



Moving to **P4**

If the overall accuracy of the layout is important to you, then P4 is worth considering.



Getting Started . . .

Why would anyone want to move to P4? Active modellers in 4mm scale who currently use OO or EM standards may feel some questions need answers.

A group of active modellers in P4 has produced this guide with the aim of providing an introduction to the world of P4 and some guidance as to how to begin modelling to P4

Our approach in writing this guide is to give straightforward practical information on what is involved in modelling in P4, to debunk, we hope, some of the myths, and to give realistic advice on some difficulties you might encounter and on the constraints which exist.

What is P4?

P4 is a set of wheel and track standards to 4mm scale that replicates the prototype as closely as possible, within the limits of manufacturing tolerances. Similar standards have been established and are in use in other scales, for example P87 for 3.5mm (HO) and Scaleseven in 7mm.

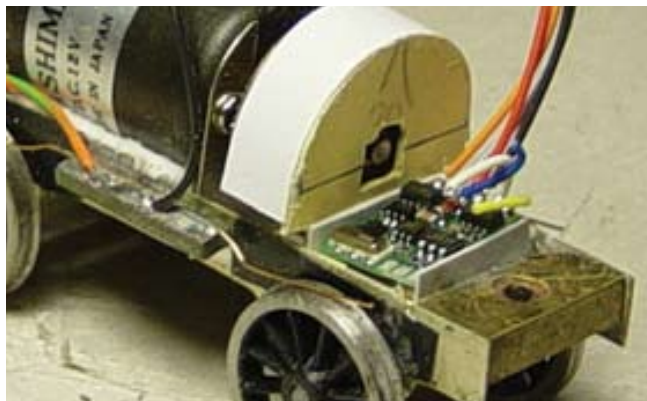
As with other wheel and track standards, there is no need to measure dimensions to a fraction of a millimetre. Key dimensions are set by gauges which are readily available for the UK Standard Gauge. Other track gauges are also catered for, some by specialist societies, including the Irish Broad Gauge and even Brunel's 7'-0^{1/4}" gauge!

Wheel profiles and the critical back-to-back dimension are taken care of by those specialist manufacturers working to the defined P4 standards, although, as with any pre-assembled wheelsets, it is good practice to check the back-to-back dimension with an appropriate gauge before installing them in your vehicle.

What are the advantages of P4?

The use of P4 standards makes it possible for locomotives and rolling stock to be built with few compromises and potentially to look right from all angles. By using scale width wheels, you can use the correct track gauge for your chosen prototype while maintaining the correct proportions of the superstructure.

Apart from the visual improvement achieved by the use of scale flanges, the finer wheel profile used in P4 enables point and crossing work to be built with close to scale flangeways which provides - as on the prototype - near continuous support to the wheelsets through the crossing. This results in trackwork which is not only an accurate model in its own right, but can give improved, and more reliable, running through these track formations.



The width between the frames of this P4 tender enables a Lenz Gold Mini decoder to be installed transversely with ease.

Can I buy ready-to-lay track in P4?

Plain track can be obtained in ready-to-lay form, or as pre-formed track bases which only require the rail to be threaded in place. Point and crossing work will, however, have to be hand-built, although recent developments in P4 modelling have effectively reduced the work involved to the equivalent of assembling a plastic kit. Later in this supplement, the section on trackwork gives more information on this aspect of layout construction.

Is compensation essential in P4?

It is a myth that all rolling stock in P4 must have compensated or sprung suspension. A rigid chassis will work in P4, if your track is laid accurately and your baseboards are rigid and stable. What compensation, or springing, will do is reduce the effect of inaccuracies in the construction of rolling stock and track, and it will ensure that all the wheels being utilised for current collection remain in contact with the track at all times. Intermittent contact is often the cause of poor running and the source of dirt on the rail head. In the sections covering rolling stock we give some idea of what is involved in the use of compensated and sprung suspension systems and how you can adopt a 'keep it simple' approach when you begin.

Do I need a large space for a P4 Layout?

Unless you are in the fortunate position of having enough space to accommodate main lines with sweeping curves, then any 4mm scale layout will involve compromise to a greater or lesser degree. The constraints set by needing slightly larger curves or longer turnouts for P4 may affect what you can achieve in a given space, but these requirements themselves make for a more realistic appearance.

But, if the overall accuracy of the layout is important to you, then moving to P4 is well worth considering.



Mike Sharman builds his exquisite locomotives to P4 standards, citing as crucial the additional space obtainable with P4 between the driving wheels. **Both Jim Summers**

Cover photos:

TOP: Moving out of David Lane's Saffron Street. **David Lane.**

BOTTOM: Bridgework covers a baseboard joint on Knutsford East by the Crewe Area of the Scalefour Society. **Jim Summers**

Getting Started . . .

Why Should I Model in P4?

Our purpose in this guide is not to attempt to persuade anyone to change who, for whatever reasons, is not interested in moving to P4. Rather, our intention is to highlight the factors to consider, should you make the move, and to suggest how best to get started.

It is perhaps important to recognise that, over a modelling lifetime, we develop our techniques and become more knowledgeable about the prototype. We also become more experienced about what will work as a model.

What we know about and what we are good at will depend on what has captured our interest, on our modelling experience and on what we have been brave enough to try.

A lot has changed over the years, and there have been significant advances in both ready-to-run stock and in what is available to the P4 modeller.

Although there are unlikely to be any aspects of modelling in P4 which could really cause you problems, it will be a big step change.

A good starting point is to begin with a small P4 layout – if you adopt a “keep it simple” approach, you should find it easily achievable, and, who knows, you may want to develop it further and build a larger layout to these standards.

The 18.83 Layout Challenge and the more recent Diesel and Electric Layout Challenge, organised by the Scalefour Society, showed how a variety of layouts can be modelled to P4 standards in a modest space. You may have seen some of these featured in British modelling magazines. If you decide to go down the finescale path and already do a fair amount of construction work yourself, then modelling in P4 is now no more difficult than finescale OO or EM; and converted ready-to-run rolling stock is likely to meet your requirements in a way that would have been inconceivable only a few years ago.

We hope that what follows will help give you a better understanding of what is involved in “Moving to P4” and that, even if you do not decide to adopt P4 standards, you will find something of interest in this guide.



Popular P4 layouts range from the contemporary scene to steam age nostalgia. The photos show:

TOP: Not exactly contemporary, for diesels have been around a long time now. Evocative modelling of the post-steam era in central Scotland: *Longcarse West* by David Furnage
Jim Summers

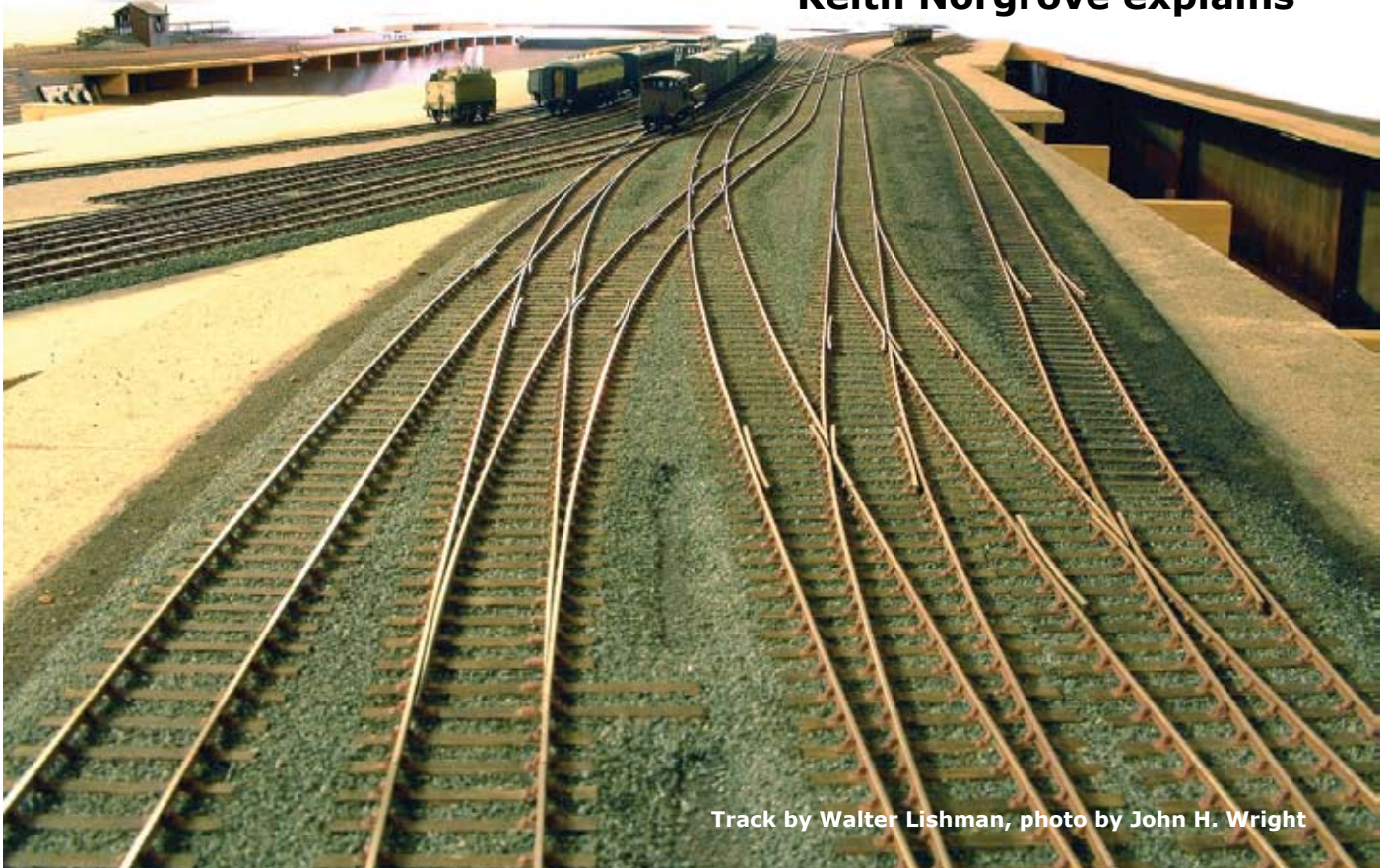
CENTRE: Ian Everett's exercise in atmosphere, *Clecklewyke*.
Tony Wright

BOTTOM: Historical accuracy of the old M&SWJR at *Chiseldon* by Dave Barrett.
Jim Summers

Getting Started . . . Track

Having chosen to use P4 wheel standards, what about the track? itself?

Keith Norgrove explains



Track by Walter Lishman, photo by John H. Wright

Plain Track

For the construction of plain track, bases are available for the UK standard track gauge, in the form of a single plastic moulding containing several sleepers joined by runners to give the correct standard sleeper spacing. These are complete with integrally moulded track fixings and simply require the sliding-in of two lengths of rail to give effectively a length of flexible track. Some makes can also be bought ready-assembled.

Apart from the limitation of chair type, there are other compromises associated with the production of a one piece plastic moulding for the sleeper and rail fixings – particularly in the representation of the wooden keys used with cast iron rail chairs. This can be overcome by the use of individual components for the sleepers and chairs.



Tony Wright



Tony Wright

For track with bullhead rails - the traditional track used in the UK until the 1960s - these track bases represent timber sleepers fitted with cast iron S1 type rail chairs suitable for the 1930s onwards. The more recent track with flat bottom rails can be modelled with the alternative concrete sleeper bases moulded with Pandrol track clips. For the transition period, eg cast iron chairs on pre-cast concrete sleepers, or flat bottom rails on timber sleepers the individual track components described later will have to be used.

The chair mouldings hold the rail in a prototypical manner, the only soldering being the attachment of dropper wires to the rail for power supply purposes. The appropriate number of chairs is threaded on a length of rail and then fixed in place by gluing the chairs to plastic or plywood sleepers. To fix the second rail in place, a track gauge is used, thus ensuring that the rails are spaced the correct distance apart.

Plastic sleepers are available with raised pips on the sleeper moulding which fit into circular recesses in the base of the chairs. These pips are spaced to suit the UK standard track gauge. The use of these locating pips makes assembly easier and should theoretically allow the track to be built without recourse to a track gauge, but the use of an appropriate track gauge is still recommended.

The use of individual chair mouldings allows for much greater variety, and mouldings are currently available for three-bolt S1,



two-bolt GWR, four-bolt MK/LMS and three-bolt LSWR chairs as well as 4 bolt L1 bridge chairs. Individual Pandrol and ST type rail fixings for flat bottom rail are also available.

These individual chairs and fixings can be combined with the different timber or concrete sleeper mouldings to represent a



wide range of track types. The chairs can also be glued directly to plywood sleepers using a suitable solvent, but the use of a track gauge is essential if this form of track construction is adopted. Some modellers prefer the appearance and individuality of wooden sleepers which can be coloured and weathered using a variety of stains or paints.

Plywood sleepers are also used in the 'Brook Smith' track system, which was the earliest form of P4 track construction. With this method, the sleepers are pre-punched for special rivets which are set into the plywood and hold the rail at the correct height above the top of the sleeper. For straight bullhead track, the rail is then soldered to the top of the rivet using a track gauge and straight edge.

A gauge is then be used to set the second rail at the correct spacing. This results in a very rigid form of track construction. For curved track it is normal to solder only one rail to the rivets before the track is curved to suit the intended track plan. This rail should be located on the inside of the curve, and when the second rail is then being set in place a triangular track gauge should be used to introduce a degree of gauge-widening on the curve, in conformance with the prototype.



After the track has been laid, ballasted and tested, cosmetic chairs can be added to complete the scale appearance. Early cosmetic chairs were cast in white metal, and some specialist chairs are still available in that form, but practice today is to use the plastic chairs described above, cut in half and glued on each side of the rail. Although somewhat tedious, if a number of sleepers are detailed every evening the process will be accomplished relatively quickly without becoming too boring!

If you are using the 'Brook Smith' system for flat bottom track construction, then etched baseplates are sandwiched between the rail and track rivet when soldering the rail in place, but using the rivets upside down. When laid using this technique, the rivet heads hold the sleepers above the underlay, and hence a slightly greater depth of ballast is needed.

For those favouring track construction using printed circuit board, fold-up etched chairs are now available, which are designed to be soldered directly to the copper coating on the sleepers. Whilst not being as three dimensional as the moulded chair components, these can be remarkably effective from normal viewing distances.

Someone starting in track construction will find the pre-formed track bases easiest to use, but those with more experience, or of a more adventurous nature, might wish to obtain components covering a selection of these construction methods in order to try them out to see what best suits their skills and interest.

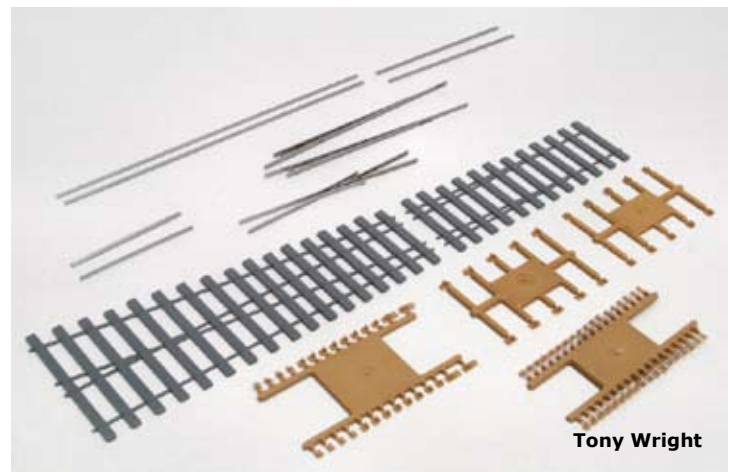
Points and Crossings

Although a P4 layout could easily be built using plain track only, especially with preformed track bases, it would have little operating potential, and thoughts must inevitably turn to points and crossings. On the prototype, points are not referred to by their radius but by an alpha-numeric code (eg: A7, B6 etc.), in which the letter defines the length of the switches (point blades) and the number defines the crossing angle.

It is the combination of these components which determines the effective radius of the point. These codes are also employed on the different templates (drawings) used in modelling P4 pointwork, and are described later.

Unlike in OO gauge, points are not available as ready-to-lay in P4, and the economics of production means that this situation is unlikely to change in the foreseeable future. All is not doom and gloom, however, as point kits have recently been introduced for bullhead track in which all the rail components are cut accurately to length (and pre-shaped where necessary) with the blades/stock rails and vee/wing rails supplied as pre-assembled units.

Plastic sleeper bases are provided together with plastic mouldings covering all the different chair castings used on the prototype. It is only necessary to thread the chairs on to the rail in the locations shown in the instructions and to glue these to the base moulding to construct the point. No metalworking skill is required, other than the ability to solder dropper wires just as is necessary for plain line. Kits for diamond crossings and single/double slips, are now available, and turnouts for flat bottom track are planned.



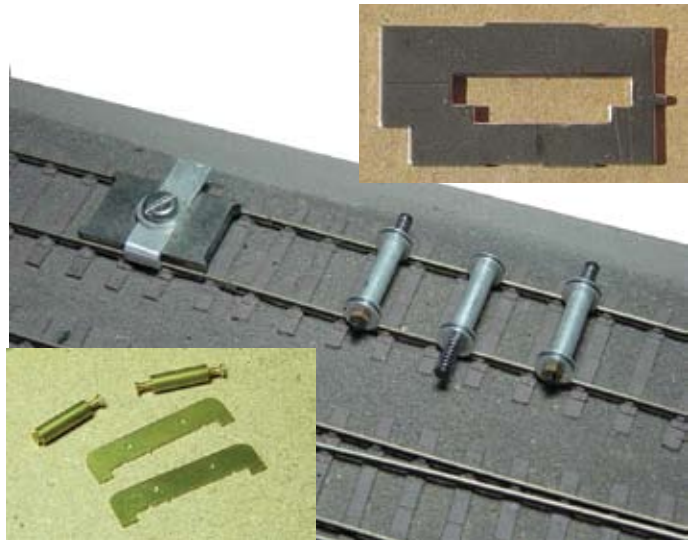
Such convenience does, however, come at a price and modellers who are able to file their own point blades and assemble their own vees can produce points costing little more than the cost of the track components for an equivalent length of double track covering the length of the point.

You can use plastic, printed circuit board or plywood point timbers to match your plain track construction. If you are contemplating building a significant amount of point and crossing work it might be worthwhile buying a set of jigs which simplify filing of the rails for the blades and vees.

Laying the track

Detailed 'how to build it' guides are available from each manufacturer along with all the components. One of the advantages of P4 is that all the components are very close to scale, and thus it is possible to build any formation of points and crossings used on the prototype. Whatever construction system is used, the assembly will be built with the aid of a drawing, usually called a 'template'. This allows the formation to be built on the workbench in good lighting and to be transferred to its final location on the layout once complete. Templates are available for most common track formations from the component suppliers. They can be also be created and printed at home, using a computer program such as 'Templot', which allows you to design your track formation on the computer and then print out templates for each element as required.

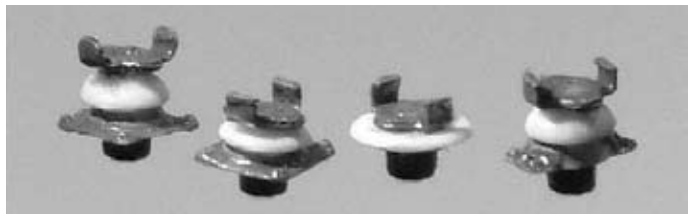
Once built, the track and points need to be laid. Underlay to represent the trackbed is available in convenient ready-cut strips of cork sheet or in closed cell foam. Alternatively the modeller can purchase larger sheets and cut to the size required. The track should be glued to the underlay using a diluted PVA glue or similar; ballast may be added at the same time or can be added later if preferred.



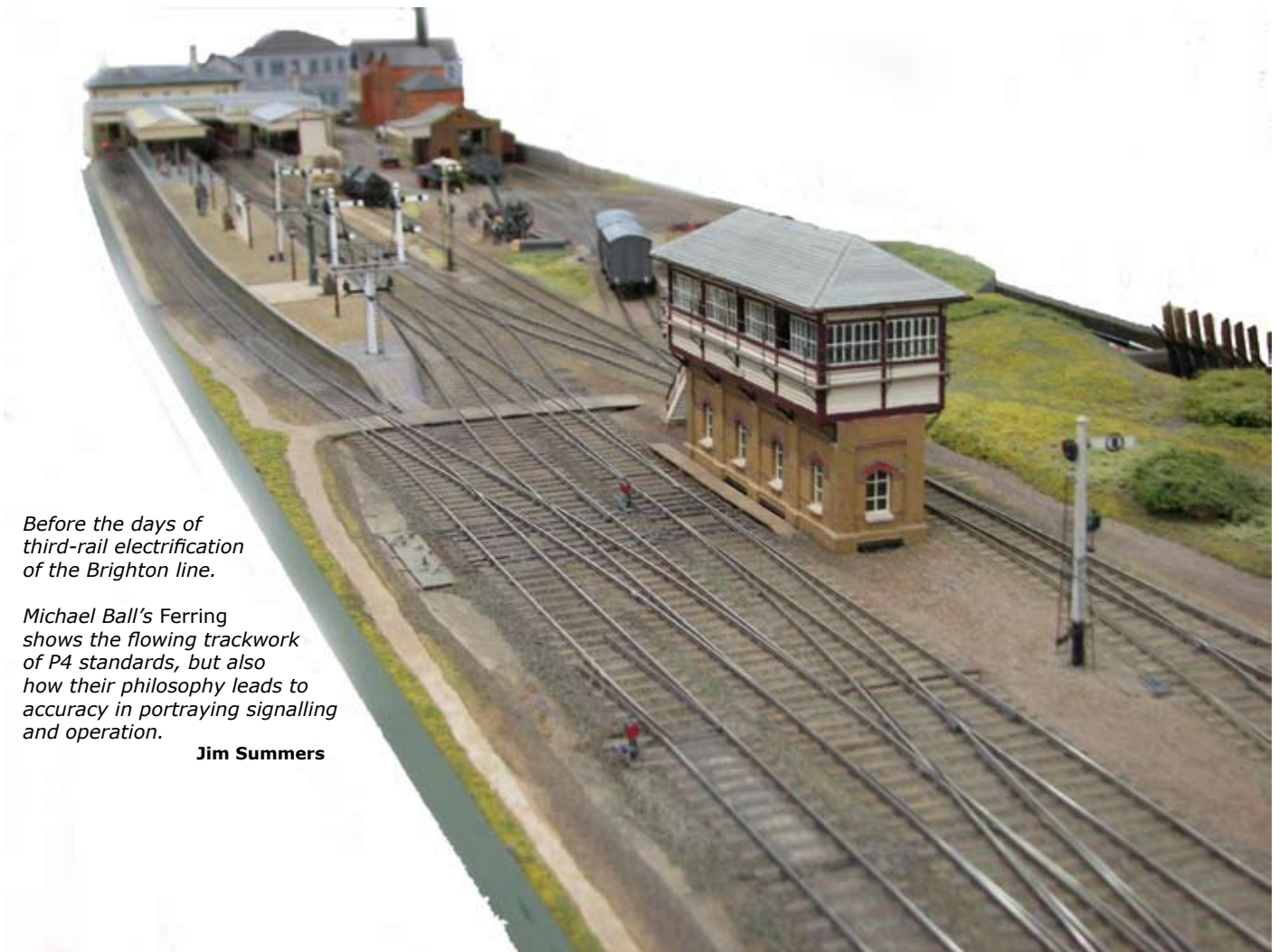
A variety of gauges and aids is available to help you ensure accuracy without needing to worry about the actual measurements. **Jim Summers**

Additional detailing

Having built, laid, ballasted and weathered your track you may wish to consider additional detailing to enhance its realism. Components are available from a number of manufacturers, covering such items as dummy point rodding and operating cranks, signal pulley wheels, facing point locks, third and fourth rail, and so on. The photo on the right shows the two varieties of conductor rail supports for third and fourth rail prototypes.



Components to make up these conductor rail supports for London Underground and ex-BR Southern Region systems are available from the Scalefour Society. **Russ Elliott**



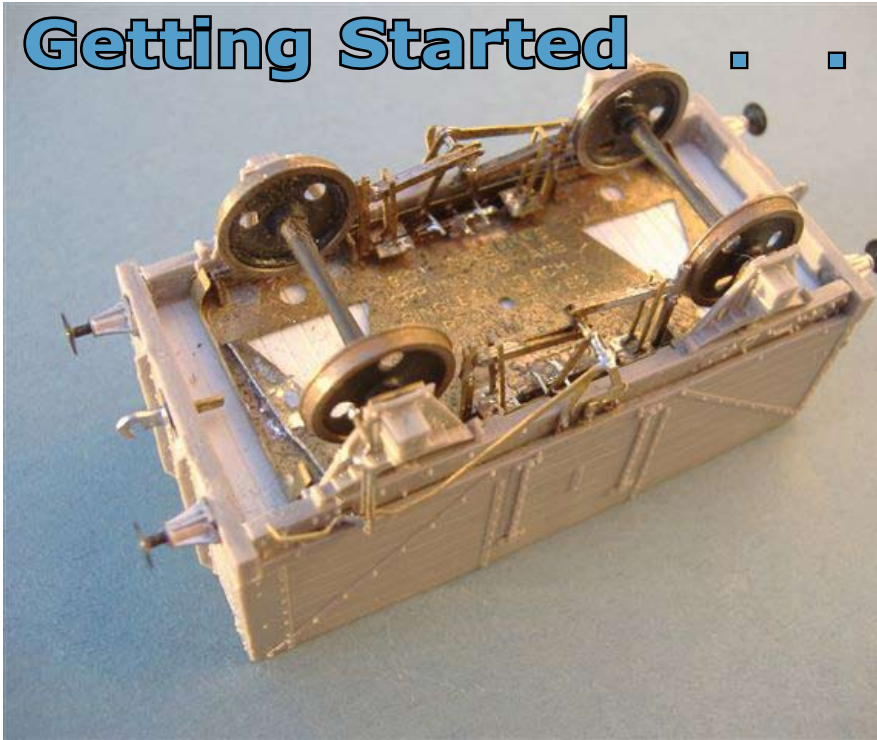
Before the days of third-rail electrification of the Brighton line.

Michael Ball's Ferring shows the flowing trackwork of P4 standards, but also how their philosophy leads to accuracy in portraying signalling and operation.

Jim Summers

Getting Started

Wagons



'Before committing themselves wholly to P4, many modellers often create a trial set-up consisting of a piece of plain track, a turnout and a couple of four-wheeled wagons. Very wise, so this section will deal with the basics on Wagons.

Of course, you may have qualms about butchering a couple of your existing wagons, so I am assuming you begin by building a couple of kits to P4 standards. Then we will look at converting existing wagons. Before you begin, it is worth pointing out, especially to established modellers who may have a substantial amount of rolling stock, that it is *not* necessary to scrap it all and start again',

says Don Rowland

David Lane

Conversion of wagons

Conversion to P4 is perfectly feasible, indeed I've a number of vehicles on my layout which began life as EM, or even - whisper it - OO models. In theory (a catch-all phrase if ever there was one), all one needs to do is change the wheels for ones to P4 gauge and profile but sadly that assumes perfect trackwork. In practice all those minor dips and humps that OO wheels with their deeper flanges tolerated quite happily are as unhelpful in P4 as they are in the real thing, so we too have to allow for them. We do so either by compensation or springing.

Whilst it may not give quite such good results as springing, **compensation** is somewhat easier, and is far more widespread amongst the P4 fraternity although springing is gaining in popularity. On a compensated four-wheeled wagon one axle remains fixed whilst the other pivots at the central point allowing it to rock. On encountering a dip in one rail the weight of the wagon pushes one wheel down thus keeping all wheels in contact with the rail and keeping it on the track. Springing usually applies to all axles and is thus more complicated, not helped by the fact that materials behave differently in model form. We will look at springing in more detail later but first let us consider how you build your two P4 wagons.

Pass the craft knife

You will be aware of the numerous wagon kits available nowadays. In their more recent releases both Parkside Dundas and 51L have made minor changes which make life that bit easier for P4 modellers and my only caveat is that, to begin, with you should choose wagons with solid floors; wagons such as tankers with all their framing steelwork showing are definitely not for the beginner. You will also need two sets of suspension units and two sets (four axles worth) of wheels. Bill Bedford, Alan Gibson and the Scalefour Society all sell the units and, along with Kean Maygib, suitable 3' 1/2" diameter wheels on pin-point axles and bearings to go with them. Exactoscale sell similar items and they also produce wheels with parallel axle ends and the appropriate bearings.

Your kits will almost certainly have axleguards and boxes cast or moulded integrally with the solebars. Remove these carefully along with any ribs on the underside of the floor; assemble your wheels and suspension units according to the manufacturer's instructions; fix them to the underside of the floor; and you have a basic P4 wagon. Add the axleguards, and from then on it's just the same as it was in, say, OO, except that now you will find the brakes line up with the wheels. Before you do that though there are two checks to be made. First, make sure your rocking axle does actually rock; each wheel should move up and down freely at least half a millimetre. Secondly, give your wagon a gentle push along the workbench. If it goes in a nice straight line, fine,

but if it veers off in a gentle arc your axles are not parallel and a bit of remedial action is needed.

Compensation was evolved as the first method of getting good running vehicles in P4 and many suppliers developed their own designs. Some, such as Studiolith, Colin Waite and D&S Models are no longer in production, leaving the field to others like Alan Gibson and the Scalefour Society.



*Above, we have an example of the compensated suspension system as applied to wagon stock. The two units are the ones the Scalefour Society supplies consisting of two sets of fold-up etches, four pin-point bearings plus one set of P4 wagon wheels with pin-point axles. With a second set of wheels there is sufficient for one four-wheeled wagon. The left-most unit, with bearings and spoked wheels in situ, is fixed to the wagon floor. Beside it, showing its component parts, is the rocking unit, pivoted centrally to allow the wheelset to rise and fall slightly to accommodate track variations. **Jim Summers***

In fact **springing** was around before compensation - S&B were producing self-contained sprung axleboxes in 4mm scale over 40 years ago - but it tends to involve a bit more work and the methods vary as between the suppliers, but all aim to keep the wheels on the track, generally by the use of spring steel wire.

Bill Bedford and Exactoscale both sell their own systems, with instructions, as does Michael Clark. This latter supplier really comes into his own with kits to convert ready-to-run wagons. Here, with numerous different manufacturers, each having his own ideas and production methods, there is no standard method of conversion and Michael has produced a range of universal kits.

Inevitably, conversion is not quite so straightforward with some models but with the excellent plastic mouldings now available an

accurate, well-detailed P4 wagon can often be produced with relatively little effort.

The photo at the head of this article shows a completed wagon with sprung suspension, this time using a system developed by Michael Clark from his 'Masokits' range of components. The result is so unobtrusive it is difficult to spot even from the underside.



A hopper wagon of the pre-grouping era discharges over the coal cells at Spital. Bob Bourne



Springing, where the suspension mimics the full-size wagon, is a newer development but, having said that, the author has two sprung wagons which are 14 years old. Illustrated is a pair of sprung units to Bill Bedford's design plus a wheelset of open spoked wheels. Here both units are fixed to the wagon but the wheels, with pin-point axles, run in bearings which are allowed to move up and down in the suspension units controlled by spring steel wire. The components for one four-wheeled wagon are shown (less one wheelset) with a bearing, spring carrier and spring in position on one unit. **Don Rowland**

Let me end with several comments:

- First, most British wagons used to be four-wheeled, but bear in mind that the longer the wheelbase the more important it is to have springing or compensation.
- Secondly there are mercifully few six-wheeled wagons; again they are not for beginners but I shall consider them in the next section.
- Modern bogie wagons are like bogie coaches, which I also mention in the next section, though their short bogies with their short wheelbase reduce the need for compensation or springing.
- Finally, if you are going to do any shunting à la prototype, you will find that sprung buffers improve operations as does a bit of extra weight. The Society recommends 25 grams per axle and this is usually achieved by adding lead in suitable places. As a guide, old roofing lead is approximately 2.5mm thick and, in round figures, weighs roughly 2.5 grams per square centimetre. With covered vans and loaded open wagons, finding space is not normally a problem but with, say, a small, open wagon built from a plastic kit, a degree of ingenuity in packing every space between the solebars usually produces the required result.

Slattocks, a major P4 layout, is under construction by members of the Manchester Model Railway Society. **Andy Goodman**



Getting Started . . . Carriages

with Don Rowland



A prizewinning LMS Open by Stephen Williams. Philip Hall

With wagons we were dealing almost exclusively with four-wheeled vehicles, now it is the turn of bogie vehicles. Again, because we are using scale flanges on our wheels, we must ensure they are always in contact with the rail, and once more the choice is between compensation and springing; the good news is that for conversion to P4, you just work on the bogies. In most cases, it is preferable to build new bogies. Should the reader be interested principally in passenger trains, he may prefer to build, say, two pairs of bogies instead of two wagons, perhaps one sprung and one compensated, rather than the wagons suggested in the previous section.

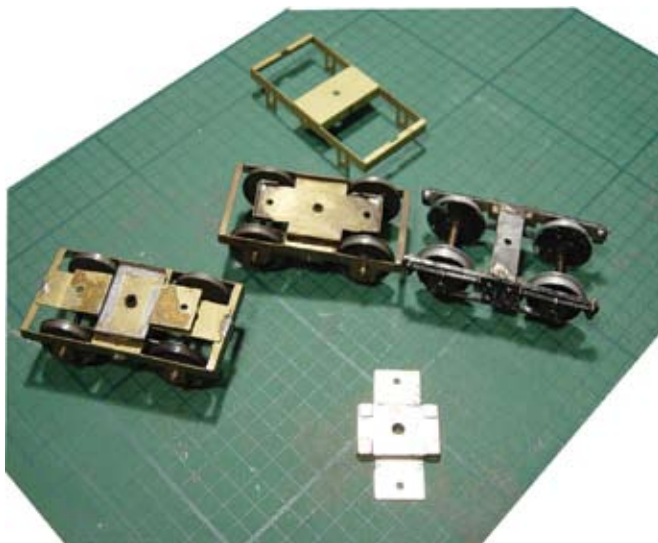
Because we use grossly tight curves, compared with the prototype, on almost all models our bogies inevitably turn far more than they should and P4 wheels, being wider overall than OO ones, may scuff on the inside faces of the solebars. This is especially true of carriages with plastic underframes and gentle work in this area with the router may be required to remove a little material from the inside faces.

It is also a good idea to allow a little horizontal rock (so that the back and front can rise and fall slightly) on the bogies. With wagons we considered the case of a slight dip in one rail and this will be coped with by bogies too, but what is more pernicious - and less easily discovered - is a dip over a longer distance, say 300mm, called 'twist', which is why a little horizontal rock for one bogie is beneficial. And for our final *caveat*, it should be pointed out that the 25gram per axle weight recommendation, that is 100 grams for an eight-wheeled coach, still applies.

And, yes, before someone points it out, not all coaches are bogie vehicles; there are six-wheelers too. Many and wonderful were the solutions devised by Victorian engineers to the full-size six-wheeler problem and by all accounts none resulted in a terribly smooth ride. The best seems to have been the eponymous system of Mr Cleminson. We are fortunate that a model variant has been developed by Brassmasters especially for P4. In our experience it works well, but I'm still no great fan of the type in general.

So far we have looked at locomotive-hauled carriages, ignoring self-propelled vehicles, electric and diesel. Here the bogies have not only to give a good, smooth ride, they have to pick up current and provide power too - and stay on the track while so doing.

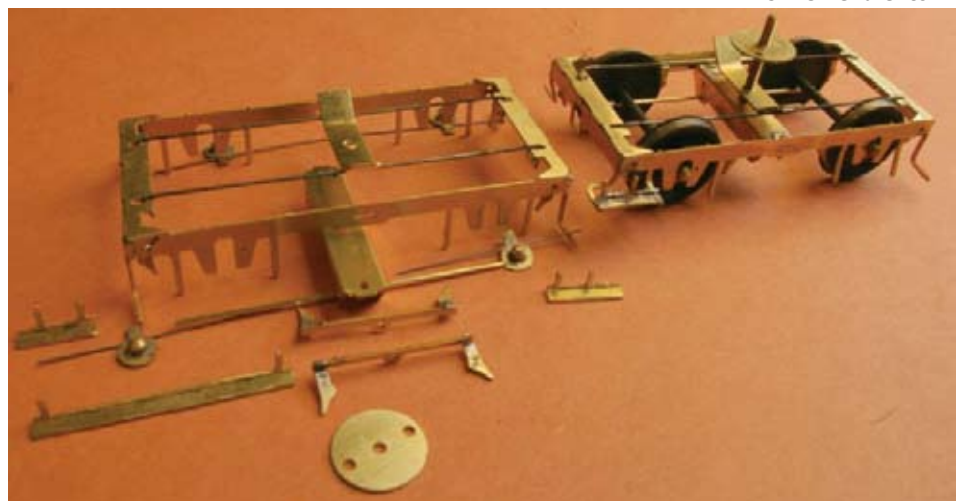
Most modellers nowadays seem to be modifying ready-to-run bogies, and this seems to apply to diesel and electric locomotives too. Certainly, drop-in wheelsets are available to help with this, and the running which results is almost invariably good. And they look good on the move too, on the properly scale track of P4.



As with wagons, let us begin with **compensation**, although with carriages the move from compensation to springing is more pronounced than it is with wagons. With coach bogies, rather than have one pair of wheels in each bogie rocking usually it is the bogie sides which twist slightly to give the same result, namely keeping all four wheels in contact with the rail. The Scalefour Society sell their own kits using beam-type suspension, while the MJT torsion type are now retailed by Dart Castings, and Comet offer a compensated bogie.

If anything, **springing** is somewhat easier with carriages than with wagons and Bill Bedford, Michael Clark and David Bradwell all have systems on sale. David is the agent for the Mitchell-Pendleton type which gives not only primary suspension but a degree of secondary suspension also. All of the above designs consist of a basic bogie frame and require the addition of cosmetic sideframes. They all use pin-point axles running in the same standard cup-type bearings as are used for wagons.

Chris Pendleton



Getting Started . . . Locomotives



with Mike Ainsworth

'If there is one thing that, more than any other, puts people off P4, it's the prospect of producing a working locomotive. Most modellers immediately imagine that something like the photo at the top of this page is required. They start to worry about springs and compensation, wheel quartering and universal joints, flexible coupling rods and floating gearboxes - and think that nothing in P4 will work without them. We aim to show that it isn't true: a P4 loco does not have to involve more technology than it took to put a man on the moon'.

The most straightforward way into P4 locomotives is through a simple ready-to-run (RTR) conversion. The operative word here is 'simple'; there are some RTR locos that can be converted very quickly and very simply. Others involve varying amounts of work and ingenuity and there are some where just about the only realistic option is to marry the body with a kit or scratch-built chassis.

So where to start?

The general view is that those modelling diesels and electrics are the lucky ones, because many proprietary diesels can be converted by simply removing a keeper plate, lifting out the OO wheels and dropping a set of ready made P4 wheels into their place. Replacement wheels, to allow you to do just this, are available from Alan Gibson and Ultrascale. Both sell the wheels in sets appropriate to the RTR loco you want to convert and the Ultrascale ones come complete with the wheels and gears already fixed to their axles.

With no rods, quartering or valve gear to worry about, this is about as close to the instant P4 loco as we are ever likely to get; it is quite possible to convert the Bachmann Class 25, for example, in about half an hour flat. The Heljan 'Hymek' is another good choice for the newcomer to P4. The one in the photo below as well as a set of Ultrascale wheels, has had new screw couplings, buffer beam pipework and air tanks but is otherwise pretty much out of the box.



Eddie Bourne

Steam locos are slightly more complicated. Even the simplest 0-6-0 will have coupling rods and so, as well as replacing the wheels, we need to think about quartering them and about how to deal with the rods themselves. We can cheat to some

extent by choosing a loco for which a complete set of wheels is available in the same way as for diesels. A good example is the Dapol Pug for which Ultrascale sell a set of wheels which come ready quartered and, again, with the gearset already mounted on the axle. So here we have a steam outline prototype that can be converted to P4 in not much more time than it would take to deal with an RTR diesel.

The photo shows you just about everything you need to know. The crankpins unscrew, so that the coupling and connecting rods can be removed. The keeper plate is then released by undoing a screw at the front and unclipping the plate at the rear. That allows the OO wheels to be dropped



Eddie Bourne

out. The pickups will need to be bent out a little to ensure that they contact the more widely spaced P4 wheels which can then be dropped in. Replace the keeper plate, fix the rods back on to the crankpins and there you have it - pretty well instant steam outline P4.

With other RTR steam locos, we are beginning to move a bit further up the food chain. Most inside cylinder 0-6-0s, though, will take little more effort than the Pug. A set of replacement wheels is all you will need in most cases.

Make sure, though, that you check the axle diameter. Most RTR manufacturers use axles 3mm in diameter rather than the 1/8 inch ones which have become standard among the wheel

suppliers. It isn't a problem because the manufacturers who produce replacement P4 wheel sets supply them with axles in both sizes. You simply need to remember to specify which size you need when you are ordering. Remember, too, that you will probably need a set of crankpins to suit the make of wheel you are using - it is unlikely that you will be able to reuse the ones fitted to your RTR loco.

This brings us on the evolutionary scale to the more complicated RTR locos - which for these purposes means those with Interesting Complications like outside valve gear, eight coupled chassis and the like. This Bachmann N Class provides a good example.



This Bachmann N Class gives a good idea of the results that can be achieved by skilled hands, in this case those of Philip Hall. It's a bit beyond the scope of this supplement to go into details of a conversion like this. But the same principles apply - a set of replacement wheels, maybe replacement coupling rods and re-use of all or most of the original chassis and valve gear. If you're tempted by something of this sort, I can do no better than refer you to the articles on this sort of P4 conversions that have appeared in the modelling press. Philip Hall

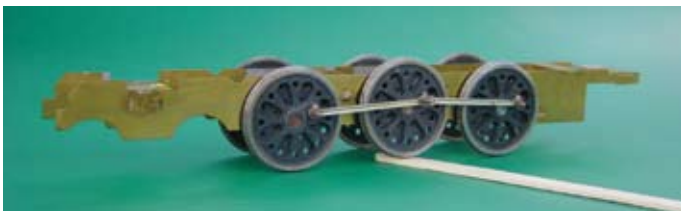
So here we are. Two thirds of the way through this treatise on P4 locos and neither compensation nor springing has yet had a mention. Does this mean that, in practice, neither is necessary?

Actually, no. It is true that, with half-decent track, springing or compensation is a bit of a luxury on diesels and electrics. As for steam outline models, many of the more recent RTR offerings have some degree of springing built in. This is usually restricted to one axle only, but a straightforward conversion will preserve it and the extra bit of flexibility it provides is well worth having. But for P4 to work to its full potential, compensation or springing is, if not essential, then certainly highly desirable.

The critical benefit of a compensated or sprung loco over a rigid one is that it will keep all of its wheels on the track. That may sound an obvious point but it is not a simple question of avoiding derailments - important though that is. The two major additional benefits are that electrical contact is much more reliable and haulage capacity is increased.

The principle of springing is obvious enough. Each wheel is pressed to the rail by either a coil or leaf spring so the chassis can take track irregularities in its stride. Compensation is slightly different. In this case, there is usually one fixed axle and - in the case of an 0-6-0 - two which float. The floating is achieved by housing the axles in hornblocks which can move up and down but not forwards or backwards. The degree of movement is controlled by a compensating beam which usually bears on the centre point of the floating axle.

The photo below by Eddie Bourne demonstrates the principle.



It shows a compensated chassis clambering over a lolly stick which represents a track irregularity. (If your track does have lumps in it on this scale, you may need to revisit your track building skills, but that's another story). As a wheel hits the

obstruction, it lifts to climb over it. The axle, meanwhile, tilts to keep the other wheel on the track.

The other axles remain flat and level and, crucially, still in contact with the rail. The trick is to ensure that the loco is always suspended on three fixed points - in this case, the two ends of the fixed axle and the mid-point of the compensating beam. A compensated chassis is like a three-legged stool, all of whose legs will always be in contact with the ground, no matter how uneven the ground may be. A rigid chassis, on the other hand, is like a four-legged stool; unless the ground is absolutely flat, one or two legs will always be clear of the ground and the stool will wobble.

Transfer this principle to your loco. If wheels lose contact with the rails you might, if you are lucky, get away without a derailment. Even if you do, though, you will be supplying electricity to the motor, and getting traction from, at most, four wheels out of six. It may well be fewer still. Look carefully at the photo of the compensated chassis, though, and you will see that all six wheels are still making contact. Springing achieves the same result and also gives an undeniably silky ride but at the expense of a sometimes more tricky setting up process.

A long treatise on compensation and springing, and on how the three-legged stool compensation principle can be applied to far more complicated locos - like the A4 or 9F which you are itching to build - is more than we can accommodate here. But if your appetite has been whetted and you want to know more, have a look at some of the articles that have appeared in the modelling press.

Better still, join the Scalefour Society and be taken through the principles step-by-step in its indispensable *Digest* Sheets.

Getting started . . .

Quartering Wheels

Quartering is often seen as very difficult. Space precludes a detailed description here, but the basic process is very simple and it is easier to do than to write about!

Take the first axle and quarter the wheels by eye, gently rotating one wheel on the axle until its crankpin leads the one on the other wheel by 90°. To be honest, getting it exact is not essential - you cannot see both sides at once! This axle should now be your reference one and not be adjusted again. Fit the next axle, quarter its wheels by eye, and then fit the coupling rods to the two wheelsets. Adjust the quartering on the second axle, by easing the wheels on it, until the chassis runs freely in both directions with no binding.

Then add the third axle, and adjust the quartering on that, (but do not adjust the previous two), until the chassis runs freely as an 0-6-0. Repeat, if necessary with further axles with coupling rods attached until you have a free-running chassis. It really is that simple

A modelling philosophy

expounded by Andrew Jukes

What P4 is - and isn't

Now P4 is often seen as being mainly about using very close-to-scale track and wheel standards, and of course the choice of these standards is an essential feature of P4 modelling. That choice can easily be seen as leading to a more difficult and demanding form of modelling and to some extent, and depending on where you are starting from, this is likely to be true. Even with recent progress in track which is easier to build and with the continued development of ideas for converting or building rolling stock, more construction work will be needed and more skills will need to be acquired than for a typical OO gauge model railway.

But what you should avoid assuming - and we hope this supplement shows this - is that the path you will be drawn along will be too difficult for you. People who could build a successful model railway to other standards could also build a successful P4 model railway, having taken a little time to understand the differences in approach.

The use of P4 standards has provided the impetus for much innovation in track, wheels, suspensions and locomotive drive systems. Of the modellers working to P4 standards, a number find the technical challenge continues to be their main interest. Just because you come across such people doesn't mean that you have to join them at the cutting edge - it is perfectly possible to build a P4 model railway using well-established methods. The most important point perhaps is that it should be done with care and with an awareness of what is important to make a railway work well.

Where P4 standards can lead

Adopting P4 standards opens up the possibility of building a model railway that is very accurate in almost every respect. Model locomotives with exact scale wheels standing on correctly proportioned track with close-to-scale flangeways seem to encourage us to look at other aspects of the model railway.

If the rolling stock and track are accurate, what about the lineside equipment, what about the signal boxes and station buildings?

Are they correct for the period and railway, and do they properly match the rolling stock? And so it goes on. How to make the tiles on the roof of the cottage near the station look exactly right; what bond should be used for that brick wall next to the cottage?



Jim Summers



Jim Summers

But though the greater accuracy of the track and wheel standards may encourage this sort of attention to detail, it is still your choice how far you go.

The much higher standards of ready-to-run OO gauge rolling stock, combined with the availability of P4 track which is easier to build, and the simplified methods of converting rolling stock to P4, can be seen as enabling more emphasis to be given to building an operating railway than on getting all the fine detail exactly right. Correct overall proportions, potentially smooth and realistic running combined with the detail and accuracy of much recent ready-to-run rolling stock are the key elements. These can provide the basis for a railway on which the satisfaction comes from following the operating procedures of the prototype and the local pattern of train movements.

If you are so minded, it is then a small step to want to interlock the signals and points and even to detect trains with track circuits, so that - as on a real railway - some aspects of correct operation are enforced. Accurate train formations, a working timetable - and so it goes on. It is up to you and the areas which intrigue you, but getting these right enhances the satisfaction in your modelling.

'Each of us models railways for reasons that may be hard to explain, but they will often be very much our own reasons.

Likewise, our main areas of interest will differ:

- some enjoy collecting and displaying a fleet of rolling stock
- some have a particular interest in track or control systems
- and some aim to simulate the whole process of operating a railway

All perfectly valid reasons for pursuing our hobby and leading to a wide variety of end results in the kind of model railway we are likely to aim for.'

None of these steps to greater accuracy, whether in the fine detail included in the models or in the way the railway is operated, is exclusive to P4. But quite often, the person who uses P4 standards then wants to achieve similar standards of accuracy in other aspects of their modelling. Seeking information and acquiring skills to achieve this result becomes part of the enjoyment we can get from our hobby.



Derek Wilcox



Philip Hall



Jim Summers

Looking at the real thing from the point of view of track and wheels leads to tackling other things similarly.

Jim Smith-Wright is working on Birmingham New St, and this (*above*) is the signalbox.

The East of Scotland lads researched and built the colliery (*top left*) which was the scene of the Redding pit disaster, while (*opposite page bottom*) the North East Finescale Folk built a lever frame to ensure safety at *Ecclestone*.

Civil engineering of bridges and buildings were an especial interest of the Crewe Area Group when building Knutsford East Junction CLC (*opposite top*).

On the other hand, in building Halifax King Cross (*left*), Steve Hall went for the gritty delapidation of industrial Yorkshire as steam gave way to diesel.

Getting Started . . . Layouts

P4 on a plank

Perhaps the most important message for someone moving to P4 is - don't be too ambitious in what you set out to start with. It is far more important to get something running, so you can get a feel for what working in these standards is like and what kind of project you, alone or with friends, can sensibly attempt.

So the best starting point is likely to be a simple test track on a base, say 1.5 or 2.0 metres long and 300mm wide. While you can learn a lot using a smaller base - a simple plank - only 1.0 metres long and 100 or 150mm wide, say - but a little more space will allow you to include some curved track. It can make sense at this stage to try out different types of track construction (eg: flexible track bases, plastic sleepered track using separate components, soldered ply and rivet construction); and you should definitely make sure you include one or two turnouts (points) in whatever you do. Much of what you need to know about track is included elsewhere in this Supplement, though we have not included information on baseboards or wiring and control systems as these are common to other gauges (and even scales).

The track layout is not important, though arranging the test track so you can do some shunting or even run round a short train will add to what you can learn from it. Some test tracks end up with scenery and become more like a proper layout, but really

it is best to regard the test track as a proving ground for building and laying track and getting something running. Then, using that experience, you can design and build a proper layout.

A proper layout

With a better idea of what's involved and the time and skill needed, your thoughts can turn to a more complete layout project. Often, this is where the difficulties really start - there are just too many choices and too much to think about at once. Choosing a period, railway company, type of railway operation, geographical location and so on is one part of this. Designing a track layout that will fit the space you have and have some chance of being a believable representation of your chosen prototype is when harsh reality closes in. The fact is, however much space you have, your imagination can always ensure it is not enough! But see overleaf.

This short section cannot attempt to deal with all the issues involved in designing a layout, and so we concentrate on the particular issues that arise with modelling to P4 standards.

It helps to have a clear idea of the rolling stock you expect to run on the layout as the choice of curve radius and turnout size may limit what you can run. There are no absolute rules as all sorts of tweaks can be applied to help large locomotives round tight curves, although sometimes at the expense of realism.

In fact, how it looks is often the best guide to what it is worth attempting to do. For example, a dockyard or industrial layout with small shunting locomotives and short wheelbase 4-wheel wagons can look good with curves of 600 - 800mm radius and use A5 turnouts - but bogie wagons, coaches and large locomotives, even if they can be persuaded to run reliably round such curves, will never look right.

You will find many different views on this, but it may be helpful to give some rough guidelines to work to:

For large steam locomotives and main line bogie coaches, aim for a minimum radius of 1200mm (4' 0").

For smaller (eg: pre-Grouping) locomotives and coaches, a minimum radius of 1000mm may be acceptable.

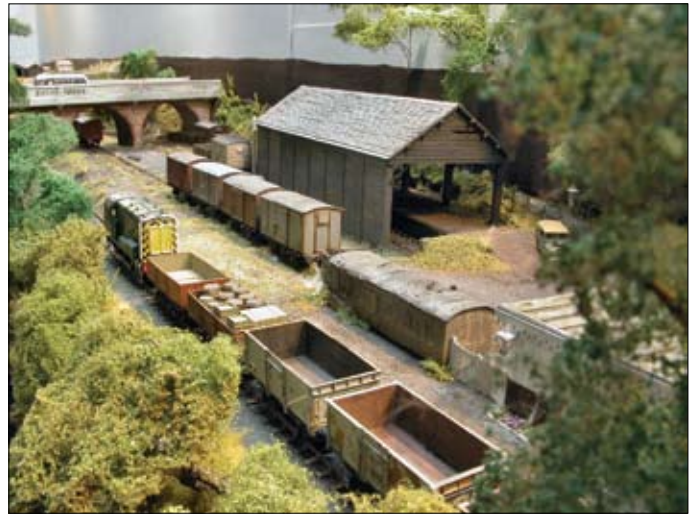
Diesel and electric locomotives do not suffer as much from excessive overhangs and long fixed wheelbases as large steam locomotives, so a minimum radius of around 1000mm may be acceptable for even the largest modern rolling stock - but use transition curves and take care with reverse curves (eg in crossovers) to avoid problems with vehicle end throws.

If rolling stock is restricted in wheelbase and overall length, much tighter curves can be used, but care must still be taken to avoid 'buffer locking' caused by excessive end throws.

For running lines, use turnouts with B or C switches. If possible, aim to use nothing tighter than a B7.

In yards and sidings, turnouts with A switches save space.

Some of this may seem very restrictive if you have until now worked with ready to run rolling stock. There is no doubt that moving to P4 involves accepting that less railway will fit in a given space than if, for example, OO gauge is used. What may be surprising is what can be fitted into a modest space and this was well illustrated by the Scalefour Society's '18.83 Challenge' - when a large number of very different exhibition layouts were produced - some by complete beginners in P4 - each occupying an area no greater than 18.83square feet.

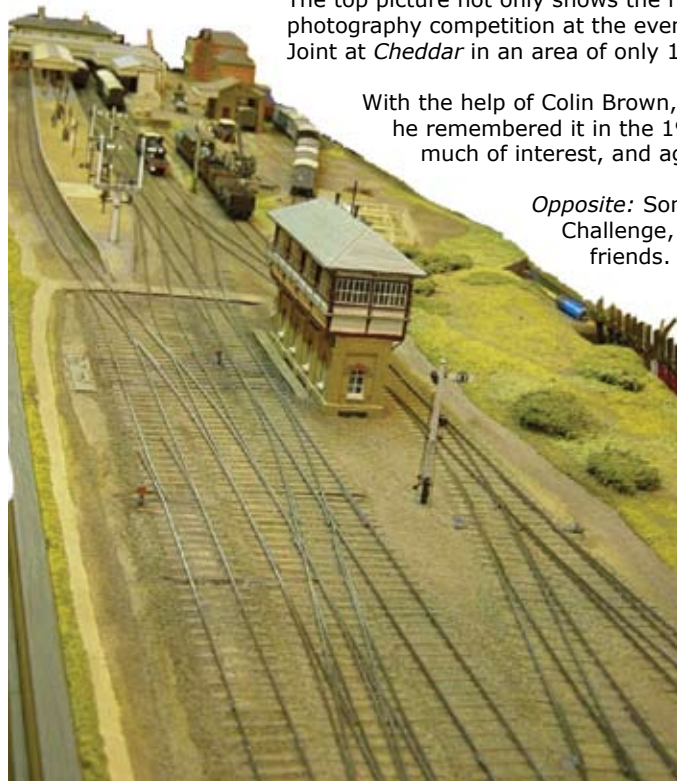


The top picture not only shows the runner-up in the '1883 Challenge' but also the winner of the photography competition at the event. Simon Challis has convincingly captured the Somerset & Dorset Joint at *Cheddar* in an area of only 18.83 square feet. **Richard Lane.**

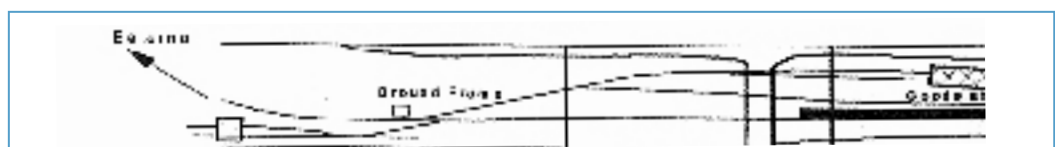
With the help of Colin Brown, Alastair Dickson set about recreating his home territory as he remembered it in the 1960s, with *Colinton*, above right. A simple plan, bottom, it offers much of interest, and again met the '1883 Challenge'. **Jim Summers.**

Opposite: Somewhat bigger, and taking a lot more years than the time for the Challenge, it's true, is the beautifully presented *Ferring*, by Michael Ball and friends. **Jim Summers.**

If you want to go narrow gauge, or broad gauge, P4 can replicate them too, as Tony Miles' *Adavoyle* shows below. **Tony Wright.**

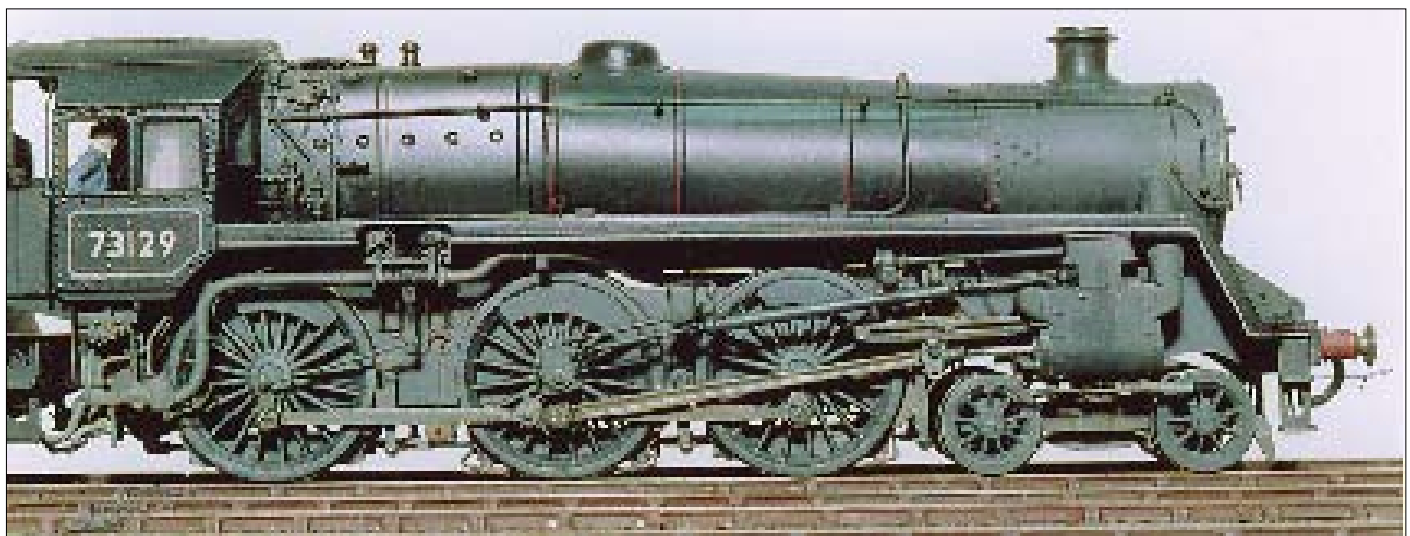


Colinton, by Alastair Dickson and Colin Brown
Location and period: Edinburgh,ex-Caledonian, 1960



Getting supplies . . .

<p>Bill Bedford Models 4 Belgrave Court George Street Pontypool NP4 8NP 01495 753 931 billb@mousa.uk.com http://www.mousa.uk.com</p>	<p>Dave Bradwell South Muirnich Cottage Gorthleck Inverness IV1 2YP 01456 486 377 d.bradwell@ukonline.co.uk www.scalefour.org/bradwell/index.htm</p>	<p>Branchlines PO Box 4293 Westbury BA13 9AA tel/fax: 01373 822 231 e-mail: sales@branchlines.com http://branchlines.blogspot.com/</p>
<p>Brassmasters Scale Models PO Box 1137 Sutton Coldfield West Midlands B76 1FU brassmasters@lineone.net http://www.brassmasters.co.uk</p>	<p>C+L Finescale Longridge House, Cadbury Camp Lane Clapton in Gordano Bristol BS20 7SD 01275 852 027 sales@lcpinternational.co.uk http://www.finescale.org.uk</p>	<p>Comet Models 105 Mossfield Road Kings Heath Birmingham B14 7JE 0121 242 2233 sales@cometmodels.co.uk http://www.cometmodels.co.uk</p>
<p>Exactoscale Ltd and The P4Track Co., 20 Waterson Vale Moulsham Lodge Chelmsford Essex CM2 9PB 01245 263 779 http://www.exactoscale.co.uk</p>	<p>Martin Finney Locomotive Kits 1 Poolestown Cottages Thornhill, Stalbridge Sturminster Newton DT10 2SQ 01963 362 400 martin.finney@virgin.net http://website.lineone.net/~cbwesson</p>	<p>David Geen Model Railway Kits 30 Silverwood Close Dale Park Hartlepool TS27 3QF 01429 269 600 sales@davidgeen.co.uk http://www.scalefour.org/geen/index.htm</p>
<p>High Level Models 14 Tudor Road Chester-le-Street DH3 3RY chris.gibbon@connectfree.co.uk http://www.highlevelkits.co.uk</p>	<p>London Road Models PO Box 643 Watford WD2 5ZJ http://www.londonroadmodels.co.uk</p>	<p>Masokits Masterbits Range 27 Crotch Crescent New Marston Oxford OX3 0JL www.scalefour.org/masokits/index.htm</p>
<p>Model Signal Engineering PO Box 70 Barton upon Humber DN18 5XY 01652 635 885 andrew@modelsignals.com http://www.modelsignals.com</p>	<p>Parkside Dundas Millie Street Kirkcaldy KY1 2NL 01592 640 896 sales@parksidedundas.co.uk www.scalefour.org/parkside/index.htm</p>	<p>Templot 85A Models PO Box 1199 Stourport-on-Severn Worcs DY13 0YN martin@templot.com http://www.templot.com</p>
<p>Wizard Models PO Box 70 Barton upon Humber DN18 5XY tel/fax: 01652 635 885 mobile: 0778 894 0312 e-mail: andrew@modelsignals.com http://www.wizardmodels.co.uk</p>	<p>Ultrascale Products Gear Services Letchworth The Wynd East Letchworth SG6 3EL 01462 685 327 enquiries@ultrascale.co.uk http://www.ultrascale.co.uk</p>	<p>A comprehensive list of suppliers can be found at www.scalefour.org, thanks to Russ Elliott. Look in the Links to Traders, where you will see also the links to numerous fascinating websites of modellers in the Scalefour family.</p>



Dave Holt's locomotives match P4 wheel and track standards in perfect harmony. **Philip Hall**

Getting support . . .



Since its formation in 1976, the Scalefour Society has grown to a membership of over 1800 worldwide. The Society caters primarily for the needs of railway modellers working to the scale of 4mm to the foot (1:76.2), the most popular of the British model railway scales. However, it promotes and encourages the use of modelling techniques and fine scale standards irrespective of scale or gauge, and has many Members who model to standards other than P4.

Although there is particular emphasis on the use of scale wheels and track, the aim of the Society is to encourage realism and authenticity in all aspects of the hobby; here are some of the ways in which help and support are provided to Members.



Scalefour News is the Society's flagship journal which all members receive five times each year. This is a high quality colour magazine packed full of news, reviews and illustrated articles covering all aspects of the hobby, and has items of interest and inspiration for modellers of all gauges and standards.

Members enjoy further discussion, guidance and inspiration via the **Scalefour Webforum** at www.scalefour.org/forum/, and via the email group, P4_Talk

The Society also promotes three major exhibitions each year. **Scaleforum**, held in Leatherhead on the last weekend in September is the biggest; **Scalefour North** is usually in the spring, in Wakefield; **Scalefour South West** is held during the summer as part of the RailWells exhibition. All the shows feature high-quality P4 layouts, modelling demonstrations, and other attractions and are well supported by trade stands.

All new members receive a copy of the **Digest Sheets** that cover many topics of interest and assistance to modellers. The subject matter ranges from planning to photography and includes comprehensive guidance on track construction and springing and compensation systems. The series is currently undergoing a complete overhaul and new sheets are in preparation.

The Society has its own shop for members – the **Scalefour Stores** – which attends Society exhibitions and provides an excellent mail order service. Our philosophy is to supply the essential items for P4 modellers, but without competing with the retail suppliers. The Stores also supply the products that the Society has sponsored; the latest addition to the range is high quality conductor rail supports for third and fourth rail electrification schemes, which complement the existing correct profile conductor rail and end ramps.



There is an extensive network of 46 **Area Groups** around the UK and six overseas. These are widely varied groups of Members, whose activities range from building and exhibiting layouts to informal social gatherings. Participation in an Area Group can be very beneficial as there will usually be other Members who can give help and guidance in developing the many skills that railway modelling fosters. There is also a lively internet discussion group for members where problems and ideas are discussed and useful tips provided. The Society is introducing modelling workshops – **Scalefour Workbenches** – where members can be introduced to basic techniques and benefit from the pragmatic guidance and experience of other members. The emphasis will be on practical work, using only the basic, essential tools.

The Society publishes books too. The latest, shown on the right, is devoted to the Alex Jackson coupling. The AJ is small, the AJ is pretty well invisible, and the AJ works in a mysterious way. This book tells the AJ story and is the ultimate guide on how to use the jigs or do it yourself. £6.00 plus £1.50 p&p from booksellers or the Scalefour Stores .

Our very comprehensive website www.scalefour.org is well worth a visit for inspiring photographs, plus lots of useful information and links.

Visitors are always welcome at www.scalefour.org where you can find a Membership application form. Of course we are always happy to deal with questions by post, and the addresses are:

General Secretary:
Mike Ainsworth, 8 Rivers Road, Teynham, Sittingbourne, Kent ME9 9TD
Membership Secretary:
Danny Cockling, 187 Painswick Road, Gloucester GL4 4AG Tel:0031 621 541 945

