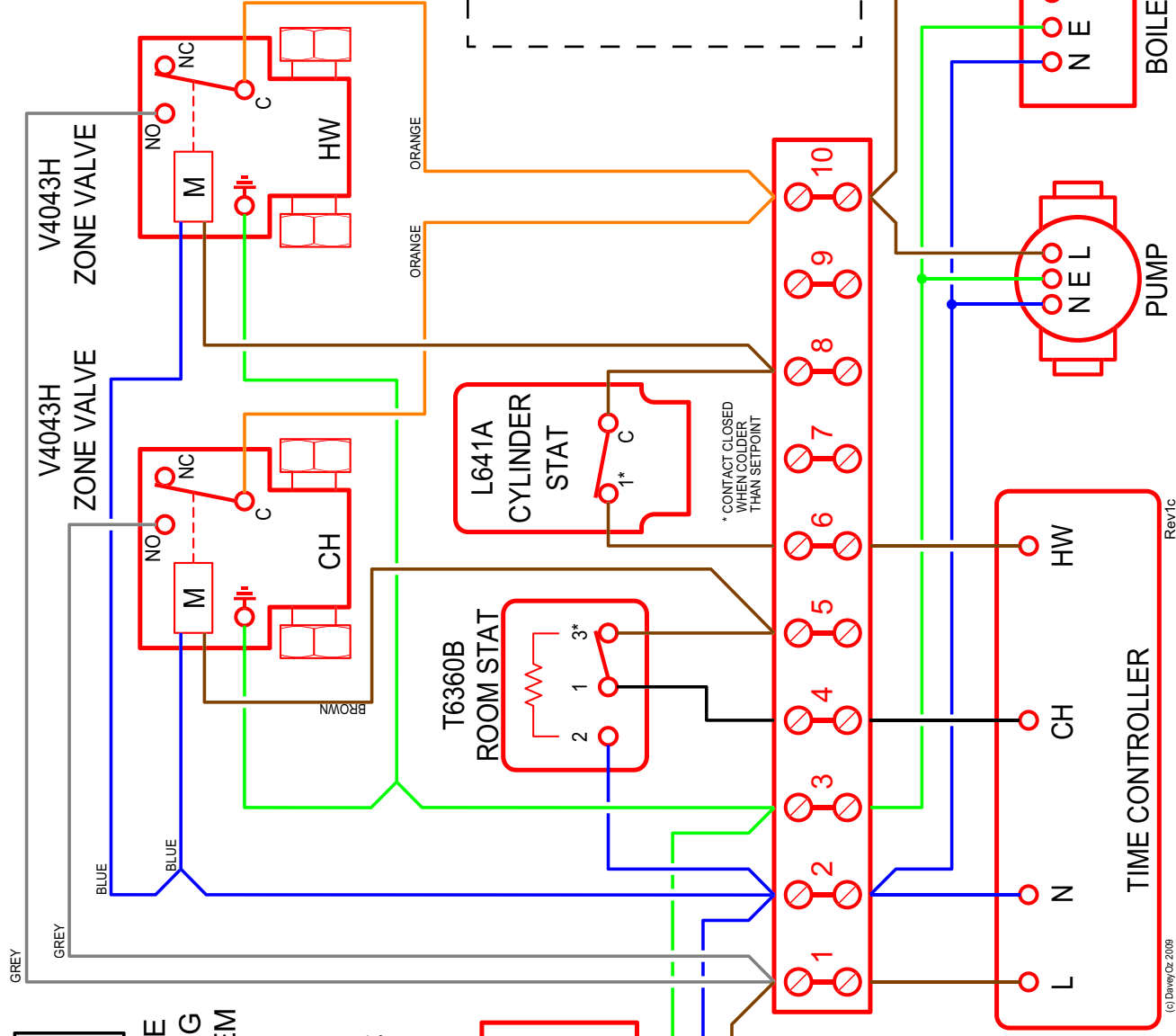
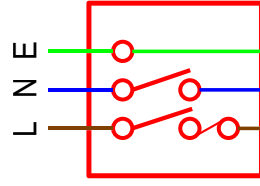


OPTION 1:
CONVENTIONAL STAT
SHARED TIMESWITCH

'S' PLAN PLUS

ADDING A ZONE TO AN EXISTING 'S' PLAN SYSTEM

SUPPLY
230V 50Hz



(c) Davey Oz 2009

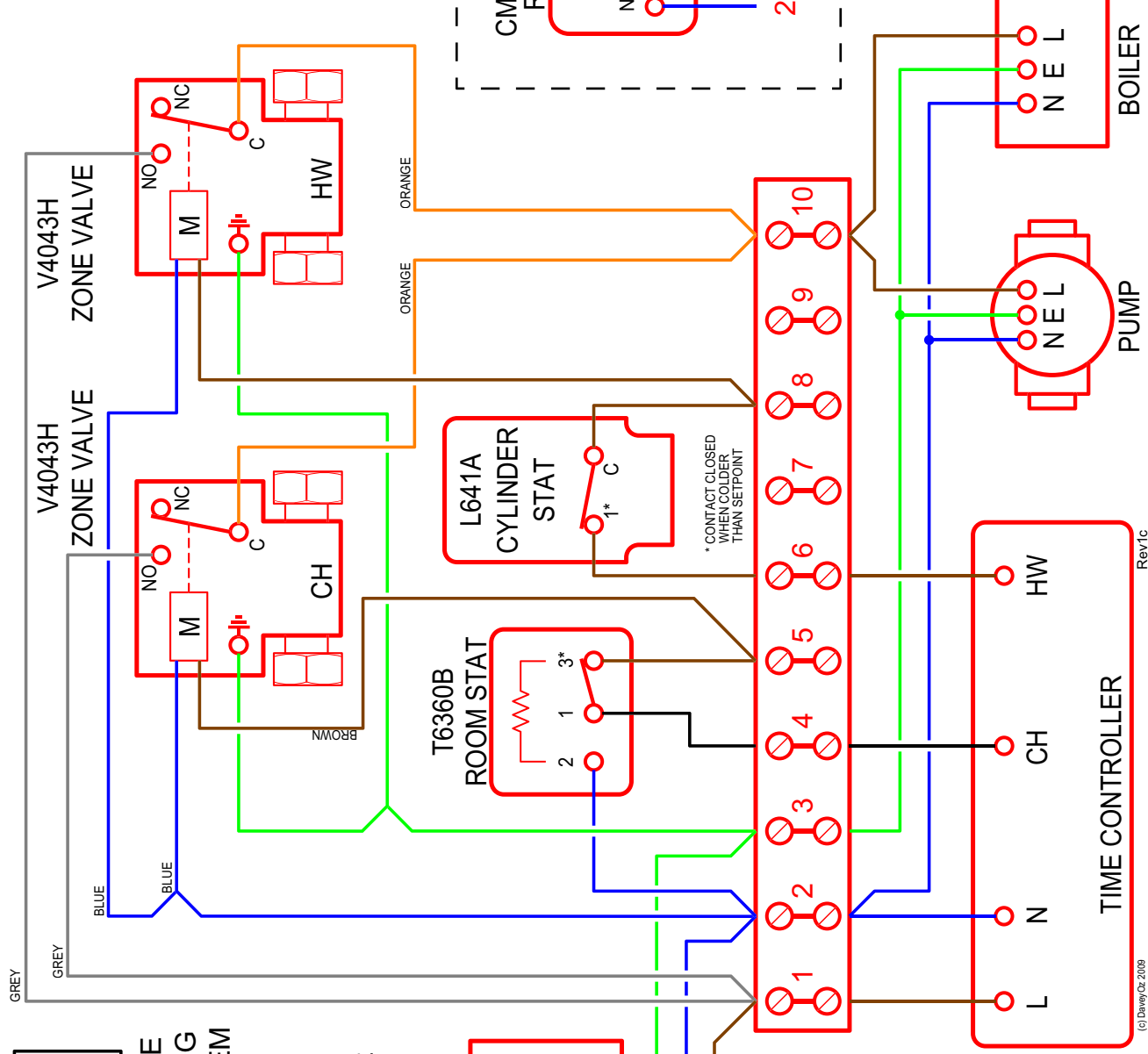
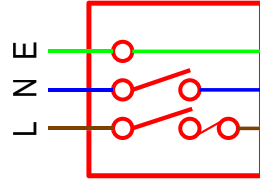
Rev1c

OPTION 2:
2-WIRE CONNECT
BATTERY POWERED
PROG. STAT

'S' PLAN PLUS

ADDING A ZONE TO AN EXISTING 'S' PLAN SYSTEM

SUPPLY
230V 50Hz



(c) Davey Oz 2009

Rev1c

OPTION 3:

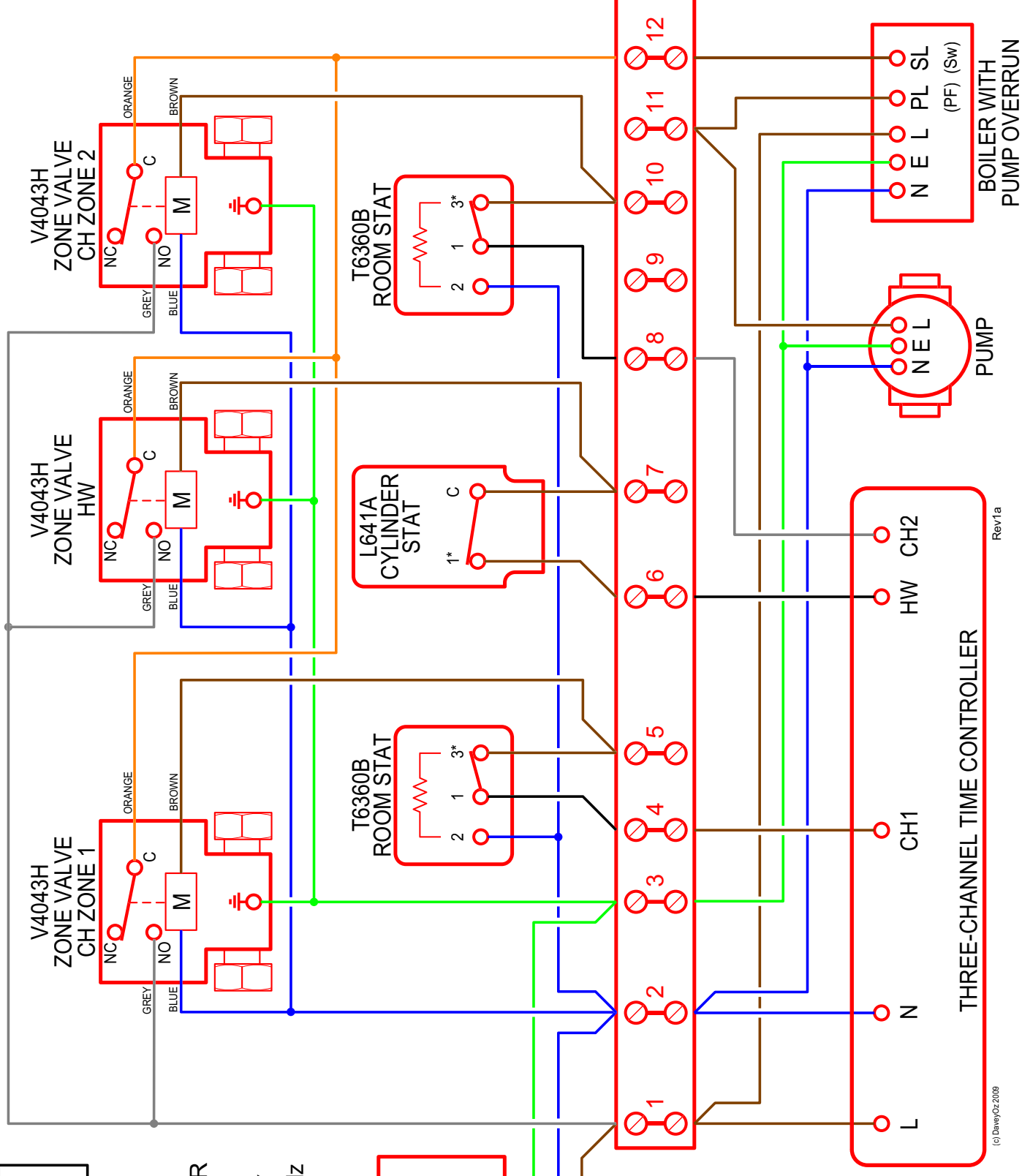
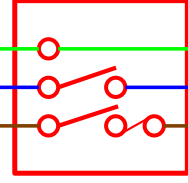
**WIRELESS
BATTERY POWERED
PROG. STAT**

'S' PLAN PLUS

WITH
3-CHANNEL
TIME
CONTROLLER

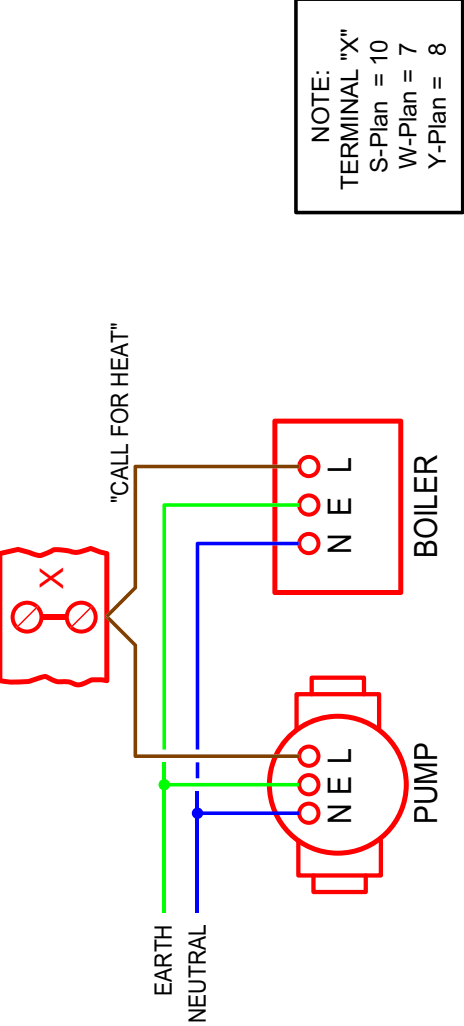
SUPPLY
230V 50Hz

L N E



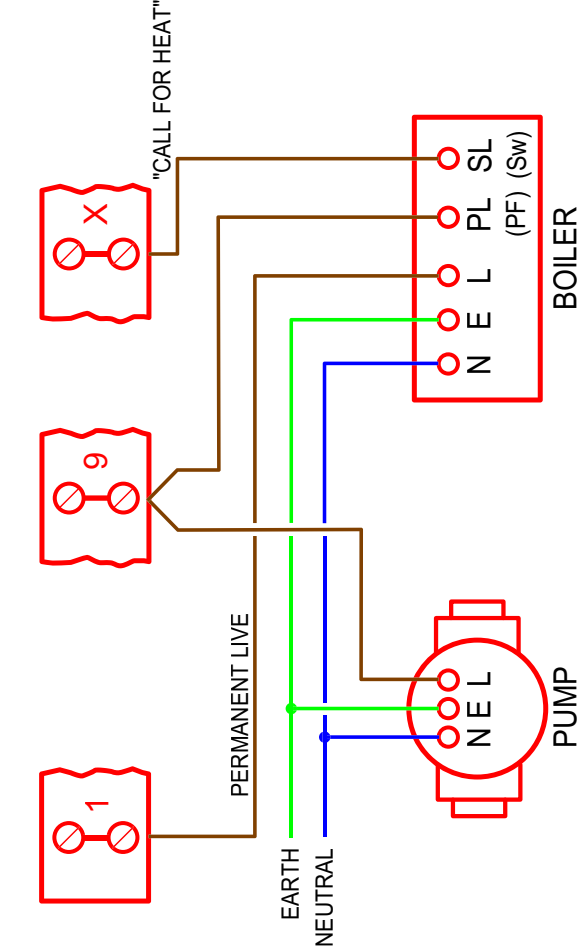
'S' , 'W' , & 'Y' PLANS MODIFIED FOR PUMP OVERRUN ON THE BOILER

"SUNDIAL" CLASSIC



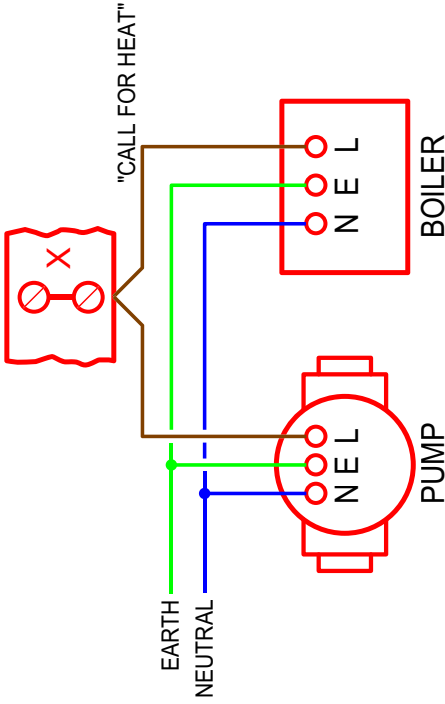
NOTE:
 TERMINAL "X"
 S-Plan = 10
 W-Plan = 7
 Y-Plan = 8

WITH PUMP OVERRUN



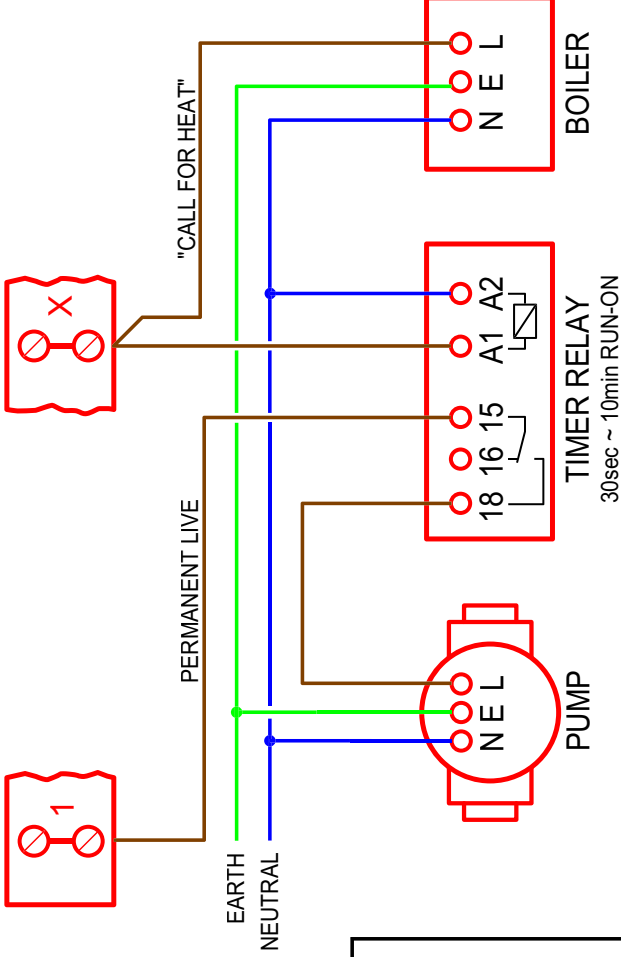
'S', 'W', & 'Y' PLANS MODIFIED FOR
PUMP OVERRUN BY TIMER RELAY

"SUNDIAL"
CLASSIC



NOTE:
TERMINAL "X"
S-Plan = 10
W-Plan = 7
Y-Plan = 8

WITH PUMP
OVERRUN

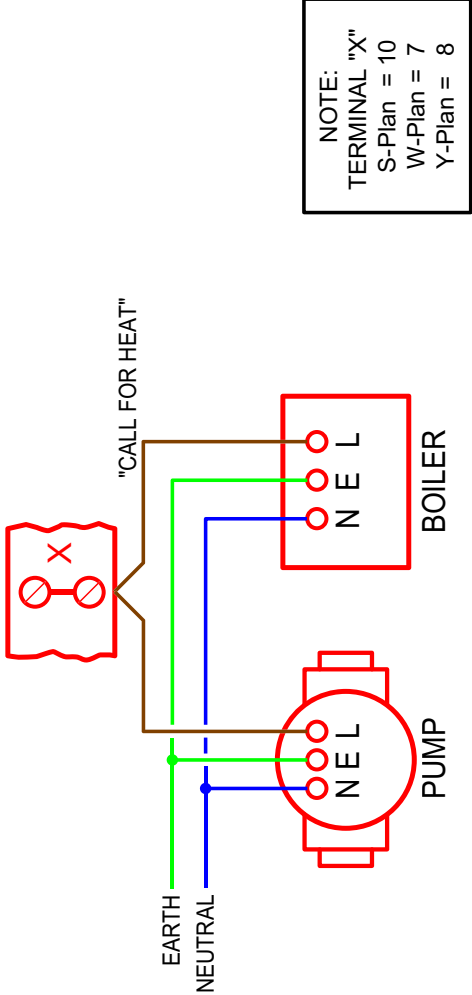


TIMER RELAY MUST BE A
"TRUE OFF DELAY" TYPE
E.G. BROYCE CONTROL
M1EDF 24VAC/DC/230VAC .5-10MI
RS Comps. 300-6045
M1EDF IS DIN RAIL MOUNTING
ALTERNATIVE PLUG-IN TYPE
E.G. BROYCE B8DF OR B1DF

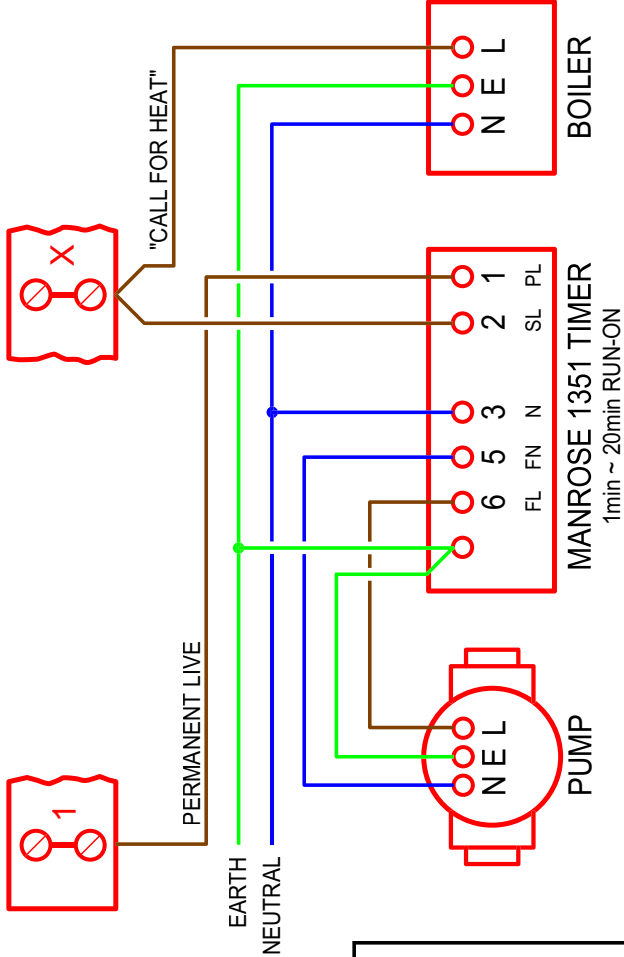
NOTE: ENCLOSURE FOR TIMER RELAY MAY NEED AN EARTH CONNECTION (NOT SHOWN)

'S' , 'W' , & 'Y' PLANS MODIFIED FOR PUMP OVERRUN BY MANROSE EXTRACT FAN TIMER

"SUNDIAL"
CLASSIC

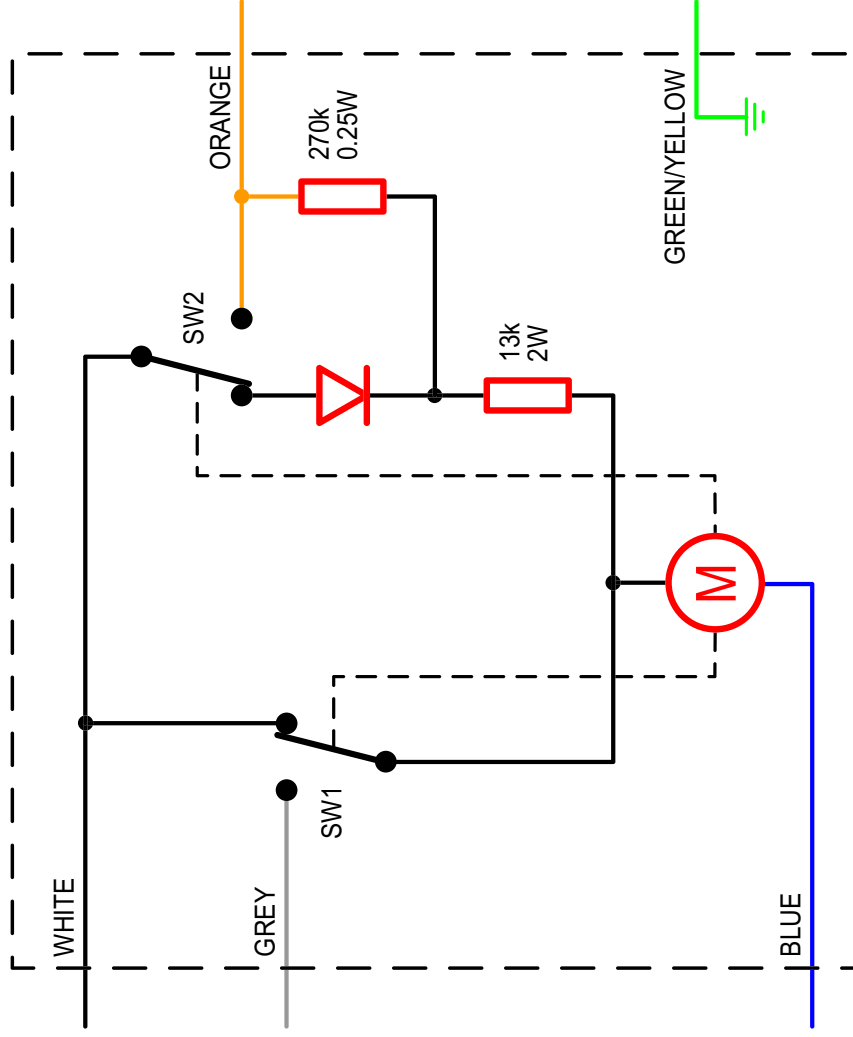


WITH PUMP
OVERRUN

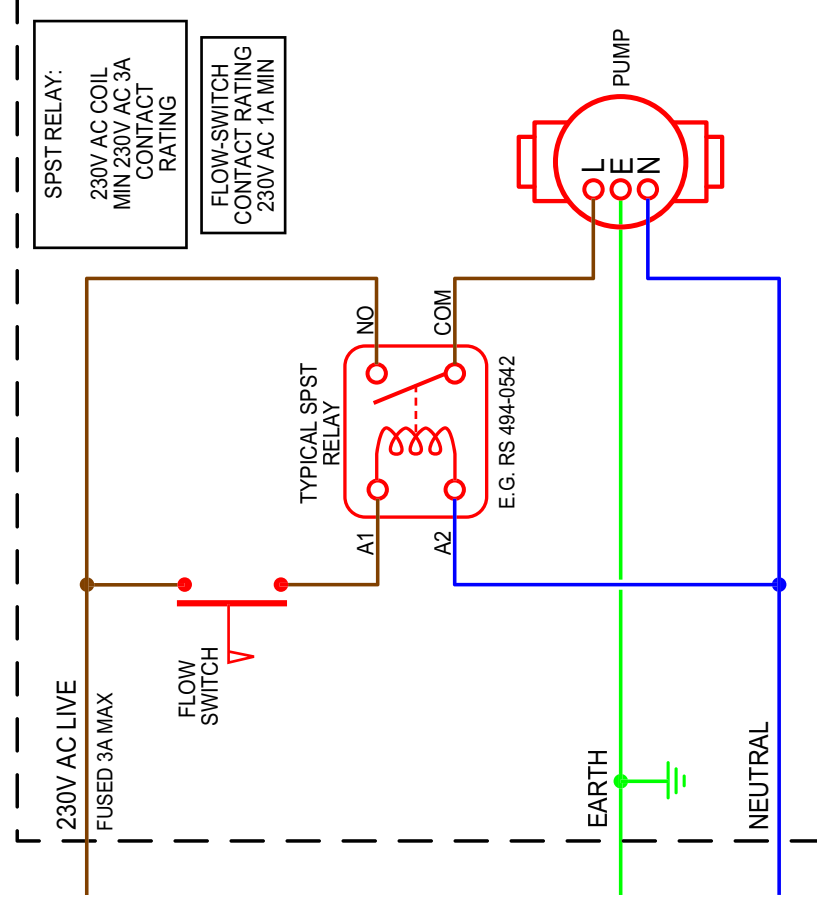


THE MANROSE TIMER MODEL 1351 IS DESIGNED FOR RETRO FITTING TO DOMESTIC EXTRACTOR FANS SO THAT THE FAN RUNS ON AFTER THE LIGHT IS SWITCHED OFF. IN THIS APPLICATION RUN-ON TIME SHOULD BE SET TO A MINIMUM OF THREE MINUTES.

HONEYWELL V4073A MID-POSITION VALVE INTERNAL SCHEMATIC

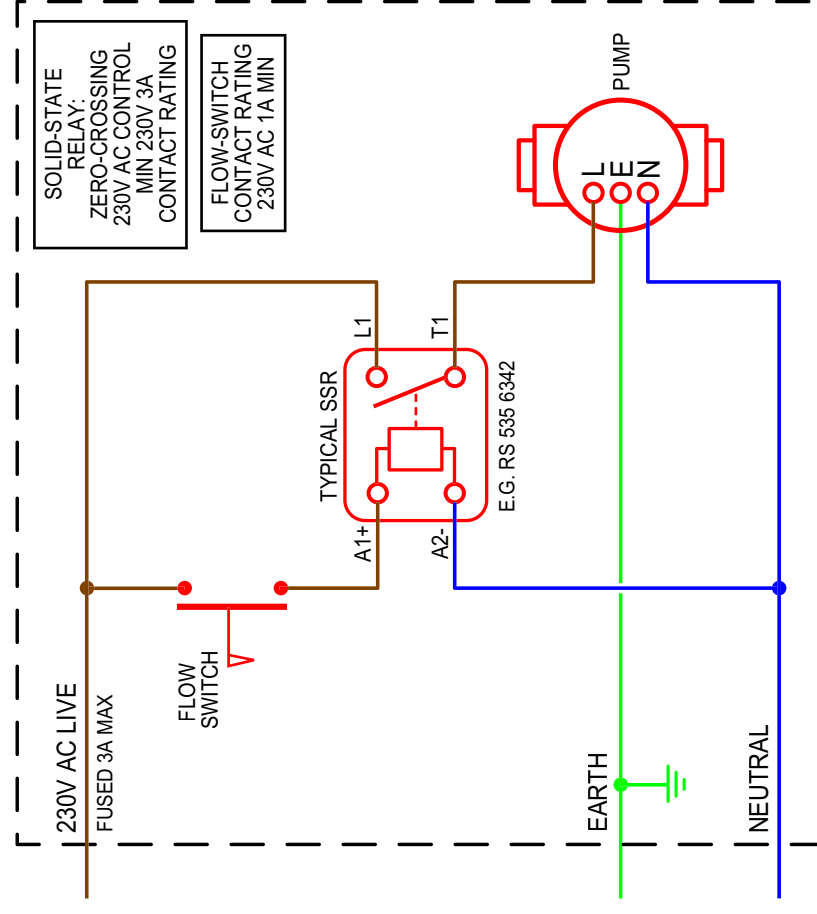


FLOW SWITCH-CONTROLLED PUMP WITH RELAY SWITCHING



(c) Dawey/Qz 2009 Rev1a

FLOW SWITCH-CONTROLLED PUMP WITH SSR SWITCHING



(c) Dawey/Qz 2009 Rev1a

BillP's Pipe Bending Notes

I was shown this method of pipe bending by a retired plumber who now lectures at college. He had been a hands-on plumber all his working life. "I don't care what you've been shown before." He said. "This is all you need to know. Memorise this table and it's a doddle" He was right .

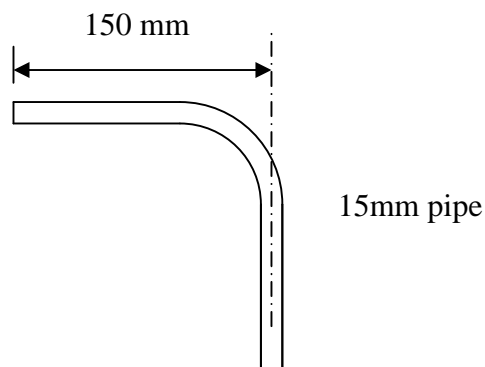
This is the table

	90 deg	60 deg	45 deg	30 deg
15mm Pipe	70mm	46mm	35mm	23mm
22mm Pipe	100mm	66mm	50mm	33mm

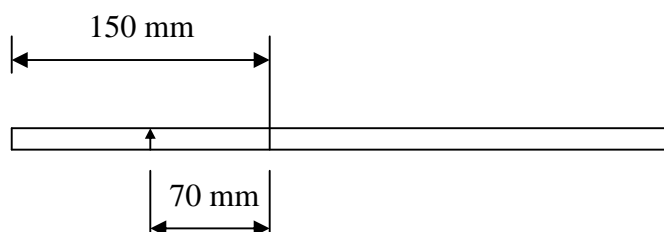
You only have to remember the first column; the rest can be worked out because they are direct relationships.

It is more complicated to *explain* how to use these dimensions than it is to actually *use* them. Once you get the idea it's so easy. You can get bends and sets in the right place without wasting off cuts.

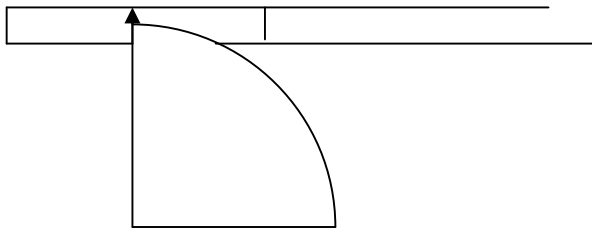
Example 1. Suppose you want to pull 90-degree bend in 15mm pipe so that centre line of the pipe is 150mm from the end.



Measure from the end of the pipe 150mm and make a mark. Look at the table for a 90-degree bend in 15mm pipe and you will see 70mm. Measure 70mm back your first mark, and mark this point with an arrow.

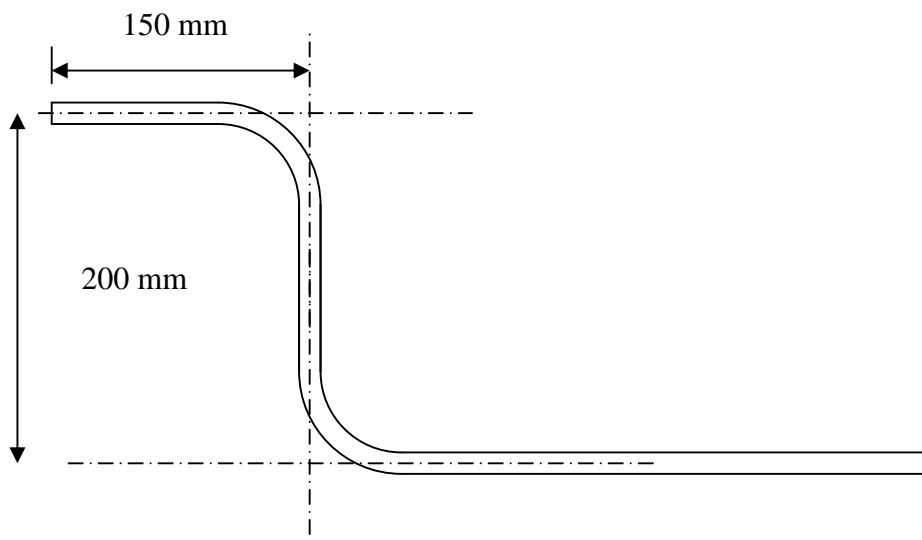


Put the pipe into the bender so that the arrow lines up with the edge of the curved former. In other words, this is where you start forming the bend.



Pull the bend to 90 degrees. Job done.

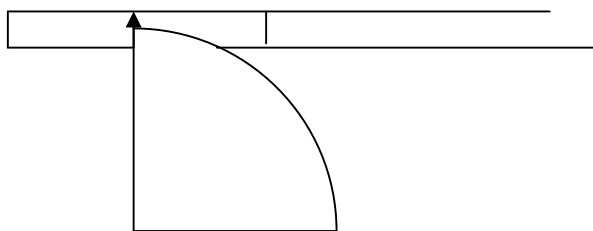
Example 2.

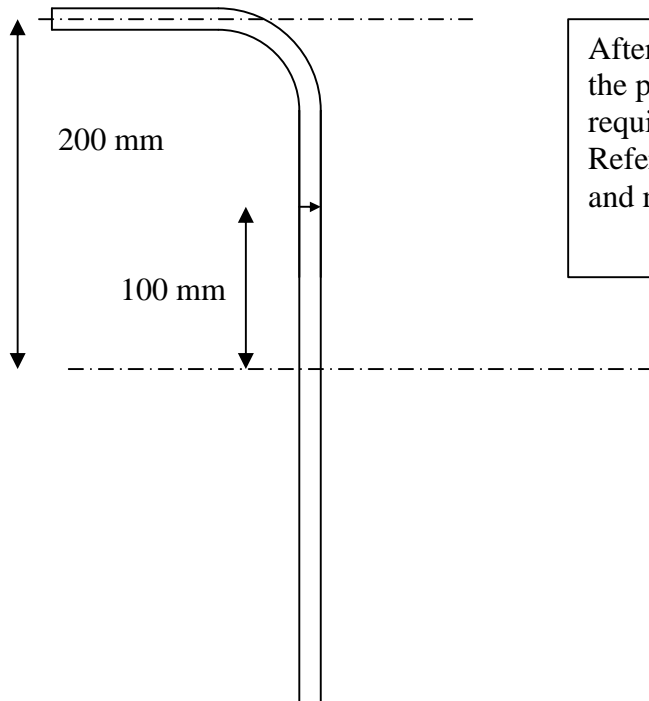


If we want to pull this set using 22mm pipe.

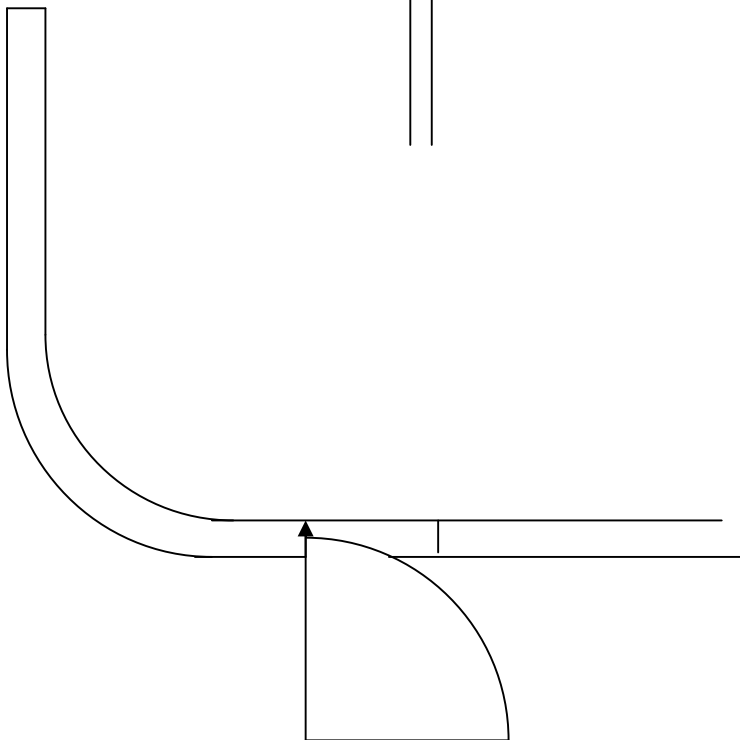
Measure 150mm from the end of the pipe and make a mark. Looking at the table for a 90 degree bend in 22mm pipe you will get the dimension of 100mm. Measure 100mm back your first mark, and mark this point with an arrow.

Put the pipe into the bender so that the arrow lines up with the edge of the curved former, this is where you start forming the first bend.



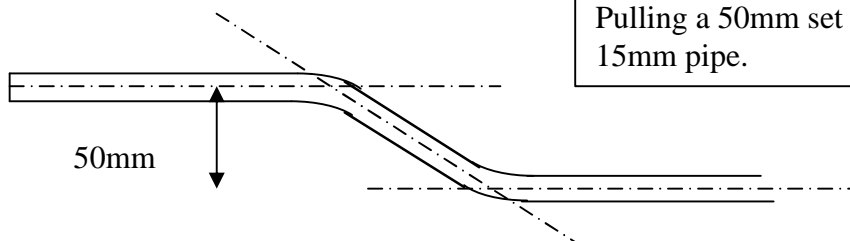


After you have pulled the first bend, mark the pipe where the centreline of the required second bend would cross the pipe. Referring to the table measure back 100mm and mark the arrow.



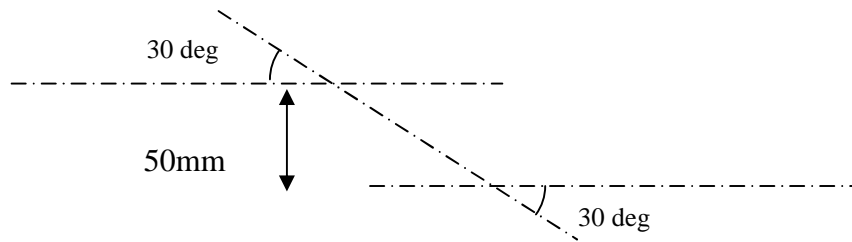
Put the pipe into the bender so that the arrow lines up with the edge of the curved former, this is where you start forming the second bend. Pull the second bend to 90 degrees.

Example 3

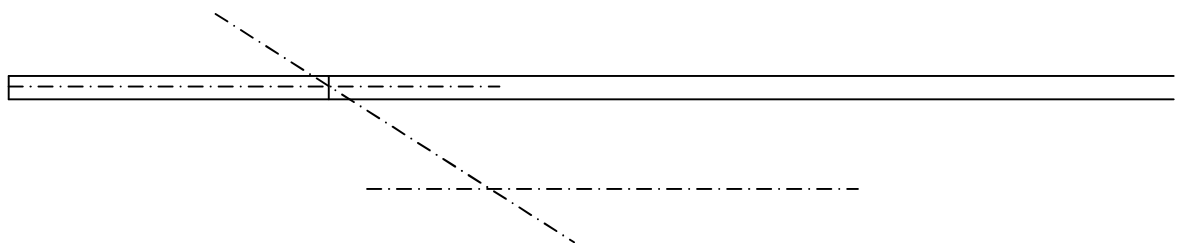


Pulling a 50mm set at 30 degrees in 15mm pipe.

The easiest way to do this is to mark the centre lines of the required bend on a work surface (on the floor or on a piece of scrap card)

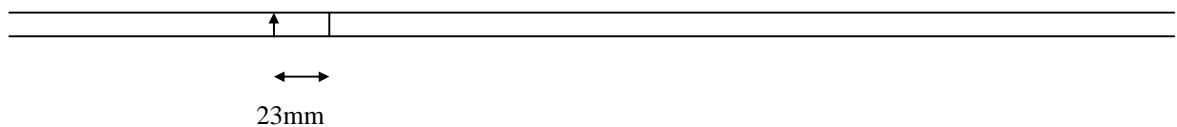


Place the pipe over the first centre line and mark the pipe where the lines intersect.

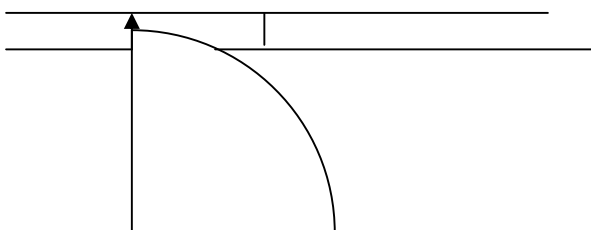


Look at the table you will see that the dimension for a 30 degree bend on 15mm pipe is 23mm.

Measure back 23mm from your first mark and mark with an arrow.

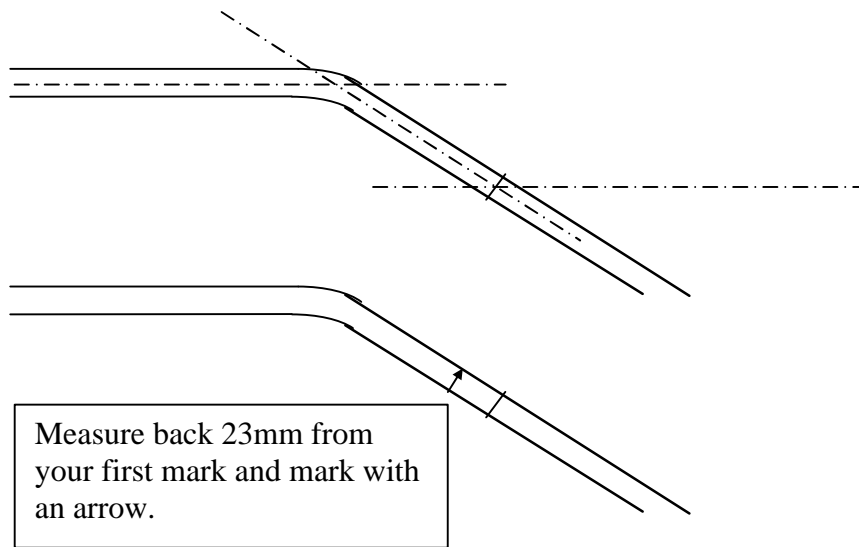


Put the pipe into the bender so that the arrow lines up with the edge of the curved former, this is where you start forming the first bend.

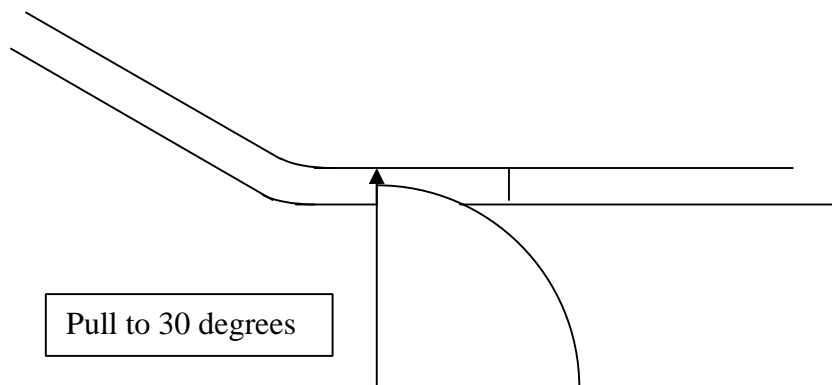


Pull to 30 degrees.

Lay the pipe on the marked out centre lines and mark the intersection of next bend



Put the pipe into the bender so that the arrow lines up with the edge of the curved former, this is where you start forming the second bend.

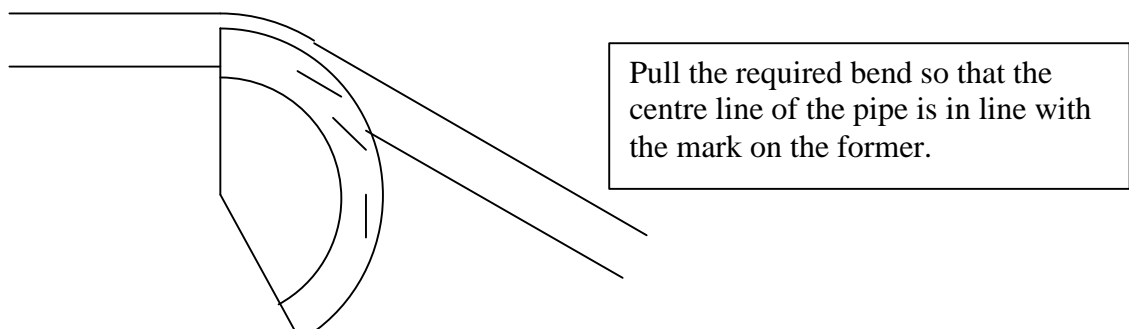


You should be able to lay the completed bend exactly over your drawn centre line.

You can use this method to pull composite bends accurately from one piece of pipe, even if the bends are in different planes.

Ever wondered what the marks on the edge of the curved former are for?

Pull to the first mark = 30 degrees. Next mark = 45 degrees. Next mark = 90 degrees.



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CONSUMER UNITS

By [Matthew Marks](#) with help from [Andrew Gabriel](#)

A consumer unit is the "fuse box" which goes between the electricity meter and all the electrical circuits in the house. Modern units do not contain fuses, but MCBs. They often also contain an extra protective device called an RCD, which replaces the isolator switch. In some cases, the RCD (described below) does not protect all the circuits, in which case there is also an isolator switch to disconnect everything. This type of arrangement is called a "split load" consumer unit. Modern consumer units can also contain other devices such as time switches and door-bell transformers, which fit in a modular fashion.

Miniature Circuit Breakers (MCBs)

An MCB is a modern replacement for a fuse, the purpose of which is to protect the wiring of its circuit from excessive current due to an overload or short-circuit. If the rated current is exceeded, the MCB will trip, and merely needs to be switched back on again to re-connect. It is thus more convenient than a fuse, and more obvious that it has tripped. Common values are 6A for lighting circuits, 16A for single sockets and immersion

heaters, 32A for ring mains, 7kW electric showers and electric cookers, and 40A for 8kW showers and larger electric cookers.

MCBs are cheap at just over five pounds each. They are available to replace fuses in some makes of consumer unit. Their operating characteristics are much better defined than that of a fuse, and they are not open to abuse such as rewiring with the wrong grade of fuse wire, or holding in the "on" position.

Residual Current Devices (RCDs)

RCDs (sometimes called Earth Leakage Circuit Breakers) are primarily designed to protect against electrocution (i.e. *death* from electric shock) by detecting current flowing to earth. Because under normal circumstances there should be very little earth current, they can be made very sensitive: 30 milliamps is common. Compare this with, say, 6 amps for a lighting MCB and it is obvious that an RCD provides far greater protection. This sensitivity also gives it the ability to detect other faults such as partial live/earth breakdown, which generates heat and can cause fires. However, it cannot protect against the less common live-neutral shock, and it does not protect against overloads so must always be used in conjunction with MCBs or fuses. A device called a Residual Current Breaker with Over-current protection (an RCBO) performs the functions of earth leakage and over current protection, and is basically an RCD and an MCB combined. Some RCDs/RCBOs have extra features, such as detection of live/neutral reversal or earth disconnection (for which they need an earth sense wire). A disadvantage of some RCBOs is that you cannot tell if they were tripped by over current, or an earth fault. This can make fault finding harder.

RCDs have to be designed to interrupt fault currents, indeed they often beat the fuse/MCB in doing so. In the case of a fault current to earth, RCD must trip within 0.04 seconds (unless time delayed type), whereas fuse/MCB is allowed 0.4 or 5 seconds (depending on circumstances).

RCDs are current operated, but there is also the older voltage operated Earth Leakage Circuit Breaker (ELCB). There is some confusion over names, so I will refer to the function. The voltage operated type has a solenoid connected between the earth of the protected area (e.g. all the sockets and pipes in the house) and "true" earth (the sheath of the incoming supply cable or an earth rod). When there is sufficient voltage across the solenoid, which I believe is of the order of 50V, corresponding to a few tens of milliamps, the RCD will trip, disconnecting the circuits protected by it. It then has to be reset manually.

Voltage operated devices have the disadvantage that as they measure earth leakage directly, they can only detect leakage to the earth circuit that passes through them. Thus, they will not detect current passing through the body to the ground when using equipment outdoors, or to current passing through the body to plumbing if it is connected to the ground (e.g. by the rising main) and therefore cannot be included in the protection circuit. It is even possible that earth faults in other properties on the same water main can cause the unit to trip!

It seems to me also that the solenoid is a weak link in the earth circuit, and if this becomes disconnected, a short to earth will result in the earth circuit becoming live.

Current operated RCDs are the norm in modern consumer units. They have no connection to earth circuits at all, and so will detect leakage to any earthed object. Instead, they rely on detecting imbalances between the live and

neutral currents which must be going somewhere, to earth. This is accomplished simply by passing both live and neutral through a metal ring, which then acts as a transformer with two single turn windings. If the current through live and neutral is the same, no magnetic flux will be generated in the core; if they are different, then the resultant flux is detected by another winding on the core. The RCD has no significant effect on the flow of live and neutral current through it.

A small amount of earth leakage is to be expected in normal situations, such as from damp fluorescent fittings and mains filters on appliances, and there are all sorts of nasty spikes which can occur on the mains supply and be interpreted as a fault. RCDs are therefore designed to offer a compromise between the degree of protection offered and the risk of "nuisance tripping". There are many factors which determine whether or not someone will survive an electric shock, but two of these are duration of exposure and the current flowing. RCDs are designed to have a tripping characteristic which takes account of both of these: typically 30mA for 0.04s. Units with larger trip currents are available, but are primarily intended to protect against fire when the earth may be too poor to allow a fault current sufficient to trip MCBs. To comply with the IEE Wiring Regulations, all sockets which could have outdoor equipment plugged into them must be protected with an RCD.

The RCD DOES NOT GUARANTEE PROTECTION AGAINST ELECTROCUTION, and electrical circuits protected by it should be treated with the same respect as any other. But it does help greatly to ensure that an electric shock is an unpleasant rather than a fatal experience.

RCDs have a test button which creates an earth leak with a resistor, and it is usually recommended that they are tested once a month. An information label near the consumer unit explains this (without telling you that you will have to reset some of your electric clocks afterwards!). The resistor passes more current than that required for

tripping, and the duration of the test is not limited, so testing in this way does not provide proof that the unit is working to specification. RCDs can also be switched off manually and can take the place of the isolator switch in the consumer unit, if they break live and neutral.

Compared with MCBs, RCDs are expensive (about 40 pounds upwards) and quite bulky. There is also no need to have one for each circuit, because the voltage to all the circuits is the same, so (all other factors being equal) the fault current in the event of an electric shock will be the same. There is usually just one RCD, which will be used instead of the main isolator switch in the consumer unit, or used in addition to a main isolator in a split load consumer unit (described below). If the RCD trips, in the case of live/earth leakage the cause can be determined by opening/removing all the MCBs/fuses on circuits protected by it and then reactivating/replacing one by one until the RCD trips again. For neutral/earth leakage, it will be necessary to remove neutral connections to isolate the fault. (Neutral and earth are rarely at the same potential due to the voltage drop across the neutral wire's length caused by current flowing through it.)

Split Load Consumer Units

If the whole house is protected by an RCD, then any genuine or nuisance trip will cause all the lights to fail. This can be dangerous, especially if somebody has just received an electric shock. A split load consumer unit avoids this by having a main isolating switch feeding the lighting circuit fuses/MCBs directly and the rest via an RCD. The split can usually be chosen by cutting a bus-bar. Electric shocks to earth are not often incurred from lighting circuits, so electrical safety is not greatly compromised. It is normal to feed a freezer from an unprotected circuit

so that in the event of a trip while the house is unoccupied, it will continue to function. Garages and outhouses are also often fed in this way if they have their own RCD, so that the main RCD will not trip in the event of a fault. (The second RCD is used where there are likely to be frequent nuisance trips or where a greater degree of protection is required, by employing a more sensitive unit. It can be fed from the main RCD provided that its trip current and trip time are both smaller so that it will always operate first.)

Last modified: 22 October, 2019 8:25 PM

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What is it?

The angle grinder is a versatile cutting, grinding, polishing and sanding machine. It is traditionally used for cutting stone and metal, but has a multitude of other uses.

Typical applications include cutting bricks, paving slabs, and roof tiles. Cutting slots and chases in walls. Fast cutting through metal bar, sheet, angle etc, and fast grinding and fettling.

Types

An angle grinder is a good example of a tool that does a few jobs very well! Although there are wide range of makes and models to choose from, angle grinders basically come in two forms: 115mm and 230mm. The smaller tool is lightweight and easy to use single-handed for some applications. The larger machine however, can be quite a handful and should always be used with two hands. The main limitation of the smaller size is limited depth of cut.

Safety

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- Mitre Saw
- Nailers and Staplers
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While not as obviously dangerous as say a circular saw, angle grinders still spin the cutting disc very quickly (typically over 11,000 rpm on the smaller machines) and the outside edge of the disc will be doing over 80 m/sec, that's nearly 180mph! Allowing a disc to touch any part of your body can result in a serious burn or cut.

In addition to ear defenders, gloves and eye protection are essential. Eye protection goggles should be of the "indirect" vented design. The more common direct vented type (recognisable by the multiple small open perforations at the side of the goggle) have a habit of letting through small hot shards of metal thrown up by angle grinders. Removing these once they have melted their way into the surface of your eye is not nice!

If you're using an angle grinder for sanding then respiratory protection is also essential since angle grinders have no in-built dust collection facility. When using an angle grinder to drive a wire brush, a leather apron is also to be recommended since picking small wire fragments out of your stomach or groin is not generally considered to be a pleasant experience!

Take care when cutting or grinding metal, since the grinder will produce copious amounts of sparks. These not only hurt when directed against your person, but are also very able to start a fire should they fall on something flammable.

A word about dust

To say that an angle grinder used to cut masonry produces "dust" is really a mastery of understatement! When used outside you can quickly find yourself operating inside your own local fog. Not only that but you will be finding dust on yours and the neighbours' cars for weeks to come. If you wish to use an angle grinder inside for

wall chasing, it is best to do so in a house that is unoccupied! Since by the time you have cut a three or four foot long chase in plaster, there is a good probability you will not even be able to see your hands in front of your face. Note that because of the dust problem a specialist wall chaser, or an SDS drill fitted with a chisel or a chasing gouge is actually a far more appropriate tool in most circumstances.

Discs

Most work with angle grinders is done with cutting or grinding discs. The type of disc dictates the type of work you can do. For metal cutting or grinding the discs are usually made from a reinforced abrasive material. For stone and masonry cutting, you can either use abrasive cutting discs, or alternatively a diamond cutting disc. Whilst significantly more expensive, the diamond disc is almost always preferred to ordinary abrasive discs since it makes a much cleaner and faster cut, and will out last many hundreds of abrasive discs (using several abrasive discs to cut one paving slab is not uncommon), so ultimately it represents much better value. Note that using a diamond disc to cut metal will quickly destroy the disc.

Other accessories

In addition to cutting and grinding discs, an angle grinder is also able to use a number of other types of accessory. These include flap discs for fast and aggressive sanding, wire brushes for rapid rust removal or paint stripping, and mortar rakes for brick removal and repointing activities. Mounting a flat backing pad will also enable the tool to be used for a sanding and polishing.

Quality indicators

The difference in quality between the high end and budget tools it's not as obvious with angle grinders as it is with some classes of power tool, since quality of finish is not usually an issue. Better quality tools will deliver more power to the cutting disc, and less vibration to the operator. On budget tools, the motors will not be rated for continuous operation, and switchgear may be of a lower quality. Better quality tools tend to have bearings and switch gear which are better sealed against ingress of dust. This is especially important when cutting masonry since the dust produced is highly abrasive and can also clog switches.

Accessories

Most angle grinders come with relatively few accessories. Typically you will get a spanner for enabling you to change the disc, and a side handle which can usually be fixed it to the body of the grinder in two or three places to help hold the machine steady.

If you find yourself changing discs frequently, you may find it simpler to buy a quick release locking nut. These replace the usual disc locking nut that requires a spanner to undo, with one that can be simply undone by pulling and twisting on a small lever it is a part of the nut. For prolonged use an anti-vibration handle may also be worthwhile.

Features

On the larger size of tool, slow start is a highly desirable feature, since it prevents the massive kick at switch-on.

A removable disc guard can be useful since it will allow a wider range of accessories to be fitted to the tool.

Cordless angle grinders

Cordless angle grinders have appeared on the market recently. These offer the freedom from a power lead, however that freedom comes at a price. Not only are the machines far more expensive to purchase, but you also have a very limited run time since these machines make very heavy demands on their batteries.

Second hand tools

Nothing special to look for, other than making sure that the switch operates correctly, and the lead is undamaged. Pay particular attention to machines that have been used heavily for cutting masonry. On poor quality tools the dust can result in a sticking power switch which can be very dangerous, as it can lead to a machine you are unable to turn off!

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Power Tools FAQ — Biscuit Jointer

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Once an obscure workshop tool, the biscuit jointer has gained popularity greatly over recent years, and a good selection of tools are now available.

So what is biscuit jointing?

Biscuit jointing is a very quick and easy way to join sections of timber together. It is ideal for situations where a number of planks need to be joined side by side to make a wide board (e.g. for a table top), or for when you need to help fix and align parts of a project as you build it. It is a quick way to achieve many joints that traditionally may have been achieved with dowels, or loose tenons or laths inserted into routed slots. It also allows very good alignment of mating surfaces - even if the pieces of timber to be joined are not uniform in thickness, while allowing a small amount of lateral movement between the surfaces for final positioning.

How does it work?

Biscuits are small lozenge shaped wooden tabs made typically from a laminate of compressed beech wood. You cut matching pockets into the side of the items to be joined with the biscuit jointer, and then insert the biscuits into the pockets with a little glue and assemble. The glue causes the biscuits to expand in their slots helping lock

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the whole assembly together.

A biscuit inserted every 12" or so will make a strong well aligned joint, and cutting a biscuit slot every ten seconds or so is easily achievable - so the whole process is very fast.

The biscuit jointer uses a small thick circular saw type blade mounted in a mechanism that allows it to be safely plunged into a work piece to a predefined depth, and with great accuracy. The pocket it produces should exactly match the profile of the biscuit (a depth stop allows you to select the correct amount of plunge for the size of biscuit you are using - there are three common sizes). The jointers use a fence to control placement of the cut with respect to the edge of the work and to keep the cut square and parallel to the edge. Most have a fence which is adjustable to allow the amount of offset to be controlled (this is a highly desirable feature), and some also allow the plunge to occur at an oblique angle which is useful for strengthening joints that do not meet perpendicular to the surface they are fixing to, or when sinking a biscuit pocket into a piece of timber with beveled edge.

What should I look for?

In a word: accuracy. The accuracy of biscuit jointing is largely dependent on the quality of the fence. Alas this is one item that can be a bit of a let down on some of the cheaper models. Not only does it need to be easy to adjust accurately, it needs to remain parallel to the plane of the blade at all times - even a tiny misalignment in the fence will very soon be multiplied into bigger errors the further you get from the biscuit location.

A smooth plunging mechanism will aid working. Typically you will simply push the body of the jointer toward the

work to make your cut. The spring of the plunge mechanism will return it to the "unplunged" position when you release the pressure. When working on thinner sections of wood (i.e. trims etc) Ideally the handles of the jointer should be designed so that you can assist the plunge operation a little by compressing them so that you don't need to push as hard against the work piece.

A good power switch that is easy to find and use will allow you to concentrate on the jointing task.

A fence that can be flipped up out of the way is handy since it will allow pockets to be sunk away from the edge of a piece of wood.

Slow start is nice as it eliminates kick when the machine starts.

Dust extraction is often provided by a small collection bag on the side of the machine. On some, these actually work quite well (the dust produced is reasonably coarse and hence not as hazardous as that produced from many tools - although it is still wise to wear a mask when working on materials like MDF). With dust collection in place these tools create surprisingly little mess.

What else can it do?

It is now possible to get some cabinet fixings (hinges etc) with biscuit tabs built in. This makes adding hinges to doors etc. very quick and easy. There are also biscuits made from alternative materials that are suitable for joints in materials like Corian®.

Alternative Approach

It is possible to cut biscuit joints with a router and a suitable biscuit jointing cutter. However it dispenses with many of the advantages of the dedicated tool, and is much less satisfactory than you may at first imagine.

It is a much slower and less intuitive task when used freehand - it is also very easy to damage the work piece if extreme care is not taken - the tool is not plunged into the work piece, but instead must be positioned on it without allowing the blade to come into contact, and then slid into the work piece to start the cut. Needless to say this is a routing task much better suited to a router mounted in a table.

Since the diameter of the router cutter is much smaller than a real jointing blade, you can not get the required pocket with a single plunge either; the router will need to be slid laterally along the slot axis to widen the slot to a suitable width.

Finally changing the plunge depth usually requires changing the size of the bearing on the end of the cutter - again not a quick process.

Buying Advice

Before buying it is always worth reading the current reviews since it is not unknown for some of the higher end brands to have produced jointers that are not well regarded, or for some of the budget models to perform well above expectations.

Second Hand Tools

Since jointers are a relatively new phenomenon, buying second hand is not as easy as it is with some tools.

Assuming you find a second hand deal at all, then use the "What should I look For?" guide above to decide.

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Power Tools FAQ — Electric Drills

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We deal with two types here: Mains and Cordless. For additional details on drill-bits and their usage see the [Drill bits and Drilling FAQ](#).

Mains Drills

Probably most peoples first DIY tool purchase. Essential for the classic DIY task of affixing shelves, but also able to make holes in most materials, sand down (quick and rough), grind, polish etc... if you start looking at all the add-on gadgets you can get, a drill becomes a very versatile bit of kit.

Drills in their most basic form are single speed with rotation in one direction only. These are fine for drilling in wood, and also OK for many polishing, sanding and grinding operations. They are also quite small and hence can be handy for getting into tight spaces, like between joists, etc.

Adding things like variable speed and reverse expand the range of tasks that can be done safely, such as screw-driving, and drilling metals. The addition of a gearbox with two or three speed ranges also adds the ability to use less speed and get more torque for tasks that will benefit. The other usual addition is “hammer” action. This gives you the ability to drill hard stuff like masonry.

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Search

For drilling big, or deep holes in masonry, especially really hard materials like concrete or engineering bricks, the SDS drill now available on the DIY market, will trounce any hammer drill, as well as adding some party tricks of its own. First-time users of SDS drills often quote a phrase like “hot knife through butter” when searching for words to describe just how much better they are.

The bigger, more powerful, drills can turn tools like large hole saws, core borers (for wide diameter holes in masonry), and are good at mixing stuff with a suitable mixing paddle.

For basic operations, the budget tools will do pretty much what the high end ones will, though the low end ones often don't last very well. Spending more money will buy you better endurance from the motor, so you can run it longer without rest periods, better speed controllers, and more robust gearboxes. Bearings will improve and become more impervious to dust - handy if you do much masonry work, or lots of grinding and sanding. If looked after, even a basic drill should last years.

Cordless Drills

The cordless drill is a godsend any time you need a drill and the freedom from a mains flex. It is ideal for screw driving, where the DC motor will provide a much better control of power than most mains drills. If you assemble flat pack furniture, then a cordless drill will save many hours of work!

The spread in performance between budget and high end is very marked in cordless drills, far more so than with mains drills. The cheaper end of the market can be pretty disappointing – to the extent that it is often better

looking only at mid-range tools or better. Remember that a good amount of money will need to be spent on batteries and a charger before you can get decent performance.

Two types are readily available, the Drill/Driver and the Combi Drill, which adds a hammer action. The former will be cheaper and in many cases more than adequate if backed up by a mains or SDS drill for times that hammer is needed.

All will have reverse, and most will have a speed controller, except the lowest voltage types, e.g. 2.4V, as on these it would not gain you anything. Speed control is essential for serious work, and when implemented well, will greatly enhance the usability of the tool. Good speed controllers can deliver slow rotation while providing plenty of torque (turning force), and this is ideal for some screw-driving tasks. Some better tools implement a rotor brake that stops the rotation when you release the trigger. This helps to avoid accidentally driving a screw too far into the work, stripping threads etc.

Many have a variable torque limiter, which allows you to set how much to tighten a screw. It can make the task of putting in lots of small screws quick and easy, since you can be quite ham-fisted with the trigger in the knowledge that the drill will back off before you over-do it! With better tools the repeatability of the limiter improves.

Having more than one battery is very much recommended. If you have three and a good charger, then chances are, you can keep going all day, and you will be worn out long before it is!

What voltage cordless drill do I want?

If you are talking about a good quality tool with decent cells then the limits of performance are roughly:

2.4/3.6V: These are basically electric screwdrivers, not drills. They are good for light screw-driving and flat-pack assembly, but you typically need to do the final tightening by hand since they run out of puff. They will only drill a few holes in wood before going flat, or drive a couple of dozen 2" screws home (and then only with a pilot hole). They will cope with all but the largest appliance screws. No use for heavier work.

7.2V: These would typically have a two-speed gearbox, and no speed controller. They are suitable for frequent light screwing and drilling tasks, very good for assembling flat-pack furniture, and OK for drilling in wood. The gearbox may not be that robust, (one report speaks of a tooth stripped from a gearwheel when a spade-bit snagged). The performance limit of such a tool is typically driving a 2" screw into a Rawlplug, or about 1.5" into solid timber (if not pilot-drilled).

9V: This drill will do most wood drilling tasks, but will struggle with larger spade bits. Hammer action (if available at all) will be feeble but better than none. Screw driving will start to have difficulties with 4" and bigger screws into softwood.

12V: This will get a 4" screw driven home with more authority, and have a better performance on masonry.

14.4V: This will deal with pretty much any screw, handle smaller hole saws, and have a reasonable hammer action.

18V+: These will swing a 5" hole saw, mix a bucket of plaster, and stick a 6" roofing screw into solid wood without any difficulty. It is at this level you match the power of a smallish mains drill, but with far more finesse and controllability. However the weight and size is creeping up so it pays to choose one with a nice balance to it.

24V: These are specialist and powerful tools, heavy in weight and price.

If you are looking at a £29.95 18V combi drill special offer on the back of a catalogue then all bets are off, but it might make a nice dumbbell!

A word on chucks

The chuck is a fundamental part of a drill and yet often overlooked. Common shank diameter capacities are 10mm and 13mm (3/8" and 1/2"), with the latter being well worth having since the shanks of some tools are too big for the smaller one (many mixing paddles for example required a 13mm chuck). Keyless chucks have become popular recently. Good ones (like those made by Rhom) incorporate a ratchet type tightening action that allow them to be tightened at least as well or better than conventional chucks that require chuck key. The poorer keyless chucks are not as good as a keyed one in ultimate gripping power, but are still adequate for most jobs.

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UK.D-I-Y FAQ

Power Tools FAQ — SDS Hammer / Chisel Drills

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The SDS drill was introduced by Bosch a few years ago and it has revolutionised the ease with which one can drill hard masonry. For additional details on drill bits and usage see the [Drill bits and Drilling FAQ](#).

What is it?

The SDS drill is a drill with an enhanced hammer action that when compared to a conventional [hammer drill](#) is able to deliver hundreds of times the energy per hammer blow. To go with this it also has a different chuck design and special SDS drill bits to eliminate the possibility of bit slip, and also to withstand the force of its hammer action.

What difference does it make?

When drilling hard masonry or engineering bricks the difference is astonishing. Where an ordinary hammer drill may take minutes to make even a shallow hole, the SDS will pound through it in seconds. For this reason you also need to take it easy when drilling right through things like walls, because as you break through you can end up removing a large chunk of wall when the drill hammers its way out. If possible, always drill a small pilot hole through the wall first, and then drill inwards from both sides with the required drill size to avoid this.

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Operating modes

SDS drills operate in 3 modes:

Drill only

Like an ordinary drill, but maximum speed tends to be slower (under 1500 RPM) and torque higher.

Drill and hammer

The above mentioned enhanced hammer drill action. In spite of the extra performance, SDS drills also tend to be somewhat quieter than the conventional hammer drill.

Hammer only, no rotation

Not all models have this (often referred to as "roto stop"). It greatly expands the range of tasks you can do. You fit special SDS chisel bits and use the drill like a mini concrete breaker. By selecting the type of chisel, the drill becomes ideal for chasing cable runs or socket cut outs in walls, removing individual bricks, removing tiles, and light demolition.

What to look for

Safety clutch: Because the SDS chuck eliminates the possibility of the bit slipping, there is the problem of what

happens if the bit should jam in the work. The mid range or better tools include a safety clutch that releases should this happen. Without a safety clutch you run a very real risk of being injured by the drill body, as it spins out of your grip. Broken wrists, or being thrown off a ladder are not unheard of results in these cases.

Sensible weight: i.e. 2kg not 5kg. Many of the budget tools are heavy. This is fine for demolition, but not so good for prolonged working.

Good speed control. Running slower results in a gentler hammer action. This makes starting cuts or marking out a cut much simpler.

Chisel position lock, for use in hammer mode: Many budget drills disengage the rotation of the bit, but leave it free to turn. You will not be able to chisel a nice straight chase in a wall with a freely rotating chisel. Better drills will lock the bit in one position, and the best will allow it to be locked in any user selected position.

Most SDS drills benefit from the occasional application of grease to the shank of a bit prior to insertion. However some of the budget tools will often require frequent and more substantial lubrication by filling a grease reservoir with grease. After a while this will begin to ooze from various places and tend to get spattered about, which is not so good for keeping either the work piece or the operator clean!

SDS downsides

SDS drill bits can be more expensive than conventional masonry bits (although usually last much longer).

You cannot put ordinary bits in an SDS chuck unless you fit a adapter chuck first. These typically extend the length of the drill further, and also do not allow use of the hammer mode. (Some SDS drills come with a replacement chuck for ordinary bits to circumvent this problem)

Even professional light-weight drills tend to be a few inches longer than a conventional hammer drill. This can make them more awkward to use in confined spaces.

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Power Tools FAQ — Jigsaw

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This is an example of a tool where there is a massive shift in performance as you move from budget to high-end, to the extent that a high-end tool is to all intents and purposes a different tool to the low-end. It makes answering the question “why would I want one?” a bit tricky since the range of things you might do with a good one is much wider than those you would contemplate for a poor one. Hence it is simpler to treat these as two separate types of tool:

The budget / mid-range jigsaw

Ideal for cutting curved lines, (indeed without practice, that may be the only type you can cut!). If you need to cut out shapes, e.g. hole for a sink in a worktop, or make some ornate woodwork this may be the tool for the job. If you need a jigsaw then there are few alternatives - there are some jobs that only a jigsaw will do. The speed of cut is relatively slow, though ones with pendulum action will cut faster (and rougher). The tools are pretty small and light, and are often uncomfortable to use since you get a fair bit of vibration. They are not suited to being a general purpose saw (a circular saw will often be a better choice). The quality of the cut is moderate, and will need a fair amount of sanding etc., prior to finishing if it is to be on display.

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The high-end jigsaw

This will do all of the things the budget one will do. However, it is a far more general purpose tool. It cuts quickly and smoothly with little or no vibration. It is much better at cutting straight lines, and can often be used with a straight edge or rip fence without the blade wandering to “interesting” angles. Try that with budget one and you will end up with a slanted cut or a broken blade.

Tool-less blade change is a given, as is a good speed controller. The base plate will be a solid cast-metal rather than a flexible pressed-steel one. With a fine or medium blade it will also give a very fine finish to a cut.

This fine finish quality will also open up the possibility of the production of patterns and jigs for use with routers and other tools.

You can also expect a much greater rigidity of design overall. With this comes better accuracy of alignment of parts, and an accurate blade support. Attention to detail like dust blowers and an integral light can make following your pattern much simpler. Soft start, and feedback speed control make for a more civilised user experience and also better quality of cut under load. Inclusion of soft shoe covers (to save marking the surface of the wood), rip fence or beam trammel attachment bush, and a motor rated for endurance and continuous use can also be expected.

Safety

Jigsaws are one of the less dangerous power tools, although can still give you a very nasty cut if not treated with

respect. Unless using for long periods or cutting some thin sheet materials then noise level is usually low enough to not require ear defenders. Eye protection however is useful. The sawdust produced will usually be coarse and not too much of a inhalation risk. However repertory protection should be worn when cutting materials prone to making very fine dust like MDF.

Great care should be taken to keep your fingers out of the line of cut - especially when they are under the material and out of site!. Care should also be taken with the flex, and the use of a RCD protected supply is strongly recommended.

Features

Features worth having include tool-less blade change (sometimes called SDS, just to confuse), a dust blower that keeps the cutting line clear of sawdust is very useful, as is a small light that illuminates the line you are cutting. A soft plastic sole plate shoe is handy in some cases since it can reduce marking of surfaces.

Blades

Jigsaw blades are simple looking things, but it is important to get ones that are made with decent materials and to a reasonable standard of construction. A blade stamped out of a sheet of steel will never cut a straight line due to having a burr on one side of it! So beware the bundle pack of 50 blades for five pounds.

Blades are available for wood, and metal cutting. Note that metal cutting blades can also be used on wood where a very slow and precise cut rate is required (e.g. scribe cutting internal corners on skirting). There are also

specialist blades like grit edged ones. These are for cutting hard materials like tile, glass, and cast iron. Note that these will not replace dedicated tile or glass cutting machines, and are not ideal for cuts in glass or ceramics since jigsaws have no water cooling provision.

There are also down cut blades (for causing less tear out and chipping on finished surfaces - like laminate faced boards), and flush cut blades for cutting right up to a wall without the body of the saw getting in the way.

Check that you buy the correct blade shank for your tool. Most look similar, however there are some subtle variations and not all tools will take all blades.

Second-hand jigsaws

Nothing special to look out for, or avoid, on safety grounds. If it requires a tool to change the blade, then check that the screw/hex heads of the blade clamp are still in a serviceable condition.

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Power Tools FAQ — Mitre Saw

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in the Wiki

There are some more mitre saw related articles in the wiki, including some user reviews of specific models.

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What is it?

The power mitre saw is a special type of circular saw designed for precision wood cutting. It replaces the mitre block used with a hand saw, and the various mitre saw mechanisms that attempt to support a manual saw in a framework. It excels at any cut where a precise angle is required. Typical applications include cutting studwork, cutting mitres for picture frames, dados, skirting, architraves and coves. plus all sorts of general-purpose carpentry and joinery.

Safety

As with all circular saws, the mitre saw cuts extremely quickly, so serious accidents can happen very fast. In addition, it is a "fixed" power tool that leaves the operator with both hands free. This automatically poses further risks since there is more opportunity for hands to get close to the sharp end. Great care must always be taken to ensure that your hands are out of the path of the blade.

Ear defenders and eye protection are strongly advised. When handling rough timber gloves should also be worn.

A good work environment also helps greatly enhance safety. Either a proper saw stand, or additional roller

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stands, or work benches should be used to fully support the work while it is being cut.

A dust extractor is well worth using if you're cutting much timber, since as with any circular saw, a mitre saw will produce copious amounts of sawdust.

Blades

The maximum size of material the saw can handle is dictated by two things: the diameter of the blade being used, and the type of mechanism used by the saw. Note that with most saws the cutting capacity is greater for straight cuts than it is for angled ones.

The quality of the blade will also have a large impact on the quality of the cut. Most mitre saw blades are optimised for cross-cutting since the limited maximum width of cut severely curtails the ability to rip cut! The best blades will also have a different tooth pitch and profile from conventional cross-cut blades - often having a negative rake. This allows for a cleaner cut with less tear-out.

The chop saw

This is the simpler type of mitre saw. The majority of the budget saws available are of this type. The saw is suspended above the work on a simple hinged mechanism. to make a cut, the operator simply pulls the saw down towards the work. The maximum size of cut is dictated purely by the size of the blade. The smallest a chop saws typically use eight-inch blades. These are big enough to make a straight cut through a 4"x2", and also to make a bevelled cut through 5" skirting - but often only using the less precise tilting mechanism. However it may

- Wall Chaser

have insufficient capacity to make a mitre cut through 4"x2". Bigger blades give a bigger depth of cut, the largest mitre saws typically have 10 to 12 inch blades.

Chop saws can only usefully be used for through cuts, since the leading edge of the cut will always have a round profile to match that of the blade. As a result most saws do not have any method for limiting the depth of cut.

The sliding mitre saw

The sliding mitre saw is more sophisticated than the simpler machines, since in addition to the hinged mechanism described above, it also has a facility where the saw will slide along a rail or guide. This allows the saw to perform a much wider cut for a given blade diameter. In addition it is now possible to make a flat bottomed cut which opens up the possibility of using the saw for producing lap joints and other joinery where non through cuts required. As result of this, many sliding saws also include a mechanism to limit the depth of cut. The maximum depth of cut available with a sliding mitre saw is usually no greater with the simple chop saw, however even a small saw with only an eight-inch blade will often be able to cut material up to 12 inches wide.

Angled cuts

All of the saws will have some form of angular scale to show the angle of cut. Better quality saws may also have a variety of pre-set positions or stops on the scale to make selecting commonly used angles quicker and easier. the most acute angle that can usually be cut is 45 degrees although some high end saws may do up to 60 degrees - at least on one side.

Tilt cuts

With most saws the head can be tilted over. This allows angles in the vertical axis to be cut. On many of the budget saws this facility is less sophisticated than the horizontal angle selection, and often there is no calibrated scale to select precise angles.

Compound cuts

The angled and tilt cuts can be combined to produce a compound cut. This can be very useful for some complex joinery tasks such as cutting struts and hip beams in roof construction.

Quality Indicators

As mentioned above the quality of the blade will have a large influence on the quality of the cut. The other major factor that governs cut quality is the quality of the saw mechanism itself. The first and primary requirement is that of rigidity. If it looks like you can park a battleship on top of it without moving a millimetre, then it's probably a good one! A good mechanism will enable the blade to be plunged without any movement or "give" in any other direction. This will help to keep the cut straight and square right through.. The next quality indicator is the ability to accurately and easily select angles, and to have the angle actually cut match that shown on the scale. Good quality saws also need to run smoothly. Hence the quality of the saw bearings dictate the amount of blade eccentricity and hence the "finish" to the cut surfaces. No matter what the saw feels like initially, dust sealing and construction will often be lacking in low end saws. This can lead to a saw that won't rise and fall properly and be

almost impossible to adjust. Disassembling and cleaning will usually help - but buying a better class of tool may be a better investment if you are using it often.

For sliding mitre saws, another vital component that will have a great impact on the quality of results achievable, is the sliding mechanism itself. This should slide smoothly and freely, and have no play or backlash in the horizontal or vertical directions. It should also allow no rotation around the slide axis (saws with twin slide rails tend to outperform those with a single rails in this respect). In addition, the saw should stay smooth and taught, and not get sloppy with use or age.

The amount of power produced by the motor is also significant. While straight cuts put relatively little load on the motor, tilted plunging cuts can put a very high strain on it.

The blade guard mechanism should work effectively, sliding out of the way easily and without causing any jolt in operation of the mechanism, and not limiting the depth or width of cut.

A budget saw will be more than capable of cutting timber for studwork, or building a garden shed. However it will often not have the capacity for cutting skirting boards, or the accuracy required for tasks like making picture frames, or cutting mitres on visible trims and coves when furniture-making.

A big high end sliding mitre saw is absolutely ideal for cutting timbers for pitched roof construction, or any other general site or construction work. It will also be very good at producing accurately dimensioned timber for furniture and cabinet making.

Features

The best choice of motor is an induction motor, although this is available on relatively few saws. For saws with the more traditional universal motor, a "soft start" facility is highly desirable since eliminates the kick at start up. Budget saws will have motors that are not rated for continual use, however use of a mitre saw is by its nature not a continuous activity, so this may be less of a limitation than with some types of power saw.

Good angular scales are highly desirable, and some way of accurately and quickly selecting commonly used angles is also a very useful.

Don't be too swayed by features such as laser line generators since these are rarely accurate enough to give you any useful additional information.

Some saws incorporate dust collection, others will typically have a port to enable connection of an external vacuum extractor.

Accessories

Probably the most useful accessory you can get for a mitre saw is a dedicated bench with in feed and out feed supports. these simplify the whole job of holding, measuring and cutting the timber.

Second hand tools

Check all the safety features are present and operate correctly. Check all the movements of the saw operate

smoothly without any jerks or graunching. High end saws don't come on to the second hand market that often, since most people who have got them to want to to keep them! The budget saws are more readily available however as the existing owners wish to upgrade to something better.

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UK.D-I-Y FAQ

Power Tools FAQ — Nailers and Staplers

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What is it for?

The single biggest advantage of the nailer is its capability of driving a huge number of nails in a very short space of time, far in excess of what can be achieved with a conventional hammer.

Safety

Nailers are among the more dangerous power tools if not used with care, and in fact quite a number of serious accidents will make the news headlines each year! Frequently however the person injured is not the user of the nailer, but a bystander or someone else working near by.

The term nail "gun" is frequently used, and this is not overstating the case, even relatively low-powered nailers will be able to launch a nail at a similar velocity to that of a bullet fired from a gun! If you treat a nailer with the same respect you would award a firearm, then you probably have the correct mind set for safe working.

For starters many nailers use a supply of compressed air, this in itself can be highly dangerous if not used carefully. Always ensure that airlines are in good condition, and that couplings are correctly made. Take great care when making and breaking connections.

- Jigsaw
- Mitre Saw
- Nailers and Staplers
- Oscilating Tools
- Planer
- Reciprocating Saw
- Router
- Sander
- Wall Chaser

Unlike a hammer, nailers will drive a nail into the wood with a single blow. This means the force of the hammer blow is many times greater, and also there is no opportunity to correct a mistake. So when something goes wrong there is more potential danger. All nailers will include safety features designed to stop the nailer from being fired when not in contact with a surface, however the foolhardy can easily override many of these! The nailer also has no knowledge of what the surface is made out of, so if you try to fire a 3 inch framing nail into a thin sheet of plywood with nothing behind it, the nail will fire straight through the surface, and continue on the other side as a projectile looking for a target.

Alternatively the nail may bend and exit the surface at an unexpected angle or position. Hit something hard and the point can curl round and pop straight out of the top of the surface you are nailing into. Hence it is important to keep your fingers well away from the location where you are nailing.

Eye protection is absolutely required at all times! In many cases ear protection should be worn as well since the noise when the nailer fires can be very loud.

With a pneumatic nailers beware of the exhaust port, since this is where the waste air will be discharged. It is very easy for this to blow grit or other debris in your face and eyes.

Take care when working close to flammable substances since the forces involved when driving nails can easily generate sparks which could start a fire.

Type of propulsion

Method Comments

Mallet

Not really the type of nailer being discussed in this FAQ, but included for completeness. A few nailers are actually driven by a hammer or mallet blow. The type used for hidden nailing in tongue and groove floorboards is often like this. The purpose of the nailer is to position and angle the nail accurately rather than drive it itself.

Electric
Nailer

Electric nailers come in two forms: mains and cordless. Most of them are designed to use the smaller gauges nails, typically with lengths of no more than 30 mm. These are typically used for tacking and finish or pinning applications. Also good for some arts and crafts. Some cordless nailers are also available in larger sizes for second fix nailing.

Pneumatic Nailer

Pneumatic nailers require a supply of compressed air to work. This is almost always supplied by compressor. Nailers do not generally have a huge requirement for free air delivery, hence a relatively small compressor (i.e. 1hp / 25 ltr) will drive most nailers with ease.

There is a very wide selection of pneumatic nailers to choose from, with models to cope with all sizes gauges of nail.

Pneumatic nailers are also very cheap to run.

The main disadvantage of pneumatic nailers is the requirement for the airline and compressor. This means there is a large amount of baggage that needs to be taken with you when you want to use the nailer, and a suitable power source must also be available.

Pneumatic Hammer

Not strictly speaking a nailer as such, the pneumatic hammer is probably worth a mention. This is a small tool driven by compressed air which is held in the palm of the hand and features a small hammer like nose. The user simply pushes this nose against an ordinary nail, and a percussive action is used to drive the nail home. Cheap and simple, and has the advantage of using just about any old nail you may have available. However very much slower than a proper nailer, and not exactly automatic.

Gas Nailer

The gas nailer (made famous by Paslode), gets round most of the disadvantages of the pneumatic nailer. Power to drive the nails is derived from a small canister of flammable gas which is drawn into a cylinder and detonated rather like in an internal combustion engine. The nailers also typically have a battery which is used to ignite gas.

Gas nailers are highly portable since they don't require a compressor or airline.

They are however far more expensive to run the since new gas canisters have to be purchased. In addition the nails are usually only available from the same manufacturer has the nailer (and often come with the gas canister). There is also a much smaller choice in types and gauges of nail and nailer. However if you are in the middle of a field making a fence it may be your only option!

Cartridge

Nailer

Similar in a way to the gas nailer, but using a small explosive cartridge to provide the motive power. These nailers really are a type of gun!. Cartridge nailers (such as those made by Hilti in their "direct fix" of DX range), are available for a multitude of specialist applications. These include special nails and a fittings for cable, conduit, and trunking fixing, roof sheet fixing, grate and tray fixing.

Cartridge nailers consume one explosive cartridge per nail or fixing fired, and so are more expensive to run than most other types of nailer. However they are free from flexes and airlines so truly portable.

Cartridge nailers are also hugely powerful (when required, the actual power per shot being dictated by the power of the cartridge

used - most makers offer a range of powers to suit different applications) and are frequently used to drive fixings into steel and concrete. Applications include fixing timbers to RSJs, fixing screens, mesh and checker plate to masonry and brickwork, or driving threaded connectors into masonry for later fixing of via a conventional nut and bolt type of arrangement. All without the hassle of pre drilling or resin bonding of the threaded stud.

Types of nailer

Type	Used For
Headless	For small narrow-gauge nails with no head. Ideal for fixing fine trim and
Pinner	mouldings when furniture-making, and for adding support a small wood items while glue is drying. The nails are almost invisible once driven home.

Brad Nailer

This is a common gauge of nail used by many budget nailers. Most nailers will handle nails up to 30 mm in length. Some will handle nails up to 50mm. Brads are thin, but quite tough. They can be used for many tacking and holding tasks.

A number of brad nailers it will also handle narrow crown staples. Whilst models that handle staples are a little more versatile, they have the down side that the firing pin is wider than that used in a nailer that just fires nails. This means if the firing pin marks the surface of the wood, it tends to leave a wider slot mark, rather than a smaller hole.

Narrow crown staples are handy for upholstery work, fixing expanded metal lath to surfaces, and many other jobs that need more holding power than a nail.

Finish

Nailer

Finish nailers usually use 16 gauge nails. They will frequently have a non marring nose so that they can be used for applications where the finish will be visible and hence no damage to the surface is acceptable. Ideal for many cabinet and furniture-making activities. can also be used for second fix carpentry.

Second Fix Nailer

Second fix nailers frequently use 15 gauge nails which are slightly thicker and heavier than the 16 gauge described above . Note however that there is a good deal of overlap in the different ranges of finish and second fix nailers.

This type of nailer is ideal for a many carpentry and joinery tasks such as fitting architraves and skirtings, fixing doorstops and fixing beading and trim during general building activities.

They can also be good for some fencing and decking tasks.

Many nailers of this type have a nail magazine which is swept back at an angle to enable skew nailing into corners.

Framing Nailer

The daddy of nailers!

Framing nailers tend to be amongst the biggest guns available. They drive heavy gauge nails up to 90 mm long. These make very short work of building studwork for walls, and roof construction including fixing rafters, hip beams, and tile batten. One man on a sliding mitre saw and another with a framing nailer can erect studwork at a awesome pace! (several studs a minute including noggins)

Ideal for fencing and decking and any other task that requires substantial nails driven in quantity.

All nailers of this type have a nail magazine which is swept back at an angle to enable skew nailing into corners.

Special	There are also a variety of special purpose nailers designed for flooring, roofing
Purpose	and other building tasks. There are also some nailers designed for fixing into
Nailers	masonry or asphalt.

Consumables

Item	Description
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Firing Pin

The firing pin is the part of the nailer that actually drives the nail into the wood. As result of this, it leads a very hard life and should be treated as a consumable.

If purchasing a budget nailer, make sure that replacement firing pins are available - otherwise when it breaks you will be needing a whole new nailer!

Nails

Nails are available in many types. Most are galvanised. Often there is a choice of smooth or ring shanked (the ring shanks are harder to drive, but also harder to pull out and so good for tasks that use nails in tension rather than shear). Different head shapes are also available. Some of the nails designed for nailers with magazines swept back at an angle have "clipped" heads. These are like round heads on traditional nails, but with a semi circle take out of the circumference. This allows the nails to be tightly packed in a strip and not have problems with one nail catching on the head of its neighbour when it is fired. Most nails have a chisel like point, although some of the larger ones have a traditional point. Flooring nails have a cut type of point to minimise board splitting.

Types of nail

Nails are typically supplied in either a strip or a coil (which you need depends on your nailer), additionally strip

nails are available either straight or swept, again the type that you require (and the angle of sweep) will depend upon your nailer.

Nail

Description

Brands and Pins

From 7 to 55mm with chisel point. Brads are usually 18 gauge and pins are finer still at 23 gauge

Finish and

Second Fix Nails

From 25-65mm with chisel point. In 15 or 16 gauge Available both in swept and straight strips.

Framing Nails

From 50-90 millimetre with a point. Heads clipped or round (depending on angle of sweep usually). Sweep angles to suit nailers with 20, 28, and 34 degree magazines. Note that nails for a different angle magazine are not interchangeable since the nails will only be pointing in the correct direction at one angle!

Flooring Nails

From 40 to 50mm with a "T" or "L" shaped head and a cut point.

In Use

Most nailers can be used in two ways: single and "bump" fire. When using single fire the nailer is placed against the work and the operator pulls the trigger. This fires a nail and reloads the next nail. The operator will need to release the trigger and pull it again to fire another nail.

In bump nailing the operator keeps the trigger held down (the safety interlock prevents it firing in free space). The nose of the nailer is then bumped against the work. This disengages the safety interlock and the nail fires and reloads. Bumping again fires again. It is possible with some nailers to get multiple fires in rapid succession if this is not done correctly.

Bump nailing is more risky since you will be positioning the nailer with less accuracy, and possibly at a more variable angle and distance from the surface. However it is quicker and handy in assembly line applications.

Note that not all nailers that support bump nailing will do so "out of the box", you may need to purchase additional accessories from the maker to enable this facility.

Accessories

There are relatively few accessories for use with nailers, however one that can be quite useful (on pneumatic nailers) is a swivel coupling since this will help to stop you getting tangled up in air hose.

Features

None marring head. This is designed to be sure that the head of the nailer and the firing pin a lever no visible mark on the surface of the wood. This is required for any work which will be visible later.

Spiked or barbed head: this is useful on framing or second fix nailers and makes accurate positioning of skew nails very easy since it allows the head of the nailer to bite into the wood a little and hold it in position before firing.

Rotatable exhaust port, this keeps the exhaust port blast out of the operator's face regardless of the orientation of the nailer.

Depth adjustment, allows the nail depth to be adjusted without needing to tweak the compressor output regulator.

Quality indicators

Budget nailers frequently suffer from poor repeatability, in other words, slight changes in air pressure (on pneumatic nailers), or material density, will affect the depth that each nail is set to.

When choosing a nailer pay careful attention to how easy or difficult it is to disassemble the nailer to clear jams.

Some are easy to take part without any special tools, while others require several different sizes of Allen key!

A note on compressors

For pneumatic nailing, ideally your compressor should have automatic stop-start, and should have an output pressure regulator (a not just a receiver pressure regulator). this will help ensure consistency of nailing.

Nailers require reasonably frequent lubrication (i.e. before/after each use), and an in-line oiler can help here (alternatively, a few drops of oil in the air inlet will do the trick).

A water separator can also be good for reducing the possibility of corrosion in your nailer.

Second hand tools

Nailers frequently turn up on eBay, however most of them are new budget models, rather than true second-hand units.

Be wary about buying second-hand units since unless you're sure the unit has been treated carefully during its life, you have no guarantee as to its safety. Note also that second hand prices for desirable nailers such as an second fix nailers and framing nailers are frequently not much cheaper than new prices!

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What is it?

A powered version of the classic woodworking hand tool. Electric planes will remove material quickly, easily, and in most cases leave a nice clean result. Ideal for finishing timber, dimensioning stock, and fettling the fit of all sorts of woodwork. A plane of some sort will feature as an "essential" tool in all but the most primitive of tool kits.

Types

Most planes are based on the same type of technology, a rotating cutter block driven via a belt from a motor, that holds a pair of blades. This spins fast and typically takes 16,000 cuts per minute out of the work. There is a fixed rear sole plate to guide the plane, and an adjustable front part to the sole plate that allows the depth of cut to be selected. Most electric planes can take cuts up to 1.5mm deep per pass, some of the more powerful ones may be able to do twice that (although lighter passes are usually to be preferred since a better finish will be obtained and there is more opportunity to correct mistakes before you go too far).

Whilst there are a ranges of sizes available, there is nothing like the huger range of subtle variations of size and design that you find with the traditional hand tool. Most planes aim to be a functional equivalent to a No.4 or Jack

- Jigsaw
- Mitre Saw
- Nailers and Staplers
- Oscilating Tools
- Planer
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- Router
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plane. Some are available with longer sole plates but these tend not to be as well suited to board jointing as a traditional No 7 plane. (for jointing and accurate dimensioning of stock the task usually falls to dedicated fixed machine tools such as the surface planer (Jointer) and the thicknesser).

Power planes are not well suited to very fine work since they don't have the same finesse as the traditional hand tools. So they won't completely replace the traditional tools in the hands of a fine furniture maker, but they will aid greatly with some tasks. They are also a bit big and heavy for some tasks, and not as flexible for jobs like cutting deep rebates.

They do score over the traditional tools in that they will cope better with man made boards such as MDF or chipboard, that are very unwilling to plane well with conventional tools. They are ideal for trimming 1mm off the bottom of all your kitchen unit plinths when you discover they only fitted correctly before you laid the flooring! (don't ask me how I know!)

Safety

Not the most dangerous of tools, but they do have the ability to bite if not treated with respect. The cutters are fast and sharp and will do a nice job of shredding fingers if you stick them in the wrong place (you have seen those adverts where someone chops a carrot in a food processor? Enough said!).

Ear defenders are a must, since planes are not only loud but concentrate a good deal of the noise into a narrow frequency band that will dull your hearing very quickly, and cause permanent damage with prolonged exposure.

Dust can be a serious hazard when planing some types of board, especially man made stuff like MDF. So a respirator is required some of the time. With more traditional woods the dust produced is more granular and less harmful.

Take care with the power flex and use a RCD protected supply. It is all to easy to take a lump out of the power lead if it gets in the wrong place.

Blades

Most planes use disposable TCT blades. These are usually reversible and if looked after should last a long time. Replacement sets start at about £5. The ease of blade adjustment and alignment is what separates some of the budget from the better quality tools however. Some are very fiddly to get set just right, while the better ones do it for you and get it right first time.

Quality indicators

Bearing and cutter block quality will have a great effect on the finish achievable, your intended applications will however decide what level of product will produce acceptable results. Even the cheapest plane will quickly smooth rough timber and plane "down to a line", the quality of finish, the balance, the flexibility however will sort the ordinary from the good.

Vibration control is also important for both quality of results and operator fatigue.

Many planes will eject dust from a spout. Some make it easy to connect a vacuum hose to this, while some have odd shaped dust ports that require custom adaptors! Better planes also include dust collection bags built in.

Professional level tools will have motors rated for continuous use, while budget ones will have much shorter duty cycles. It is unwise to buy a tool based just on the amount of motor power and maximum depth of cut it can manage, since high power combined with deep cuts is unlikely to give a satisfactory result unless the mechanics of the tool are also up to the job.

When choosing a model it is worth reading the reviews since even the top end brands have some less well liked tools in this category.

Accessories

Handy to have extras include fence attachments that enable to plane to be perfectly aligned in the horizontal axis - ideal for planing the edge of a door for example. Simple ones allow a right angle only, Better ones are adjustable to allow a variation in angle for applying a bevel to an edge. More elaborate accessories allow the plane to be mounted in a cage so that it can be used as a basic thicknessing machine (although with limited width of cut).

Cordless Planes

Relatively recently available these now offer freedom from the flex which is a big step forward for a plane!. As usual expect to pay plenty for the option however. Currently the cordless tools seem restricted to the "pro" level

brands so the usual warnings about poor batteries and chargers do not apply.

Second hand tools

Check that the unit runs smoothly. Make sure the cut is even and clean. Inspect the power lead for missing bits of insulation. If it is supposed to come with accessories like fences, guide, dust port adaptors etc, then make sure you have them as they can be difficult to buy later for many of the lower end brands.

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UK.D-I-Y FAQ

Power Tools FAQ — Reciprocating Saw

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What is it?

A reciprocating saw is perhaps best described as a mechanised version of a hand saw. A blade is clamped into the end of the saw, and a motor drives the blade backward and forward. Typically, reciprocating saws do not have a great amount of finesse, but they are well suited to fast and crude cutting (think in terms of a somewhat safer alternative to a chainsaw rather than an electric version of a tennon saw!). As a result and they are more likely to find applications in demolition work than they are in fine cabinet making!

Example Uses

The following jobs recounted by users of reciprocating saws, give a good idea as to the flexibility of the tools:

Cutting through tree roots below ground level. Freeing a door frame upright from the floor that it was skew-nailed to, when the nails were fully home and the frame was held firm above. Using the flexibility of a 9" blade to enable a cut to be made flush with the floor, under the jamb. Accurately cutting off a horizontal soil-pipe which was flush with the ground 500mm under the suspended floor immediately before it passed through the footings, while reaching through a 12" wide gap in floorboards. Cutting a 2m length of 50mm aris off the underside of a floor joist to make a "squint" in the ceiling above a staircase. Taking out old window frames.

- Jigsaw
- Mitre Saw
- Nailers and Staplers
- Oscilating Tools
- Planer
- Reciprocating Saw
- Router
- Sander
- Wall Chaser

Types

There are several types of reciprocating saw. Proprietary designs like the Black and Decker Scorpion saw (not really comparable to most reciprocating saws, and more like a jigsaw on steroids), and the DeWalt Alligator Saw (a double action saw with twin counter acting blades). Most however are what one might call “standard” designs. The standard designs benefit from being able to share a large range of different blade types, and this tends to greatly add to the versatility of the tools.

Safety

Reciprocating saws are among the more benign power tools, however they are certainly not risk free! The standard design encourages the operator to keep both hands on the tool at all times. This has the added advantage of keeping him away from the sharp end! As a result of this design, most risks are of the environmental nature (i.e. you cut through something and it falls on you!) rather than from the tool itself. Like with most power tools, the use of an RCD protected power supply is recommended.

When cutting most materials, the relatively coarse sawdust produced does not represent too much of a health risk. For some cutting applications ear defenders may be required. Gloves are always recommended, as is eye protection.

One should take special care when removing the saw from the work that the blade has stopped moving completely. Otherwise, it is easy for the blade end to hit the work and cause the saw to kick back. At best, this

can give the operator a bit of a jolt, and the worst could cause the blade to bend.

With prolonged use, vibration may become an issue. Note that pushing the blade stop at the nose of the saw against the material you are cutting can help reduce the vibration.

Blades

It is the wide range of available blades which give the reciprocating saw its great versatility. Metal and timber cutting blades are readily available, as are demolition blades which cut both! In addition there are special blades for cutting green wood. You can also get grit edged blades for cutting very hard materials and such as ceramics or cast iron. Blades typically range in length from 3 to 8 inches.

Since the blade is of a simple design, and there is no complex mechanism involved (unlike for example a chainsaw) so reciprocating saws can be used in quite "blade hostile" conditions like when cutting through tree roots partially covered in soil. The blade design is also very tough, and hence they can be used for cutting flush with other surfaces or even cutting slightly "round corners" rather like a pad saw.

In Use

Some people find reciprocating saws tricky to use at a first, as some practice is required to work out how to keep the blade moving and the saw steady. Using the nose of the tool to help hold it in position against the work helps greatly (much as the sole plate of a jigsaw keeps the body of the tool steady), although this is not always possible, or desirable (one of the great attractions of the reciprocating saw, being its "reach" that gives it the

ability to cut in places that would be inaccessible to other power tools).

Get the blade stuck in the work, and you can end up with a stationary blade, while you try to hang on to a reciprocating saw – literally! Think through your cutting activities in advance, and arrange each cut such that the material does not “close up” on the blade as the cut progresses, thereby trapping it. Lubricating blades by rubbing with a candle or giving them a spray of PTFE lubricant can also help to prevent binding.

Quality indicators

Better tools will exhibit better endurance and will be of a more rugged design. They will also have motors designed for continuous use. Vibration damping is also better on the higher end tools.

Features

Variable speed is well worth having, since this allows an appropriate cutting speed be selected for material in question. A “tool free” blade change mechanism is also highly desirable (budget saws tend to require an Allen key for blade changes). A few saws also include an orbital blade action. This can help improve the speed of cut.

Cordless reciprocating saws

The cordless versions of these tools are ideal for helping you get into places the other saws cannot reach, however expect to pay a price premium for the privilege. Note also that run time will be somewhat limited as effective cutting makes quite high power demands on the tool and hence its batteries.

Second hand tools

Nothing in particular to lookout for. Make sure that the blade clamping mechanism works correctly, check the power switch and speed controller are OK. Also check that the mains lead is undamaged.

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UK.D-I-Y FAQ

Power Tools FAQ — Router

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The router is one of the most flexible and versatile tools in the workshop. However, unless you have used one a few times the uses may not be obviously apparent. What is more, their use grows enormously as you learn that much of the technique with routers is the production and use of jigs to expand the range of tasks they can safely do.

What does it do?

A router holds a router bit (or a “cutter”) and spins it very fast. Different cutters will allow all sorts of different cuts to be made. They are versatile tools used for joint construction in the workshop, and also for many decorative and edge moulding purposes.

Cutting grooves, rebates, flanges. Making mortise and tenon, lap, and dovetail joints (among many others). Profiling, rounding over, sculpting of edges for practicality and decoration. You can use them for fitting locks, and hinges, jointing kitchen worktops, or making staircases.

What types are there?

- Jigsaw
- Mitre Saw
- Nailers and Staplers
- Oscilating Tools
- Planer
- Reciprocating Saw
- Router
- Sander
- Wall Chaser

Routers come in two basic types: “plunging” and “fixed base”. While the fixed base variety is common in the US, it is rarely seen in the UK. The plunging type is generally thought of as being the more versatile, while the fixed base type may have the edge for quality of finish.

The types are further sub divided into power ranges, and “collet” sizes. The collet (the chuck that grips the shank of the cutter) dictates the size of the cutter shank. 1/4" and 1/2" are the most common sizes, although 6mm and 8mm are not unheard of. The larger sized shaft is stronger and hence able to deal with either larger cutters, more power, and deeper cuts with more material removal per pass. Many 1/2" routers will allow a collet reduction adapter to be fitted to enable use of the smaller shanked cutters. 6mm and 8mm bits are less widely available. 6mm is more often used in continental designs and does not offer any real advantage over 1/4". The 8mm however can be handy for owners of 1/4" routers, since some of the larger cutters that are not available with a 1/4" shank, are available in 8mm and many 1/4" routers can be fitted with a 8mm collet.

The Laminate Trimmer

This smallest routers (if we ignore the tiny ones assembled from die grinders like the Dremmel) are often sold as laminate trimmers. They are typically very small and well suited to edge profiling tasks. Often they will be comfortable to hold single handed, single speed (and usually pretty fast at >20k rpm). Total power will normally be 600W or less. These are not ideal general purpose routers, but are very handy to have around in addition to a bigger tool. Many laminate trimmers are also of a fixed base design.

The small router

This class of tool is typically 800W or less with a 1/4" shank collet, and is lightweight and easy to handle. These are ideal for decorative work, laminate trimming, and edge profiling. They can also be used for the lighter joint making tasks. Usually of a plunge design.

The medium router

This is the most versatile tool and can be pressed into service for most tasks. Power will typically be in the 600W to 1600W range. Collet size typically 1/4". These tools are a bit bigger and heavier than the smallest ones, but will do all the things the small ones will do as well as being more useful for machining joints and mortises. This size of router can also be used to good effect inverted and mounted in a router table.

The large router

Typically a 1/2" collet machine with power of 1500W to 2500W (or more). These tools are much heavier (often over 5kg) and hence far less suited to hand held work like decoration and edging. They come into their own when big heavy cuts are required, and when used with the larger joinery tasks, like kitchen worktop jointing, or staircase string manufacture. They are also ideal for use in a table where they will safely turn the biggest cutters for things like panel raising (i.e. chamfering the edge of a panel that will form the central part of a door assembly).

Your first router

For many people buying a router will actually be the first of several. Often it takes a while of using one to find out

which characteristics and features are of most use to you. Also one size does not fit all, and a combination of different sized tools can be very useful to complete some jobs. The ideal first router is the medium sized 1/4" collet machine. Small and light enough for hand held use, but man enough for many jobs.

What dictates the quality of the work produced?

When a router is being used for edge finishing and decorative work the quality of the finish is all important. The main factors that will govern this are the quality of the main bearings (i.e. how smooth and true the bit rotation is), and the quality of the plunge mechanism - the less play or backlash in it, the better. Smoothness is the key.

Must-have facilities

Side fence: This is used to guide the router along the edge of the work piece.

For all but the smallest routers, variable speed: is needed to be able to match the type of bit in use. Bigger diameter bits typically require less speed. Too fast and you run a greater risk of snapping a bit off its shaft, burning or scorching the work piece. Too slow and you risk a rough quality of finish to the cut.

Depth lock: This vital mechanism locks the router at a fixed depth of plunge. If poorly implemented you run the risk of taking passes over a work piece where the depth of cut varies due to the plunge mechanism slipping as a pass is made.

Dust extraction: Some ability to catch the dust produced is very useful since routers can produce very fine dust that will otherwise remain airborne for a long time and may injure the operator.

Depth stop: This allows you a way to preset a maximum depth of cut. Some routers use a turret system that allows you to preset several different stop positions which can then be selected quickly with a partial turn of the turret.

Switch lock: It is becoming increasingly common in these health and safety conscious days (read nannyism!) to remove the facility to lock a power tool into the “on” position when it is not being held. If you ever want to use the router in a table however, then some form of switch lock becomes essential. Some routers still have a switch that will lock on, and others can be modified with the addition of an external switch lock. Switch lock is also handy on small routers when “cutting out” or profiling circular shapes. Unless you have rubber arms, keeping a power switch held down through 360 degrees of rotation can be difficult!

Nice-to-have facilities

Soft Start: Brings the motor up to speed over a couple of seconds. This eliminated the “kick” at start-up and makes it simpler to align the tool ready for a cut before turning it on.

Feedback speed control: Sets the speed to an absolute setting. It increases the power fed to the bit as the load increases, ensuring the speed remains constant. This will help keep your cutting finish consistent and the speed in the appropriate range for the bit. Beware, however, that it removes one of the audible indications that you are trying to take too deep a cut in one pass. The shank of the bit snapping, lumps of wood flying about, and smoke

are other clues!

Fine height adjuster: Ideal when making complex joints, like the dovetail, where the height of the bit dictates the fit of the joint. This is usually a knob that can be turned to wind the plunge height up or down in small accurate increments. Some routers use an add-on height adjuster that engages with the depth stop turret (making use of depth-stop and fine height adjustment at the same time impossible), others have it built in as a separate control which can be engaged when required.

Micro adjustment on the side fence: Allows more precise changes to the positioning of the fence, and hence better control of the amount of material removed per pass.

Router table

One of the most useful additions for a router is a router table. This turns the tool into a fixed machine that can take on extra tasks that would not be easy or safe when using it hand held. In a table, the router is generally inverted so that the bit protrudes upwards through the table, and the workpiece is fed into the fixed rotating cutter. Big powerful half inch collet routers work really well in a table, although the medium sized machines can also be used.

Safety

Router cutters spin very fast (up to 30,000 rpm), so do not underestimate the speed with which they will have a finger off - it will be gone long before you even feel it! This becomes even more of an issue when the unit is

mounted in a table and both your hands are freed from holding the tool. Good guards are clearly essential.

Always treat this tool with respect. Use clamps and hold downs to fix work in place. Use a push stick or block to feed work onto the cutter to keep your hands away.

Make sure when feeding wood into a fixed router that you are doing so against the rotation of the cutter. Do it the wrong way, and the work piece can be grabbed from your hands and flung across the workshop at 80 mph. For someone standing in the wrong place, this can be an experience rather like being on the pointy end of a crossbow bolt!

Good dust collection and respiratory protection is essential, especially when machining hard woods (the dust of many being toxic). Routers are capable of machining a very finely finished surface, leaving it mirror smooth. This does however imply they are capable of generating very fine dust (sub-micron) that once inhaled is very difficult to get out of the lungs. The effects of fine dust inhalation are also cumulative.

Ear defenders are a must. It is easy to be lead into a false sense of security since a medium sized router of good quality may not seem that loud when running. However the moment a cutter comes into contact with wood the noise will get much louder, and it is often concentrated into a narrow frequency band that will dull your hearing quickly, and will cause permanent damage with prolonged exposure.

Router cutters

The first and most useful general purpose cutters are the straight fluted ones. These will plunge, grove, rebate,

and mortise. After that, many people will want some decorative edging bits like a round over, or ogee profile.

Good cutters are expensive, carbide edged, and worth looking after. Cheap HSS cutters are at worst a waste of space, and at best handy for infrequent use in soft woods. Don't be influenced in your choice of router by the “bargain” of having 20 cutters bundled with it.

If you get really serious about woodwork you may end up with a cutter collection worth many times the cost of the routers!

Jigs

Jigs can be as simple as a straight edge guide, or complex machines in their own right such as a “router lathe” (see [Trend Machinery](#) PDF document). Jigs greatly extend the range of tasks you can perform . Many jigs are simple to make yourself, and many can be bought ready made, including ones for tasks like making dovetail or finger joints, mortise and tenon joints, jointing worktops, hinges and locks rebating, making letterboxes, and chopping out rebates for stair treads. Full details of these are beyond the scope of this FAQ, but many examples can be found on specialist routing manufacturers sites like [Trend Machinery](#), or online tool vendor [Axminster Power Tool Centre](#). There are also many good books on the subject available, such as “Woodworking with the Router”.

Second-hand tools

Make sure you get the important accessories like the dust extraction cowl, tools for bit changing, etc. Check for a

smooth plunge action and a plunge lock that stays done up! Cutting a rebate or grove that you find gets shallower and shallower along the cut is very irritating and the sign of a plunge lock that does not work well enough.

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UK.D-I-Y FAQ

Power Tools FAQ — Sander

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There is a big range of sanders to choose from, and many different types. Each have their strengths and weaknesses. Some people will insist that you can only do the job right by hand, but a machine can make it very much faster in some cases!

Sander types

Type	Comments
Rotary Disc	You will be hard pushed to find a dedicated disc sanding hand tool, however it is a task that many drills and angle grinders are will suited to. A disc sander consists of a flexible backing pad that supports an abrasive faced disc (often paper - but there are other types). It is spun quickly by the tool, and one side of the disc is brought into contact with the material to be sanded.

- Normal / Hammer Drills

- SDS Hammer / Chisel Drills

- Impact Driver

- Jigsaw

- Mitre Saw

- Nailers and Staplers

- Oscilating Tools

- Planer

- Reciprocating Saw

- Router

- Sander

- Wall Chaser

Drum Sander

As above, few tools are available that are designed for this, however a visit to your local DIY shop will usually turn up at least one attachment for a drill that has a foam cylinder, onto which slips a sanding belt, usually fabric backed. Similar to the disk sander, but the drill body is in line with the surface to be sanded.

Orbital

The orbital sander uses a flat sheet of abrasive on a backing pad, and sands by vibrating the pad in small orbits (but no rotation). Various sizes are available to take different sizes of abrasive and suited to different sized areas.

Detail / Delta

A variation on the orbital sander, typically smaller and lighter with a smaller triangular shaped backing pad. This makes sanding into corners and other tight spaces much simpler.

Random Orbit

This looks like a cross between an orbital sander and a rotary disc sander. The disc is moved in orbits just like on a orbital sander, however it also rotates slowly at the same time. This has the effect of continuously changing the angle at which the orbital action is taking effect. The greatly enhances the sanding action and is also less likely to leave any visible marking on the finish.

Belt

Here a length of abrasive is formed into a wide fabric backed belt. This is then stretched over rollers and driven at high speed, a little like a tank track.

Uses and Results

Type	Rate of sanding	Finish achievable	Ideal applications	Comments
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Disc	Very fast	Very poor - surface will have visible swirl marks from the disk, it is difficult to achieve a level finish either. Not possible to sand into corners.	Rough shaping and mouldings prior to finishing with a more refined tool.	<p>Disc sanding is a cheap and easy way to get fast results. Special tungsten abrasive discs are available that have very long life and serious cutting ability. The quality of the machine spinning the disk will have little effect on the results although better machines will have longer endurance.</p> <p>Technique is everything, you need to always keep the pressure light enough to avoid the possibility of digging in, always keep it moving, lean the drill</p>
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over slightly so its the side of the disc that's doing the work, and move it sideways. If you sweep it parallel to the cutting edge, gouges are guaranteed. If for a moment you allow a bit too much pressure on it, ditto. The secret is to use a very coarse fibre disc. Try 20 or 30 grit. 60 grit paper is a waste of time.

Drum	Very fast	Poor, surface may have visible lines from the drum, and it is difficult to achieve a level finish. Not possible to sand into corners.	Rough sanding of large flat areas, to remove paint, or smooth rough-cut lumber. However, smooth (though not very flat) results can be obtained if successively finer papers are used.	Drum sanding is a cheap and easy way to get fast results. It is more controllable than disc sanding, and large areas can be sanded with ease. However, dust extraction is at best very poor, generally non-existent, making use of dust masks or supplied air mandatory, and needing extensive clean-up of dust.
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Orbital	slow to medium	Good to fine - best result achieved when working down through grades of abrasive	Good all round tool suitable for rough rubbing down and well as final finish work. The orbital action may however leave a slightly visible pattern of scratching on some types of material.	A wide range of tools are available here, with sizes ranging from "palm" sanders - ideal for final finish work, and larger 1/3rd and 1/2 sheet models for bigger areas. Less useful for rough shaping however.
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Detail

slow

as orbital

Special purpose tool for sanding small areas and also right into corners. Note that some of the better orbital sanders will now come with extension arms that elongate the pad of the sander making the delta sander less unique in its corner sanding ability.

A moderate range of tools are available. Usually small and designed for single handed operation. The poorer ones do not sand well at all.

Random Orbit	Medium to fast	Fine finish achievable	Very good general purpose sanders. They cost a little more than orbital ones but will outperform them in most applications. With a coarse grade paper they will remove material very fast, with a fine grade they will produce a high quality finish.	Smaller range available. Poor quality examples are less frequently found however. They can be a little less controllable on small surfaces than an orbital for example. When sanding "fast", they will also eat sanding discs very quickly.
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Belt	fast to very fast	Fine finish achievable	Good for when you need to remove lots of material quickly, but with controllable results and good finish. Used with fine abrasives can also give very good results. Can replace planning in some applications.	Moderate range. These cost more than most other types, The quality of construction is also more significant. Poor ones are simply not worth buying since they do not have the mechanical quality required to keep the belt running accurately and smoothly. Controlling a belt sander is not always as easy as other types (they want to run away with you in tow!), however the addition of a sanding frame can help greatly; not only giving better
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control, but also improve the consistency in the level of the finish.

With suitable jigs they can also be adapted to bench mounting to allow more accurate sanding activities to be undertaken.

About Vibration

Most sanders produce vibration to some extent. Better quality tools make more strenuous efforts to control and minimise this. For occasional use this does not matter too much, however for prolonged use it will quickly have a noticeable effect on operator comfort and fatigue. For extended periods of use (say in the course of your job) then exposure to ongoing high levels of vibration can have serious and permanent medical effects - particularly to the hands and joints. Buying tools further up the model ranges and from the traditional "pro" tool makers is usually a good way to get tools with less vibration risk.

Dust Collection / Extraction

Sanding is one of the most innocuous DIY activities and yet is also laced with serious potential health risks if attention is not paid to dealing safely with the dust hazard. Sanding dust is particularly dangerous because of its very fine particle size. Small particle sizes can be very difficult for the bodies normal dust protection mechanisms to deal with. This can result in permanent trapping of fine particle dust in the lungs, which can go on to cause a variety of unwanted conditions. Many wood dusts are also toxic by inhalation. Inhalation of some dusts (e.g. that which can result from rapid sanding of fibreglass) can even result in fatalities after only relatively short durations of exposure.

Many sanders have a dust collection facility. This is better than nothing and will cut down the mess produced, but it is rarely sufficient to protect you from the dust hazard. To be protected you need to wear effective fine particle filter masks (or better still a respirator), and / or have very effective dust extraction from the tool. Note also that sanding dust is very effective at clogging filters in extraction / vacuum systems. Well designed high power cyclone systems can work well at collecting this type of dust.

Take care when using sanders that extract through holes punched in the paper. These holes often serve not only for extraction, but also a supply of cooling air for the sander. Block them with no punched paper and you may be rewarded with an overheated sander!

Differences

The cost range of sanders is large. The most notable thing you find with better ones is less vibration. Note also however that the low end tools are not usually rated for continuous operation (and sanding is a task that you can

go at for hours at a time if the mood takes you!).

Special Mention

There are a few specialised power tools that also make good sanders, but don't directly fit into any of the categories listed above. Versatile tools like the Fein Multi-master will make a good job of detail sanding. Many modelling sized tools (Dremel etc) also have several ways of sanding. There are also special purpose tools like some of the Festool range that allow "linear" sanding (bit like an orbital that only goes from side to side) for sanding long straight but intricate things (like handrails, architrave, and dados for example).

Second Hand Tools

Nothing much special to look for. Take care with sanders that hold the paper via a "hook and loop" backing pad, that the backing pad has not worn out and will still hold the paper firmly. These types of backing pads need to be considered as consumable items. Sanders with dust collection may require new filters / bags.

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A Tribute to Andy from his friends in
the uk.d-i-y Usenet Newsgroup

This is very sad indeed. Andy was truly one of a kind, who touched everyone he met, with his fantastic sense of humour and in-depth knowledge of almost all subjects. Both myself and Mrs G will miss him greatly, and feel privileged to have known him.

Grunff <grunff@ixxa.com>

That's terrible. I'll miss lots about Andy...the ideas, the perfectionism (to aspire to, at the very least), and of course taking the rise out of him too! A sad loss.

"Bob Eager" <rde42@spamcop.net>

That is very, very sad news. My sympathy to his family.

Bruce <no@nospam.net>

A terrible shock. His contributions here will be greatly missed. Poor Andy.

Derek Geldard <derek@miniac.demon.co.uk>

How very sad. One of nature's gentlemen - that opinion reinforced on the couple of occasions I met him in person. His posts will be much missed for the levelness they brought into many a discussion - as will his excellent advice on those things he was expert in, which were many.

Dave Plowman <dave@davenoise.co.uk>

Agree or disagree—and I did both—he will be missed. Most especially, by me, on many of the off-topic rambles and meanders. It would be nice to think that his family could come by here sometime and read this.

Rod <polygonum@ntlworld.com>

That is very sad to hear, Andy was one of the most prolific and useful posters to uk.d-i-y, he will be missed.

Chris Green <tinnews@jsbd.co.uk>

Over 22,000 posts to uk.d-i-y, over 27,000 to usenet overall. That's quite some record.

Tim Downie <timdownie2003@obviousyahoo.co.uk>

That is a real real shock: I've met Andy at several meets and the Sandown woodworking show. We may not have agreed about everything but his contributions to this group will be sadly missed

Tony Bryer <tonyb@delme.sda.co.uk>

That is very sad news indeed. Andy always demonstrated a very professional approach to all subjects on which he posted, and I had a great deal of respect for him - although I never met him in the flesh. I was aware from his posts that he had various health problems - but his sudden demise is still a great shock. This newsgroup will be poorer without him. RIP Andy.

Roger Mills <watt.tyler@googlemail.com>

I had wondered where he was, and was considering posting to ask if he was okay. His contributions here will be missed.

Sheila Viemeister <sheila@viemeister.co.uk>

That's very sad news. I too hope that you might pass on to his family our appreciation of Andy's high-quality contribution to this newsgroup over many years.

Jon N "The Night Tripper" <jkn_gg@nicorp.co.uk>

We never met but I'll miss him. The debate about Agas will never be quite the same again. He was always ready to argue his case eloquently yet at the same time gave freely of his time to help others particularly newcomers here. If there is any form of continued existence I suspect their QC department is going to have a real problem on their hands when they have to explain to Andy his relocation was due to faulty pipework.

Peter Parry <peter@wpp.ltd.uk>

Not much I can add to this - sad, sad news indeed ☹️ Never met him, but have had plenty of “discussions” on here over the years. Best hope for everyone's sake heaven isn't paved in laminate or someone will have hell to pay :-☹️ He'll be missed in here, it'll not be the same without him ☹️

Darren Chapman <D.M.Chapman@ukc.ac.uk>

I was genuinely shocked and saddened to hear this news despite never having met Andy. No disrespect to any other members here (as many have been of such invaluable assistance), but it was always reassuring to have a contribution from Andy in the thread of a post - his input was always right on the money. UK.D-I-Y has certainly lost one of its key contributors. As others have said, I sincerely hope that his close friends and family are shown this thread so that they understand the respect that others had for Andy. My condolences to his family.

Phil

Sad news. This newsgroup will be overrun by complaints on cheap chinese ALDI/LIDL tools, and Mr Hall won't get the chance to say "I told you so...". He'll miss that, and we'll miss him for it....

Adrian C

Not to mention his views on laminate flooring. He will be will sadly missed on this newsgroup for both his very good advice and his sense of humour. My condolences to his family.

Adam "ARWadworth" <adamwadsworth@blueyonder.co.uk>

I'm very sorry and it would be good if his family could be sent our condolences.

Mary Fisher <mary.fisher@zetnet.co.uk>

I liked this man. He was always helpful and had time for new people with daft questions. He helped me a lot with my projects, particularly my new central heating and was a great help to me. I will miss reading him. ☹ R.I.P.

EricP <ericp@blueyonder.co.uk>

How very sad. He will be greatly missed. My condolences to his family.

Anne Welsh Jackson <amygdala@zetnet.co.uk>

Really sad news. He'll be sorely missed on here.

Frank Erskine <frank.erskine@btinternet.com>

I'm saddened. Truly. Andy had his own opinions, and was not backward in coming forward, but I mean that as a compliment. I enjoyed occasional debates with him, and truly appreciated his advice.

Graeme <Graeme@nospam.demon.co.uk>

The month's silence was ominous, and the news is quite a shock. I add my condolences.

Andy Wade

What a sad loss for his family and this group. He will be sorely missed. This newsgroup will never be the same without you and all the help you have given. There is something to be said for someone who will give their time away for free helping others that they will never meet for real. Rest in peace Andy our thoughts and prayers are with you. Thank you for all your help Andy even though I never told you how much you have helped me specifically I couldn't have done my house without you. God Bless.

Samantha Booth <mail@cheekySPAMchurros.com>

Beautifully put. May I take the opportunity to add my condolences. The response here has been truly touching and as others have said, I hope his family can see the appreciative sentiment expressed in this newsgroup.

Andy Capp

I've always admired and respected Andy's posts, and he will be a great loss to the newsgroup. I met him a number of times at the DIY meetings we had in London and Berkshire areas. His area of business was similar to mine, although we never actually worked together on anything. However, I did use him as a voice of reason and logical thought when I was weighing up two slightly different career paths, where his advice was just as valuable as his comments here have always been. I will certainly miss him, and my thoughts are with his parents, wife, and children.

Andrew Gabriel

I am now thoroughly annoyed with myself. No such meeting having been mentioned in ages, I had thought to suggest one earlier this summer. (Circumstance made this difficult, so I did not do so.) I certainly would like to have met Andy. I am finding it poignant that those posts of his that I most appreciated were on OT health issues. Please put my name to any such card - and if I have said anything quotable, do so.

Rod <polygonum@ntlworld.com>

Just goes to show that once the “*If only*” have gone, they are gone and that you only get one go. Andy put a fair amount into that one go. Maybe a wake up call for some of us.

geoff <raden@kateda.org>

I've been arguing with Andy for longer than I care to remember, but I don't think we ever fell out. Despite not agreeing on anything, I shall miss his consistency and reasoned arguments

Stuart Noble <stuart_noble@ntlworld.com>

Please put my name on the card too. I've always valued Andy's contribution, and shared his general outlook. I'd like to think that he has contributed more than mere practical advice, but also valuable advice on how best to consider things for yourself. Farewell Andy.

Ron Lowe <ronATlowe-famlyDOTmeDOTukSPURIOUS>

As a relative new comer and lurker, I can see how much of a loss this will be not only to this group but also, undoubtedly, to those closer to Andy. Not to mention the manufacturers and vendors of premium tools. A sad loss all round. RIP Andy.

GMM <Handyl@dsl.pipex.com>

Please add my name. I can't think of any thing to say that hasn't been said already. Farewell Andy, we never met but you will be missed.

Dave Liquorice <allsortsnotthisbit@howhill.com>

What sad news. My last message exchange with Andy was a biscuit pun. Good to have a happy memory.

Paul Herber <SubstituteMyFirstNameHere@pherber.com>

That is really sad news. I hope Andy got as much from the group of what he gave to it. The power tools have spun down and the lid of the toolbox closed.

Owain <owain47125@stirlingcity.coo.uk>

That's not right.

The Natural Philosopher

This is a shock. My condolences to his family - I will always be grateful for Andy's contributions to this group. He has given me a number of ideas over the last few years, which are now proving to be invaluable for the current job in hand. Although it will be no consolation for Andy's family at this time, if a man can leave this world thought of so highly by even people he hasn't met, he's done well. But, no, it's not right.

Tim S <ts@dionic.net>

I thoroughly agree on all counts. To be rich in spirit and remembered as a decent person is the greatest thing anyone can aspire to IMHO, all other aspirations are frippery and will pass. Andy seems to have met all the requirements to be regarded as high quality. Please pass on my condolences if there's to be a card or such.

Clint Sharp <clint@clintsmc.demon.co.uk>

Ah, bugger. Really, really sorry to hear that - the place definitely won't be the same without his good-humoured (and sometimes pig-headed) defence of quality. Pass on my condolences. Please ask his wife to make sure the coffin/urn is made of the finest materials and delivered by hand-selected veiled maidens. He'd appreciate that.

Dave "Grimly Curmudgeon" <grimly4REMOVE@REMOVEgmail.com>

Very sad news. I have been busy today so have come late to this thread so will just say that I agree with all the good things that have been already said about Andy. He will surely be greatly missed. My condolences to his family.

Roger Chapman <roger@nospam.zetnet.co.uk>

I am so sorry to hear that Andy has died, he will be missed. I appreciated being able to trust that he would always have his facts right .. and his opinionated views. My condolences to his family.

Anna Kettle

I'm always one of the last to comment on announcements such as these even though usually one of the first to see them it would seem. I never know just what to say or how to say it. I'm a bit rubbish with this sort of stuff, so bare with me... For me no-one "passes away" for that indicates they leave those they loved, places they appreciated and tasks they enjoyed behind. Passed over, crossed over, gone to the other side, how ever it's termed, it's *never* "passed away" ! I, like many (most) others here I didn't know Andy Hall personally so I can't relate to him as just "Andy" for me he will always be "Andy Hall" a man with great input into the group who's opinions and thoughts will be greatly missed and always respected. No doubt he will be keeping an eye on his family from the other side and giving guidance in whatever way he can to anyone that asks him for DIY spiritual assistance. The answers that come to us in light of sleep are I believe answers from those that have passed before us and those who are always in our thoughts. My thoughts and wishes go to everyone touched by Andy Hall; friends, family, acquaintances and those like myself that only knew him as a source of wisdom in the realms of uk.d-i-y Andy Hall, gone but never forgotten.

Pete <0845.86.86.888@GymRatZ.Gym.Equipment>

As a long-time lurker and occasional poster, you echo my sentiments completely. My condolences to his family and friends.

Grumps

Jings, I'm really sad to hear it. I'd assumed he was off seeing to the massive business empire. I'll miss the irascible, but thoroughly worthwhile Andy.

Steve Firth <%steve%@malloc.co.uk>

I am not a believer, but if he is there, God bless Andy, I always admired his very knowledgeable posts to this group.

Dave <davenpat@btopenworld.com>

That's a tragedy. I met him in Exeter before an Axminster tool show at Westpoint one time. He was a gentleman. My condolences to his family.

Al Reynolds <ajr-news@bat400.com>

Poor sod, he'll be missed greatly ☹ RIP Andy

Colin Wilson

Oh no. I just can't believe that, what a tragedy. I'm going to miss the guy, things won't be quite the same around here anymore.

Dave "The Medway Handyman" <davidlang@nospamblueyonder.co.uk>

I will certainly miss his expert contributions on many many subjects. His contributions were often laced with his wicked sense of humour. I never met the guy but had a great respect for his views and advice. He steered me towards several excellent products with his constant search for perfection - boilers, garage doors, fridges particularly spring to mind. I'm sorry I never made it to one of the uk.d-i-y meets - sadly I won't now have the chance to put a face to the name. My sincere condolences to his family.

Simon Stroud <simon.stroud@btoutternet.com>

I'd like to add my name to the growing list of those expressing their sadness. Through the wonders of Google I've just been looking back at questions which I asked the good people of uk.d-i-y to which Andy gave answers. Until I did that I hadn't actually realised how much help he'd given me over the years, and how many things in this place owe something to his advice. He was always generous with his help, and remarkably patient given some of stupid things I've asked at times. His contributions embody the spirit of uk.d-i-y and what makes it so agreeable. I can't imagine what his family must be feeling, but I'd like to pass on my condolences.

Martin Pentreath <martin_pentreath@hotmail.com>

A sad loss and the newsgroup will miss his in depth and incisive posts.

Ed Sirett <ed@makewrite.demon.co.uk>

I haven't been on this newsgroup for some time but I know Andy was a regular poster. I just saw a thread the other day wondering where he was and now I see this. I'm really sorry. Didn't always agree with his insistence on buying the most expensive tools, but he did give a lot of good advice including some to my DIY queries.

<daddyfreddy@gmail.com>

He was one of a very few people on my Highlight list. Their posts light up red. I never wanted to miss his contributions. I'm not surprised to learn he was a Technical Director. The Memorial is a nice touch on their website. His family are in my prayers.

R. "TheOldFellow" <theoldfellow@gmail.com>

Losing this man leaves a space that will require several to fill. Remembering his opinions on quality power tools was always a welcome read although sometimes infuriating :) A couple of weeks ago I began looking forward to the next Andy Hall Quality Power Tool 'Seminar' in order to 'offer' something but I've missed that chance now. I'm remembering the Prof Toff, this day.

Arthur <pangga@btinternet.com>

To add my name to the list - so sudden, and scarily young.

Andy Champ

Indeed.. but he was just too young☹...

Tony Sayer <tony@bancom.co.uk>

Really sorry to hear that. I sometimes wondered how he managed to find the time to fit work in around his dedication to uk-diy. I met him a couple of times, and he'll be sorely missed

geoff <raden@kateda.org>

As a regular lurker and very occasional contributor I'd like to add my condolences to his family. I always read his posts with interest, although I didn't always agree with him - especially around his view on cheap tools. Anyway, I'll miss the old sod. R.I.P Andy Hall

Iain, in Pudsey "Swarfmaker" <iain@swarfmaker1.co.uk>

Damn. I don't know what to say, but I'll try to say it all the same. I was fortunate to meet him at one or two of the Thames Valley meets, must've been a few years ago. I liked him. I think if I'd only had his posts to the group to go by I might have found his rather right-wing views[1] disagreeable, though that only came through in a few threads - I recall discussions on postal services, and how the private sector was almost by definition superior to the public sector (although Andy made it clear he was speaking from his own experience: he never came across to me as a bullshitter). I did find his views of parts of Reading I drive through and work in as being no-go areas comparable to the warlord strongholds of Baghdad rather comical! And that's about all I can say about him that's less than eulogistic, and other contributors have spoken much better than I can of Andy's prolific, informed, helpful, expert contribution to this group and elsewhere. I suppose if you can't die instantly in an accident with a monstrous angle-grinder then Andy's was at least mercifully swift, but what a blow for his family. And for us all, in a relatively tiny way. I'd been thinking of suggesting another local meet but never got the round tuits.

[1] as in economic libertarian rather than social authoritarian: I didn't get the impression Andy would have wanted to or approved of dictating anyone's personal lives to them.

John Stumbles <john.stumbles@ntlworld.com>

Like everyone I can only say that is truly bad news. I enjoyed his contributions here; his clear thinking, tenacity of expression, a determination never to settle for second best.

djc <slais-www@ucl.ac.uk>

I was fearing the worst about Andy. I knew he was a diabetic. I have been away and just logged in and saw this thread. I never thought I could cry about someone I had never met.

"Doctor Drivel"

So long Mr Hall, him up stairs doesn't do arguments. ;-)

George <20xx20@blueyonder.co.uk>

Oh dear, I am gutted at that. We should have realised it would take a lot more than another of Andy's epic jaunts around Europe, the far east, S. Africa or America to keep him away from here for more than a few days. I first met Andy in the early 80's, when he was commissioning a fancy new piece of microprocessor development kit for us in British Aerospace, before his career really took off. This kit ran the (then) mysterious Unix system, and Andy took extra time out to teach me the basics of it - he was clearly an expert in Unix and comms even then - and I owe him a lot for getting me started in Unix and its offshoots. He moved on to the more esoteric technologies that now keep the web in good shape, and we lost touch until meeting up again in cyberspace, courtesy of uk.d-i-y, and then in person at that DIY meet in London in 2001. I met him again a couple of times at the 2004 meets in Exeter, where he recommended the hotel he was staying at - I guessed then it was not going to be cheap, but as in all things Andy did, it was the quality that mattered, not the cost*. That's not to say he was a snob, far from it, Andy was as comfortable as the rest of us supping ale (so long as it was a good one!) in any pub, along with a bar meal. He never once mentioned he was a Technical Director, nor indeed what his job was, and in discussions on here never pulled rank, relying on logic and his knowledge in a very wide range of topics to fire his many debates. Andy's death is a very sad loss, and though I only met him a few times he was a genuinely *NICE GUY*, and as others have said, a gentleman in the real sense. I am proud to count myself amongst those that have received much helpful advice from him, both as direct answers and from his host of helpful responses to others. My usenet filters have for years been set up to capture posts authored by "Andy Hall". I will miss posts ending with ".andy". Please add me to the condolence card list (if there is room!).

*Yes, it was expensive, but a damn good hotel.

Phil Addison <phil_a@bigNOSPAMfoot.com>

That's a shock and I'll miss his posts. My condolences to his family and especially his parents, I hope I don't suffer the grief of losing a child.

Andrew Heggie <news@sylva.icuklive.co.uk>

I am deeply saddened by the news. My thoughts are with his family and friends at this time. I think when I first stumbled across uk.d-i-y some six years ago or so, Andy was one of the first posters that truly made a lasting impression on me, and he helped set the tone for the group as a whole. I was thrilled to have found such a great collection of like minded people with wide and diverse interests and knowledge who were so willing to devote their time. Andy's devotion to providing detailed and comprehensive answers to questions even when from people just "dropping in" to the newsgroup was inspiring, and I felt a yardstick by which ones contributions could be measured. I will miss not only his detailed contributions, and advice, but also the humour, and the joy of someone else who liked the occasional bad pun as well!

John Rumm <john@internode.co.uk>

Oh, wow. Having been aware of Andy's absence for the last few weeks, as soon as I saw Andrew's email header I had that sinking feeling in my stomach. What a sad loss. Andy will really be missed round here; he's certainly helped me out on diy stuff over the years on more occasions than I can begin to count. Please convey my sympathy to his family, too.

David "Lobster" <davidlobsterpot601@hotmail.com>

Just a simple set of thoughts: 1. His advice was always honest. There was never self-interest in it. 2. His advice was usually correct. Yes, there were arguments but on balance he was always the most sensible contributor to this site. 3. I brought up my kids with a few messages. One of which was that the sort of people who mended and fixed things were better than those who wrecked things. My lads install things in their homes, are engaged in useful practical jobs and are happy. Sort of "Andy" people, perhaps. Thanks Andy
My big regret is that I have to say thank-you this way.....

Tim Brook "naffer" <timbrook99@hotmail.com>

I will miss Andy. My sincere condolences to his family and real-world friends.

Mike Harding "Ziggur" <ziggur@morlaix.com>

I'm late to the wake, but I'll add my own condolences to the family, and also say that he'll be missed. I can only aspire to the thoughtful and knowledgeable contributions he made to uk.d-i-y. I'm glad that people like him take the time and trouble to help others using his extensive experience. As others have said, a gentleman, and the kind of person who makes life better for everyone, not just himself.

Sid.

Brilliant: well said Sid - for me too. RIP Andy.

John <lalaw44@hotmail.com>

I'm truly saddened to hear this. I had a number of disagreements with Andy over differing points of view, but despite this it was obvious to me he was a gentleman with great integrity and knowledge covering many subjects, that he was able and willing to share with other people on this group. My heartfelt condolences go to his family and all his friends.

Mark

Oh Bugger ☹

Fred Carnot <FredCarnot@mob.invalid>

I think like you all I have followed the enquiries as the Andy's whereabouts with increasing concern, and to find that he has died is truly a great loss. The list of contributors to this thread covers all the regular members and more, and is a true reflection of the respect we all hold for him. And then his total resistance to anything that wasn't the best, which was all very well if you could afford that, but he wasn't prepared to compromise. So sorry - the world is a poorer place. My thought are with his family - and so young too.

Rob Graham <robkgraham@btinternet.com>

I'm sorry to hear of Andy's death. I have received much valuable advice from this group, of course including valuable advice from Andy that I will refer to throughout my future endeavours. My thoughts are with his family and friends.

Simon <sm_jamieson@hotmail.com>

Highly respected. "The Singer, not (always) the song."

Cicero <sheldrake@hellfire.co.uk>

How very sorry I am to hear of Andy's sad and untimely death. Please pass on my very sincere condolences to his family. As a long time lurker and occasional contributor to uk.d-i-y I appreciated his constructive comments on matters as diverse as DIY tools through to network attached storage devices. With the all-too-late knowledge of his background, I now understand the depth of experience from which those comments came. He will be missed

Richard Perkin <richard.perkin<AT>myrealbox.com>

I think everything has been eloquently put already. I too am a frequent lurker and very occasional poster. Andy responded to my first ever question here with advice I took and have never regretted. Very sad news indeed my thoughts are with his family. God bless you Andy R.I.P.

Andy Barron <andy@the-barrons.freemove.co.uk>

Oh no, this is so sad. And one of those situations that words can never do justice. His clarity on political matters will be missed as well as his DIY expertise, though this is no comparison to the loss of his nearest and dearest.

NT <meow2222@care2.com>

Finally, in Andy's own words,

"Perfection is just an illusion, and as I've said to you before, when you've achieved it, there is only one way to go."

.andy