



PICADE

+ HACKS

BUILDING YOUR

BUTTONS

1

5

4

LEFT

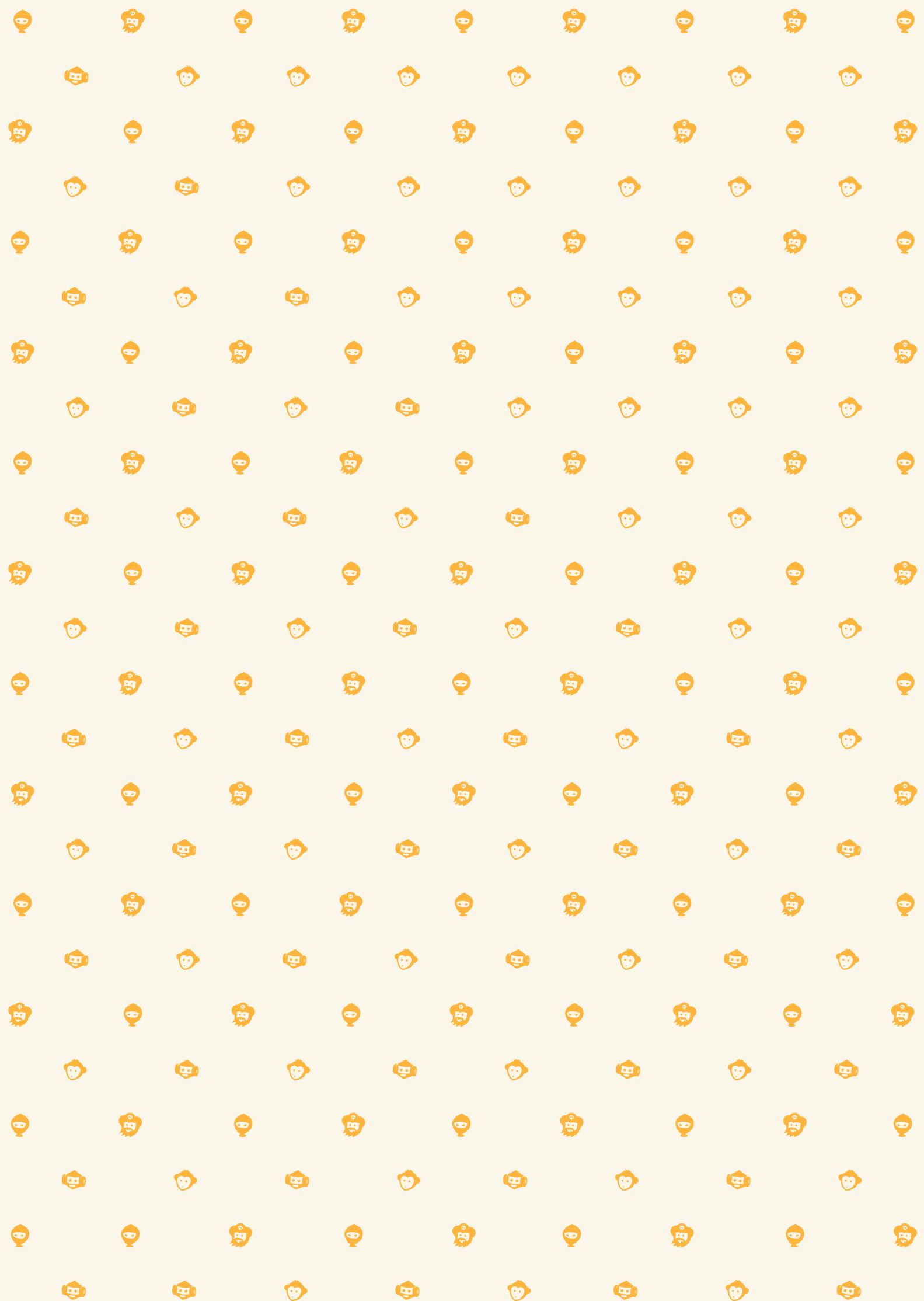
DOWN

RIGHT

UP

PIMO
RONI





Building your Picade

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<http://pimoroni.com>

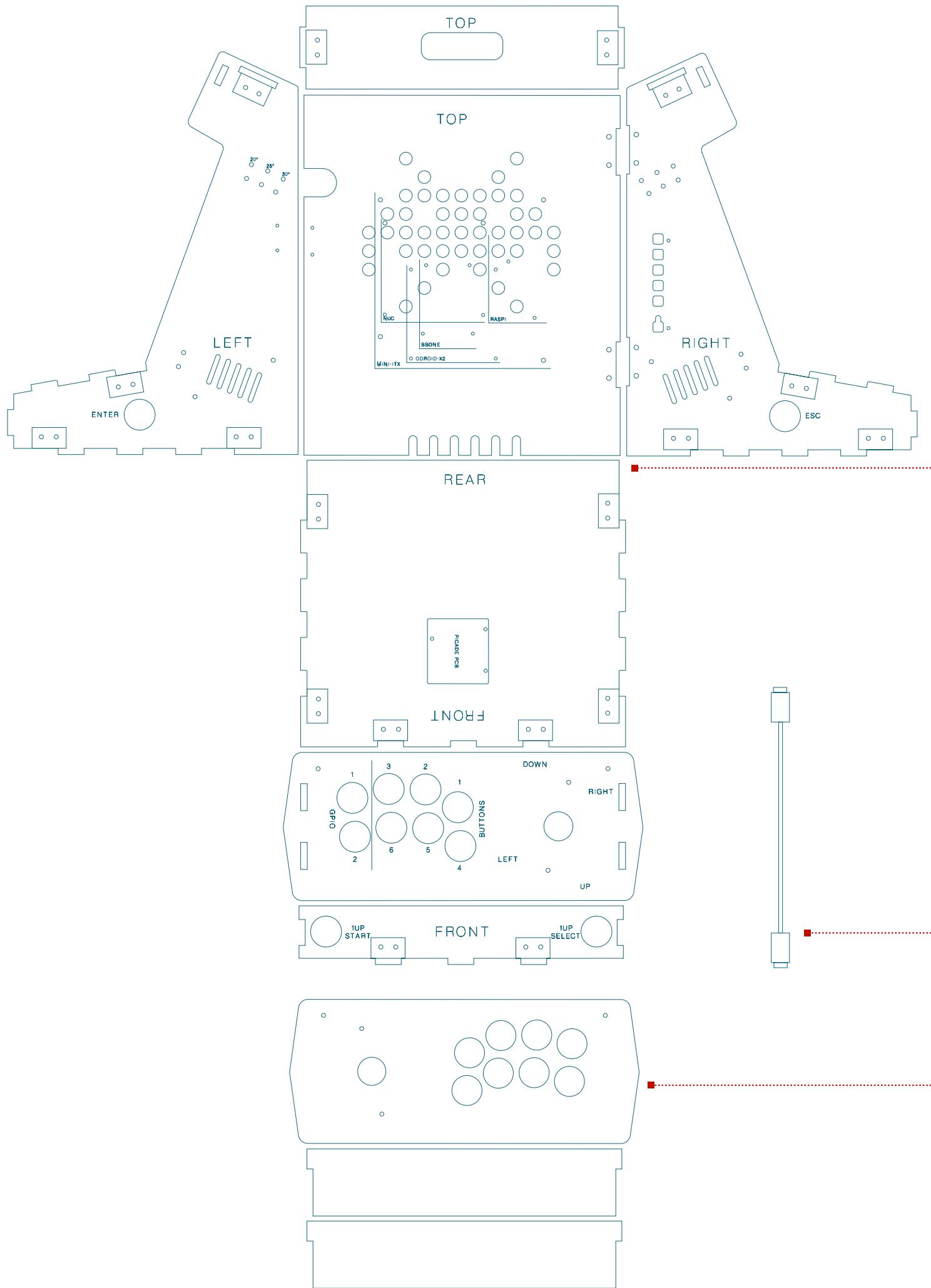
Produced for the Picade Kickstarter

The UK's 1st official Kickstarter project.

<http://www.kickstarter.com/projects/pimoroni/picade-the-arcade-cabinet-kit-for-your-raspberry-p>

Thanks to everyone who kept us going as we took our sweet time to deliver, especially:

Paradiso Shlee, nickr, Aguirrech, Daniel Mackey, Pharrap, Rich King and the comment crew. The crowds of Maker Faires around the world & the beautiful people of the Raspberry Pi Foundation, especially Liz and Eben ❤



Building a Picade should be a simple and rewarding experience.

If you like nuts and bolts.

Hopefully you're not too fussed by wires and screw terminals either.

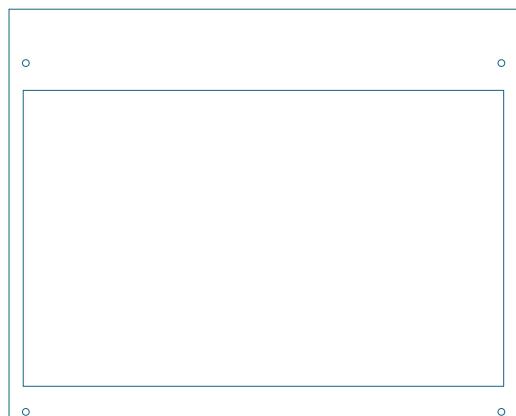
But apart from that it's great, and the end results feel solid and complete, with the bonus that you can say, "I made this."

Let's get started by looking at what you have...

In The Kit

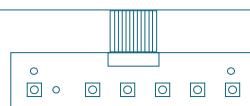
Cabinet Woodwork

The powder-coated MDF that makes the shell of the cabinet.



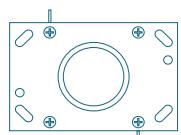
LCD Module

A screen for your Picade. Safely sandwiched in acrylic sheets and with the driver board and keypad mounted on the back.



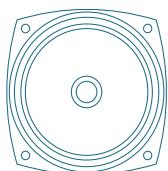
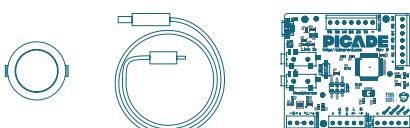
Joystick

4 switches, 8 directions, 'nuff said. The 'brick' for LCD power is also nestled in here.



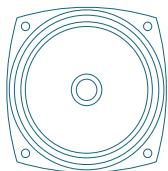
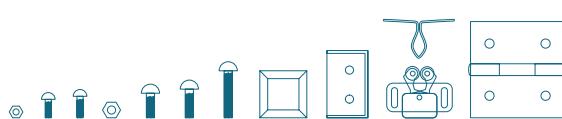
Button & PCB Pack

A set of 30mm buttons, the PCB and a cable to hook it up to your computer of choice. The HDMI cable for inside the cabinet is also tucked in here.



Cabinet Fixins

All the nuts, bolts and other bits and pieces that you attach to the cabinet to make it whole. Speakers are in the top for your audiofication.



HDMI Cable

From LCD driver to your computer. Short and flexible to keep it all inside.

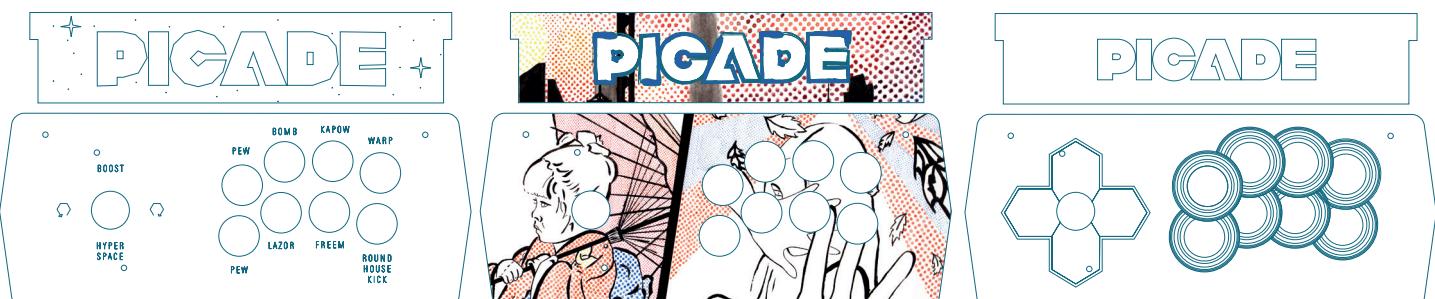


Artwork Sets

Artwork to give your Picade some style. You can also make your own if you want, using the templates provided in the blueprints.

Check you've got it all ready, and then let's waste no time getting started...

Acrylic Pieces



Quick Tips

The text on the woodwork is always on the inside of the cabinet.

Each plastic fixed corner uses M4 bolts from the 14mm bag and M4 nuts. These are the two bags with lots of nuts and bolts in.

The bolts go on the outside, the nut is on the inside.

Tip from Australia: Righty Tighty, Lefty Loosey.

Use a finger on top of the nut to hold it in place while you tighten it with a hex wrench.

If you're having trouble getting a nut to go on you can turn the bolt in the loose direction until it catches the thread. Then tighten it as normal.

None of the nuts need to be mega-tight. Finger tight or slightly tighter is enough.

Place the long end of the wrench in the bolt, the short length of the wrench provides enough leverage.

If you get stuck, have a cup of tea and a think.

If you get **really** stuck, have another cup of tea and talk to us, or other Picaders for tips.

picade@pimoroni.com

Building the Cabinet

For the next few steps you'll need:

- 1 Cabinet Woodwork
- 2 Fixed corners (white plastic bits)
- 3 14mm M4 bolts (the big bag)
- 4 M4 nuts
- 5 M4 hex wrench (the largest Allen key of the two)

We use the same method to fix all bits of the cabinet together, and to fix the control panel and the LCD to the cabinet.

The positions of the fixed corners are etched into the woodwork to help with construction.

Bottom Up

Start with the bottom piece of the cabinet. This is the one with one flat side, and three sides with 'battlements'.

For each of the marked positions, place a bolt through the hole.

Hold the bolt in place with a finger on the outside and place a fixed corner over the bolt so it matches the outline on the woodwork.

You should now be able to let go of the bolt, and pick up the hex wrench and a nut.

Place the nut over the end of the bolt and tighten it with the wrench.

Repeat for all the blocks on the base.

Feet

Now would be a fairly good time to stick the feet to the bottom of the bottom as they provide grip and protection.

You can place them however you see fit, but we recommend one about 20mm in from each corner.

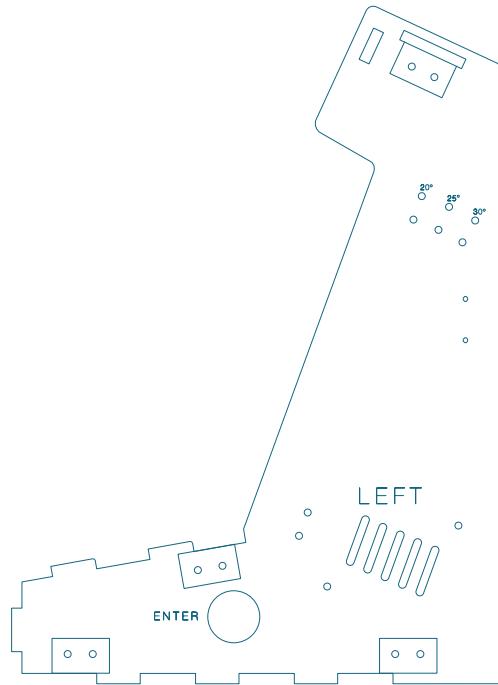
Front

The front fits into the bottom, like a jigsaw. Fix it to the bottom pieces with bolts through the front and the fixed corners already in place on the bottom.

Left

Place the side panel marked 'LEFT' in large letters against the left side of the bottom.

The battlements on the left should line up with the bottom and front, and the etch for the plastic blocks will line up as well.



Place bolts through both of the holes on the left from the outside.

Fix them with nuts as before.

Right

Do the same for the other side, marked 'RIGHT'.

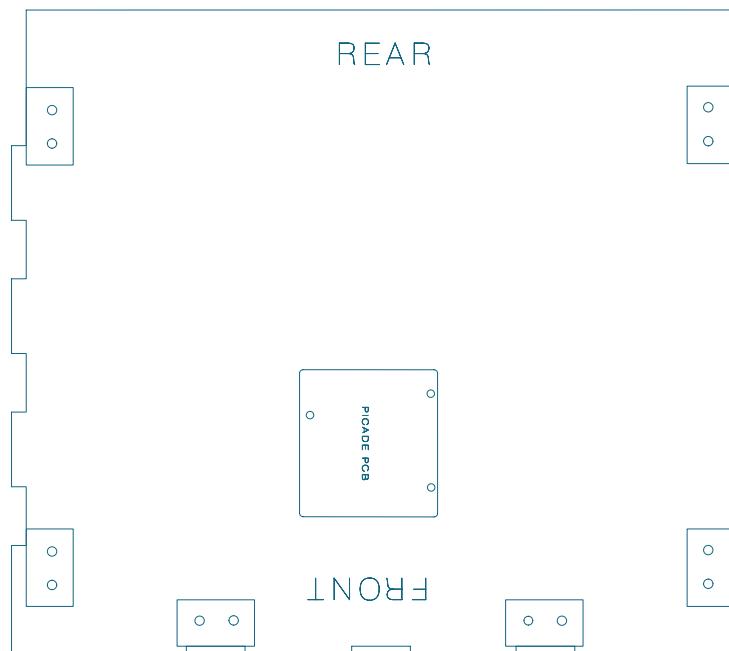
Top

Attach the two fixed corners to the top plate in the same way as other pieces.

Place the tab on the left of the top piece in the left side top slot. The wide one marked with an etch, rather than the small one.

Repeat with the right hand side by gently bending the right side just enough to slide the top piece into the slot on the right side.

Place bolts through the left and the right side holes into the fixed corners on the top piece but **don't bolt them yet**.

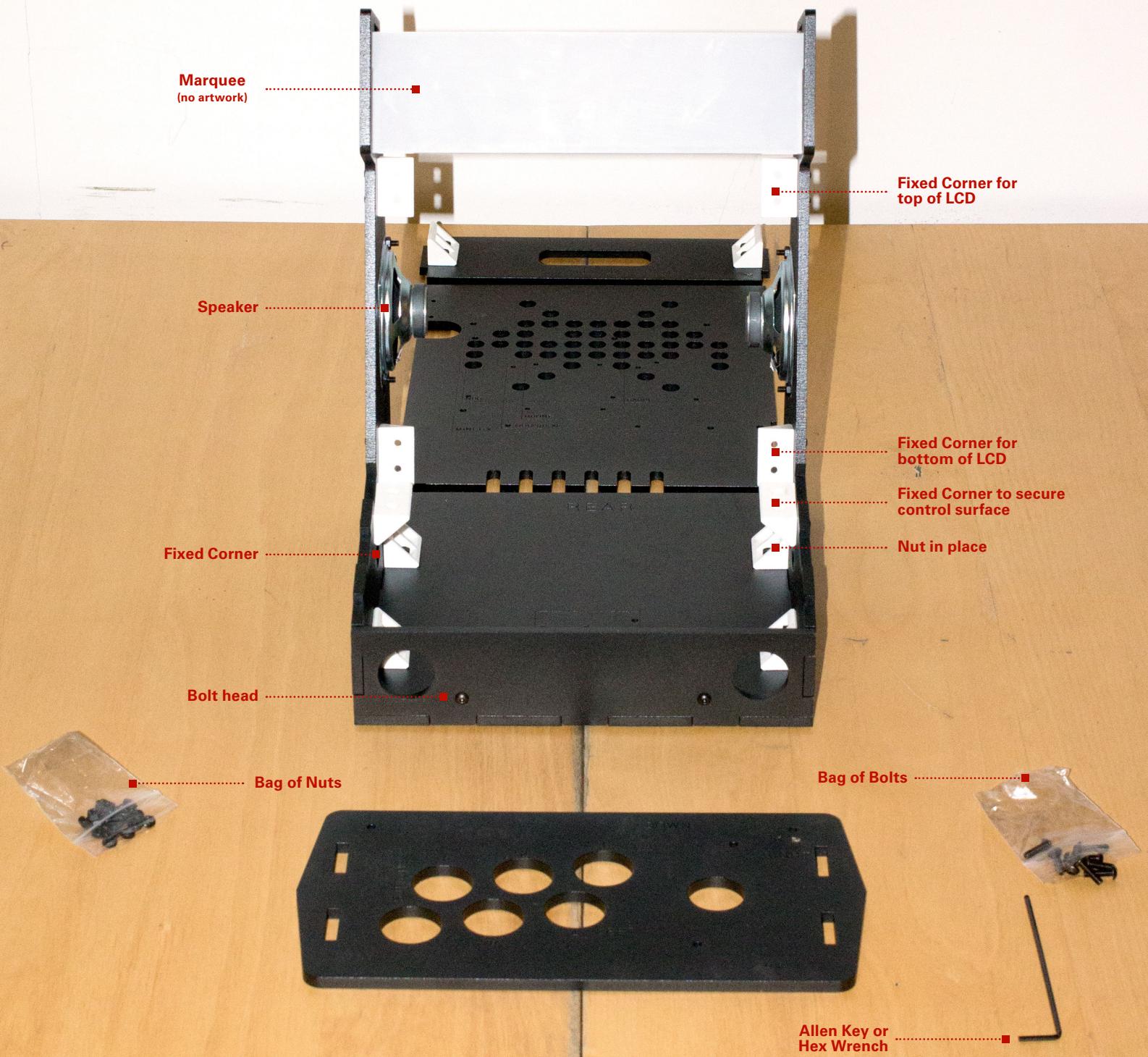


Here's One We Made Earlier

Hopefully your efforts look a little bit like this by now. We've place the Fixed Corners for the LCD in place here, but we recommend attaching them to the LCD first.

There's not just one way to approach things. If you think it's easier to build one bit first, go right ahead.

As long as you've put the Fixed Corners in the right place and got the knack of the nuts and bolts things should go fairly smoothly.



LCD

You need:

- 1 The LCD unit

You now have enough sides to mount the LCD.

Your first choice is what angle to mount the screen at. You have 3 choices, depending on whether you'll be using the Picade standing or sitting more often.

The angles are marked on the left side.

Place four fixed corners on each bolt on the back of the LCD unit. The blocks should have their flat face outwards to attach to the cabinet. The writing on the back of the LCD should be right side up to be readable.

For the Maxi: The bolts should go in the top hole at the top of the LCD and the bottom hole at the bottom of the LCD.

For the Mini: The bolts should go in the top hole of the fixed corners.

The LCD should slide into the cabinet and the blocks should align with your chosen holes/outlines.

On the cabinet there is one hole for the bottom block. The etch shows roughly how the second hole on each block should be aligned.

If you get the screen roughly in place from the front, you can see exactly where the screen will fit from the back of the cabinet.

The bottom of the screen will be level with the top of where the control panel will go.

Now slide bolts into each hole to hold the LCD in place. A bit of wiggling should get them into the fixed block.

For the topmost bolt you may have to slide the nut behind the bolt for the LCD and then insert the bolt, otherwise the bolt on the LCD interferes.

Marquee

You need:

- 1 The marquee acrylic sheets
- 2 Your marquee decal of choice

Remove the protective backing from both sides of the two sheets of marquee acrylic sheet.

Choose your favourite artwork and sandwich it between the two pieces.

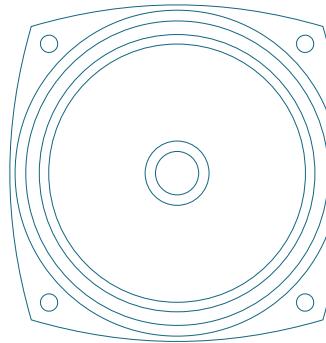
Place the tabs of this sandwich in the slots at the top of the Left side.

Bend the right side just enough so you can place the tabs in the slots on the right side, using the bolts on the top to make sure it doesn't fall out.

The marquee should now be held firmly in place.

Speakerboxx

Now is probably a good time to attach the speakers to the left and right panels. Each speaker uses two of the normal cabinet bolts you've been using and two nuts.



Attach the speakers with the wires facing the front of the cabinet where the Picade PCB will be.

Back Door

You may want to attach your computer to the back door before you attach it to the cabinet.

The door gives good access if you want to do it later, and then if you drop the door while securing it, you haven't just broken your precious CPU.

You will need:

- 1 Hinges
- 2 Roller catch
- 3 Small hex wrench
- 4 The 8 shortest M4 bolts from the small bag (12mm long)
- 5 Bag of M3 nuts and bolts
- 6 The back door. It's hooge

Hinges

First we'll attach the hinges to the door.

Make sure they're turned 'inside out' so that the barrel of the hinge will fit into the slot on the back door.

Looking at the top of the hinge, there are two halves. One half has the outside loops attached to it. The other half has the middle bit attached to it.

The door needs to have the outside loop-half bolted to it.

Place a hinge against the inside of the door, with the barrel in the gap cut for it.

Now slide the short M4 bolts through from the outside and use the normal M4 nuts to secure the hinge on the inside.

Leave the nuts slightly loose so you can finesse the fit of the door once all the bolts are in.

Repeat with the second hinge.

Now fold the hinges so they are facing outwards and parallel with the door.

Align the bits that stick out with the holes on the inside of the right side of the cabinet.

Slide the remaining four short M4 bolts from the outside, through these holes and through the hinges.

Using four nuts to attach the door to the cabinet.

Now tighten each of the nuts, making sure the door is aligned with the cabinet and freely moving.

The door should now swing nicely and freely on its hinges.

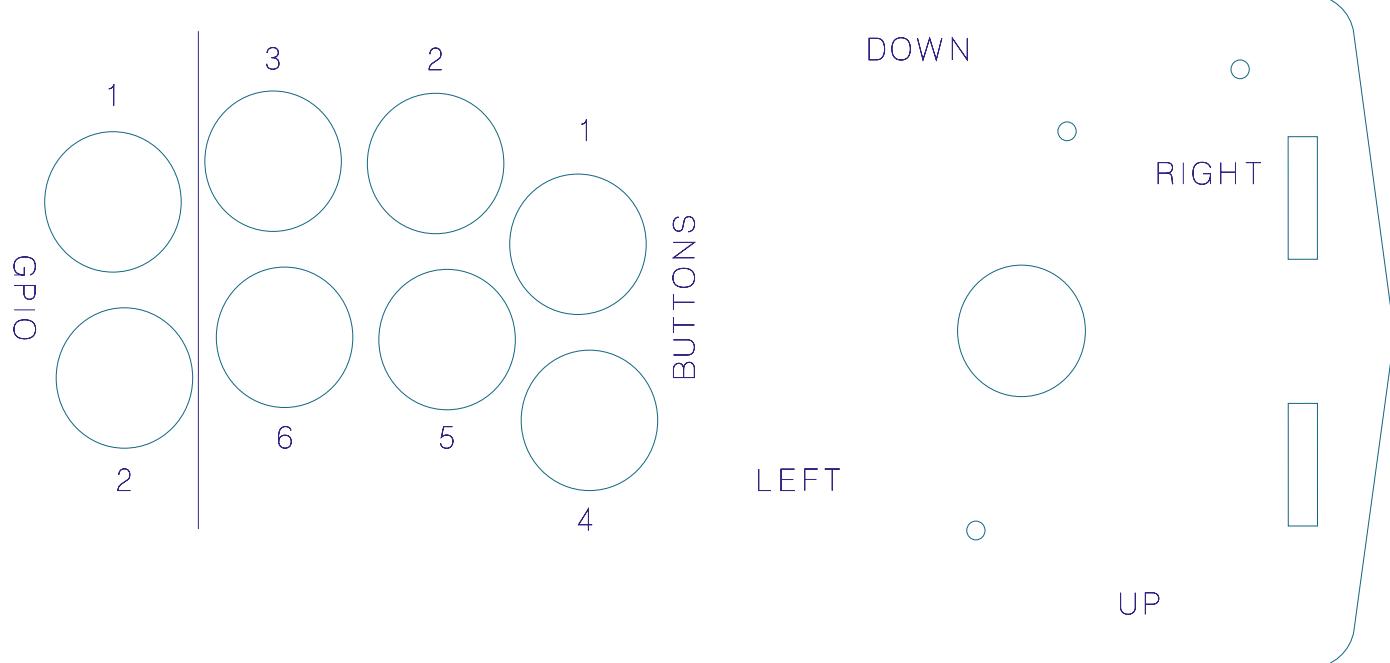
The Catch

Find the small bit of the roller catch, the bit that doesn't have rollers.

Using the short black M3 bolts (NOT the silver ones in the bag with the catch. They're useless and a bit crap), attach this to the small holes on opposite side of the door, on the inside of the door.

You want these bolts to be fairly tight, but don't overtighten them or they will sink into the wood and damage the finish.

We'll now use the other two short M3 bolts and nuts, and the bit of the catch that **does** have rollers.



Bolt these to the inside of the left side, at the same height as the catch on the rear. There are two small holes for this.

Place the bolts from the outside, but don't tighten them yet.

You can adjust how strong the catch is by moving the roller bit of the catch forwards or backwards in it's mounting holes.

See which position feels best to you then tighten the bolts on the roller portion of the catch.

When opening the door, place one hand on the side of the cabinet next to the catch then loop a finger through the hole on the rear neat the catch to pull the door open.

It's really quite solid isn't it?

Woo! The cabinet bit is complete!

Have a nice hot cup of tea.

The Control Surface

Making up the Control Panel is no more complex than wiring the Cray 1, which had 60 miles of wires and doubled as a nice sofa¹.

You will need:

1 30mm Buttons

2 Picade PCB

- 3** Joystick
- 4** Wiring Looms
- 5** Control panel woodwork
- 6** Control panel decal
- 7** Control panel
- 8** Two normal M4 bolts
- 9** Patience and a steady hand

Sudo Make Me A Sandwich

Remove the protective layers from both sides of the acrylic sheet.

First make a sandwich. The decal artwork (pick your favourite) is the filling. The wood and the acrylic are the bread.

The text on the woodwork should be on the bottom.

The holes should all line up on all 3 bits.

Joystick

Grab the joystick.

Unscrew the ball head from the top. You can replace this ball top with a variety of styles.

Also remove the black cover circle.

Now place the joystick through it's hole, making sure the bulk of the joystick is on the bottom of the sandwich.

Place the circle back on with the writing uppermost, and screw the ball back on. The joystick will now hold temporarily while you line up the correct holes to the control panel.

Using the M4 bolts, place them through the holes from the top.

The joystick should be straight and square, with the short sides of it's plate at the UP and DOWN positions.

This should line the plate up to the correct holes, which are circular, rather than elongated.

Place the joystick plate through the holes and tighten the nuts onto the bolts by hand, tightening fairly well with the hex wrench.

Buttons

We're going to use the buttons to hold this all together for now.

Using your favourite colours of button, slide them in from the top until they click into each of the holes.

Support the bottom of the sandwich while you do this.

With the remaining buttons fill the holes on the front and left and right side of the cabinet.

Wiring Fun Times

Now grab the wiring looms.

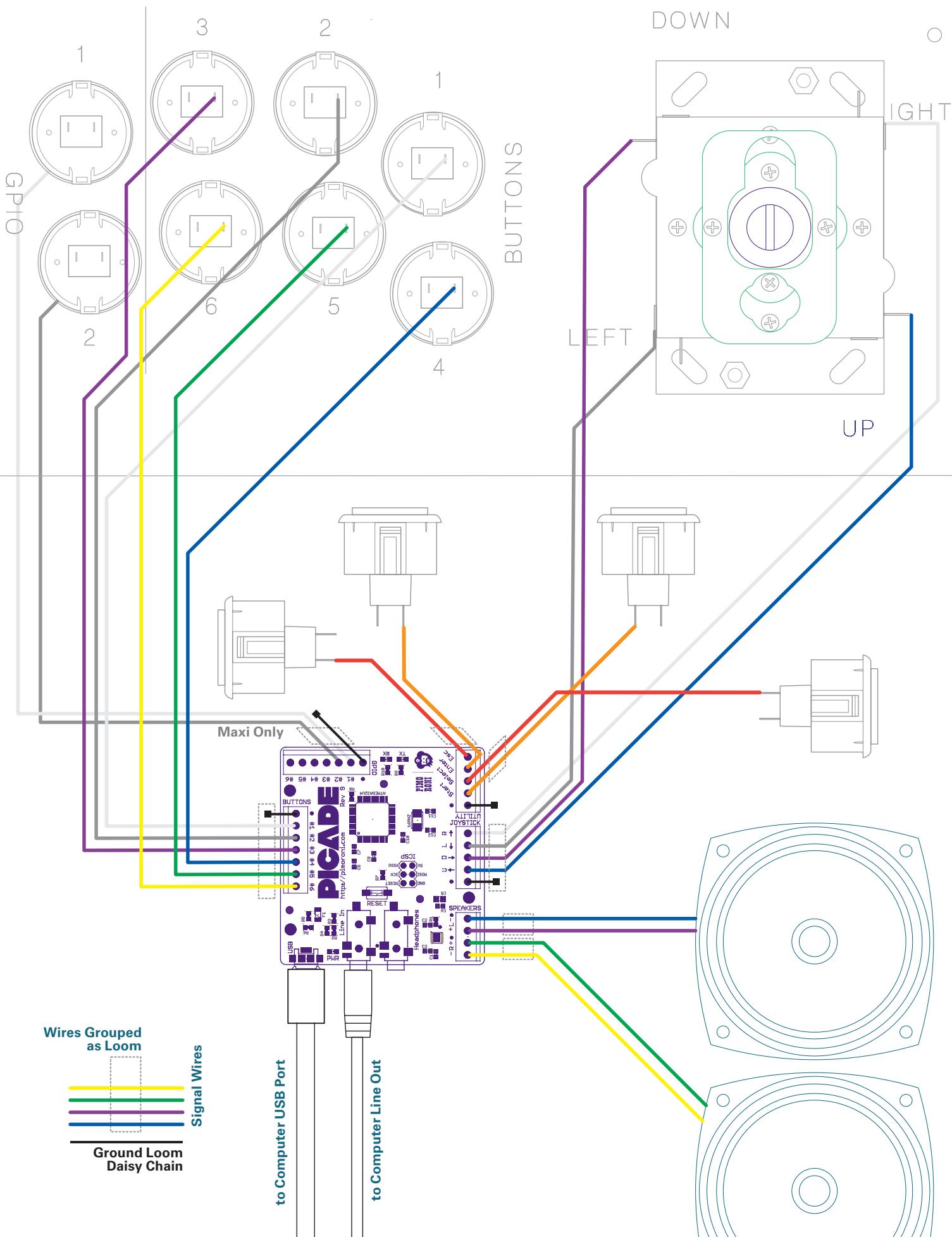
Pro Tip From Gee: If you need to remove a spade connector from the joystick or buttons, gently hold and wiggle the spade connector, not the wire. The crimp is usually stronger than the actual wire!

There is a nice full page diagram showing the connections on the next page.

There are two ends to the looms. The spade and the wire.

¹ <http://www.computerhistory.org/revolution/supercomputers/10/7>

The Big Bad Wiring Diagram of Doom



There are also 2 sizes of spade connector. The larger one attaches to the joystick, the smaller to the buttons.

Find the loom with the larger spade connector.

On each loom there are the signal connectors, which are generally an interesting colour, and a line of black connectors daisy-chained to each other, which is the ground loop.

We will start by connecting the ground loop to the joystick.

Going around the joystick, on each switch, pick a contact and slide a connector in the black daisy-chain onto it. It doesn't matter which of the two connectors on the switch you choose. Now work your way around the joystick until each switch has one ground loom cable on one of its contacts.

You should have connected four black wires to four different switches and have four coloured connectors left on the loom. Now work your way around the switches again and put one of the coloured spade connectors on the remaining contact of each switch.

Yey! First loom done.

Now find the wider of the two looms with wee spade connectors on them.

This will attach to the buttons on the control panel.

Do the same with the switches and the ground loop here, but be a little more careful as the contact bend much more easily if you apply too much pressure.

Try wiggling the connector side to side a little to encourage it to slide on if necessary.

Now you should have all the button with a single connector taken and the same number of coloured contacts left as there are buttons.

Fill the button's empty contacts with a coloured connector.

Now do the same with the remaining separate ground loom and the buttons on the front and both sides of the cabinet.

Bomb Defusal Expert

The next bit is the steady hands and attention to detail bit. You'll need a small straight-head screwdriver.

Loosen all the terminal screws on the Picade PCB about 10 turns. They need to be high in their socket but not enough to fall out.

Each button and joystick switch has a label.

Each socket on the PCB has a corresponding label.

The dot on the PCB socket indicates where the ground-loop will connect.

For each button and switch on the joystick, follow the wire.

When you reach the end, slide that wire into the hole in the screw terminal from the side.

This is very similar to threading a needle.

Once the wire is inside the terminal hole, tight the screw with your third or fourth hand.

Repeat for all the switches and connectors and the end of the ground loop.

We recommend a cup of tea before, during and after this process.

You now have something that looks like a jellyfish having a bad day at the office.

Test that each of the wires is firmly screwed in by giving it a gentle tug.

If it comes loose, unscrew the terminal, place the wire in the hole and retighten until it stays.

Install the PCB

There is a place on the bottom of the cabinet for the PCB. You can either use the included adhesive PCB mounts, or any spare M3 bolts to mount the PCB to the base of the Picade.

The adhesive mounts are easier to use but fairly permanent as removing them may damage the finish of the Picade.

If you decide to use the bolts, place these through the base of the cabinet now, then place the PCB over them and tighten nuts over the top to hold the PCB in place.

The one between screw terminals is quite hard to screw so we recommend using the small hex wrench.

If you decide to use the adhesive mounts, first place them through the holes on the Picade PCB, then remove

the cover on the feet to reveal the adhesive.

Now push the PCB firmly where you want it to be mounted. The feet will stick after a couple of seconds.

You have a short time to pull them up and replace before the adhesive gets pretty sticky.

Console Install

You will need:

- 1 The long M4 bolts from the small bag o' bolts.

Install fixed corners to the left and right sides of the cabinet where indicated next to where the control surface will sit. They should sit at the same angle as the sloped edge of the left and right side.

Make sure none of the wires will get caught between the Control surface and the edge of the cabinet as you place the control panel down onto the pegs that fit into the slots under the control panel.

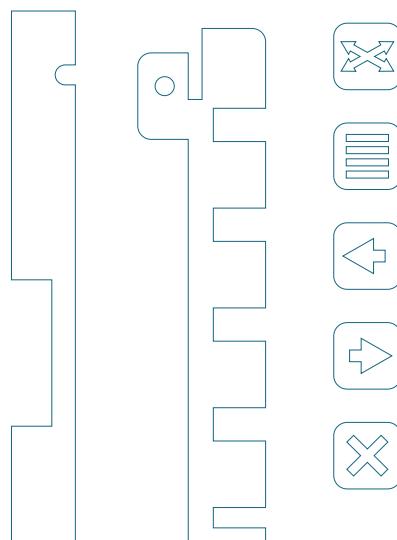
A bit of wiggling may be in order and you may need to push the left and right sides in slightly, as the fit is intentionally quite tight.

We expect the control panel to take quite a bit of stick, so this is intentional.

Now take the long bolts and thread them through the corners of the control panel so they pass through the fixed corners.

You may need to have the rear door open and look through the back to help with this.

Once they're through, place a nut on the end of the bolt and tighten it with the hex wrench.





The length of the bolt should make it easier to reach your hand inside and hold the nut while you tighten from the outside.

Yey! You now have a mostly complete Picade!

Finesse

For this you will need:

- 1 LCD keypad buttons
- 2 LCD keypad acrylic retainer
- 3 LCD keypad polypropalene mount
- 4 Remaining M3 bolts
- 5 M3 nuts
- 6 LCD keypad

The LCD keypad has been dangling in the way for a while now, and it's time to sort that out.

The easiest tip to do this is to make another sandwich.

We're going to temporarily put the M3 bolts from the inside out to help us.

First, slide the keypad onto the bolts with the buttons facing away from the head of the bolts and the LED at the bottom.

Now place the retaining acrylic piece so that the two small notches fit around the bolts and the big notch fits around the keypad connector.

Place the polypropalene mount over the bolts so the pads line up with the buttons, the holes are over the bolts and the LED is not covered up.

Place this sandwich into the holes for the bolts on the side of the Picade.

Now, one by one, take one of the bolts out, and thread it through from the outside instead and fix it with a nut.

You should be able to press each button through it's hole with the wrench and hear a positive click.

Each of the acrylic buttons has an adhesive back.

Peel this off the button and place it in the correct hole in the keypad as shown at the end of this section, with the adhesive on the inside.

Press it firmly onto the mouting pad and it will stick.

The button should now be fairly flush with the cabinet and still give a nice click when you press it.

Repeat for all the buttons.

Doesn't that look nice?

The Brains

If you haven't already, now is a great time to mount your computer to the back door.

There are pre-drilled holes for Raspberry Pi, Mini-ITX, Intel NUC, Beaglebone and ODroid.

If you need more holes, refer to the section on drilling holes without ruining your beautiful cabinet.

The PCB adhesive mounts can also be handy if you do not use them for the Picade PCB.

You should have mounting bolts with your computer, or be able to scavenge some from the surplus we include with the Picade.

Mount your computer with the ports facing downwards ideally.

Once it's fixed, you can connect the Picade PCB to it using the Micro-USB to USB cable, and the LCD to it using the HDMI cable, or another cable you have if you require VGA etc.

Use the cable ties to keep these cables tidy and to a decent length for inside the cabinet.

Attach the monitor power supply to the driver board and thread it out of the cabinet through the holes at the base of the door.

Attach power to your computer and thread the cable through another of these holes.

If you wish to run a decent emulation on the Raspberry Pi we recommend PiMAME from Shea Silverman <http://pimame.org>

You can download it and 'burn' it to an SD card and you will have emulators galore and useful things like XBox controller drivers pre-installed.

On other systems, you will have to hunt down your own taste in software, although we do recommend the following packages to get you started:

Android: Mame4Droid

Windows: MAME

Mac: MAME OS X

Linux: MAME

Fire up the shoesaw!

The power supply barrel jack plugs into the barrel socket on the LCD driver board.

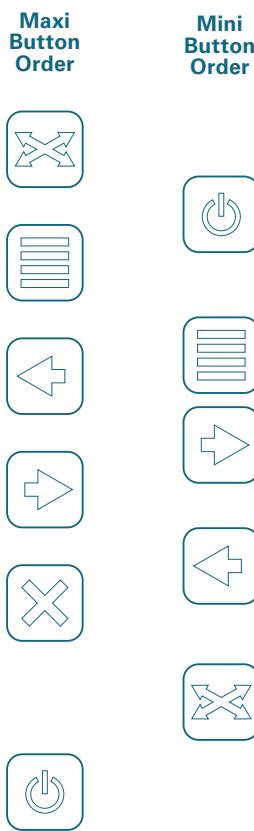
OK. Plug it all in and hope for the best!

Hopefully your shiny new computer will boot up on your shiny new monitor in your shiny new Picade.

Your work is done, but your journey is only just beginning.

Why not contemplate it with a nice cup of tea, Earl Grey, hot?

If nothing happens, please carry on to the Troubleshooting section.



Troubleshooting

Sometimes things do go wrong, and a machine with this many bits can be complicated. Try the tips below.

If none of these work, snap some photos and send them to picade@pimoroni.com describing your problem and the steps taken so far, and we'll see what we can do to get you up and running.

My LCD Menu Is In Chinese

Oops, this should have happened before the LCD left Pimoroni Towers. This is generally only happening on Maxi panels.

You can fix this without learning basic hanzi by using our own bit of Konami code

```
menu  
left  
left  
left  
menu  
menu  
left  
menu
```

The LCD Won't Switch On

First, make sure the power supply is plugged in to the right place on the LCD driver board and is firmly seated.

Make sure the power supply is plugged in properly, both to the wall outlet, and where the pigtail goes into the power block.

Has the fuse in the plug blown?

Is the button panel plugged into the LCD driver board? This controls power on and it's LED also indicated if power is getting to the LCD.

Check that it's white plug is the right way around (it has ridges to ensure it can't be put in the wrong way) and that it is properly inserted.

Finally make sure that all the cables to the LCD look properly seated and check for any signs of damage. It may be that one has come lose during shipping.

None Of The Buttons or the Joystick Work

It sounds like your Picade PCB is not talking to your computer.

There are any number of reasons for this, but in short:

If the Picade PCB power light is not on, then check that the USB is plugged into your host computer and

that it can provide enough power on its USB.

If the power light is on, but you still get no response from the buttons/joystick, check your computer has recognised your Picade PCB and it shows up under **Isusb** on Linux, **Device Manager** under Windows and **System Information > USB** on a Mac.

Have you tried to program your board under Arduino? It may be the firmware didn't work. Check your code and try reuploading it.

One or Two Buttons Don't Work

This sounds like one of the wires is not connected properly. Check the spade connectors on the Button/Joystick and then the screw terminal at the other end.

Reseat them to see if that helps and check that metal is connecting to metal properly.

Are they in the right sockets? Is the ground loop connected to the right socket?

The Computer & LCD Are On But No Picture Is Showing

Check the input source is set to the correct input for your computer. This is the button with four little arrows pointing outwards.

The first time you boot the Raspberry Pi with the Picade, make sure the monitor is on, then switch the Pi on before the LCD goes into power saving mode. After this the Pi and the LCD will be friends and play nicely. Changing your Raspberry Pi config to force the HDMI connection will also help.

For other computers, check the HDMI cable is securely inserted, and that the monitor displays **something**, even if it's 'No Signal'. Otherwise refer to the 'The LCD Won't Switch On' section.

The Hinges Won't Close Properly

Check the hinges are the right way around as shown in the diagram when installing.

The Catch Is Too Loose Or Too Tight

You can adjust the catch as shown in the instructions to make it tougher or easier to open.

I Have Nuts & Bolts Left Over

We tend to stick spares in. This is not a biggie. Save them in case you lose any while hacking your Picade, or make a little bolt sculpture from them.

I Don't Have Enough Nuts & Bolts

Check you've used the right bolts in the right places. The hinges, the catch, the LCD, Control panel and LCD buttons all use different bolts than the 14mm used elsewhere.

If this isn't the problem, get in touch and we'll send you more bolts!

The LCD Buttons Don't Click Properly

Check that the sandwich is made properly, with the bolt holes all lined up and the buttons over the switches on the LCD button PCB.

Loosen the bolts a turn or two, as if they're too tight, they may trap the polypropylene backing.

Worst case, remove the polypropylene backing from the sandwich and let the buttons stick directly to the switches.

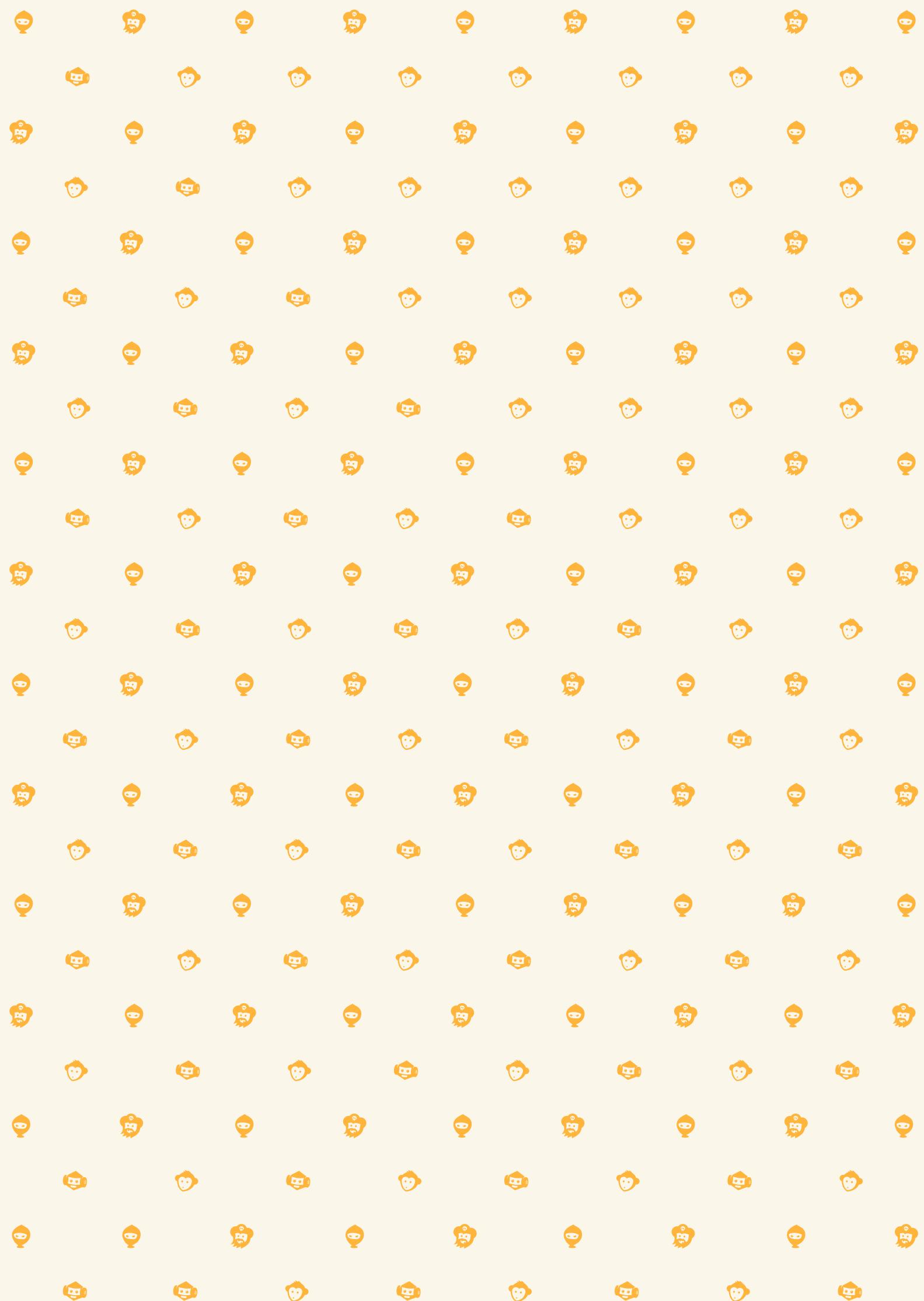
I Have A Question Not Covered Here

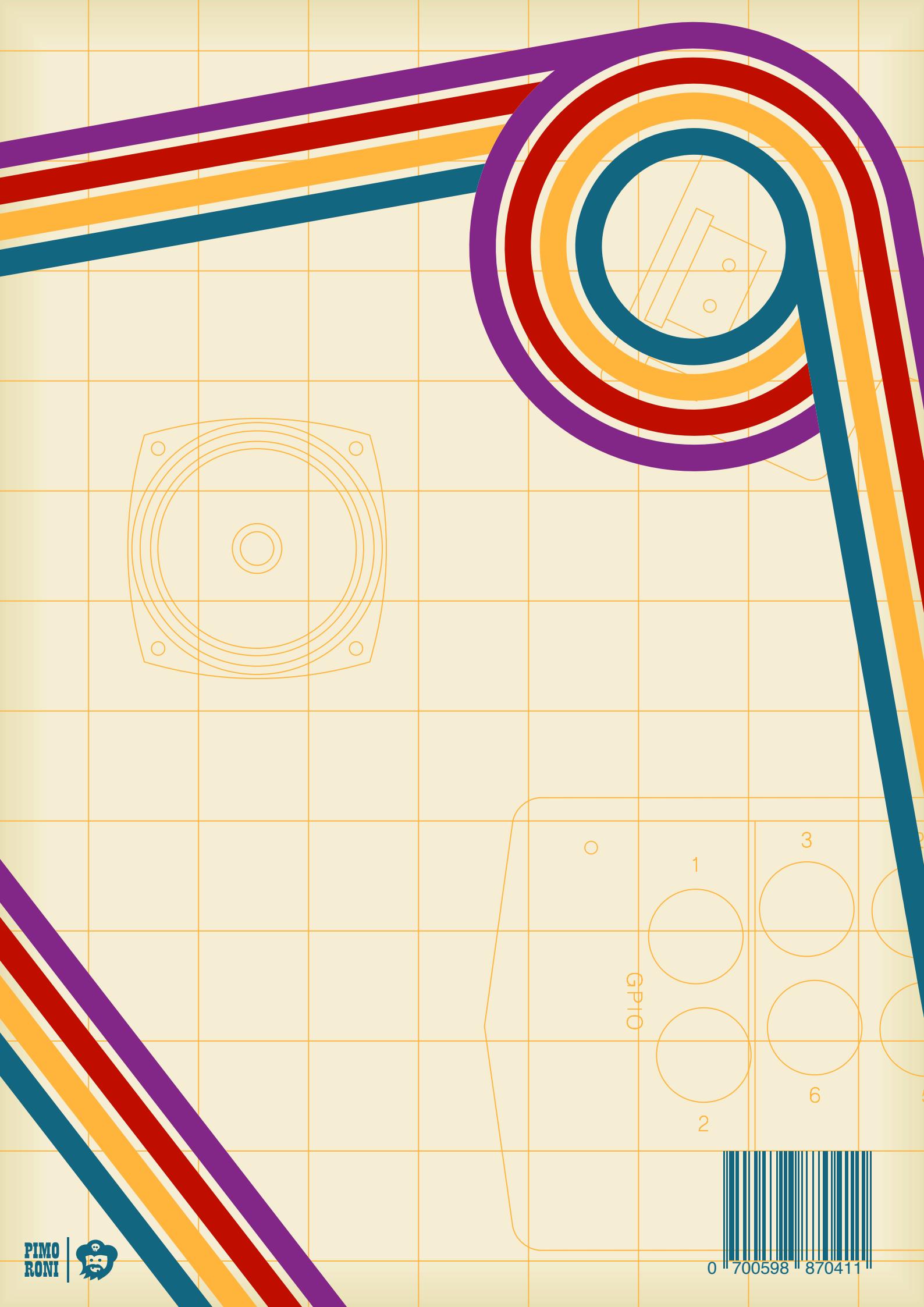
Either email us, or ask the crew on the Kickstarter page for their input.

Hacks

Note your hacks here and share them with the Picade crew on the Kickstarter page.

We'll credit and include the best hacks in future editions if the hack author is agreeable :-)





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