Part 2: Marking out

Having built the basic box, the next task to tackle is the sides. These are undoubtedly the most critical parts of the whole project, and it is worth taking extra time and effort over them. For a panelled coach, there are two principal layers: the panelling itself, and the outer layer proper. The inner layer, you will recall, is part of the basic box. The figures in the previous part should clarify this. The panelling is made from 0.010in. styrene sheet, which is pretty much scale thickness for most prototypes. For the LSWR coaches that 1 was building, the panelling only extends as far down as the waist. There is a strip right at the bottom of the side but that is quite separate from the rest of the panelling and so it can be added later using microstrip. For other coaches it may be necessary to extend the panelling layer to cover the full depth of the side.

The outer layer 1 also make from 0.010in. styrene sheet. Because I shape the inner sides to give the correct tumblehome, the outer sides are everywhere supported and do not need much strength. If 1 were using a flat inner side and supporting the outer side on stringers (you may need to refer back to Figs 1 and 2 in the previous part to follow this), 1 would be inclined to make the outer side from 0.020in sheet for extra strength. But no thicker than that; we shall be doing a lot of cutting for windows and other apertures and thicker material just makes for extra work.

Before going into detail, it is worth briefly reviewing construction of the sides. We start by making the panelling layer. The panels are cut out to leave a very flimsy skeleton which is then bonded to the outer layer. Bolection mouldings are added on top of the panelling layer where windows occur, and then the windows themselves are cut out. This last operation involves cutting through the moulding, panelling and outer layers, which is why none of them should be thicker than they need to be. Droplight openings are also cut out, and then the whole lot is set into place on the inner sides.

The first thing to do, therefore, is to make a careful study of the prototype drawings and photographs to ensure that you understand the various layers. What 1 have described is fairly typical, but there were variations, and you may have to make some changes to suit. Once you have understood how the various layers go together, and which details are part of which layers, you are ready to start marking out.

The good news here is that only the panelling layer need be marked out. When this layer is cut out and bonded to the outer side, the positions of the windows and any other cut-outs can be taken from the panelling. In fact that is the only way to ensure that the various layers are in accurate alignment. If you mark and cut out the layers separately, come the time to put them together you will almost certainly find that small misalignments have crept in, so that not all of the windows are exactly centred inside the panelling.

Marking-out is another point of departure from David Jenkinson. His method is one of marking-out by hand, using a straight edge and set square to ensure that all the lines are parallel and at right angles. I draw the panelling layer on the computer and print it straight on to the styrene sheet. The advantage of this approach is that it eliminates any drawing errors that can creep in when you draw by hand. Furthermore, it is possible to reuse a lot of drawings or part-drawings. For example, for my LSW coaches I have a drawing of one compartment panelling, comprising a door and the window sections on each side of it. These were standard sizes for many coaches and all classes of compartment. For the six-wheel coaches that had five compartments each, I copied this drawing five times, ensuring that the centres of the compartments were at the correct spacing. Once that was done there were just a few panels between compartments (which did vary in size) to complete. Because the two sides of a coach are usually mirror images (though there are exceptions), only one need be drawn, and this is then copied and the copy flipped over on the computer. At this stage you can if you wish also add to the drawing marks to locate features that are added later, such as door hinges and handles.

To mark out in this way you need access to a computer and a suitable printer, together with the appropriate software. The drawing can be done using almost any CAD or graphics package. No great sophistication is required, because all you need to be able to do is draw vertical and horizontal lines and arcs at precise locations relative to each other. If you already have, or have access to, such a package, you probably don't need any more information. If you are buying specifically for this task, there is no point in spending hundreds of pounds on a fully-featured package intended for professionals. Look for something cheap; you might even find one free to download from the web or on the cover disk of a com-

puter magazine. If it is advertised as a CAD package it should do what you need. If it is a general-purpose graphics package, make sure that it does vector rather than bitmap graphics.

The type of printer is also important. The ideal is the type of plotter used in professional design offices, which is accurate and will handle almost any size of sheet that we are likely to need. If you have access to one, use it. Like me, most people, I imagine, will have an inkjet printer designed for domestic use. I have heard of people using laser printers, but the thought makes me nervous. These printers work by spraying the ink on the sheet in the form of an extremely fine dry powder, and then fusing the powder by flashing it to about 200degC. I have visions of the heating process softening the styrene sheet and leaving an awful mess in the printer. If you know better, go ahead, but don't blame me!

Printers aimed at the domestic market usually handle sheets up to A4 size, but for all but short coaches we have to print on styrene sheets larger than that. The width of A4 will almost certainly be the maximum width; it is not physically possible to feed wider sheets into most printers, but sheets longer than A4 can be used with the manual feeder instead of the paper tray. So you will have to arrange the drawings within the width limit. You should also leave some margin around each panel layer. The printer will not print right up to the edges of the sheet, and in any case when the panels are all cut out the remaining skeleton is very flimsy so the margins will give it some strength and leave you something with which to handle it. You may have to play around with the printer settings and the sheet size settings in your graphics software to get the printer to print complete sides on sheets longer than A4. I cannot really advise because each software package and each printer is different. Be prepared to experiment.

So let’s suppose you have drawn all the panel layers you need. Before hitting the print button in eager anticipation, there are a few other things to do. First of all, it is a good idea to draw as many bolections and droplight frames as you will need. An even better idea is to draw a few more than required, then if you mess up one or two when cutting out it does not matter. You will probably be able to fit these on to the same sheet as the panel layers, but you can use a separate sheet if that is more convenient. The inside and the outside of the bolections are drawn to size, as is the inside of the droplight frames. The outside of the droplight frames should be large enough to fit behind the door framing without intruding into the adjacent window spaces.

The result of all this should be something like Fig 3. This shows the two panel layers for one coach. On the same sheet is drawn enough droplights and bolections for the two sides. To make things easier when cutting out, I mark window openings with a W, droplight openings with a D, and bolection openings with a B. You can extend this to other openings if you wish, but I have not found it necessary to do so.

Next make a trial print on paper. Paper is cheaper than styrene, and it is prudent to ensure that everything prints as it should. In particular, check the size when printed, in both the horizontal and vertical directions. Find the longest dimension that you can and measure it carefully, then compare that with what

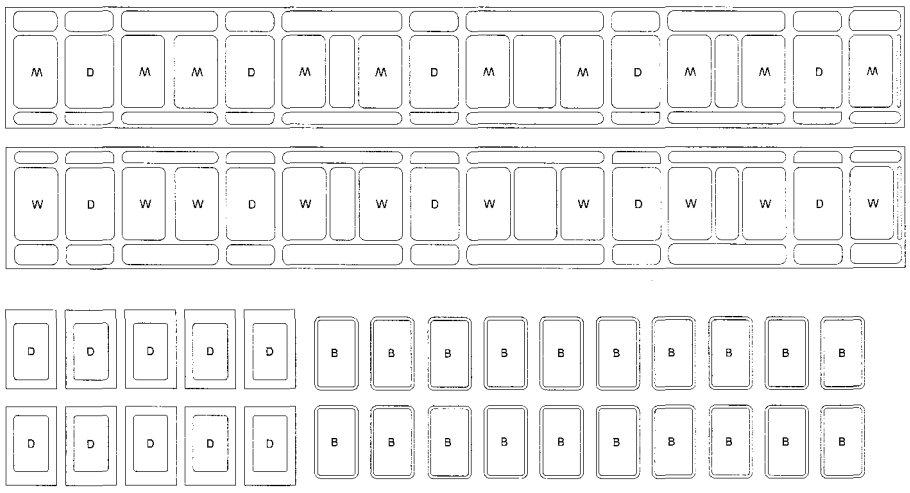


Fig 3

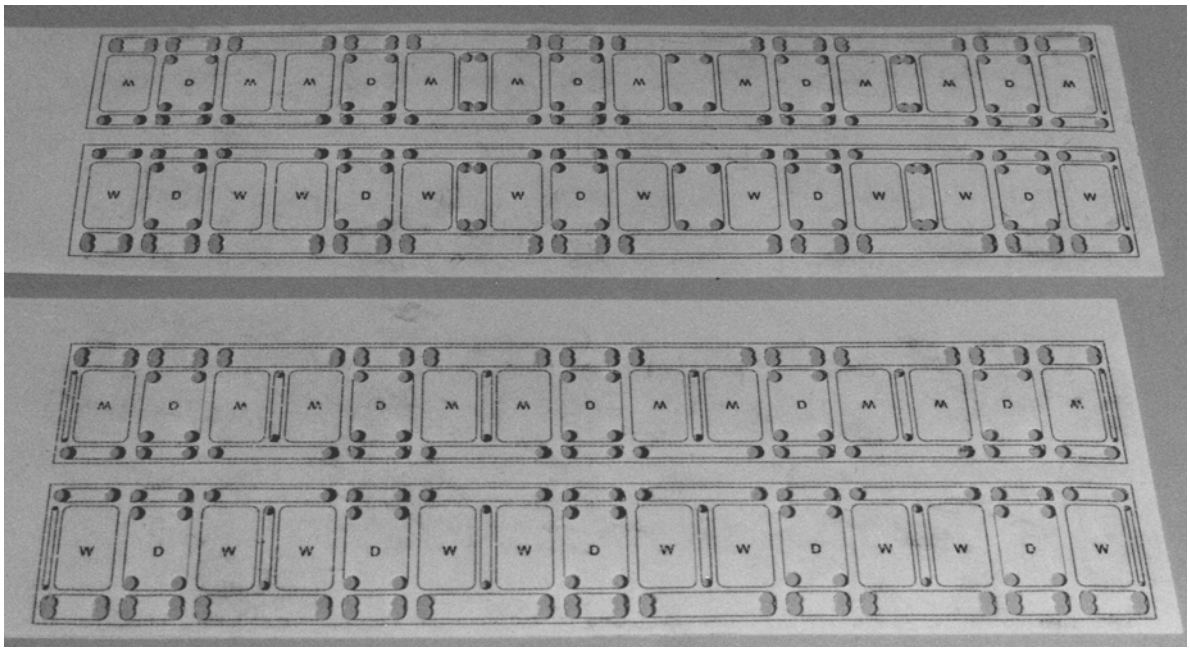
it actually should be. Printers are not always accurate enough for our purposes, and you may have to scale the drawing up or down to compensate for the printer. Your software should allow you to apply a constant scaling factor in either direction to every object in the drawing.

Finally, it is necessary to prepare the styrene sheet in order to take the ink. A matt surface is required for this, so put the styrene sheet on a smooth flat surface and work it over quite hard with a very fine abrasive paper or block. Make sure this is done evenly over the whole surface of the sheet. The ink used in inkjet printers is designed to dry very quickly when it is absorbed into paper, but otherwise very slowly. Unfortunately styrene sheet has little absorbency even when worked over as I have suggested, and the ink on the sheet is likely to smear if touched immediately after printing. This is where patience is required. I find I have to leave it for some time, ideally several days, before working with it. Again, you will have to experiment with your own set-up. A technique that I have not tried but is worth a go, particularly if you cannot wait, is to spray the printed sheet with artist's fixative. If anyone has success with this, could they let me know?

There are several instances like this during construction when it is necessary to leave things alone for some significant length of time. One advantage of the 'batch building in series' approach outlined in the first part is that I can get on with another coach during these times.

Some readers, I am sure, will not have access to the right equipment for this or will begrudge the time it takes to acquire the skills to produce useful results. In that case there is always the manual method, which I used quite successfully (although somewhat tediously) for my first coaches. In that case you should still work over the styrene sheet to give it a matt surface, and mark out with a hard pencil kept very sharp.

Next time we will consider cutting out the panels and starting to assemble the sides.



Panel layers for two sides. This is getting ahead of the story because I have started cutting out, but you will see from this how the layer is marked.