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COVER FEATURE

# Build your own arcade PC

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GUIDE

## WOOD FROM THE KEYS!

You'll be pining for  
this PC case that's  
made out of wood!  
It's barking mad!

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COOL  
GADGETS

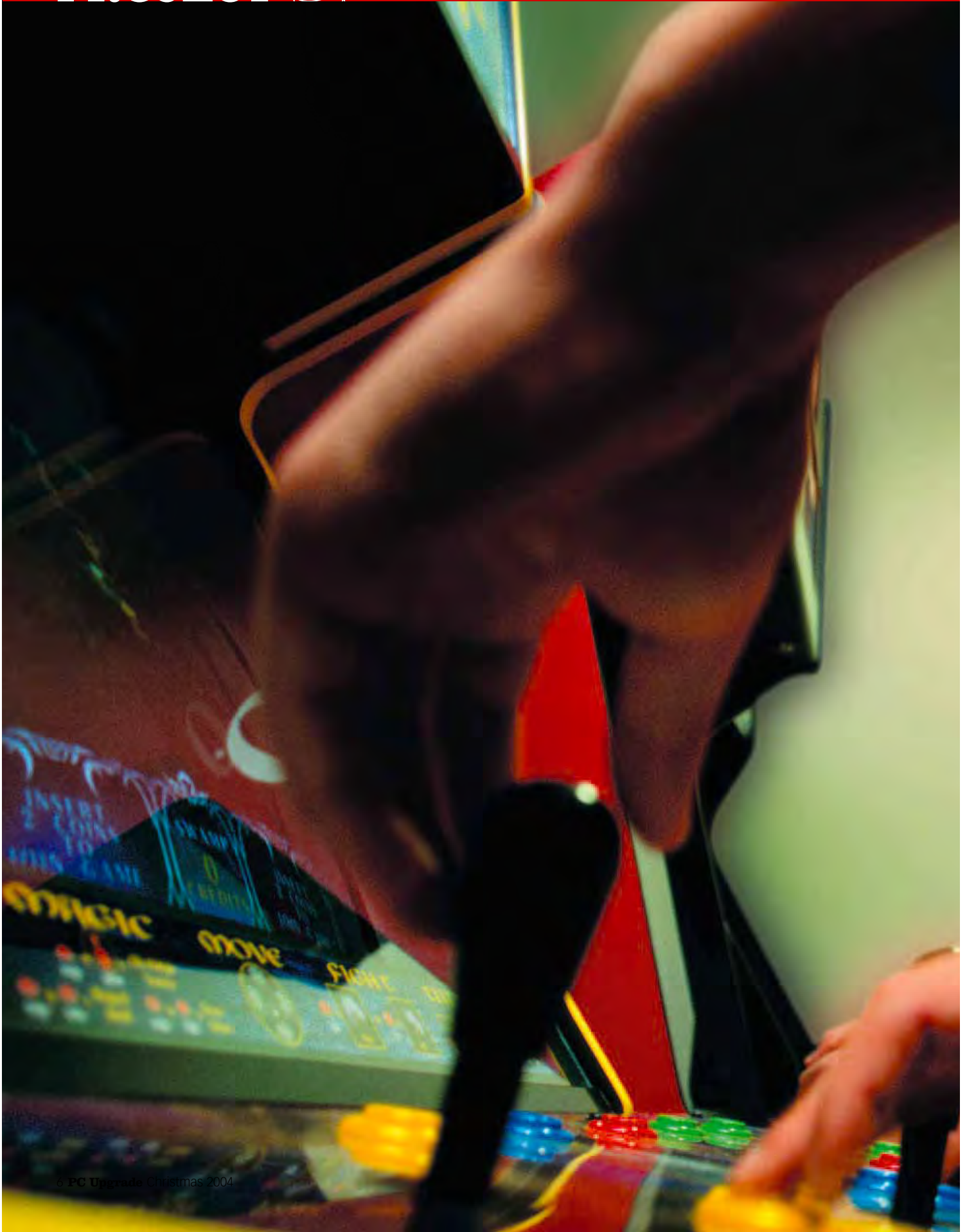
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DON'T TRY  
THIS AT  
HOME!





# PROJECT



**BUILD YOUR OWN...**

# Arcade machine

Mike Abolins, Tim Edwards and Andy King reminisce about the good old days of arcade classics. Then they stop talking and get down to building their very own old-skool gaming system

**ON THE  
CD**



**O**ur PC is one of the finest games machines on the planet. It can chew through enormous numbers of polygons, process billions of instructions, and retrieve massive amounts of information, change it to light and sound, and display hugely complex scenes, just for your entertainment. As the hardware evolves, the way we view games is changing. Where we once accepted high scores and extra lives as the pinnacle of achievement, they're now relics of a bygone age.

That's simply not fair. Arcade games are our heritage: we owe everything to that moment when Nolan Bushnell placed the first *SpaceWar* cabinet in Andy Capp's tavern. The problem we have is one of longevity: arcade hardware is fragile. Day in, day out, beer is spilled down their controllers, kids push up against them. The videogame industry has no central archive or library for software, let alone hardware.

**Emulation enables us to resurrect the classics of yesteryear...**

When the apocalypse comes, and the humanoids emerge from underground cocoons, there will be no record of the games we played.

Emulation offers that archive. The work of thousands of dedicated programmers, and the monstrous capabilities of your PC, enables us to resurrect the classics of yesteryear, in bright, occasionally pixel perfect, CGA. From simple nostalgia, to academic research, gaming is laid bare.

Even better, emulation is something we can all do. Here, we'll explain how you can convert a reasonably specced PC into an arcade monster machine. We'll show you the software you need to get started, a couple of ways to update your hardware to keep the games ticking over, and, best of all, how to build your own cabinet. You can find all the parts for next to nothing. It's a chance to put your scrounging abilities to the test.

So go and build, but most importantly – play. These games aren't going to be around forever! >>



# Return of the Space Invaders

The elegant lines of the latest PCs may look stunning, but what can be better than a good old-fashioned Space Invaders console?

**M**aking a Space Invaders-style console is easy. You only need a few tools, and it can be built with three sheets of MDF, (two 19mm thick, one 13mm thick) costing, ooh, £35. It doesn't have to follow any specific guidelines – simply make a shape that looks right for the side panels, with shelving to suit: a central shelf for the control joystick or trackball and the monitor, a base one for the computer, and most importantly for true authenticity, a top one for your pint!

To make it, we need a jigsaw, a small router, 19mm and 13mm straight-cutting router bits, a

6mm radius round-over router bit and a circular saw for the majority of the work. A straight piece of timber and a couple of clamps are also needed to make the grooves for the middle shelf. Some sandpaper for cleaning up the edges and a round object (such as a saucer or a tin) can come in handy for marking the curves.

A standard sheet of 19mm MDF ripped down the middle will make the two sides, giving you a width of 600mm at the widest point. Cut these two panels to 1,800mm long, the overall height of the cabinet. You can get timber cut to size at B&Q Warehouses if you can't transport full sheets.



## #01

Make a mark 1,200mm from the floor for the central shelf. The base of the unit is to be 500mm deep: make a mark to this distance and join to the central line. Measure 115mm back from this central line for the overhang of the monitor panel. The top of the cabinet is 540mm deep, so make a mark for this and join to the last mark.



## #02

Radius the corners at the top and where the centre shelf meets the sloping edges. Cut to the lines using a circular saw on the straight lines, and a jigsaw to run the curves through. Use this template to mark the other cabinet side. Rout the front edges: position the boards so they're mirror images and make a mark on each to ensure you rout the correct faces.



## #03

To run the grooves in the panels is simple. The shelf panels are made from 19mm MDF, the front sloping panels and the back panels are from 13mm MDF. Starting with the shelves, fit the 19mm bit in the router. Mark up each position of the shelves before you rout. The central one is 1,200mm from the bottom of the panel, the bottom is 75mm from the bottom and the top one is 20mm from the top. All the shelves stop 50mm from the front of the curved edges, and all grooves are 8mm deep.

Set the fence for the bottom shelf (75mm from the edge of the cutter) and rout the first groove. With the router still set at this, rout the corresponding groove on the opposite side panel. Reset the fence for the 20mm inset top shelf and repeat the procedure. The central shelf cannot be cut with the fence so you will need to clamp a straight edge for the router to follow. Measure the distance from the edge of the router bit to the edge of the router base, and mark this distance back from the shelf position. Clamp the batten to this line and make the cut, repeating on the opposite side panel.



## #04

This now leaves three grooves in each panel. These have to be connected with 13mm grooves for the sloping front panels. Change the bit in the router for the 13mm one and set the fence to make a cut 50mm in from the edge. Make the cut in both boards, to connect the bottom shelf to the middle one.



## #05

The sloping monitor panel needs a straight edge, as the fence won't follow the edge. Measure back from the front at the top shelf position by 150mm and by 115mm at the middle shelf position. Set the straight edge using the same method, measuring the edge of the cutter to the edge of the base and clamp and rout the grooves. You've finished the side panels.



**#06**

The shelves and front panels are cut to size by determining the width of the finished cabinet (in this case 632mm). They should be 610mm wide, which accounts for the grooves they have to fit into. The central shelf is cut 150mm longer as it has a shaped front. Measure the length of the groove and transfer it to the middle shelf. Use the saucer/tin to mark curves on it from this point and cut with the jigsaw.



**#07**

The cabinet needs to be temporarily assembled for the next stage. Drill three holes in each shelf groove and screw each shelf into position using 50mm x 5mm countersink screws. The front sloping panels are marked on the shelves using the slots in the side panels as guidelines. Measure the length of the panels at this point, allowing an extra 14mm to sit into the grooves that are to be routed.



**#08**

Take the cabinet apart, set the fence to these marks and rout a 13mm-wide groove 8mm deep at each position. The 13mm-wide grooves for the back panels can now be cut. The grooves in the underside of the top and middle shelves are 8mm deep and the grooves in the top of the middle and bottom shelves, 3mm deep. This allows the shelves to lift into the top groove and trap into the bottom one once fitted.



**#09**

The cabinet can now be fully assembled. Fit the shelves to one side, check and slide the sloping front panels into place. Drop the other side panel into place and screw it securely. Stand the cabinet up and measure the back panels. These need to be about 2-3mm narrower than the inside width of the cabinet, and 5mm longer than the inside faces of the shelves, to allow them to sit comfortably in the grooves.

Drill two holes into each panel for your fingers to pick the panels up and then check they fit. Place the monitor on the middle shelf and slide it up until it touches the back of the sloping panel. Depending on the height you want the screen, you may have to build up a plinth inside. This can be done by gluing strips of MDF to the sides and cutting a secondary shelf to sit on top. Centre the monitor on the sloping panel and make marks for the sides and top.



**#10**

The panel needs to be removed to cut it out; this can be slid out by removing the screws for the top shelf and sliding it out. Cut the shape with the jigsaw. Re-assemble and push the monitor into place. Lastly, drill holes inside the cabinet through the middle shelf for the connecting cables to the computer and through the front curved shelf to drop the trackball lead inside. Now paint it. Note that you may need deeper sides for a bigger tubed one.

## THE FINISHING TOUCHES

Welcome to our very own paint shop pro

Our wooden cabinet looks convincing enough, but there's a few things missing. First things first is paint. For the main body we've gone for a suitably cheerful coat of Crown non-drip Tibetan Gold gloss. Well, when we say 'coat', we mean two coats, as the first was simply absorbed by the MDF and disappeared entirely. It could do with a third coat, too. For the sides of the cabinet, we went for no messin' Crown Solo Jet Black. The one coat version, which is perhaps

a lesson we should have learnt before picking the yellow paint.

Once the wood's dried, it's time to squeeze the technology inside it. Our PC will go in the bottom of the cabinet, and the monitor rests on the top shelf peeking cheekily through that expertly cut hole. We've left a gap so we can access all its buttons and knobs in case we need to change anything, but you might want to obscure this and rely on physically lifting out the monitor if you ever want to tweak

any of its more fiddlesome settings. We've also cut holes for the cabling – power supplies in and out, gaps for the VGA cable in the shelf and a small hole in the front ledge for the USB connectors to the diminutive keyboard and the trackball and the gamepad.

Stupidly, we didn't cut a space for the power controls to the PC, so have had to devise a cunning system in Windows' power settings whereby it sinks into hibernation when unused and can be

reawakened at the touch of a button, or roll of the trackball, as the case may be.

You might have observed at this stage that we haven't left ourselves an easy-to-get-to CD drive. Well, you could install a spring-loaded flap at the front, but we don't want to spoil the effect, so we've got our arcade beast linked via a network cable to a router. Another PC on the same network passes essential files, such as ROMs, back and forth.



# From pub to PC retro games

OK, you've got the semi-authentic case. So how to make it play old arcade games?

**C**an you fix it? Yes, you can. So long as you've got an oldish PC, a little technical nous and a... well, let's say 'flexible' approach towards copyright laws, you should have something up and running all those fondly remembered 8- and 16-bit classics of yesteryear in no time at all.

We're presuming at this stage that you've built the cabinet we've spent the last few pages showing you how to

construct. Alternatively, you could try and build something really spanky of your own imagining to suit whatever hardware you intend to use, or, better, something especially relevant to which games you want to ultimately run on it. For instance, remember those old *Pac-Man* arcade machines built into pub tables, and some nice big plastic buttons built into the gap betwixt pint and ash tray? That's what we want, and if we can ever bear to look a circular saw in the face again, hopefully one day we'll have one.

## Hands on

Which brings us to control systems. We've used a slightly unorthodox set-up for our cabinet, but one of the best options – outside of a standard joystick or gamepad – would be to get hold of an X-Box arcade stick, which replicates the look and feel of beat-'em-ups, complete with aluminium stick and huge buttons. To use this on your PC, head over to [www.consoleplus.co.uk](http://www.consoleplus.co.uk) and pick up a Titanium X-Joy Converter (about £10), which enables you to use an X-Box controller with a PC's USB port. There's PS2 and Gamecube versions, too.

## ARCADE JUNKIES

if you're feeling really lazy you don't need a PC to get that old skool arcade feeling...

### ATARI 10-IN-1 CLASSICS

**Publisher** Atari  
Available through The Gadget Shop, the Atari 10-in-1 features all the great hits from Atari's early years, including *Missile Command* and



*Centipede*. It plugs into the inputs on the front of your

television, or monitor, if you've got one with suitable connectivity.

### NAMCO ARCADE GAME STICK

**Publisher** Namco  
Another plug-into-your-telly affair. Along with



Mr P Man, you'll find pixel perfect conversions

of *Dig Dug*, *Galaxian*, *Rally-X* and *Bosconian*. The last two smack of barrel scraping, but *Pac-Man* is still a classic.

### SEGA ARCADE COLLECTION

**Publisher** Empire  
Long before Sega abandoned the Dreamcast, it briefly indulged itself with PC conversions of its favoured licenses.



*Virtua Fighter 2*, *Sonic R*, *Sonic 3D*, *Virtua Tennis*

and *Sega Rally Championship* are all revived in this package.

### ULTIMATE PINBALL

**Publisher** THQ  
Retro gaming isn't just limited to the world of arcade games: pinball machines have been transcribed to the PC. The



attempt isn't always successful, but unless you're willing to invest in a table of your own, it's the best you're going to do.

## THE WIRED ARCADE

Thanks to the ingenuity of a select breed of hardcore programmers, *MAME* and a small number of other emulators can offer some limited online functionality. Yes. Re-read that sentence.

This is simply astonishing: the co-option of the PC's greatest advantage into something genuinely beautiful, a worldwide network of online arcade gaming. Right now you need a separate program, *Kaillera*, to act as a gateway, along with a fast DSL or Cable connection. *Kaillera* ([www.kaillera.com](http://www.kaillera.com)) is an astonishing achievement: hopefully, its development will spur copyright holders into something a little more ambitious with their next shovelware collection.

# Source your components

Arcade by name, archaic by nature

The requirements for an arcade system are a little different to what you'd expect from a normal games PC. *MAME* relies on the 2D capabilities of your graphics card, rather than enormous polygon pushing power.



This is exactly the right time to go hunting around charity shops and second-hand auctions for a basic chassis – look for something with enough space for a couple of hard drives and an ATX motherboard. Don't worry about looks though: rest assured it's going to be hidden under an MDF monstrosity.

For that reason, a fast processor, a nice fat wodge of RAM and a monster hard-drive are more important than the latest ATI or NVIDIA card.

*MAME* also comes in a variety of Operating



All this hardware has been donated and scrounged from around the office. If you're our kind of reader, you've probably got the raw silicon hanging around already. Note the big RAM sticks – we're a bit worried about *MAME*'s bloated architecture, so we're erring on the side of overkill.



Because we're obsessed by the history of arcades, we expect to expand on our initial *MAME* collection. We've done a bit of research and realised that we'll fill any hard drive we throw in there. We've started with a 100Gb+ model, with the expectation that in just a couple of months we'll throw in another.

System versions, so you don't necessarily need to shell out for an Operating System license – you can get away with a decent Linux distro and a Linux client instead. You'll need to bear in mind that Windows XP doesn't support legacy

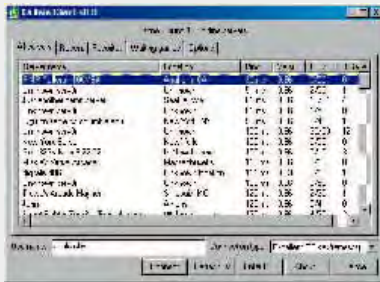


We've rescued an old 15-inch monitor from the scrapheap. The quality isn't brilliant, but it shouldn't matter. If you're determined to go down the fuzzy screen route, consider investing in a graphics card with a TV-out, and searching for a cheap PAL television. And some spectacles.

## WHAT'S IN A MAME?

The *MAME* project is bloated and obese. It's grown too big, attempting to emulate too many types of board from within the same engine. That's the opinion of an increasing number of emulator programmers, who've begun flexing their code muscles in attempts to build faster, more robust emulators for specific arcade machines. Rather than letting delicate code fester within the *MAME* project, machine specific emulators tend to be robust, and most importantly, fast.

There's a catch. While few are willing to argue the moral toss about emulating forgotten average-ware like *Yie Ar Kung-Fu*, things turn ugly with emulators such as *Callus*, which does a great job of bringing the Capcom System 1 board to life. Capcom is still releasing and profiting from *Street Fighter 2*: emulating their most famous game is simple piracy (see The Moral High Score).



## THE MORAL HIGH SCORE

No, we didn't know that much about it, either.

Emulation, along with Abandonware, is a legal grey area. There are some basic facts you need to be aware of before you embark on an all-encompassing tour of videogame history. Emulating and distributing emulators for arcade boards isn't a problem as long as any hardware that exists hasn't been broken: i.e. the emulators have been built by reverse engineering, rather than simply cribbing from the specifications of the silicon. Use and distribution of the ROMs themselves is even simpler: it's forbidden unless you have permission from the copyright holder, or the copyright has lapsed. A rare occurrence, you may think.

Not at all. It doesn't take much effort to discover ROMs where permission to redistribute the code has been given. For example: *Robby Roto*, a cross of *Dig-Dug* and *Pac-Man* that shouldn't exist in any fair world, was released by Jay Fenton, in 1999. Jay wrote, 'I used to write games for Bally/Midway in the 1970s and the early 1980s. One of my less successful titles was *Robby Roto*. My contract with Midway specified that after shipments dropped below a certain level, the rights to this game reverted to me. Needless to say, this has happened. I notice that *Robby Roto* is available on a few download sites for *MAME*. I would like the world to



know that as the legal owner, the ROM images from *Robby Roto* are declared free for unlimited non-commercial duplication and play by *MAME* users.'

In other cases, the copyright may simply be untraceable. After the collapse of the Berlin Wall, entire corporations dissolved. Titles such as *Powerplay*, a multi-game machine, are now freely disseminated simply because the copyright holders cannot be traced in the fallout. Playing *Poly-Play* today is fascinating: it's a barely concealed Communist knock off of some of the most revered titles in arcade history. There's a barely credible communist take on the capitalist legend of *Pac-Man* named *Hare and Wolf*, and a hilarious, 'realistic' version of *Horace Goes Skiing*. Astonishing!



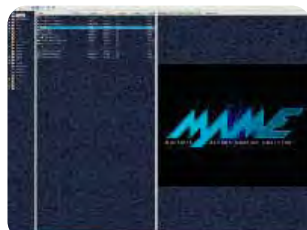
Gameports – if you have set your hearts on a dinky joystick, you'll have to invest in a 15 pin to USB converter.

When we say monster hard-drive, we mean it. ROMs aren't big, but they are addictive.



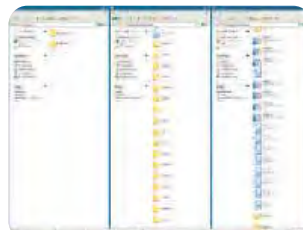
The PC's assembled, now we need to sort out a control system. We've bought ourselves a Belkin Nostromo keyboard/gamepad hybrid, along with a trackball. The keyboard's going to come in handy for configuring the cabinet, while we've left ourselves the option of fitting a light-gun if we manage to track one down.

ROM collections are arranged alphabetically; expect each letter to weigh in at about 300 to 400 megabytes. 40 gigabytes should be your barest minimum – anything below is just going to cramp your ambition. You'll



Now comes the fun part. We're making our first inroads into the emulation scene with *MAME32*, because it comes with a lovely graphical user interface, that doesn't scare us off within ten minutes of us loading it. It enables you to see just how incomplete a collection you really have on your hands.

also need to figure out a way of getting the ROMs on to the PC in the first place: a simple network connection should do the trick. We'll be taking advantage of that in a moment.



Our ROM's arrive in Zip format. We've extracted each to a separate directory with the ROM's folder within *MAME32*. *MAME32* then audit our collection, and each pops into view, available for play. Some ROMs are more legal than others: we're not recommending you go and download loads, we're just saying that they're out there.



Our work here is complete. Everything is set up and ready to use. We shall now play for days, without rising from our seat, exploring the very history of our joyous hobby. Hail our good friend Pong and all his four colours and less chums. There's no finer use a 2GHz CPU can be put to than running *Galaxian*.





## Work that arcade magic

Once you've lovingly crafted your cabinet, it's time to fill it with all the kit that turns it from a cupboard into a shoot-'em-up wonderland. **Mike Abolins** presses the Player One button

**H**aving spent well under £50 building the exterior, there's no reason why you can't continue the cost-conscious theme when putting together the interior. *MAME*, the emulator we're using to run the old 2D classics such as Pac-Man, doesn't require the latest Pentium 4 or steroid-enhanced graphics cards to run perfectly well. If you've got an old PII or III lying around gathering dust then you're set.

However, if you succumbed to the temptation of hitting it with a 20lb sledge as soon as your shiny new P4 system arrived through your door then fret not – there are plenty of places where you can get your mitts on some dirt-cheap kit.

Once your hardware is gathered together, start planning where you want to put it all. Although you can install everything in an old ATX case and then stand that at the bottom of your cabinet,

it's far easier to mount the components you need directly into the cabinet itself. Wood may have many uses to which it's superbly well suited, but conducting electricity isn't one of them so there are no concerns about shorting everything out. Another benefit of abandoning the old metal case is cooling: despite the fact that your processor isn't going to be running Athlon-like clock speeds, it still needs to be kept cool. Keeping it in a metal case inside a large wooden cabinet can create heat dissipation issues, all of which can be avoided by leaving the motherboard, drives and PSU naked.

### GOING, GOING, GONE...

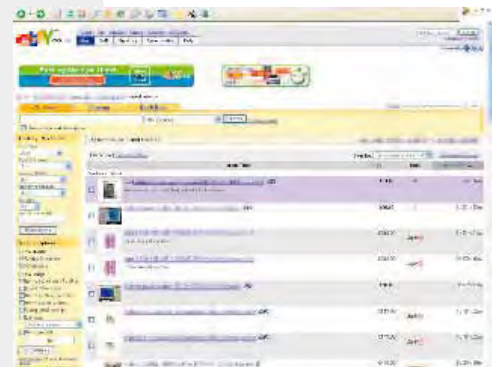
...but not forgotten! Grab an old Pentium board for gaming on the cheap

*MAME* (Multiple Arcade Machine Emulator) may have a graphical user interface in its Windows32 version but it'll still run on a PC with an agricultural specification. The main *MAME* Web site at [www.mame.net](http://www.mame.net) lists the system requirements as an Intel Celeron or AMD Duron running at 700MHz, 64MB of RAM and a DirectX-compatible graphics card. You can pick up a complete system that meets (or exceeds, in many cases) that checklist for around £50 on eBay.

Computer fairs can be a happy hunting ground for an older system, but prices are usually higher as sellers tend to be after a bigger profit than a private seller on eBay. Car boot sales are also an option, although you'll

be lucky if you find someone who's selling a PC that knows enough about its specification to answer any questions you might have.

Yet the best place to try is your local tip, sorry, civic amenity site. Don't laugh: many local councils now offer recycling facilities for computers and you'll find a wide selection of older systems, many of which still work, that have been thrown out by the local populace. They're usually stored in a lock-up and you'll raise more than a few eyebrows if you just start walking off with armfuls of PC components, so make sure you check in with the foreman of the site first. Not everything you grab will work, but be persistent – after all, you're not paying anything for it.



*It's a buyer's market for old Pentium systems, so haggle hard and pay low*

## Building the ghost in the machine

You've built the cabinet – now it's time to install the electronic heart of the arcade experience



### #01

Don't dive straight in and start nailing pieces to the cabinet. Plug everything together first so that you know how far apart all of the pieces can be spaced without being able to reach one another. Cables will be the main limiting factor.



### #02

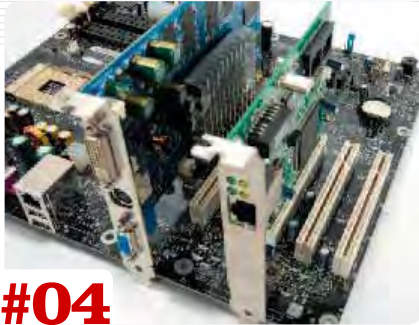
Plan where you're going to locate everything in your cabinet. Use a pencil to mark on the inside where you'll position the mobo, drives and so on, keeping in mind that you might want to add an access point in the front of the cabinet to get to your CD drive.



### #03

Mount the PSU first, with the exhaust fan facing towards the back of the case. You can hold in place using glue from a hot glue gun or Velcro, but make sure that whatever you use won't be detrimentally affected by the heat generated.





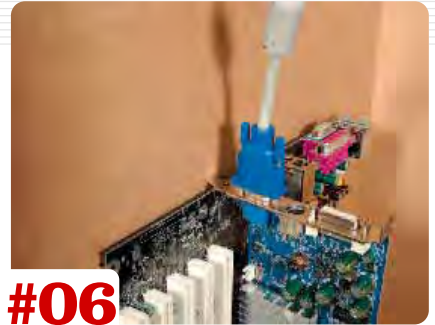
## #04

If you haven't done so already, fix your processor, RAM, graphics card, sound card and network card to your motherboard, as it's easier to install them properly while outside the cabinet. Use an anti-static wrist strap to avoid shorting out any components.



## #05

A great way of fixing your mobo into the cabinet is to hang it via one of the sides. You can use the motherboard's mounting holes to hang it off a picture hook, nail or screw, or use Velcro tape. This makes removing the mobo for upgrading easy.



## #06

Position the motherboard so that the ports that would be on the rear of the PC are facing upwards. This will make connecting your monitor, speakers and control devices a lot easier and avoids getting the cables tangled together.



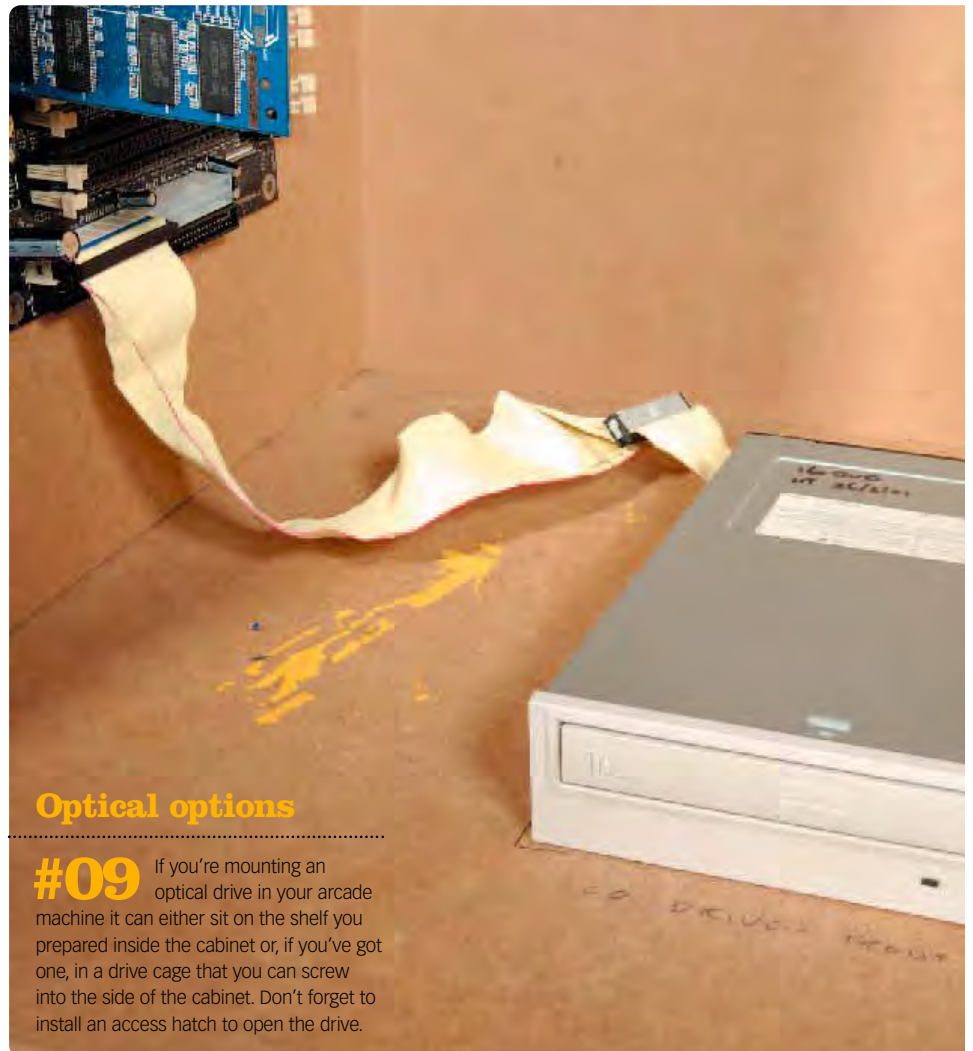
## #07

Use the pencil again to mark on the inside of the cabinet where the mounting holes are. Depending on the thickness of the MDF you're using, you might need to use a shorter nail. If the point penetrates the outside of the cabinet, use a file to remove it.



## #08

Use at least four hooks/nails/screws to make sure the motherboard is held up strongly. If vibrations from the CPU cooling fan become a problem, get some small rubber washers to place between the motherboard and the cabinet to absorb them.



### Optical options

**#09** If you're mounting an optical drive in your arcade machine it can either sit on the shelf you prepared inside the cabinet or, if you've got one, in a drive cage that you can screw into the side of the cabinet. Don't forget to install an access hatch to open the drive.



## #10

However you install the optical drive, it must be held securely to avoid vibrations. If you're installing it flat on the shelf, place a few lumps of blu tack under the drive to act as a damper. If you're using the cage, add some blu tack between it and the cabinet.



## #11

Connect the optical drive to the motherboard via the ribbon cable and then fit the hard drive in the same manner, using blu tack again to minimise the affect of any vibrations between the cabinet and the drive itself. Connect both to the PSU.



## #12

As you're using an older PC, chances are it won't be running Windows XP. More likely it's using Windows 98, so you'll need a 3.5-inch floppy drive at some point in the near future. If you can't get one second hand, you can pick one up for less than £10 online.

### ROMS via Wi-Fi

**#13** If you fancy installing a wireless networking card so that you can transfer *MAME* ROM files from your main system to this, you might need to mount the Wi-Fi antenna on the top of your cabinet with an extension to avoid interference and signal loss.



## #14

Mount your monitor into the upper part of the cabinet and place your controllers – whether they're mouse, keyboard or joystick – on the front shelf, and connect all of them to the motherboard. Connect the PSU to the motherboard.



## #15

Use tape or cable tacks (the little nails with white plastic hooks) to route the various cables around the inside of the cabinet so that they don't hang down and work themselves loose. Drill a hole in the front of the cabinet and insert the power button into it.



# Sound advice

Add a set of speakers for authentic blips and beeps

**E**ven though games like *Space Invaders* and *Centipede* aren't renowned for their excellent sound track, it can be useful to add a set of cans to your arcade cabinet. A sound card is an optional extra, as most motherboards – including aging Celeron and Pentium systems – have a rudimentary audio processor. Considering that it's only going to have to handle the lo-fi chirps and whistles that eighties classics emit at random intervals, even something that basic will suffice. Likewise there's no need to splash out on the latest set of MegaWorks from Creative, either: look for a simple stereo set that doesn't need a subwoofer (2.0 rather than 2.1 channel).

The best place to mount the speakers is behind the front panel of the cabinet, in the space above the screen. So that you can hear the sound clearly, drill small holes

*Use a drill to countersink any buttons or dials on the front of the speaker*

(use a 3mm bit) in the front of the cabinet in a circle, with the holes radiating out from the centre in a symmetrical pattern. Measure and mark out your drill points before you get busy with the Black and Decker, mind.

Where possible, remove the cloth grilles from the speakers and either install a small shelf for them to sit on or, if they're flat-faced and lightweight, use a hot glue gun to stick them in position (being careful not to get any glue on the speaker cone itself). If you're feeling particularly brave, you could disassemble a set of Creative TravelSound speakers and mount them directly in the cabinet skin; as the cones are small, a disc-cutter fitting for a drill



## Look for a simple stereo set that doesn't need a subwoofer

would create the perfect-sized hole.

All that remains to be done is to connect the speakers to the audio out on the motherboard and to plug them in. The speakers will require their own power source, remember. ■PCU

## PLUGS AND PLAY

If the sight of two or three kettle leads snaking out of the back of your arcade machine offends, simply install a multi-plug extension lead inside the cabinet. It's easy to do as most multi-plugs these days feature mounting points on the underside. These require you to do little more than to put a couple of screws inside the cabinet onto which the multi-plug can be hung. Plug the monitor, screen and speakers into the multi-plug and you're left with one power lead rather than three to spoil the view. For added piece of mind, use a multi-plug with an integrated circuit breaker.



One lead to power them all: cut down on trailing power cables with a multi-plug

## Taking it further

Lights and retro artwork are just two of your options

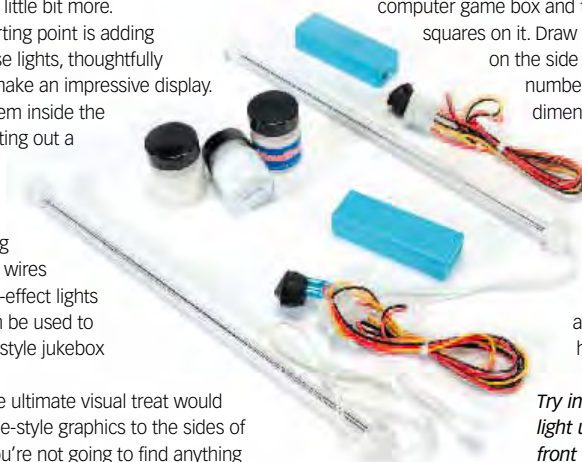
**C**onsidering that this is a retro-chic piece of kit (that's what you've got to keep telling yourself!) it might seem a little contrary to look for future possible upgrades, but there's always something you can do to personalise your cabinet and home arcade experience that little bit more.

A good starting point is adding some lights: case lights, thoughtfully mounted, can make an impressive display. By mounting them inside the cabinet and cutting out a window for them to shine through, you can avoid having the fixtures and wires on view. Bubble-effect lights in particular can be used to create a sixties-style jukebox appearance.

Perhaps the ultimate visual treat would be to add arcade-style graphics to the sides of the machine. You're not going to find anything

prefabricated, but why not nip down to your local art shop and pick up some paints? Acrylic paints are a good choice; not only can you get a massive range of colours but they dry relatively fast and are water soluble, making cleaning your brushes a doddle. Use the old trick of choosing a picture from a magazine or computer game box and then drawing a grid of squares on it. Draw a larger grid of squares

on the side of the cabinet (the same number of squares, just larger in dimension) lightly in pencil and copy the picture across, grid by grid. It might sound suspect but it really does work and you don't need to be an artist of Tony Hart's calibre for it to produce a result that you'll be happy with.



Try installing a fluorescent case light under the shelf on the front for down-lighting