

Alberni PD Racers

How to build a “Hatch Kit” of lumber-parts for a basic PDRacer

The purpose of this kit is to facilitate Duck Hatches where several boats are constructed by relatively inexperienced wood workers. It assumes:

- you are building the “Basic 18” Duck (almost but not exactly as per PDRacer.com *)
- you have made two side-curve patterns from a sheet of 3/4” MDF
- you have made a bevel board with the five cross member bevels marked on it.

Once you have the kits completed, hatchlings can build the boats without any large power tools and minimum hand tools.

If you are building only one boat you can't justify the cost and effort making the patterns and bevel board. But the general approach of this kit is still a good idea. You get all the messy work out of the way at the beginning and then you can build the boat in a (relatively) clean shop. Once you have all the pieces it comes together really quickly.

Materials used for the kit (per boat)	Tools required to create the kit (not including making patterns)
2 1/2 sheets 1/4” plywood * 1 Sheet 3/8 plywood Lumber 1 16 foot 2 by 4 1 8 foot 2 by 4 1 8 foot 2 by 6 1 12 foot 2 by 6 3 feet 1” angle aluminum (if you are including the rudder fittings) Glue (if you are pre-laminating the rudder and tiller or pre-building the mast – which will also require a few nails)	Skill saw with guide - initial plywood cuts. Skill saw freehand - taper mast Table saw - most of the plywood panel cuts, all the milling of lumber except the mast Jig saw - initial cut for the side curve, cut hole for hatches and backing plates Chop Saw - trim some parts to length - could be hand saw Router freehand - trim sides to pattern Router table - round-over many of the parts - 1/4" and 1/2" round-over bits Handsaw - notch bulkheads Hole saw (on drill) for the mast hole Sliding bevel - set table saw blade for bevel cuts Tape, marking tools, squares and a few clamps

* This boat differs from Shorty's Basic 18 - we can't get 1x12 lumber for the rudder and lee board. So we laminate them from left over ply and another 1/2 sheet. We cut a *round* hole in the fore-deck for the mast. Deck lengths are cut oversize, to allow for any variation in the location of the bulkheads, and trimmed to fit at construction. We use cheap 5” plastic inspection plates as hatch covers

Alberni PD Racers

First sheet of 1/4 plywood

Measuring from each of the long machined edges of the sheet, cut two pieces 18" by 8 feet for the sides. The machined edges become the TOP of the sides. This leaves a strip from the middle of the sheet approx 11 3/4" wide (48" minus two times 18", minus two saw kerfs). This piece is used for laminates for the lee board and rudder and one of the hatch backing plates. Cut it into a 48" length (lee board), a 36" length (rudder blade) and a 12" length (hatch backer). Cut the hatch backer to 8 1/2" square.

Align the two 18" wide pieces along their machined edges. Make sure the two good sides of the plywood are outside and the two rough sides facing in the middle. Place them on a bench on top of one of the MDF patterns overlapping the pattern about an inch on the curved side. At this point the lower pattern is just for support. Place the other MDF pattern on top of the plywood and align the two ends of the top (machined) edges with the marks on the sides of the TOP MDF pattern (The marks are exactly 18" from the outer edge of the curve.) Ignore the marks on the bottom pattern for now.

Check alignment – The two ply pieces exactly aligned on top edges and two ends: the top exactly aligned with the marks on the pattern. Check a third time! Note that there is a flat spot at the bottom of the curve. You will probably find the pencil slips off here when you try to draw the curve. That is OK. If the flat spot is *behind* the pattern your 18" piece was cut too narrow.

Draw the curve on the upper piece of plywood with a sharp pencil held close to the upper pattern. Draw the slope of the bow as well.

Move the upper pattern back six inches – enough room for the jig saw. Make sure that the lower pattern is still back an inch or so. It is advisable to clamp the whole sandwich to the bench at this point. Using a jig saw cut the curve and bow through both pieces of ply together *leaving about 1/8 inch of wood outside the pencil line*. Don't cut into the line!

Now re-clamp the whole sandwich with the plywood aligned with the marks on the BOTTOM pattern. Check the alignment. The small 1/8" of excess wood should project over the pattern for most of the curve and bow. At the flat spot it may be just flush.

Make sure the upper pattern is pushed back far enough to leave room for the router. Use a hand-held router with a flush cut pattern bit (bearing on the BOTTOM of the bit). Adjust router until bearing is in the middle of the pattern so that the cutter is more or less centred across the plywood edge. Run the router carefully along the bow and curve. Go slowly to keep a clean edge on the ply. Don't tilt the router or you may damage the pattern. Unclamp everything and you have two identical sides.

With care this process could produce four sides at a time. Alignment would be a bit trickier.

Second full sheet of 1/4 plywood

This is cut into a series of panels 48" wide - all cuts across the sheet. To simplify handling the large sheet on a table saw you might want to cut it first with a skill saw at about 43" from one end.

Alberni PD Racers

From the 43" piece cut:

Bow Bulkhead	48x14 3/4"
Stern Bulkhead	48x15 1/2"
Stern Transom	48x12"

From the longer piece cut:

Bow Transom	48x13 3/8"
Stern Deck	48x13 1/2" - cut oversize for now
Bow Deck	48x23 1/2" - cut oversize for now

Take the two bulkheads and trim them to 47 1/2" wide - they fit *inside* the boat.

Mark the top and bottom of the two bulkheads – arbitrarily if there is no flaw in the ply.

At the top of each bulkhead cut notches at each end 1 1/4" wide and 1 1/2" deep to allow for the gunwale strips at the top of the sides. At the bottom of each bulkhead cut notches for the chines 3/4" wide and 9/16" deep – the extra 1/16" depth helps fit the curving chine.

When you have cut the third sheet of plywood and have two hatch backers – see below - mark the centre of the stern bulkhead and use a compass to draw a 2.75" radius circle around that point. Then drill a 3/16" hole in the centre. Mark the centre of the port side of the Bow bulkhead (i.e. a point approx 12" from the port edge and halfway up). Draw another circle of the same size here and drill the same sized hole there. Take the hatch backing plates (One from first plywood sheet above and second from the half sheet - see below) and draw similar centred circles on these and drill the hole in their centres.

Put the 3/16" drill through the holes in all four pieces and align them with the stern bulkhead on the bottom and the two backing plates on top. Clamp the assembly together keeping the drill as near vertical as possible. Remove the small drill and drill a larger hole through the circle somewhere else and use it to insert a jig saw. Cut out the circles in all four pieces at once.

Third full sheet of 1/4 plywood (uses only half)

Cut this sheet in half to make two 4x4 sheets. Discard one for use on the next boat.

Set the table saw to the width of the laminates derived from the middle section of the first sheet – see above. Cut two 48" lengths at this width for the other two lee board laminates. Turn the remaining 4 by 2 foot piece around and cut a strip off one end the width of the laminate – put this aside. Turn the remaining 3 foot by 2 foot piece around again and cut two 36" lengths for rudder blade laminations. From the off-cut that you put aside cut 8.5" off one end and then make that piece 8.5" square - for one of the hatch backer plates. Cut the remaining approx 12" by 15" piece into two 12" by 7.5" pieces for use as oar blades.

Milling "two-by" Lumber

From a twelve foot 2x6

Cut five strips off the side 3/4" wide. Lay aside three of the resulting 1.5" x 3/4" pieces for now. Take the other two pieces and rip them down the middle to produce four 3/4" square strips.

Alberni PD Racers

There will be a piece remaining approx 1 3/4" x 1 1/2". Cut 9 feet six inches of that piece and mark it "Sprit boom". Mark the remaining piece "Tiller". Lay these aside until the routing step below.

From an eight foot 2x6

Cut two strips off one side 1 1/4" wide and mark them each "Gunwale" put aside for routing.

Cut five feet off the remaining piece, cut it down the centre to make two approx 1 1/2" square pieces. Mark them "oar handles" and lay aside for routing.

Cut 12" off the remaining piece and rip it into two 3/4" thick pieces. One of these is marked "Rudder backup plate". The other is cut in half to make two approx 6" by 3" by 3/4" pieces. One is marked "mast step backup plate". The other is marked "Mast Step" and put aside for routing.

From the remaining 24"x3"x1.5" piece cut two pieces 2 1/2" long and mark them "Mast step spacer". The rest is trimmed later for the lee board backing plate.

From an eight foot 2x4

Cut three 1/2" strips off one side and mark each of them "Skid" and lay aside for routing

Cut 48" off the remaining piece and mark it "Spray Rail" and put aside for routing.
The rest is spare scrap.

From a sixteen foot 2x4

This will be the mast and it will be tapered down to 1.5" at one end. Inspect the lumber and select where to remove the scrap. Try to cut off knots and checks/splits.

From one end measure up five feet. Mark a point 2 1/2" from the best side at the five foot mark. From this point draw a line to taper the mast to 1 1/2" square at the top. Use a 12 foot strip as a rule.

Use a skill saw to cut the mast down to 2 1/2" for the first five feet and then taper it to the top as marked. Take the offcuts and rip two pieces 1/2" by 1 1/2" by five feet. These are mast stiffeners.

Routing

Set up the router in a table with a 1/4" round-over bit. Round over the following with this bit:

- All four sides and the end of the boom
- Two adjacent edges and all round one end of the tiller. Then route the other two edges but leave 8 1/2" at the end where the tiller will lie flush with the rudder. At that end round over edges of the end leaving the edge next to the rudder – between the two non-routed side edges.
- Pick the best face of each skid and route its edges
- Pick the worst narrow side of the spray rail which will be glued down to the deck. Route all

Alberni PD Racers

- other edges.
- Route the front face edges of the mast step
- Pick the worst side of each gunwale. That side will be flush to the inside of the plywood. Route the other two exposed edges.

Change to a 1/2" round over bit and round over all four edges and **one** end of the oar handles.

Cutting bevels

There are five 48" cross member pieces made out of the 3/4" by 1.5" twelve foot strips. These are the bottom cross members of the transoms and bulkheads and the upper cross member of the bow transom. (The stern transom is square to the top.) The five need to be bevelled so that the bottom will fit flush and seal the flotation chambers well. If you are making several kits these pieces can be bevelled from twelve foot lengths and cut to 48" later. This means five table saw bevel adjustments will suffice for several kits. When bevelling make the offcuts as small as possible but ensure a maximum width on the sloping face. The bevels are recorded on a bevel board that is kept with the side patterns.

While you are at the table saw, set the blade to 45 degrees and taper the ends of the oar handles flush with the non-routed end where the blades will be attached.

With the blade still at 45 degrees trim the edges of the mast stiffener pieces to that angle removing the minimum amount of waste – err on the side of too little waste.

Marking

Very carefully mark the centre line on both sides of all transoms, bulkheads, decks and the 3/8 sheet of plywood. This measurement is critical.

Mark the centre line on the mast step, rudder and mast step backup plates, and spray rail.

Using a carpenters square along the top edge of the sides, mark the point at the stern where the side is exactly 15 1/2" deep. This is the point where the back of the stern bulkhead will fall. Measure 1/4" forward of that point and mark a square line down the INSIDE of the side piece and label it "Front of stern bulkhead".

In a similar way mark the point from the bow where the depth is exactly 14 3/4", measure aft of this 1/4" and draw a line labelled "front of bow bulkhead"

Using the same points as above at bow and stern measure 3/8" aft of the stern mark and forward of the bow mark. At these points draw square lines down the OUTSIDE of the side pieces and mark them "nail/screw line".

Mast hole

The spray rail will be installed across the aft end of the bow deck with its longer dimension vertical. Lay it in place with its centreline matching the centreline on the bow deck. Draw a line across the bow

Alberni PD Racers

deck marking its front edge. Measure forward 1 1/4" from the spray rail front edge along the bow deck centreline. Draw a 2.5" diameter circle centred on that point. It should just touch the spray rail forward edge. Err on the side of leaving a tiny space between the circle and the spray rail. That can be adjusted later as the deck is oversize. Use a 2.5" hole saw to cut a hole through the bow deck at that place.

That's it. You're done. (unless you want to add some of the extra items listed at the end.)



The kit look a bit like this. Except that those three 12" square pieces of plywood behind the two hatch cover backing plates will be forming the middle layer of our laminated rudder because we made a . . . um . . . mistake. The piece with the small hole is not the bow deck, it is a template for helping to shape the mast.

Alberni PD Racers

Plywood parts checklist

You should now have (for each boat):

- 2 identical shaped sides 8 feet long and max depth 18"
- two full width transoms
- Two similarly notched bulkheads 47 1/2" wide and different heights and with 5.5" dia holes in different places
- Two over-sized decks full 48" wide – length to be trimmed when installed. The bow deck has a 2 1/2" mast hole
- Two hatch backing plates 8.5" square with 5.5" dia holes in the centre
- Three 36" rudder laminates
- Three 48" lee board laminates.
- Two pieces for oar blades
- One full sheet of 3/8" plywood for the bottom

Lumber parts checklist

You should now have (for each boat):

- Two gunwales, Two oar handles
- One boom, one tiller, one spray rail
- Four 12' strips of 3/4 square
- Five 48" bevelled pieces of 3/4 by 1 1/2
- Approx 16' of 3/4 by 1 1/2
- Small pieces for rudder backing plate, mast step and backing plate and two spacers
- Mast and two 1/2 by 1 1/2 stiffeners
- Three skids
- A scrap piece for making the lee board backer.
- Quite a lot of other scrap – keep it around for use to fix problems or other small parts.

Other items that you may want to include in the kit for a hatch.

- Assembling mast and stiffeners and shaping at least the lower 5' of the mast to fit a 2.5" dia hole
- Laminating the rudder blade and lee board and rough shaping of the rudder and lee board
- Cutting the aluminum angle for the rudder hardware
- Drilling holes for the lee board and tiller
- Drilling the holes for the mast step bolts – using drill press
- A hardware kit of nut/bolts/washers etc. and a tarp for the sail and a roll of Tuck Tape