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HOW TO OPERATE YOUR MODEL RAILROAD

SUMMER 2012

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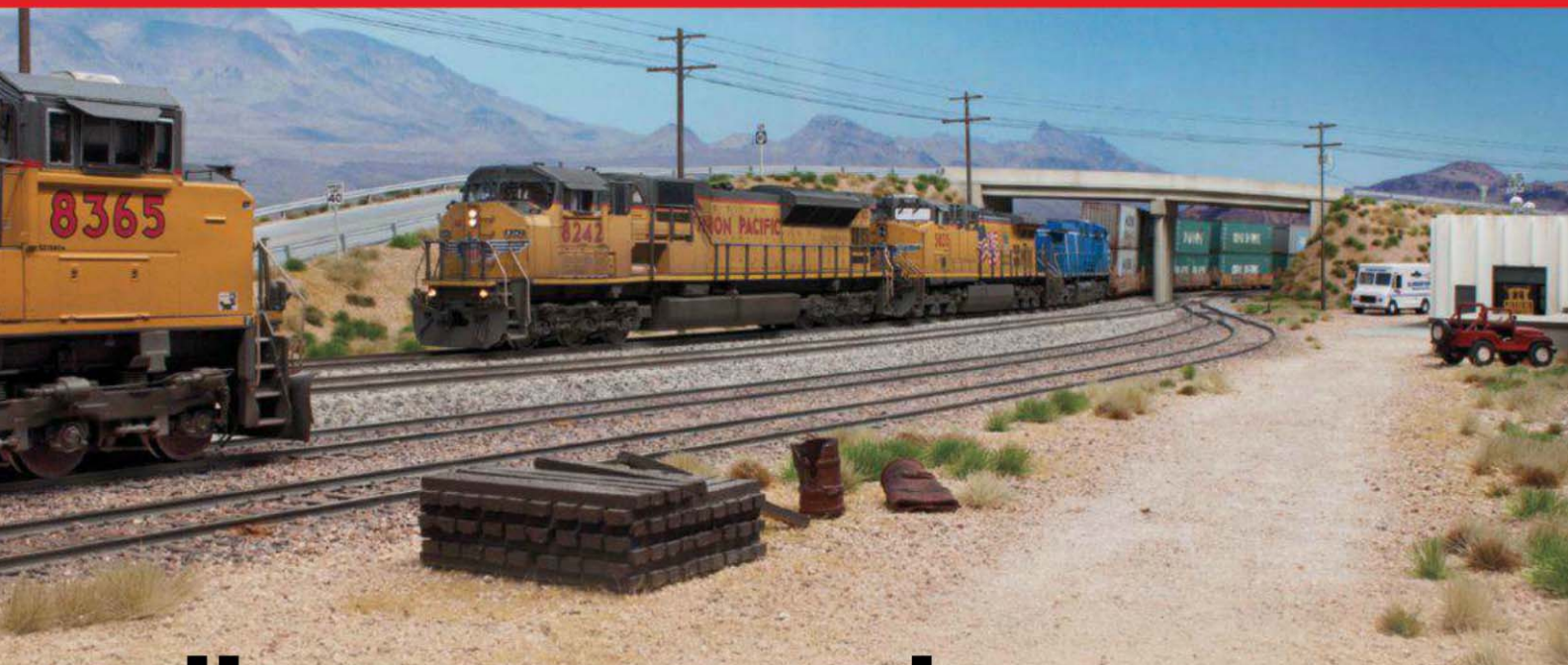

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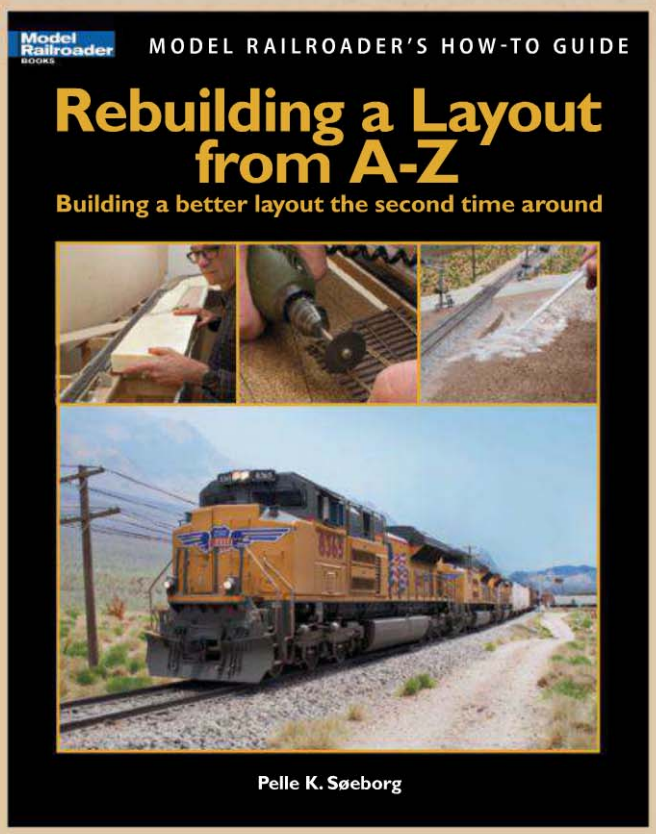

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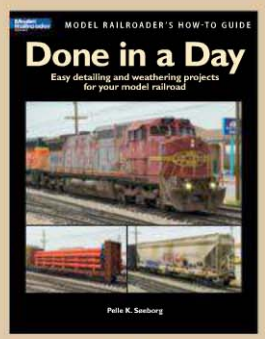

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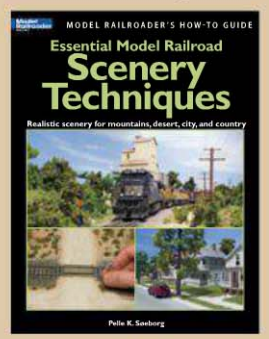

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HOW TO OPERATE YOUR MODEL RAILROAD

GETTING A RUNNING START

Model Railroader **managing editor David Popp switches local industries at the town of Torrington, Conn. David used many of the techniques shown in this magazine to set up his N scale layout for realistic operating sessions.**

WHEN I WAS GROWING UP in the 1970s, a lot of my summers were spent reading my dad's collection of *Model Railroader* magazines and working on our family's latest train layout in HO or N, or sometimes both. In reading those magazines over and over, two model railroads captured my attention more than any other. One was John Allen's Gorre & Daphetid and the other was Bruce Chubb's Sunset Valley. I was fascinated with the concept that these two model railroads were run like real railroads. Trains were made up and broken apart because the cars had actual destinations. Industries shipped and received goods and materials, and you could tell whether a car was loaded or empty. And both layouts ran scheduled trains with a clock marking their times.

Although I didn't understand all of the details of how operation worked, I knew I wanted that kind of realism for my own model railroad. For years afterward I picked up any book or article that promised to help me achieve better operation, and the succession of layouts I built reflected that drive.

FAST FORWARD to an evening in 2006. Andy Sperandeo had agreed to come over after dinner and help me get my N scale Naugatuck Valley RR ready for its first operating session. I'd already built several model railroads with varying degrees of operation, but this was going to be my first real experience with timetable and train order. I'd done a lot of the leg work in developing an operating scheme from prototype New Haven paperwork and practices, but there was still a mountain of car cards and waybills to fill out. And I wasn't too clear yet on how to write train orders.

Andy has operated more layouts than anyone I've ever met, and he is a wealth of knowledge when it comes to connecting prototype practices to model railroad operation. I felt very fortunate to have Andy's help in getting the layout ready to roll. Over several sessions, he taught me how to write those train orders, as well as how to organize a freight yard, and my layout operates smoothly now thanks to his help in the beginning. He's been a great teacher.

WHEN PULLING THE MATERIAL together for *How to operate your model railroad*, I chose stories that answered many of the questions I had in the days when I was just getting started. Inspiration was a big part of why I got interested in model railroad operation, so I've included a fun article by Jim Providenza explaining a typical operating night on his HO Santa Cruz Northern layout. (See page 6.)

Although Andy can't personally help everyone set up their layouts for realistic operation, his expertise can. You'll find this magazine contains a lot of writings from his MR The Operators columns, teaching you about dispatchers, train orders, and many other important operating details.

You may be surprised to find that you don't need to do a lot to get started operating your model railroad. Simply installing a car-routing system will provide hours of switching enjoyment for you and your friends on any layout, large or small. And when you want to add something more, we've organized this magazine into book-like chapters for easy reference. Pick a subject and dig right in.

AN 84-PAGE MAGAZINE cannot tell you every last detail about what you need to know when it comes to model railroad operating sessions. However, if you follow the articles presented here, you'll be well on your way to finding the enjoyment that comes from running your model railroad realistically, even by yourself – and that should leave you far better off than I was when I got started in the 1970s.

David Popp

HOW TO OPERATE YOUR MODEL RAILROAD

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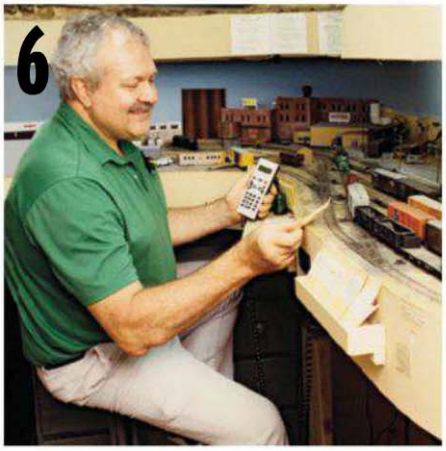

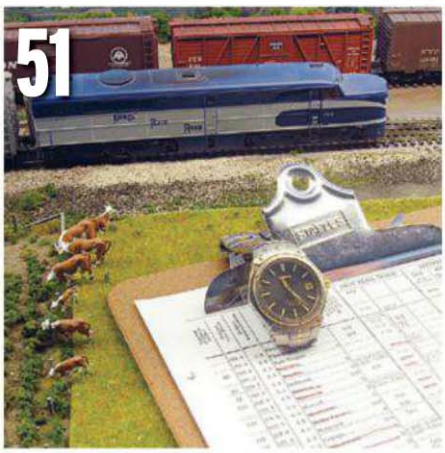

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OPERATING NIGHT ON THE SANTA CRUZ NORTHERN

What's really behind operating this HO railroad

BY JIM PROVIDENZA
PHOTOS BY GEORGE HALL

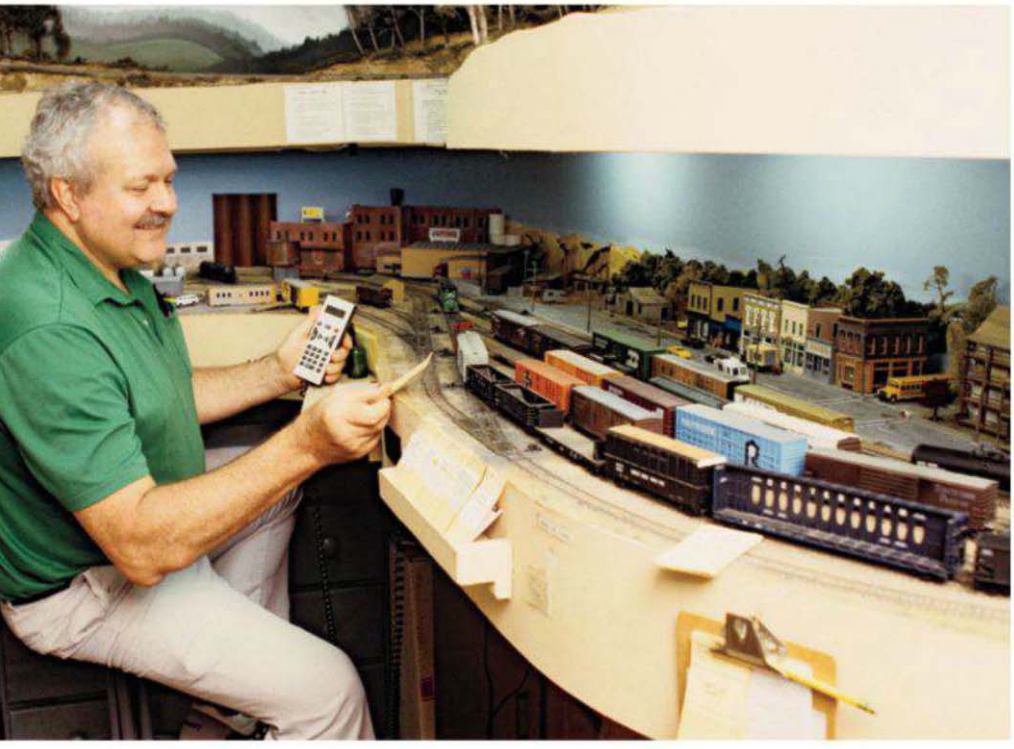
I STILL RECALL A PHOTO in the January 1973 *Model Railroader*. It was included in Bruce Chubb's "Brakeman on the Yellow Extra" article, and it showed his father-in-law, Ed Huston, giving hand signals to an engineer making a pickup. At about the same time I got the chance to operate on Rick Kang's layout. Revelation! The foundation for my interest in model railroad operations was poured.

Over the years I've developed my Santa Cruz Northern RR to have one focus – operations. Besides the operating sessions, the fun has also come from developing operation systems.

SANTA CRUZ NORTHERN OVERVIEW. The SCN is a prototype freelanced railroad. That's means it's all made up, yet grounded in prototype practice. I located it in a specific place in the real world during a particular era. The SCN deals with the economic, political, and historical forces that real railroads faced in that same time and place.

Owned jointly by the Western Pacific and the Atchison, Topeka & Santa Fe, the SCN runs from a connection with the WP in San Jose, Calif., south to Santa Cruz on the Pacific coast. It shares many of the characteristics of lines in the area, such as the Central California Traction Co., the Sacramento Northern, or the Northwestern Pacific. Motive power is either secondhand or leased, often from the parent roads.

Traffic traditionally centers around industrial products in San Jose and agricultural products from the Santa Clara Valley and Santa Cruz Mountains. The railroad also delivers cement to the site of a large dam project.



1. Vern Alexander, the Mac Street yardmaster, checks a waybill to see what block of cars he'll add that car onto. For the moment, these strings of cars are no more than that – individual cars grouped by destination. They only become a train when the dispatcher calls the crew.

FIRST THINGS FIRST. I usually hold operating sessions in the evening. Crew members arrive over a half-hour period and mark up on the call board for the jobs they want. If a job's taken, they look for another one. It's sort of seniority by arrival. The call board is nothing fancy, just an old whiteboard listing the train numbers and the locomotives assigned to them. Next to each train on the board I've drawn a box for engineers and conductors to sign up in.

Trains on the SCN include high-priority through freights, unit trains, intermediate through freights with car block swapping, helper operations, way freights, work trains, industrial switching, transfer runs, and yard operations.

During a typical operating session on the SCN we run an East and West Perishable, a drag freight in each direction, the Cement Train, two local freights (the East Rica Local and the Mountain Local), an industrial switcher (The Crusher), a three-trick switcher at MacDonald Street Yard (Mac Street), and a work train.

A set of helper locomotives goes on duty during the day and usually makes two trips up the hill with the loaded cement train and the westbound drag. Recently a state-supported Amtrak passenger train called the *Suntan* started running between Santa Cruz and San Jose/San Francisco.

CREW CALL. Each mainline freight train usually has an engineer and conductor. A helper set needs only an engineer. The work train and The Crusher may run with or without a conductor.

2. Santa Cruz Northern no. 2917, an ex-Southern Pacific Alco RS-11, is in charge of the Work Train today. It's shown here on the back track at MacDonald Street Yard in West San Jose. Mac Street, as it's known to SCN operators, is the operational hub of the railroad.

Train movements over the main line are controlled by a dispatcher who issues track warrants via radio. Both the Mac Street yardmaster and the dispatcher jobs may be broken into a first and second trick.

Finally, there's the trainmaster. I fill this position quite often myself but try to hand it off to experienced crew members when I can. The trainmaster is "management." He or she makes operating decisions, troubleshoots both operational and mechanical problems, and puts the ball in play by giving the dispatcher the calls for trains coming onto the modeled portion of the SCN and by calling crews when they go on duty.

During the evening the trainmaster and dispatcher will make sure that all operating problems are resolved as they crop up and that mechanical ones are either fixed on the spot or brought to my attention for repair before the next operating session.

THE CLOCK'S TICKING. Tonight's yardmaster, Vern Alexander, and the dispatcher, Dave Clemens, are the first two crew members on duty. They start their work before any trains move. Vern, our yardmaster at Mac Street, is a "footboard yardmaster" – a fancy way of saying he runs his own yard switcher.

Vern starts by comparing the waybills for each yard track with the cars actually there. The cars to go in the regular trains we operate should have been blocked by the last session's yardmaster, but Vern double-checks to make sure they're all where they're supposed to be.

If he finds any bad order cars, he sets them out at the tail end of one of the yard tracks for repair. He also reviews the moves he will coordinate with each train crew as it comes on duty. Finally, he looks over the day's lineup to see if any trains have missed their usual arrival times.

As trains arrive during the session Vern switches in cuts of cars blocked for destinations farther down the line – either on or off the modeled portion of the SCN. Meanwhile, he will receive blocks of cars destined for Mac Street and the surrounding Santa Clara Valley area. He will also receive cuts of cars that have to go to interchange. In between trains Vern will sort cars into new blocks for the next day's trains.

Meanwhile, dispatcher Dave Clemens puts his desk in order, sets the 4:1 ratio fast clocks, fills out the train sheet headings for the day, and checks to see which locomotives are already assigned to the day's trains. He tests the radio to see

3. Not a railroad that can afford to let locomotives sit idle, the WP routinely uses its passenger FP7s on short turnaround freights between passenger assignments. The 804A is heading up today's westbound Perishable through west San Jose. Meanwhile, The Crusher is spotting a mechanical reefer at the Del Monte Cannery in the background.

4. Cement Train conductor Morgan Trotter and engineer Don Cabrall plan the moves they'll make to work Damsite on the upper level. Behind them Bill Kaufman runs The Crusher at West San Jose. Bill's running The Crusher alone this evening, so he has both a radio headset and a throttle.

which channel to use during the session. Cordless phones and baby monitors in the neighborhood often gum up a few of our five available channels.

Dave also checks with the trainmaster regarding the day's train lineup. He starts to formulate his game plan for meets on the single-track railroad.

YOUR BREAK-IN RUN. We start the session when enough crew members arrive to run the first four trains. Since this is your first trip over the SCN we'll let you work a through train to get a feel for the railroad. You'll work as the engineer of

the Santa Cruz Perishable West and have an experienced conductor to guide you over the road.

As you become more familiar with the SCN you'll get the chance to take on jobs that require more knowledge and give more varied experiences.

You mark up for the Perishable on the callboard and introduce yourself to your conductor. Your train is waiting on the main at Mac Street Yard as the van takes the crew that brought it in back to the station. Your conductor will pick up the clipboard for the Perishable; looking it over together, you find a short "Train and Job Description" with an air brake test card laminated to it.

The job description tells you briefly what work your train does. The air brake test card shows you how to simulate air tests. A half dozen track warrant forms are clipped to the board as are the waybills for all the cars in your train. Your conductor puts on an FM headset and checks in with the dispatcher. He can also communicate with Mac Street Yard and other trains by radio. You'll work closely with the conductor, communicating by voice or via hand signals.

You pick up a Lenz walkaround throttle and dial in the last two digits of the lead locomotive's road number. You then check your throttle and make an air test. As you're doing that, the conductor gets permission from the yardmaster to depart the yard and contacts the dispatcher for and authority to proceed over the main. In no time at all, dispatcher Dave Clemens issues his first track warrant for the evening, "Check box 2, proceed from Mac Street to Dougherty's."

The Perishable is a hot train, but its trip over the SCN isn't made at lightning speed. Maximum authorized speed on the SCN is 30 mph (count "one, one thousand; two, one thousand" as the nose of your locomotive passes two 50-foot boxcars). The pace is moderate but steady; you won't stop for any other train except the first class *Suntan*.

You proceed to West San Jose, where the dispatcher has given you "joint work time" to set out a hot reefer with help from The Crusher. Work completed, the conductor exchanges paperwork with The Crusher's crew and you are off through East Rica. You have a couple of good units and a short train so you don't stop here to pick up a helper for the hill (also known as the helix).

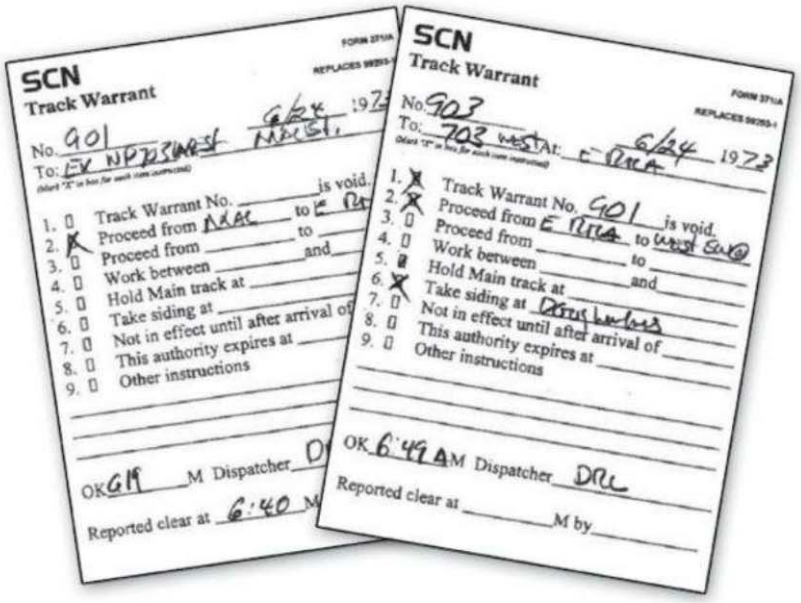
A CHANGE OF SCENERY. After crossing Los Gatos Creek on a through truss bridge, your train begins the climb up the east slope of the Coast Range toward Dougherty's. Once there you'll have to get a new track warrant to proceed.

As your train crosses Watson Crick Trestle, your conductor radios dispatcher Clemens. He issues a new warrant giving you authority to proceed through Fallon after you meet the *Suntan* on the siding at Dougherty's.

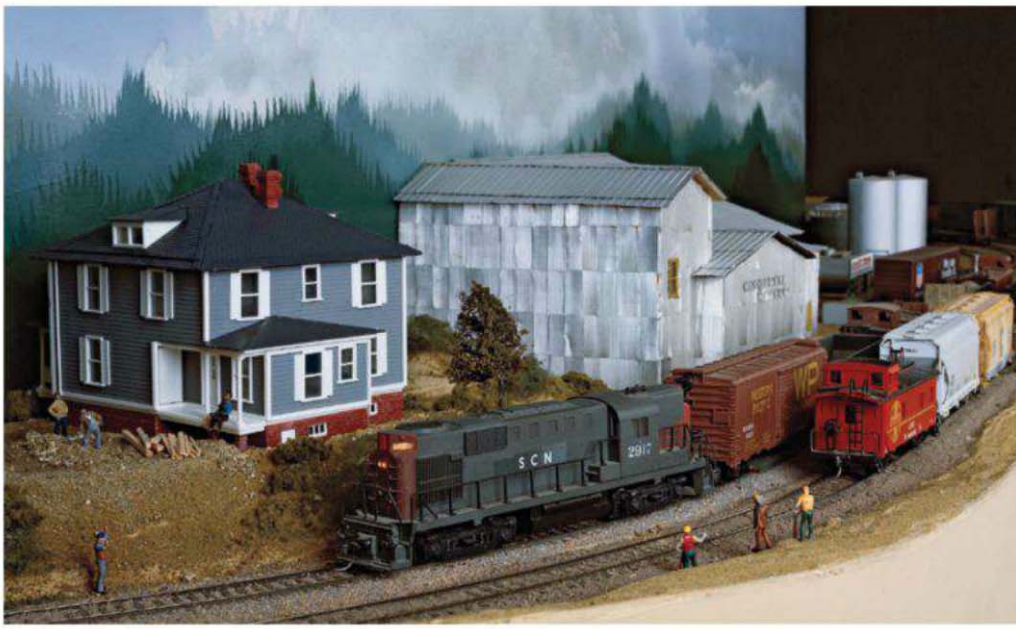
After the meet you ease out of the siding, roar upgrade through two tunnels and a loop, and finally reach the summit at Sergeant's. Foreman Juan Gonzales' motorcar is on the siding, and he gives you a roll-by inspection. You drift downgrade past the junction with the Damsite Branch then through Fallon and Fall Creek Junction, heading for Santa Cruz.

At the end of your trip you leave the West Perishable in the only available staging track at Zayante. Your conductor releases his last track warrant and hangs the clipboard on a fascia hook by Fall Creek Junction.

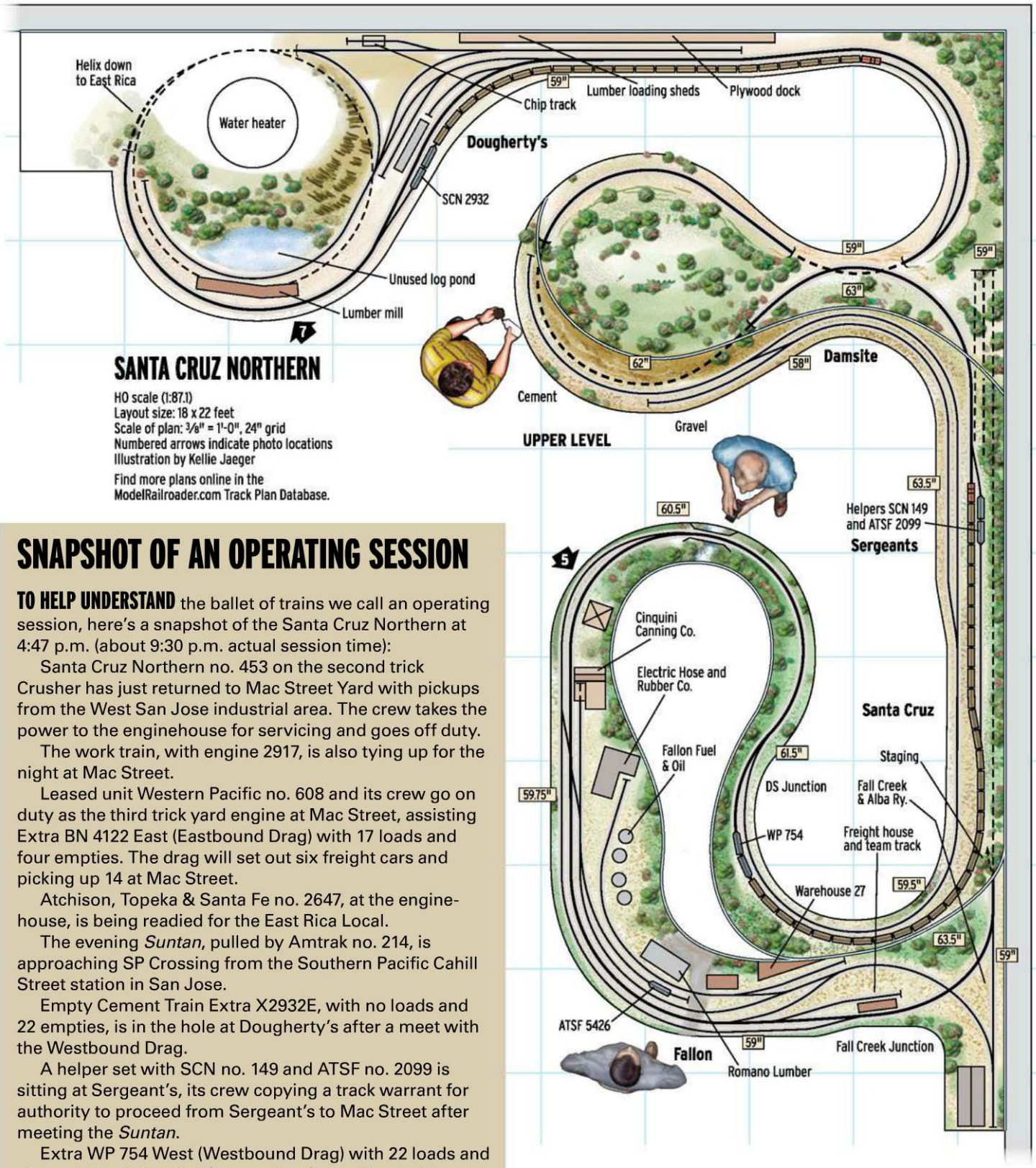
SHOOTING THE BREEZE. While you wait for your next job, you can railfan awhile. Let's talk about the railroad. The SCN is



Crews write down instructions from the dispatcher on track warrants. Any crew operating without a warrant faces suspension if something goes wrong.



5. The Work Train is in the siding at the east end of Fallon as the Westbound Drag rolls past on the main line. Some of the maintenance-of-way crew are standing on the opposite side of the main to give the drag a rolling inspection for hot boxes, loose loads, and dragging equipment.



SNAPSHOT OF AN OPERATING SESSION

TO HELP UNDERSTAND the ballet of trains we call an operating session, here's a snapshot of the Santa Cruz Northern at 4:47 p.m. (about 9:30 p.m. actual session time):

Santa Cruz Northern no. 453 on the second trick Crusher has just returned to Mac Street Yard with pickups from the West San Jose industrial area. The crew takes the power to the enginehouse for servicing and goes off duty.

The work train, with engine 2917, is also tying up for the night at Mac Street.

Leased unit Western Pacific no. 608 and its crew go on duty as the third trick yard engine at Mac Street, assisting Extra BN 4122 East (Eastbound Drag) with 17 loads and four empties. The drag will set out six freight cars and picking up 14 at Mac Street.

Atchison, Topeka & Santa Fe no. 2647, at the enginehouse, is being readied for the East Rica Local.

The evening *Suntan*, pulled by Amtrak no. 214, is approaching SP Crossing from the Southern Pacific Cahill Street station in San Jose.

Empty Cement Train Extra X2932E, with no loads and 22 empties, is in the hole at Dougherty's after a meet with the Westbound Drag.

A helper set with SCN no. 149 and ATSF no. 2099 is sitting at Sergeant's, its crew copying a track warrant for authority to proceed from Sergeant's to Mac Street after meeting the *Suntan*.

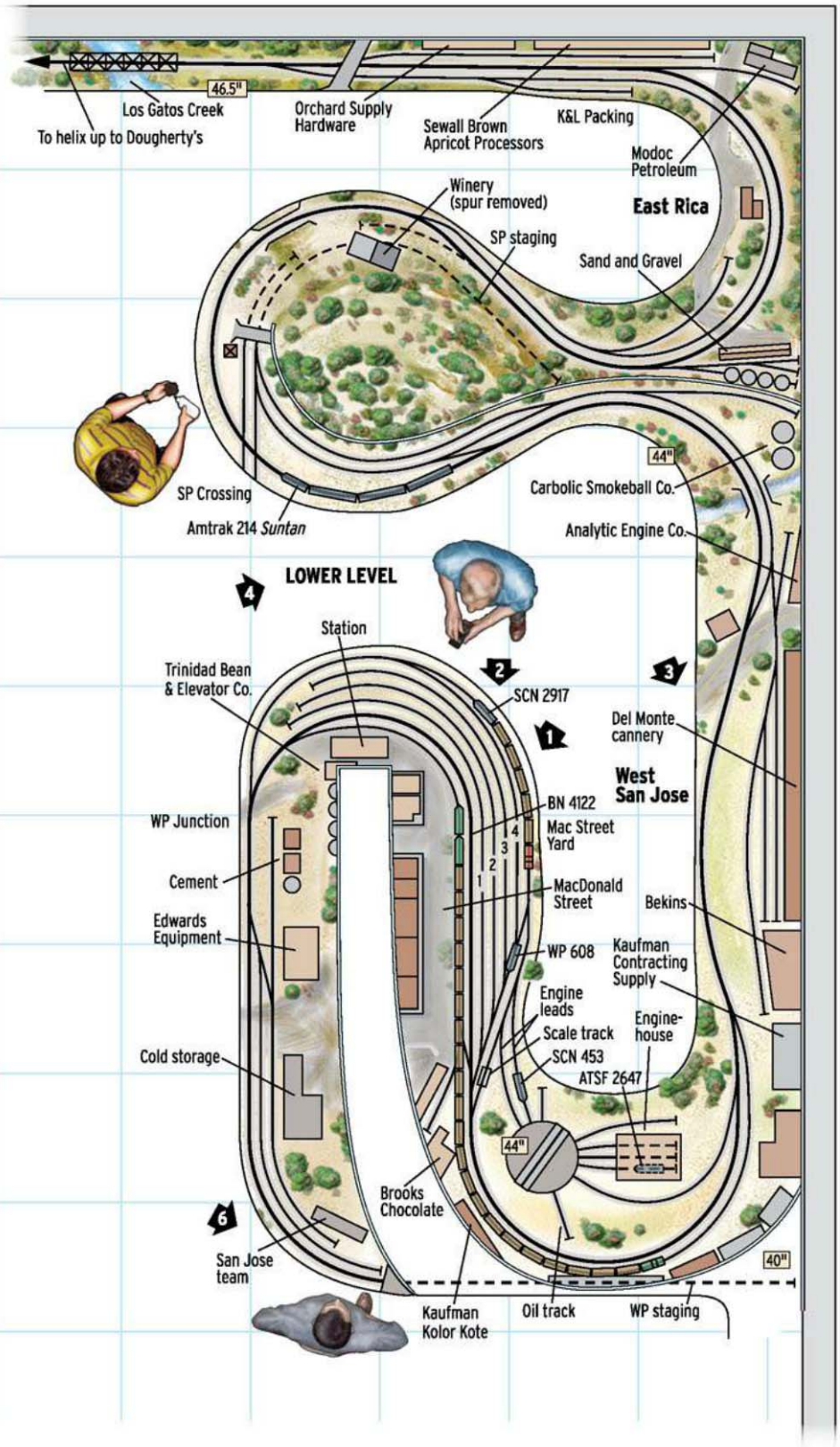
Extra WP 754 West (Westbound Drag) with 22 loads and nine empties is leaving Sergeant's after cutting out the swing helper. It's on its way to Fallon, where it will set out its "mountain cars" for the Mountain Local.

Santa Fe no. 5426, power for the Mountain Local, is at Fallon, awaiting the arrival of the X754W.

And there you have it, the SCN frozen at a moment in time. When you see it like this, it's easy to appreciate and enjoy the complexity of an operating session. – *J.P.*

a point-to-point, double-deck, walk-around layout in a garage. The railroad is single track with about 200 feet of main line, of which 45 feet are in a helix.

The four major sidings are at least 13 feet long. Aisle width is 24" at choke points and a minimum 36" in operating areas. The design is tight, but the trade-



offs between aisle width, minimum radius, and siding length were hard fought. Each is narrower, smaller, or shorter than I like, but the design gives me the sort of operation I wanted in the space I had.

The distance between the lower level track and the bottom of the upper level fascia varies from 8½" at the west switch at East Rica (the beginning of the helix) to 15" between West San Jose and Damsite. I inset the upper level over East Rica, West San Jose, and Mac Street to create open operating space.

For track power the SCN uses Lenz Digital Plus Digital Command Control. I've been using some form of command control since 1977.

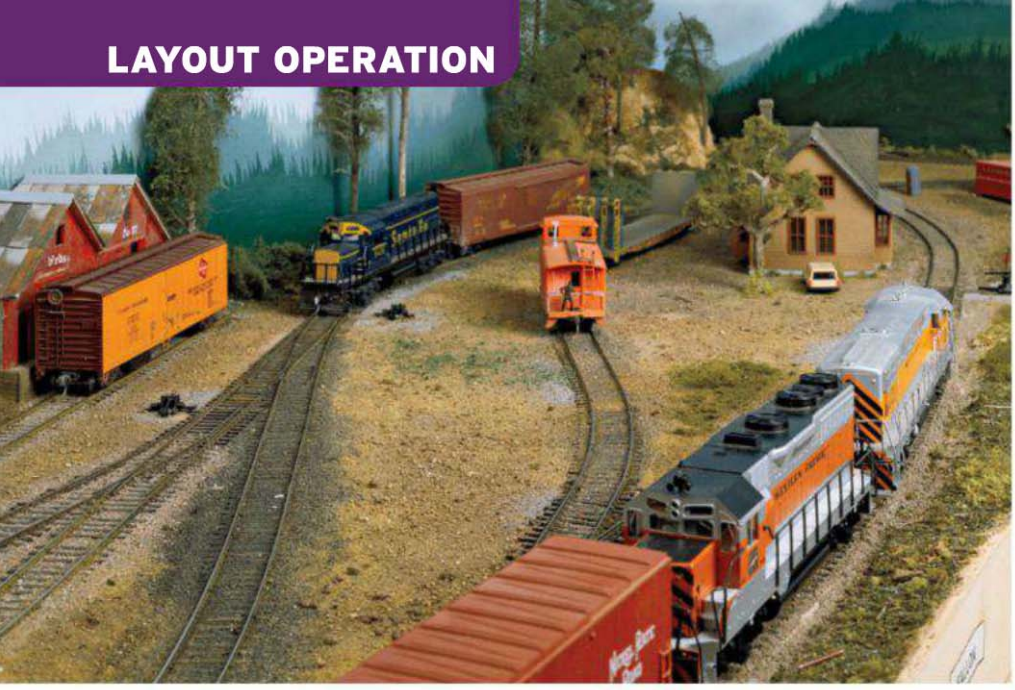
THE LAYOUT AT A GLANCE

Name: Santa Cruz Northern
Scale: HO (1:87)
Size: 18 x 22 feet
Theme: freelanced
Locale: San Francisco bay area, California Coast Range
Era: 1973
Style: double deck, walkaround
Minimum turnout: no. 4
Minimum radius: 26"
Maximum grade: 2.25 percent (main), 3.5 percent (branch lines)
Benchwork: modified L-girder and box frame
Height: 44" to 63"
Roadbed: ½" plywood with Homasote
Track: handlaid code 70 and 83 nickel silver (visible), flextrack (hidden)
Scenery: plaster over screen and hardshell (lower level); wallboard mud over extruded foam (upper level)
Backdrop: tempered hardboard with taped joints
Control: Lenz Digital Plus Digital Command Control

The crew: Regular operators on the Santa Cruz Northern are, from left to right: Scott Kew, Jim Providenza, Vern Alexander, Frank Jozaites, Morgan Trotter, Bill Kaufman, Mike Providenza, Don Cabrall, and Dave Clemens.

WRAPPING IT UP. As the session winds down, the yardmaster concentrates on getting cars for the Southern Pacific out of Mac Street Yard to the SP Crossing and on blocking incoming cars from the East Rica Local and the Eastbound Drag for the next session.

The dispatcher makes sure trains have tied up and that the bad order sheet is filled out. Occasionally we end a session at a predetermined time. More often though, crew members leave individually, with a few staying around for as long as I leave the layout power on.



6. Extra WP 754, the Westbound Drag, slows for the west switch at Fallon in the right foreground. On the point tonight are a U30B and a GP35. At top center, the crew of the Mountain Local, using leased Santa Fe power, is pulling a Santa Cruz Northern boxcar from the Fall Creek & Alba Ry. interchange.

When everyone has left, I take a walk through the SCN to make sure all the radios and locomotive headlights are turned off, any soda cans are collected, and everything is where it belongs.

Now I reflect on how little effort all this really took. Several weeks before the session I made some phone calls to regular operators and other people who asked to be invited. I then spent a few hours over several days working as freight agent and hostler turning and blocking trains, turning waybills, cleaning track, and making sure I repaired items from the bad order list compiled by the dispatcher during the last session.

It's quiet now. Before I open the garage door and drive in the car I take one last look. I'm amazed that so many friends can derive so much enjoyment from something I've created. For me, this is what it's all about.

15 YEARS ON. The SCN has grown and changed over the years since this article was first published in the May 1996 *Model Railroader*. The railroad is still recognizable, but evolution has been constant. Changes include a wider aisle at Mac Street, improved layout lighting, and cushioned floor mats on most aisles.

Over the years our round robin work group laid additional main and secondary track and revised staging on both ends of the railroad, including a hidden reverse loop at San Jose and a combination active station/visible staging at the Santa Cruz end of the railroad. I scratchbuilt and kitbashed structures to create several major industries, including a new

EXTRA 2932 WEST VS. THE HILL

I WAS WORKING THE DRAG over the hill from Mac Street Yard. My assigned power was SCN 2932, an aged Alco RS-11 that was in bad need of shop time, and WP 703, an EMD GP7 whose new-ish paint job belied an electrical system in bad shape.

Julie Thomas was the somewhat green conductor who had been pressed into service on this job. I'd only been over this part of the road a few times myself. Our combined lack of experience was soon to show.

The yardmaster released us from Mac Street nearly an hour late and dispatcher Dave Clemens was not too pleased. We had 20 cars in tow and a useless caboose. Over the squawk box I heard the dispatcher give us the main out of the yard and authority to go as far as SP Crossing. I waited for my conductor to acknowledge the order and relay it to me.

I released the air and moved the throttle to notch 2. Number 2932 growled reluctantly, and I had to play with the throttle to get the train moving. Coming to a stop at the SP Crossing interlocking, we waited for the northbound *Coast Starlight*, running as late as we were.

The *Starlight* passed, and I was waiting for Thomas to get orders from the dispatcher when I realized that I didn't remember her reporting that we were at the crossing. I jumped for the radio. "Thomas!" I barked. "Did you call Dispatch when we stopped?"

"What?" was all she managed to get out before I heard Dave on the air.

"The SP dispatcher informed of Amtrak's passing 10 minutes ago, 2932! You guys asleep?" His voice was steady and firm. He knew this was Julie's first run on this job.

"Sorry, Dispatch, sir!" Julie blurted out, "but I really don't know what I'm doing here!"

Great line to use for keeping your job, I thought.

"Keep calm, Thomas, we'll get you through this in one piece," Dave said.

"I hope the railroad is still in one piece when I'm through with it!" Julie replied. I heard Dave laugh over the radio for the first time in the years I've known him, and I suspected that Julie had just won herself a helping hand.

"Extra 2932 West, advise when you're clear to copy a track warrant," Dave said in his official dispatcher's voice.

We took the siding at East Rica for a meet with the Cement Train. After it passed, we lined the switch for the main. I notched out the throttle, and 703 coughed, sputtered, and died. I knew we were in trouble. We would never be able to make it up the 2.2 percent grade to Dougherty's with one unit. We needed assistance.

"Thomas, this is Jozaites," I called back to the caboose.

"What's the problem?" she asked.

"Call dispatch. We lost a unit, and will need a helper getting up the hill."

"Lost a unit?" she asked. "How did we do that?"

"I mean it quit running, Thomas!"

"Oh!" she replied, with just a hint of malice.

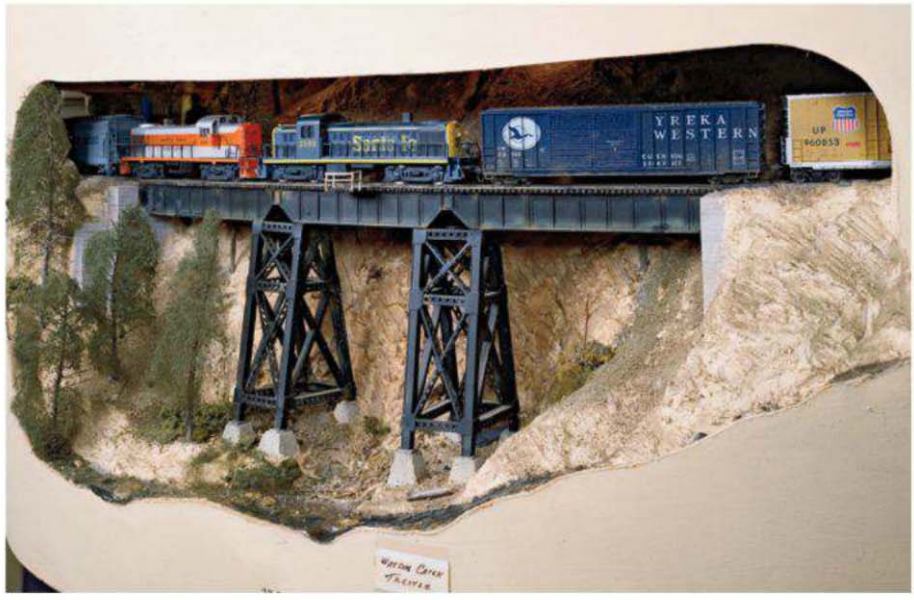
I listened to her call, and wasn't too surprised when Dave informed us there was no helper available. I had already started to laugh when Julie asked if we could use our one working locomotive to take part of the train up

cement plant and an enlarged lumber mill. A five-year shift backward in era to late 1971-early 1972 gave me a push to build a more focused and better-detailed car fleet as well as upgraded and "vintage dated" motive power.

Many of my locomotives are now sound equipped, which really helps in running an engine realistically. We're still using the original Lenz DCC system, upgraded of course, and a second generation of CVP wireless throttles for the engineers on through trains.

Operation remains the SCN's reason for existence. Probably the biggest change was the switch to timetable-and-train-order operation. We added two Agent-Operators who copy orders and act as the local freight agents. This re-creates more of the teamwork needed in mid-20th century railroading. Timetable No. 9 covers a 24-hour period; we split the day into two sessions of unequal length, with different trains and differing traffic and crew density.

Change continues, but will always focus on enhancing operations. Even as I write this update, we're running the first full-length 19-car "loads/empties" log trains between Fall Creek Junction and Dougherty's using the former Santa Cruz staging tracks rebuilt to extend into the mill complex. We are still learning, growing, and having fun operating. This really is what it is all about. OP



7. Almost 20 percent of the SCN main line is hidden in a helix. To show some of the potentially hidden running, a museum-style shadow box exposes one-third of the middle helix level. Here's the helper set on the Westbound Drag crossing Watson Crick Trestle in the shadow box.

Jim Providenza is a police captain. He lives in the San Francisco Bay area with his wife, Terri, and a teenage daughter. They also have two adult children. Jim has been a model railroader for 50 years.

to Dougherty's and then come back for the rest. This is known in railroad parlance as "doubling the hill" – something I'd never done in my time as a hoghead. My chuckles hadn't even died down before Dave told us that was exactly what we must do.

We figured we could take the first 12 cars on the first run, as the five empties for Fallon were blocked first behind the units. We did an air test, and then I slowly notched 2932 out. We moved at a crawl, but we were moving. Run 3, then 5, finally run 8, and we were moving at about 10 mph.

By the time we reached Dougherty's it was obvious we'd have a struggle with the tail end of the train as well. It was almost 7:00 and I was starving. By the time we got back down to East Rica, the market was closed. The 2932 wasn't the only thing growling over the road!

We came close to losing it on the way back up the hill, and I didn't like the idea of having to start the train on the grade. Number 2932 was already straining for every ounce of power she had.

Dougherty's came into sight as the sun was a few inches from the horizon. We should have been heading for beans in Santa Cruz long before now, and I knew there was no place to find sustenance until we got there. It was a painfully long time before we got our whole train back together, but, alas, more painful times were ahead.

For all the years I've worked on the SCN, I had to choose today to forget where the summit was – and it wasn't at Dougherty's! We still had five miles to Sergeant's, a signpost mounted on a 4 x 4 stuck in the ground in the middle of nowhere that marked the line's true high point.

In my reaction to Julie's suggestion to double the hill, none of us, including the level-headed Dave, remembered the obvious. You have to get up to the top before you can go down the other side!

I personally called Dispatch.

"Dispatch, this is the 2932."

"Dispatch."

"Dave, this is Jozaites."

"Frank?"

"Dave, we're at Dougherty's. We need to double the hill to Sergeant's."

"Arrrghhh!"

Silence.

"X2932W, you own the road from Dougherty's to Sergeant's," was all he said, pure resignation in his voice and not in the formal language the rule book calls for, but clearly understood nonetheless.

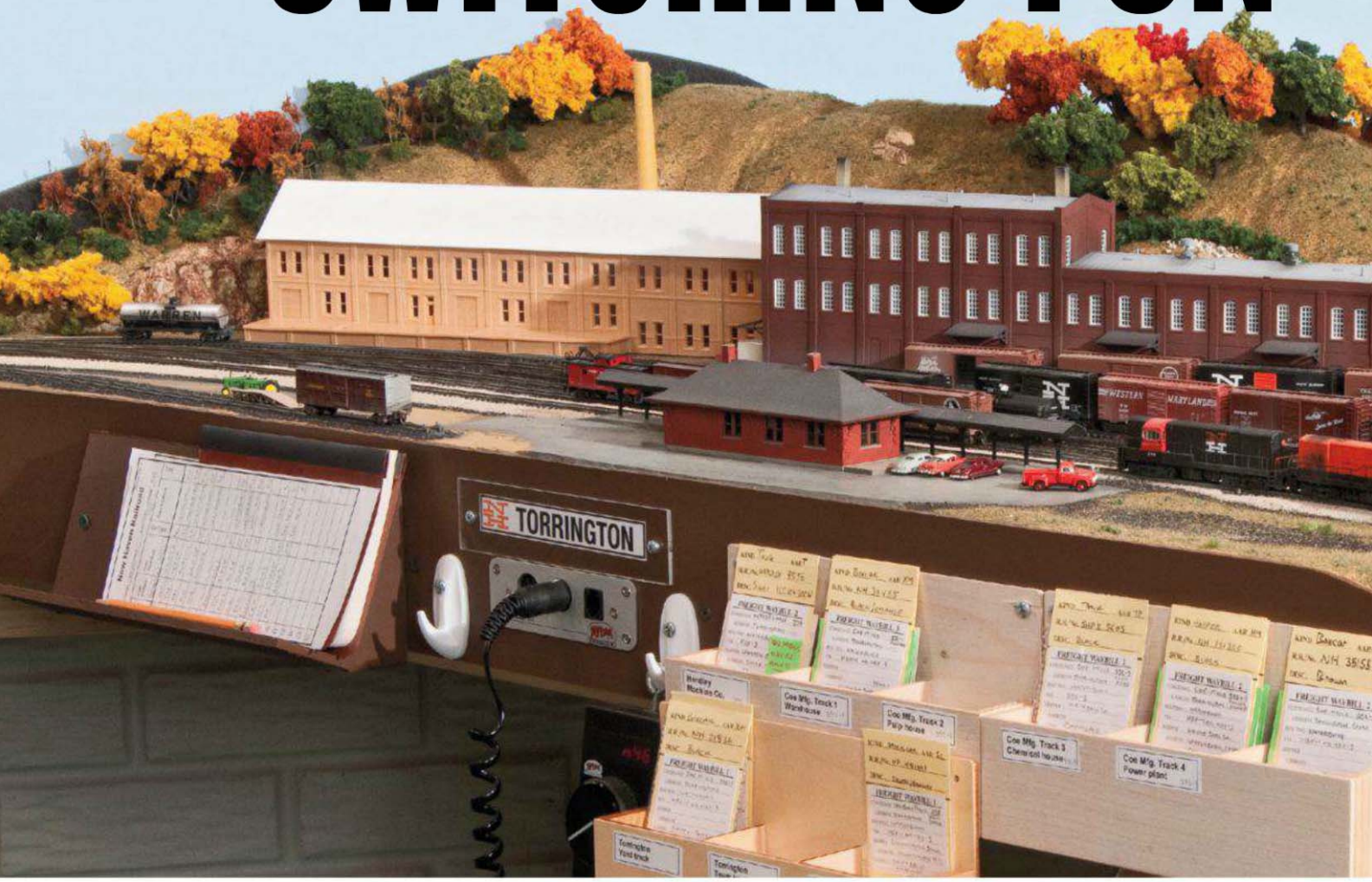
Two more hours passed before we left Sergeant's, dropped the empties at Fallon, and headed for Santa Cruz.

With our job finally done, we pulled what remained of Extra 2932 West into the staging yard that represents Santa Cruz on the HO scale SCN.

The "beans" we headed for turned out this evening to be soft drinks and Oreo cookies. Rookie conductor Julie and I congratulated ourselves on getting our train from one end of the layout to the other without actually knocking anything onto the floor.

I'm sure Dave, working at the kitchen table as the dispatcher for this operating session, was equally glad to finally put X2932W to bed. – *Frank Jozaites, member of the SCN crew*

PRACTICAL TIPS FOR SWITCHING FUN



Design ideas and working examples for moving freight realistically on a model railroad

BY DAVID POPP
PHOTOS BY JIM FORBES AND DAVID POPP, ILLUSTRATIONS BY RICK JOHNSON

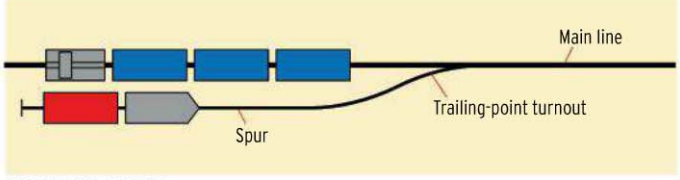
RAILROADS HATE SWITCHING PUZZLES. It's a fact. If you think about it, the mission of every prototype railroad is to make money and to do it as efficiently as possible. As much as we may want to build our layouts with tangles of track to keep our friends entertained and challenged, that purpose conflicts with the prototype's mission.

So, you may ask, where's the fun in following prototype practices when it means my operating crews finish their work in 15 minutes or less? Even after you strip out the puzzle aspect, there still are many ways to design a model railroad that offers plenty of switching challenge. As with most everything in model railroading, looking to the prototype provides a lot of answers, including how real railroads switch cars.

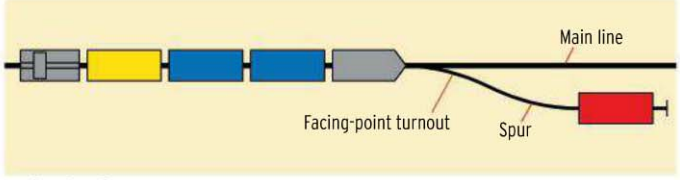
SWITCHING BASICS. Almost all switching work on a railroad boils down to three basic moves, shown in the diagrams at

David Popp followed prototype track layouts when designing the new town of Torrington, Conn., on his N scale model railroad, making it both realistic and fun to operate.

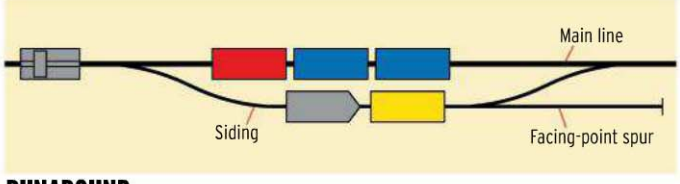
The crew of HDX-2 picks up an empty tank car at Polsgrove Fuel, which on the return trip to Waterbury is now a trailing-point move. This is the easiest type of switching.



TRAILING POINT. The train crew simply cuts the locomotive from the train and backs into the spur to collect the red car.



FACING POINT. Here, the train crew can pick up the red car, but they have no way to drop off the yellow car.



RUNAROUND. A siding makes it possible for the locomotive to run around the train to switch the facing-point spur. The crew has removed the red car and now spots the yellow one.

right. The easiest switching is done with a trailing-point move (top). This is where a turnout is positioned so that a crew can make a setout or pickup by cutting their train at the desired location, and then backing the locomotive (and often cars) into the spur. Railroads like trailing-point moves the best because they involve the least amount of time to perform and usually require the minimum amount of track to get the job done.

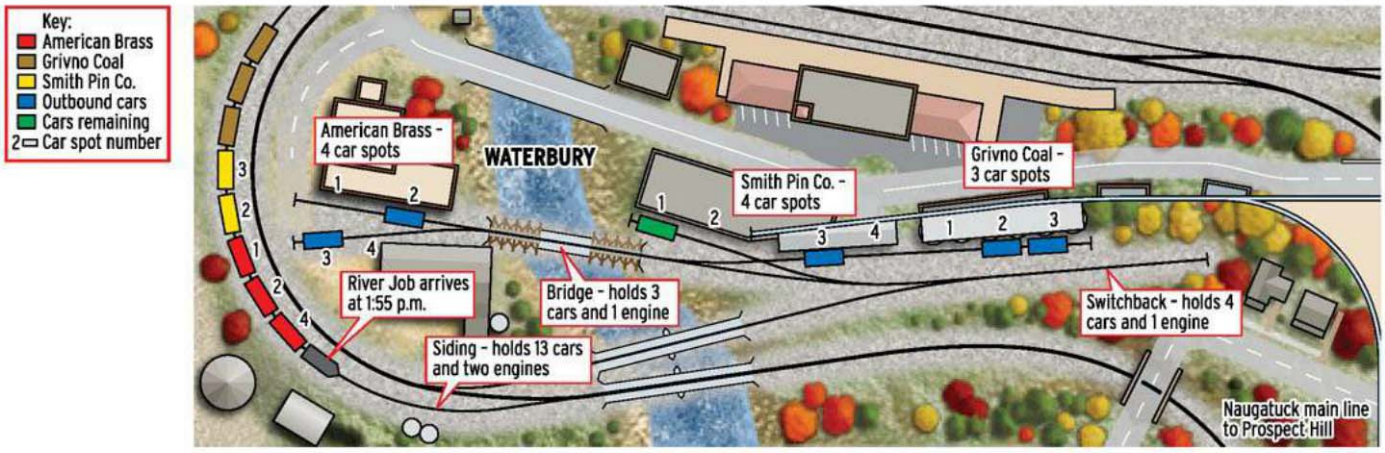
Facing point moves, however, are another story. As shown in the center diagram, the train crew can't collect the red boxcar from the facing point spur without leaving it in front of the engine. To make matters worse, the crew cannot spot the yellow boxcar on the spur at all. To do so will require a "drop" (a rolling move of questionable safety that's used by some prototypes but is difficult for modelers to replicate) or runaround move.

In the third diagram, the facing point spur is connected to a siding, allowing a locomotive to run around its train so it can make the required pickup and setout. While the spur is now workable, it adds extra track and requires additional moves to switch it – all of which make it a more expensive option.

RAILROADS WANT TO KEEP things simple, and they approach switching in the most efficient way they can. The truth is, however, it's not always possible, and that's great news for modelers.

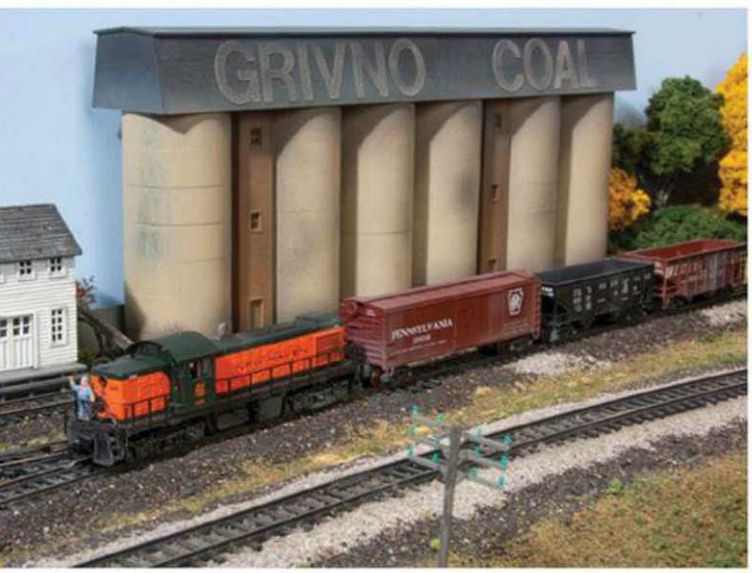
To give you some ideas for designing and operating your own layout realistically, let's look at four towns on my own N scale New Haven layout. All four include track arrangements and operating ideas that I found from studying the prototype. Although none of the towns are exact replicas, it's the prototype practices that make them realistic and fun to switch.

THE SWITCHBACK: TIGHT SPACES ON THE RIVER JOB



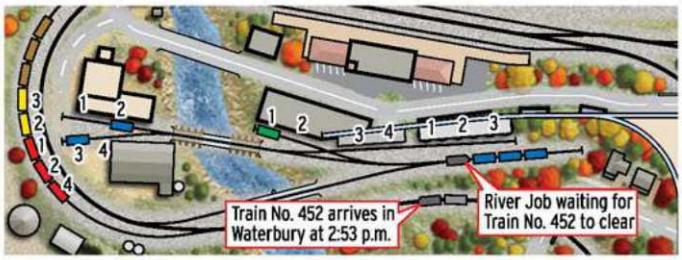
AS MUCH AS RAILROADS want to keep things simple, big cities can be a challenge. As a case in point, Waterbury, Conn., the largest city on my New Haven layout, was once home to four railroads. Those railroads eventually all became part of the New Haven, and when they did, a lot of the redundant track was removed from service – the "simplify" part. However, this resulted in several locations requiring the use of a switchback, a stub track that allows a train to reverse directions, to reach some of its customers.

I placed a switchback, which can hold four cars and one engine, at the entrance to the Waterbury industries along the Naugatuck River. These customers, including the Smith Pin Co., American Brass, and Grivno Coal, are busy industries and are served by a daily local called the River Job. By following the crew's switching steps, you'll see that the switchback makes the job an interesting challenge, yet it's still easy work. My best tip for the River Job: Don't take any cars in with you until you've pulled some out! **WORK TIME: 35-45 MINUTES**

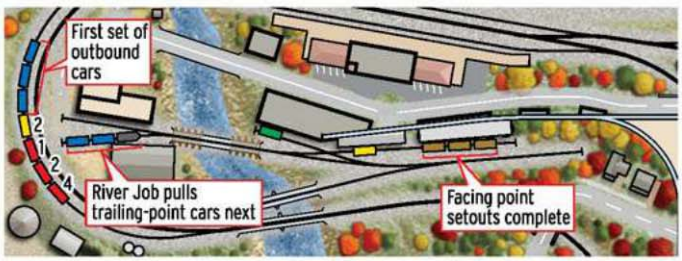


Space is tight, so the River Job crew begins by pulling outbound cars from the facing-point industries along the Naugatuck River in Waterbury, Conn. Only after these first cars are pulled can they bring cars in to spot.

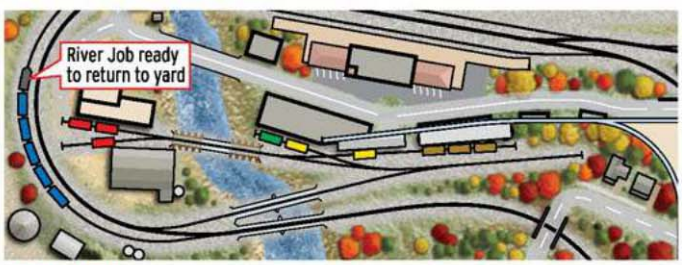
1 Getting started. In this snapshot, the River Job has just arrived, and its crew has parked the train on Bank Street siding. The main needs to be kept clear for commuter trains, so no cars can be left on it unattended.



2 Facing-point pickups. Things are tight along the river, so the first thing the crew does is to pick up all of the outbound cars at facing-point industries (spots 3 and 4 at Smith Pin and all the spots at Grivno Coal).

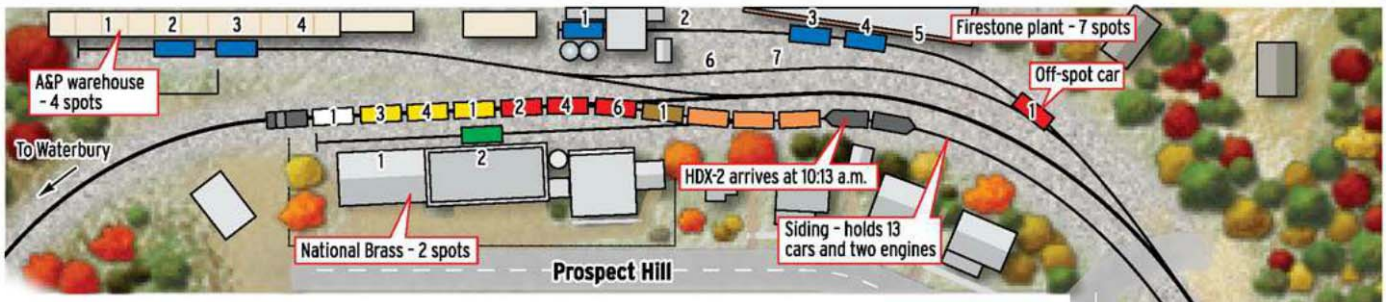


3 First setouts, second pickups. In the second trip into the switchback, the crew takes all the facing point setouts. After spotting those cars, they then pick up all of the trailing point outbound cars (American Brass).

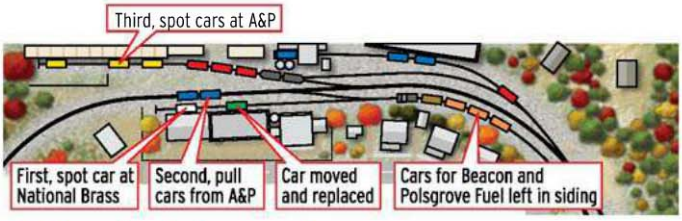


4 Final trip. On their third and final trip through the switchback, the River Job crew spots all the trailing point cars (American Brass and Smith Pin spots 1 and 2). The crew then takes the outbound cars to the yard.

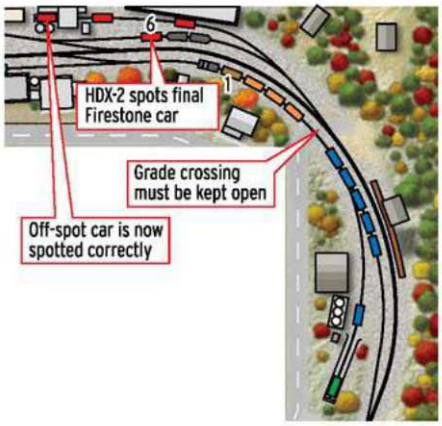
THE TURN: TWICE THROUGH PROSPECT HILL ON HDX-2



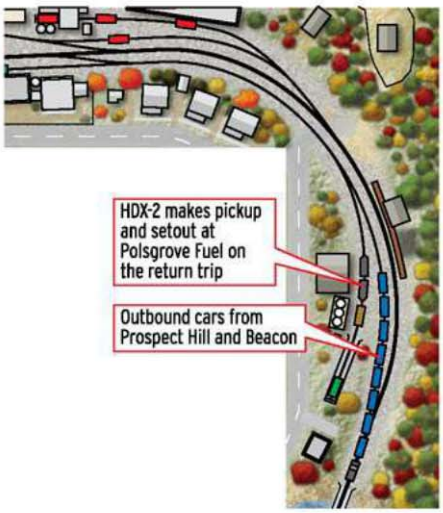
1 Getting started. Turn HDX-2 from Waterbury arrives at Prospect Hill at 10:13 a.m. and takes the siding. National Brass will be the first work for the crew, and the train was blocked by Waterbury Yard with that in mind, placing those cars (white) on either the front or the rear.



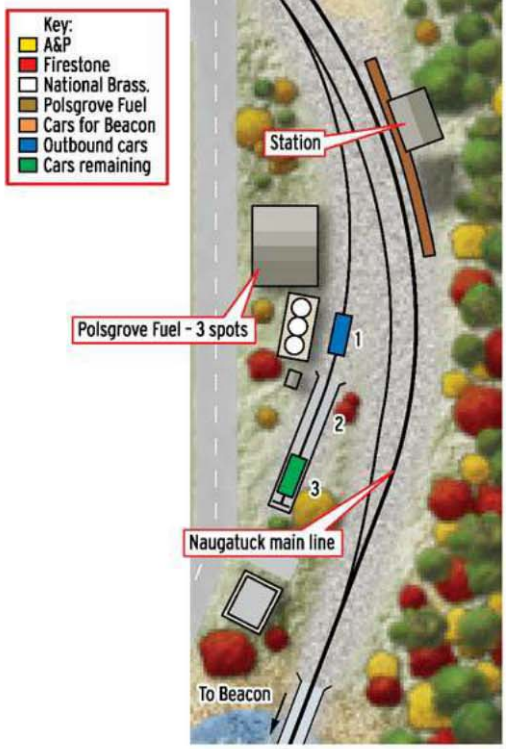
2 Take only what you need. Next, the crew leaves the car for Polsgrove Fuel and those bound for Beacon on the siding. The crew then uses the main to work the A&P warehouse, spotting the cars at the correct doors.



3 Firestone. The Firestone plant has seven car spots spread along two tracks, making for some sorting work. Also, there's often a car or two of raw materials in reserve (off-spot cars) left on the Firestone lead to be re-spotted.



4 Homeward. Later in the day, after switching Beacon, HDX-2 passes through Prospect Hill again on its return to Waterbury. At this point, the crew makes the pickup and setout for Polsgrove Fuel, which is now a trailing-point move.

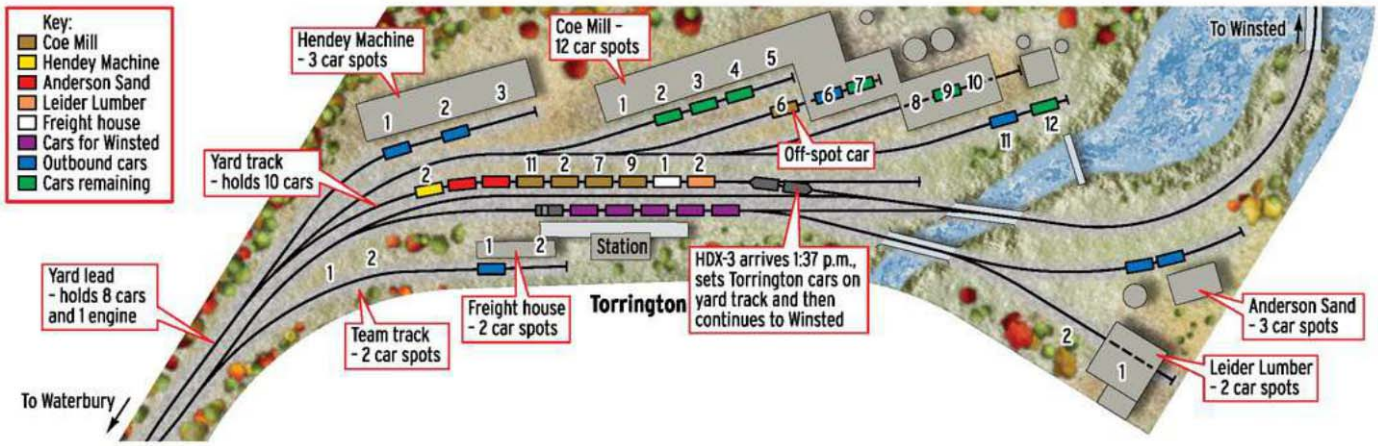


RAILROAD OPERATING PRACTICES can also play a part when designing for realistic switching. The New Haven's Naugatuck line was worked by several local trains that ran as daily turns. These trains originated at Waterbury, worked their way through certain towns, and then returned to Waterbury at the end of their shifts.

In the mid-1950s, the New Haven converted its double-track main line between Derby Junction, Conn., and Waterbury to single track. The fictitious town of Prospect Hill, Conn., on my layout is a combination of my favorite pieces of the cities of Naugatuck and Seymour. Both had been on the double-tracked portion of the New Haven and had trailing-point spurs aligned for the appropriate main lines. However, whether the line has double track or single track, since a turn passes each of the intermediate towns twice, it means that all spurs can be worked as trailing-point moves. I use this operating practice on my layout as well, and you'll see it here and in the Torrington example.

WORK TIME: 45-55 MINUTES

THE YARD TRACK: WORKING A TOWN YARD AT TORRINGTON



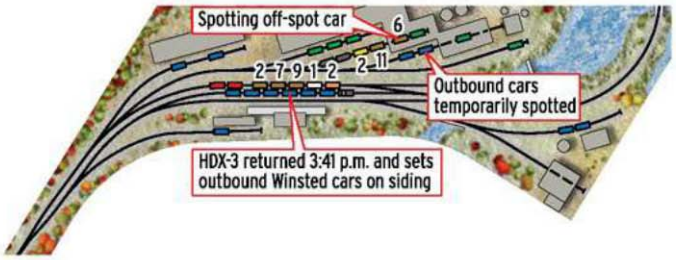
MANY TOWNS WITH BIG INDUSTRIES have their own yard tracks. These are different than classification yards, where trains are broken up and sorted into new trains. Instead, these small yards may be used to hold cars for large customers, and they can also be used by through trains to set out cars that will be switched later by a local.

The town of Torrington, Conn., on my layout has a single yard track, but don't let that fool you because it sees a lot of action. The town is home to the massive Coe Mill. Torrington is served by two turns each day, HDX-1 (morning) and HDX-3 (afternoon). The crew of HDX-3 also switches Winsted, Conn., the town beyond Torrington. That crew typically drops the Torrington cars on the yard track before heading to Winsted.

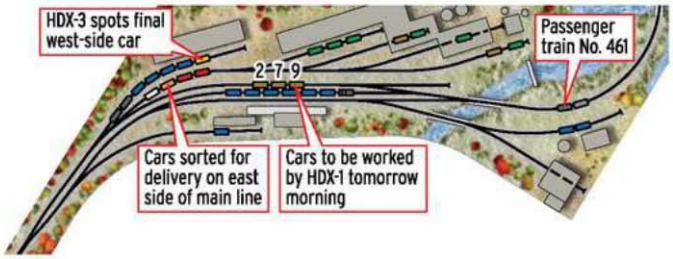
When HDX-3 returns, its crew takes the cars from the yard and works the Torrington industries before returning to Waterbury. Coe Mill is switched twice a day and typically has more cars on hand at any moment than it can use. Cars that can't be spotted are left on the yard or lead tracks for the next crew. Crews also need to check for any off-spot cars that now have open places and can be spotted. **WORK TIME: 35-50 MINUTES**

Before leaving Torrington, Conn., the crew of HDX-3 pushes two loaded hoppers of sand over the Naugatuck River to be spotted at the Anderson Sand Co. on the east side of the main.

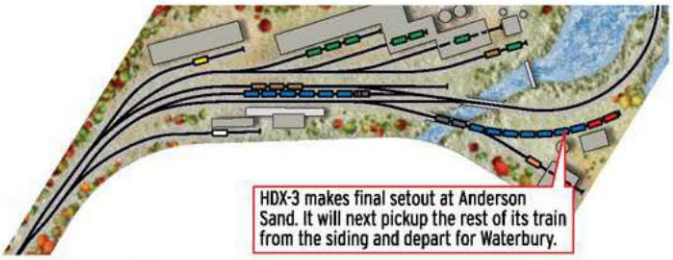
1 Drop and go. For a train arriving from Waterbury, all of the industries in Torrington are facing point moves. Since HDX-3 is a turn, the crew drops off the Torrington cars on the yard track and continues north to work Winsted.



2 Yard lead. On the return trip, all industries are now trailing-point moves for HDX-3. The crew begins by pulling cars from the yard track for Coe Mill and Hendey Machine and spotting them and off-spot cars as needed.

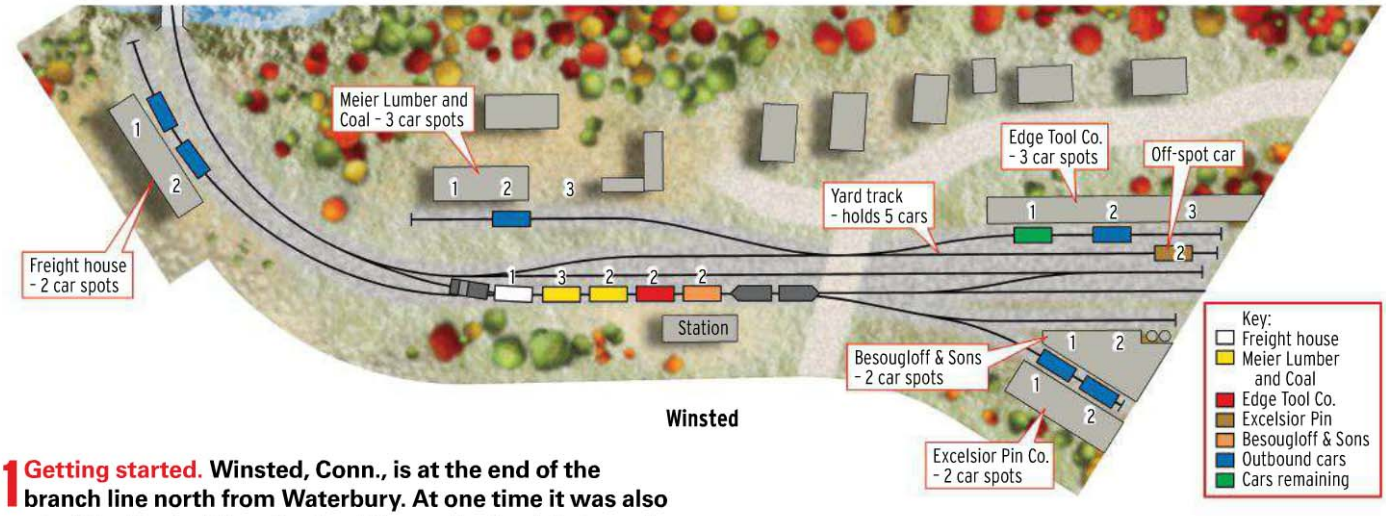


3 Keeping in the clear. Torrington has a yard lead, and it allows HDX-3 to keep working while staying out of the way of scheduled passenger trains. Here, the crew has used the lead to sort east-side cars before crossing the main line.

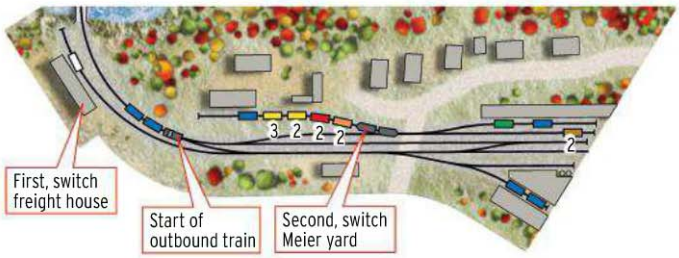


4 Station side. The crew of HDX-3 needs to use the main line to switch the customers on the east (station) side of Torrington. There are now too many outbound cars for the siding to hold, but they could be parked on the yard lead.

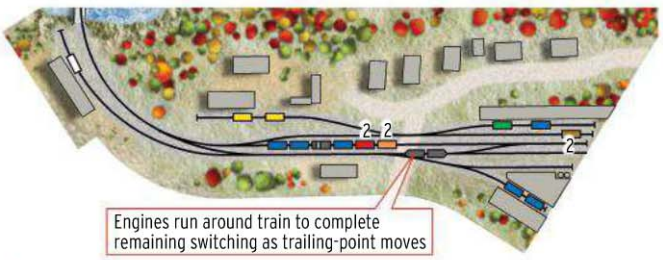
THE TERMINAL: GETTING THE RUNAROUND AT WINSTED



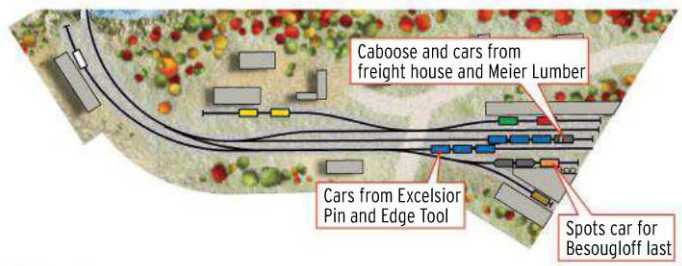
1 Getting started. Winsted, Conn., is at the end of the branch line north from Waterbury. At one time it was also part of the Central New England Ry., so the track in town is actually remnants of two different railroads.



2 Trailing-point pickups. The crew of HDX-3 handles the freight house and Meier Lumber and Coal first, as both are trailing point moves. In the process, the crew begins building the outbound train on its caboose.



3 The runaround. Next, the crew of HDX-3 pulls its train into the siding and uses the main track to make a runaround move. The crew will then move all of the outbound cars behind the caboose and work Edge Tool.



4 Final move. The final move is to set out the car for Besougloff & Sons. (Note that the off-spot car from the yard has now been correctly placed at Excelsior Pin.) After assembling the train, HDX-3 will leave to work Torrington.

WORKING A TURN AT THE END of the branch line at Winsted, Conn., is much the same as working a turn through any other city on my layout. You just do all the work on one visit instead of two. Winsted has all of the features we've looked at in the other examples, including trailing-point and facing-point customers, a siding for making run-around moves, and a stub-ended yard track that doubles as a switchback for spotting cars at the Meier Lumber and Coal Co.

When HDX-3 arrives in Winsted, the crew sets to working all the trailing point industries first, beginning with the freight house. Since the train will be heading back down the branch, the crew uses the caboose to grab the pickups from the freight house, then builds the rest of the outbound train on it from there. Later, after Meier Lumber has been switched, the crew will pull the train into the siding and run the engines around it, making all the remaining switching work trailing-point moves as well. **WORK TIME, 20-35 MINUTES** OP

At the halfway point of switching Winsted, the crew of HDX-3 runs the engines around the train to complete the rest of the job as trailing-point moves. Meanwhile, the conductor and the station agent exchange paperwork.

DIFFERENT WAYS TO WAY FREIGHT

In a classic image of an early 1950s way freight, the Trinity Subdivision's South Local to Houston leaves New Waverly, Texas, on the Missouri Pacific's Palestine Division. It's 1951 and the local is running as a third-class train. R.S. Plummer photo

How to run some of our favorite trains

BY ANDY SPERANDEO

MODEL RAILROAD OPERATORS often find way freights are among the most interesting trains to run. These local freight trains may stop at every station and spur track, setting off and picking up cars wherever necessary to serve the railroad's customers. They may go by such names as "peddler," "patrol," "road switcher," "tramp," and others even more colorful, but they all represent the retail end of railroad transportation, down to individual cars for individual shippers and receivers. Still, that doesn't mean that they all do their work in the same way.

Fortunately for model railroaders in search of variety or for operating plans tailored to individual railroads, there are many different ways to "way freight." We'll look at a few of them, and when you study the operations of your favorite prototype you'll probably discover there are even more.

END-TO-END LOCALS. One of the most straightforward ways to operate way freights is to run one in each direction over a segment of railroad, whether a division or subdivision. Each local starts out of its terminal with cars for stations along its route, which railroaders often call "shorts" because these cars aren't going all the way to the next terminal or beyond it. The yard that makes up the train usually blocks (groups) the cars in station order from front to back. However, it may put cars for delivery to facing-point spurs on the rear end, so the engine can easily reach them after running around the train.

(A "facing-point" spur has its turnout's points toward the engine, and getting a car into one requires either running around the car on a double-ended track or a "drop," a momentum maneuver that's impractical in model railroading. See page 15 for more information.)

Yet as much as the runaround move and facing-point switching are staples of model operations, railroaders avoid them when they can. Where locals run in opposite directions over the same line, the crews may leave cars for facing-point delivery "off spot" at the destination station for their opposite numbers to handle as a simpler trailing-point move.

Speaking of cooperation, on some lines work rules allowed the crews of opposing way freights to exchange trains at a designated midway point. That would get each crew back to its home terminal after the day's work.

ONE-WAY LOCALS. When through-freight traffic is markedly heavier in one direction than the other, the railroad might run local freights only in the direction opposite that flow. This helps equalize

crew and train movements as well as power distribution. A one-way local necessarily has to do all the work at each station, whether it's ahead of or behind the engine.

Shorts from the opposing direction may be left at appropriate stations by a set-out train for the local to deliver. The set-out train would drop off and pick up cars on storage or house tracks, but wouldn't spot cars for loading or unloading at each industry.

LOCAL TURNS. A "turn" is a train that runs out and back from one terminal within the hours of service of a single crew (now 12 hours, but 16 in the "classic" or steam/diesel transition era).

All turns aren't locals, but a local turn can run out from its terminal to an intermediate station on the subdivision and then go back to its starting point. Again, it's a way to get the crew home at the end of the run, and a railroad might provide local service with turns from opposite terminals of a subdivision instead of two end-to-end locals.

The crew of a local turn can plan to avoid facing-point switching by leaving cars for such destinations to be handled as trailing-point switches on the way back. They may also leave any cars picked up on the outbound trip on convenient storage tracks where they can be retrieved on the homeward trip. The turn might thus arrive at its most distant station with only the cars to be delivered there, simplifying the task of running around the train.

LOCAL AND ROAD SWITCHERS. Where customers for local switching are concentrated at an intermediate station, or there's one large customer, the railroad may assign an engine and crew to handle the work without coming and going from a subdivision terminal. That kind of job is often called a "local switcher."

A variation is to extend the local switcher's work limits to include two or more stations along a designated segment of main line, requiring short over-the-road trips from the home station. This may be called a "road switcher" or "traveling switcher."

The road switcher resembles a turn in working out and back from a base, but the base need not be a terminal for other trains or crews. The road switcher's crew might also use the local turn strategy of setting aside cars for facing-point delivery on the outward trip to be handled as trailing-point movements on the way back.

With a Geep at each end to handle facing- and trailing-point switches and make it easier to head for home, CSX local freight B747 rolls west under the catenary at West Haven, Conn., in November 2006. Scott A. Hartley photo

Through set-out freights make connections from the local and road switchers to the railroad's terminals. These trains leave cars to be delivered by the switchers at some convenient storage track and take cars the switchers have gathered to yards that will forward them to their destinations.

DOUBLE-ENDED LOCAL. A current prototype practice whose time may have come in model operation is the double-ended way freight, a caboose-less local with a four-axle diesel unit at each end. This is the ultimate for avoiding time-consuming runarounds and rule-violating drops (momentum switching). To get a car into or out of a facing-point spur, the engineer simply moves to the rear unit and uses that engine to do the work. It also makes turns simpler, as the trailing unit on the outbound trip becomes the leader on the homeward run.

On the full-size railroad, the trailing unit simply freewheels along like another freight car until needed, although of course it's connected to the train line pipe for braking. (This isn't like using remote-controlled distributed power units – DPUs – on heavy trains.)

Model locomotives with worm gears need to be powered to run, but Digital Command Control makes that practical. Two units can be consisted for over-the-road running even though separated by a string of freight cars, then can be taken out of consist to operate separately for switching.

Perhaps there's a model railroader somewhere already operating double-ended way freights, but I haven't seen it done. Maybe you still have a chance to be the first.

EXTRA CABOOSES OR RIDER CARS. In the "classic" steam or transition eras, you wouldn't have seen an engine on each end of a local. But there were some roads that used a caboose on each end, or a cupola-less "rider car" behind the engine. Many railroads assigned locals a sixth crew member in addition to the usual five-person crew (engineer, fireman, conductor, brakeman and flagman), and the extra car gave him a place to ride at the front of the train.

The title given this sixth crew member could vary, but "list man" was a common one. He was usually a senior brakeman who kept the train's switch list and directed the switching operations at each stop. In pre-radio times, when all communication was by hand and lantern signals, having extra help on the ground made a big difference in efficiency.

The extra man might have extra duties, too. Often he would be responsible for picking up and delivering company mail at points along the line. Where there was no local passenger service, the Railway Express Agency might employ the list man as a train expressman, paying part of his wages, and use the extra caboose or the rider car to pick up and deliver express packages along the local's route.

These services, along with the boxcar many locals carried for LCL (less-than-carload-lot) shipments, give you plenty of reason to stop the way freight's head end at the depot for a few fast-clock minutes before plunging ahead with switching. Anything that slows the pace and gives train crews time to think makes operation more prototypical, so this can be a welcome pause.

STILL MORE WAYS TO FREIGHT. I know I haven't exhausted this subject, and there are other options. Even so, using any of the methods listed here will provide you with hours of switching enjoyment. OP

SWITCHING USING SURE SPOTS

Prototype railroads don't park cars just anywhere

BY ANDY SPERANDEO

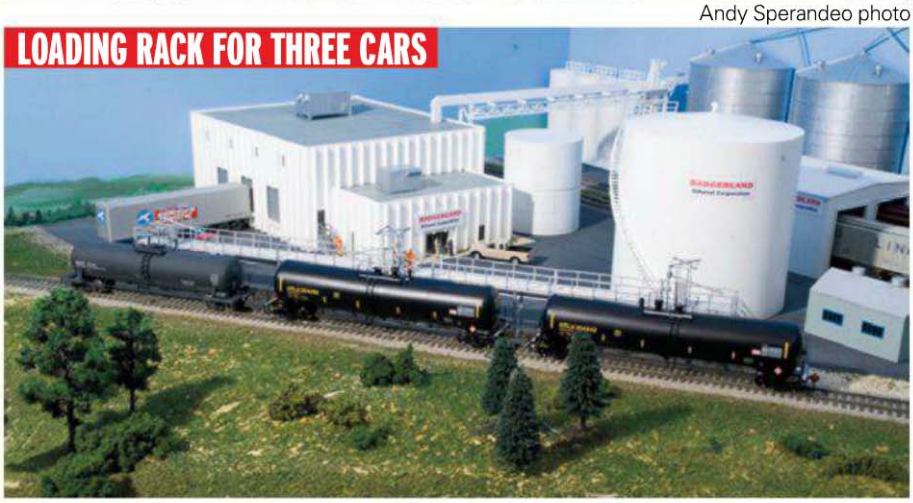
MILWAUKEE 20451 TO DOOR 8

Andy Sperandeo photo

ON THE RIGHT TRACK AT SCHLITZ

Andy Sperandeo photo

LOADING RACK FOR THREE CARS



MR staff photo

"SURE SPOT" IS A TERM some railroads use for placing cars at specific track locations, not just anywhere near the customer's building. Shippers and receivers usually need cars placed precisely, as at numbered doors, for loading or unloading. For us this can add to the fun by requiring additional switching to line up and spot cars as specified on waybill cards or switch lists. Here on *Model Railroader*'s HO scale Beer Line layout, a Milwaukee Road boxcar (top) is being delivered to door 8 at the freight house.

WHEN INDUSTRIES HAVE multiple tracks, each track usually serves a particular purpose and the customer wants certain cars placed on certain tracks. At the Schlitz warehouse on the Beer Line (center), the switch list orders cars to be placed on either track 1, 2, or 3. The switch crew usually sorts cars for like tracks together so that each track's cars can be spotted with one shove. Making the fewest possible movements inside the building is generally safest for both railroaders and warehouse workers.

AT THE ETHANOL PLANT on MR's Wisconsin & Southern layout, each tank car is uncoupled to be spotted at a filler point along the loading rack. Only three cars can be spotted at a time (bottom), and any extra empty cars will be left "off spot." That means leaving them on the plant lead off to the right, or on a nearby storage track, to be placed the next "day" (operating session) after the loaded cars are pulled. The left-most spot also serves for unloading the gasoline used to denature the ethanol. When a gasoline car is spotted for unloading, only two ethanol cars can be loaded at a time. OP

FASTER SWITCHING AT SLOW SPEED

A little advanced planning can save a yard crew lot of time

BY ANDY SPERANDEO

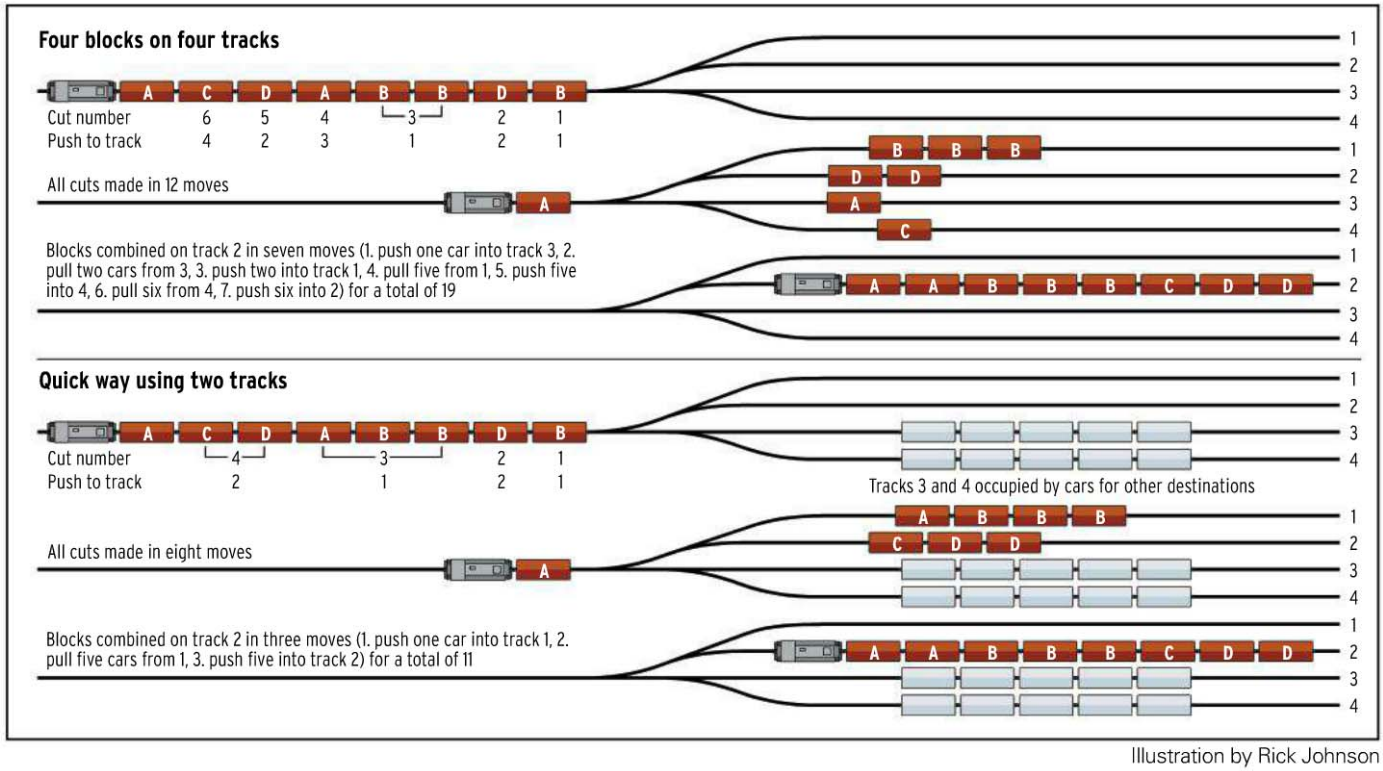


Illustration by Rick Johnson

SOME MODEL RAILROADERS I KNOW were recently discussing what I've called "the yard problem." Even at scale speeds, trains run across our short main lines faster than we can switch them in the yard.

One solution that's almost never proposed is to make the yard work faster. Nobody wants to see switch engines banging cars back and forth at high speed, but if the yard crew works more efficiently it can get the same work done in fewer low-speed movements. That, however, requires planning by the yardmaster or yard engine conductor.

THE SLOW WAY. First let's look at the most obvious way to "classify" or sort or a string of cars. Imagine that the "Four blocks" illustration above shows cars for a way freight to be classified in station order. The letters represent the cars' destinations, and alphabetical order from left to right equals station order.

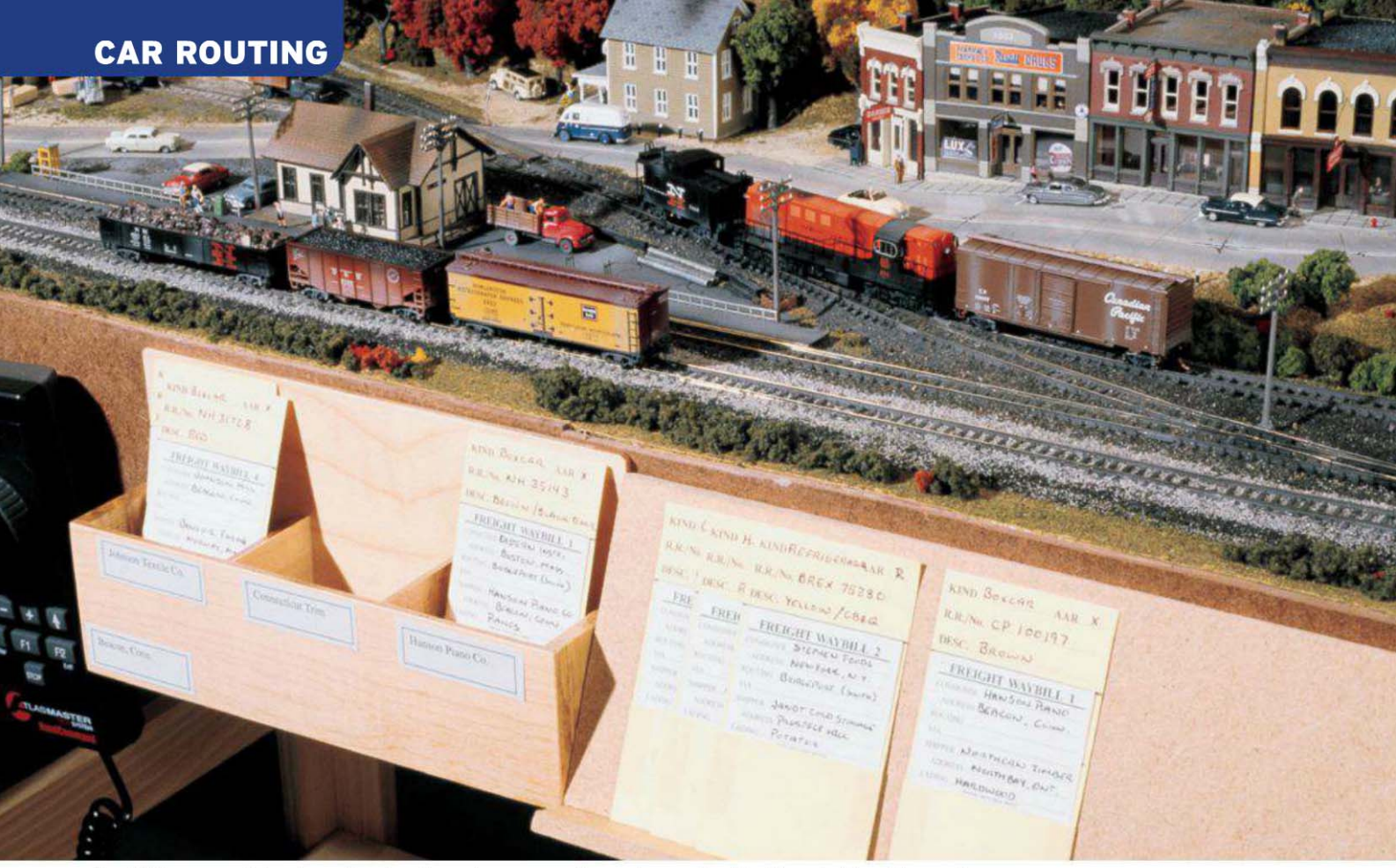
Since there are four destinations, the conductor can simply deal off cars for individual stations to each of four separate tracks, then recouple them in the desired order. As the second and third diagrams show, that requires a total of 19 moves with the engine, counting each time it heads into or backs out of a yard track as one move.

THE QUICK WAY. The more efficient method not only takes fewer moves, it can be done on just two tracks. The key is that the conductor first scans the switch list for any groups of cars already lined up for consecutive destinations, then plans the switching to keep those groups together. (A switch list, not surprisingly, is the best tool for planning this kind of work.)

Working this way, cars for as many as four destinations can be classified on two tracks, cars for five or six destinations can be sorted on three tracks, and so on.

As the "Quick way" illustration shows, the cars on the lead include two such groupings, so the conductor plans the rest of the work around those. The cars are classified after eight moves, and putting the train together by doubling the cars from track one into track two takes only three more, for a total of 11 moves. Meanwhile, tracks three and four hold other cars either already classified or waiting to be switched.

Besides the time saved, model yards almost never have enough tracks to assign one to each destination. Doubling up on classifications helps us make the most efficient use of the tracks that we have. OP



David Popp explains how he developed an operating scheme for his N scale New Haven layout.

MOVING FREIGHT AND MAKING NAMES

Five steps to get you started in model railroad operations

BY DAVID POPP
PHOTOS BY THE AUTHOR AND KALMBACH PUBLISHING CO. PHOTO STUDIO

ONCE YOU'VE RUN A FEW TRAINS on your layout, you may find yourself asking, "Is this all there is?" Though part of the allure of model railroading is watching your trains travel through towns and scenic landscapes, this limited level of participation gets old quickly. However, if you find yourself occasionally stopping a train to switch out a car or two at an industry, you're ready to start one of the more enjoyable aspects of the hobby – operation.

The motive behind the construction and operation of all prototype railroads is to make money, a purpose directly linked to the trains a railroad runs and how it conducts its day-to-day business. Though most model railroads don't actually turn a profit, adopting the idea of operating trains with a purpose will make your layout more interactive and realistic.

There are many ways to add prototype operating practices to a model railroad, so it's best to get started with something basic, like freight car routing. Follow along as we look at several steps you can take to simulate serving the online customers on your layout.

STEP 1 MAPPING YOUR RAILROAD

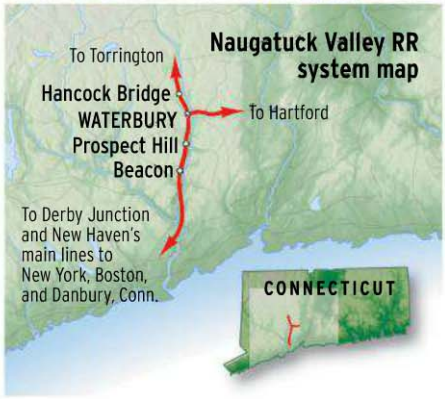
WHETHER YOU'VE MODELED a stretch of real railroad or freelanced your own line, you'll need to know how it fits into the outside world before you can start moving freight. Making your own system map is the first step. All you need is a detailed road map that shows railroad grades or a railroad atlas.

For my layout, set along the Naugatuck River Valley in Connecticut, I used a highlighter to mark on my atlas the location of the main line and its north and east branches. This project is especially important if you haven't modeled a specific place because it will give a frame of reference for your railroad's connections with other lines.

Next, pick names for your towns. If you're modeling real places with landmarks that people will recognize, go ahead and use the actual town name. However, if your locations aren't that specific, you may want to consider creating new towns on your map.

There are four towns on my layout, the focal point of which is Waterbury, Conn. Because it's the key to my entire railroad, I've modeled certain city features faithfully enough that it looks like Waterbury. The other three towns, however, are generic New England communities.

I could have named these for real places, but instead made up names for the other towns. For instance, following a New England practice of using the same name over a given region, I set my town of Beacon between Beacon Falls and Beacon Hill Creek.



STEP 2 INDUSTRIAL ANALYSIS

THE SECOND STEP is to perform an industry analysis of your layout, determining the products your on-line customers make, the materials they use, and how often they receive supplies or ship finished goods. By making a chart like the one shown below, you can figure out the shipping and receiving requirements for each industry on your layout.

Many industries are self-explanatory, such as a coal dealer – loads come in and empties go out. All you'll need to do is determine the frequency. Others, however, take some research to model delivery and shipping cycles.

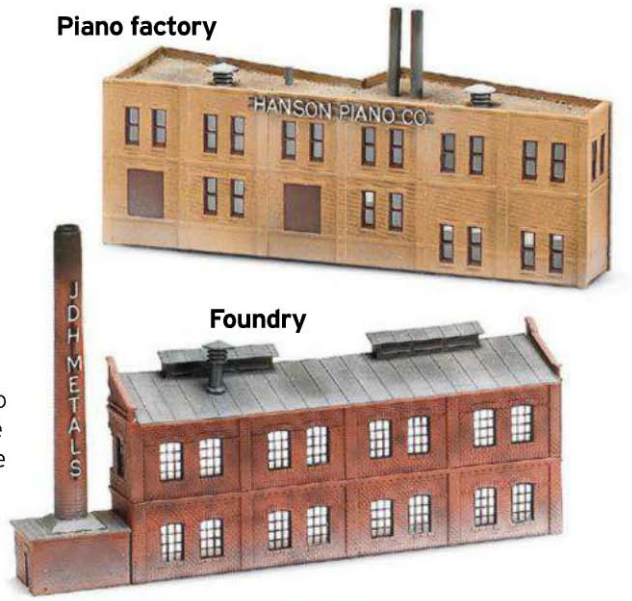
For the car requirements of more-complex industries, let common sense be your guide to get you up and running. Later, when you've had time to complete some research, you can update your analysis to match the prototype.

One other important consideration is that most industries don't use all the material they receive, so don't forget to include carloads of waste products on your list. The piano factory on my layout ships out carloads of scrap wood and sawdust from time to time.

On-line Industry List

Town: Beacon

Industry	inbound/ outbound	Car type	Material	Frequency
Hanson Piano Co.	inbound	boxcar	hardwoods	1/week
	inbound	boxcar	frame castings	1 every other week
	inbound	boxcar	wire	1 every other week
	inbound	boxcar	crating lumber	1/week
	outbound	boxcar	pianos	1-2/week
	outbound	gondola	scrap wood	1 every other week (gon stays until filled)
Connecticut Trim Co.	inbound	boxcar	hardwoods	1 every other week
	inbound	boxcar	softwoods	1/week
	outbound	boxcar	milled trim and moldings	1-2/week
	outbound	boxcar	sawdust	1/week (car stays until filled)
Johnson Textiles	inbound	boxcar	raw wool or cotton	1-2/week
	inbound	tank car	dyes and chemicals	1 every other week
	inbound	boxcar	cardboard shipping cartons	1-2/week



Fuel dealer

Produce warehouse

STEP 3 STARTING WITH SWITCH LISTS

NOW THAT YOU KNOW the location and requirements of your industries, your railroad can start serving them. A method that works particularly well with small railroads is a switch list.

A switch list is a nearly universal form used by railroaders to plan and record car movements. Though some are more elaborate than others, all have the same basic information, including spaces for car identification and destination. I made mine (left) on my computer using Microsoft Word. You can download a generic version of my form at www.ModelRailroader.com.

FORM 146-S

Switch list

TRAIN 23 COND. ____ DATE OCT 7 1989 TIME A.M.

No.	Car Initials	Car Number	Car Type	Destination	Remarks
1	NH	35143	X	B/HANSON P.	
2	CP	100197	X	B/CONN. TRIM	
3	NH	31728	X	B/JOHNSON TEXT	
4	BREX	75280	R	PH/JANOT COLD ST	
5	DEH	5792	H	PH/GRAND COAL	
6	NH	61021	G	HB/JDH METALS	
7					
8					
9					
10					
11					

To make up a train using a switch list, start by looking at your industry analysis sheet to determine which businesses will receive cars this trip. Proceed down the list town by town, selecting car models to meet each industry's requirements, filling out the switch list as you go.

There are a number of ways to handle cars waiting to be picked up at industries. The easiest is to walk around to each industry on the layout and add those cars to your switch list, marking "P" for pickup in the remarks column. When you've finished the list, assemble the train and give the list to the crew.

As you get into the habit of using switch lists, you'll find that you can take shortcuts, such as using abbreviations for town and industry names.

STEP 4 CAR CARDS AND WAYBILLS

WORKING WITH SWITCH lists is fun, but filling out the paperwork for every train can get tedious. Car cards and waybills offer an interesting, flexible solution, and after filling out the forms once, the system can run itself forever.

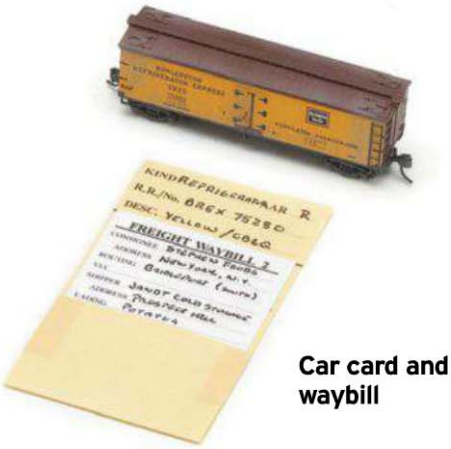
With a car-card-and-waybill system, every freight car on the layout gets its own card, listing its reporting marks, type, and usually what to do with the car when it's empty. When the car is assigned a load, it's then given a waybill, which is attached to the car card. The waybill lists the destination, lading, and routing information for the car. Since the car card follows its car around the layout, a train crew can look at the waybill at any given time to see how they should handle the car.

There are several manufacturers of car cards, or you can buy computer software to make your own. For my layout, I used the car routing system (no. 82916) from Micro-Mark. (We used the same set on our Beer Line layout shown on page 81). It comes with paper car cards and special, four-cycle waybills.

A four-cycle waybill actually has four waybills printed on it, each with a number. When filled out and assigned to a freight car, that car is then routed to four different locations on or off the layout (Off-layout destinations are represented by storage tracks called staging yards.) After the car arrives at a destination, the waybill is cycled (flipped over), revealing a new destination for the car.

The process is repeated until the car ends up at its starting point, where you can either send it through the cycle again or swap its waybill with a different one. This way your train crews don't see the same car showing up in the same place session after session.

Micro-Mark's car routing set is very easy to use and comes with a short instruction book to help you fill out the paperwork and get things rolling. You can also use switch lists with the car card system to help crews keep track of their work, though the four-cycle waybills now determine movements.



Car card and waybill

Car card

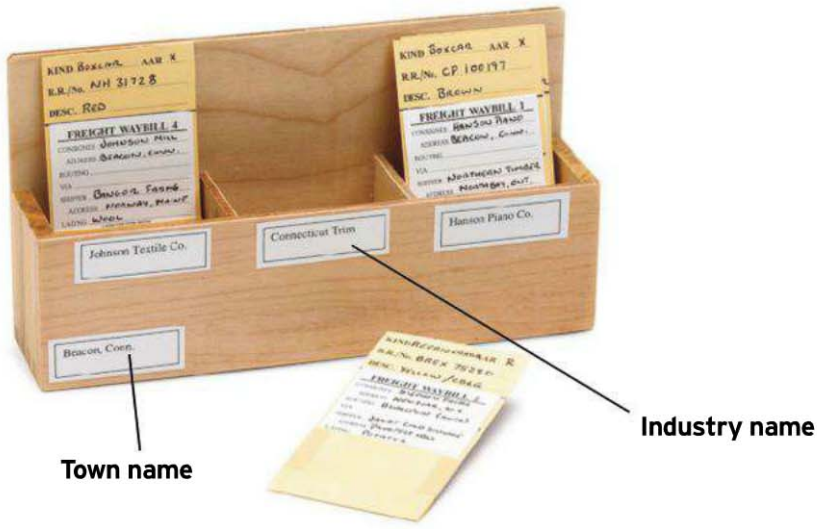
Pocket for waybill

4-cycle waybill

STEP 5 BOXES AND SHELVES

WHEN YOU DROP OFF a car at an industry, you'll need a place to put the paperwork (its car card and waybill). That's where bill boxes come in handy. Though I've made my own in the past, the waybill kit from Micro-Mark includes some nice boxes. These three-slot card boxes are made from thin plywood and sealed with a clear finish. You'll need one compartment for each industry on your layout. As shown above, you can make labels for the boxes on your computer, cementing them in place with a glue stick.

Train crews have a tendency to sort their car cards on layout surfaces. To solve this problem, you can make sorting shelves. Mine are made from ¼" hardboard and joined together with carpenter's glue, as shown at right. The overall size is 4" x 12". Once the glue dries, fasten the shelves to the layout next to your bill boxes. On my layout, I placed one at each town and two at the yard in Waterbury. OP



Now on ModelRailroader.com

You can download the industry lists and switch lists David uses on his N scale New York, New Haven & Hartford layout. Get the forms at our website, **ModelRailroader.com.**

MORE ROOM TO WORK

OTHER THAN THE DISPATCHER, no operating position on my layout requires more paperwork than the yardmaster's. To keep the switch lists, car cards, train schedules, and other operating paraphernalia off the layout, I built a simple work desk for the Waterbury yardmasater. It gives him the room he needs to fill out switch lists and organize waybills.

The desk is just a 16" x 36" wood shelf mounted on steel shelf brackets. I bolted two short sections of 2 x 4 to the concrete basement wall and then attached the brackets to the 2 x 4s with screws. Since the yardmaster is on duty for the entire operating session, I've provided a stool.

To reinforce the layout's prototype connections, I've mounted a map of the entire New Haven system above the desk. – D.P.

The yard office on David's layout includes a small desk for filling out paperwork, a map of the New Haven system, a stool, and plenty of bill boxes for organizing car cards and waybills.

Removable open loads add realism to card-order operating sessions on Mont Switzer's HO scale Monon RR.

ENHANCE OPERATIONS WITH AUTHENTIC LOADS

Tips for planning and modeling a series of appropriate shipments

BY MONT SWITZER
PHOTOS BY THE AUTHOR

THIS ALL BEGAN the evening before an operating session while I was checking my HO Monon layout to make sure all the freight cars and car cards were in their proper places. All was going well until I came upon an empty New York Central gondola, NYC 711546, that had paperwork indicating it was supposed to be carrying a load of coiled steel wire. I was caught in my own game.

Before I filled out the Micro-Mark car cards and waybills for my layout, I'd spent considerable time researching the prototype Monon's car types and listing the different loads they hauled for the actual customers depicted on my layout. Then I used this information to complete my car cards and waybills that travel with the cars to determine their movements on and off the layout.

However, I hadn't had time to make the appropriate loads for many of the open-top cars. Thus, my operators were destined to encounter an empty gondola with a waybill indicating it's supposed to be loaded with telephone poles, or an empty flatcar that should be carrying a load of lumber. I couldn't get my entire car fleet outfitted with loads in time for each operating session, but it was practical to load one car that evening and pursue the others as time allows.

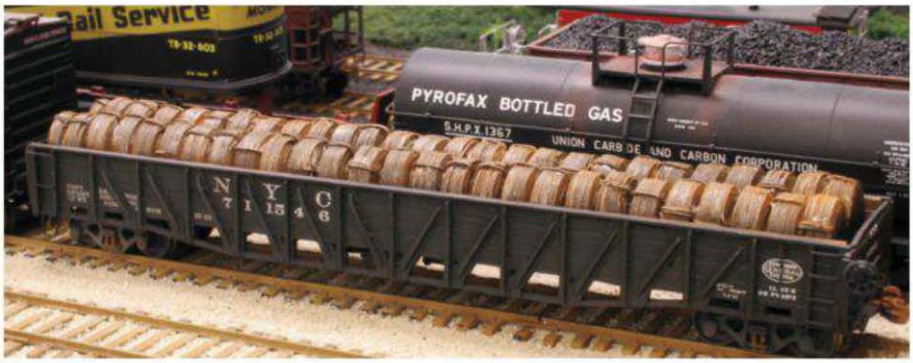
Serial gondola loads. My model of NYC 711546 is an eye-catcher in its own right. It's a Sunshine Models kit that I built more than 15 years ago. The model represents a composite (wood and steel) car built during the steel shortages of World War II.

I developed a series of waybills and matching loads to fit this model. They represent typical shipments that might have traveled on the Monon. All of the examples shown here are easy to build, and add a touch of realism to an operating session. In each case, the matching waybill is shown with an explanation of the car movement it requires.

I've found the handling of open-top freight cars on a model railroad is much more interesting when the cars carry the appropriate freight. It's even more fun when these loads represent the signature businesses that are located online.

Mont Switzer is a prolific author and modeler of the Monon RR in HO scale. He has shared his modeling techniques in more than 200 published articles.

INITIAL MOVEMENT FROM STAGING

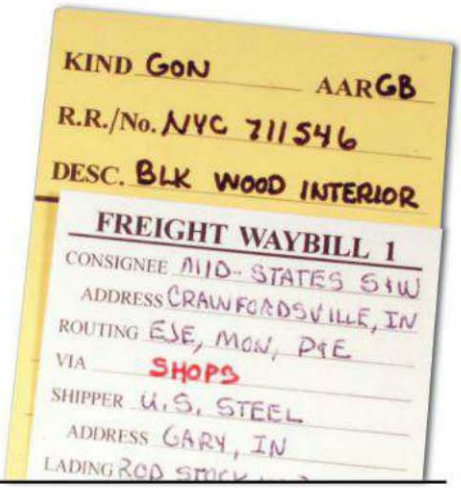


WAYBILL 1: The gondola's first waybilled load is coils of wire shipped from United States Steel in Gary, Ind. It originated on the Elgin, Joliet & Eastern, and travels via the Monon (my railroad) to Crawfordsville, Ind., where the Peoria & Eastern will deliver the load to Mid-States Steel & Wire.

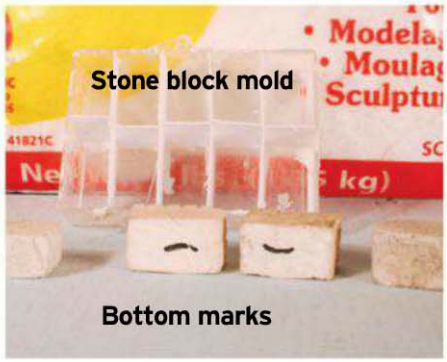
This car appears from the north staging on a southbound second-class freight train and travels the entire length of the layout. It's set out at Shops Yard (Lafayette, Ind.), so the yardmaster can forward the car to Crawfordsville on train No. 43, a local (which terminates in my south staging yard) daily except Sunday.

Modeling the coiled wire load was easy, as it's available as item no. 7221 in the Chooch line of cast-resin car loads. I used a belt sander and a razor saw to trim the casting to fit the car. I was careful to cut it off at a location that left a full coil at the cut.

The Chooch load looks good as it comes, but I applied a black wash to enhance the individual wire coils. Prototype wire is secured with steel banding that's cast into the load. I used a black marking pen to highlight the banding. Wire coils are often stored outside and may begin to rust, so I added rusty accents using Bragdon's weathering powders.



SPECIAL MOVEMENT



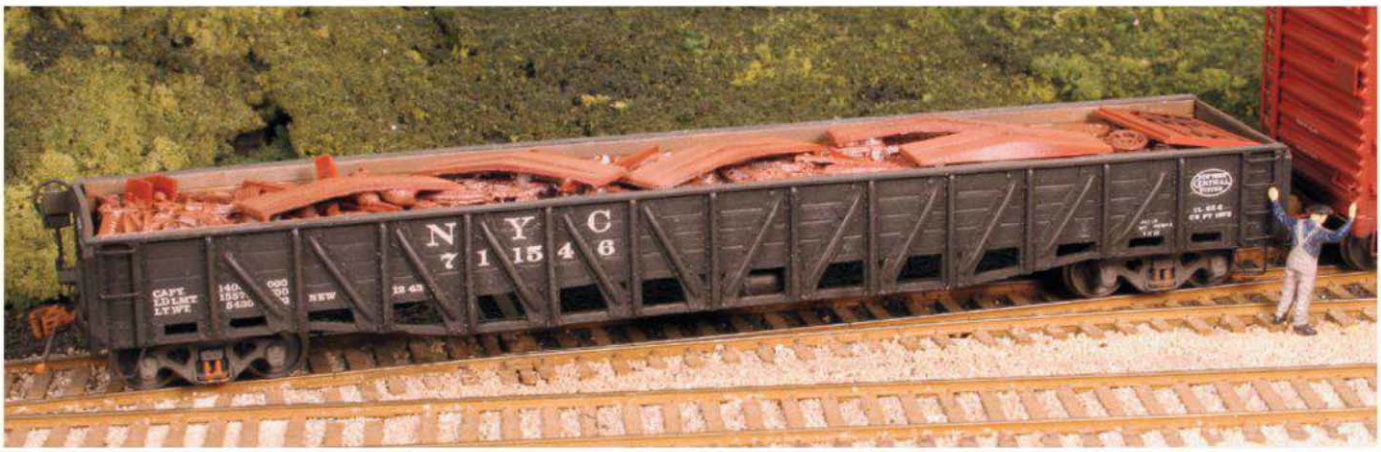
WAYBILL 2: Once NYC 711546 has been unloaded in Crawfordsville, it would normally return home according to the reverse routing of the car service rules. However, I have this car routed south to McDoel Yard in Bloomington, Ind. This unusual movement follows a prototype bulletin from the Division Superintendent ordering "any gondola regardless of ownership or condition" to McDoel for a special move.

These loads consist of large stone blocks destined to prevent erosion on the Michigan City, Ind., lakefront. Hauling these blocks was good business for the Monon.

To model the stone blocks, I made a simple styrene box mold for 10 scale 4 x 4 x 8-foot blocks and filled it with Sculptamold. After they set for a day, I pry the blocks out of the mold and add the drill marks by pressing an awl against the block on two sides, about a foot apart. It takes a few more days for the blocks to fully harden.

To make sure I load them so the details show, I put a black mark on the bottom of each block.

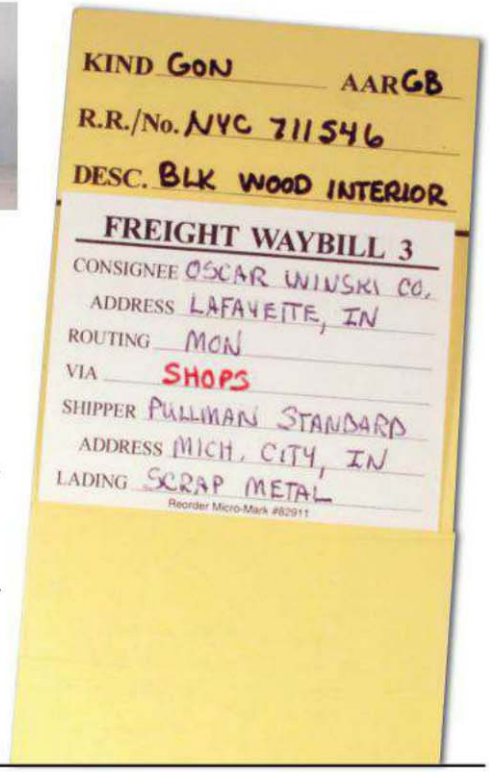
CROSSTOWN MOVEMENT



WAYBILL 3: After the stone movement, I send NYC 711546 across Michigan City to the Pullman-Standard freight car plant that was Monon's largest customer. This waybill indicates the car builder has sold a load of steel scrap to Oscar Winski, an on-line dealer in Lafayette. Since the Monon was perpetually short of its own gondolas, it "borrowed" the NYC car to service its good customer. The prototype term for this rerouting is "confiscating" the car.

To model the railroad scrap load I started with a Chooch no. 7238 scrap load. As before, I used a belt sander and snap saw to trim the load to fit into the car interior. Next, I added a piece of 1/4" square tubing to one end of the load casting to make it fill the entire car.

To make the load casting appear to be P-S scrap, I added to it readily identifiable railroad car parts from my scrap box. These included running board sections, sill steps, and partial doors. For the load shown in the photo, I used recognizable Pullman-Standard parts such as boxcar end sections, the firm's proprietary door panels, and the end ladders unique to PS-1 boxcars. I gently deformed the larger parts for added realism. Then I painted the parts with primer or in various railroad colors, and applied Bragdon rust weathering powder.



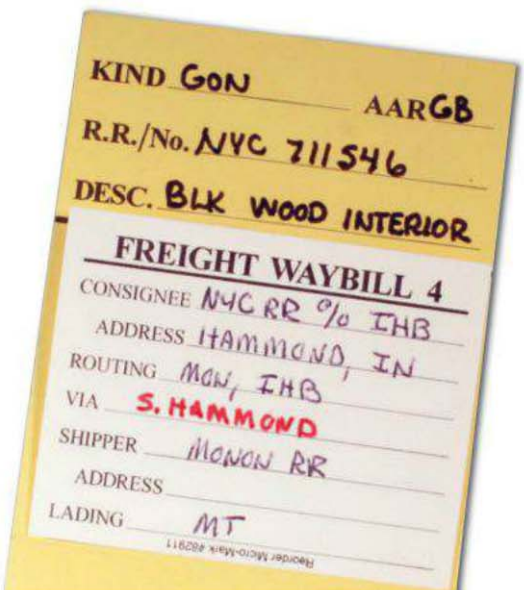
RETURN TO HOME ROAD

EMPTY WAYBILL 4: By the time NYC 711546 reaches West Lafayette and is unloaded by the scrap dealer, the empty gondola order has been suspended and the breakwater emergency is over. This car can now be picked up by the Monon local as an empty to begin its return move back to the NYC via the Indiana Harbor Belt (a NYC subsidiary) at South Hammond.

Operators on my Monon RR layout know South Hammond as the north staging yard, or the same place where this car's serial routing began some four operating sessions ago.

Perhaps the best part of all this is the loaded open-top car looks right for the simulated job it's doing. Having the appropriate loads on hand certainly enhances the layout's operating realism.

BUILDING A LOAD LIBRARY. Its going to take some time and effort to assemble enough appropriate open loads to handle during my operating sessions. However, there's nothing that prevents the same load from riding in another similar car. Just mark the underside of the load with the car type it will fit. OP



SIMPLIFIED CAR ROUTING

Identify a car's destination with color-coded dots

BY ALAN SAATKAMP
PHOTO BY JIM FORBES, ILLUSTRATION BY RICK JOHNSON

THE FIRST FEW OPERATING SESSIONS on my 19 x 26-foot HO scale Dakota, Minnesota & Eastern were rocky, to say the least. The yardmasters at Mankato and Waseca and the engineer assigned to New Ulm all indicated some confusion when trying to put together their trains. I'm sure some of it was their lack of familiarity with my new layout, but most of the confusion stemmed from the fact the layout is triple deck and that on the main and upper decks, west is to their right rather than left. Though there were diagrams of each town showing directions as well as online industries, operations weren't as smooth as I would have liked.

My friend Gary Freseman suggested that I adapt an idea used by fellow operator John O'Brien. He attaches ¼" self-adhesive color-coded dots (Avery no. 05795, available at office supply stores) to his waybills to help the operators, and especially yardmasters, route and classify cars quickly and accurately. Rather than reading the waybill and checking a route map before classifying each car, the operator or yardmaster simply checks the color of the dot to determine the car's destination.

A SIMPLE SYSTEM. I use whole dots for destinations where cars arrive at one of the staging yards and for the station destinations where trains make pickups or setouts. Examples include Tracy, New Ulm, Mankato, Waseca, and Winona.

The other locations on my layout would require additional dot colors, but I couldn't find any. This proved okay since a rainbow of colors would be unnecessary and overly complicated.

My solution was to use half dots. For example, empty anhydrous ammonia fertilizer tank car RTMX no. 3571 is set out at Mankato. Since the car's ultimate destination requires it to be sent west on the Chicago & North Western to Sioux City, Iowa, I put a green half dot on the waybill. This tells the yardmaster that the car won't be worked at Mankato. Instead, it's going elsewhere. As shown in the illustration, the bottom half of the dot means the car is going south (timetable west) to the Omaha staging track. If the car were destined for the Twin Cities on the C&NW, I would have used the top half of the dot to indicate north (east).

ENHANCING OPERATIONS. The color-coded dots have done what I hoped they would.

Alan Saatkamp shares how he uses this technique on his HO scale Dakota, Minnesota & Eastern.

They've simplified paperwork by providing a quick recognition tool. Operators don't have to read or study their waybills or refer to the system map to figure out where is station is located. Instead, they glance at the color-coded dot, which indicates the ultimate destination for the car, and refer to the stick diagram showing each station's color code. The dots have been especially helpful to operators who aren't familiar with the area I'm modeling. Matching color-coded dots to waybills makes it easy to identify a car's destination. OP

Alan Saatkamp lives in Harrisburg, S.D., and models the Dakota, Minnesota & Eastern Tracy Subdivision.

Andy Sperandeo offers useful ideas on freight yard operation and design. This is East Yard on Bill Darnaby's HO scale Maumee Route. Bill Darnaby photo

13 TIPS FOR FREIGHT YARD OPERATION AND DESIGN

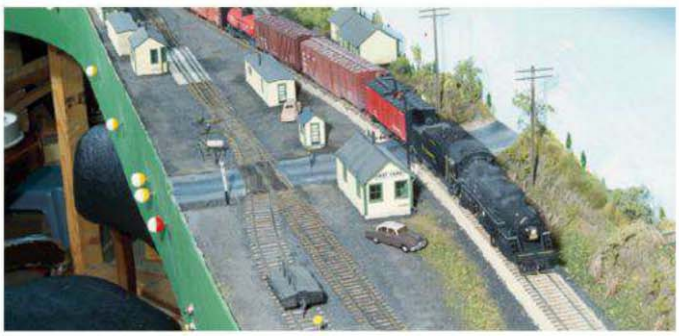
How to do a better job building and running model freight yards

BY ANDY SPERANDEO

FREIGHT YARDS can take up a lot of space on a model railroad, so it's good that they're fun on several levels. They make great displays of our modeling, not just cars but also trackside details. In terms of operation, a freight yard sets the pace for the rest of the model railroad. If things go smoothly in the yard, an operating session is likely to be more fun. Here are a baker's dozen suggestions for better freight yard operation and design.

Understanding how a freight yard works is obviously a big help in designing one, so first I'll offer seven operational ideas. After that I have six yard planning suggestions. I'm sure you'll find some concepts here that you can put to good use on your layout.

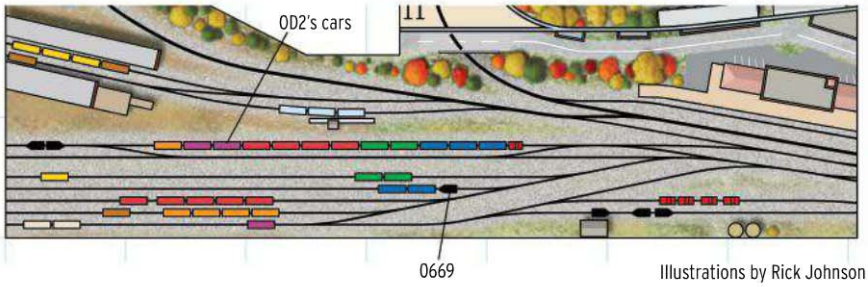
1. CARS IN FREIGHT YARDS ARE ON THEIR WAY SOMEWHERE ELSE



THE YARD isn't a destination. Its function is to classify (sort) cars into blocks (destination groups) moving to wherever the cars will be loaded or unloaded. A classification yard is a sorting center, and it accomplishes its mission every time a properly assembled road train, way freight, transfer run, or industrial switch job leaves its tracks.

The payoff in yard operation is getting cars organized into trains and getting them out of the yard. This is the Maumee Route's eastbound local freight No. 20 departing from East Yard at LaFontaine, Ohio. Bill Darnaby photo

2. CLASSIFY ARRIVING CARS ACCORDING TO THEIR NEXT DESTINATION



Illustrations by Rick Johnson

The next task for switch engine 0669, at Waterbury Yard on managing editor David Popp's N scale Naugatuck Valley RR, is to break up the arriving train by sorting its cars into the outbound blocks indicated by the color codes at right.

FOR THE MOST efficient classification, break up arriving trains by sorting the cars directly into outbound blocks. As the tracks fill up, the cars on each track will be ready to dispatch as trains.

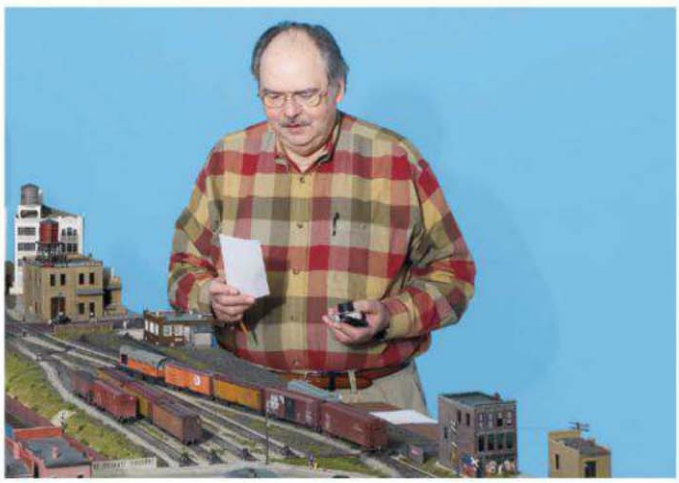
I'll leave the choice of a car-routing system to determine those destinations up to you, but I advise you to choose one that provides this information for arriving trains. You don't want to have to move cars around more than necessary, and it's best to avoid building outbound trains by "cherry-picking" one car at a time from unsorted tracks.

Even in sprawling prototype yards there can be times when there are more classifications than there are tracks. The big roads then designate a "for-now" or "slough" track, and use it to hold cars for trains that won't be departing until later in the shift or the next day. When track space is available, a switch crew pulls the for-now track and re-sorts those cars into outbound blocks.

3. WORK FROM A SWITCH LIST

WHETHER YOU USE a car-card system or computer-generated routing instructions, transcribing a switch list of the incoming cars with shorthand destination information will save time in the end. You can be sure that the list shows the order in which the cars stand on the track, and that will allow you to see blocks already formed and shortcuts to combining cars into new blocks.

You can also enjoy the added realism of working with a prototypical form. Yard foremen on the big roads don't carry fistfuls of waybills, and using switch lists is sort of a yard equivalent of operating with written train orders.



Andy uses a switch list as he sorts cars from the Midnight Beer Train at Humboldt Yard on *Model Railroader*'s HO scale Milwaukee Road Beer Line layout. Bill Zuback photo

4. USE STAGING YARDS TO REPREPRESENT MULTIPLE DESTINATIONS

WHEN YOU WANT to come up with a lot of places to send cars from a yard, nothing beats an off-layout staging or fiddle yard. Even though the departing trains all end up in the same place, the on-stage yard can send them out as road trains for distant cities, transfers for connecting railroads, or switch jobs serving industries on the other side of town. You can even block cars in station order for a way freight serving industries on the un-modeled subdivision represented by a staging yard.

The one staging yard on Chuck Hitchcock's HO Argentine Industrial District Ry. represents both the Atchison, Topeka & Santa Fe's Argentine Yard, gateway to all parts of the Santa Fe system, and all the other connecting railroads in Kansas City. Paul J. Dolkos photo

5. CHANGE THROUGH-TRAIN ENGINES AND CABOOSES FOR MORE ACTION

IN STEAM DAYS it was common to change engines at the same points where their crews changed, approximately every 100 miles. With more modern steam locomotives and then with diesels, there could still be reason to change from "valley" or flatland power to mountain engines.

Right into the 1960s, cabooses on many railroads were assigned to specific train crews. (See page 74). That meant that the cabooses had to be replaced wherever the crews changed. This gives us a great excuse for having lots of cabooses on our railroads, as if we needed one!

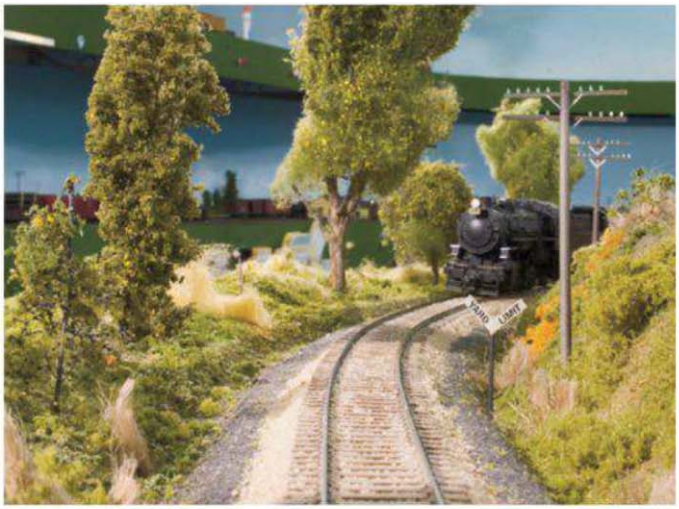
Through freight OA-2 to Hartford is changing crews at Waterbury, so the switcher is swapping the assigned cabooses. Caboose or engine changes can add action even when there are no cars to set out or pick up. David Popp photo

6. MULTIPLE OPERATORS HELP YARDS KEEP UP WITH OUR SHORT MAIN LINES

IT'S A COMMON complaint that trains get across our model railroads much faster than they can be worked in the yard. (This is why efficiency is a concern in many of these suggestions.) Assigning more than one operator to your yard will help, even if the yard doesn't allow more than one engine at a time to do classification switching. The second operator can hostle engines arriving at the engine terminal and line up power for outbound trains. Or one can be the yardmaster writing switch lists for the next moves, while the other is the engine foreman running the switcher. If there are a lot of local industries to serve, or a nearby passenger station to work, the additional operator can do those duties while the first concentrates on the yard itself.

It's an all-MR team as associate editor Cody Grivno, left, and DCC Corner columnist Mike Polsgrove work together in the Naugatuck Valley's Waterbury Yard. Tonight Mike is the yardmaster and Cody is handling the Freight House and River Job assignments. David Popp photo

7. ESTABLISH YARD LIMITS FOR USING MAIN TRACKS ADJACENT TO A YARD



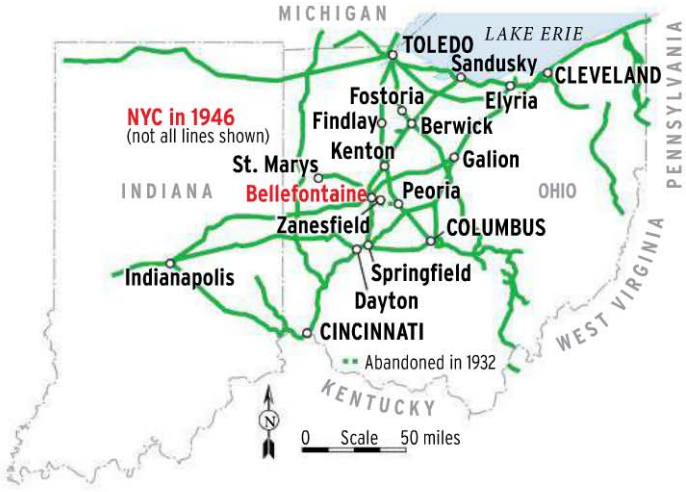
THE CLASSIC RULE 93 YARD LIMITS apply on the main line, not in the yard itself. This rule allows trains and engines within the specified limits to use the main track without other authority, usually only clearing the scheduled times of first-class (passenger) trains. Trains other than first class must approach the yard with caution, expecting to find the main track occupied, switches not lined, and other obstructions.

Within yard limits, the main line can be used as a longer switching lead, a runaround or thoroughfare track to the far end of the yard, or even as an extra arrival or departure track when no first-class trains are due.

The yard limit sign shows how much of the main line the Maumee Route's East Yard switch engine can use under the authority of Rule 93. Yard limits, which apply only to main tracks, allow for flexibility in occupying the main adjacent to a yard. Bill Darnaby photo

8. MODEL A YARD AT OR CLOSE TO A JUNCTION

WHETHER BASED on a prototype or freelanced, junction yards provide opportunities for combining trains from different origins and separating trains bound to various terminals. A yard where trains are passing through between a pair of distant cities can't compare to the operating possibilities at a junction. The junction can either be modeled on the layout or represented in an adjacent staging yard. Either way makes no difference to the switching opportunities in the nearby yard.



The strategic location of Bellefontaine, Ohio, on the New York Central led to intense yard action, with more than 40 trains in or out per day. Learn more from "High intensity freight hub" by MR publisher Terry Thompson in our 2007 special issue, *How to Build Realistic Layouts: Freight Yards*.

9. DOUBLE-ENDED YARDS ARE MORE FLEXIBLE AND "RAILROADY"

ALTHOUGH THERE'S a space penalty for having switch ladders at both ends of a yard, the gain in flexibility is enormous. It's easy to have two switchers in action simultaneously, for example, when one works from the east end and the other from the west. As for appearance, most real railroad yards are double-ended, so a model yard laid out that way automatically gains in realism. Even at end-of-the-line terminals, cars can flow in and out in both directions to reach industrial customers and connecting railroads.

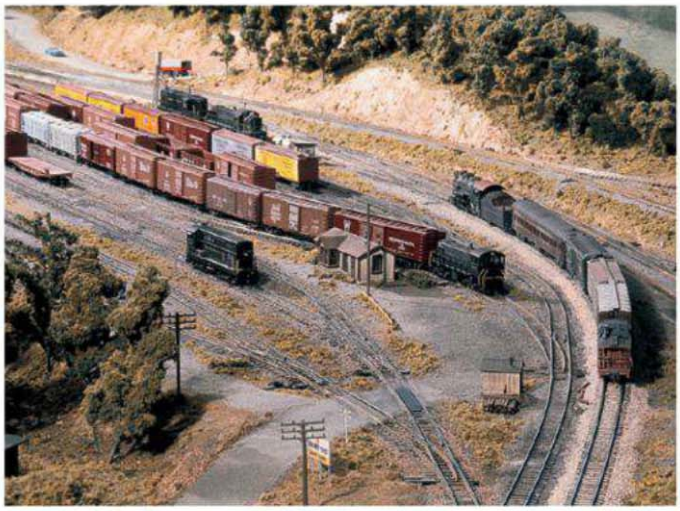
In the left-hand photo, double-ended yards cluster together at Avondale, La., across the Mississippi from New Orleans. The yard on the left is the Texas Pacific-Missouri Pacific Terminal's, and the others serve the Southern Pacific's Texas & New Orleans subsidiary. Missouri Pacific photo

The right-hand photo shows a classic example of a double-ended yard on a model railroad, Alturas on Whit Towers' HO scale Alturas & Lone Pine. Whitney K. Towers photo

10. INCLUDE A DRILL TRACK (OR TRACKS) OFF THE MAIN LINE

THE DRILL TRACK or switching lead lets a yard switcher keep working while trains pass by on the main line, and it also provides a place for the switcher and a cut of cars to "hide" while a train pulls into or out of the yard.

Many smaller yards on full-size railroads lack drill tracks, usually because light mainline traffic at that location makes them unnecessary. However, model main lines tend to be relatively busy. Another consequence of our railroads being too short is that trains arrive at yards that much more often. For that reason, drill tracks make even more sense for model freight yards than for the big ones.



The drill track to the left of the light-ballasted main track allows Pennsylvania RR switchers to keep working in Shomo Yard while an eastbound milk train rolls through. This scene is at Hagerstown, Md., on Bill and Wayne Reid's N scale Cumberland Valley System. Andy Sperandeo photo

11. PROVIDE CROSSOVERS TO AVOID INTERRUPTIONS TO LEAD SWITCHING

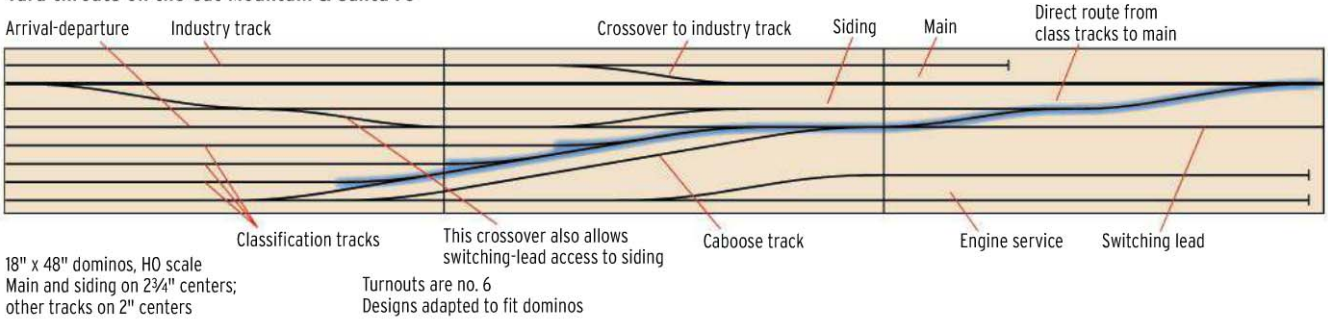
USUALLY THE ADDITION of a single crossover can make it possible for trains to arrive and depart while the yard switcher continues to work on its lead and drill track. Often there's only a small penalty in space, or perhaps none at all.

The efficiency of such arrangements should be obvious, and the gain in fluidity of movement will further help the model railroad yard to keep up with the demanding pace of mainline operations.

The RS-1 switcher can keep working in Waterbury Yard while a road freight arrives, thanks to crossovers David Popp installed for flexible connections between the drill, arrival/departure, and main tracks. David Popp photo

12. ALLOW DIRECT ACCESS BETWEEN CLASSIFICATION TRACKS AND THE MAIN

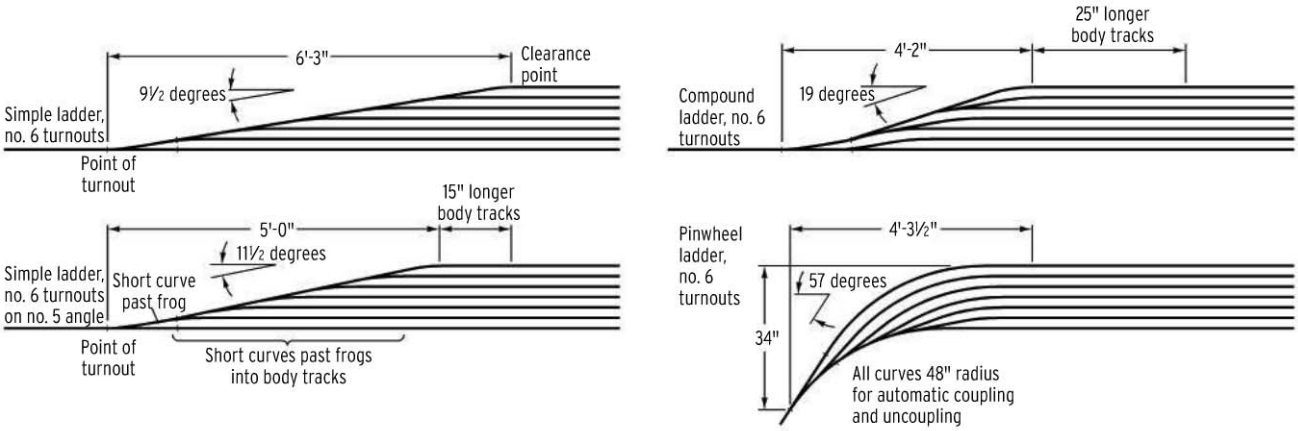
Yard throats on the Cat Mountain & Santa Fe



THIS CAPABILITY adds a lot of flexibility in how you can use your yard tracks. If the arrival/departure tracks are full, trains can depart from or arrive in a classification track. This is an option you'll find in most prototype yards.

The highlighted route shows the direct connection from the classification tracks to the main line in this yard throat David Barrow adapted from his HO scale Cat Mountain & Santa Fe Ry.

13. USE SPECIAL LADDERS FOR LONGER BODY TRACKS IN TIGHT SPACES



THE BIG ROADS commonly build yard ladders on angles steeper than the frogs of the turnouts. A short curve into each body track is usually evidence of this arrangement.

The compound ladder is more unusual because of safety concerns, but railroads can use extended switch rods to locate all the switch stands in a row outside the ladder. That minimizes the need for switchmen to cross tracks where cars are being switched.

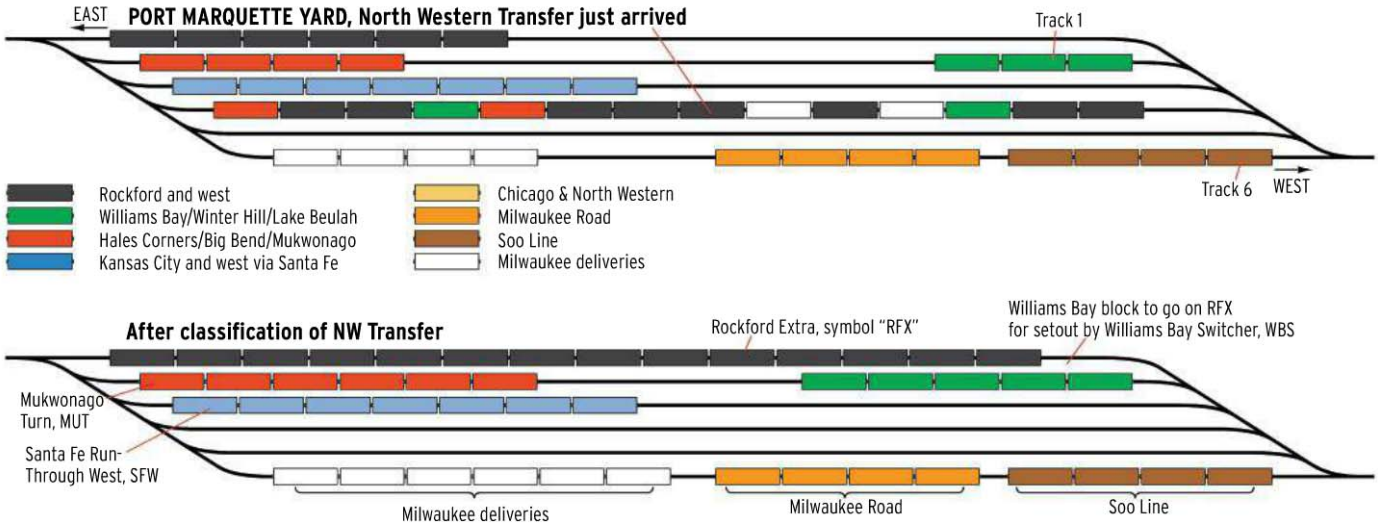
Using dimensions for HO scale with tracks on 2" centers, these diagrams show how special ladders can allow longer body tracks or bending the end of a yard around a corner.

A pinwheel ladder can let the end of a yard curve, and that's especially handy on model layouts. All the switch stands can be inside the curve of the pinwheel ladder, avoiding the safety issues of the compound ladder. OP

YARD WORK

Learn the basic function of a classification yard

BY ANDY SPERANDEO



I'M ALMOST ALWAYS WILLING to take on a freight yard job when I'm invited to an operating session. It really doesn't matter if I've even seen the layout before or know anything about its operating patterns – I'm happy to do it. Am I just foolhardy and overconfident?

Quite possibly. However, I've also learned through experience and observation how yards are supposed to work, and I know they all pretty much work the same way.

The basic function of any freight yard is what the railroads call "classification." That means sorting cars with similar routings or destinations together to build trains, or blocks for trains carrying cars with multiple destinations. Each grouping of cars is a "classification," and you "classify" cars by sorting them.

For efficiency, the classification needs to be done as cars arrive in the yard, so trains are ready before they're supposed to leave.

PORT MARQUETTE YARD. I can illustrate classification switching with an actual example instead of something abstract. The diagrams above show Port Marquette Yard, the Milwaukee freight terminal on our old HO scale Milwaukee, Racine & Troy club layout. The colored blocks represent cars, and the key shows the classifications represented by each color. Notice that we had eight classifications but only six tracks in the yard. Some doubling up was necessary, especially since the yard crew kept at least one track clear for arriving trains. Having more classifications than tracks is typical of model railroad yards.

In the upper diagram, track four is occupied by cars with a variety of destinations just brought in by a transfer from the Chicago & North Western. The next assignment for the two Port Marquette switchers, one working from either end, is to classify the cars from the North Western and add them to the blocks already standing in the yard.

(There are no cars in Port Marquette for the C&NW because the transfer job took them back to its base in Butler, Wis., represented by a staging track.)

CLASSIFICATION BUILDS TRAINS. The lower diagram shows the yard after the cars from the C&NW have been classified. As you can see, they've gone directly into blocks being built for outbound trains, as identified in the lower diagram.

The RFX and SFW are both through trains headed west. The WBS and MUT blocks on track two are both for way freights, but they will be handled differently. The WBS block will go out on the head end of the RFX, and that train will set out those cars at Williams Bay for a road switcher based there. The MUT operates as a turn to its namesake station, and it'll be clear to pull to the west out of track two once the RFX departs.

The cars on six are in three blocks. The Soo cars are at the west end for pickup by a westbound Soo train operating over the MR&T on trackage rights. After a few more Milwaukee Road cars show up in arriving trains, the yard crew will pull the middle block off six and start building a transfer for that connection on track four or five. When there's a lull in the yard switching, the east end switcher will spot the Milwaukee deliveries at local industries, returning to the yard with pickups to be classified.

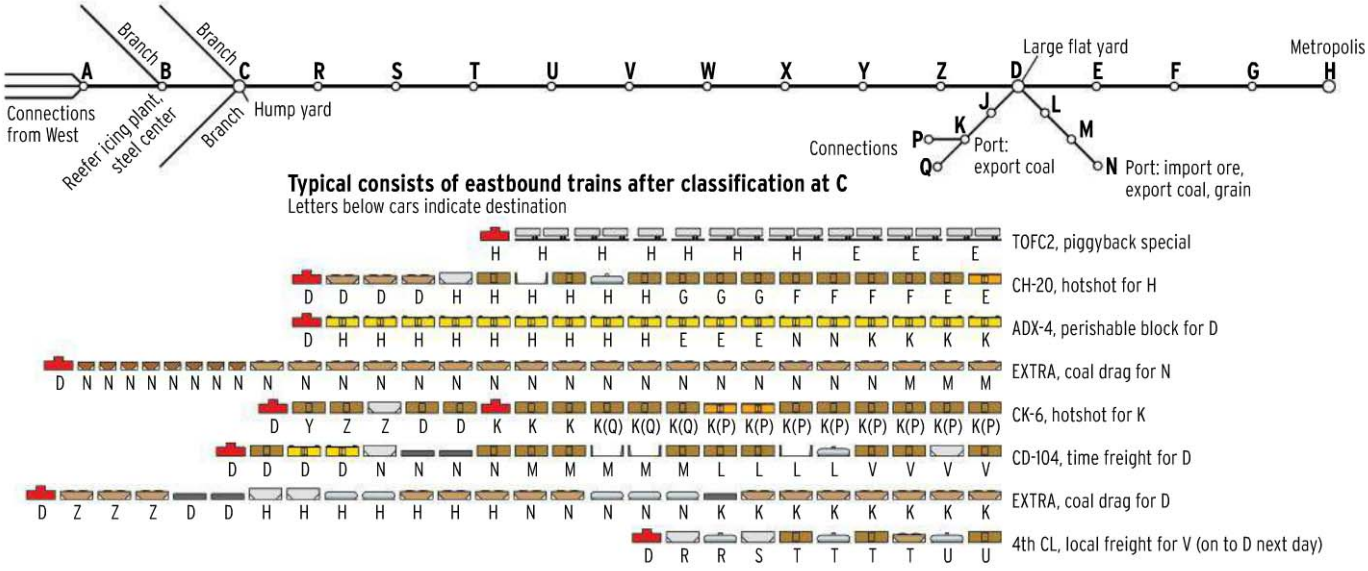
WHERE TO NEXT? And so it went. The yard was always in a state of flux as trains came and left, but the outbound trains were usually ready in time for scheduled departures because we classified the incoming cars upon arrival.

I haven't said anything about our car-routing system. We had one, but its particulars don't matter. As long as the paperwork in your operating system indicates where cars are going next, you'll have the information needed for efficient classification switching. OP

BLOCKING TRAINS

Classify trains like the prototype roads for efficient operations

BY ANDY SPERANDEO



BLOCKING IS organizing cars in a train so that they are handled together as a group. Blocks of cars are generally put together in classification yards, but may also be assembled by local switchers at intermediate stations. Road trains doing online switching will generally attempt to keep their trains blocked. Local freight crews, on the other hand, will often re-organize their trains along the way for their own convenience.

A THROUGH FREIGHT made up entirely of cars for one destination (one block) is often referred to as a "solid" train. Solid trains with less tonnage (cars) than their locomotives can handle may also be "filled" with additional cars, loads or even empties, moving in the same general direction. If a yard down the line has additional tonnage for the train's main destination, part or all of the fill may be removed and held for a later train, making room for the new cars.

Road freights are often blocked for convenient switching both in terminals and en route. For example, even a train with every car destined for the same terminal city might have at least two blocks, one of terminal "propers," cars to be delivered in that city by our railroad, and one of terminal interchange, cars to be forwarded through connections with other railroads.

The loading may override other blocking concerns. Roads that carried a lot of perishable traffic in ice refrigerator cars usually wanted all the "icers" on the head end, to be easily spotted for re-icing en route. Stockcars loaded with livestock also rated head-end placement on many carriers to reduce the animals' exposure to slack action and possible injury.

When trailer-on-flatcar (TOFC) service became important in the 1950s, there were different views on its placement in trains. Some railroads put the cars up front, again for reduced slack action. Other lines carried the cars on the rear, where they could easily be added close to departure.

By the 1960s TOFC and COFC (container-on-flatcar) equipment was so commonplace that it rarely rated special blocking.

BLOCKING WAY FREIGHTS. Local freights are generally built by originating yards with blocks in station order. Cars to be set out at the first station are on the head end, and cars for subsequent stations are in order back in the train. One common exception might be for a station where the majority or even all of the work will be at facing-point spurs. Cars for that station might be blocked on the rear of the train, for convenient handling after the engine runs around the train.

When time allows, the way freight's crew will place cars picked up behind the cars still to be worked.

THE ILLUSTRATION ABOVE, from John Armstrong's *Track Planning for Realistic Operation* (Kalmbach Books), shows how several different types of trains could be blocked. Besides the train blocking, note where most of this interesting classification work takes place, primarily in the yard at "C," and to a lesser extent at "D."

A model railroader planning a layout to offer challenging yard operation might want to include a place like C (it could be a flat yard rather than a hump yard), or perhaps D if less space is available or less intense switching is the goal.

The entire system of main lines and branches doesn't have to be modeled. A confirmed yard fan might be happy with just one yard and a lot of staging tracks. The idea of destinations beyond the layout would provide the rationale for classifying cars into blocks and combining blocks into trains. OP

WEIGHING FREIGHT CARS

Use a scale track to add prototypical operation to your layout

BY ANDY SPERANDEO

A Baltimore & Ohio boxcar is spotted for weighing on the Beer Line track scale.

ON OUR MILWAUKEE ROAD Beer Line HO layout, most freight car weighing is done by the switch crew working the Elevator Job. Weight is one factor in determining how much the railroad can charge the shipper, so this task is important business. I've described the rest of the Elevator Job's work on page 76. Here I'll explain how this crew weighs cars at the scale track.

The conductor may use any convenient spur track to sort the cars to be weighed into one group. It's most efficient to block the cars together and weigh one after the other.

The conductor may put cars between those being weighed and the engine to serve as a "handle" to keep the engine off the scale, or he can switch the engine onto the gantlet bypass track.

TO THE SCALE. When the crew is ready, they signal the engineer to pull the cut of cars being weighed and the handle past the switch to the scale track. Then they open the switch and have the engineer back the cut to spot the last car on the scale's live rails. The crew uncouples that car and signals the engineer to pull ahead so only one car is left on the scale. The Beer Line's scale was a "spot scale" that weighed one car at a time.

The conductor gives a list of the cars being weighed to the operator in the scale house. He needs only a moment to read the weight and record it on a weigh ticket, a form used to enter the weight on the car's waybill. Then he rings the scale house bell outside to signal the crew that he's ready for the next car. Some scales automatically print the weigh ticket and ring the bell at the same time.

SPOT, WEIGH, REPEAT. On signal from his ground crew, the engineer backs the cut to push the weighed car past the scale. Then he gets a signal to pull ahead to spot the next car, and then to pull away again once it's uncoupled on the scale. The crew repeats this procedure for every car being weighed before taking the cut back to the train.

We're simulating the weighing and recording, but we do spot, push, and pull the cars as if the scale really functioned. This adds interest to the switch crew's run, and accurately models the work done on the full-size railroad.

WEIGH-IN-MOTION. At locations where many cars have to be weighed, railroads use "weigh-in-motion" scales that can weigh cars on the move. Cars can be pushed or pulled over the scale continuously, typically no faster than 4 mph. While slow, this is quicker than using a spot scale. In Walthers' HO kit, the "heavy-duty scale" represents a weigh-in-motion type.

Full-size hump yards often include weigh-in-motion scales just past the hump apex. At automated yards weight, speed, and other factors are used to control the graduated retarders that slow the cars as they roll into classification tracks.

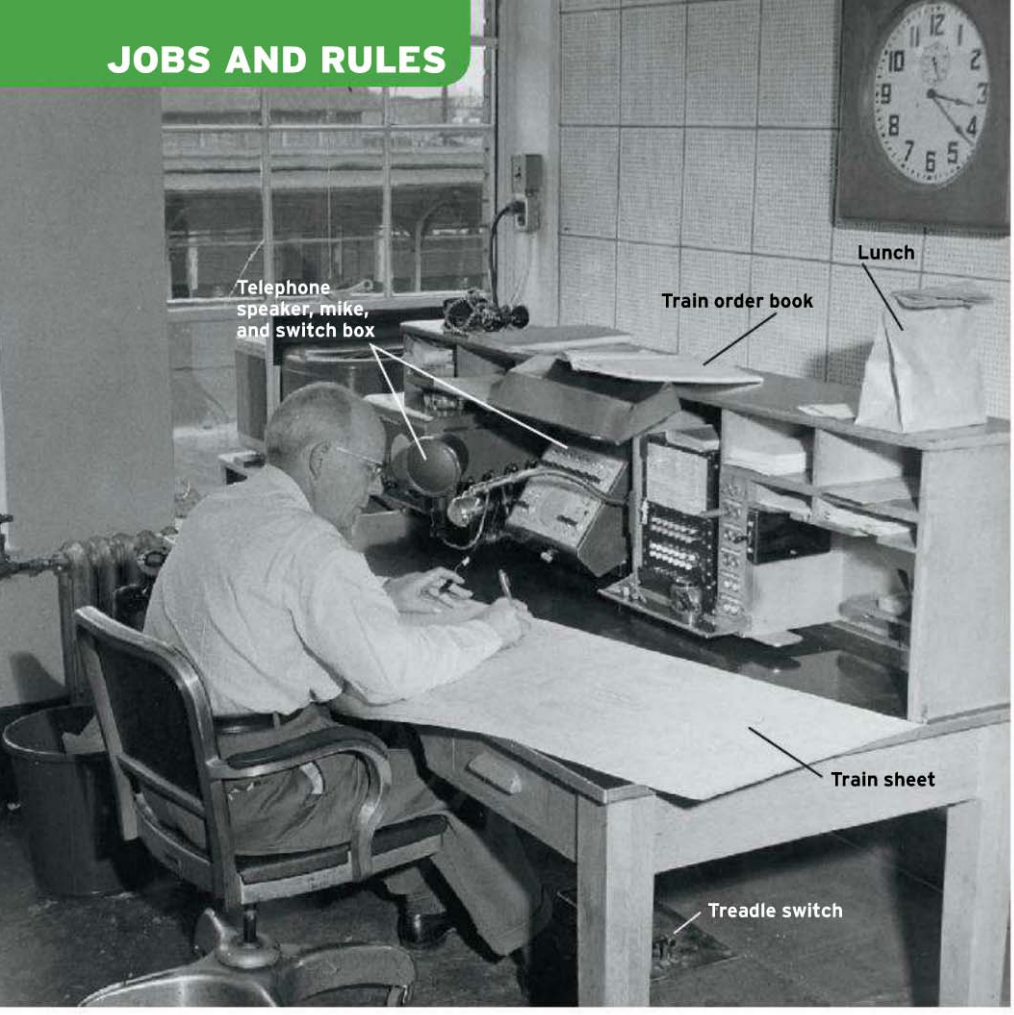
PAPERWORK. With car cards and four-step waybills, you can simply enter "TO BE WEIGHED" as the destination for the next step after the car is loaded to route it to the nearest scale. After the car has been "weighed," the waybill can be turned to show the actual destination.

Another method is to insert slips reading "TO BE WEIGHED" in front of the waybills of cars to go to the scale. The operator who weighs the cars will remove the slips and send the cars on to the destinations shown on the waybills.

WEIGHTY READING. For information on prototype track scales, I recommend "Weighing Freight Cars," in *Railway Prototype Cyclopedia Vol. 12*, available from RP CYC Publishing Co (rpcycpub.com).

To model a weigh-in-motion scale, see Ken Pfaff's article, "Modeling track scales," in the September 1991 *Model Railroader*. To build a model scale that actually weighs cars, look up Jim Ferenc's article, "Build a working track scale," in the August 2000 MR.

Weighing freight cars is a basic prototype procedure that will add realism to your railroad's operations. OP



Here's a Southern Pacific train dispatcher at Sacramento, Calif., surrounded by the tools of his trade. A model railroad dispatcher's office could re-create such a setting, including the push-to-talk foot switch. Phillp R. Hastings photo

THE TRAIN DISPATCHER

This key player keeps the main line moving

BY ANDY SPERANDEO

A TRAIN DISPATCHER supervises the movement of trains over a designated portion of a railroad and also supervises the other employees involved in that movement. The dispatcher's first responsibility is safety, to see that each train gets over the road without trying to occupy the same piece of track at the same time as any other train. In addition, the dispatcher is supposed to expedite train movements.

The dispatcher works to help scheduled trains maintain their schedules, to run extra (unscheduled) trains as needed when other movements allow, and to see that late-running scheduled trains cause the least delay possible for other trains.

On single-track roads dispatchers are particularly concerned with where opposing trains meet. They are responsible for adjusting scheduled meeting points as needed, and for designating meeting points between opposing extra trains.

On a layout with only a couple of people running trains, a train dispatcher may not be absolutely necessary. On a small layout you can say to your friend running the other train, "I'll meet you at Slate Falls, you take the siding." But when you want to have more trains moving at the same time, or run them on a railroad large enough to make face-to-face communication difficult, the need for a dispatcher soon becomes evident.

Besides fulfilling a useful role, a dispatcher can add a layer of enjoyment to model railroad operation. That's because the dispatcher doesn't run trains with a throttle, but by interacting with other people. Depending on the particular system of movement authority, the dispatcher may interact by way of written orders and instructions, by telephone or radio communication, or by signal indications controlled from a 1940s-style Centralized Traffic Control (CTC) machine or a modern desktop computer. (See "Authority to use the main track" on page 42 of this issue.)

However it's done, the dispatcher is mindful that instructions communicated to train crews and other operators must be clear and understandable.

DISPATCHING DUTIES. Here's a list of some of the things a train dispatcher may do on a model railroad.

- Clear trains to start from their initial terminals, either verbally, by okaying written clearance "cards" prepared by train-order operators, or by track warrants transmitted directly to train crews.
- Keep a record of movements on a train sheet, where times from "OS reports" (see "OS-ing trains" section on the next page) are entered in timetable-like columns for each train. Besides serving as a record, the train sheet helps the dispatcher visualize where trains are on the railroad.
- Plan for and set meeting points between trains on single-track railroads, using train orders dictated to an operator, track warrants, or by setting CTC signal indications.
- Plan for and set up overtaking movements on double- or multiple-track railroads. Instructions may be transmitted by written messages copied by operators as well as by the methods listed in the previous paragraph.
- Where helpers are needed, manage the use of helper locomotives and provide for the return of helpers to their base, usually as extra trains.
- Allow time for way-freight and other online switching as needed.

And that's just a start. It can be a fascinating job on a busy railroad. OP

OS-ING TRAINS

Operators were the dispatcher's eyes along the main line

BY ANDY SPERANDEO

Operator I.G. Barrett calls in an OS to the dispatcher from the Santa Fe station in Stratford, Texas. People reporting trains "on sheet" kept dispatchers informed in railroading's classic era. J. David Ingles photo

A SHARP BUZZ ALERTS the dispatcher to an incoming telephone call. Pressing the foot switch that activates the microphone above his desk, he answers:

"Dispatcher."

"OS Beacon," the caller responds through the loudspeaker in the dispatcher's office.

The dispatcher has picked up his pen by now and holds it hovering over the line for the station of Beacon on his train sheet.

"Go ahead, Beacon," the dispatcher answers.

"Extra 1414 East by at 8:42 a.m.," the caller reports.

"Fourteen-fourteen East at '42, thanks," the dispatcher replies, as he writes the time at Beacon in the column he's designated for this extra freight. Releasing the foot switch, he ends the call.

So what's this exchange really all about? What does "OS" mean anyway? How does any of this apply to model railroading?

OS REPORTS. The telephone conversation notified the dispatcher of the progress of a train across his territory. He used that information to update his record of train movements and his mental picture of the railroad. The exchange follows a common prototype format, even though it's actually about a train on David Popp's N scale New Haven Naugatuck Branch. "Beacon" is Beacon, Conn., and "Extra 1414 East" is the train-order designation for symbol freight ND-2.

(Why ND-2 operates as an extra with no schedule is explained on page 46.)

The abbreviation "OS" is the old telegraph shorthand for "on sheet," used when a telegraph operator at a wayside station or tower had noted a movement on his own train record and reported it to the dispatcher. When communication by telephone replaced the telegraph, operators kept sending the same message verbally instead of in Morse code. Because the time reported is usually the time the last car of the train passes the operator's office, some sources give "out of station" as an alternative definition for "OS."

IN MODEL OPERATION. Since model railroads generally don't have the space or the numbers of people to assign train-order operators to every station, the convention most often adopted is to have a member of a train crew stand in for the operators at the offices (stations or towers) along the train's run. The crew member temporarily shifts roles when phoning the dispatcher, delivering the OS report as the train-order operator. Where there are yard and tower operators on a model railroad, sometimes they'll make the report for the train crew.

The dispatcher needs to know where trains are to be able to issue orders that both keep them apart and assist their progress. When running a train in an operating session, I take it as a matter not only of expectation but of politeness to help out by making OS reports when I should. Dispatchers usually respond by helping crews who make helpful reports.

The layout owner can help too, by making it clear where train crews are expected to report. This may be presented prototypically with notations on the timetable schedule page to show which stations have open offices as well as what hours they're open if not around the clock. A more direct approach that many find effective is to put prominent signs with the letters "OS" on the layout fascia at reporting stations.

The next time you're at an operating session, you'll understand what "OS-ing" is all about and be ready to play your part. OP

AUTHORITY TO USE THE MAIN TRACK

At Burbank Junction, the conductor of Southern Pacific Train 803 from Los Angeles picks up a clearance card authorizing his train over the Mojave Subdivision of the San Joaquin Division. Stanley Groff photo

A railroad main line is governed by strict operating rules

BY ANDY SPERANDEO

A RAILROADER EXPLAINING operation to a group of modelers began by emphasizing that there two kinds of track, main tracks and everything else. On anything other than a main track, he told us, crews can do their jobs without specific authority to move from A to B, protected by rules that movements on other than main tracks should be slow enough to avoid accidents.

But on main tracks trains run too fast to stop within sighting distance of other trains or obstructions. They must be kept apart by adherence to rules, schedules, and signal indications. In particular, a train or engine needs specific authority to occupy or use the main line from its initial station on any district or subdivision until it completes its prescribed run. The different ways of granting that authority make one system of operation distinct from another. Here are some forms of authority that are useful in model railroad operation. (In addition, see "Yard limits" on page 34 of this issue.)

TIMETABLE AND TRAIN ORDER. Trains are authorized by timetable schedules under rules for the superiority of trains. Both schedules and superiority are subject to modification by the dispatcher in the form of written train orders.

The basic document needed, in addition to the current timetable and rule book, is the clearance card. Often but not always called "Form A," the clearance gives a scheduled train authority to proceed on its schedule, and also serves as a receipt listing any train orders or messages being delivered at the same time.

The dispatcher can also authorize extra trains not scheduled in the timetable. (See "Running extra trains" on page 46 of this issue.)

SIGNAL INDICATIONS. A railroad operating by timetable and train orders may have an automatic block signal system to increase its capacity. On a single main track, automatic signals don't convey authority to occupy the main, but do serve as safeguards in case crews exceed their authority.

However, on two or more main tracks with a "current of traffic," automatic signals may convey authority to trains running in the designated direction, typically under Rule 251. The signals protect following trains, and opposing trains run on different tracks.

Usually a clearance is all that's needed to authorize a scheduled train at its initial terminal, and where allowed in the employee timetable that could be true for extra trains too under Rule 251.

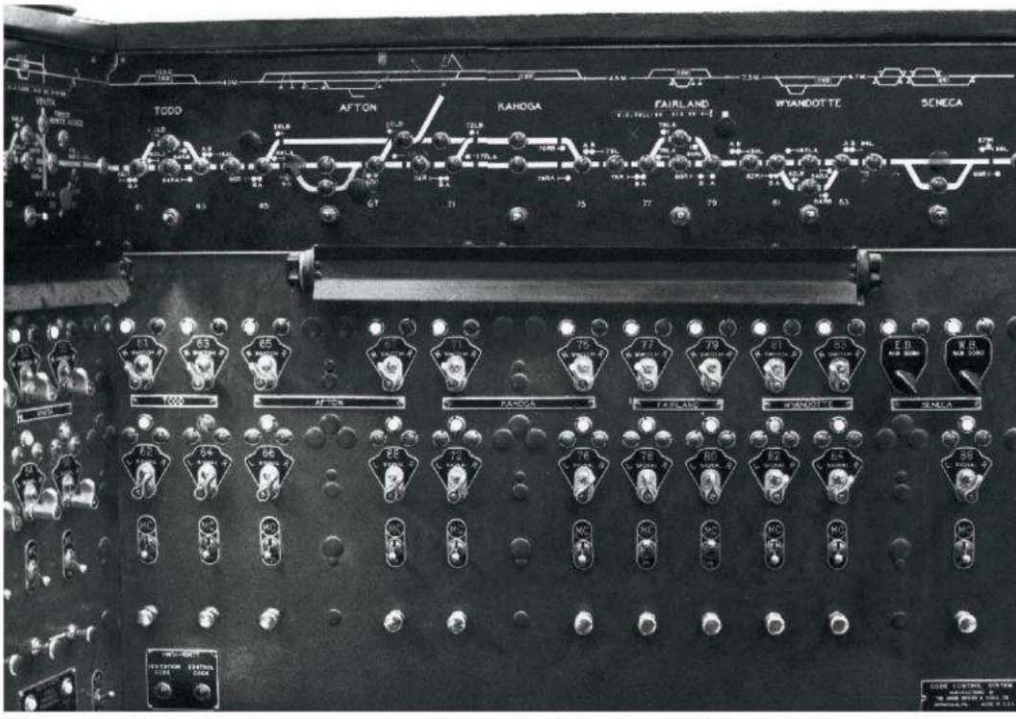
CENTRALIZED TRAFFIC CONTROL, or CTC, is a system to remotely operate interlocked control points that may extend over an entire operating district or subdivision. The dispatcher monitors train movements on an office display and sends instructions for the system to line turnouts and clear signals at the control points. The CTC system has built-in safety checks – the interlocking – that prevent it from clearing conflicting movements, so it protects both opposing and following trains. Between control points, intermediate signals function automatically.

With CTC the governing rule was most often Rule 261, with trains originally authorized at their initial stations with clearance cards and proceeding over the road on the authority of the signal indications. In later practice verbal clearances radioed to trains at initial stations became accepted.

TRACK WARRANTS. Track Warrant Control has generally replaced timetable-and-train-order authority for both unsignaled and automatic block signal territory, and is also used in conjunction with CTC. Authority on the main line is given using a printed form with check-off boxes and blank spaces that train crews fill in following instructions radioed by the dispatcher. At initial stations, warrants may instead be printed by a computer link from the dispatching center, and some advanced systems allow warrants to be printed by onboard computers in engine cabs.

Track warrants do the job of both clearances and train orders, but since they can be transmitted directly to train crews, train-order operators at lineside stations aren't necessary. For CTC, trains receive initial authorization by track warrant instead of a clearance.

Direct Traffic Control, DTC, is similar, but gives authority to occupy specific blocks. Again the dispatcher radios instructions to crews, who fill in blanks on printed forms. However, TWC is more flexible because authority can be granted to or restricted at any identifiable point on the railroad, such as a milepost or a siding turnout.



The most efficient way to move a lot of trains is Centralized Traffic Control, represented here by a Union Switch & Signal CTC "machine" at Springfield, Mo., on the old St. Louis-San Francisco. A machine like this also makes a great toy for a model railroader. Harold A. Edmonson photo

AUTHORITY FOR MODEL RAILROADS. Here's how I rate these choices in order of ease of implementation.

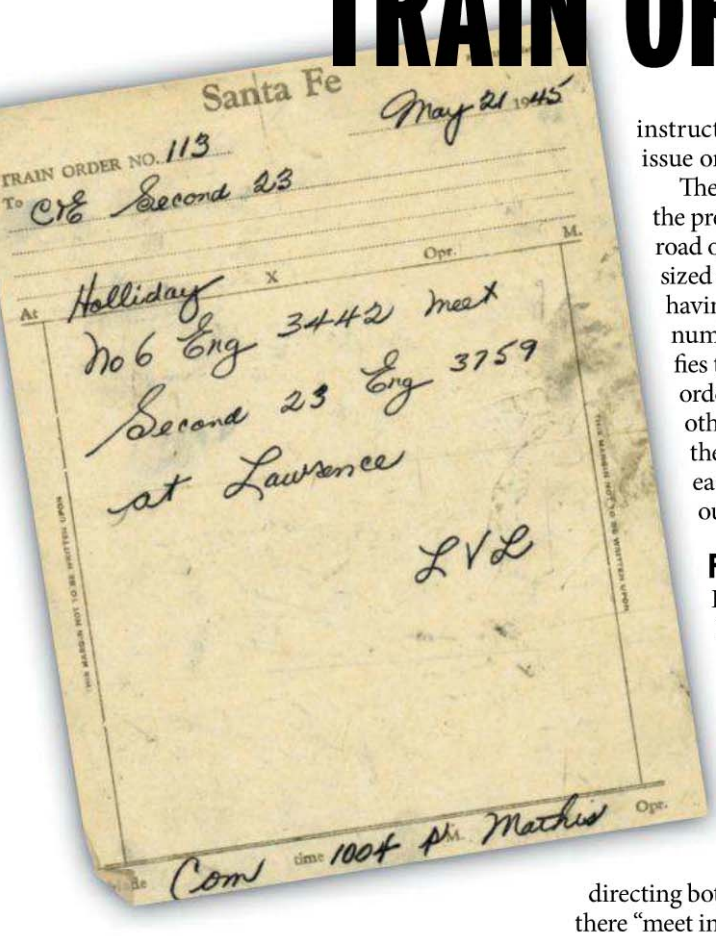
1. TRACK WARRANTS: All you need are printed pads of warrant forms, two-way radios for communication, and clipboards and pencils for your train crews. But this is one of the slower systems to use on a model railroad. As the number of trains increases, the radio traffic increases even more, and unlike the prototype, the crew on a model railroad usually has to stop the train to copy a warrant. Track warrant instructions are easy to use as long as crews follow them exactly. But if era is a factor, track warrants are only realistic from about 1980 to the present.

2. TIMETABLE-AND-TRAIN-ORDER: This takes more setup, requiring timetables, train order forms, clearance cards, register books, and dispatcher's train sheets and train order books. Some stations will need working train order signals, and in my experience it's best to have at least one operator copying orders and clearances from the dispatcher. You can use radios for communication, but telephones work better and are more prototypical. The crews need to understand the superiority of trains and how to apply the rules, but if they do you can generally move a given number of trains with fewer train orders than track warrants.

3. AUTOMATIC BLOCK SIGNALS: This takes a working signal system and two main tracks with a current of traffic, plus all you needed for timetable/train-order authority. But running trains by signal indication is easier for train crews, and there will be many fewer clearances and orders. Conventional wisdom says this is less enjoyable than single track with meets between opposing trains. However, scheduled passenger trains, junctions, and helpers can cause almost as much interaction on double track.

4. CENTRALIZED TRAFFIC CONTROL: While this is the most complicated system of authority to install, CTC is just as effective for moving lots of trains on model layouts as on the big roads. It's also the simplest for train crews to understand and use. The dispatcher will be just as busy as when dictating train orders, but a CTC machine that works realistically provides lots of satisfying feedback – it's a great toy! Today's hardware and software options make CTC more doable than ever, but it's still a major investment of cash and time. OP

FORMS OF TRAIN ORDERS


Santa Fe

May 21 1945

TRAIN ORDER NO. 113

To C&E Second 23

Opr. M.

At Holliday X

No 6 Eng 3442 meet

Second 23 Eng 3759

at Lawrence

LVL

Opr.

Com time 1004 P.M. Mathis

Here's a real-life example of a Form S-A train order, delivered by the Santa Fe operator at Holliday, Kan., in 1945. It tells the conductor and engineer of the second section of the westbound *Grand Canyon* to meet the eastbound *Ranger* at Lawrence, Kan.

Writing train orders by the book

BY ANDY SPERANDEO

AN IMPORTANT REQUIREMENT of Rule 201, under "Rules for Movement by Train Orders" in most railroad rule books, is that train orders must be "in the prescribed forms when applicable." That's not a reference to the paper order forms on roads that used them. Instead it refers to the "Forms of Train Orders" section of the rules that gives examples of the various instructions that dispatchers may issue on a particular railroad.

There are benefits to following the prescribed forms in model railroad operation, just as on the full-sized roads. For the dispatcher, having to choose from a limited number of forms greatly simplifies the task of composing train orders. For the train crews and others who must act on them, the prescribed forms make it easier to understand and carry out dispatcher's directions.

FORM S-A, "Fixing Meeting Points for Opposing Trains," is a basic and widely used form of train order. For example: "No 2 meet No 1 at Delta." ("Number" is abbreviated as "No" because no punctuation may be used in train orders.)

The dispatcher is directing both trains to run to Delta and there "meet in the manner prescribed by the rules." The rules might require No. 1 to take siding, for example, if both trains are of the same class but westbound No. 1 is inferior by direction to eastbound No. 2.

This is what is sometimes called a "hard meet." On most railroads, meeting points shown in timetable schedules only hold up if the inferior train runs on time. If the inferior train is late, it must find another place to clear the schedule of the superior train. (See "Meeting opposing trians" on the next page.) But the right conferred by a train order is superior to any other form of superiority, so the two trains holding a Form S-A must meet at the prescribed station and nowhere else.

Besides setting a meeting point, such orders have other uses. If No. 2 were running late, say, No. 1 might be stuck at a more easterly station, Easton or Foxville, waiting on No. 2's schedule. By setting the meeting point at Delta, the dispatcher allows No. 1 to advance against the late-running eastbound. This can be done safely because both train crews understand that the authority of the train order overrides the timetable. The language of the Form S-A is simple and understandable, but also powerful.

FORM G, for extra trains, is powerful as well: It creates a train where none exists in the timetable. It's simplest form is "Eng 100 run extra Alpha to Norman." (Again, "Eng" is the unpunctuated abbreviation for "Engine.") The crew of engine 100 is given authority to run on the main track from the first-named station to the last-named station, subject to the superiority of any regular trains that might be scheduled in the timetable.

The dispatcher may just leave the extra to find its way between the scheduled times of regular trains, but the forms of train orders provide various tools to help extra trains if that's called for. We've already seen one of them, Form S-A. An order such as "No 59 meet Extra 100 East at Jackson" might allow the extra to advance to the named station against the regular train's schedule.

Suppose the dispatcher later needs to run another extra to come west against the extra east. The best dispatching practice is to first put out an order protecting the two extras against each other. It doesn't have to be a Form S-A, but since that's already familiar let's say the order reads "Extra 100 East meet Extra 95 West at Kingston." Ideally there's an open station between Kingston and the last reported location of the extra east where it can receive the Form S-A order. A "middle order," one delivered to a train at a meeting point, is best avoided.

With the meeting point set, the dispatcher can then issue a Form G saying "Engine 95 run extra Norman to Alpha." At Norman, their initial station, the crew of engine 95 will get at least two orders, the Form S-A and the Form G.

Those are only two of several forms of train orders, but they can cover a lot of operation on a model railroad. Knowing other forms allows greater flexibility, but model railroad dispatchers should follow the injunction in Rule 201 that train orders "must be brief and clear."

Some model railroaders have tried putting train-order instructions in a track-warrant style check list. To me that gives up too much of the authenticity in paperwork that's one of the best reasons for operating with train orders.

Our train dispatchers learn the most common forms and keep the rule book handy for the more unusual situations. Using forms of train orders helps us to enjoy running our railroads the way the big roads once did. OP

MEETING OPPOSING TRAINS

The art of getting one train past another

BY ANDY SPERANDEO

Photographer J. Parker Lamb was aboard Central of Georgia southbound time freight No. 34 when it met No. 29 at Smith's, Ala., in March 1955. The automatic block signal provided safety but didn't convey authority for train movements.

SINGLE-TRACK RAILROADS are often the preferred prototypes for our operating layouts. We enjoy the interaction of trains meeting at sidings spaced along the single main line. If the railroad runs by signal indication under Centralized Traffic Control (CTC), train crews can simply follow the lights, stopping at red absolute signals and advancing in response to any signal that's not red. The dispatcher and the CTC system's automatic interlocking keep the trains apart and let them get by each other safely.

It's a different story when operating under timetable-and-train-order authority. Often train crews must figure out for themselves where and how to clear for superior trains, and even when the dispatcher issues a Form S-A meet order, it won't necessarily specify which train takes the siding for the other. In the absence of specific instructions, however, train crews can rely on the rules to spell out where they should be and how soon they need to be there.

The full text of all rules mentioned here, quoted from the *Standard Code of Operating Rules, Block Signal Rules, and Interlocking Rules* of October 1953, is at ModelRailroader.com. Or you can refer to the rule book of your favorite prototype, which likely has similar rules with the same numbers.

A MEET BETWEEN TRAINS of different classes, or between any regular train and an extra train, is the simplest case. The inferior train goes into the siding and the superior train "holds the main," according to rule S-89. By rule the inferior train must clear the scheduled leaving time of the superior train by five minutes. (The Operators in the June 2011 *Model Railroader* quoted the rules governing the superiority of trains.)

For extra trains meeting regular trains, the five-minute clearance is required by Rule S-87. "Clear" in both cases means all of the train is in the siding and the siding switch is lined and locked for the main track. If for any reason that can't be accomplished, the inferior train must protect itself as prescribed by Rule 99.

If the meeting trains are of the same class the five-minute cushion doesn't apply. The train in the inferior timetable direction has to take the siding, but only in time to clear the scheduled leaving time of the train in the superior direction. If both trains are extras, Rule S-88 requires the extra in the inferior timetable direction to take the siding. No time limit can apply because extra trains don't have schedules.

THE DISPATCHER CAN MODIFY which train takes the siding with a train order, often by ordering the superior train to "take siding and meet" the inferior train. Or the inferior train may be ordered to hold the main at the designated station. Either way, the crews of both trains receive copies of the same order in the same words so everyone involved will know what's expected.

Meets between scheduled trains are usually indicated in the timetable in bold or "full-face" type. The number of the train to be met is shown in smaller figures. However, on most railroads such scheduled meets don't restrict the superior train. If the inferior train isn't at the scheduled meeting point on time, the superior train may continue.

Rule S-87 requires that an inferior train keep out of the way of opposing superior trains, and a late-running inferior train that can't make a scheduled meet must either clear the main line at some point ahead of the schedule of the superior train or protect itself according to Rule 99.

Rule S-87 also states that extra trains "will be governed by train orders with respect to opposing extra trains." This makes it the dispatcher's responsibility to issue train orders that will allow extras in opposite directions to meet safely.

TRAIN CREWS RUNNING under timetable and train orders have to think for themselves in applying the rules for meeting opposing trains. That's a higher level of involvement than simply following signal indications, and it's why so many model railroaders find that it's fun to operate by these rules. OP

Running as Extra 1954 East, a Louisville & Nashville coal train known as the Loyall Turn blasts through Grays, Ky., in 1954. The M-1 2-8-4 carries white flags to identify the train as an extra. Philip R. Hastings photo

RUNNING EXTRA TRAINS

How to handle trains that aren't on the timetable

BY ANDY SPERANDEO

AN EXTRA TRAIN IS DEFINED in railroad rule books as a train without a timetable schedule. Railroads use extra trains in a variety of ways, and we can do the same in our model railroad operations.

On railroads that scheduled most or many of their trains in the timetable, an extra might be exactly what its name seemed to imply: an additional train needed for traffic that can't be accommodated on the scheduled trains. Other railroads ran most or all of their freight trains as extras.

Even when all freights run extra, at least some of the extra trains might be regular services with schedules published to attract shippers. Others could be trains operated regularly with set duties known to dispatchers, yardmasters, and train crews – the train shown in the photo is one of these. Still other extras operated as needed for temporary increases in business or other occasional purposes, including special passenger trains.

Whatever the reason for operating extra trains, since they aren't scheduled in the timetable, they must operate under other authority.

KINDS OF AUTHORITY. Under classic timetable-and-train-order rules, extras are authorized by Form G train orders in the format "Engine (number) run extra (initial station) to (terminal station)." That gives the train headed by that locomotive authority to occupy the main track for the purpose of running from the first-named station to the second.

The extra's formal identity comes from its engine number and direction. It may be known as the "Green Fruit Express" or the "Loyall Turn," but in train orders and other records it's "Extra (engine number) (timetable direction)," such as "Extra 145 East."

Where signal indications conferred movement authority, such as two or more main tracks with a current of traffic and automatic block signals, or under Centralized Traffic Control (CTC), timetable instructions could allow extra trains to be authorized by a numbered and okayed clearance card instead of a Form G train order.

Today the term "extra" is no longer used, but neither are timetable schedules. In effect all trains operate as extras, authorized by track warrant and governed by additional warrants or by automatic or CTC signals. The engine number is used as the train's formal identification, and track warrants are addressed to the engine rather than to a train symbol or name.

OVER THE ROAD. In terms of superiority of trains, extras are inferior to all regular trains (all trains with timetable schedules). The conductor and engineer of an extra are responsible for clearing the schedules of opposing superior trains, and of first class trains in the same direction. "Clearing the schedule" means getting off the main line into a passing siding or other track at least five minutes before the scheduled time of the superior train.

The dispatcher may modify the extra train's superiority by train order, and often will issue orders to help an extra progress against a late-running superior train. On single track, the dispatcher is also responsible for issuing orders to protect opposing extras from each other, since the crew of an extra train can't know where an opposing extra might be.

Forms of train-order protection against opposing extras include:

- Form S-A meet orders, specifying where opposing extras will meet.
- Form S-C right orders, giving one extra superiority, "right," over another to a particular station.
- Form E time orders, giving one extra a schedule opposing extras can run against as if it were a timetable schedule.

(These forms of orders were also used to help extra trains against opposing regular trains, or to modify the schedules of regular trains.)

When extra trains meet, the train in the inferior timetable direction takes the siding unless otherwise directed by train order. Note, however, that this doesn't mean extras in the superior direction have any superiority not given in a train order.

EXTRA TRAINS CAN OFFER interesting variety in train movements, and for certain prototypes can be the majority of all trains. By understanding how and why they run, you can make them an important and realistic element of your railroad's operations too. OP

RAILROADING AROUND THE CLOCK

Railroad operation rarely fits neatly into a 24 hour period

BY ANDY SPERANDEO

Gorre & Daphetid train No. 5 is on its way to Great Divide on the famous HO railroad. But if John Allen decided to stop the clock before it got there, the train might wait in a siding ahead until the next session. John Allen photo

REAL CLASS 1 RAILROADS are 24/7, day-after-day-after-day enterprises. Even the most enthusiastic model railroad operators rarely manage more than 12 hours at a time. Most of the time a layout owner is doing well to get the necessary number of friends together for an evening or an afternoon, and anyway it's a hobby and not a career, right?

But there are ways to get closer to the relentless continuity of a big-time prototype. Allow me to share some personal history.

LONG AGO AND FAR AWAY, when I began operating model railroads, everyone I knew who did it with timetables used fast clock ratios of 12:1 and ran off 24-hour schedules in two actual hours. Our Crescent City Model Railroad Club operated its layout that way too. In truth, our club didn't have a fast clock then, but we read the minute hands of our watches as indicating hours, a 12:1 clock on the cheap.

The 12:1 ratio now seems awfully fast, but more on that later. The other thing we did then that now seems odd to me was to start every operating session at 12:01 a.m. and end at 12 midnight. The logic was that we were thus representing a complete "day" on the real thing, but the end of an operating session always felt a bit like the railroad was turning into a pumpkin.

On the one hand, we never wanted to establish schedules that didn't get all trains into their terminals by our self-imposed witching hour. However, anyone caught on line with a late train at midnight wanted to finish his run. And of course the yard guys always had a little more work to do before shutting down. Our sessions lasted longer than two hours, but we were having fun.

I LEARNED A DIFFERENT APPROACH when I was able to join John Allen's Gorre & Daphetid operating group. John used a 12:1 fast clock too. However, the G-D Line's operating sessions were quite flexible in both length and start/finish times.

John just turned on the railroad and started the clock from whenever it had been stopped at the end of the previous session. The clock didn't indicate a.m. or p.m., but by checking to see where we were in the schedule – which trains were out on the line and which we had cars waiting for in the yards – we could tell when it was and pick up the operation from there.

We ran the railroad until John felt he was ready for some coffee and conversation upstairs, sometimes for less than two hours and other times for more than three. Then he stopped the clock, and we all stopped whatever we were doing on the railroad. All switching work paused where it was, but John wanted any trains on the main line to continue just far enough to pull into the next passing siding. That left the main clear so he could run trains for his frequent visitors.

The effect of this, I found, was a fair simulation of the continuous action of a full-size railroad. Each session began with some trains and switching in progress, and regular operators could appreciate how situations on the railroad had been set up by what had gone before. It felt more realistic than a stereotyped 24-hour cycle.

TODAY MANY OPERATORS have found their own ways to organize time in operating sessions. Perhaps the biggest change I've seen is a movement toward slower clock ratios. Now 8:1, a fast hour in 7½ minutes, is considered pretty fast. Ratios of 6:1 and 4:1, with 10- and 15-minute fast hours, are common, and 3:1 and 2:1 clocks have their adherents too.

Fast time feels more natural when it isn't so fast that you see the clock hands moving as in a speeded-up movie, and slower ratios allow more time for the higher levels of operational detail that are growing in popularity.

One consequence of slower clocks is that the 24-hour day takes longer. At 4:1, a 24-hour op session lasts six hours. That might be okay on a weekend, but do you want an evening session after work to stretch into the small hours?

So more and more operators find that the 24-hour cycle isn't so important after all, or at least that it can be spread over two or more sessions. If you break the operating day into eight-hour shifts or tricks, just like the big lines do for non-road jobs, you can run off a trick in two hours even with a 4:1 fast clock.

As variations of this theme spread, one result is that more trains and switching work get held over from one session to the next. That means more layouts are achieving the effect of continuous operation, albeit with occasional week- or month-long pauses for real life. Whatever reasoning or necessity gets us to this end is okay with me. Ultimately it adds realism in the same way as on John Allen's Gorre & Daphetid. OP

TRAIN ORDER SIGNALS

The lower-quadrant train order signal for westward movement is in its down, or "proceed," position as the Santa Fe's westbound *El Capitan* makes a station stop in Pasadena, Calif., on July 11, 1946. Santa Fe photo

Before radios, railroads relied on these signals

BY ANDY SPERANDEO

TRAIN ORDER SIGNALS are not only interesting lineside details, they can serve a prototypical purpose in model operations.

Train order signals are installed at any office of communication where a train order operator is assigned to receive orders from the dispatcher for transmittal in writing to train crews. That can include stations, interlocking towers, and small buildings designated "cabins," "offices," or "towers," used solely by train order operators.

An important exception is a station at the initial terminal of any subdivision or crew district. There every train receives at least a clearance card (often but not always called "Clearance Form A") if not train orders as well. Thus there's no need for a signal.

Other exceptions may be a station where there's no operator, such as a stop on a commuter train route. At a manned interlocking tower where one railroad crosses another at grade, the signalman might also work as an operator for the line that runs the tower, but not for the other road. In that case there's no train order signal for the latter railroad at that tower.

Train order signals typically aren't used on lines operated by signal indication under Centralized Traffic Control. Controlled signals instead of written orders convey authority and restrictions.

Train order signals are used on lines protected by automatic block signals, whether single or multiple track. Automatic signals are primarily a safety and train-spacing system, and movement authority still comes from the timetable as modified by train orders.

SIGNAL INDICATIONS. The "classic" train order signal is a double semaphore with blades and spectacles facing in either direction. The semaphore may be either "upper quadrant," operating through an upward 90-degree arc, or "lower quadrant," operating through a downward arc.

In both types the horizontal position, with a red light at night, indicates "stop, unless clearance card received." (Train orders or messages are always delivered with a clearance, and the clearance alone may be delivered if the signal is displayed for another train in the same direction.)

The full up or down position, with a green light, indicates "proceed, no orders." If a third position is used, it's 45 degrees up or down with a yellow light, indicating "proceed under clearance or train order and clearance" (the clearance and orders are set to be picked up from the moving train).

The governing blade of the double semaphore is the one extending to the right as seen from an approaching train. The other blade is significant only to trains in the opposite direction. If a railroad also uses semaphores for block and interlocking signals, the blades of its train order semaphores may be a different color or have a differently shaped end, or both.

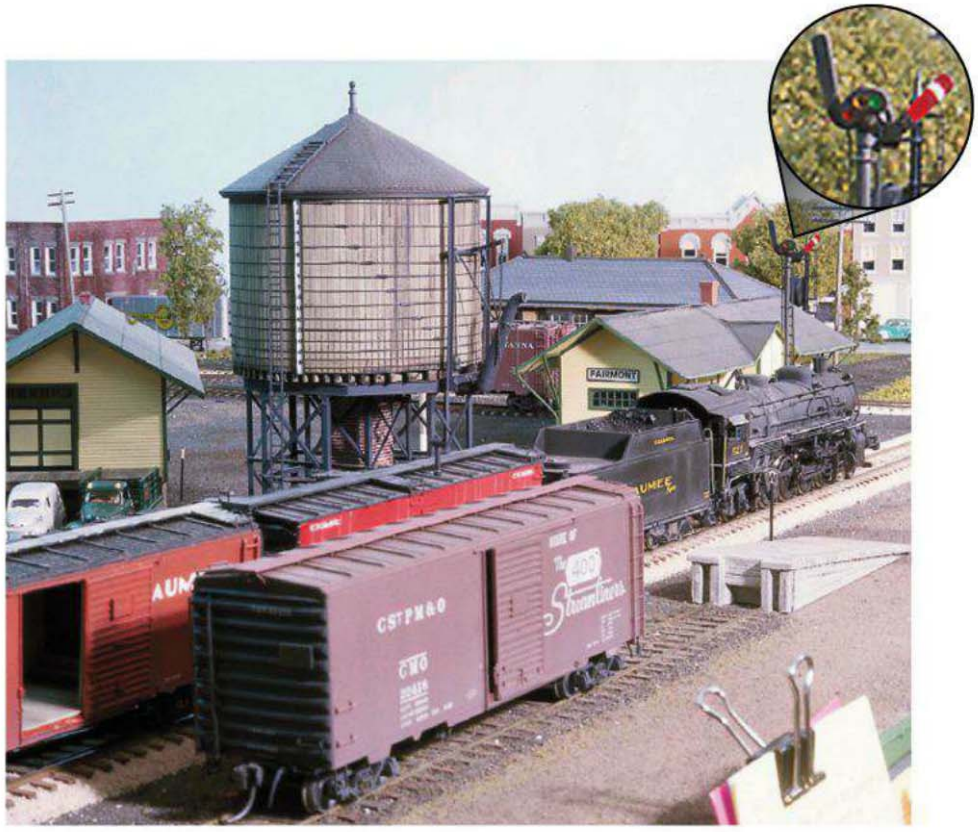
OTHER TYPES OF SIGNALS. An older kind of train order signal was the paddle or banner signal. A horizontal paddle,

usually painted red, hung from a vertical shaft on a bracket extending from the station, tower, or office. A four-lens lantern like a switch lantern was mounted on top of the vertical shaft.

In the "stop" position the paddle was perpendicular to the track, and the lantern's red lenses faced both ways along the line. In the "proceed" position the paddle was edge-on to approaching trains, and the green lantern lenses faced both ways along the track.

Some rule books allowed a third indication with a paddle signal. A yellow flag, or yellow lantern at night, displayed with the red signal, indicated "proceed under clearance or train order and clearance."

Color-light signals much like block signals were used in more modern applications. The colored light might flash to distinguish it from steady-aspect block signals. The website at http://mysite.du.edu/~etuttle/rail/to.htm shows several types of train order signals.



The train order semaphore at Fairmont, Ohio, tells the crew of a Maumee Route local that there are orders to pick up. The Tomar train order signals on this HO railroad are locally controlled. Bill Darnaby photo

THE BIG QUESTION then is how to use train order signals on model railroads. Obviously we want to be able to signal train crews that they'll receive orders at a given station. Most operating layouts, however, won't have enough space or crew members to have an operator at each station. There are several ways to deal with that situation, but first you should be aware of a certain problem created by the rules governing train order signals.

There were two schools of thought about the normal position of a train order signal. On railroads using the *Standard Code of Operating Rules* or similar rule books, "order boards" were normally set at "stop" when an operator was on duty.

When a train approached, the operator checked with the dispatcher to be sure if the train would receive orders or not. Only when the train approached within sighting distance would the operator clear the signal if there were no orders, or move a three-position signal to indicate that a clearance and orders were ready to be picked up.

However, according to the *Consolidated Code of Operating Rules* and similar books, the normal position of a train order signal was clear whether or not an operator was on duty. The operator changed the signal when told by the dispatcher to copy an order for a train in one direction or the other, and only cleared it again when the order had been delivered.

Most model railroads will probably follow the Consolidated Code on this, whether or not they use it otherwise. Having clear as the normal position is more convenient for the dispatcher or operator who has to control signals at multiple stations from a single location.

Here are three ways of handling train order signals I've seen used successfully on model railroads.

DISPATCHER ONLY. On some layouts the dispatcher composes and writes copies of orders and clearances for the train crews. In that case train order signals are controlled from the dispatcher's desk.

To issue an order, the dispatcher first sets the signal at the issuing station to stop and then writes the order. Crew members get orders and clearances from the dispatcher, so the dispatcher knows when a signal can be cleared.

DISPATCHER AND OPERATOR. The dispatcher dictates orders to the operator by phone just as on the big roads, and the operator reads the orders back for the dispatcher to check. This reproduces the atmospheric communication of train-order dispatching, lets the operator learn from a more-experienced dispatcher, and also helps if the operator catches a mistake before it's published to the train crews.

The train order signals may still be controlled remotely, but now it's the operator who has the controls. And crew members report to the operator to pick up their orders instead of to the dispatcher, adding a realistic layer of remoteness to the dispatcher's position.

LOCAL SIGNAL CONTROLS. Again there's a dispatcher dictating orders to the operator. However, instead of controlling the signals remotely, the operator must go to the station to set the signal. Returning to the desk, the operator reports "SD (signal displayed) west (or east)" to the dispatcher, who then dictates the order and take the op's read-back.

There may also be clips on the layout fascia at train order stations, so the operator can hang the orders and clearances for pickup. The crews won't have to go to the operator's location except when orders require a crew member's signature. The train crews may even be empowered to clear the signals, if they understand the responsibility of making sure there aren't orders remaining for another train in the same direction.

COMPROMISES. As with many aspects of model railroad operation, we often have to accept compromises in adapting prototype procedures to our layouts. But there are enough varied possibilities, even more than I could describe, to reproduce what you find to be the most important effects of using train order signals. OP

RUNNING ON SCHEDULE

Learn the basics of timetable operation

BY ANDY SPERANDEO

3

TOLEDO—MONTPELIER—1st District

Westward Trains					Time-Table No. 40			Eastward Trains			
THIRD CLASS			FIRST CLASS	Distance from Toledo	In effect Feb. 26, 1950	Capacity of sidings in 63 ft. cars exclusive of engine and caboose.	Station numbers	FIRST CLASS	THIRD CLASS		
79	77	71	13		STATIONS			12	76	70	78
Red Ball Freight	Red Ball Freight	Local Freight	St. Louis Freight					Toledo Limited	Red Ball Freight	Local Freight	Red Ball Freight
Daily	Daily	Daily Except Sun.	Daily					Daily	Daily	Daily Except Sun.	Daily
PM	AM	AM	PM					AM	AM	PM	PM
.....	.....	.....	6.55	.....	DN TOLEDO	.....	1	6.50	.....	.....	.....
					2.3						
9.30	10.00	7.15	6.59	1.3	23 TOLEDO Y'D WC	.....	2	6.39	7.30	1.00	8.30
					2.6						
9.40	10.10	7.20	7.03	3.3	A B S WALBRIDGE JCT. C T C	.....	.....	6.35	7.25	12.45	8.06
					2.8						
.....	.....	.....	.....	5.3	DN GOULD	.....	5	.....	.....	.....	.....
					3.3						
9.50	10.20	7.40	7.10	8.6	WANICK JCT.	.....	.....	6.28	7.02	12.35	7.56
					3.6						
9.55	10.25	AM	PM	9.2	MAUMEE	.....	9	AM	7.00	PM	7.53
					3.4						
10.05	10.35	.....	.....	12.6	MONCLOVA	.	332	.....	6.40	.....	7.41
					4.6						
10.17	10.47	.....	.....	17.2	MIDWAY	99	333	.....	6.25	.....	7.26
					5.9						
10.32	11.02	.....	.....	22.2	BRAILEY	.....	334	.....	6.10	.....	7.11
					4.1						
10.47	11.17	.....	.....	26.3	DELTA	.....	336	.....	5.57	.....	6.59
					3.1						
10.55	11.25	.....	.....	29.4	DELTA YARD	112	337	.....	5.47	.....	6.49
					4.3						
11.55	11.45	.....	.....	33.7	D WAUSEON F	66	338	.....	5.35	.....	6.37
					5.7						
11.30	12.00	.....	.....	39.4	ECKLEY	.....	340	.....	5.20	.....	6.22
					3.1						
11.40	12.10	.....	.....	42.5	ELMIRA	103	342	.....	5.10	.....	6.13
					6.6						
12.00	12.30	.....	.....	49.1	WEST UNITY	52	344	.....	4.55	.....	5.52
					9.2						
12.45 AM	1.15 PM	.....	.....	58.3	DN MONTPELIER WC	.....	912	.....	4.30 AM	.....	5.30 PM
Daily	Daily	Daily Except Sun.	Daily					Daily	Daily	Daily Except Sun.	Daily
3:15	3:15	0:25	0:15	.....	..... Scheduled time	.....	.....	0:22	3:00	0:22	3:00
17.5	17.5	17.5	34.4	.....	..... Average miles per hour	.....	.....	23.4	19.0	17.5	19.0

Timetables are a framework for authorizing trains to occupy the main line. This one governed a short stretch of the old Wabash RR in northwestern Ohio.

RUNNING TRAINS ON TIMETABLE schedules, whether timed by fast or standard clocks, seems to be widely misunderstood. It doesn't have to be an exercise in split-second timing. Most often it's a way of authorizing train movements on main tracks over a broad window of time.

A 12-HOUR MOVING WINDOW. Rule 82 states, "Timetable schedules, unless fulfilled, are in effect for twelve hours after their time at each station." (This is from the Atchison, Topeka & Santa Fe's *1927 Rules and Regulations, Operating Department.* Your favorite road's rules may vary the wording a bit.)

That means that even if a train doesn't leave a station by its scheduled time, its schedule authority persists for 12 hours after the time in the timetable. And this window of authority moves because it begins at a later time at each station up the line where time is shown. The rule accounts for the likelihood that trains won't always run on time.

SUBJECT TO SUPERIORITY. Rule S-83 ("S" means it applies to single track) shows how superiority takes effect. It says "A train must not leave its initial station on any district, or a junction, or pass from double to single track, until it has been ascertained whether all trains due, which are superior of the same class, have arrived or left." (The "D" or double-track version of this rule omits the phrase "or pass from single to double track.")

At the initial station on a district (or subdivision), and at some important junctions, the railroad will maintain a train register book. The conductor or other crew member of every train will register their train's arrival or departure at that station in the book, giving the time and noting if any signals (green flags or lights) are displayed for following sections. This is how a crew about to depart learns whether superior trains have arrived or are still due.

Suppose an opposing superior train that was due to arrive earlier hasn't registered, and that it's less than 12 hours overdue, so its schedule is still in effect. Since Rule S-87 requires an inferior train to keep out of the way of opposing superior trains, the inferior train ready to depart must wait.

Even though the inferior train has a scheduled departure time, it isn't required to depart at that time and under certain conditions may be prohibited from doing so. Since the inferior train's schedule remains in effect for 12 hours, it has authority to run when all superior trains due have finally arrived.

ON THE ROAD. Our train gets out of its initial station, late but within the window authorized by its timetable schedule. How far can we go on the main line?

Our conductor and engineer will scan the timetable and determine how far we can go before we infringe on the schedule of an opposing superior train. They'll then head into a siding at the farthest station we can reach before the opposing superior train is due to leave that point.

If the opposing train is superior by class, they'll plan to be clear of the main line at least five minutes before the superior train's scheduled departure (Rule S-89). That satisfies Rule S-87 while our train advances as far as possible.

Rule 92 requires that "A train must not leave a station in advance of its schedule leaving time." This makes it safe for our inferior train to run against the schedules of opposing superior trains.

These are just a few of the rules for the movement of trains and engines by timetable schedules. They show that it's not so much a matter of split-second timing as a framework for safe movement along the main line. It does require thought, but that makes running trains by timetable an enjoyable challenge. OP

OPERATE WITH A PROTOTYPE TIMETABLE

A timetable governs movements on Tony Koester's HO scale Nickel Plate Road. Late-running No. 98, left, waits in the siding as passenger train No. 9 leaves Linden, Ind., at 1:11 a.m. Tony uses a 3:1 fast-clock ratio, and revised the times shown in NKP Timetable 68 except at the main terminal in Frankfort, Ind.

How to adjust time and distances for model railroad use

BY TONY KOESTER
PHOTOS BY THE AUTHOR

I MODEL THE 1950S, a time when the movement of trains by timetable and train-order rules was common. The employee timetable included train schedules along with special instructions supplementing the book of rules, which was each railroad's bible. Train orders could amend the timetable – say, to tell all concerned that a superior train was now to run an hour late, thus helping opposing trains keep moving against it, or to authorize an extra (unscheduled) train.

The key is that all trains moved in relation to the schedule – as published or as amended – in the timetable. Unless they had an order that gave them right over a scheduled train, an extra train's crew had to find holes in the schedule that allowed them enough time to move between stations without interfering with a scheduled train.

Since the railroad I'm modeling operated under timetable and train-order rules, I needed to publish a timetable that my dispatcher and crews could use as the basis for train movements.

ALL THE TRAINS, ONLY PART OF THE RUN. I wanted to run the entire schedule of trains the Nickel Plate Road ran on the part of the line I model in HO scale. The NKP's Clover Leaf District Timetable 68, of Sept. 26, 1954, shows two first-class passenger trains (9 and 10) and 10 second-class freights, including a local that ran westbound only. I knew the NKP commonly ran sections of its hot freights to handle extra traffic, not to mention the occasional extra, so this timetable was clearly the place to start.

But there was a snag. The timetable showed all 25 stations along the Third Subdivision that I model, but I'm modeling only 10. Also, this subdivision's 113-mile length was much more than the roughly 8 scale miles of main line I have in my basement. Obviously, a train leaving the west end of the Third Sub at Charleston, Ill., would arrive at the east end, Frankfort, Ind., a lot sooner than its full-size counterpart!

That's where fast clocks come in. A fast clock operates at a speed faster than a normal clock. A 6:1 clock counts off six hours in the space of one. You can purchase fast clocks from several manufacturers, including GML Enterprises (www.thegmlenterprises.com) and Rail-Lynx (www.rail-lynx.com).

For me to model the actual running time from one end of the subdivision to the other, I'd need a 14:1 fast clock (113 actual miles divided by 8 scale miles, from the example above). However, experience on my old HO scale Allegheny Midland and other model railroads suggested that 6:1 was about as fast as I wanted the clock hands whirling around the dial. Experience on railroads such as Bill Darnaby's Maumee Route strongly suggested that slower ratios, no faster than 3:1 (one scale hour equals 20 minutes of real time), allowed more time for yard switching and both issuing and reading train orders. So 3:1 it was.

ADAPTING THE TIMETABLE. The first chore was to use a stopwatch to time test runs of a few sample trains over the layout.

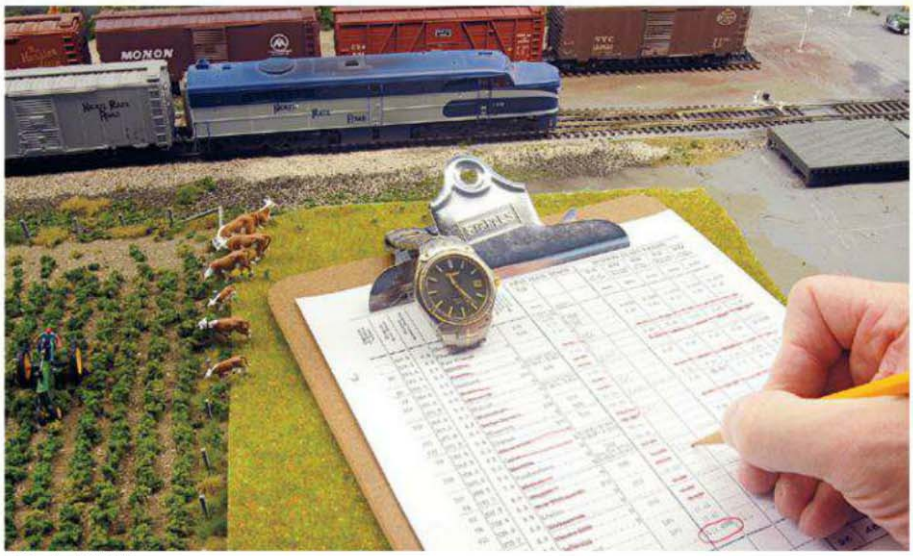


FIG. 1 TIMING. Tony used a watch to time trains between towns on his HO railroad. After timing in seconds, he converted each interval to 3:1 minutes by multiplying by 3, dividing by 60, and rounding up to the nearest minute. He "padded" freight schedules, allowed extra time, for switching work and meets.

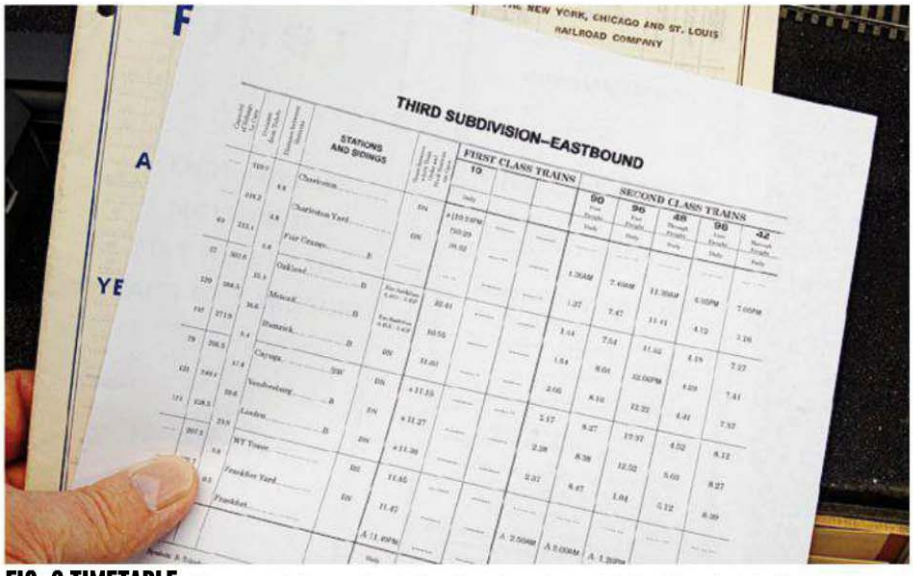


FIG. 2 TIMETABLE. Tony put the schedules he developed into timetable format following the example of his Nickel Plate Road prototype.

This process is shown in **FIG. 1**, at the top of this page. Passenger trains would lose time owing to scheduled and flag stops. I held them at each station for 1 minute 40 seconds (5 fast-time minutes at 3:1), but they're allowed higher track speeds (ranging from 59 to 65 mph as given in timetable special instructions). Fast and through freights are allowed 49 to 55 mph. The prototype timetable shows 2 hours 24 minutes (including stops) for No. 10 between Charleston and Frankfort, 2:45 for fast freight 98, and 3:55 for through freight 42, which probably ran as fast as 98 but switched a few major interchanges along the way.

My time tests showed that it takes roughly 17 actual minutes to run between the two crew terminals on my layout nonstop. For passenger trains, I multiplied the measured times between stations by 3 and then rounded them up to the nearest whole minute. For example, 45 actual seconds multiplied by 3 is 135 fast-clock seconds, or 2 minutes 15 seconds, which I rounded up to 3 minutes. So the 17 actual minutes became about 51 fast-clock minutes – almost an hour. I then added 30 minutes to the fast-freight schedules and 60 minutes for through freights to give them time to do work and make meets.

The KC Local, No. 45, was scheduled for a five-hour run, and I used the train's actual times at each modeled town. I doubt the actual KC Local ever made the run that fast, and I doubt that my model will either.

Speeding up the clock ratio would lengthen the run, but my sense is that would be too fast for the timetable-and-train-order operations of the Third Sub. Besides, few freights make the run nonstop. They are delayed by meets and red home signals at crossings with other railroads, and they often need to take water at Cayuga. Busy interchanges, notably with the Milwaukee Road at Humrick, Ill., and the Chicago, Indianapolis & Louisville (Monon) at Linden, Ind., require stops by passing freights to deliver and pick up cars throughout the day. Even westbound freights work busy interchanges, as the one daily local (No. 45) can't ensure that "hot" loads such as auto parts are set out or picked up in time to make connections.

WHERE TO START? The short distances between towns meant that only one spot on the railroad could be chosen to match the prototype's times. This was an easy choice: Frankfort (Ind.) Yard, one of two critical hubs on the NKP. Here trains from four divisions were "mixed and matched" on tight schedules.

Using a photocopy of the actual document, I made a trial version of Timetable 68 for my railroad using the actual times in or out of Frankfort and adding the measured fast-clock interval between modeled stations, plus the fudge factor for freights. We tested assumptions with this while operations on the layout settled into a routine.

One question was whether to show only towns that I modeled in a truncated timetable, or show all towns to be more realistic. My friend Bob Hanmer listed all the towns on his prototypes but put a gray tone over those he doesn't model. I'm showing only modeled towns, figuring crews have enough mental gymnastics to cope with as it is.

After I'd adjusted the marked-up timetable, my friend Steve King set up a master Third Subdivision employee timetable using an Excel spreadsheet. I tweaked this spreadsheet by substituting fonts that looked reasonably close to the Nickel Plate's. The eastbound page of the resulting Third Sub timetable is shown in **FIG. 2** above. **FIGURE 3** on the opposite page is an example of one of the worksheets Steve used to compare prototype with model railroad times and plot the necessary adjustments.

THE OTHER THREE DIVISIONS. The fast-clock version of the St. Louis Division's

Third Sub timetable took care of one of the four divisions radiating from Frankfort – the one I've actually modeled. Preparing timetables for the other three divisions was even easier, since each was represented only by a short stretch of mainline track between Frankfort and a hidden staging yard. The only meaningful times are for the arrivals and departures at Frankfort.

The crew members who serve as the engineers and dispatchers for all staged trains in and out of Frankfort work with photocopies of the actual NKP timetable pages for the Toledo, Sandusky, and Peoria Divisions. These timetables serve as general guidelines only, as many trains, especially westbounds from Buffalo and Cleveland, are late by the time they get to Frankfort.

As retired NKP engineer Don Daily frequently reminds me, "The passenger trains and some of the eastbounds were close to the published times at Frankfort, but the closest westbounds were typically an hour and a half late." As a result, eastbound trains, superior by direction, were routinely ordered to take sidings for late westbound symbol freights so the westbounds wouldn't lose even more time. Even first-class No. 10 was often handled this way.

A schedule is a 12-hour window of authority to run a given train (since trains more than 12 hours late lose their schedule), and reality usually didn't match the printed times. As the timetable cover stated, "The Company has the right to vary the running of trains as circumstances may require."

RE-CREATING REALITY. And there lies the key to timetable-and-train-order operation, not simply mimicking prototype schedules. If everything ran on time and no sections or extras were required, the dispatcher and operators could spend their working hours reading magazines. But as trains fall behind and hold up opposing traffic, the dispatcher's job is to issue helping train orders to adjust the existing schedules or create new ones in an effort to keep delays to a minimum.

At the heart of this re-enactment is the employee timetable. As I've shown here, you can adapt a prototype timetable to match your model railroad's operating objectives and provide a realistic basis for train movements. OP

Tony Koester is a Model Railroader *contributing editor, Trains of Thought columnist, and author of several books from Kalmbach Publishing Co.*

TIMETABLE WORKSHEET

LOCATION	NO. 10'S ACTUAL TIME	MODEL RUNNING TIME WITH 5-MIN. STATION STOPS	3:1 EQUIVALENT TIME (ROUNDED UP TO NEAREST MINUTE)	MODEL TIMETABLE TIME (MATCHED AT FRANKFORT)
Charleston (depot)	9:25 p.m.	----	----	10:29 p.m.
Charleston yard	9:27 p.m.	45 seconds	3 minutes	10:32 p.m.
Fair Grange	9:32 p.m.	75 seconds	4 minutes	10:36 p.m.
Bushton	Not shown	(not modeled)		
Rardin	9:37 p.m.	(not modeled)		
Oakland	9:43 p.m.	160 seconds	8 minutes	10:44 p.m.
Brocton	9:49 p.m.	(not modeled)		
Melwood	9:54 p.m.	(not modeled)		
Metcalf	9:59 p.m.	220 seconds	11 minutes	10:55 p.m.
Mortimer	10:04 p.m.	(not modeled)		
Ridge Farm	10:10 p.m.	(not modeled)		
Humrick	10:16 p.m.	160 seconds	8 minutes	11:03 p.m.
Cayuga	10:25 p.m.	240 seconds	12 minutes	11:15 p.m.
Silverwood	10:30 p.m.	(not modeled)		
Cates	10:38 p.m.	(not modeled)		
Mackie	10:44 p.m.	(not modeled)		
Veedersburg	10:49 p.m.	240 seconds	12 minutes	11:27 p.m.
Mellott	11:00 p.m.	(not modeled)		
Wingate	11:05 p.m.	(not modeled)		
New Richmond	11:11 p.m.	(not modeled)		
Linden	11:15 p.m.	220 seconds	11 minutes	11:38 p.m.
Kirkpatrick	11:24 p.m.	(not modeled)		
Clarks Hill	11:30 p.m.	(not modeled)		
Jefferson	11:40 p.m.	(not modeled)		
WY Tower	11:45 p.m.	140 seconds	7 minutes	11:45 p.m.
Frankfort Yard	11:47 p.m.	40 seconds	2 minutes	11:47 p.m.
Frankfort	11:49 p.m.	40 seconds	2 minutes	11:49 p.m.

FIG. 3 ADJUSTMENTS. After a marked-up NKP timetable was tested over several operating sessions, Steve King created new timetable pages in an Excel spreadsheet. This worksheet shows the relationship between the actual times in NKP Timetable 68 and the running times on Tony's HO railroad.

SIX STEPS TO A PROTOTYPE-BASED TIMETABLE

STEP 1: Obtain a prototype employee timetable for the division of the railroad you model or use as a basis for freelancing. They're sold at railroadiana meets or can be obtained through railroad historical societies.

STEP 2: Use a watch with a second hand or a stopwatch to time runs (in seconds) between towns on your layout. Convert these intervals to match the fast-clock ratio you plan to use, keeping in mind that it takes time to issue and check train orders.

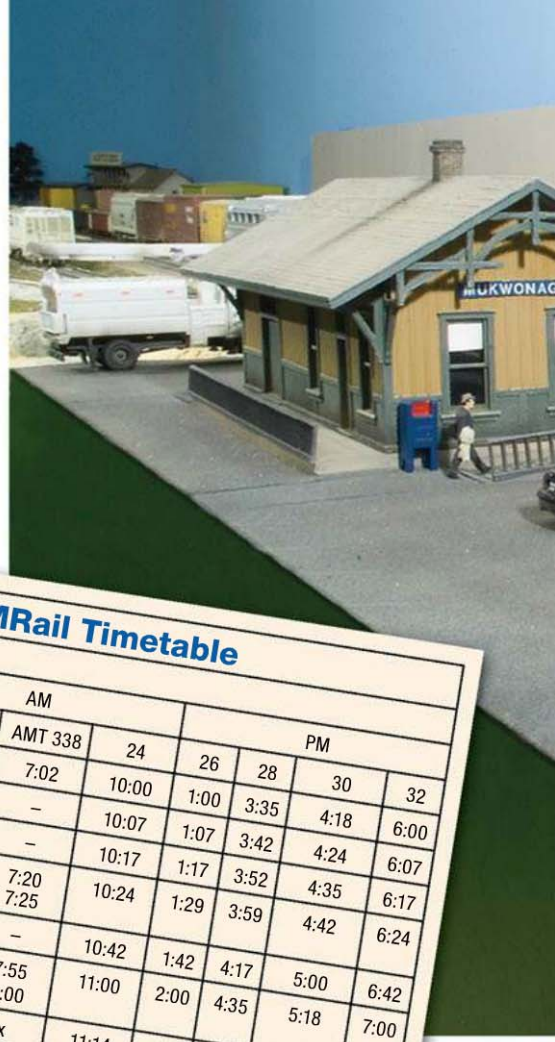
STEP 3: Pick an anchor point such as a major freight or passenger terminal where the prototype timetable's arrival and departure times will be retained.

STEP 4: Adjust the published times at all other stations to match the reduced running times on your model railroad. Pad the freight schedules a bit, as the trains may have work to do en route, and it's likely they'll be running somewhat late anyway. (A train's schedule remains in effect for 12 hours at each station where time is listed; if it's more than 12 hours late at any point, it "dies" – loses its schedule – and can move only on train orders.)

STEP 5: Use marked-up copies of the prototype timetable for several operating sessions to ensure that all bugs such as overly optimistic schedules have been identified and resolved.

STEP 6: Use spreadsheet software to create an authentic-looking timetable schedule, and don't forget the special instructions section that supplements the book of rules. – *T.K.*

COMMUTING TO WORK ON THE MR&T



Adding commuter service is easy with careful planning

BY DAVID POPP
PHOTOS BY THE AUTHOR

WITH ITS NUMEROUS TRAINS, frequent station stops, and challenging timetable operation, modeling commuter rail service has a lot to offer. You can add commuter trains to almost any layout that features a standard-gauge railroad with connections to a major metropolitan center – even if that metropolitan center is nothing more than a staging yard on your layout.

As an example, the *Model Railroader* staff and I decided to add commuter service to our HO scale club layout, the Milwaukee, Racine & Troy (MR&T). Though there are no real commuter lines into Milwaukee beyond Amtrak's intercity service, we thought there should be (especially at the current price of gas). So we purchased some passenger cars and locomotives and came up with a catchy name – Milwaukee Regional Rail, or MRail for short.

Just like starting up a prototype commuter railroad, however, there's a bit more to adding this type of service to your model railroad than simply running a few passenger trains. Although you really don't need to do population-density studies and demographic research (HO and N scale people aren't inclined to fill out surveys anyway), you do need to carefully examine your railroad's infrastructure to see if it will support the type of commuter service you wish to run. You'll also need to develop and test an operating plan to simulate the train frequency found on prototype commuter railroads.

MRail Timetable

Westbound schedule

	AM				PM			
	20	22	AMT 338	24	26	28	30	32
Milwaukee	–	6:21	7:02	10:00	1:00	3:35	4:18	6:00
Oklahoma Ave.	–	6:28	–	10:07	1:07	3:42	4:24	6:07
Big Bend	–	6:38	–	10:17	1:17	3:52	4:35	6:17
Mukwonago	–	6:45	7:20 7:25	10:24	1:29	3:59	4:42	6:24
Lake Beulah	–	7:03	–	10:42	1:42	4:17	5:00	6:42
Williams Bay/ Troy Junction	5:40	7:21	7:55 8:00	11:00	2:00	4:35	5:18	7:00
Troy	5:50	7:35	x	11:14	–	4:49	–	7:14

3-minute station stops

Eastbound schedule

	AM				PM			
	21	23	25	27	29	31	AMT 339	33
Troy	6:00	–	7:45	11:24	–	5:05	x	7:30
Williams Bay/ Troy Junction	6:10	6:50	7:58	11:34	4:44	5:15	5:50 5:55	7:40
Lake Beulah	6:29	7:05	8:13	11:53	4:59	5:33	–	–
Mukwonago	6:47	7:23	8:31	12:11PM	5:17	5:51	6:25 6:30	–
Big Bend	6:54	7:30	8:38	12:18	5:24	5:58	–	–
Oklahoma Ave.	7:04	7:40	8:48	12:28	5:34	6:08	–	–
Milwaukee	7:14	7:50	8:58	12:38	5:44	6:18	6:48	–

3-minute station stops

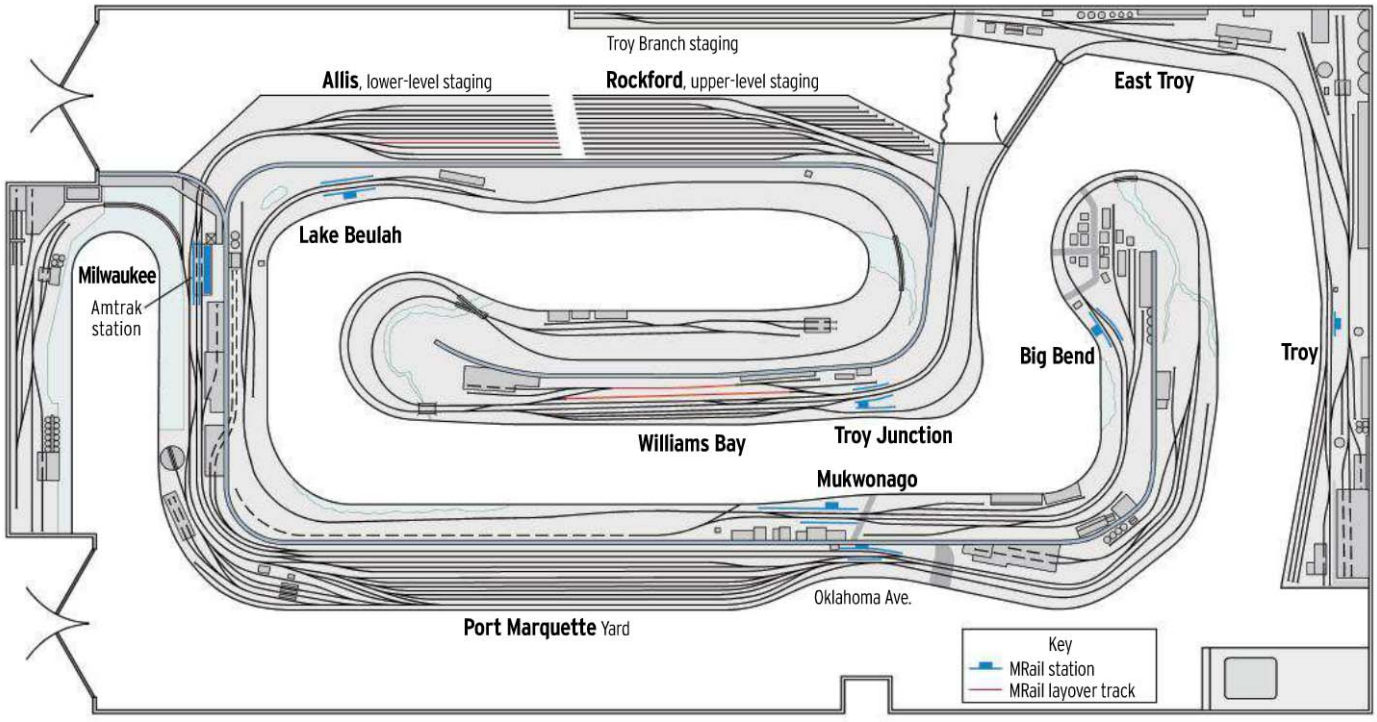
Here's a look at the method I used to develop the operating plan for our commuter service.

INFRASTRUCTURE NEEDS. Commuters need places to catch their trains, so the first step was to plot out station locations. The track plan on page 56 shows the sites we chose for our MRail stations in blue. My original station list included downtown Milwaukee and the towns of Mukwonago, Lake Beulah, and Williams Bay. I thought that the even spacing between these stops would offer good running distances between towns.

After making a few test runs with trains on the layout, however, uniform running distances and four station stops didn't make running commuter trains very interesting. I discussed the test further with several staff members, and we decided to add stations at Big Bend and Oklahoma Ave. We also added limited service to the town of Troy on

Milwaukee Regional Rail train No. 24 pulls into the station at Mukwonago, Wis., as a freight waits in the siding. Commuter rail operation like this can be added to most any layout using a handful of trains and a simple timetable (left).

Train No. 20 arrives at Troy, Wis., at 5:50 a.m. to pick up morning commuters. Troy is the western most station on the MRail system. Since there are no layover tracks here, trains are run back up the line to the yard at Williams Bay.



STATION LOCATION. **MRail stations are marked in blue on the Milwaukee, Racine & Troy track plan.**

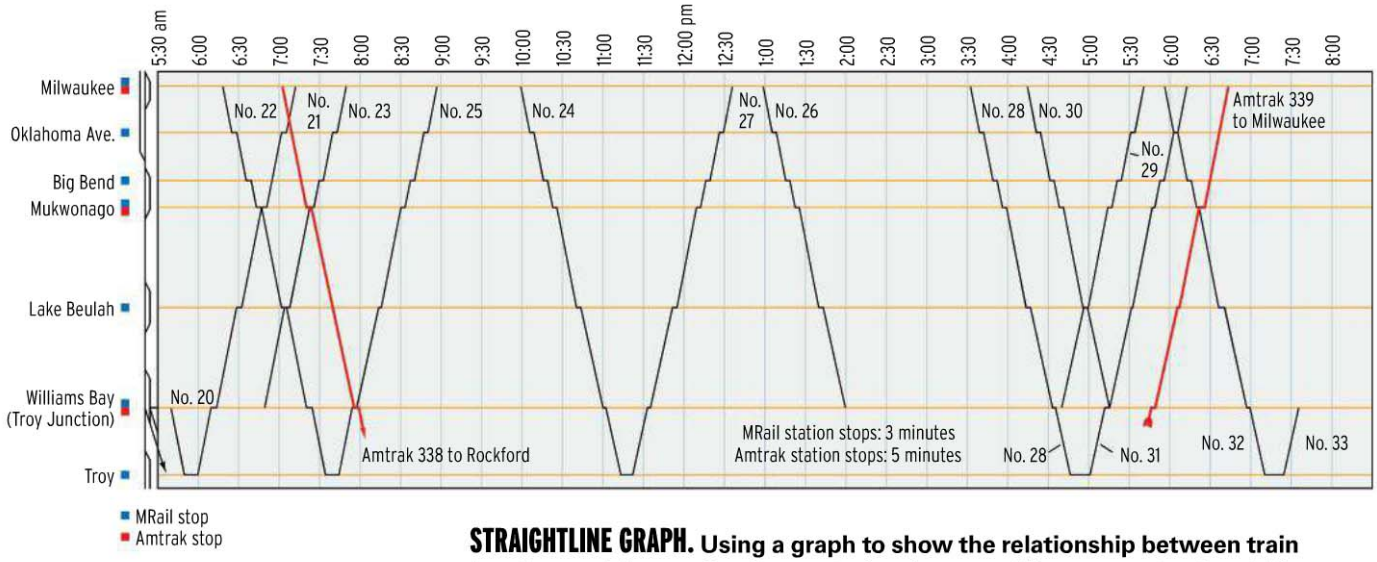
The only track modification needed on the MR&T to support MRail commuter service was to add a layover track at Williams Bay. The train in the background is sitting on the new commuter yard track, waiting for its next run.

the Wisconsin & Southern's Troy Branch. (For more on the Wisconsin & Southern Troy Branch, see the January through April 2008 issues of *Model Railroader*. – *Ed.*) Some trains would originate and terminate at Williams Bay, while others would run all the way to Troy and back. The extra stations and mix of termination points made for a more interesting operating schedule.

With the station sites selected, I next looked for places to park the trains while they were not in use. At Milwaukee, the mainline tracks run right through the station, so commuter trains couldn't be left in the station between runs. Though there's an engine servicing terminal at Port Marquette Yard, there are no tracks available for a coach yard, so I couldn't park commuter trains there either. My solution was to claim one of the Allis staging tracks for commuter trains. Running three coaches and a locomotive, I could easily stack all four of our commuter trains on just one track in the long staging yard.

Williams Bay is the main western terminus for our commuter district, and two or three trains would need to tie up there overnight. To accommodate layover trains, I added a track parallel to the passing siding. This track can hold two three-car trains. A third train can be parked on the switch lead behind the layover track. The layover tracks are marked on the plan in red.

The town of Troy had no room anywhere for a commuter storage track. So, trains starting a run at Troy begin at Williams Bay and make the short trip between the two towns in the morning and evening as needed.

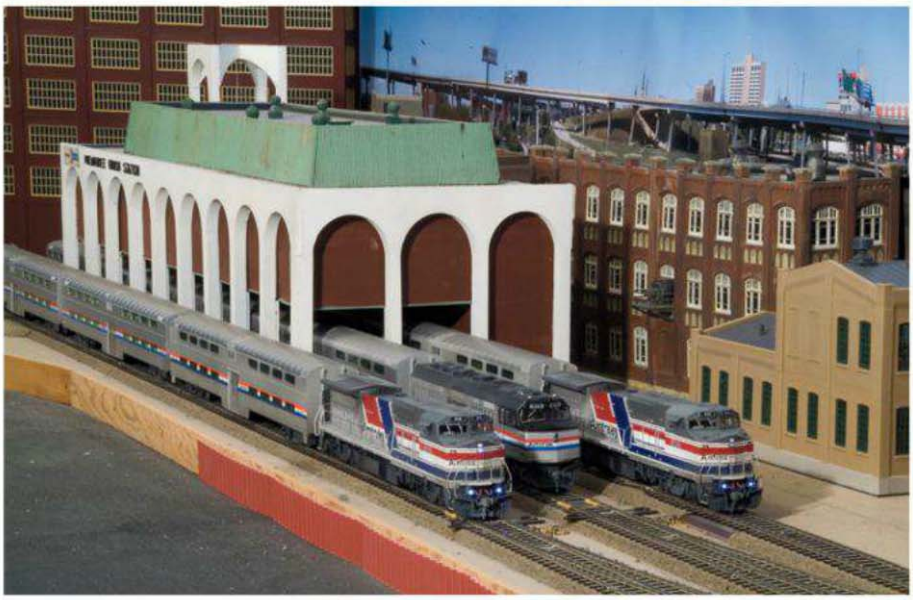


STRAIGHTLINE GRAPH. **Using a graph to show the relationship between train location and time makes it easy to develop a working commuter timetable.**

PUTTING IT ON THE TIMETABLE. Commuter traffic works best on a double-track main line – something the MR&T doesn't have a lot of. Still, there's enough double trackage to make a carefully designed commuter timetable work. However, to have commuter service, the only trains allowed on the MR&T's main line between Milwaukee and Williams Bay for approximately 1½ hours in the morning and evening are passenger trains. The layout's limited number of sidings are used for meets between MRail trains, so all freight traffic needs to be held in Milwaukee or west of Williams Bay during those times.

I started building the timetable by estimating how many trains we hoped to run during a morning session. There were four three-car commuter train sets at my disposal, so that had a lot to do with my choices. I also didn't want to tie up the layout for the better part of an operating session running MRail trains, so I limited mainline-consuming traffic to a 1½ -hour block in the morning and evening. In the morning block one train runs from Milwaukee to Troy, while two trains run from Troy to Milwaukee, and one longer train (using a double set of cars) runs from Williams Bay to Milwaukee. I reversed the sequence for the evening block but added a second train eastbound from Williams Bay for a more realistic workday traffic schedule.

I employed the straightline graphing method, used to design schedules in railroading's classic period, to plot commuter train movements and establish the schedule times. As seen above, the graph provides a time/distance relationship to show where trains should be on the layout when traveling at a set speed.



Evening trains line up at Milwaukee Union Station. Because the MR&T's main line runs through the station, MRail trains lay over on a staging track.

When you overlay the graph with a model of your track plan showing passing sidings and station locations, you can accurately plot train movements and determine running times. My default station stop is 3 minutes. While this may be longer than the prototype, when working with a 4:1 fast clock (15 minutes = 1 hour), the extended station stops help lengthen running times.

The MR&T operating plan also calls for intercity Amtrak service between Milwaukee and Rockford, Ill. I decided to use the Amtrak train to increase traffic density during the morning and evening MRail blocks. The Amtrak train serves as an outbound express in the morning, making station stops only at Mukwonago and Williams Bay (5 minutes each) before heading into Rockford staging. The Amtrak train works its way inbound in the evening block.

Finally, I added a midday MRail train from Milwaukee to Troy and back, as well as one train from Milwaukee to Williams Bay in the mid-afternoon that returns in the evening rush. The finished timetable is shown on page 54. There's still room for trains in the morning and evening, should we want to add them.

GOOD TO GO. Planning commuter service on the MR&T was a fun project. Though we still have to build most of the stations, we can already run the trains following the schedule. If you're interested in adding more passenger service to your layout, consider modeling commuter railroading. Your layout's miniature workforce will thank you. OP

PASSENGER
STATION OPERATIONS

Passenger trains create plenty of railroading action

This photo, looking east toward Kansas City Union Station, shows some of the action a busy passenger terminal can provide. From left to right: a terminal switcher with head-end cars; two St. Louis-San Francisco E units backing in to power the *Sunnyland*; and three Chicago, Rock Island & Pacific units that have been serviced and are awaiting the arrival of the *Twin Star Rocket*. Under the bridge (left), an Atchison, Topeka & Santa Fe F unit waits with a 20-car mail train.

BY FRANK E. SHAFFER

PHOTOS BY THE AUTHOR UNLESS NOTED

NOTHING IN AMERICAN RAILROADING matched the excitement of a busy union station with its vividly colored streamliners from many railroads. Let's look at how these stations worked, with an eye toward adapting the action to a model railroad. Then we'll look at a prototype four-track terminal, where one train every 20 minutes kept switch tenders and yard engineers busy 18 hours a day.

If you've never considered modeling a union station scene, you'll find plenty of inspiration here – particularly when you realize that passenger terminals can provide much more action in a given space than freight operations.

Variety is a big part of the appeal of a union station. Take Kansas City, where the silvery Santa Fe and Burlington met with the red of the St. Louis-San

Francisco Ry. (the "Frisco"), Missouri-Kansas-Texas RR, and the Kansas City Southern, and the blue of the Missouri Pacific and Wabash. Cincinnati's "Temple of Transportation" was home to a rainbow of trains from the Baltimore & Ohio RR, the New York Central, Pennsylvania RR, Chesapeake & Ohio Ry., Louisville & Nashville, Norfolk & Western, and Southern Ry. The union stations in Jacksonville, New Orleans, Chicago, Denver, St. Louis, and many other cities were still served by 25 to 50 daily trains into the 1960s.

MANY STATIONS, THREE BASIC DESIGNS.

Although passenger stations range in size from a few tracks to the giant complex that is New York City's Pennsylvania Station, their designs fit into one of three broad categories:

Stub-end stations are found at the end of the line. All trains must either head in or back in.

Combination stations have a series of stub tracks at one or both sides of the station, plus one, two, or more through tracks for trains that don't terminate.

Through stations are designed so that trains can enter or leave the facility from either end.

Of the three designs, stub-end stations are by far the most difficult to operate, so railroads avoided them like a plague – but sometimes no other type of station would work. In fact, two of the last union stations to be built, New Orleans and Los Angeles, used a stub-end design. Stubs were also found in Boston (both North and South stations), Chattanooga, Chicago (Grand Central, North Western, Dearborn, and LaSalle), Louisville, Montreal, Norfolk, Pittsburgh, St. Louis, and Savannah.

The massive Union Station in Washington, D.C., is an excellent example of a combination station. Through tracks on the station's lower level handled trains from the Atlantic Coast Line; Seaboard Air Line; Chesapeake & Ohio; Richmond, Fredericksburg & Potomac; and Southern Ry. Stub tracks on the concourse level accommodated the Pennsylvania RR's traffic between New

Stub tracks dominate this view of Washington Union Station, but some of the tracks descend to a lower level and enter a tunnel under Capitol Hill.
Association of American Railroads photo

York and Washington and Baltimore & Ohio trains to and from the west and Baltimore. (All B&O trains turned on a wye east of the station and backed in.)

The Pittsburgh & Lake Erie station in Pittsburgh had the same track pattern as Washington D.C., on a much-reduced scale, except that all of its tracks were on the same level. Across town, the PRR built an interesting variation of the combination design, with stub tracks at the center of the station. The Fort Wayne line used through tracks on the north side of this station, where the *Broadway Limited* paid a nightly visit. The Pennsy's Panhandle Line tracks passed on the south side of the station, and the *Spirit of St. Louis* was the standard bearer.

A smaller version of the PRR's Pittsburgh design is represented by Main Street Station in Richmond, Va. This station (pictured on page 64) has added interest since it's reached by a long series of girder bridges above the city streets.

The station was flanked on two sides by the double-tracked mains of the C&O and the Seaboard Air Line. Stub tracks occupied the center. This station was busy with trains of both railroads – it handled 24 daily trains in 1946.

The best example of a giant terminal with through tracks was Kansas City Union Station. There were a few stub tracks, of course, but these were for mail and express and office cars. Atchison, Topeka & Santa Fe and Rock Island trains operated straight through the station. All other roads terminated there: Missouri Pacific, Wabash, Burlington, Chicago Great Western, Kansas City Southern, Frisco, and Union Pacific.

POCKET-SIZE STATIONS WERE BUSY, TOO.

It's not easy to model a big-city station, but fortunately for the more space-challenged among us, there were many stations where a large volume of passenger traffic was handled on a limited number of tracks. Two fine examples, Ashland, Ky., and Charlottesville, Va., were found on the C&O.

Ashland's four-track through terminal handled 22 daily trains on three platforms in 1946, fortunately with no interference from freight traffic. As late as the early 1960s, Ashland had 10 trains, and there was activity aplenty when the westbound *George Washington* split into Cincinnati, Detroit, and Louisville sections in the early hours of the morning.

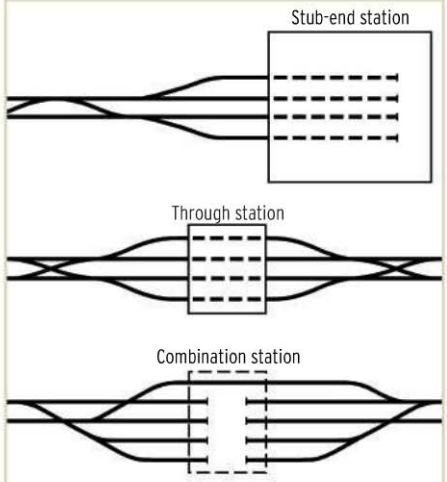
Charlottesville had only one platform for 24 daily trains in 1946. Try that for switching problems on a model railroad! And be sure to add a few freight trains into the mix for variety – even though the majority of C&O's freight tonnage operated through Lynchburg, Va., instead of Charlottesville.

The B&O handled 28 passenger trains (plus a dozen Mallet-powered freights) through its Wheeling, W.Va., station in the heyday of steam. Fourteen of those passenger trains terminated at Wheeling, and there was plenty of switching needed for breaking up or consolidating the others. The Wheeling terminal would be an excellent candidate for full-size reproduction in HO – its longest track could handle only eight cars and a 4-6-2 Pacific steam locomotive.

These stations prove that a busy passenger terminal doesn't need to have a dozen tracks. In fact, the fewer the station tracks, the more skillful the terminal superintendent must be in planning his operations.

A big fleet of passenger cars isn't necessary, either. With the freedom enjoyed by presidents of model railroads, the flagship streamliner may need four to six cars. A secondary passenger train might have four heavyweight cars and one or two head-end cars. A switch engine and a spare Pullman could complete the list of equipment.

PASSENGER STATION TYPES



STATION ACTION ROUTINE AND OTHERWISE.

What kind of action can a terminal provide? Here are six activities that provide interest and can be scheduled as a part of the regular routine.

Changing locomotives was a standard station ritual in the steam era, and it still may be done with prototype accuracy in the diesel era.

Adding a unit to arriving diesels.

Moving locomotives to the opposite end of an arriving train, as the Missouri Pacific did with the *Colorado Eagle* in Kansas City.

Setting out or picking up a sleeper, diner, lounge, parlor, or coach.

Adding or removing head-end cars.

Consolidating two trains into one or breaking up an arriving train to create two departing trains. Sometimes two trains would exchange cars at a station, allowing two trains to serve four routes with single-seat service.

Continued on page 64

SMITHFIELD STREET: A CASE HISTORY

LET'S LOOK AT THE OPERATION of what was once one of the hottest passenger operations on the Baltimore & Ohio, the four-track stub terminal at Smithfield Street in Pittsburgh. This was a relatively small station given the number of trains it served. I also like its abbreviated, old-style train shed and its combination of long-distance "name" trains, middle-distance runs, and commuter trains.

The station opened in 1889 and was modernized and expanded in 1915. Smithfield Street's importance began to dwindle in late 1934 when the B&O switched its mainline traffic onto Pittsburgh & Lake Erie tracks between McKeesport and New Castle.

Before 1934, many through B&O passenger trains, particularly the nighttime *Capitol Limited*, didn't enter Smithfield Street at all. Instead, they paused at Laughlin Junction, where they were met by three switch engines that broke apart and reassembled the train's consist. In a closely coordinated effort, the switchers removed the dining car from the westbound *Capitol Limited* (or added a dining car to the eastbound), removed the Pittsburgh-bound sleeping car, coupled on the outbound sleeper (which had been open for boarding all evening at Smithfield Street), and coupled the train back together.

All this in the dead of night without whistle signals or bunching slack. The *Capitol Limited* was all sleepers in those days, and the passengers had retired for the evening. The B&O didn't want to disturb their slumber!

After Sept. 30, 1934, B&O through passenger trains (and freights) used the P&LE. The only trains to use Smithfield Street were the Wheeling-Cincinnati trains, Buffalo-Rochester trains, the Connellsville local, and the commuter trains to Versailles.

Even so, the little station remained a busy place. One train every 20 minutes over an 18-hour span called for precision railroading. Reduced to model railroad size, Smithfield Street would keep as many as four engineers, a dispatcher, and a tower operator busy on operating nights. A solo operator would be able to handle the slower portions of the schedule with little difficulty.

THIS 1930 TRACK-ASSIGNMENT SCHEDULE, compiled with the help of Smithfield Street expert James Mischke, may not be correct in every detail, but it's the best we can do 75 years after the fact. We set aside Track 1 for most of the commuter trains. Because these trains finish their work by early evening, this track becomes available for parking outbound Pullmans by 10 p.m.: three for no. 16 and two for no. 68.

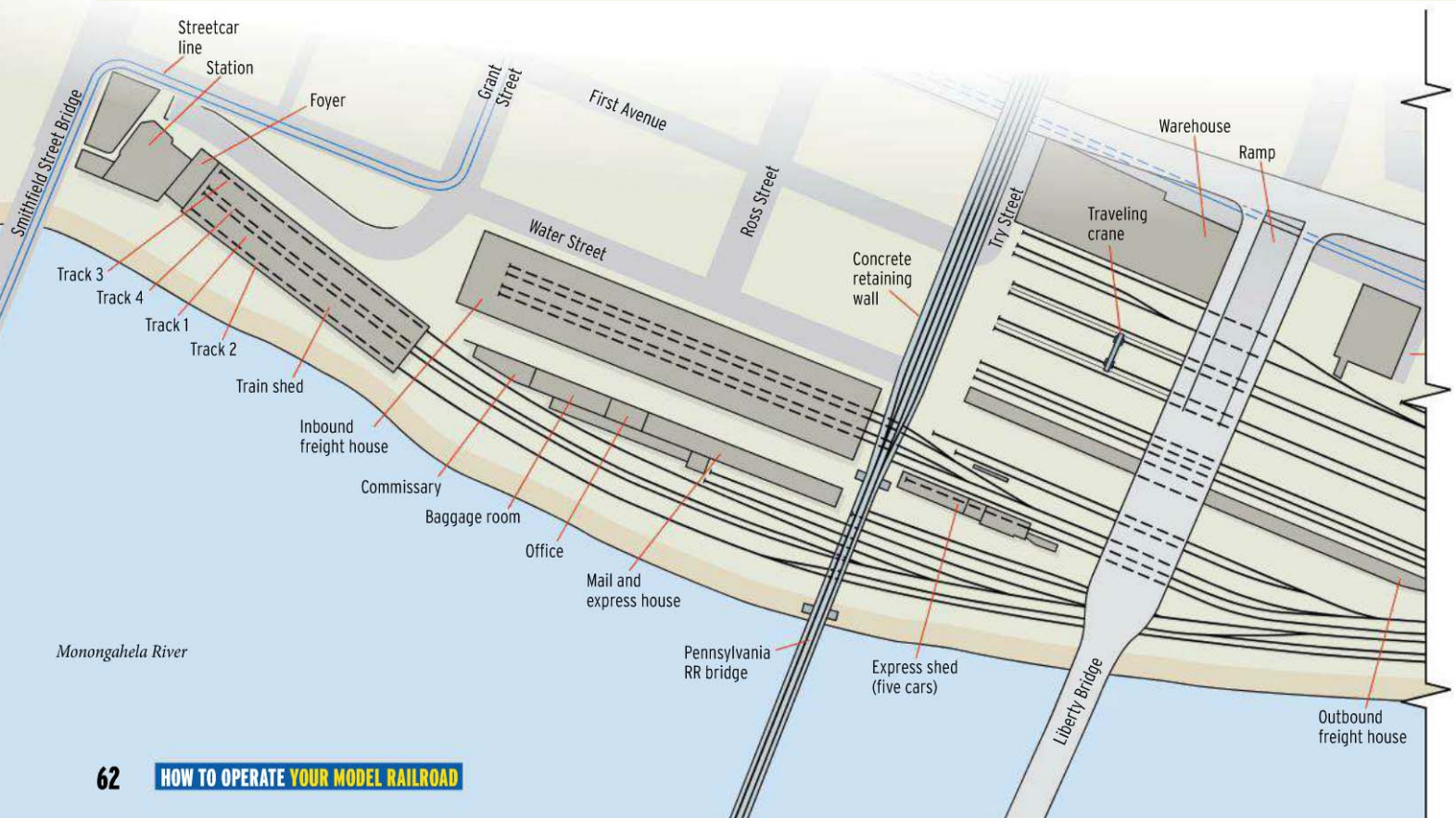
Keep in mind that there were no escape tracks at Smithfield Street. All tracks stub-ended. So inbound passenger trains had to back in from the wye at Laughlin Junction, three miles away, with the exception of the 1953-built RDC commuter trains, which were double-ended.

Here's a look at Smithfield's morning traffic jam:

7:15 a.m. No. 9 arrives from New York with two Pullmans for Pittsburgh and picks up one car from No. 17, which is following.

7:33 a.m. No. 8 arrives with one Pittsburgh sleeper. It must wait for two sleepers from No. 26, which is following. A diner and a parlor car were also added to No. 8 at Pittsburgh.

7:40 a.m. No. 17 arrives from Washington with three Pittsburgh sleepers, one for No. 33 to Columbus and one for No. 9 to Chicago. The two cars to be forwarded are on the rear of No. 17. After unloading passengers, the last two cars are cut off and the balance of the train is yarded. No. 9



then pulls out onto the inbound main from track three. A switcher heads into track two, picks up the Chicago sleeper, and sets it on track three. No. 9 returns to track three, couples up, and prepares for departure.

7:45 a.m. No. 33 backs into track two and couples to the Columbus sleeper that arrived on No. 17.

7:45 a.m. Buffalo, Rochester & Pittsburgh RR No. 342 arrives on track one with sleepers from Rochester and Buffalo. Local train No. 145 arrives.

8 a.m. No. 9 departs for Chicago from track three.

8:05 a.m. No. 33 departs for Wheeling, Columbus, and Cincinnati from track two. There is now a short breathing spell. Tracks two and three are open. No. 8 is still on track four. The BR&P engine has been sent to the enginehouse at Glenwood to be serviced. It will return homeward on No. 345 at 9:35 a.m.

8:30 a.m. No. 26 arrives on track two from Chicago with two sleepers and an observation for Pittsburgh, plus Chicago-New York-Detroit-Washington cars for No. 8.

8:32 a.m. No. 36 from Cincinnati backs into track three.

8:35 a.m. No. 26 leaves its last three cars on track two and pulls the rest of its train into the coach yard.

8:38 a.m. No. 8 pulls from track four and backs into track two to get two cars from No. 26.

8:45 a.m. No. 8 departs for Washington.

8:50 a.m. No. 36 leaves the station for the coach yard.

At this point, the mid-morning lull sets in. Only the BR&P train on track one remains in the station.

With this explanation serving as a pattern, it'll be relatively easy to figure out the handling of No. 38's two Pullmans arriving at 11:05 p.m. and the one eastward car arriving on No. 10 at 11:25 p.m. All three cars continue eastward on No. 18.

Interestingly, a look at Smithfield's operations reveals that a Memphis-New York Pullman appears as eastward-only No. 38-18. The westbound movement of this car was through Keyser and Grafton, W.Va., to Cincinnati and Louisville, where the Illinois Central took it southward.

Modeling Smithfield Street's trains would be relatively simple. If the terminal is built for 1930-style operation, USRA Pacifics would serve as standard power (except for commuter trains). If the general idea of the terminal has appeal, but you want to move into the late 1950s or early 1960s, RDC units could be used for commuters and other diesels for most passenger trains.

In the 1930s, Smithfield's locals were powered by Ten-Wheelers, either a B&O 2000 class or the much lighter 1300 class. A light 1000 class 0-8-0 was used for switching Smithfield Street, but many B&O terminals used a 350-class USRA six-wheel switcher. The B&O's stylish P-7 Pacifics didn't operate into Pittsburgh until after mainline passenger service was moved over to the P&LE, but no one would quarrel if you wanted to use a Pacific at Smithfield Street.

A passenger terminal of eight, 12, or more tracks is out of the question for most modelers and probably for many club operations. But if you like passenger trains and are intrigued by the possibility of handling limiteds and express trains, and if you have space for three or four tracks, then you're in business as vice president and general manager of terminal operation. – *Frank E. Shaffer*

A pre-1915 view of Pittsburgh's Smithfield Street Station. In the 1930s, this compact and modelgenic station handled an average of one train movement every 20 minutes.

PITTSBURGH'S SMITHFIELD STREET STATION

In October 1961, a Seaboard Air Line freight eases past historic Main Street Station in Richmond, Va. The station is unusual in having elevated through tracks for SAL and (on the opposite side of the building) Chesapeake & Ohio Ry. Stub tracks occupy the center. J. Parker Lamb photo

Continued from page 61

For variety, I suggest you try imposing one of the following operating challenges on the regular schedule. While the events below are not normal, they're a valid part of the railroad routine, and the sort of things that caused headaches for the superintendent and overtime pay for switch crews.

• **One of your trains is 30 minutes late.** How will this affect its regular track assignment? How will you work this late train with your switcher when you already need that switch engine to handle an on-time train?

• **An arriving diesel unit must be replaced.** You have an hour's notice after the train throws off a message at a tower 60 miles away. The replacement must be brought to the terminal and parked where it will be available with a minimum of switching.

• **The date is December 15.** Mail and express is heavy. A "Santa Claus Special" is added to your regular schedule daily through December 24.

• **A sorority has arranged for two coaches to handle a group movement.** These cars must be worked into a regular train in addition to any regular switching that train may require.

• **A National Guard unit is going to summer training.** It needs two special trains originating in your terminal.

• **Hundreds of people are heading to the East Coast for a political convention.** This is the night when your flashiest streamliner will operate in two sections. Make sure that the first section is carrying green classification lights (indicating a following section) on the engine.

• **The general manager is leaving on the midnight train.** His office car must be coupled to the rear of the consist.

• **The biggest college football game of the year is in your city.** A special train will bring 300 fans into your terminal at 9:30 a.m. The special must be serviced and turned, then parked for departure at 7 p.m.

Card operation makes it possible to handle all these regular and special movements. But in passenger operation, there's more than one engineer involved. Cards will have to be made in duplicate, or even in triplicate. The road engineer, tower operator, and yard engineer must know what movements are planned. [For more information, see Bill Darnaby's "Card order operations for passenger trains" in the October 1993 *Model Railroader. – Ed.*]

UNWANTED, UNLOVED, UNAVOIDABLE. A stub-end passenger terminal is an unwanted piece of property on any railroad. And often that includes model railroads. But someone must love (or need) them because there are so many of them around. Although we may take delight in a smooth operation based on a slimmed-down through terminal, there are many advantages to adding a stub terminal to your layout.

Stub terminals are an excellent use of what otherwise might be wasted space in an odd corner of your train room. With only one set of lead tracks and switches, the stub design saves valuable space – three feet or more on an HO scale layout. If the room next to the railroad can be "borrowed" for a few hours, it's possible to build a six-track, three-platform terminal that can fit through a door.

The operation of any passenger station may appear to be a complicated process. It is, of course, but the process was shaped into a convenient pattern of normality by years of experience. In Washington's vast Union Station, and in many other places, regularly scheduled trains were handled on the same track every day as established by timetable assignment. There were changes, but the important fact to remember is that efficient station operation calls for regular scheduling of tracks.

In planning the operations of your passenger terminal, a careful study of train schedules and space available will disclose that you, too, can establish an orderly pattern. For trains terminating or originating, be sure to allow sufficient time after arrival for unloading or before departure for taking passengers and head-end traffic on board. OP

A former newspaperman and resident of Charleston, W.Va., Frank E. Shaffer is a frequent contributor to railroad magazines. His first byline in MR was in the March 1962 issue.

SWITCHING MAIL AND EXPRESS

Head-end cars add operating interest for passenger trains

BY ANDY SPERANDEO

LET'S LOOK AT SOME operating opportunities with mail and express cars. These cars moved in passenger trains to take advantage of the trains' speed and regular schedules, and often added significantly to passenger train earnings.

In general the operations I'll describe went on until the late 1960s. The post office cancelled most Railway Mail Service contracts in 1967, and around the same time the Railway Express Agency shifted most of its business to trucks, airlines, and trailer-on-flatcar rail service.

Mail and express cars were typically right behind the locomotive, so they were collectively known as "head-end cars." "Head-end business" and "working the head end" likewise refer to mail and express operations.

Electro-Motive Division SW8 no. 2 shifts mail and express cars at New Orleans Union Passenger Terminal in this undated photo. James G. La Vake photo

TERMINAL SWITCHING. Larger terminals often included mail and express buildings with their own tracks. When a train arrived, one of the first switching movements would often be to uncouple the head-end cars and spot them on mail and express tracks.

A Railway Express building might resemble a large freight house, and its functions were similar in many respects. Parcels and larger shipments unloaded from express cars were transferred to delivery trucks. The same trucks returned with outgoing traffic to be loaded.

In some cities post office annexes were adjacent to important passenger stations, and mail cars were spotted there. In New Orleans, my hometown, mail was trucked between the mail tracks and a nearby post office.

Outbound cars were handled in the reverse manner. The head-end cars for a particular train were pulled and switched into the desired order. After the passenger cars were spotted at the platform, the head-end block would be coupled to the front of the consist.

INTERCHANGE. Storage mail and express cars were commonly exchanged between connecting lines, although RPOs, as a rule, were not.

At a union station or other shared terminal, interchange might simply mean switching a car or cars from one road's arriving train to another's next departure. But switch engines could also transfer connecting cars between different terminals in the same city.

ON-LINE SWITCHING. Express and mail cars were both set out and picked up as needed at important intermediate stations. If there was a station switcher on duty, it would do the work. Otherwise, the cars were switched with the passenger train's road engine.

On routes where mail and express cars were set off on a regular basis, they might be at the rear of the train leaving the initial terminal and uncoupled in order at the receiving stations. In such cases some so-called head-end cars ran on the rear, adding to the switching needed to make up the train.

Where passenger road engines made pickups and setouts, railroads tried to keep the work simple to minimize delays. Setouts were made to a designated station track, such as a house track, and pickups were positioned in advance to be easily reached by the passenger engine.

For example, cars might be loaded on industrial tracks for pickup by passenger or express trains, such as a fruit packer loading express reefers or a magazine printing plant loading baggage-express cars. Work by other engines and trains was then needed to place the cars for the passenger train's convenience.

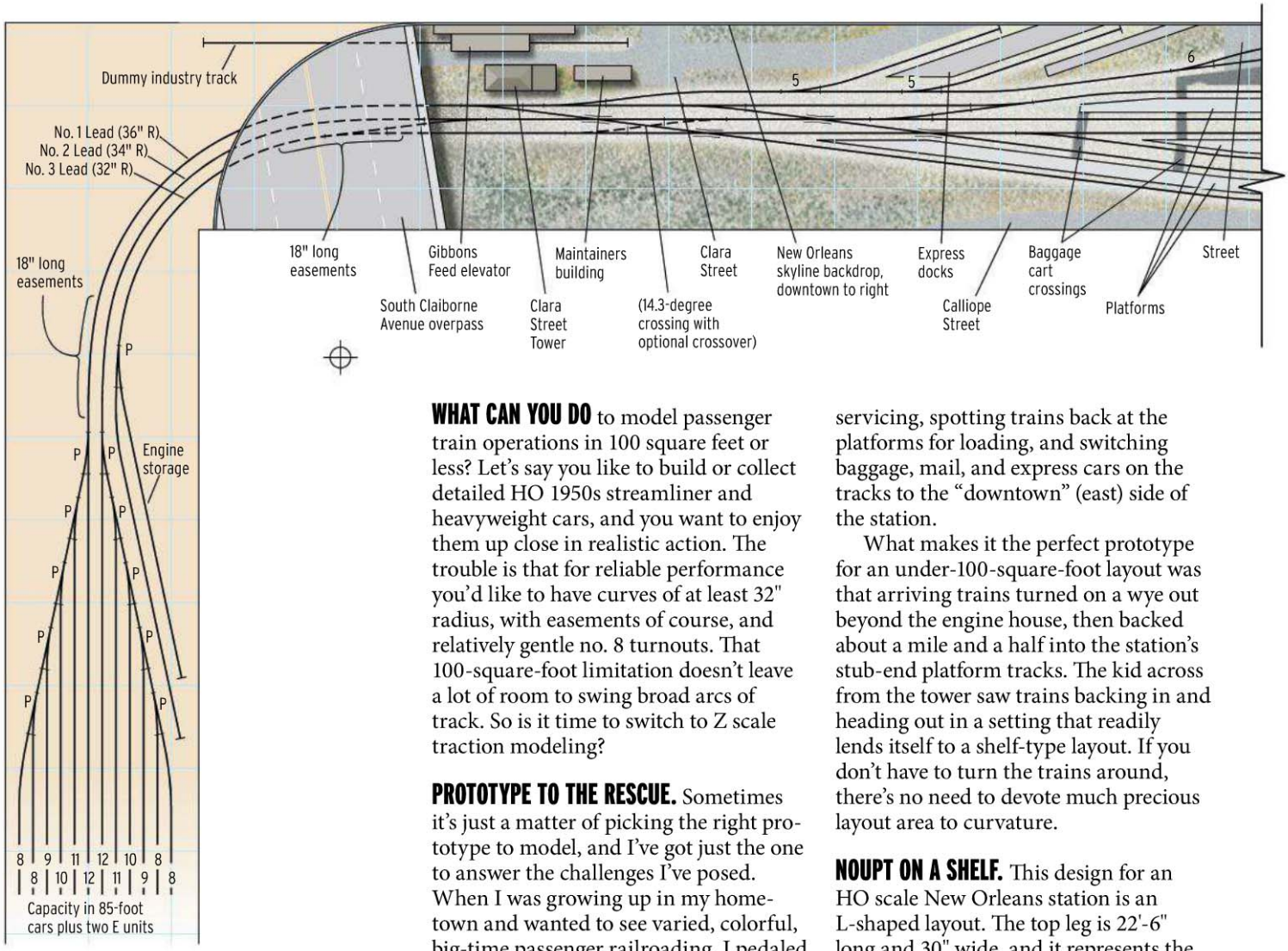
Interchange took place at intermediate stations as well as terminals. Another railroad crossing yours might be one more reason for trains carrying mail and express cars to stop and switch.

Switching mail and express cars can add another level of interest to passenger train operations. For more prototype examples and model possibilities, see my book, the *Model Railroader's Guide to Passenger Equipment & Operations*, from Kalmbach Books. OP

NEW ORLEANS
UNION PASSENGER TERMINAL

HO passenger railroading without space-eating curves

BY ANDY SPERANDEO



WHAT CAN YOU DO to model passenger train operations in 100 square feet or less? Let's say you like to build or collect detailed HO 1950s streamliner and heavyweight cars, and you want to enjoy them up close in realistic action. The trouble is that for reliable performance you'd like to have curves of at least 32" radius, with easements of course, and relatively gentle no. 8 turnouts. That 100-square-foot limitation doesn't leave a lot of room to swing broad arcs of track. So is it time to switch to Z scale traction modeling?

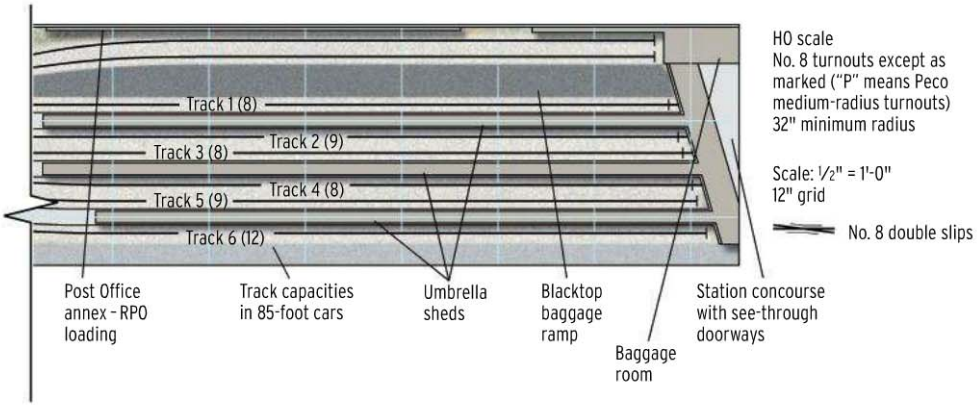
PROTOTYPE TO THE RESCUE. Sometimes it's just a matter of picking the right prototype to model, and I've got just the one to answer the challenges I've posed. When I was growing up in my hometown and wanted to see varied, colorful, big-time passenger railroading, I pedaled my bike (and later drove my mother's car) to a spot at the throat of New Orleans Union Passenger Terminal, right across from Clara Street Tower.

Trains of seven railroads arrived and departed, and for every arrival or departure there was a "light engine" move to get the power to or from the enginehouse on the "lake" or north side of the South Claiborne Avenue overpass. In between, NOUPT's blue-and-orange SW8s were almost always busy hauling consists out to the coach yard for cleaning and servicing, spotting trains back at the platforms for loading, and switching baggage, mail, and express cars on the tracks to the "downtown" (east) side of the station.

What makes it the perfect prototype for an under-100-square-foot layout was that arriving trains turned on a wye out beyond the engine house, then backed about a mile and a half into the station's stub-end platform tracks. The kid across from the tower saw trains backing in and heading out in a setting that readily lends itself to a shelf-type layout. If you don't have to turn the trains around, there's no need to devote much precious layout area to curvature.

NOUPT ON A SHELF. This design for an HO scale New Orleans station is an L-shaped layout. The top leg is 22'-6" long and 30" wide, and it represents the station throat and platform tracks on the "river side" (south) of the Claiborne overpass. The left leg is 20 feet long and 28" wide, and it's entirely devoted to a staging yard representing the coach yard, engine terminal, and all the distant cities served by passenger trains from NOUPT. The area is about 78.5 square feet, comfortably within our 100-square-foot limit.

The station tracks and throat are compressed of course, with three leads where the real thing had five, and six



MEDIUM-RADIUS TURNOUTS

PECO'S MEDIUM-RADIUS code 100 HO turnouts are ideal for staging yards. They are very compact and diverge on a 12-degree angle, a half-degree sharper than a standard no. 5. But unlike standard turnouts, they have a continuous 36"-radius curve through the points, closure rails, and frog.

Because of their sharp angle of divergence they can form much shorter ladders than conventional turnouts, saving valuable staging track length. Nevertheless, almost all HO locomotives and rolling stock can negotiate their curvature. – *A.S.*

platform tracks where NOUPT had 12. Still, the general arrangement is pretty close to the prototype, including the extra-long tracks on the "uptown" (west) side of the station. Tracks 11 and 12 were the regular slots for really long trains such as the Southern Pacific's *Sunset Limited* and the Louisville & Nashville's combined *Gulf Wind* and *Pan American* or *Piedmont Limited*.

The mail and express tracks will keep the terminal's dedicated switchers occupied in between runs to and from the coach yard. On this layout, servicing a train means pulling the recently arrived consist back out to the staging track it came from. The switcher can either wait out there with it or be fiddled (hand-carried) back to the staging throat to reappear from beneath the overpass.

If you had a little more than 100 square feet, you could model NOUPT on a U-shaped layout, and put the coach yard and enginehouse across the bottom of the U. The September 1954 *Trains* magazine article on NOUPT includes a track diagram that could guide this kind of expansion.

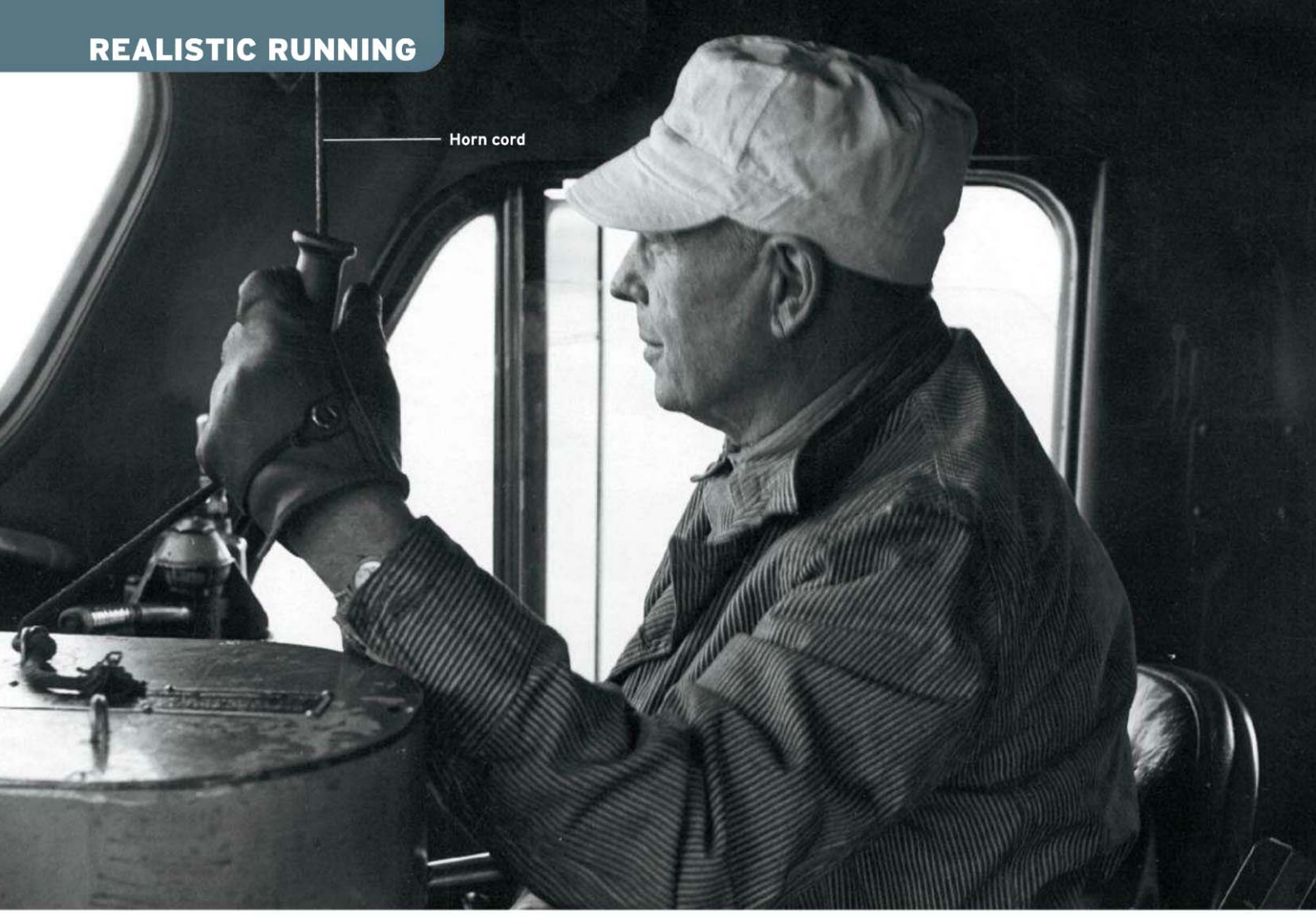
COMPACT STAGING LADDER. Out in the open, the layout is designed for Walthers code 83 track with no. 8 turnouts and double-slip switches on the station leads, and no. 6 and 5 turnouts to handle the shorter head-end cars.

It's 4:30 p.m. on a May day in 1954, and the all-sleeping-car *Panama Limited* is leaving New Orleans Union Passenger Terminal on its overnight run to Chicago. Meanwhile, one of three blue-and-orange NOUPT SW8s is switching express cars on the lead in front of Clara Street Tower. James G. La Vake photo

There's no substitute for length in staging long trains, and the Peco medium-radius turnouts described in the sidebar above can save valuable distance. I've tested these with full-length passenger cars close-coupled with Kadee no. 5 couplers and cut-down Walthers diaphragms, and they're completely reliable. (See *Great Model Railroads 1991*, page 22, for details of the car standards I follow.) Even the short S-curves on the two tracks to either side of the center tracks don't cause problems with lengthy lightweight streamlined cars.

Long cars don't look their best going through these tight S curves, but my answer to that would be to conceal the staging with storage shelves on top and sliding access doors in front.

With staging capacity for 116 cars in 12 trains, this layout will support a lot of passenger train modeling. OP



Sound effects can put us in the cabs of our locomotives, blowing the horn like engineer George Price on the Chicago & North Western's *Dakota 400* back in 1957. William D. Middleton photo

LOCOMOTIVE SOUNDS
ADD FUN AND REALISM TO OPERATION

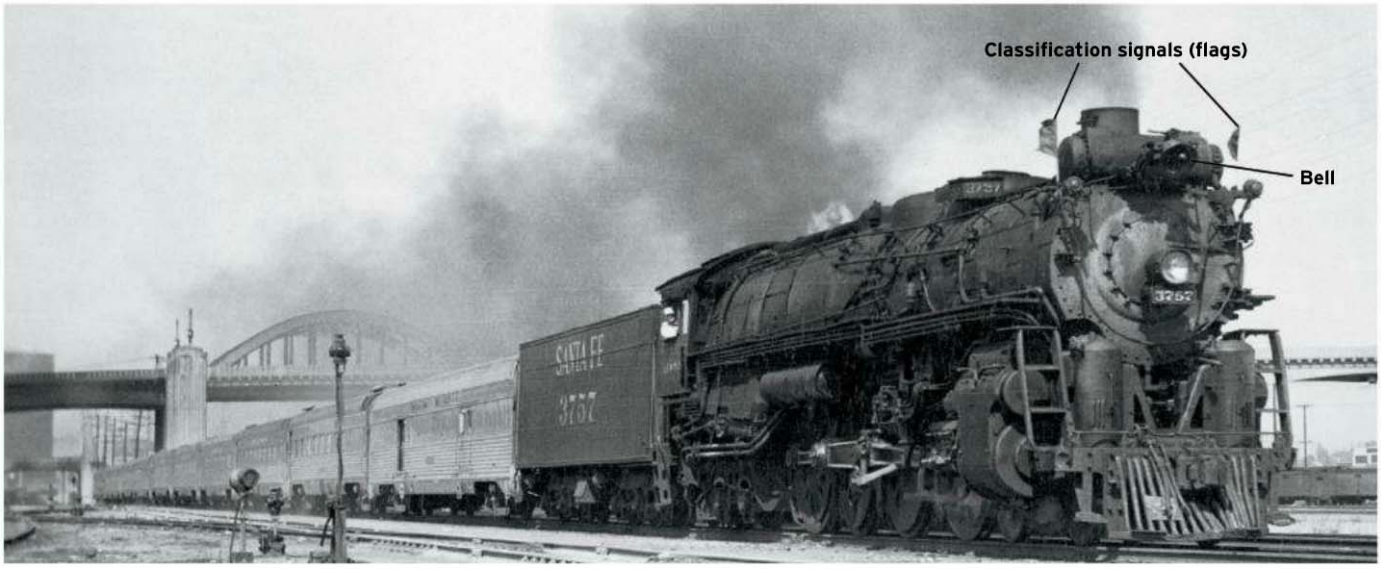
How to use the whistle, bell, and other DCC sounds realistically when running your railroad

BY ANDY SPERANDEO

TODAY'S SOUND DECODERS can add new levels of realism and enjoyment to model railroad operation with Digital Command Control. But unless you spend a lot of time working for or at least observing prototype railroads, you may not be ready to use DCC sound effects realistically. Here's an overview of how sound signals, the whistle (or horn) and bell, are used on the full-size railroads, and of the sounds steam and diesel locomotives make at work.

One thing I've learned as DCC sound decoders have developed is that many are capable of generating or triggering sounds in unrealistic ways. For example, some decoders can be programed to automatically sound two blasts of the horn or whistle as soon as the locomotive starts moving ahead. That may seem an appealing bit of automation, but the purpose of that particular signal is to warn the train crew and anyone else nearby that the engine and whatever it's coupled to is about to start forward. Once the engine moves, the signal is too late.

That kind of sound flub can be avoided or corrected using the decoder configuration variables (CVs). How CVs govern



Bell ringing for a grade crossing ahead, Atchison, Topeka & Santa Fe 3757 leads a *San Diegan* streamliner through Los Angeles in 1945. The 4-8-4 is protecting this service while the usual warbonnet E1 diesels are in for their regular maintenance. The green flags on the engine show that another section of this schedule is following. H.L. Kelso photo

sound effects differs from one make of decoder to another. I can explain how whistle and bell signals are used on the railroads, but the programming is up to you.

Another kind of sound miscue happens when the user triggers a realistic effect at the wrong time. An example would be turning on a diesel decoder's dynamic brake sound – usually function 4 – while the locomotive is pulling a train upgrade. Since this sound represents fans getting rid of waste heat from regenerative braking on a downgrade, it makes the model diesel sound like it's working against itself.

A friend was so annoyed by operators doing this on his mountain-climbing layout that he reprogrammed his decoders to disable the dynamic brake effect. I think a better solution is to learn when certain sounds are apropos and do our best to use them realistically.

WHISTLE AND HORN SIGNALS. There's a long list of mostly standard whistle (or horn) signals defined in most railroad rule books. In the late steam and transition eras, this was usually found in Rule 14. The "Whistle signals" box at right includes most of these. If your favorite prototype's Rule 14 (or whatever number) is different, by all means follow that example.

As you read through the list, take notice of which signals are appropriate from a moving train or engine and which ones are used when standing.

The most common signals are 14(b), (h), and (l), for obvious reasons.

Many model railroad operators now use miniature flags or flagmen in their operations according to Rule 99, to protect trains that have to stop on the main line. (See page 75). If you're among them, you can use signals 14(c), (d), and (e) to add sound to your flagging procedures.

For layouts operating under timetable and train order authority, signals 14(g), (k), and (n) can come into play. A train running ahead of a following section of the same schedule can call attention to

WHISTLE SIGNALS

RULE 14. ENGINE WHISTLE SIGNALS

NOTE: The signals prescribed are illustrated by "o" for short sounds; "–" for longer sounds; and "–––" for extra long sounds. The sounds of the whistle should be distinct, with intensity and duration proportionate to the distance the signal is to be conveyed.
(From *The Standard Code of Operating Rules* adopted March 1949.)

SOUND	INDICATION
(a) o	Apply brakes. Stop.
(b) – –	Release brakes. Proceed.
(c) – o o o	Flagman protect rear of train.
(d) – – – –	Flagman may return from west or south.
(e) – – – – –	Flagman may return from east or north.
(g) o o	Answer to any signal not otherwise provided for.
(h) o o o	When train is standing, back. Answer to 12(d) and 16(c) [trainmen's signals to back]. When train is running, answer to 16(d) [signal to stop at next station].
(j) o o o o	Call for signals.
(k) – o o	(Single track.) To call attention of engine and train crews of trains of the same class, inferior trains, and yard engines, and of trains at train order meeting and waiting points, to signals displayed for a following section. If not answered by a train, the train displaying signals must stop and ascertain the cause unless otherwise provided. (Two or more tracks.) To call attention of engine and train crews, and yard engines, to signals displayed for a following section.
(l) – – o –	Approaching public crossings at grade. To be prolonged or repeated until crossing is reached.
(m) ––––––	Approaching stations, junctions, railroad crossings at grade, and other locations as may be required.
(n) – – o	Approaching meeting or waiting points (see Rule S-90).
(o) o –	Inspect train line for leak or for brakes sticking.
(p) Succession of short sounds.	Alarm for persons or livestock on the track.
(q) – o	Where there are two main tracks on which movements are made in either direction by signal indications, trains on left track will sound this signal preceding signal 14(d) or 14(e). When running against the current of traffic: (1) Approaching stations, curves, or other points where view may be obscured. (2) Approaching passenger or freight trains and when passing freight trains. (3) Preceding the signals prescribed by (d), (e), and others as prescribed by rule.

BELL RINGING

RULE 30: The engine bell must be rung when an engine is about to move, when running through tunnels, while approaching and passing public crossings at grade, and when passing a train standing on an adjacent track. (From the *Pennsylvania RR Book of Rules*, effective October 28, 1956.)

RULE 14. ENGINE BELL: Except where the momentary stop and start is a continuous switching movement, engine bell must be rung when engine is about to be moved, while passing through tunnels and, except when shoving cars, while approaching crossings at grade. Ringing must be commenced sufficiently in advance to afford warning, but not less than one fourth mile before reaching crossing, if distance permits, and continuing until the crossing is occupied. If distance does not permit, bell must be rung sufficiently in advance of entering crossing to provide warning. Bell must be rung elsewhere when necessary as a warning signal.
(From *The General Code of Operating Rules*, effective April 28, 1985.)

RULE 20. ENGINE BELL. If a train is equipped with an engine bell, it must be sounded:

1. When the engine is about to move.
2. When running through tunnels.
3. While approaching and passing public crossings at grade.
4. When approaching locations where Roadway Workers may be at work on track, bridges, and other points.
5. When passing a train standing on an adjacent track.
6. In an emergency.

In cases where a momentary stop and start, forward and backward movement is part of a switching operation that does not involve movement over a public crossing at grade, the engine bell need not be sounded, unless roadway workers are known to be in the area.
(From the *Northeast Operating Rules Advisory Committee NORAC Operating Rules*, Eighth edition, effective January 1, 2003.)

its green signals by blowing a long and two shorts – 14(k) – when meeting other trains. Those trains can acknowledge the green signals by blowing two shorts – 14(g). Indeed, if the 14(k) signal isn't acknowledged, the train sounding it is supposed to stop so its crew can find out why. Missing signals for a following section can lead to a deadly collision. Just as on the prototype, whistle or horn signals can serve useful functions both as warnings and as communication.

COMMUNICATE WITH THE WHISTLE. Interlocking plants controlled by an operator or tower man offer another opportunity for communication using the whistle or horn. Signal 14(j), four shorts, is a call for signals when approaching or waiting at an interlocking signal displaying stop.

Many roads also had whistle signals for requesting a specific route at a tower or control station. For example, the Atchison, Topeka & Santa Fe's 1959 *Rules and Regulations, Operating Department*, included these signals under Rule 14(z): – (one long) main track; – o – (long, short, long) siding; oo – o industry track; o – oo transfer track; and o – o to notify the operator or towerman that the train can't take the signal displayed.

For more complicated junctions, railroad employee timetables sometimes listed a separate whistle signal for each of the various routes at specific towers. You could do the same in your road's employee timetable, and let engineers communicate with the towerman using whistle or horn signals.

Whistle signals are also useful for communication when you add pusher engines to boost heavy trains up steep grades, a kind of fun that DCC makes easier.

To get a train started with two or more engines working together, first the road engineer "whistles off" – sounds signal 14(d) – and waits to hear the pusher (or pushers) answer with the same signal. The pusher engineer sounds 14(d) in acknowledgement and immediately starts pushing in the slack. Hearing the pusher whistle off tells the road engineer that he can also start, and the train will get moving smoothly. That's exactly how it was done on the big roads in the days before two-way train radios.

TIMING AND RESTRAINT. Timing can be important, such as knowing when to start blowing the grade crossing signal – 14(l) – so the last long sound can be prolonged as the engine passes over the crossing. You can help your engineers with this by installing a realistic whistle post, maybe a small square sign with a scale-size "W," sufficiently in advance of each grade crossing on your layout.

And try not to overdo it. The forward and reverse starting signals, 14(b) and (h), shouldn't be used for every change of direction in switching. Save them for when an engine or train has been standing for a while, and when starting from a terminal, station, or operating stop.

RINGING THE BELL. The bell is the other main controllable locomotive sound effect. The "Bell ringing" box at left quotes three rules for use of the engine bell from different times. It's interesting that these rules grow more specific and definitive with time. For the most part I think that reflects an effort to preserve earlier experience.

Again note that the bell is to be sounded when an engine is about to move, so an automatic bell sound won't do the job unless the decoder can detect your intentions before you advance the throttle. And like the whistle, the bell isn't used for the continuing start-and-stop action of switching.

Using the bell as a warning at grade crossings brings up one application where automation of sound control may be realistic. Many modern diesel and electric locomotives allow the engineer to push one button to simultaneously start the bell ringing; trigger an air-horn sequence of two longs, a short, and a long; and switch the ditch lights to flash alternately. Doing the same thing with a function button or macro control on a DCC cab can simply mirror this prototypical setup for model railroads set in the current day.

STEAM LOCOMOTIVE SOUNDS. The most important steam engine sound effect is the chugging exhaust in rhythm with the rotation of the drive wheels. On the vast majority of actual steam locomotives, this sound results because the engine is powered by two double-acting steam cylinders connected to drive-wheel crank pins set 90 degrees apart on opposite sides. The piston in each cylinder makes one stroke forward and one back

for every revolution of the drive wheels. While live steam is admitted from one end of the cylinder to push the piston, exhaust steam is simultaneously allowed to escape from the from the other end.

This configuration produces a total of four exhausts or "chugs" per revolution of the drivers, which may be considered almost an iron law of steam engine sounds. I've found that the most realistic reproductions of exhaust sounds are timed to driver or axle rotation, such as with a cam or segmented contact disk. "Auto chuff" effects are typically controlled by the speed step setting of the DCC cab, and are always second best at matching the drivers' rotation. When the DCC exhaust sounds are timed by driver rotation, there's absolutely no need for a CV to adjust the chuff rate.

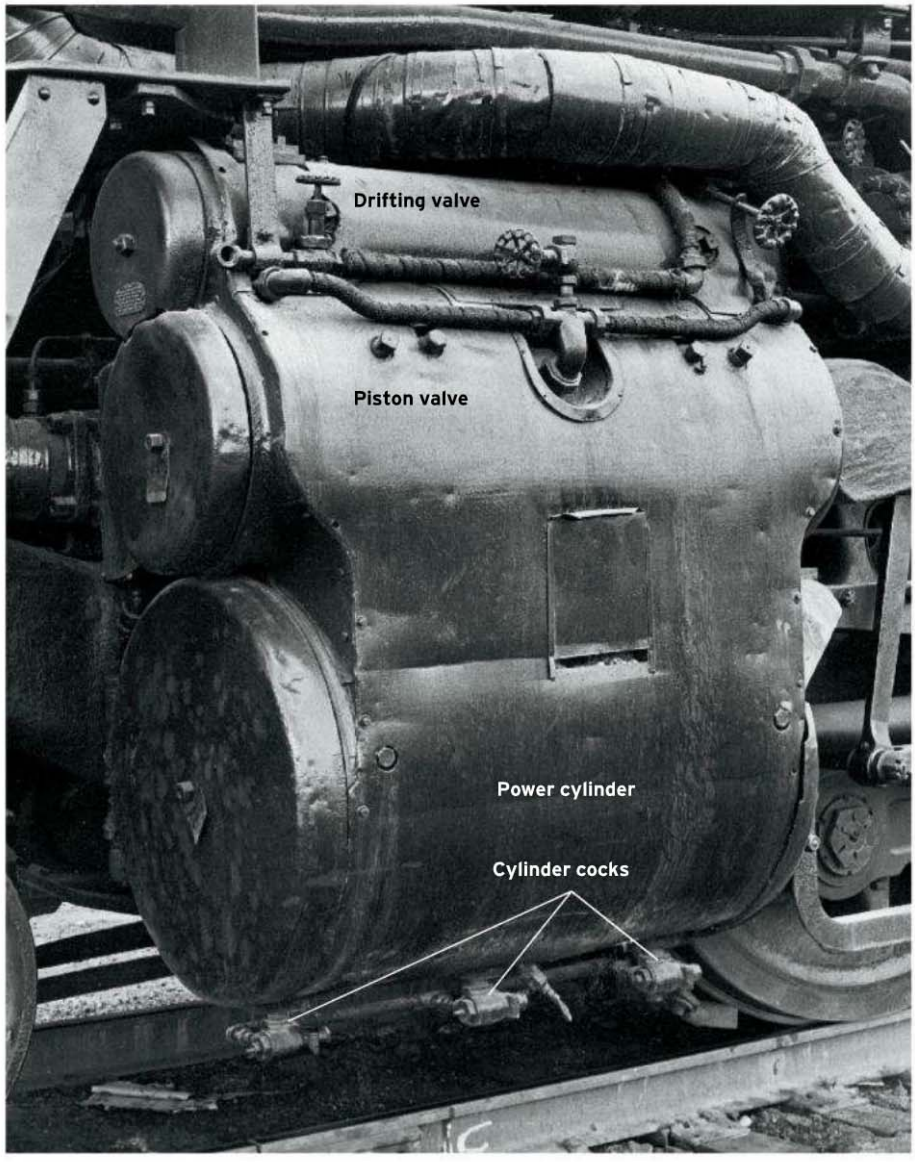
MORE THAN FOUR? I said that four chugs per revolution is *almost* an iron law because, of course, there are exceptions. They all have to do with the number of steam cylinders at work and how they're connected to the driving wheels. Three-cylinder locomotives, like the Union Pacific's 4-12-2s, produce six chugs per revolution, and usually three-cylinder exhausts are a little uneven or off beat because of differences in crankpin settings and lengths of steam passages.

Simple-articulated or duplex-drive locomotives make things more complicated, because their two independent engines – sets of cylinders and drivers – can get out of step. Then they produce eight exhausts per revolution with unequal intervals between pairs of chugs. But when in step they can sound like ordinary two-cylinder engines.

Some sound decoders can mimic the extra action of having the exhausts go in and out of step. However, no model locomotive manufacturer has figured out how to make the two engines run independently when both are powered from the same drive line by a single motor.

Mallet articulateds sound different, however, because as compounds they use steam twice. The high-pressure cylinders of the rear engine exhaust to the low-pressure cylinders in front, and all you hear through the stack is the four-beat exhaust of the front engine.

Geared engines like the Shay and others sound different because their steam cylinders turn a drive shaft geared to the wheels. For that reason, timing exhaust sounds from the drive shaft gives the greatest realism from sound decoders in geared steam locomotives.



Typical of most steam locomotives, this double-acting cylinder (on a Santa Fe 2-10-4) both produces power and releases exhaust steam on each stroke forward or backward. The engine's two cylinders exhaust a total of four times for each revolution of the drivers. Trains photo by Harold A. Edmonsen

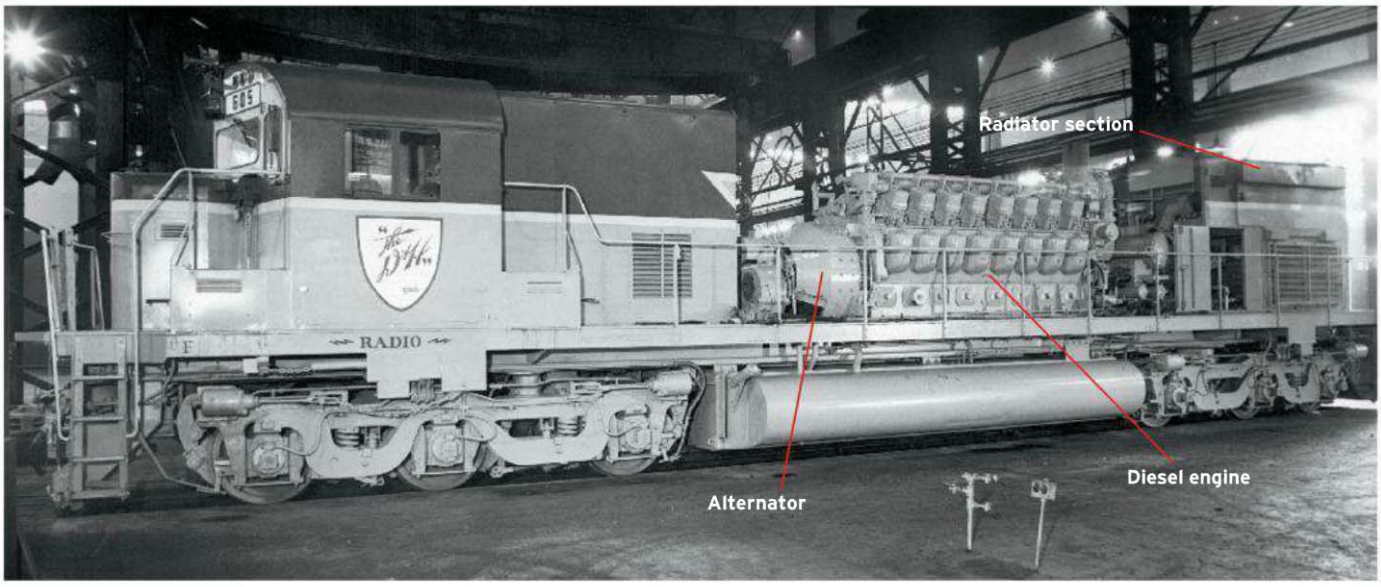
Climax, Heisler, and two-cylinder Shay locomotives make four chugs per revolution of their drive shafts. Three-cylinder Shays and the Shay-like Willamettes make six chugs per drive shaft revolution, which is why they can sound like they're going pretty fast when actually moving sedately.

WHEN THE CHUGS GO QUIET. Once he gets his engine in motion, a steam locomotive engineer can close the throttle and "drift" or coast to descend a grade or make a short movement where speed isn't needed. With the throttle closed the drifting engine is no longer "working steam," so the exhaust goes silent or becomes very faint. The best decoders include drifting features triggered by reduced load on the motor or a reduced speed step setting, or both.

It's far more realistic when an engine comes down a hill or drifts through a yard without sounding as if it's working steam. Drifting effects usually require a fair degree of momentum programmed into deceleration variable CV4.

The chugging can also go away to clear unwanted condensation from the cylinders. A standing locomotive collects condensed water in its cylinders as trapped steam cools. Since it isn't compressible, this water can blow out a cylinder head when the engine starts.

To avoid this, the engineer first opens valves called cylinder cocks under each end of the cylinders (sometimes in the middle too). Then when the engine starts, the exhaust steam comes whooshing out



With its engine-room hood removed, a Delaware & Hudson Alco C-628 shows off its series 251C V-16 diesel engine. The diesel drives the alternator to produce electricity for the unit's axle-mounted traction motors. Jim Shaughnessy photo

of the cylinder cocks with the condensate instead of chugging up the stack. Engines doing this spray steam from under their cylinders.

The whoosh of escaping steam takes the place of the usual chugging sound while the cylinder cocks are open, but has the same four-beat timing. After a few strokes of the pistons the condensate is cleared out and the engineer can close the cylinder cocks. Then the engine resumes chuffing as it goes on its way. Some, but not all, steam sound decoders can reproduce this effect.

DIESEL LOCOMOTIVE SOUNDS. The primary sound effect of diesel locomotives is also exhaust, but from a diesel engine. Variations in number and arrangement of cylinders, cylinder displacement, and use of blowers or turbochargers all make diesel engines sound different. For this reason sound decoders are either offered with the distinctive sounds of a particular engine, or with the option to use any of a number of sound sets for particular engines downloaded from a website.

Different locomotive types from the same builder could share the same engine, so a decoder with the sounds of an Electro-Motive Division 567-series V-16 diesel works for an F7 and GP7. We expect locomotives that come with sound decoders to have the appropriate sounds, but if you're installing a decoder in an unequipped model, it may be up to you to find the right sound for that unit. References like Jeff Wilson's *The Model Railroader's Guide to Diesel Locomotives* (Kalmbach Books) tell which diesels power various kinds of prototype locomotives.

DIESEL-ELECTRIC: IT MATTERS. As used in North America, diesel locomotives are almost all diesel-electrics. Instead of being mechanically connected to the axles, the diesel engine turns a generator or alternator to make electricity. When sufficient current is available to the electric traction motors on the axles, they turn the wheels and the locomotive begins to move.

This is why you usually hear the diesel engine rev up before the locomotive starts to move. The best way to reproduce this sequence is to program momentum delay into acceleration variable CV3. The engine sound will increase in volume and speed as you advance the throttle, but the locomotive will take longer to start moving. Momentum in deceleration variable CV4 will also allow the locomotive to continue drifting with its engine sounds slowing to "idle" when you turn the throttle off.

Earlier I mentioned the use of dynamic brake sounds. Ideally a decoder should automatically cut the engine sounds back to idle when the dynamic brake fan sound is turned on. Some decoders can be programmed to do this.

That way the throttle can be used to control a train's speed downhill without unrealistically speeding up or slowing down the engine sounds.

DON'T SHUT 'EM DOWN. Finally, although some decoders include "shut-down sequences" that sound like you're putting your diesel away in its garage, it's usually more realistic to let locomotives idle while standing in an engine terminal. Until relatively recently, locomotive diesel engines were almost never shut off except for maintenance. The starting sequence for a large diesel takes time, and having to start and stop engines all the time would make terminal hostling slow and inefficient.

If you find too much diesel rumbling annoying, use the quiet mode supported by some decoders to automatically shut off the sound after a delay you can program. Once your attention is elsewhere you won't notice exactly when the sound stops, and it won't be a noticeable "event" as in some shut-down sequences.

Today many roads do shut down idle units to save fuel and reduce emissions, but even so operational considerations – such as the need to move units around to keep a terminal fluid – can outweigh conservation. And in cold weather there's often no alternative to letting the diesel idle. These big engines are water-cooled, and the large quantities of anti-freeze they'd require aren't considered cost effective.

REALISM IS UP TO US. Digital Command Control sound effects bring a new level of action and interest to our railroads. They also offer opportunities for greater realism, if we make the most of their potential. OP

Now on ModelRailroader.com

Andy Sperandeo demonstrates the use of horn, bell, and diesel engine sounds in a video you can watch at **www.ModelRailroader.com.**

HELPER OPERATIONS

Using locomotives realistically at the end of a train

BY ANDY SPERANDEO

This four-unit set of matched F7s is headed away from us, pushing a Baltimore & Ohio coal train up West Virginia's Cranberry Grade from behind the sturdy steel wagon-top caboose. The flag on the side of the nearest cab unit is a marker indicating the rear of the train. H.W. Pontin photo

HELPER OPERATIONS on model railroads can transform an operating problem – a grade steep enough to limit train length – into an operating highlight. It's perfectly realistic to get long and heavy trains over a steep section of line by adding extra locomotives, whether steam, diesel, or electric. Before today's radio-controlled distributed power units (DPUs), those added locomotives most often had their own crews who worked as a team with the road engine crews to get trains over the railroad's Big Hill.

Digital Command Control makes it easy to independently control two or more locomotives on one train. That makes helper service an opportunity that can add excitement to your railroad's operations.

DOUBLE-HEADING, with the helper in front of the road engine, is the simplest way to add power to a train. This was often done on passenger trains, but was used on freights too. However, too much power applied from the head end might exceed the strength of freight car draft gear.

Draft gear limitations aren't a problem on model railroads, but our sharp curves can introduce another difficulty, "stringlining." That's when the power up front and the load behind are each great enough to pull cars off the inside of a curve, as if drawing a straight line between points along the arc.

PUSHERS at the rear of the train reduce the strain on prototype draft gear since many drawbars are in compression instead of tension. Having part of the train pushed rather than pulled also makes stringlining a lot less likely on a model railroad. If neither engine can move the train upgrade by itself, the pusher can't derail the train by buckling it in the middle. If either engine hesitates, the train just stalls.

WITH CABOOSES the question is whether the pusher can be behind the cabin or must be ahead of it. Often the deciding factor was whether the prototype's caboose had a steel underframe to transmit the pusher's power. There were also laws in a few states requiring pushers of a given weight or tractive effort to be ahead of occupied cabooses.

If the pusher is ahead of the caboose, some kind of switching maneuver, possibly involving a gravity "drop" from an inclined track, is needed to cut the pusher out of the train and get the caboose back on. Then the train needs to make a standing set-and-release brake test, which it may need to do anyway if it'll be descending a steep grade on the other side of the mountain. This can add interest even to through freight runs.

There's also drama in dropping a pusher on the fly from behind the caboose. The big roads did it with a long valve handle on the caboose platform to close the angle cock in the brake pipe, as well as a chain or extension lever to lift the coupler pin. The pusher's brakes set automatically when the air hoses separated and the train went on its way.

On model railroads we can simulate this maneuver by blocking open the knuckle of the pusher's front coupler. The pusher can stay with the train just by pushing hard enough to help. When the train starts over the summit, the pusher engineer can back off his throttle and let the train pull ahead.

Mid-train pushers add more complication, both in getting the helpers into the train and out of it again. This was usually done where there were crossovers between parallel tracks. Again, a brake test would definitely be required when the train was back together.

OPERATING RULES treat helpers as part of the train they're helping. The helper crews receive copies of all the clearances, train orders, or track warrants delivered to the train while they're helping it.

Once cut off from a train, a helper engine needs independent authority to return to its base. Typically it runs as an extra train displaying white classification signals and rear-end markers.

On a road with two or more main tracks and current-of-traffic signalling, such movements were often authorized with a clearance card assigned a number and okayed by the dispatcher. On single track the light (without cars) engine would need a Form G running order.

Under Centralized Traffic Control, a clearance might be issued from an open office, or the crew could get the dispatcher's verbal authority, by telephone or radio, to proceed to the next signal and run on signal indication from there. Under track warrant authority the light helper needs its own warrant.

However it's done, getting the helpers back to their base adds at least one train movement down the grade for every train that needs help going up. OP

CABOOSE OPERATIONS

The end of the train adds operating interest

BY ANDY SPERANDEO

The way car (caboose) tracks at the Atchison, Topeka & Santa Fe's Barstow, Calif., yard were busy in 1948. Train crews ran out of this terminal in three directions – north, east, and west – and every freight train that arrived left with a different way car. Donald N. Nesbit photo

CABOOSES have been missing from most freight trains since the 1980s, but for many of us they're still a necessity. And all of us who model some period before the caboose's demise can take advantage of the additional movement and interest they add to our operations.

CABOOSE FUNCTIONS are worth reviewing since they've been gone so long. A caboose was a shelter at the rear of the train for the conductor and flagman/brakeman, an observation post so they could keep watch on their consist, and an office for the conductor's paperwork. It had a pressure gauge to monitor the train's air brakes, and a brake valve for emergencies.

Some cabooses had combined air whistles and brake valves on the end platforms for signalling and braking during backup movements. Around 1950 cabooses began to carry two-way radios for conversations en route with the engine crew and wayside stations and towers.

The classic caboose could serve as living quarters at the train crew's away-from-home terminal. Usually it had a table with seats, a stove and sink, an icebox, bunks, and a toilet. Living aboard gradually became less common, but a few crews did so well into the 1950s, especially laying over at outlying terminals.

SWITCHING CABOOSES at crew terminals was a necessary operation for years. Until fairly late in the game, the mid-1960s on many roads, cabooses were assigned to specific crews. This was typically required in work-rules agreements that railroads were obliged to follow.

Crews worked on districts (or subdivisions) of 100 miles or more, and long-distance trains required several crews to reach their destination. Every time the crew changed, the old crew's assigned caboose was switched off the train and the new crew's caboose put on. Even if all cars in the train were going through, and the locomotive too, there was still some work for a yard engine.

If the yard on your layout is a crew-change point, assign some of your cabooses to the district to the east and others to the one to the west. Any train passing through gets its caboose changed. If you use a card-order system, the district assignments can be entered on each caboose's car card. Or letter division assignments on the cabooses themselves, as some of the big roads did.

For a higher level of detail, note the time on your fast clock when an arriving caboose is spotted on the caboose track, and use that as an off-duty time for the incoming crew. Then don't use that caboose again until its crew is rested, at least eight fast hours later.

You might find yourself running out of assigned cabooses during an operating session, or at least running short of cars representing rested crews. That's a great excuse to buy or build more cabooses – as if you needed one.

MORE CABOOSE TRICKS. If you run more trains in one direction than the other, even occasionally, you might run short of cabooses at one end of the subdivision. Prototype roads tried to anticipate this and balance cabooses just as they did locomotives. In anticipation of a westbound weekend rush, for example, a few eastbound trains at the end of the week could have two or more cabooses.

Only the rear car of a multi-caboose train necessarily carried a working crew, however. The other crews, paid to "deadhead" to the other end of the district, might ride a passenger train on their passes.

Regular runs such as a five-day-a-week way freight often attracted high-seniority crews because of the regular hours. Their cabooses in effect became "assigned" to those trains and were thus subtracted from the pool available for through trains. Oh good, now you need still more cabooses!

These are just a few of the ways that prototypical procedures can let us have more fun with cabooses. Give them a try and it won't be just nostalgia making you glad you still use cabooses on your railroad. OP

FLAG PROTECTION

Tips for keeping trains occupying the main line safe

BY ANDY SPERANDEO

As required by Rule 99, rear brakeman Ralph Canty walks back from the caboose to protect the rear of Illinois Central symbol freight MB-2, which has stopped on the main track near New Athens, Ill., in 1955. Canty is carrying a red flag in his right hand and a flare that railroaders call a "fusee" in his left. Wayne Leeman photo

ONE OF THE OLDEST SAFETY practices in railroading is flag protection for trains or engines occupying main tracks. The photo shows how it was done in the classic era, and flagging is still part of today's rule books, although signal and communication systems now sometimes allow train crews to be relieved of the requirement by specific timetable or bulletin instructions. Using flag protection in model operations not only adds realism but can make some kinds of movements more convenient and efficient.

FOR MOST of the 20th century, flag protection was generally prescribed by Rule 99 in each railroad's book of operating rules. A widely used version of this rule reads, in part:

"When a train stops under circumstances in which it may be overtaken by another train, the flagman must go back immediately with flagman's signals a sufficient distance to insure full protection, placing two torpedoes [explosive noisemakers that detonate under wheels] and, when necessary, in addition, displaying lighted fusees [flares]. When recalled and safety to the train will permit, he may return, leaving the torpedoes and a lighted fusee."

MODEL RAILROAD operators have devised various ways of fulfilling Rule 99. I've seen everything from a slip of red paper or cardstock folded into a small tent across the rails to a scale figure holding up a red flag, as shown in Tony Koester's Trains of Thought column in the May 2007 MR.

The Operations Road Show group in Michigan came up with a "paper flagman" that can be printed out in multiple on a sheet of cardstock or paper, then cut out and folded to stand up next to or on the track. You can download a color PDF file from the group's Web site at www.railsonwheels.com/ors. Click on "Paper flagmen," found in the left column. This is an easy and inexpensive way to start using flag protection on your layout.

THE OPERATIONAL BENEFITS of flagging rules might not be apparent if you think only of unexpected stops on the main line. After all, our worm-geared trains can stop in much shorter scale distances than their prototypes. But flag protection also allows for more convenient use of the main line.

For example, you can leave most of the consist of a way freight on the main under flag protection while the engine takes just the cars to be worked into town and has the passing siding free for running around. Full-size railroaders did this all the time, but I rarely see it on model layouts.

Or say your train is tucked into a siding for a meet but your engine's in a spur on the other side of the main line where you've been making a setout. The timetable says the opposing second-class train is due, but you know it's running late and you only need about five minutes to pull out of the spur and back into the siding. If you've sent out a flagman to protect the movement, you can go ahead and use the main safely, and recall the flag when your engine is clear.

"Recall the flag"? Oh yes, now that so many of us have onboard digital sound effects, we can use them realistically to "whistle out" and call in flagmen as necessary.

I described this on page 69 of this issue. Blowing that whistle or horn is even more fun when you know you're using it for a functional signal.

And notice that the train dispatcher doesn't have to be involved in any of this. Except in Centralized Traffic Control territory, under the regime of Rule 261, train and engine crews don't need the dispatcher's "track and time" or "work time" authority to use the main. It's up to the crew of each train to know when they can safely use the main track, and flag protection makes that easier. OP

1. *Model Railroader* staff members Dana Kawala, Steven Otte, and Andy Sperandeo hold an operating session on the Beer Line. Andy and David Popp show you how they set this HO *Model Railroader* project layout up for operation.

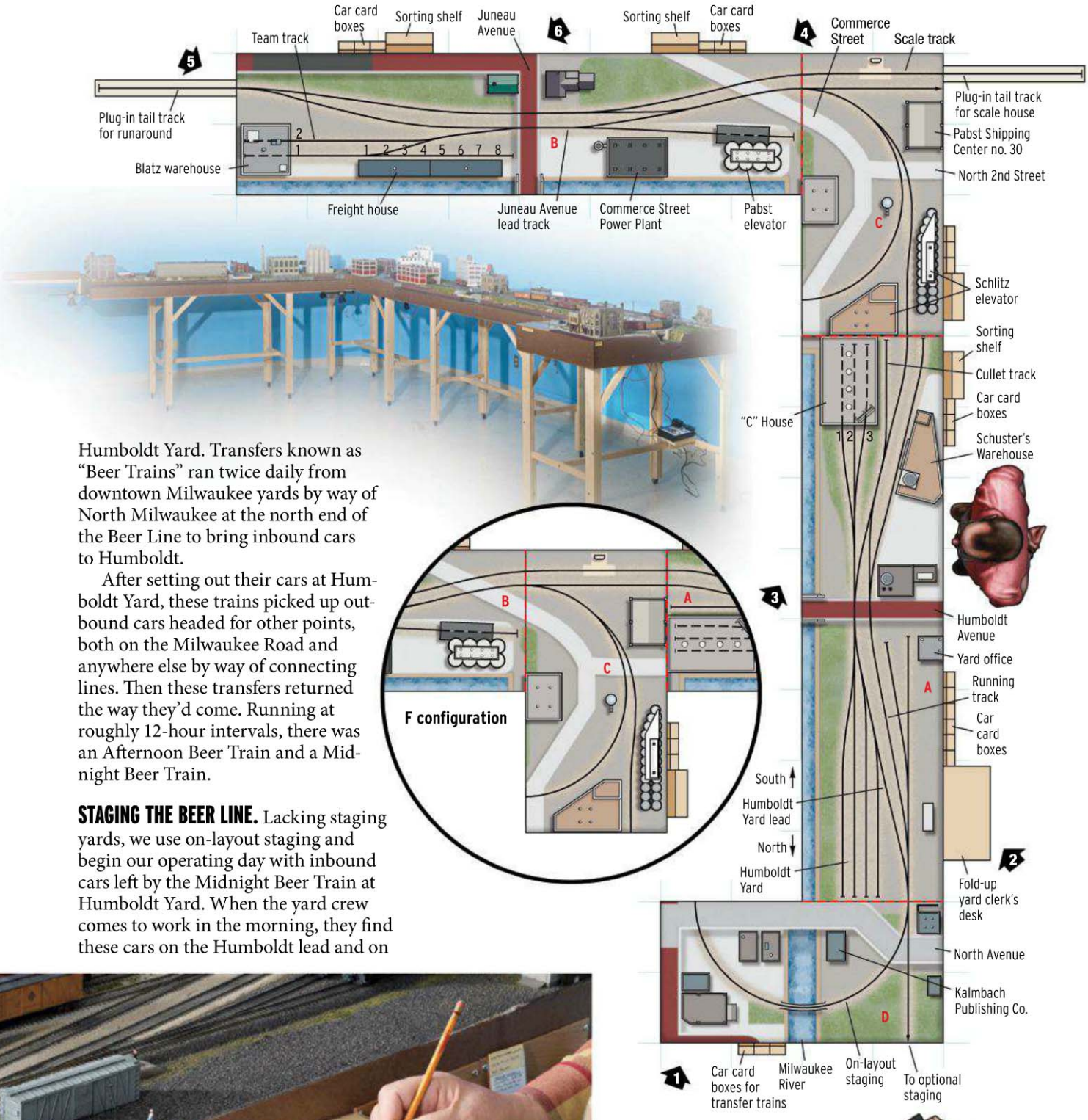
OPERATE THE BEER LINE

Preparing a small HO scale railroad for operation and running a typical session

BY ANDY SPERANDEO WITH DAVID POPP
PHOTOS BY BILL ZUBACK

WITH THE COMPLETION of our HO scale Beer Line project railroad (featured in the January through April 2009 issues of *Model Railroader*), managing editor David Popp and I set to work on getting the layout ready to operate. To give you an idea of how a session on the Beer Line works, I'll describe what a typical running day on the railroad looks like. Along the way, David will explain some of the things we did to prepare the layout for operation. Many of the techniques we show here can be used to begin operating almost any model railroad.

WORKING THE BEER LINE. Our Beer Line layout represents the far south end of a north-south branch that served as an extended switching lead for breweries and many other industries north of downtown Milwaukee. It includes the hub for crews working the Beer Line's south end,



Humboldt Yard. Transfers known as "Beer Trains" ran twice daily from downtown Milwaukee yards by way of North Milwaukee at the north end of the Beer Line to bring inbound cars to Humboldt.

After setting out their cars at Humboldt Yard, these trains picked up outbound cars headed for other points, both on the Milwaukee Road and anywhere else by way of connecting lines. Then these transfers returned the way they'd come. Running at roughly 12-hour intervals, there was an Afternoon Beer Train and a Midnight Beer Train.

STAGING THE BEER LINE. Lacking staging yards, we use on-layout staging and begin our operating day with inbound cars left by the Midnight Beer Train at Humboldt Yard. When the yard crew comes to work in the morning, they find these cars on the Humboldt lead and on

2. After sorting the Midnight Beer Train, Andy, serving as yard clerk, writes up the switch list for the day's first switching run.

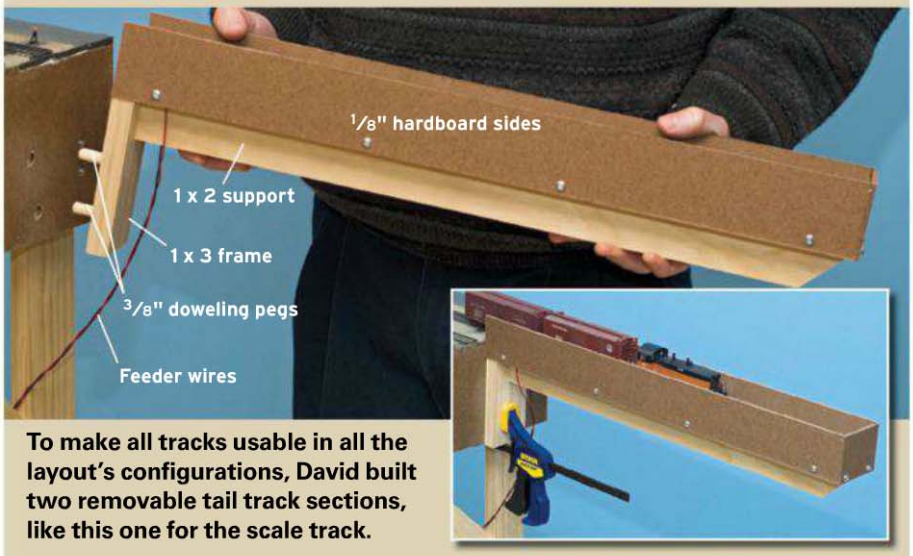
MILWAUKEE ROAD BEER LINE

J configuration

HO scale (1:87.1)
Layout size:10 x 14 feet
Scale of plan: ½" = 1'-0", 12" grid
Numbered arrows indicate photo locations

3. Steve (engineer) and Dana (conductor) are working as today's local crew. Steve is preparing to pull a cut of cars from the Schiltz "C" House bottling center.

REMOVABLE TAIL TRACKS



To make all tracks usable in all the layout's configurations, David built two removable tail track sections, like this one for the scale track.

BECAUSE WE BUILT THE LAYOUT to be used in any of three configurations (See the January 2010 MR), in some setups, we have one or two tracks that need to be extended to be useful. I made two removable tail tracks, one for the scale track and one for the runaround track by the Blatz warehouse. These temporary tail tracks plug into the layout when needed, are held in place with a clamp, and have a set of feeder wires that plug into the track bus.

The removable tail track frames are made from 1 x 3 pine boards and have a 1 x 2 attached to the bottom for support. The finished tails are cut 24" long. All the joints are glued and parts are fastened with wood screws. I used 3/8" doweling pegs (the same as on the layout sections) to align the tail tracks with the benchwork. To protect the trains on the tail sections, I built 2½" tall walls from 1/8" tempered hardboard. – *David Popp*

the line across North Avenue. The cars will have been exchanged for those left as outbound cars at the previous session, and they'll all have waybills for industry spots served out of Humboldt. The "conductor" of the Midnight train – whichever of us stages the layout – leaves a switch list form detailing the train's cars in order along with the car cards and waybills.

With on-layout staging we're omitting the Afternoon Beer Train. If you had room to add a staging yard to this layout, two tracks are all you would need to let you run both the Midnight and Afternoon Beer Trains from staging to Humboldt Yard and back.

YARD WORK. The first job for the Humboldt Yard switch engine crew is to sort the arriving cars into cuts for the three switch runs that work out of Humboldt. These are the "C" House Job, which also works the Schlitz cullet track and Schuster's warehouse; the Elevator Job, switching the Schlitz and Pabst elevators, Pabst Shipping Center No. 30, and the Commerce Street Power Plant; and the Freight House Job, which also serves the Blatz warehouse and the team track.

The yard clerk at the Humboldt office marks up the list of the inbound cars showing which of the three jobs will handle each car. The clerk also adds any cars that may have been waiting in the yard for the next convenient switch run. These may be cars that couldn't be spotted earlier for lack of track space, and cars brought in by a switch run going back out on another job.

The yard engine crew, probably the same person as the yard clerk, will sort the arriving cars and those in the yard according to the list. The cards can be left on the desk until the sorting is done, and then placed in the appropriate yard track file boxes.

Then the yard engine and crew go "on spot" (on break) at the yard office so the "C" House Job has room to work on the Humboldt Yard lead. As each switch job returns to Humboldt, the yard crew organizes the incoming cars for the outbound Beer Train.

"C" HOUSE JOB. The industrial switcher crew gets on its engine at the yard office and moves over to the yard lead to pick up the cars for the "C" House Job. They won't take a caboose, since all the work is just across the tracks from the office. The clerk has meanwhile filled out a switch list for the "C" House Job. It lists the cars to be delivered, and also any cars to be picked up at the "C" House bottling

plant, the cullet (broken glass) track, and Schuster's warehouse.

The "C" House crew works from this list, but may re-sort the cars for convenience. They want the cars for each of the three "C" House tracks grouped so each track can be set in one move. Cars for the cullet track and Schuster's will be held next to the engine, to serve as a "handle" for reaching into the "C" House.

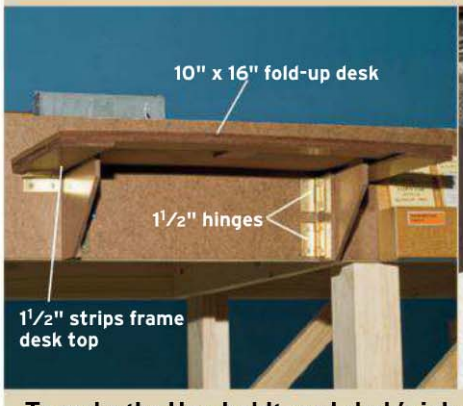
When ready, the switcher pushes the cut toward the "C" House. After checking with the warehouse foreman to be sure the outbound cars are ready to move, the switch crew reaches in with the full cut and pulls all three tracks. They set the outbounds over onto the Beer Line running track (it would be the main track were it not just an industrial lead) past the switch to the cullet track. Then they push the inbound cars to their spots.

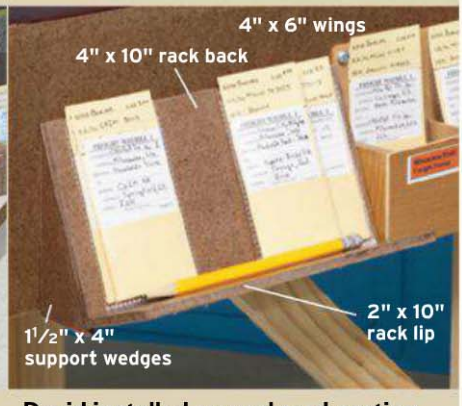
If there's work at the cullet track, that comes next, and then the switcher comes out onto the running track to swap outbound and inbound cars at Schuster's. When that's done, the switcher drags all the pickups back onto the Humboldt Yard lead, while the conductor makes out a new list for this cut.

The engine cuts off and returns to the yard office, then the yard switcher goes

4. The Elevator Job switches the grain elevators on the Beer Line. Steve is pulling an empty boxcar and a load to be re-spotted from the Pabst elevator.

ADDING OFFICE SPACE TO THE LAYOUT





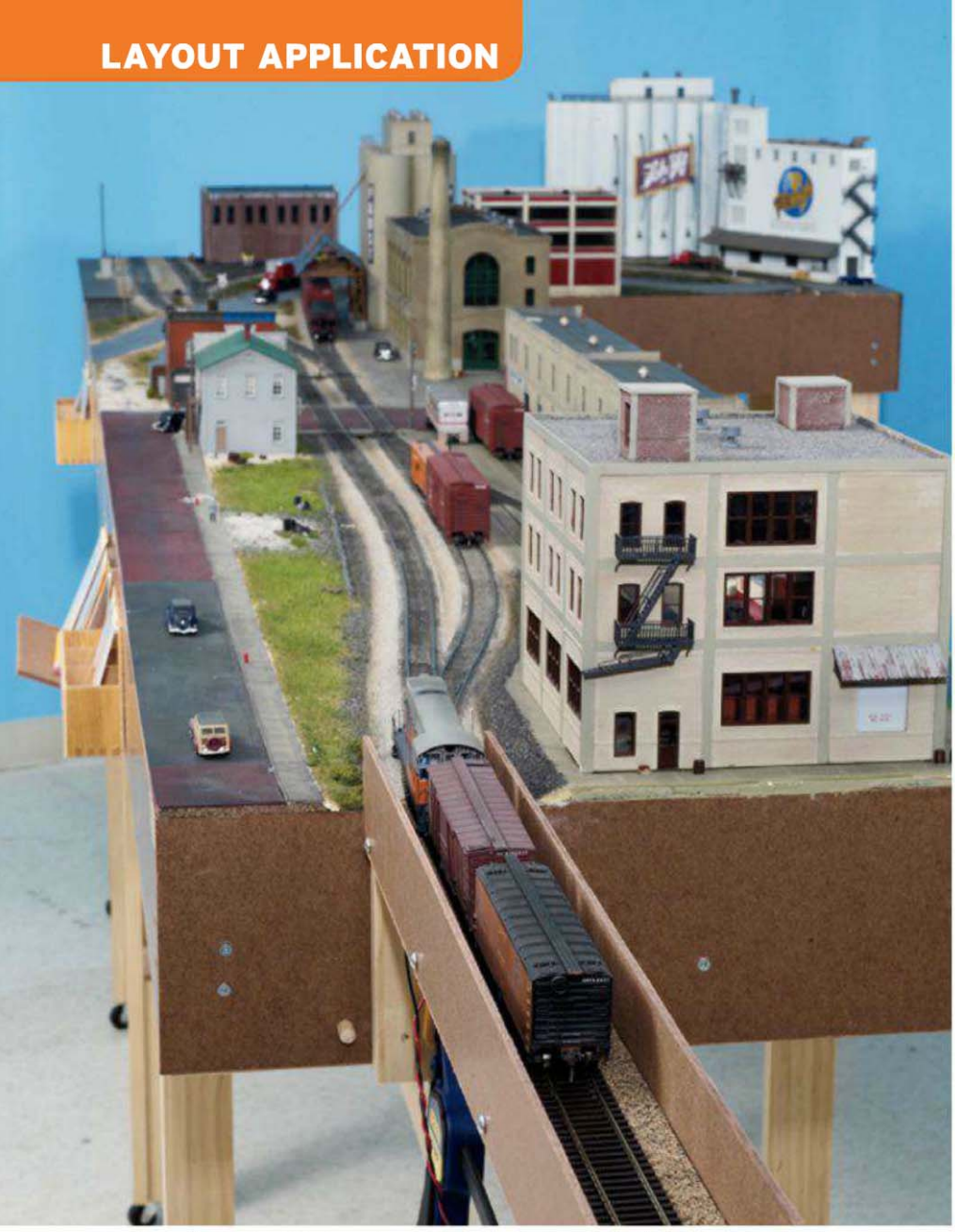
To make the Humboldt yard clerk's job easier, David built a fold-up desk from ¼" tempered hardboard. The desk uses two hinged supports that fold under the top when not in use. You could also build a simple permanent desk.

David installed several card-sorting shelves around the layout, so the operating crew could sort car cards.

FOR OUR BEER LINE operating sessions to be successful, we needed to provide our crew members with some office space. So, I built a desk and some sorting racks for the layout. I started by building a fold-up desk for the Humboldt yard clerk. The desk is made from pieces of ¼" tempered hardboard, and it uses a total of six 1½" brass hinges (two for each support wing and two for the top) to fold out of the way when not in use. The desk sticks out from the layout just ⅞" when closed.

The 10" x 16" top is made from a single piece of ¼" hardboard, and it's framed with two layers of 1½"-wide strips of ¼" hardboard. This frame creates a pocket for the support wings when everything is folded up. In hindsight, it would have been far simpler to have made a permanent desk or a simple clamp-on desk, using similar construction techniques as those I used on the trail tracks, shown on the previous page.

I also built some sorting racks for the switching crew to use. The racks measure 10" long and are made by gluing and clamping four pieces of tempered hardboard together. The dimensions are given in the photo. Each rack attaches to the layout with two 1¼" screws. – *D.P.*



5. The tail track added to the end of the layout lets the crew use the Juneau Avenue lead track as a runaround when the Beer Line is in this configuration.

6. Dana, as conductor of the Freight House Job, refers to his switch list while making pickups and deliveries. He'll file the car cards when the work is done.

to the south end of the lead. If there are any carloads of cullet to be weighed, the yard crew sets them onto the block for the Elevator Job. Then they shove the remaining cars from the "C" House Job out of the way across North Avenue, and wait there while the next job is worked.

ELEVATOR JOB. The industrial switcher pulls out of the engine track again, this time with a caboose, and backs over to the Humboldt lead. The conductor has a switch list made out by the yard clerk showing where to spot the cars he'll take out of Humboldt Yard, and which cars to pick up or respot at the industries.

Leaving the caboose on the north end of the lead, the switcher runs around on the running track and pulls the Elevator Job cars out of the yard. It may just set them over on the caboose to make up its train, but if the conductor wants to re-block the cars, he does so now. Generally he wants any cullet car(s) to be weighed to be first behind the engine, followed in order by cars for the Schlitz elevator, the Pabst Shipping Center, the power plant, and the Pabst elevator.

When ready, the Elevator Job sets out south from Humboldt Yard, and the Humboldt yard switcher follows it back onto the lead to work the cars from the "C" House Job.

At Schlitz the Elevator Job picks up grain boxcars that have been unloaded and reloaded with spent grain, used in dog food and other animal feeds. Then it sets out the incoming grain cars. The loads of spent grain need to be weighed, as do any cullet loads brought down from Humboldt.

The next stop is the scale track, to weigh the spent grain and cullet cars. See page 39 in this issue for the weighing procedure and using scale tracks.

After the weighing, the crew pulls any outbound loads from the Pabst Shipping Center next to the scale track, then spots an empty reefer for the next load.

Crossing Commerce Street, the elevator Job pulls onto the Juneau Avenue lead track to reach the power plant and elevator spur. First, the crew pulls all the empties off the spur. If there's a loaded grain boxcar at the far end waiting to be respotted at the Pabst elevator, they pull that car too. Then they line up the cars

Now on ModelRailroader.com

Visit **www.ModelRailroader.com** to read Andy's tips for the Freight House Job and watch an operating video.

going into the spur in this order: arriving grain boxcar, grain box to be respotted, and loaded coal car. They push those three cars to their spots on the spur, then pull the rest of the train onto the lead, leaving the caboose just north of Commerce Street.

From that position the engine can run around the train to get the caboose and place it at the south end for the return trip. Then the engine goes to the north end of the train, the crew "laces up" the air hoses and makes a brake test, and the Elevator Job goes home.

FREIGHT HOUSE JOB. The industrial and yard crews go through pretty much the same procedure to handle the returning Elevator Job. The main difference is that before pushing the inbound cars beyond North Avenue, the yard crew sets the caboose on a yard track where it can be reached for the Freight House Job. Again, the clerk made a list for this next run while the Elevator Job was out.

Switching the Beer Line with separate jobs like this does more than follow the prototype. It gives us realistic work for two to four operators, keeps the trains short enough for the layout, and makes the railroad seem larger than if we tried to do everything at once.

The conductor of the Freight House Job may also organize his cars before pulling out of the yard. For this run, the preferred order is any car for freight house doors six or eight, cars for Blatz, cars for the team track, and any car for freight house door one. (Limited space means we can set cars only at freight house doors one and six or eight, but that leaves the other doors available for trucks, as they were on the real thing.)

Here's the Freight House Job heading south as listed from front to rear:

- NYC 160000, X (boxcar), for freight house door eight.
- URTX 5847, R (refrigerator), for the Blatz warehouse.
- URTX 87028, R, Blatz.
- MILW 703425, X, team track.
- MILW 18522, X, freight house door one (spot on switch across from door).
- MILW 010803, N (caboose).

The list also shows the following cars to be picked up and where from:

- MILW 703848, X, freight house eight.
- NH 34006, X, freight house one.
- URTX 2037, R, Blatz one (back).
- URTX 7044, R, Blatz two.
- C&IM 8103, X, team.

Referring to the track plan on page 77, how would you do this work? You aren't allowed to move any cars spotted by the other jobs, the plug-in tail tracks hold an engine and three cars each, and the engine can't go inside at Blatz. After you've worked out how you'd switch the Freight House Job, go and visit Model-Railroader.com to read how I'd do it.

When the Freight House Job makes it back to Humboldt, the crew leaves the engine next to the yard office. The Humboldt switcher then finishes assembling the outbound Midnight Beer Train, and when that's done, the yard crew goes off duty. It's the end of another day's work on the Beer Line, but it won't take long to swap the outbound cars on the staging track for a new train of inbound cars. And with that, the entire operation starts over. OP

USING CAR CARDS AND WAYBILLS

To set up the car forwarding system, David and Andy filled out a car card and waybill (at least one step to start) for each Beer Line freight car.

FOR THE BEER LINE, we bought a Micro-Mark 82916 car routing starter set and several extra 82914 car card boxes (www.micromark.com). The set (also shown on page 26) comes with complete instructions on how to use it. After selecting the cars we'd run on the layout, Andy and I had their cards ready to go in a few hours.

In this system, each car needs its own car card, and that card follows a car wherever it goes on (or off) the layout. The car card provides some basic information about the freight car, including its type and reporting marks (road name and car number). The car card also has a pocket that holds a waybill. Waybills provide information about where to send the car and what it's carrying.

The Micro-Mark system uses four-cycle waybills, meaning that there are actually four waybills printed on each slip of paper. After a car is delivered to its billed destination, the waybill can be turned to its next cycle, providing new routing information for the car.

A lot has been written about car-forwarding systems (methods for moving freight cars). For detailed information, see Tony Koester's book, *Realistic Model Railroad Operation* (Kalmbach Books). – *D.P.*

Following reader Bryn Crandell's suggestion, David made protective plastic sleeves for the car cards by cutting up Avery 76009 standard business card pages.

Each industry track on the Beer Line has its own card box slot. David made labels for the card boxes using Microsoft Word. He cemented the labels in place with a glue stick.

A fold-up shelf on *Model Railroader*'s HO Beer Line gives us a place to do paperwork and keep throttles, lists, and cards off the layout.

OPERATE LIKE AN "OLD HEAD"

Tips for operating like a veteran model railroader

BY ANDY SPERANDEO
PHOTO BY BILL ZUBACK

AN "OLD HEAD" is an experienced railroader who knows how to get his job done safely and efficiently. To become the model railroad equivalent of an old head takes experience too, but you can learn many of an old head's skills without spending years going to operating sessions or hosting them yourself.

Here's some friendly advice offered as a model railroad operator of some modest experience.

RUN SLOWLY. Slow, smooth movement helps model engines act more like their ponderous prototypes and gives you more time to think about what you're doing and enjoy what's going on. Railroaders save minutes by doing the right thing at the right time, not by rushing.

COUPLE ON FIRST, THEN UNCOUPLE. I often see someone manually uncouple the end cars they want to pull from a string, then shove them back together again when the engine couples on. Having to make the same cut twice always looks like a rookie mistake, and it's easy to avoid with a little patience. And if – *and only if* – the layout host allows lifting the end of a car to separate the knuckles, always lift the car away from the engine, and put a finger alongside the truck to keep it in line with the track. Clumsy manual uncoupling causes a lot of derailments.

IN YARD SWITCHING, PULL CARS OUT TO THE CLEARANCE POINT TO UNCOUPLE. This lets our imaginary scale switchmen save a lot of walking, and it lets you see that you're really getting the cars you want. Of course there can be exceptions, for example if the switcher can't pull all the cars on a track. Then the switchman has to walk in to make the cut, but at least we can imagine him riding the last car back out.

DON'T LEAN CARDS AGAINST CARS. In general it's a good idea to keep paperwork and other extraneous items off the layout surface out of respect for the layout builder's modeling. But leaning cards against cars not only looks bad, it delays getting anything done because you can't move the cars while the cards are there. If the layout has a shelf or rack for sorting car cards, use it. Better yet, learn to work from a switch list, as I explained in the December 2008 *Model Railroader*. Switching from a list is both realistic and convenient; the latter is why the pros do it.

IF IT'S ABSOLUTELY NECESSARY TO NUDGE A STALLED ENGINE, PUSH ON THE COUPLER. Couplers are sturdy enough to stand it, which may not be true of a model's details or finish. First, however, be sure it really needs a push. If the headlight is on or you can blow the whistle of a sound-equipped engine, then it's picking up current, and pushing probably isn't going to make it start. Something other than contact is the problem, perhaps a setting on a Digital Command Control throttle. Unless the issue is obvious, ask the host for help.

WALK ALONG WITH YOUR TRAIN ON A WALKAROUND LAYOUT. This might seem obvious, but some operators tend to stand at the open end of a dead-end aisle and let a train go away from them and come back. Those engineers aren't in position to observe trackside signals, turnout positions, and other important operating cues. Walking along is also the best way to see and appreciate all the layout's scenes.

RESTORE ANY TURNOUTS YOU USE TO THEIR MAINLINE OR OTHERWISE NORMAL POSITIONS. This is a rule on full-size railroads, and it makes model operation smoother too. It helps your buddy who isn't being as careful as you are.

PRONOUNCE NAMES CORRECTLY. This is polite, makes communication clear, and helps you pick up the layout's local color. Keep in mind that regional pronunciations of names can be idiosyncratic, so the correct way to say them may be unexpected. Ask the host to be sure.

BE A GOOD GUEST. These are only a few suggestions. But if following them makes it more likely that you're invited back to another operating session, you're on your way to becoming an old head. OP

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See video of Andy Sperandeo showing how to operate a model railroad like an old head on our website, **www.ModelRailroader.com**.

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