

School of making: Woodworking 101

Bring traditional techniques to your Raspberry Pi setup



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Jenny is a woodworking enthusiast with a background in bespoke furniture making, particularly reclaimed woods. She tutors at The Makershed Bristol.

As a woodwork tutor teaching traditional joinery using hand tools, I meet a lot of people from the technology industry looking to take time out away from the screen and gain a more balanced skill set.

This Raspberry Pi box project brings woodwork and technology together. Being small, it is fairly fiddly to make, but the end result is hugely satisfying. The corners of the box are joined with a whole and half dovetail, and the lid and base sit in grooves. The half dovetails enable the top grooves to continue to the ends of the box so that the top can slide in and out. This box is for a home server, so there's only a hole for the power cable and we've used the WiFi network connection.

I like to use reclaimed timber, and the maple and mahogany of my box are floorboards planed down

to 10mm and 5mm thick respectively. Commonly available 10mm pine for the sides and thin plywood for the base and lid would work just as well but if using pine, add an extra millimetre to the internal box height to allow for it to shrink across the grain as it dries out. Glue narrow lengths of pine together edge to edge to create wider lengths.

MARK OUT

Accurate marking out is essential to well-fitting joinery so take your time with it. Use the try square to score knife lines straight across the grain of the length of wood you are using for the box sides to show the ends of the sides, the shoulder lines of the joints, and the sides of the power source hole. Position any knots or defects in between the sides.

Run the marking gauge along the edges to show the edges of the grooves that the base and lid will sit

TOOL LIST

ESSENTIAL TOOLS

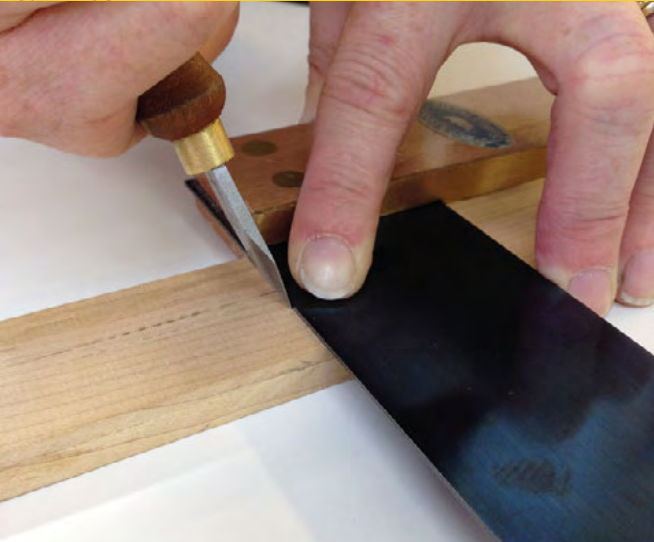
- ◆ Ruler
- ◆ Try square
- ◆ Pencil
- ◆ Fine-tooth tenon/dovetail saw
- ◆ Marking gauge
- ◆ Narrow bevel-edge chisel
- ◆ Clamps

DESIRABLE TOOLS

- ◆ Marking knife
- ◆ Wide bevel-edge chisel
- ◆ Plough plane
- ◆ Block plane
- ◆ Screwdriver
- ◆ Sliding bevel
- ◆ Coping saw



Above ◆ Who doesn't want to give their Raspberry Pi a snazzy new home?



Above ♦ Chisel across the grain to cut the wood fibres

in and the top and bottom of the power source hole. The grooves should be as wide as the thickness of your plywood.

When marking out the position of a saw cut, score two lines, 1 mm apart. You can then scratch out the fibres in between those lines to create a channel for the saw teeth to sit in. This will help to keep your saw on track when you make the cuts.

Tips for accuracy:

- ♦ Maintain firm consistent pressure on the stock of the try square and the marking gauge, pushing it against the edge of the wood
- ♦ Place the flat side of the marking knife against the blade of the try square

DRILL THE HOLE AND RECESSES

Carefully drill holes (on a low speed setting to avoid splitting the wood) inside the lines around the edges of the power supply hole to remove some of the waste wood. Then, deepen your knife lines across the fibres with a narrow chisel before paring away the waste wood that remains layer by layer. Have a piece of hardwood or laminate underneath the box side to support the fibres of the wood as you remove the last layers and stop tear out underneath.

Use the chisel to also remove the waste wood from the HDMI and audio recesses. When chiselling in line with the grain of the wood, take care to use light pressure on the chisel to avoid splitting.



Above ♦ Carving out holes for the Pi's sockets

Now cut the lengths for your box, placing your wood on top of a scrap piece that you're happy to sacrifice to stop the wood tearing out underneath as you cut.

MARK OUT THE DOVETAILS

Mark out the shape of the dovetails onto the end grain and inside/outside faces of the long box sides using a pencil, try square, and sliding bevel or ruler.

Don't yet mark out the dovetails sockets/pins – you will do this to precisely match the shape of your dovetails once they have been cut. Mark the waste side of all of your lines with a pencil cross so that it's →

Below ▣ Before you pick up your chisel, saw along the lines you marked



really clear which sections of wood you are keeping and which you will remove.

Use a dovetail or fine tenon saw to cut on the waste side of all of the lines. Use a try square to position the lines you are cutting at 90 degrees to the bench – it's far easier to saw straight down than to try and lean a saw to the correct angle.

Remove the waste wood from between the dovetails, either with a coping saw or narrow blade (that can turn the corner at the bottom of one of your saw cuts) or by using a series of chisel cuts.

CHISEL THE DOVETAILS AND SHOULDERS

Use a bevel-edge chisel to pare away thin slices of wood from first the shoulders (the gaps in between

the dovetails) and then the cheeks (sides) of the dovetails, back to your pencil lines.

Use the try square to check that all your surfaces are flat and square, marking high points in pencil to be chiselled away – squareness is more important than paring exactly back to your lines of the dovetail shape, as you will mark out the sockets to fit the resulting dovetails.

A good way to chisel square shoulders is to use a scrap piece of wood (fence) clamped in line with the shoulder line to position your chisel. Clamp the box side and fence flat to the bench and slide the chisel down the fence. It's difficult to check if the shoulder in between two dovetails is square using a try square due to the restricted view. If the blade of the try square touches the edge of the wood when the stock is held against both inside and outside faces, though, you can deduce that the shoulder is square.

When paring the cheeks, position the surface at 90 degrees to the bench so that you are chiselling straight down.

MARK OUT AND SAW THE SOCKETS

Label both sides of each corner with the same letter A/B/C/D so that you can be certain that you are always putting the same ends together. Then, draw the shape of your dovetails onto the end grain of each matching piece, making sure that the inside faces are correctly positioned facing each other and the edges of both pieces are flush.

Continue those pencil lines straight down to the shoulder lines on both the inside and outside



Above

Mark pencil crosses on the waste side of each line to clearly show the areas to be removed

Right

Cut on the waste side of all the lines you've marked





Above ♦
Marking out the sockets, following the lines of the dovetails

faces. As with the dovetails, position the saw cut at 90 degrees to the bench, saw on the waste side of the pencil lines, and remove material from between the pins with a coping saw.

CHISEL THE SOCKETS

Chisel the shoulders and then the cheeks of the sockets flat and square, as you did with the dovetails.

Make sure that you don't chisel away the pencil lines on the end grain – these lines were marked on the outside of your dovetail shapes and if you lose them, your joint will be loose.

Keep trying to fit the two sides of the joint together as you chisel back to the lines – it will often go together before you think it is ready.



Above ✕
This is a plough plane: use it to carve grooves for the box lid to slide into

PLOUGH THE GROOVES FOR THE BASE AND LID

On the dovetail sides, the grooves for the base and lid can be cut using a plough plane. This plane has a narrow cutter and a moveable fence that can be set at the required distance from the cutter. When pressed against the edge of the wood, the fence ensures the groove is straight.

Mark the depth of the groove in pencil on the end grain at both ends of the dovetail sides. →



Left ✕
A strong joint depends on corresponding surfaces touching each other on assembly so that the glue can form a bond

Right 

Assemble the box once before you glue it together, just to make sure it all fits together



You'll need to set up a jig using offcuts of your wood screwed down onto a base to surround the box side and hold it in position, as it is too small to use clamps directly – they would be in the path of the plane.

Set the distance between the plane fence and the cutter to 3mm. If the plane has a depth stop, set this also to 3mm. Press the fence firmly against the edge of the wood to ensure accuracy and try and remove even layers along the whole length. The lid grooves will run through the half dovetails.

If you don't have a plough plane, you can pare away the waste wood from inside the groove with a narrow chisel. Be careful!

The base grooves of the socket sides need to be chiselled out, as opposed to plough-planed, because they need to stop short of the end. Ensure you chisel across the fibres first to break them and then gradually pare away thin layers to minimise the risk of splitting. A depth of 1mm is sufficient to hold the base in position.

MAKE THE LID AND BASE

We chiselled a rebate into the edges of the base and positioned the raised section inside the box in order to reduce the internal dimensions. This meant that the power source hole could be positioned further away from the bottom edge, giving it more support from the surrounding wood. If you're using solid wood, mark the rebates out with the marking gauge set to 3mm and use a wide bevel-edge chisel to pare away thin layers down to the line.

Make sure the inside corners are clear of all fibres so that the lid runs smoothly inside the grooves.

If you're using plywood, you can build up a rebated lid and base by gluing two layers together, with one layer slightly smaller than the other.

The base needs to extend into grooves on all four sides. The lid only needs to fit into grooves along the dovetail sides and can be cut flush at either end.

The socket sides of the box need to be reduced in height to allow the lid to pass over the top of

// If you're using plywood, you can build up a rebated lid and base by gluing two layers together, with one layer slightly smaller than the other **//**

them. Assemble your box and mark the required height. You can remove the unwanted sections with saw cuts and then sand or plane to a smooth finish.

GLUE UP

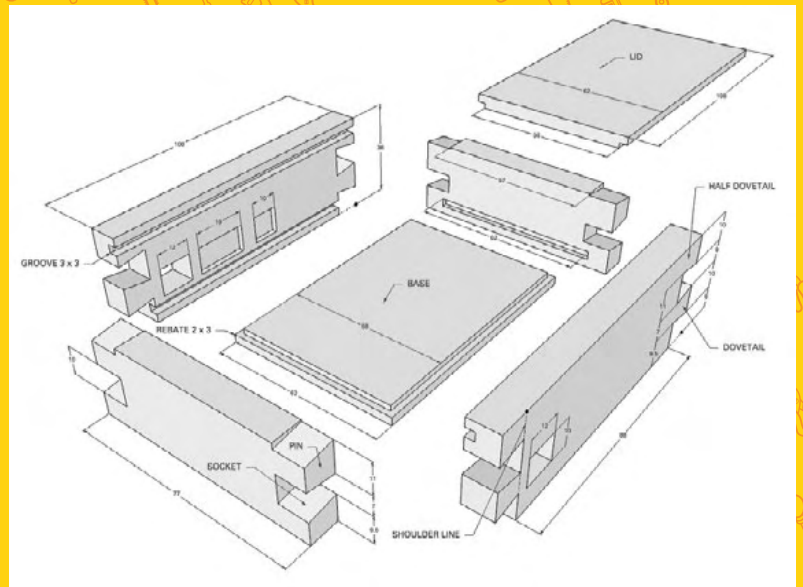
Before you glue up any project, you should fit all the pieces together without glue to make sure there are no adjustments to be made.

Once you're happy with the fit, lay out your pieces and apply wood glue to the inside faces, cheeks, and shoulders of the dovetails only – no glue is required on the socket sides or the base and lid.

Clamp the box together in both directions, using small sections of scrap wood to protect it from being damaged by the clamps. Allow 24 hours for the glue to dry.

FINISHING

Your box will need to be either planed, scraped or sanded to clean up the surfaces ready for finishing. If you use a plane, take care not to plane off the edge of any areas of end grain, as they will splinter out. If you use sandpaper, always sand in the direction of the grain to disguise scratches. Start out with a coarse paper to remove marks and then work up through the grades to a fine finishing



paper, removing the scratches of the previous coarser grade as you go.

Danish oil is a quick, easy, and durable finish. Apply this sparingly with a soft lint-free cloth, using a small brush to get into corners. Remove any excess Danish oil, particularly in the grooves and the edges of the lid. This will ensure that the box opens and closes smoothly after finishing. Well done! Now your Raspberry Pi projects can have a nice new home. □

Above ■ Here are the measurements if you want to make your own Pi box



Left ■ The finished article: lending gravitas to our Pi web server