

## Building Easitrac Turnouts

*This material is part of the forthcoming 2MM Track Handbook. As it is likely to be several months before the Handbook is published the committee felt that in view of the current interest in Easitrac it would be useful to make this part available on the web. Only the sections of the Handbook that relate to Easitrac turnout construction are reproduced here.*

*The Handbook will be considering four methods of turnout construction. The techniques that are common to all of them will be in a separate chapter. The relevant parts of that chapter are also available for download and are necessary for a complete understanding of this material.*

*Easitrac\_Turnouts\_Techniques.doc   References to Chapter 5 in the text refer to this document*

*Please recognise that it is part of work in progress and may be refined before final publication and that there are occasional references to material not provided here.*

*As editor I would welcome comments on anything in this material including errors, additional material that would be helpful and particularly areas that are not clear. Email me at:  
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### Pointwork

Throughout these sections we have used the term timbers to refer to the “sleepers” in pointwork. This is the term used by permanent way men. For the same reason we also refer to crossings not frogs (American) and switches or switch blades not point blades.

The procedures outlined here are not the only ways of building turnouts. However, they do ensure that everything fits correctly and, provided your workmanship is clean and neat, they will work properly.

There are two critical areas in a turnout: the switches and the crossing:

The switch blades must fit snugly against the stock rails. If they don't then wheel flanges may snag against them and that often leads to derailment. We explain in chapter 5 how to file a switch to a suitable point and how to arrange the joggle for it to fit snugly or how to file the tip of the switch if you don't use a joggle.

At the crossing there is a gap in the rails where they cross. If the crossing is not aligned properly or if the check rails are incorrectly placed wheels can hit the nose of the crossing or even start to run up the wrong side of it. That, needless to say, inevitably leads to derailment. The crossing assembly jig described in chapter 5 is a very useful tool that makes it much easier to produce a correctly aligned crossing. We strongly recommend that you use one and the instructions here assume that you do.

Do be sure that you understand how the correct alignment and positioning of these components is being achieved by the methods described here before you adopt a different approach.

The use of a template as a guide is always very helpful for getting parts where they belong but the final alignment must always be done with gauges. Templates are very helpful to assist you in placing the rails but the final precision must come from gauges. Gauges combined with an appropriate order of assembly are essential.

We recommend building all pointwork over a template unless you are using an Easitrac milled base, where a different approach, which is explained here, is necessary.

See the section on crossings together with Fig 12 in Chapter 2 for an explanation of the working of a crossing which will help you to understand what is needed.

### **Before you Start**

We discuss the basic issues of electrical connections in chapter 7; however, there are some matters which must be dealt with while you are building the track or, in some cases, before.

It is difficult to make an unobtrusive electrical connection to the track once it is laid and even more difficult after it is ballasted. Generally the least visible place to connect the wires is the bottom of the rails where the connection and the wire will be largely hidden by the ballast.

We recommend always making two connections to every piece of rail. Then if one fails there is no need to make a messy and obtrusive repair.

If you build your track on the workbench before laying it there are few problems. Simply solder two wires to every piece of rail once the track panels are complete and feed the wires through holes in the baseboard as you lay track. If you build in situ you might consider connecting wires to each piece of rail and feeding them through the baseboard before you fix the rail. There are some specific suggestions about this for Easitrac milled base turnouts in the construction section below.

### **Use of Cast Brass Track Base 1-178**

As well as the standard plastic track bases lost wax cast brass bases for BH track are also available. The principal use of these is to provide additional strength usually at baseboard joints and in areas where rail creep is a possibility. They can also be used to make electrical connections, but this is really only worthwhile where they are already required for strength or where soldering to the rail is impractical.

### **Issues with Easitrac not found with Other Methods**

Before embarking on building Easitrac pointwork, particularly if you have previous experience of soldered pointwork in any scale you should understand the limitations of an all plastic system.

Rail is held in small plastic chairs and these, interestingly, suffer from some of the same sort of problems as prototype chairs:

- Common chairs are very effective at maintaining the gauge but they are less effective at preventing the rails creeping along the length of the track.
- Slide chairs on turnouts do not have jaws on the inside as the switch rails must be able to close against the stock rails. This could allow the stock rails to move under gauge.

Generally creep is not a problem but it can be in pointwork where the switch rails are short and are typically restrained by no more than about a dozen chairs. On prototype turnouts creep is prevented by a restraining link that anchors a switch to its adjacent stock rail fig 1. On Easitrac turnouts this can be resolved by gluing the rail to the chairs with cyano. In practice once the track is painted the paint has the same effect as glue. However painting is best not carried out until the track has been thoroughly tested so cyano should be used as an interim measure.



Fig 1 Switch rail anchor on a BH turnout

An alternative method is to use sections of cast brass sleepers for one of the timbers of the switches. Unfortunately this is not a particularly easy option as the curved switch rail is not at right angles to the timbers, although some are close enough on turnouts sharper than B8. The use of equalised timbers, which are set at right angles to the centre line of the turnout (see chapter 2), will make this easier. This is only feasible for ABS sleeper strip pointwork built in situ where the short length of brass sleeper can be glued down immediately. Templot is the only source of templates showing equalised timbers.

Creep can also create problems with electrical gaps where the rail movement may close the gaps creating short circuits or energising locos that are supposed to be isolated. It can be caused on models by temperature variations or by vigorous track cleaning. Usually painting the track will anchor the rails firmly enough to prevent this, but on layouts subject to extreme temperature variations more complex measures may be necessary. Cast brass sleepers or a soldered PCB sleeper either side of a critical gap will probably be adequate for this. Any short lengths of rail which could cause electrical problems should be fixed with cyano.

Maintaining the gauge around slide chairs on the prototype is achieved by bolting the rails to the chairs. See fig 1 in chapter 5. The simplest solution to this is again to use glue. After a turnout has been built put cyano around the outside of each switch chair that has had its inner jaw removed.

A much stronger solution is as follows:

- Fix the stock rail in position without those slide chairs that will need their inner jaws removing (7 for an A switch, 8 for B).
- Detach the slide chairs from their sprue, cut away the inside jaw of each chair with a scalpel and smooth any remaining roughness.
- Place a spot of epoxy adhesive on the inside of each chair jaw and slide it under the rail. If necessary place a weight on the rail to ensure that it sits firmly on the slide chairs.
- When the epoxy is cured stick the slide chairs to the timbers with solvent as usual with a triangular track gauge in position to ensure the correct gauge is maintained.

This produces a much stronger result than using cyano. However, handling these small flat bits of plastic with blobs of glue on them is definitely not a calming activity.

For turnouts built with ABS sleeper strip the use of a few PCB timbers as recommended in the section below is by far the easiest and most effective solution to both the creep and the slide chair problems.

## Tools

All the method descriptions include a list of materials needed together with any special tools. This is a list of the tools that are generally necessary for all trackwork:

Craft Knife

Soldering iron, solder and flux

Side cutters

Three square or knife needle file No 4 cut

Hand (flat) needle file No 4cut

240 and 400 grit wet and dry blocks

Glass fibre scratch brush

Tweezers

Pliers with thinned down points see 2MM Magazine April 2010

2 Track roller gauges 1-250

2 Triangular track gauges 1-252

2 Crossing nose gauges 1-253

A small mirror for sighting along track before it is finally fixed to see that it is straight or has a smooth curve with no kinks.

Small clips - Miniature Bulldog clips are referred to in the text and shown in several of the photographs but these are no longer available. You can use cut down hairdressers' clips, as a substitute. See fig 2. They are available from Boots and similar shops.

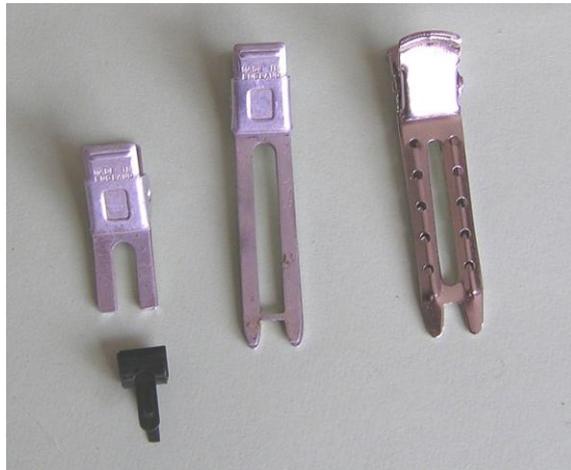


Fig 2 Aluminium hair clip cut down as a substitute for the withdrawn miniature bulldog clip shown below it. Unmodified version to the right together with a steel version which seems to have replaced the aluminium one. These clips are very adaptable and cheap and can be easily bent and shaped for all sorts of tasks, eg fig 12 below.

### **Easitrac Pointwork**

There are two options for building pointwork using Easitrac components: assemble on a milled track base or build up from ABS sleeper strips.

The milled track bases provide a set of ABS turnout timbers correctly spaced and tied together by a thin base. They are available for a limited range of standard straight turnouts. The ready laid timbers and the rigidity provided by the thin base are their principal advantages. A little additional work is necessary on the base to provide access for electrical connections and it is not possible to build directly over a template.

ABS sleeper strip allows you to build any form of pointwork including curved turnouts and all types of complex configurations. Cutting the sleeper strips is much simpler and quicker than with PCB sleepers as it can be done on the template with a craft knife taking no more than a few minutes for a typical turnout. Pointwork built solely with plastic timbers and Easitrac chairs is very delicate. The method described here includes several PCB timbers to add strength at critical positions. Built this way the result is perfectly strong enough to withstand the limited handling involved in transfer to the baseboard. If you prefer to build in situ on the baseboard you can omit the PCB timbers although we do recommend at least one near the toe which will help to prevent any tendency for the stock rails in that critical area to move under gauge. This is a possibility when the inner parts of the chairs have been removed.

## Threading chairs

The chairs for turnouts are supplied in sprues of 11 chairs: 2 slide, 8 common and 1 check rail. When cut from the sprue the individual chairs are very difficult to handle and the recommended approach is to thread the rail through the chairs while they are still on the sprue and then cut them off with a pair of fine pointed scissors or a sharp scalpel, fig 3. To do this you must ensure that the end of the rail is smooth and slightly tapered. See fig 4. Failure to do this will lead to many split chairs and a lot of frustration.

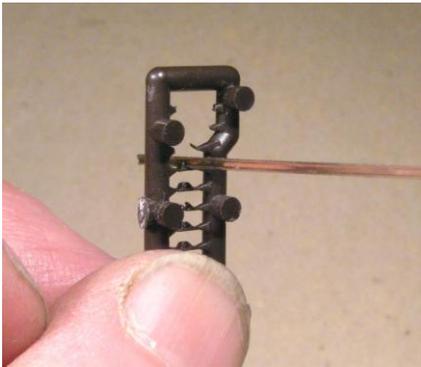


Fig 3 Threading chairs



Fig 4 Rail end prepared for threading

The chairs can be fixed to the timbers using any of the normal plastic solvents such as Mek Pak or Butanone. The usual method of application by brush works well but some modellers find that the Pin Flow hypodermic syringe is more effective.

## Easitrac Turnouts with a Milled Turnout Base

### Materials

Easitrac milled turnout base 1-184 to 193  
Printed Template provided with the turnout base  
BH Rail  
Easitrac Sprues of chairs 12 pack 1-181  
Switches and crossing to suit. See chapter 5  
Styrene Solvent (Butanone, MEK etc)  
Pritt or water soluble adhesive

Some of the photographs in this section are of a left hand sleeper strip curved turnout under construction. In most cases the procedures for the two types are the same so we have used the clearest pictures.

1. Fix the turnout template supplied with the turnout base to a work board; any smooth flat surface will work fine. You should fix the template with double sided tape at each end beyond the working area to ensure that the base remains absolutely flat. Sundeala, if you have it, is ideal as you can stick pins into it and use a stapler to fix it. Do not cut away the blank area where the milled base was attached to the template in the packet.

2. You will need to cut slots in the milled base for making electrical connections to the switch rails. (The bases all have a slot milled in them but they are generally in the wrong place for making connections.) On the prototype there are normally three timbers between the crossing nose and the rail joints between crossing and switches. In fig 5 the narrow slot is one that was already in the base and is at the point where the rail joint should be. The wider slot to the right is where the builder intends to make the connections allowing two timbers beyond the joint. This allows for possible weakening of the nearest plastic chair by soldering nearby. The further slots in each side will allow the builder to provide a single wire link between each switch and its stock rail. All these connections can be made after the rails have been fixed and adjusted. There are also two holes in the base at the toe of the switches. These are for the wire droppers for the TOU. You will probably find it easier to install the TOU if you extend these to the edge of the base.

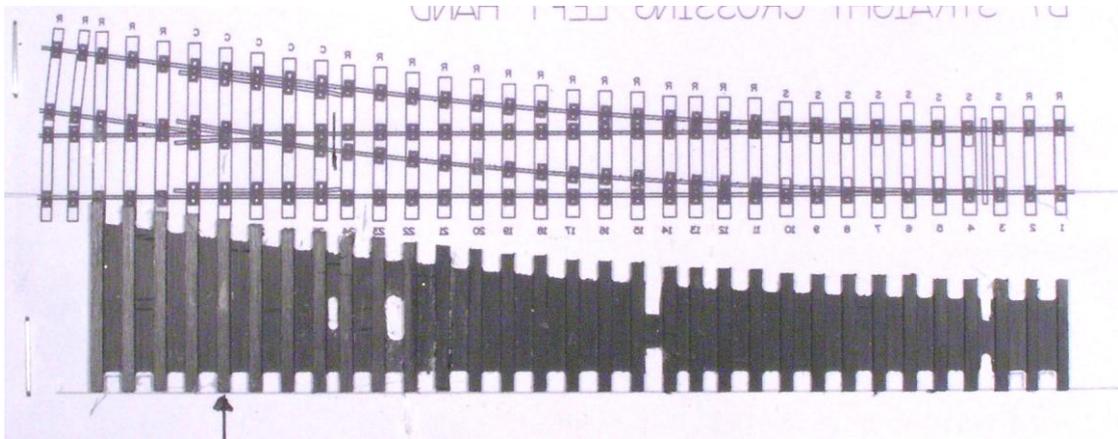


Fig 5. Turnout base with additional holes for electrical connections. The two slots at the toe are for the TOU wires. These are the holes that were provided extended to the edge..

3. Stick the modified turnout base to the template sheet with the timber ends on the straight edge parallel with those on the template and all the timbers aligned. Use Pritt or some similar water soluble adhesive. See fig 5. Ensure that the milled base is strictly parallel with the template using a pair of dividers on the ends of the timbers at each end of the template see fig 6. Keep these dividers set so that you can position the rails as you proceed in much the same way as if you had been working over the template.

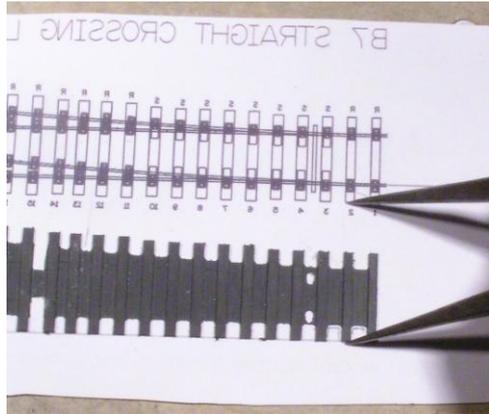


Fig 6 Using dividers to ensure that the base is parallel with the template.

4. Joggle the straight stock rail. See chapter 5.

5. Thread the chairs onto the straight stock rail. The template should show where the slide chairs come. There should be 9 for an A switch, 10 for a B and 12 for a C. If you are planning to use Epoxy for the slide chairs as described in the section on Easitrac issues above they should be left off at this stage.

6. You can now fix the straight rail in position. You can hold the rail with short lengths of Easitrac plain track sleeper at each end. Make sure that the joggle is just short of the first slide chair where the tip of the switch rail will be. You can fix the position of the rail using the dividers against the template. You may also find it helpful to lay a ruler against the rail to ensure that it is truly straight. Start at each end then in the centre, checking as you go that it is straight. Then fix all the rest. You will need to press down on the rail as you go to ensure that all the chairs are fully in contact with the base.

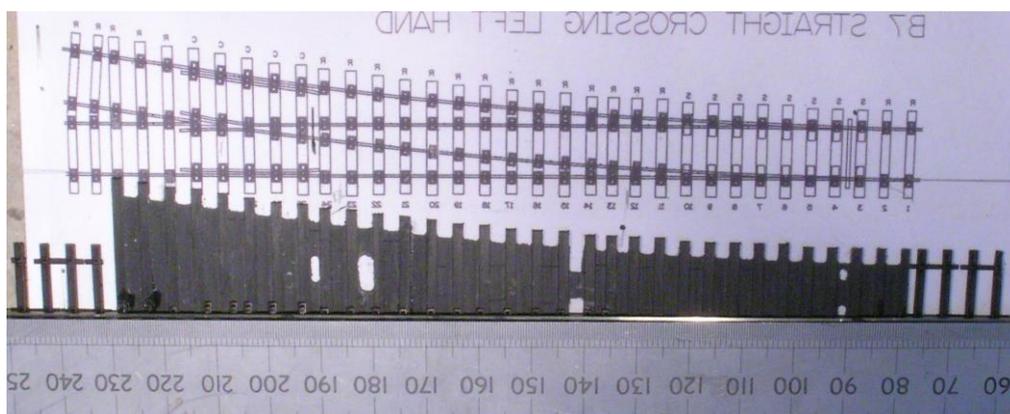


Fig 7 Setting the straight stock rail with a ruler and short lengths of plain Easitrac at each end to hold it in position.

7. You can now fix the crossing see chapter 5 for making the crossing. The crossing nose should be fully supported by the appropriate timber shown on the template and its tip level with the far edge. The crossing should have 0.25mm chairplates under the nose and for two timbers under the wing rails and one under the vee, four in total. The wing rails should extend for at least three timbers beyond the nose towards the toe of the turnout.

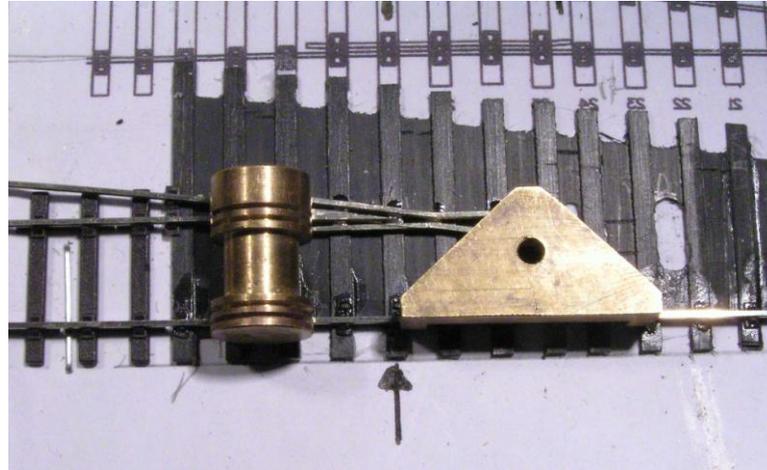


Fig 8 Setting the crossing with the tip of the nose on the edge of the timber with the arrow and the gauges holding it in the correct position.

8. Slide on the chairs for the crossing rails. Some of these close to the crossover point will need to be cut at the sides to fit opposite each other. As some of the rails are very short you will probably need to cut the chairs off the sprue and slide the rail in on the bench. Not the ideal way of handling these little things, but necessary here.

9. Use 1 hour epoxy on the crosspieces of the crossing to stick it down on the timbers. Get it in the correct place over the template. Use a roller gauge and a three point gauge to position the crossing and get it exactly to gauge with the stock rail. See fig 8. Leave it to cure with a weight on it.

10. Prepare the switches, see chapter 5, and gently curve the one that will close against the straight stock rail so that it matches the template and is the correct length with its tip just short of the joggle. It should fit snugly there so that there is no shock to a wheel approaching in the facing direction. At the crossing end it should not touch the wing rail as it must be electrically isolated from it.

11. Before you can fix the switch rail you will need to remove the inside jaws of the plastic chairs from the slide chairs. A sharp craft knife will do the job with a vertical cut against the rail and a horizontal one to cut it free. There will probably still be a tiny bit left. There is also usually a mould parting line on the slide part of the chair that is best removed. To do this you need a special wet and dry file, fig 9. It is simply a piece of 1.5mm styrene sheet with rounded ends and narrow strips of wet and dry stuck to the top and bottom edges with a piece on one side as well. 400 grade at one end and 240 at the other.



Fig 9 Wet and dry file for clearing slide chairs

12. You can now fix the switch in position using the pre-set dividers to ensure that it follows the line of the template and that there is a smooth transition from the crossing rail to the switch. You may find it helps to use a miniature bulldog clip at the tip of the switch as you make the first fixings, fig 10. Start at the crossing end making sure that the transition from the crossing to the switch rail is smooth. Make sure that the end of the switch rail does not touch the crossing rail. The chairs nearest to the toe will probably need trimming slightly as there will not be enough room for two full chairs as the rails come closer together. On the prototype the chairs here would be on smaller square bases.

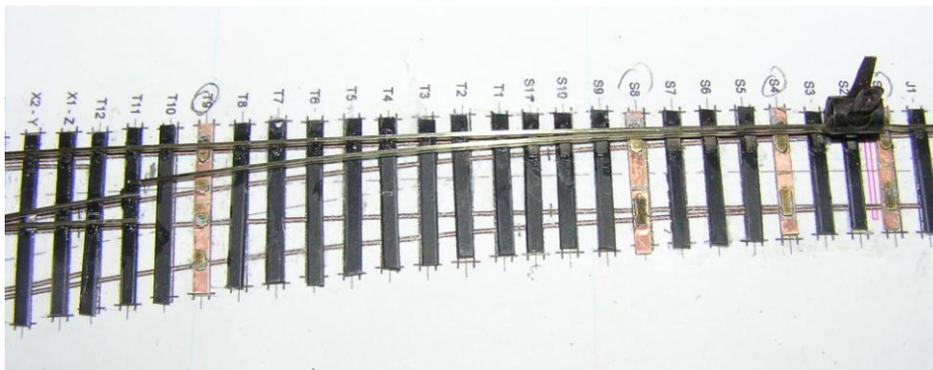


Fig 10 The curved switch rail held in position by the bulldog clip first to determine the correct length and then for fixing the chairs.

13. Prepare the curved stock rail the same way as the straight one. At the joggle put a set (bend) in the rail so that it matches the taper on the switch rail. See fig 11. This means that the switch rail will be in a straight line with the stock rail when it is closed. Curve the rail to match the template before chairing it.

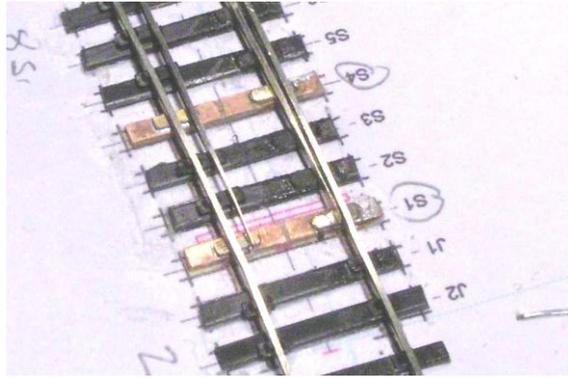


Fig 11 The switch toes showing how the curved stock rail has a set in it to accommodate the switch. The joggle on the curved rail doesn't show in this shot but it is clearly visible in the straight stock rail.

14. To fix the stock rail you must gauge it from the rails that you have already laid. Figs 12 and 13 show how. You must be very careful when gauging from the switch rail not to press on the unchaired part. When it is fixed do as you did with the straight stock rail and remove the inner jaws of the slide chairs.

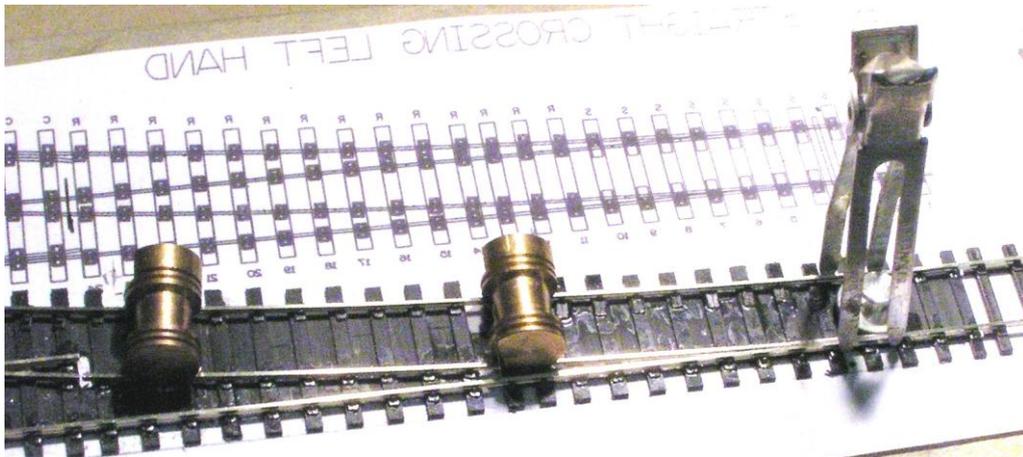


Fig 12 Gauging the curved stock rail from the curved switch rail and, at the toe, the switch firmly set against the stock rail by the aluminium hair clip and button gauge.

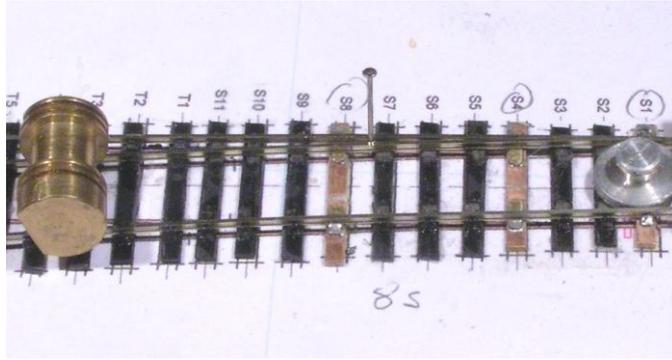


Fig 13 Preparing to gauge the centre of the curved stock rail. The pin, which is pressed carefully into the underlying Sundeala will prevent the button gauge moving the switch rail when it is placed there. This is an ABS sleeper strip example but for a milled base you can use a slip of wood or styrene carefully placed in the gap between the switch and the stock rail to prevent the switch moving.

15. The straight switch rail can now be fitted. It can be located by two triangular gauges or by roller gauges. A bulldog clip helps to ensure that it stays correctly placed with respect to the joggle.

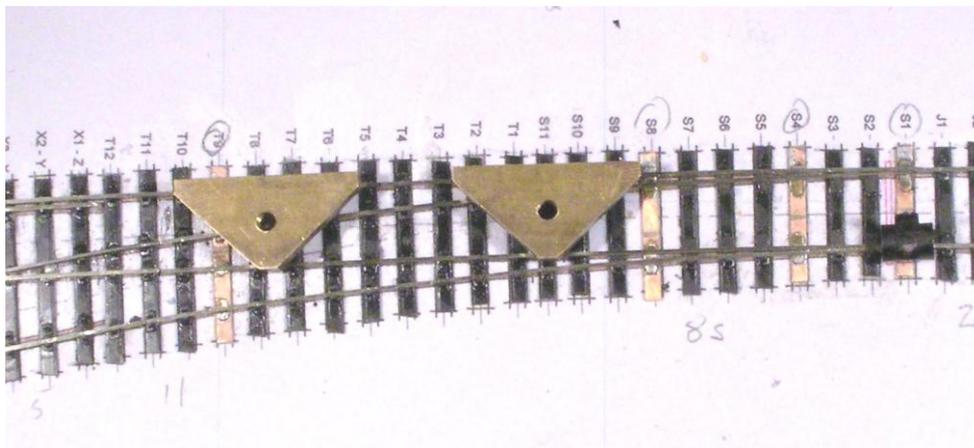


Fig 14 Gauging the straight switch from the stock rail. The rail is held in position by the bulldog clip at the toe.

16. Before you fit the check rails test the turnout by gently rolling a wagon backwards and forwards by tipping the building board. This will detect any rough or out of gauge spots that you have not found as you were working. It is best to do this by tipping rather than pushing which can cause the wagon to run skew and hit the crossing nose as there is no check rail yet.

17. Finally you can fit the check rails. Put the flare, which should be very small, on one end, thread the rail through the check rail chairs and then put the flare on the other end using pliers with a very thin nose. See chapter 6. The flare should be just enough to guide a wheel in. On the prototype it is about half the width of the rail but our standards are somewhat over scale so something about the width of the rail, 0.5mm, is needed.

If you find that you have got something wrong – it happens to all of us – you can break the solvent joints between chairs and timbers with a sharp scalpel. The very narrow no 11 blade is ideal. Try to get the slide chairs right the first time as they don't take too kindly to this treatment and you may need to replace them. Luckily you have to remove the inner jaws of the chairs so replacement is not too difficult.

## Electrical Connections

We recommend that every piece of rail should have two electrical connections. This belt and braces approach may seem excessive; however, making new connections after the track is laid and ballasted can be difficult and will often leave an unsightly join. It is disastrous if you have to do it during an exhibition.

The method is to solder wire droppers to the bottom of the rail. To prevent heat damage to the adjacent chairs you should use a heatsink. Figs 15 and 16 show two versions of a very simple design consisting of two 10BA screws in a metal bar. The screw slots are aligned so that the rail fits into them. The screws are 6.7mm apart. The version in fig 15 is for track built on the bench before installation. The metal finger is useful as it holds the track in position leaving you with both hands free. It is held by a woodscrew with a simple spring. It could equally well be made of wood. The version in fig 16 is for use when the track is installed or being built in situ. There is a gap for access for the soldering iron, but you have to use a finger or a weight to hold the heatsink in position.



Fig 15 Heatsink for soldering wire connections to the bottom of the rail.

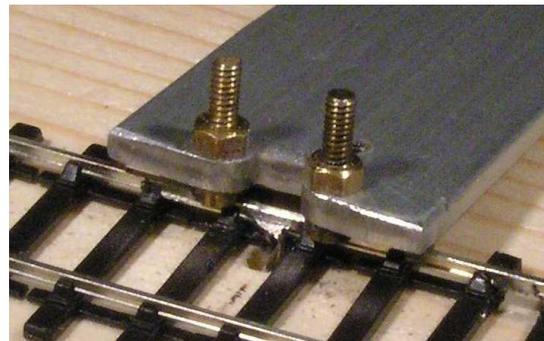


Fig 16 Heatsink for soldering connections to rail in situ

Some modellers use the brass cast sleepers for making the electrical connections. If you do this the joint must be soldered and the wire soldered to the link at the bottom of the sleeper. This works well for plain track but is less easy to apply in pointwork as some of the rails are not at right angles to the sleepers. If you don't solder the rail to the chair the dry joint will be unreliable as an electrical connection.

## **Easitrac Turnouts with ABS Sleeper Strip**

### Materials

Printed Template 1-310/314 or C&L or Templot

BH Rail

Easitrac ABS Sleepers 1-180

Easitrac Sprue of chairs 12 pack 1-181

PCB Turnout Sleeper strip 1-125

Versaline Turnout chairplate etch. Any type 1-132/135 enough chairplates on a single etch for several turnouts

Switches and crossing to suit see chapter 5

Styrene Solvent (Butanone, MEK etc)

Modelling filler/putty. (Molak Stucco, MMD etc)

Pritt or water soluble adhesive

Several of the figure references in this section are to figures in the milled track base section. In many cases the procedures for the two types are the same and we have used the clearest pictures in those cases.

1. Fix the template to a work board, any smooth flat surface will work fine. You should fix the template with double sided tape at each end beyond the working area to ensure that it remains absolutely flat. Sundeala or soft balsa wood, if you have it, is ideal as you can stick pins into it and use a stapler to fix the template.
2. Cut the timbers to length using a craft knife. Work from both ends at the same time, towards the middle. Cut a long timber first then the piece left can be cut for the other end with very little wastage. Leave gaps for the PCB timbers. These should be at the 1<sup>st</sup>, 4<sup>th</sup> and 8<sup>th</sup> slide chairs and another close to the crossing end of the switch rails. See fig 10.
3. Prepare the PCB timbers. Cut them to length with a pair of side cutters, cut insulation gaps in the copper in the centre with a three square or knife file and fill the gaps with modelling filler/putty. If you are not using chairplates, see 5 below, fix strips of 0.25mm styrene to the bottoms of the PCB timbers which will bring them up to rail level.
4. Stick the timbers to the template using Pritt or some other water soluble adhesive.

5. Solder chairplates onto the PCB timbers using the template as a guide. The chairplates come from any Versaline turnout chairplate etch. One of these will provide enough chairplates for several turnouts. Use long ones for the slides and the short ones for the long timber near the crossing. Cut a spine of chairplates from the frame and tin the bottoms of the ones you want while they are on the etch spine. Then use the spine to hold the chairplates as you solder them onto the PCB timbers and only cut them free with a round bladed knife when they are soldered. When they are all fixed run a file over their tops to remove any solder that might have stuck from the iron, fig 17

This step is recommended for appearance but is not essential. If you raise the level of the PCB timbers as described in 3 above you can solder the rail directly to them.

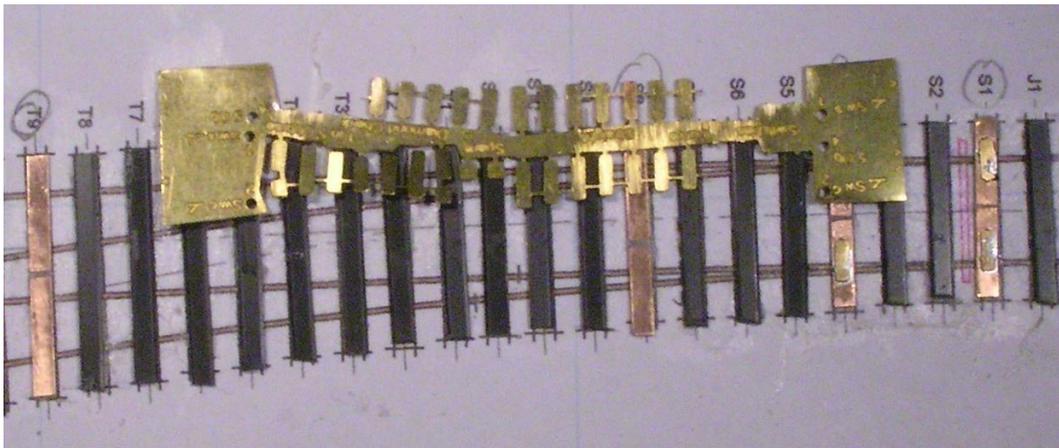


Fig 17 Soldering a Versaline chairplate onto a PCB timber. This example was from a pre-production etch. The production versions are nickel silver.

6. Joggle the straight stock rail. See chapter 5. If the turnout is curved, as in this example, gently put the curve into the rail at this stage.

7. Thread the chairs onto the straight stock rail leaving gaps for the PCB timbers. The template should show where the slide chairs come. There should be 9 for an A switch, 10 for a B and 12 for a C.

8. You can now fix the straight rail in position. You can hold the rail with short lengths of Easitrac plain track sleeper at each end or use double pins as shown in fig 18. Make sure that the joggle is just short of the first slide chair where the tip of the switch rail will be.



15. You can now fix the switch in position making sure that it follows the line of the template and that there is a smooth transition from the crossing rail to the switch. You may find it helps to use a miniature bulldog clip at the tip of the switch as you make the first fixings, fig 10. Once you have the rail in position solder to the PCB timber and then make the plastic joints. Make sure that the end of the switch rail does not touch the crossing rail. The chairs nearest to the toe will probably need trimming slightly as there will not be enough room for two full chairs as the rails come closer together. On the prototype the chairs here would be on smaller square bases.

16. Prepare the curved stock rail the same way as the straight one. At the joggle put a set (bend) in the rail so that it matches the taper on the switch rail, fig 11. This means that the switch rail will be in a straight line with the stock rail when it is closed. Curve the rail to match the template before chairing it.

17. To fix the stock rail you must gauge it from the rails that you have already laid. Figs 12 and 13 show how. You must be very careful when gauging from the switch rail not to press on the unchaired part. When it is fixed do as you did with the straight stock rail and remove the inner jaws of the chairs.

18. The straight switch rail can now be fitted. It can be located by two triangular gauges or by roller gauges, fig 14. A bulldog clip helps to ensure that it stays correctly placed with respect to the joggle.

19. Before you fit the check rails test the turnout by gently rolling a wagon backwards and forwards by tipping the building board. This will detect any rough or out of gauge spots that you have not found as you were working. It is best to do this by tipping rather than pushing which can cause the wagon to run skew and hit the crossing nose as there is no check rail yet.

20. Finally you can fit the check rails. Put the flare, which should be very small, on one end, thread the rail through the check rail chairs and then put the flare on the other end using pliers with a very thin nose. See chapter 6. The flare should be just enough to guide in a wheel. On the prototype it is about half the width of the rail but our standards are somewhat over scale so something about the width of the rail, 0.5mm, is needed.

21. Soak the whole assembly in water, leave for a few minutes, and you will be able to easily remove the turnout from the template.