Bells, Horns and Fooling the AI

Welcome. This tutorial is actually several mini-tutorials on various subjects you may find helpful in working with your route:

- Using dummy junctions to improve train movement
- Adding automatic bells and horns at your passenger stations
- Using the Invisible Speed Signal to slow passenger trains at a station
- Using trackmarks at portals
- Improving signal operations at a divergence

Using dummy junctions to improve train movement

In this section, we'll discuss how you can improve the efficiency of your route and how to keep your trains moving with a minimum amount of delay. Specifically, I'll show you how the Auran AI system can add significant delays to trains entering your mainline and what you can do work around the problem.

Let's say you have a train waiting to leave the sidetrack, but it can't seem to get a green signal. Often this problem is caused by an approaching train, which has "locked" the switch in front of your waiting sidetrack train. Usually that's fine, but if the oncoming train is miles away, your sidetrack train may be in for a long, unnecessary wait.

Consider the following example:

In the right-hand picture above we have a GP38 waiting to leave a sidetrack. The left picture is our oncoming mainline train, an Amtrak F40PH. Notice the turnout is aligned toward the mainline train and the F40 has a green signal. The GP38 has a stop signal.

What you can't tell from the drawing is the mainline train is twelve *baseboards* away. To be exact, the distance is 27,000 feet …that's more than five miles or about 8.3km. When we start the session, which train do you think will cross the switch first, the GP38 or the F40?

The answer is…it depends on the timing. If the GP38 starts first, the AI will change the switch to the sidetrack and GP38 can enter the mainline. If, however, the GP38 starts anytime after the mainline train, the F40 will "lock" the switch…even from 27,000 feet away…and the GP38 has to wait. For how long? Well, at the default 40mph/63kmh track speed it will take the mainline train eight minutes and forty seconds to reach the switch. Even at a track speed of 65mph/104kph it will still take the mainline train seven and a half minutes to reach the sidetrack.

What can we do to let the GP38 leave earlier? I've developed a technique to help work around this problem, by inserting an extra sidetrack in the line, like this:
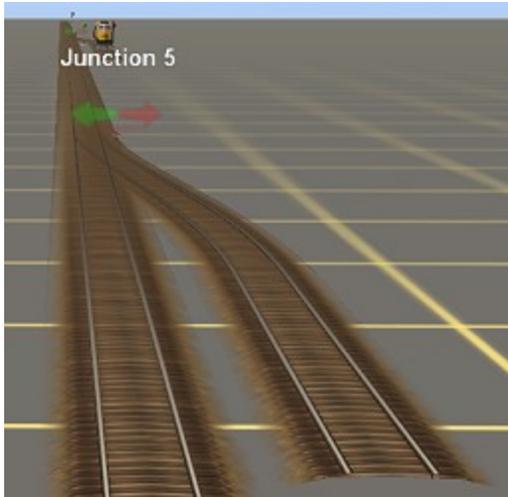
To the left, you can see the "dummy" sidetrack just down the track from where the GP38 is waiting.

What happens is the oncoming F40 sees Junction 5 first and locks **it** instead of the switch in front of the GP38, allowing the GP38 to proceed, long before the F40 reaches the switch.

Now let's look at this technique a little further. We've demonstrated it works at 27,000 feet, but what's the *minimum* distance?


After experimenting a bit it seems that if the F40 is more than 800 feet/246m from the dummy switch when the GP38 starts, the GP38 can still leave the sidetrack. If the F40 is closer than that, the F40 will lock the turnout in front of the GP38 as well, forcing it to wait until the F40 has passed. Actually that seems pretty prototypical, for the sidetrack train to wait if the oncoming mainline train is reasonably close.

If this technique is of interest of you, I suggest you experiment with it on your own route so you can see how it works.

You can also experiment with how far to put the dummy switch from the real sidetrack. In the example above, the distance between the switches is 925 feet or about 285m.

About now some of you may be saying, "I understand about the dummy switches, but I don't want a bunch of them cluttering my route. How can I make them more realistic?"

Good question, and I can offer two suggestions. The picture below was taken on my Midwest Central route. The dummy switch is disguised as an abandoned sidetrack, with the partially buried track covered with debris and leading off into the distance. I used a different type of rusty-looking track to heighten the effect. Notice also that I labeled the turnout with a comma (,) and I use that same name for all of my dummy switches, to show they are not active.
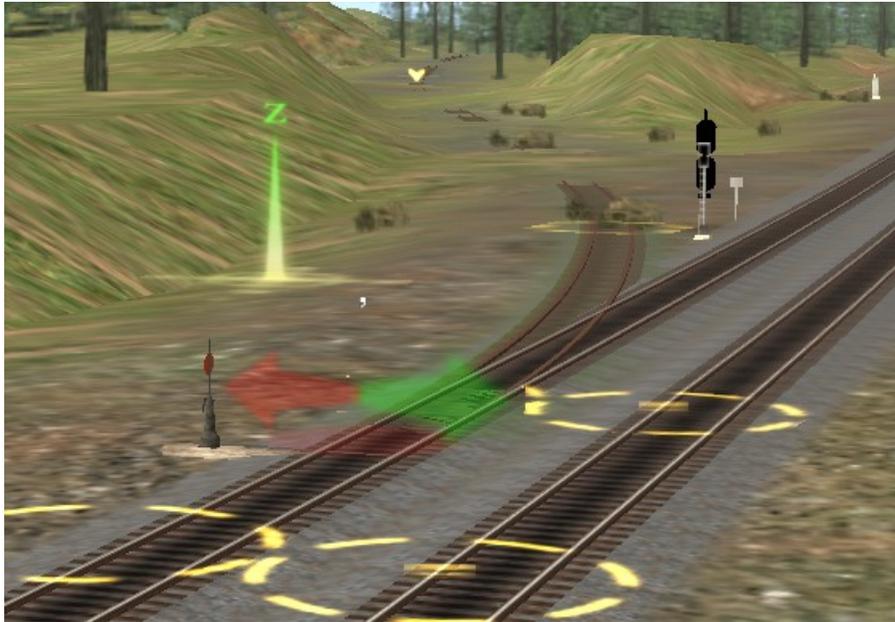
The abandoned track looks quite nice on any route, but you don't always have room for a sidetrack, so the picture below shows how you can do it when you have limited space.
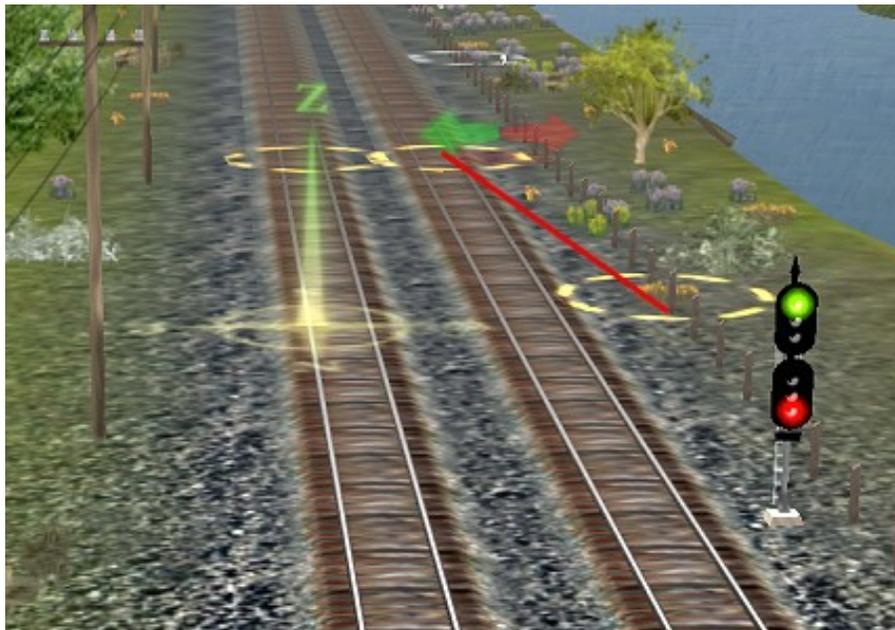
The picture above was taken on my Erie Northern route. In this case I used a section of "Invisible Track" <KUID:9000:38001> to form the other leg of the sidetrack, as shown by the red line in the

drawing. For the switch lever, I used "Lever invisible" <KUID2:151900:100211:1>.   We still have the red/green arrow, but I again labeled it with a comma, my standard way of indicating dummy switches.

Either technique works fine and will help improve the flow of traffic on your route. I have 16 of these dummy junctions on Erie Northern and they work quite nicely.

Using Bells and Horns at passenger stations

Another technique you can use to improve your route is to use automatic locomotive bells and horns or whistles at passenger stations. For example, you can start ringing the locomotive's bell when you reach a point a short distance from the station. Then, when the train has finishing loading passengers, you can sound the horn just before the train pulls out. It's pretty cool, so let's take a moment to explain how to do it, using an example from my Erie Northern route.

First, we need to define a point where we want the bell to start ringing. Does that sound like a trackmark? Yep, that's exactly right.   Have a look:

In the drawing, we're looking at the Pocono station. I've placed a trackmark called "Pocono Bell WB" on the westbound track leading to the station. When the train passes the trackmark, we'll tell it to start ringing the bell.

As you might suspect, there's also a companion trackmark for the eastbound track. Look for the white line near the top of the picture and you can see the trackmark. It's called, appropriately, "Pocono Bell EB."

To use this technique, we tell the train to "Drive via Pocono Bell WB", start the bell, then drive to the station.

To give our AI driver the ability to sound his bells and horn or whistle, we need to download and install two new driver commands for Trainz. They are:

     Hornz <kuid:66277:80001> and
     Bellz   <kuid:66277:80002> (both created by Smileyman.)

Once you've downloaded and installed these commands using Content Manger, you have to go to Surveyor and enable them for use in your session. In Surveyor, click "Edit Session" and then select "Driver Commands" and then "Edit ". That will bring up the following dialog box:

To the left you can see a portion of the available driver commands. At the moment, only those commands that have the green check marks are enabled for the current session.

Since Bellz and Hornz are not checked, we have to turn them on to make them available for our drivers. Just click the check boxes to turn them on.

Note that these selections are valid for the current session only. Enabling Hornz and Bellz for this session will not automatically enable them for other sessions.

To use the commands, simply insert them in the driver sequence for each train where you want the bell or horn to begin. The Hornz command sounds the loco horn once, for about two seconds. You can repeat the command several times to get a longer duration. The Bellz command acts as a toggle. The first time you give the command it starts the bell, and the second time turns it off.

Here's an example, taken from the Erie Northern Route Demo session, where an eastbound commuter train is stopping at our Pocono station.


The first red trackmark tells the train to "Drive via Trackmark Pocono Bell EB". As soon as the train hits the trackmark, it sees the Bellz command and the bell begins to ring. At same instant, the train sees the command to drive to the station and begins to slow down.

When the train reaches the station, the bell continues to ring while the passengers are loading. When loading is finished, we issue a Hornz command to sound the horn, preparing for departure. The horn lasts a few seconds, but while it is blowing a second instance of the Bellz command turns the bell off. A repeat instance of Hornz keeps the horn blowing a few more seconds, and the last red trackmark sends the train to the bell trackmark at the next station, in this case Clearview.

In actual practice, the two Hornz commands blend together, making the horn sound continuous, with the bell stopping about halfway through.

If you don't like the idea of the bell continuing while the passengers are loading, you can turn the bell off by inserting the second Bellz command between the Drive to Station command and the Load command instead of placing it after the first Hornz command.
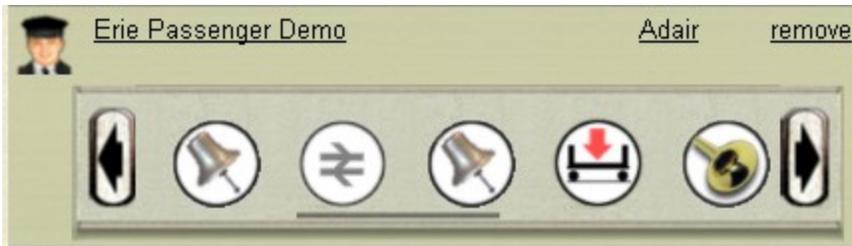
In the picture above, we don't see the initial drive via bell trackmark command, but it's there, and after we pass the trackmark, the bell starts ringing. Then when the train reaches the station, we turn the bell off before the passengers start loading.

Either way works fine, and some experimenting on your route will help you determine which method you like best.

As I said, the overall effect is very cool, but here are a three of things to remember. First, the ability of the bell to sound is dependent to some extent on your hardware and the complexity of the scenery at each station. On Erie Northern, I've found the bell works fine at the smaller stations, but when is station is located in a large city, such as at Erie and Buffalo, the presence of a large amount other scenery and dense trackwork makes the bell somewhat intermittent.

Second, remember the locomotive you use must *have* a bell as part of its configuration, or you won't hear it. On Erie Northern, the Amtrak F40PH has a bell, whereas the Amtrak Genesis locomotives, the P40 and P42, apparently do not. That's too bad. Experiment with the locomotives on your route to see which works best.

Finally, the distance from the trackmark to the station is important. Why? Because since the train is scheduled to go to the trackmark first, it will not know it's going to the station until it passes the trackmark, so we need to make sure the train has enough time to stop. The track speed at Pocono is 45mph, so slowing a passenger train is not too difficult, but the track speed out east at Concord is 79mph, so the trackmark needs to be considerably further away. In fact, a quick check with the ruler tool showed the distance from the trackmark to the station to be 360 feet at Pocono, but at Concord at took 800 feet to slow a five-car passenger train from 79mph. Quite a difference, and some of you may be thinking, "I really don't want to start the bell 800 feet from the station." That's a good point, so here's a suggestion:

Using the Invisible Speed Signal to slow passenger trains at a station

Here's a technique for slowing down a passenger train approaching a station without affecting other traffic. Let's say the track speed at that Concord station is 79mph/126kph, and we'd like passenger trains stopping at the station to slow to 25 as they approach the station. But let's also say freight train and passenger trains not stopping at the station should continue at full speed through the station.

Given the above conditions, we can't use a regular speed limit sign, since that would slow all traffic, not just the stopping passenger train. We need to find a way to limit speed that affects only trains stopping at this particular station.

Those of you familiar with the other tutorials in this series will remember the Invisible Speed Signal v2 <KUID2:137715:23002:2> created by BPanther. This versatile control allows you to "watch" a given turnout and set the track speed based on which direction the switch is facing.

The ISS tutorial discusses this control in detail, so I won't repeat that discussion here. What's important to the current situation is that the ISS can *also* set a speed limit based on train priority. What we do is place an ISS a short distance from the station, and tell it to set a speed of, say, 25 for all trains with a priority of 1. Then we just give our passenger loco a priority "1" and when it hits the control, the train will slow to 25. And since the control only affects trains with a priority of 1, other trains will continue at normal speed. Get the idea?

Okay, let's travel out to the Erie Northern Concord station and look at this technique in detail.

As you can see above, I've placed an Invisible Speed Signal control 800ft/246m from the station. Now check out the drawings below to see how we set it up.

The picture on the left shows the first part of the setup dialog. We've given the control a name that describes its function, which is critical when you have 50 ISS controls on your route like I do. ☺

After naming the control, we tell it MPH or KPH and decide it we want the control to affect all trains or only AI trains. We then click "Add Rule" to create the parameters for this control.

In the right hand picture, I've clicked on the "activation train priority" control, which opens the dialog. You can see we now have the ability to set a speed limit for each priority of train. In our case, we want to set priority 1 trains to 25 and leave the other classes alone, so all we do is enter "25" in the Prio 1 dialog and leave the others at their defaults.

Now for the third line of the dialog. It allows us to set speed based on a particular junction and which direction it faces. In our case, we don't need the ability to set speed based on turnout direction, so what I've done is create a dummy junction called, "Always facing right." This is simply a switch that faces in the right hand direction all the time, like this:

This dummy switch is just one I stuck on the end of an industry track elsewhere on the layout. As you can see, it has an invisible track and switch lever.

The essential thing is this switch faces to the right and *never changes*, so I can refer to it from anywhere on the layout any time I need a reference junction for an ISS.

Now let's return to our Concord station ISS dialog.

Now I've filled in the rest of dialog box, telling the control to watch junction "Always facing right" and whenever it's facing in the right hand direction—which it is always is—to set the speed limit for priority 1 trains to 25. What this does is set a continuous speed limit of 25 for all trains with a priority of 1.

Pretty cool.

With this control in place, any priority 1 train that approaches the station will slow to 25 before stopping. One thing to remember though: If you use this technique to slow your trains, *don't forget to restore the speed limit after the station* or your trains will continue down the line at 25!

One more thing. Let's say we have a number of passenger stations and we've placed these ISS controls at each station. Given that, priority 1 trains will slow to 25 as they approach any station.

That's fine for commuter trains that need to stop at every station, but what about the express train that only stops at one or two places? We don't want the express to slow for every station, only where it's scheduled to stop. How do we work around that problem?

We do it by changing a train's priority on the fly, by using the Priorityz command, <kuid:66277:80003>, also created by Smileyman. This is a command you can insert in a driver's sequence the same way would with a "Bellz" or "Hornz" command.

Let's say we have a passenger train that enters the route from a portal. This train will pass three stations before stopping at a place called Binghamton. Then after leaving Binghamton, it will pass two more stations before leaving the route. What we need to do is set the priority of the train to 1 only for the Binghamton station. Here's how we do it:

The first trackmark symbol can be any trackmark after the third station and before we reach Binghamton. The dialog tells the train to drive via this trackmark, then set the train's priority to 1. On reaching the ISS control at Binghamton, the train slows to 25 before stopping. Then, after the train finishes loading, we change it's priority back to the default "2", so we can bypass the rest of the stations and exit the route.

One final thought before we leave the ISS.   We've just talked about using the ISS to limit train speed at passenger station. The good news is we can use the same technique to limit train speed on an industry track as well. Consider the following example from my Midwest Central route:
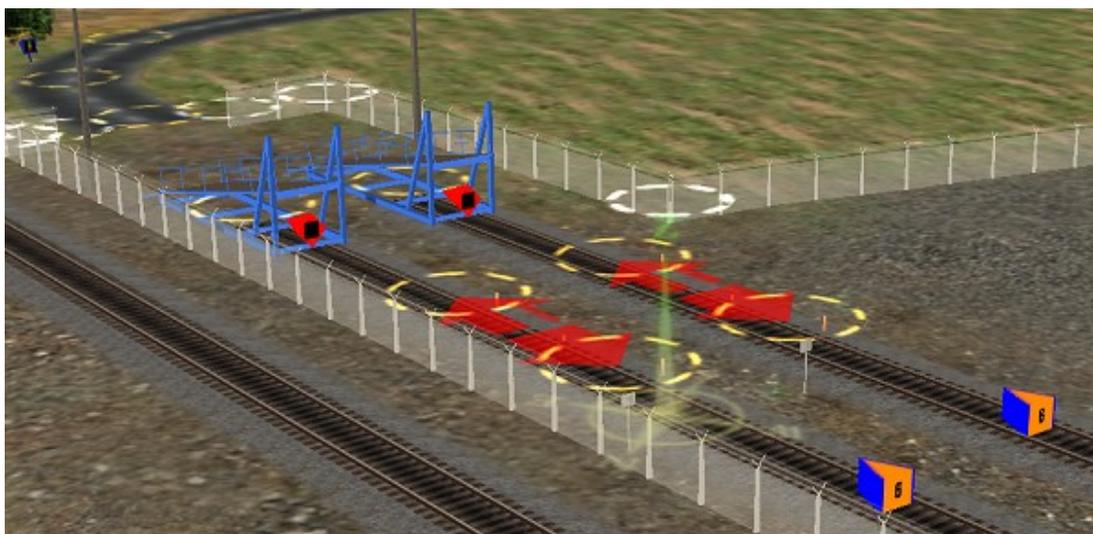
What you're looking at above are the two automobile loading ramps at the Midpoint Auto Plant. In operation, we want the car carriers, called, "Autoracks", to back right up again the blue ramps, since the automobiles are loaded from the end of the train. I needed a more precise way of controlling where the cars stop, so I used a pair of ISS control to set the speed limit to 6mph/10kph as the cars approach the ramps. Just point the ISS controls to that "Always facing right" dummy switch and the ISS stays at 6mph all the time.

This method works quite nicely, but as with the passenger station, don't forget to restore the speed or your train will leave the industry at 6mph! In the example above, notice the two gray speed limit signs facing toward the ramps. When the train pulls out after loading, these signs set the train speed back to 15mph, the industry speed.

Here's the auto plant in operation. The cars are loaded and the train is about ready to depart.

Notice the speed limit sign near the fence opposite the car on track 2. As the train departs and the last car passes the sign, the speed is restored to normal industry speed.

Putting it all together

Okay, we've talked about Bell and Horns and the ISS and all that, and some of you may be saying, "Man, this is way too complex for me." Well, just give me another minute or two and you'll see the whole sequence.

Let's travel back to Concord one more time. Check out the drawing on the page.

Concord Bell EB

In the foreground, we have our ISS control, now set up to slow all priority 1 trains to 25mph, just as we demonstrated earlier. I've placed it 800 feet from the station.

A bit further down the track is our "bell" trackmark, "Concord Bell EB", now placed about 300 feet from the station.

Since the train will pass the ISS first, it will begin to slow down from the 79mph track speed to 25mph long before it hits the trackmark, allowing us to place the bell start point much closer to the station than we could if we rely only on the trackmark to slow the train down. Get the idea?

So, then, it's up to you to decide how much of this you want to do. If you opt not to the ISS, that's fine, just be sure to place your "bell" trackmarks far enough from the station the train has enough time to stop.

Using Portal Trackmarks

One thing that has always bothered me about portals is how trains slow almost to a stop before they enter a portal. Over the years I've tried various methods to work around this problem, and recently I discovered one that seems to work well.

What we do is place a trackmark a short distance from the start of the portal, like this:
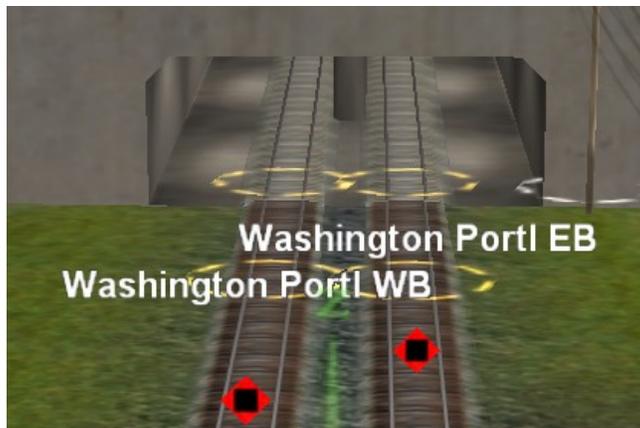
In the drawing above, we're looking at the Erie Northern Washington portals. There's a trackmark near the entrance to each portal. Notice that I named the trackmark very similar to the portal, with only the "a" in "portal" removed. Doing so makes it easy to remember the trackmark name.

In building your session, just tell the train to go via the trackmark, then the portal, such as:

Drive via trackmark Washington Portl EB
Drive to Washington Portal EB

In operation, the train doesn't see the "drive to portal" command until it passes the trackmark, and so it enters the portal at track speed. This method seems to work well with 80mph US trains, but I haven't tested it with very high-speed trains such as the TGV. If you run such trains on your other routes, drop me an email if you have trouble with this technique. One word of caution: This technique does *not* work with iPortals, and may result in a collision, so don't use it with an iPortal.

The use of this technique is purely optional. You can simply command the train to drive to a portal, and it will work just fine without the trackmark.

Improving signal operations at a divergence

One last subject before we close this tutorial, and that's about getting correct signal indication at a divergence. In the picture below, we have a double track mainline with a small yard branching from it. At the right, our GP38 is waiting to enter the yard, and what I want to show you is how we might signal the junction to make it more realistic.
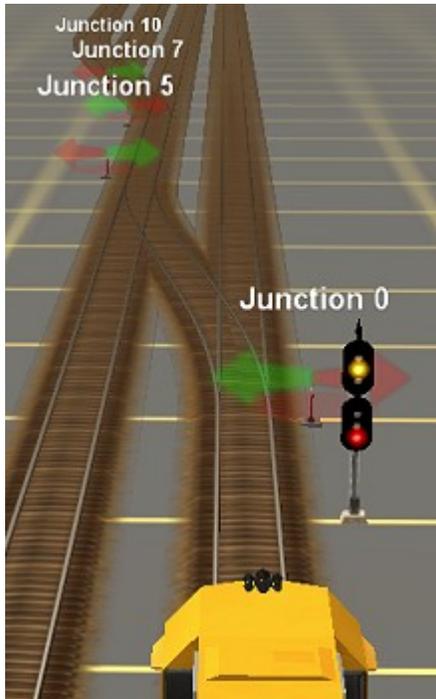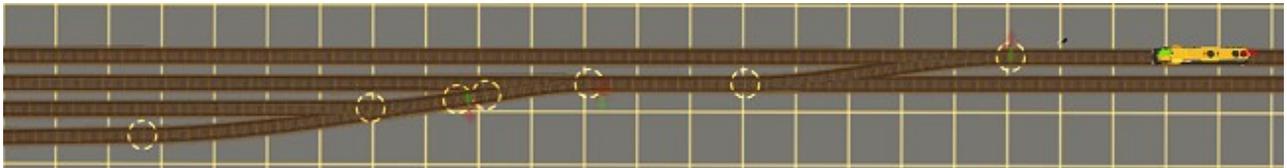

To left we have another view. The switches are aligned for the GP38 to drive to the first yard track, but the signal indication is not correct. What we expect to see on this signal is red-over-yellow, indicating the divergence to the left

This is a limitation of the Trainz AI system. In fact, the manual says that in this situation the signal will only display correctly if you have signals at every switch or if all the turnouts face left.

Personally, I'm not a fan of placing signals at every switch. In the example above, I prefer to hold the GP38 on the mainline until he has a clear path all the way to his destination track. If we allow him to take the crossover and stop at one of the yard ladder switches for a signal, his train may block both mainlines. So, I make him wait on the main until he can get all the way to his destination without stopping.

That leaves us with the incorrect signal indication. The solution--although I hold my nose, as I present it—is to place a dwarf signal on the crossover track between the mains. Check out the drawing on the next page.
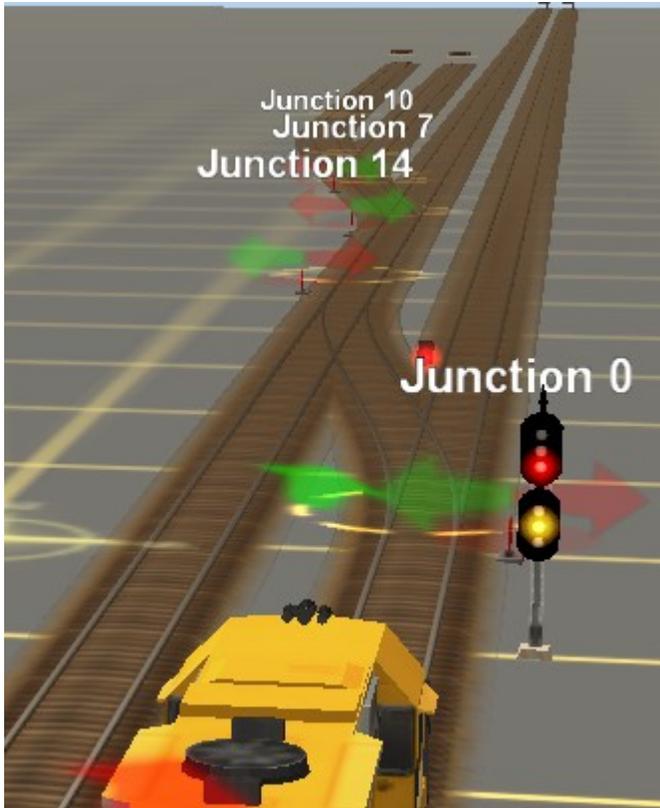
You can see the new dwarf signal on the crossover track. With this signal in place, the mainline "02" signal always gives a least the red-over-yellow indication any time the turnout is set for the crossover.

The disadvantage of this method is that it will allow the GP38 to make the turn toward the crossover track even if the opposite switch is still set for the mainline. The dwarf signal will hold the GP38 before it takes the crossover so there's no danger of a collision or derailment, but it's not an ideal situation.

The advantage of using the dwarf is that when the loco is finally allowed to cross the mains, the "02" signal will always correctly indicate the divergence.
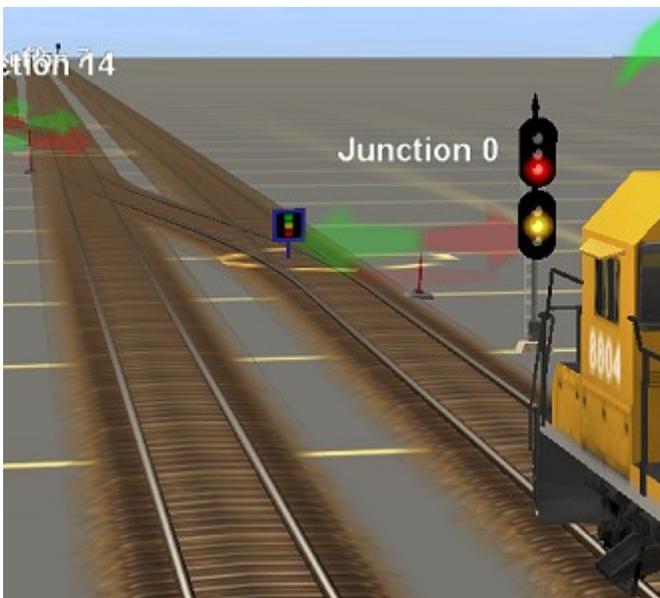
Another possibility is to use an Invisible Signal, in this case <KUID2:45324:24010:1> created by NorfolkSouthern_37.

This has a couple of advantages. First, because it has no visible indication, you can slide the control almost all the way to the switch points, which will stop the loco while it's still on the mainline. It will still pass the "02" signal anytime the turnout faces left—nothing to do about if you use this technique—but at least it stops on the main.

The other advantage is most of the time it looks more prototypical than having the visible dwarf signal on the crossover track.

Here's what it looks like in Driver.   I blocked the other track, so the GP38 couldn't cross. After I slid the invisible signal almost to the switch points, the loco stopped just short of the switch.

So, neither method is really ideal, and it's up to you to decide what you like. You can settle for the incorrect indication on the mainline signal or put a signal on the crossover. Your choice. ☺

Well, that wraps up this tutorial. As always, I hope you found something you can use on your route.

Chuck, September 2009