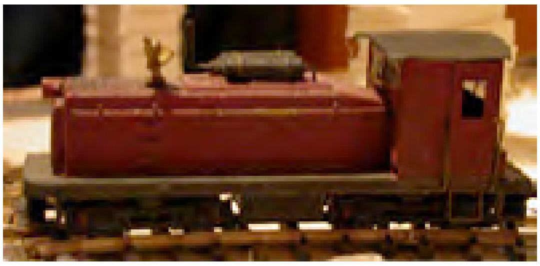
Dynamite Canyon Tramway

The Dynamite Canyon Tramway is a small (300mm X 1000mm, or 12" X 39") HOn30 mining operation set somewhere "Over yonder". Motive power consists of a single 4 axle diesel loco, bashed and modified from a Life Like N scale SW1200. This little loco hauls a rake of 3 ex- N scale Atlas 100 ton ore hoppers from the mine at the top of the layout via 2 "hairpin" or spiral loops, down to a barge dump. From there, the ore is barged downriver to a concentrator plant.



The reason for this layout's existence was and is to prove a few electrical and mechanical theories that may be of interest to some model railroaders. The layout uses 4" radius curves as a minimum, and combines them with a very simple solution to the old modeller's problem of wiring up reverse loops for regular, basic DC.

For the lightweight benchwork fans, DCT is based on 3 X 2" slabs of extruded polystyrene foam I had lying around of appropriate size. The roadbed, even the hyper-raised sections, are one thickness of 5mm "Foamcore" or "Kappa board".

For the trackwork techies, The track is mostly hand laid, (Yes, even the 4" radius curves!), using individual wooden sleepers, code 80 rail stripped from PECO N scale flextrack, and PECO N scale track pins for track spikes.

The risers are simply stacks of small foamcore pieces, hotglued together. Fast to construct, reasonably cheap, and ridiculously light.

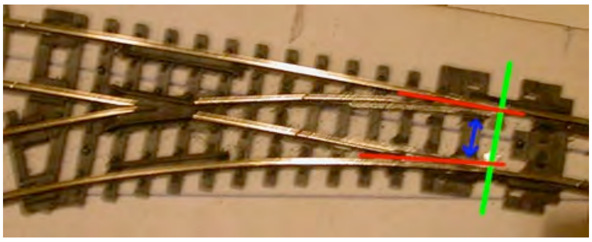
While the DCT trackplan may be pretty twisted, I also figured that it could form the basis for many a single track shelf layout of even show layout. Point-to-point show layouts are avoided by many of the regular exhibition modellers, mainly due to a perceived issue with keeping enough trains running to keep the viewers happy. Reverse loops are often thought of as a solution, but are then rejected as too hard to wiring up, and too hard to operate in a pressure show environment. (At a show, the last thing you want to do is have to remember in exactly which order you had to throw X number of switches, just to get a train back onto the mainline).

Always Straight Points

I owe the kernel of this idea to legendary Australian Narrow Gauge Modeller, Gerry Hopkins. His last NG exhibition layout featured handlaid dual gauge points that always allowed a train to "go straight", thus allowing automated multi train passing loop operations and suchlike, with minimal additional active electronics. I just found a way to simulate Gerry's idea, using off the shelf PECO Insulfrog points.

One of the key elements of the DCT "automatic reversing loop" is a point which always forces a train approaching it to take the straight path. There are a few different ways to achieve this, but one of the DCT criteria was that the point have *no moving parts*.

Here's how it was done.



1 The green line represents where the original throwrod was. It was simply removed, along with the PECO over-centre spring. This allows each switch rail to swing independently.

2 The blue arrow indicates where the switchrails have been pushed hard up against the nearest stock rail, and soldered to it. This may appear to require the modeller to have 3 or more hands available, but if you tin the rails first, and use a pair of "reverse" or "self clamping" metal tweezers to hold the switch and stock rails together, your 2 regular hands are free to manipulate the soldering iron and solder ;-) This PECO N scale "setrack" point was done with a 40 watt electronics soldering iron. Make sure that the switchrails are clamped vertically inline with the stockrails, they may attempt to creep "up" the inside of the stockrail, and end up soldered slightly "proud" of the top running surface of the stockrail.

NB, this does not have to be a immaculate solder joint, in fact a little extra solder pooled in-between the switch and stock rails will be beneficial.

3 Having soldered the stock and switch rails together, you will quickly realize that it is now impossible for any piece of rollingstock to use the point. The solution is shown by the red lines. These indicate the areas where you will need to saw/file/carve a "flangeway". through the switchrail and pooled solder. Razor saw, Dremel tool with cutoff disk, narrow file, all will do the job. Just remember that the faster the tool works, the more certain you have to be that you are cutting the right part of the rail away!

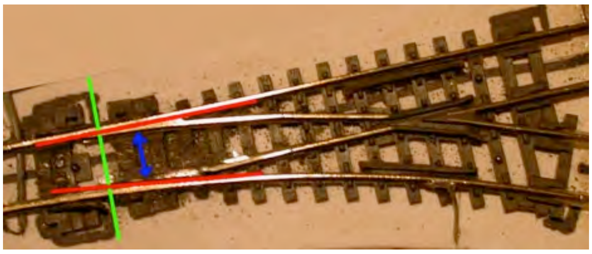
There are 2 basic approaches to carving a working set of flangeways.

One is to use an appropriate NMRA trackgauge or similar, and carve the flangeways relative to the appropriate stock rail.

The 2nd is to connect a length of flextrack to each leg of the point, grab a piece of rollingstock, and start cutting the "straight" flangeway, (the top one in the pic above). Every so often, roll the car from the toe to the heel end of the point, (from right to left on the point shown above). When the car smoothly passes through the "straight route" without "humping" over the curved switchrail, Stop Cutting! Now start cutting the "curved" flangeway, occasionally rolling the test rollingstock from the heel to the toe end of the point, along the curved route. Again, when the car rolls through the point without "humping" over the straight switchrail, Stop Cutting!

Having cut the flangeways, check that the top running surface of the rails is smooth, (run your test car through the point again a few more times, I know you will want to, esp if the point is working properly ;-)). If not, give the solder joint top areas a few swipes with a small file to smooth them off. Now roll that test car to check the point again.

Here is the "Bottom Loop" point on DCT. Note that between the 2 loops, DCT provides a working example DCT "Always straight" points of both a "left handed" and "right handed" loop. Both use the same techniques and electronics, and both work flawlessly.



A quick note about point selection. This technique will only work with PECO "Insulfrog" or other plastic frog points that have a "power routing" feature. As soon as the switch rails are soldered to the stock rails, they become electrically joined. With a metal frog point, this would mean an inherent short circuit. So, for the purposes of this project, "Electrofrog" or metal frog equipped points need not apply.

One or 2 modellers have questioned the butchering of a completely good and serviceable point for this project. "Why not just remove the over-centre spring, and add a spring to the "curved route" side of the throwrod, thus turning the point into a "sprung switch"?" Well, apart from the intrigue of a point with absolutely no moving parts, it was discovered that some plastic wheeled and lightweight rollingstock, esp in the smaller scales, simply did not have the force to push the sprung switchrails aside when exiting the loop. Making the spring weaker meant that the point did not reliably return to the "straight" position everytime, and for this project, reliability and predictability were high on the list of specifications.

Reversing Loops

Reversing loops, almost every modeller has thought about using them at one time or another. Those with electrical skills can get them to work, but often at the expense of having an operator/train driver/guest modeller navigate their way through extra switches/control panels/throttles just to get their train around the loop. Others attack the problem with high $$$ electronics. For the rest of us, a simple solution, which doesn't require the operator to do or learn anything extra when running their train, and costs minimum $$$, would be great.

Here's the DCT solution. Lets start with a few known facts and limitations.

1 This solution assumes that you wish to use the reversing loop purely for turning trains around, and thus, you will not mind that your trains must always navigate the loop in the same direction.

2 This solution requires some knowledge of your track and wheel details, (specifically in relation to gauge and flangeways), as it involves modifying a PECO Insulfrog or similar plastic frog point, (sorry, metal frog points need not apply).

3 This solution has been tested and optimized for regular DC throttles. (I can run Dynamite Canyon directly off a 9VDC battery if need be). DCC systems were not considered when designing it. Most DCC systems already have facilities for handling reversing loops and suchlike, (dual "switchable" boosters etc). If you are running a DCC system, or are considering obtaining one, check the respective

manufacturer for details on reverse loop wiring.

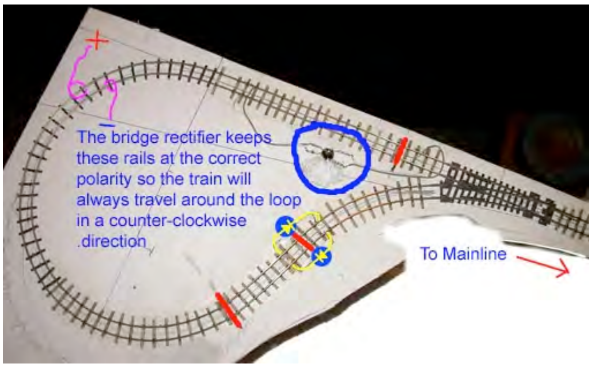
OK, having set out the rules, Keep the following detail in mind: the NMRA standard says that "*where a locomotive is moving 'Forward', the Right hand rail must be + polarity.*"

This small but significant detail means that we can accurately, and reliably, make a train go in a desired direction, by ensuring that "Forward" = Right hand rail is + volts.

Here's another basic detail to keep in mind: a train approaching a track point/switch, everything else being equal, will want to takee the straight route.

Now check the pic of the "top loop" on the DCT layout.

The RED lines show the location of isolation gaps which have been cut in both rails. The Yellow things backed with blue dots represent regular 1N4001 silicon diodes. The Black thing in the blue circle is a bridge rectifier. In this example, it is talking a track feed from the mainline rails, (at right of the bridge), and are feeding constant polarity track power to the loop block, (exiting the bridge to the left).



OK, follow me step by step around the loop.

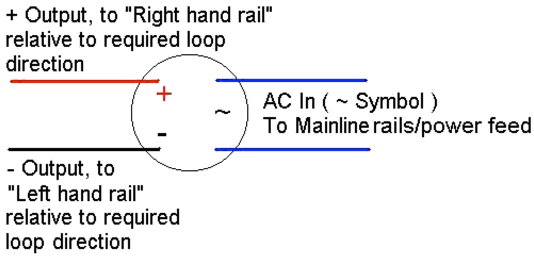
1 Mainline train heads left on Mainline (At right of pic above)

2 Due to point modification, train takes the "straight route" through the point, and heads into the loop, (Top side of loop in pic above).

3 Train passes over 1st isolation rail gap.

Now, between the point and the rail gaps, (top gaps on pic above), the train is still getting power from the mainline, via the points. If the driver were to stop the train before crossing the gap, (if they stayed on the RIGHT side of the gaps), the train could be backed out of the loop, because it's direction polarity is still under the direct control of the Mainline throttle direction switch.

As soon as the train passes over the gaps however, (passes over the gap from Right to Left), it has entered the "loop block". This stretch of track receives it's power from the mainline, via the bridge rectifier. The bridge rectifier keeps this section of track powered with the + polarity to the "right" of the train, hence the train will continue to proceed around the loop in a Counter-clockwise direction. (Remember "Detail #1"?).



Bridge Rectifier wiring.
Mainline power feed can be connected to "AC In" in any direction, polarity doesn't matter.

Remember that a train going "Forward" will have the + polarity on the "Right Hand" rail.

So, first, work out which direction you require the train to circle round the loop, (which way is "Forward"), then wire the + Output to the "Right hand rail" when travelling "Forward", the - Output to the "Left hand rail".

For reference, any 2 amp or bigger bridge rectifer will do, I use WO-4 4 amp rectifiers for HO and smaller scales.

Above is a quick wiring schematic for bridge rectifiers. DCT uses WO-4 4amp bridges, which should handle enough current for most locomotives up to On3.

4 Train now proceeds, with bridge rectifier controlling the direction, around loop (Counter-clockwise in above pic).

5 Train passes over 2nd rail gap, (bottom centre of pic).

Here's where the real issues start, and many modellers are convinced that they need extra electronics. If you have been following the steps on the pic above, and you have been keeping track of which rail is what polarity, you will soon realize that the train cannot return back onto the mainline without causing a short circuit.

Look at the pic again. With the train having navigated the loop, it has now crossed onto another short "block" section. In practical terms, this section need only really be as long as the longest loco you envisage running around the loop. This short block gets its power not from the bridge rectifier, but from the mainline, via 2 inline or "series connected" diodes, (shown in yellow on the pic).

In basic terms, diodes will let power pass through them in one direction, (or at one polarity), but not the other. By using the diodes to power this short section, we can effectively work out if the mainline throttle direction is still set to head "into" the loop, or has been reversed, ready to accept a train exiting the loop. If the throttle is still set to "inbound", the diodes will stop power passing to the short block, and the loco will stop.

How do you know which way to wire the diodes? Remember "Detail #1"? Wire the diodes so that the "triangle symbol" has the triangle head pointing from + to - for the desired direction of travel.

6 If/when the throttle direction switch is changed to accept the train from the loop, the diodes will let the correct polarity mainline power through, and the train will continue over the final "rail gap", out of the loop, and back onto the mainline, in the opposite direction.

That's all there is too it. No mention of, or need for, detectors, point motors, extra switches, or anything complicated. Your operator drives their train "into the loop", it turns itself around, if the operator changes their throttle direction switch while the train is navigating the loop, it will continue without stopping or reversing, and will exit the loop, back onto the mainline. If the operator does not change their throttle direction switch, the train will stop automatically on the "short block", and will wait there until they do.

BTW, there is a slight voltage drop across the bridge rectifier and diode pair, around 1.2volts. If your train heads into the loop at a "medium cruising speed", it will slow slightly as it negotiates the loop. If you are building the reversing loop for the purposes of turning a train, you will probably have used whatever your minimum radius is, so it takes up as small a space as possible. Being a tight curve, having the train slow slightly is actually a small bonus of this circuit ;-)

That takes care of the electrics. As a bonus, if you're clever, you can adjust the length of the "loop block" and "short block" so that the straight leg portion of the loop can be used in regular operations. See the pic at left for a suggestion on how to do it. Note that because you have modified the point to always "run straight", it acts effectively like a piece of straight track. Hence, you can run in true "Point-to-Point" mode, by entering the loop, switching the district, then leaving the loop the way you came, or run around the loop, and return to the mainline using the "reverse loop".