Contents

Tools and adhesives

Put together a basic tool kit *Jim Hediger* 7
Select tools that bend, grip, and cut *Terry Thompson* 8
Get a grip on glues and adhesives *Jim Hediger* 10
Glue structures using braces and jigs *Cody Grivno* 12

Track and wiring

Ballast track easily *Cody Grivno* 15
Work with curved turnouts *Jim Hediger* 16
Use magnetic couplers *Andy Sperandeo* 18
Tune up turnouts *Jim Hediger* 19
Use connectors for easier layout wiring *Jim Hediger* 20
Wire a layout for two-train operation *Neil Besougloff* 22
Shape and install spike-head feeders *Andy Sperandeo* 25
Solder wire and track feeders *Jim Hediger* 26

Structures

Scratchbuild a station from drawings *Cody Grivno* 29
Make simple hoses *Cody Grivno* 32
Model a weather-beaten structure *Cody Grivno* 33
Put a big industry in a small space *Cody Grivno* 36
Glaze windows with adhesive *Cody Grivno* 39
Cast your own wall sections *Andy Sperandeo* 40
Cut door and window openings *Cody Grivno* 41
Kitbash large modular structures *Jim Hediger* 42

Locomotives and freight cars

Perform rolling stock checkups *Jim Hediger* 46
Service locomotives *Jim Hediger* 47
Open handrail holes with reamers *Cody Grivno* 48
Remove and replace molded details *Cody Grivno* 49
Install a distinctive nose bell *Jim Hediger* 50
Clean locomotive wheels *Cody Grivno* 51
Repair and paint acetal handrails *Cody Grivno* 52

Scenery

Add mounting pins to fence sections *Cody Grivno* 55
Make a forest of puff-ball trees *Neil Besougloff and David Popp* 56
Uncover the basics of ground cover *Cody Grivno* 57
Create a quiet grade crossing *Cody Grivno* 60
Cast rocks in place *Cody Grivno* 63
Add gravel parking lots and roads *Cody Grivno* 65
Model water with two-part resin *Cody Grivno* 67
Build a ballasted-deck bridge *Cody Grivno* 69
Install modern car-stopping devices *Cody Grivno* 71

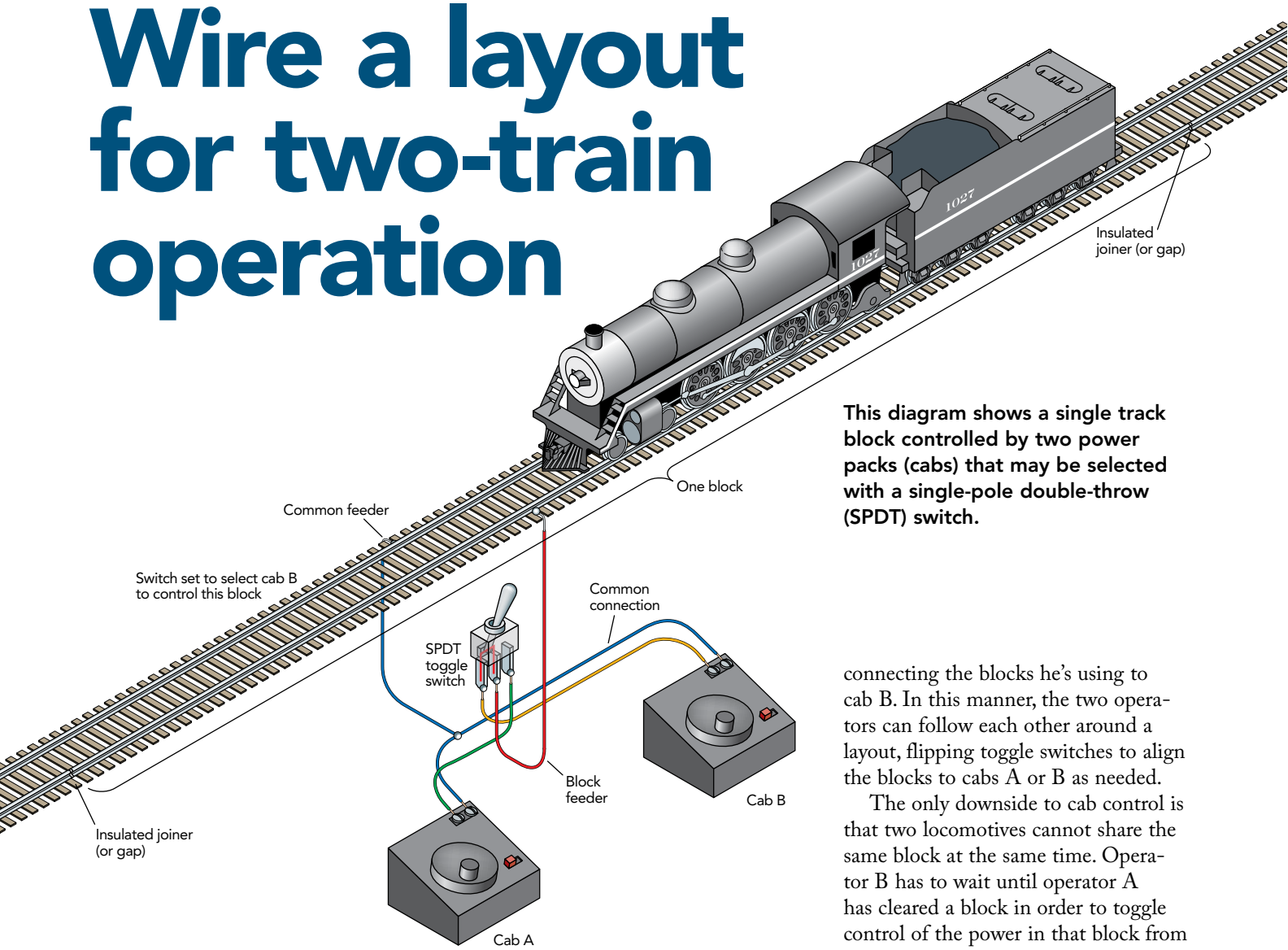
Painting and decaling

Learn the basics of airbrushing *Cody Grivno* 74
Loosen paint jar caps *Cody Grivno* 80
Airbrush models with acrylic paint *Cody Grivno* 81
Paint yellow boxcars *Cody Grivno* 84
Tint turn signals and taillights *Cody Grivno* 85
Detail with different brands of decals *Cody Grivno* 86
Model patch out freight cars *Cody Grivno* 88

Weathering

Weather and string line poles *Cody Grivno* 92
Create hard-working diesel locomotives *Cody Grivno* 95
Re-letter and weather steam engines *Cody Grivno* 100
Make couplers look realistic *Cody Grivno* 104
Produce great ghost lettering *Cody Grivno* 105
Add grime with an airbrush *Cody Grivno* 107
Apply washes with artist's oils *Cody Grivno* 108
Weather with powdered pastels *Cody Grivno* 109
Simulate rust with makeup applicators *Cody Grivno* 110
Drybrush different weathering effects *Cody Grivno* 111

Wire a layout for two-train operation



This diagram shows a single track block controlled by two power packs (cabs) that may be selected with a single-pole double-throw (SPDT) switch.

With two direct-current power packs, single-pole double-throw (SPDT) toggle switches, and hardware-store wire, you can divide any layout into electrical blocks that will allow two trains to be operated independently.

How it works

With cab control wiring, a layout using two power packs is divided into several electrically isolated sections called *blocks*. Each block is independent of the others, so a train in block A can be operated by power pack A, and a train in block B can be run by power pack B.

Each block starts and ends with a plastic insulated rail joiner or a narrow gap cut through the metal rails. So while a cab control layout visually looks like a continuous track, electrically, it's several independent track sections that line up with one another at each end.

As an operator using power pack A moves his locomotive through one block and approaches the next block, he uses a toggle switch to connect the second block to power pack A (or cab A). Now, the two blocks are electrically united to cab A and the locomotive seamlessly moves from the first block to the second. Just before he enters a third block, he connects the new block to cab A. Following this pattern, the operator can move his locomotive from one end of a layout to the other.

While this is occurring, a second operator using cab B can operate his locomotive elsewhere on the layout by connecting the blocks he's using to cab B. In this manner, the two operators can follow each other around a layout, flipping toggle switches to align the blocks to cabs A or B as needed.

The only downside to cab control is that two locomotives cannot share the same block at the same time. Operator B has to wait until operator A has cleared a block in order to toggle control of the power in that block from cab A to cab B.

SPDT electrical switches can connect only one cab to a block at a time, so there's no way for both operators to connect their power packs to the same block at the same time. The only way to get into trouble is to run a train across the insulated rail joiners into another block connected to the other cab, so it's important for operators to know exactly where one block ends and the next begins.

Blocks and wiring

A layout, at minimum, needs three blocks for two trains, but more blocks give operators more flexibility. Figure **1** shows wiring for a simple oval layout with one passing siding that's been divided into five electrical blocks. Each block is controlled by its own SPDT toggle switch.

Some SPDT switches have a center off position that doesn't connect power in either direction. This is especially useful for passing sidings (and spurs), since it allows you to cut power in that track to park a train.

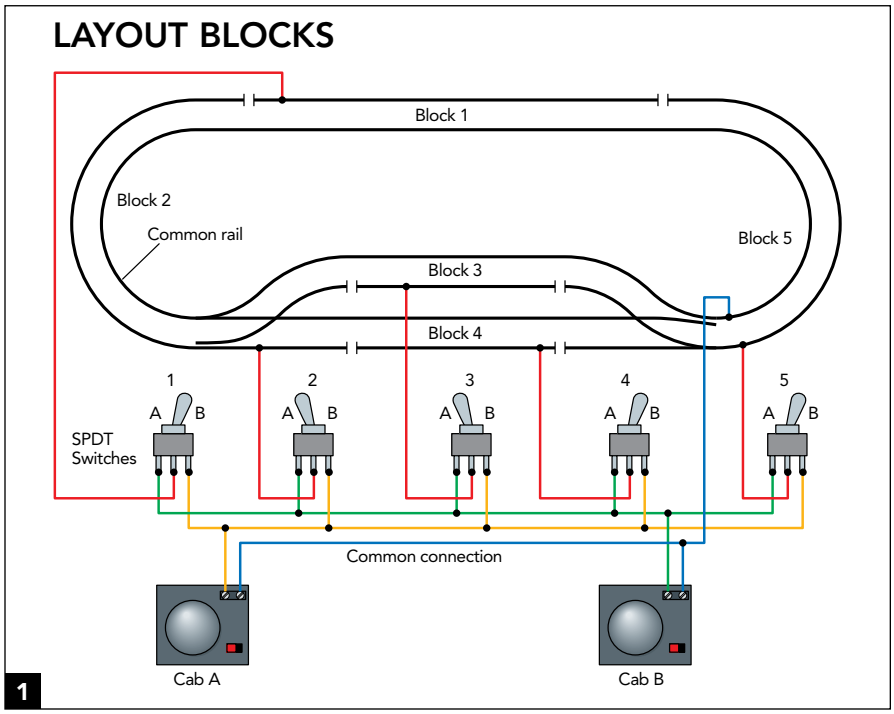
It's also smart to turn a block off after your train departs, or the next train that enters the block will be controlled by the wrong cab.

Each block has a feeder wire connecting it to an SPDT switch. If a layout has six blocks it will need six SPDT switches.

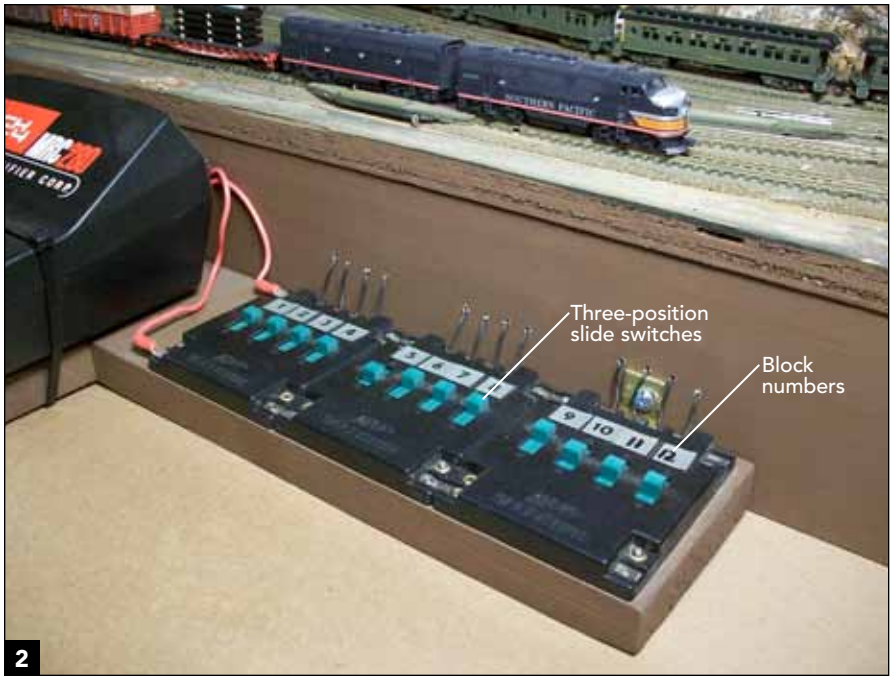
When making track blocks, you need to insulate or cut a gap in just one rail. Think of a light switch in your house. When you turn a lamp on or off, you interrupt only one of the wires that lead to the lamp, not both.

In cab control wiring, the rail that isn't insulated or cut is called the *common rail*. This rail gets connected to both power packs (see the blue wire in figure 1). While connecting two power packs in this manner may cause a bit of anxiety for a model railroader new to electricity, trust me, it works.

Also, by using a common rail, you save on wire, toggle switches, and soldering, since you'll need to purchase only SPDT switches instead of the more expensive double-pole double-throw (DPDT) switches.



This diagram shows cab control wiring for an oval layout with a passing siding (block 3), four other blocks, and two cabs.



Three Atlas selectors are connected side by side to control 12 blocks on this small N scale cab control layout.

Atlas Selectors

An alternative to toggle switches are Atlas Selectors, which are banks of four SPDT switches designed specifically for model railroads, and using them doesn't require soldering, **2**.

The Atlas no. 215 Selector is an inexpensive set of four single-pole double-throw slide switches for model railroad applications. Each selector has screw connections and can be used with two power packs to operate four blocks. Selectors are designed to be used in multiples, so any number can be easily connected side-by-side (called *ganging*) to control any number of blocks.

Like SPDT toggle switches, selectors have three positions: a connection to power pack A, a center off position, and a connection to power pack B. Selectors are even labeled A and B.

Atlas also makes a companion device called the no. 220 Connector, which contains three on/off single-pole single-throw switches in the same housing.

Power packs

The easiest way to build a cab control layout is by using a pair of identical DC power packs. Figure 1 shows how to connect one track terminal from each power pack to the common rail on your layout. Keep in mind that your track configuration may shift the common rail from the inside of your layout to the outside. Follow the rail around your layout with your finger to be sure

Scratchbuild a station from drawings

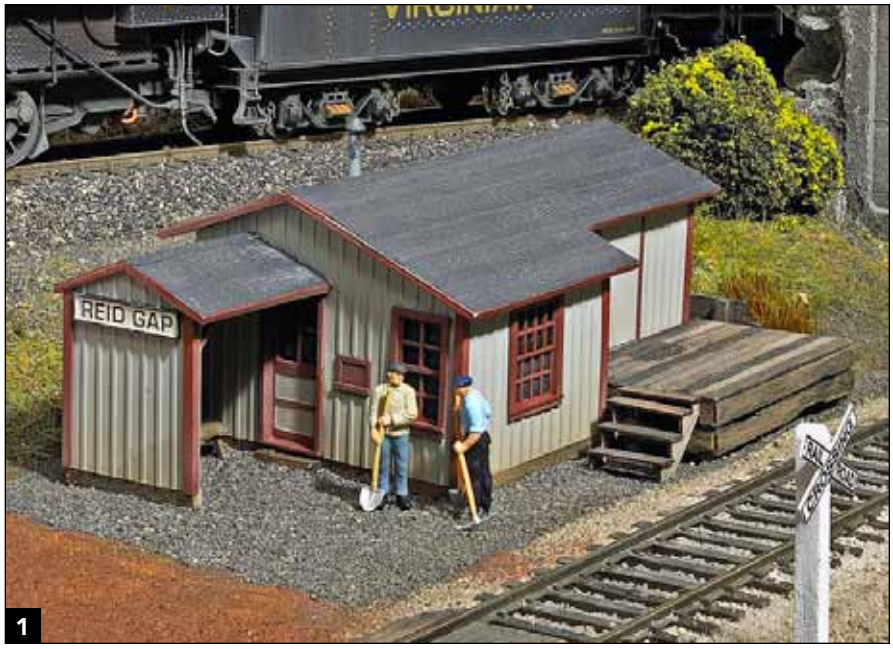
Like many modelers, I enjoy studying prototype drawings. Whether it's a locomotive, freight car, or structure, it's fun to examine a drawing and think about what it would take to model the subject. But for *Model Railroader*'s Virginian Ry. project layout, I had to quit dreaming and turn plans into reality—in this case, the HO scale Reid Gap depot, **1**.

Though the depot is located in the fictional town of Reid Gap, I modeled it after the full-size building at Cullen, Va. If modeling accurate structures is your goal, try scratchbuilding from prototype drawings.

Scratchbuilding may seem intimidating, but it isn't. Start with a small project and you'll gain confidence. I've flubbed some projects over the years, but I learned from those experiences. The key to getting better is to keep building.

It's also important to work in a medium that you're comfortable with. Wood, styrene, and brass are some popular options. For this project, I used styrene, but I could just as easily have used wood board-and-batten siding for the walls.

Prototype drawings can be found in a variety of places. *Model Railroader* and other hobby magazines regularly publish drawings. Most railroad historical societies have collections of locomotive, freight car, and structure diagrams. And don't overlook city, county, and state museums. They may have the drawings you need to take your next project from a dream to reality. And wouldn't you know it, not long after I built this depot, American Model Builders released a kit for it!



1

The scratchbuilt Reid Gap depot was based on drawings of a depot in Cullen, Va., which included an agent's office, a freight room with loading dock, and an open passenger waiting area.

Prototype drawings

Plans for the Cullen, Va., depot were published in *The Virginian Railway Handbook* (H-W Publications, 1985, out of print), **2**. Though not specified, the drawings are S scale. To convert them to HO scale, I photocopied them at 73.5 percent. (Reduce 40 percent for N scale and enlarge 133.3 percent for O scale.) The depot's footprint is 13'-4" x 30'-4". The dock measures 8'-0" x 12'-2" and is 3'-6" tall.

I was fortunate that the book also included photos of all four sides of the depot, as well as a close-up of the passenger shelter. The latter was helpful for accurately re-creating the bracing.

Depot and shelter

I prefer working with styrene for scratchbuilding, so I used Evergreen no. 4543 board-and-batten siding for the walls. However, for the windows to seat flush, I had to carefully trim away the battens around each opening, **3**.

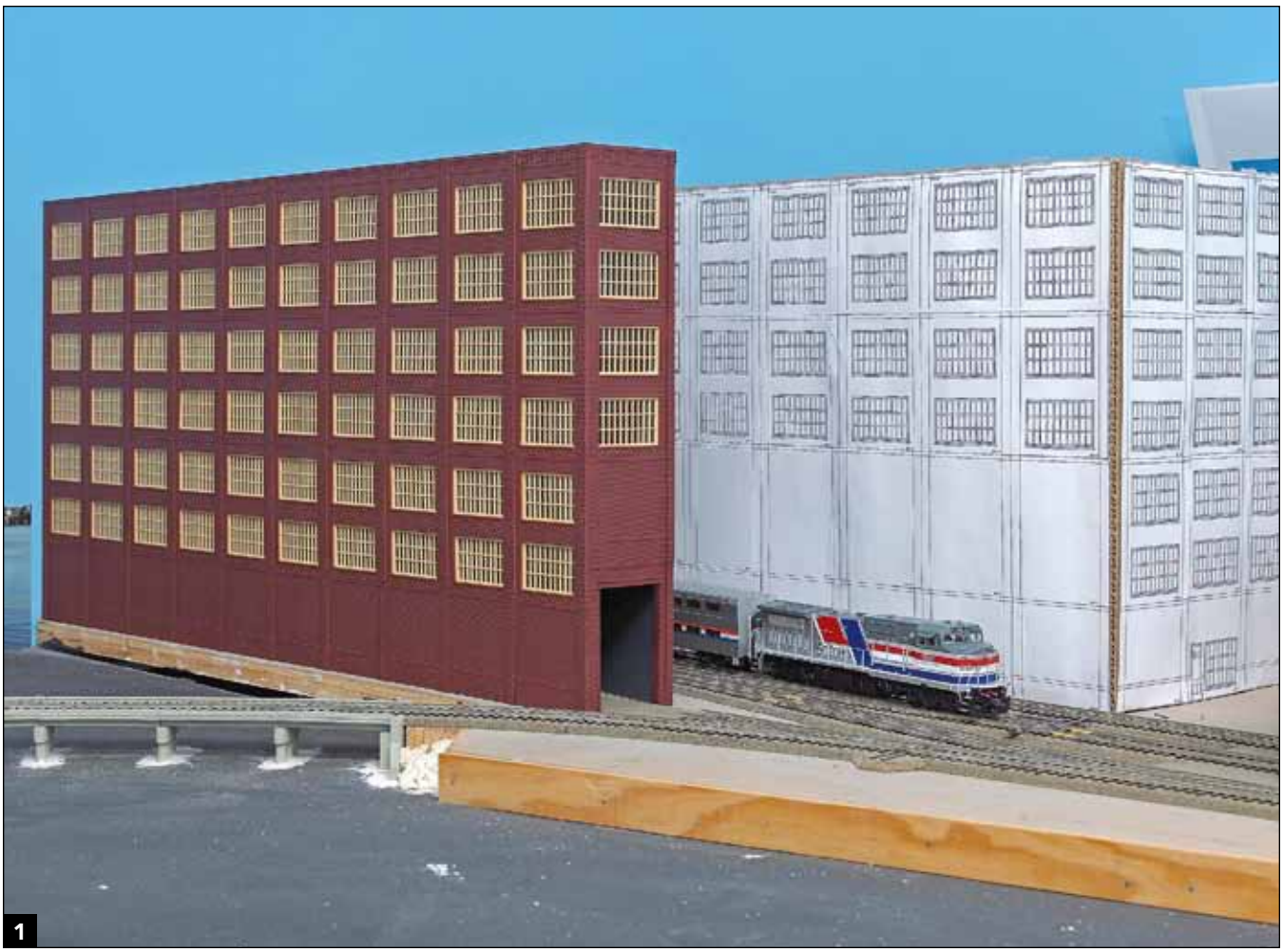
With the door and window openings cut, I assembled the walls. To prevent the walls from bowing, I added interior bracing. I used the thicker styrene strips because the depot model is for our 4 x 8 Virginian project railroad. The layout is transported to local train shows and subject to extreme temperature swings. The .100" x .100" strip would be sufficient throughout if the depot is on a permanent home layout, **4**.

I built the passenger shelter as a separate piece using the same board-and-batten styrene for the walls. Then I added the interior bracing using scale 2 x 4 and 4 x 4 styrene strip, **5**.

Windows and roof

I used stock Tichy Train Group windows for all but the rear freight room window. For that, I cut a Tichy six-light window (no. 8023) in half, **6**. To do so, I removed the upper two muntins with a sprue cutter. Then I used a razor saw and miter box to cut the sash. I used a jeweler's file to smooth the sash before

Kitbash large modular structures



1

Photocopying actual kit parts and taping the cutouts onto cardboard to create full-size mock-ups of your buildings allows you to see how they fit on your layout.

Big buildings surround and usually tower above most city passenger stations, so I wanted to create a similar effect on *Model Railroader*'s HO club layout, the Milwaukee, Racine & Troy. In downtown Milwaukee, prototype trains literally run through "concrete canyons" as the tracks snake between rows of aging warehouses and vintage factories that line both sides of the main line.

Most of these buildings are older concrete and masonry structures that had numerous windows. However, many of the windows that formerly provided plenty of natural light and ventilation are now covered.

Older buildings also include remnants of railroad service. Their track-level doorways may be bricked over now, but their shortened docks and platform footings are unmistakable details remaining from busier times.

Modeling big buildings takes some ingenuity and careful planning. Few layouts have room for a scale-size commercial warehouse, so modelers have to resort to some theatrical tricks and build only what can be seen. In fact, all that's really needed is the wall or corner of the building facing the viewer.

However, I've found that printed background buildings are too flat and don't work well in our closeup environment. Thin walls or narrow structures with three-dimensional details look more realistic. Fortunately, modelers in HO and N scales have excellent modular building parts to work with, thanks to Design Preservation Models (DPM), Great West Models, and Walthers Cornerstone Modulars. It's also

Build a ballasted-deck bridge

1

Spanning the Milwaukee Harbor is a ballasted-deck bridge that can easily be scratchbuilt from wood but made to look like concrete. The bridge abutment at right and the piers were constructed from stripwood.

To cross the water in *Model Railroader*'s Milwaukee Harbor scene, we used two different bridges: a lift bridge assembled from a kit, and a ballasted-deck bridge that I scratchbuilt from wood, **1**.

Scratchbuilding from wood is easy if you have the right supplies. Miter boxes and a razor saw are handy for cutting wood at angles. Both wood glue and cyanoacrylate adhesive (CA) work well for bonding wood. Other helpful items including sanding sticks, a rule, and a machinist's square.

Abutments and wings

I started the project by cutting the abutments and wings. To ensure the parts of the abutments will be at right angles and have clean cuts, use a miter box and a fine-tooth razor saw, **2**. Assemble the components with medium-viscosity CA or wood glue. Use a clamp to hold the three-piece assembly together while the glue dries.

Depending on a location's terrain, the wings on prototype abutments can face backwards at an angle of 30 degrees or greater. Once you've marked the angle for the wings, use sanding sticks to shape the stripwood. Start with a coarse stick and then use medium and fine sticks for the final shaping.

The wings in our harbor scene angle downward, **3**, but to be prototypically correct, they should be flat and at the same height as the sheet piling. On full-size railroads, the wings angle down if the roadbed behind them does.

Trestle bents

Each trestle bent has a cap which transfers the load to the piles below. The caps on our bridge are 1¾" lengths of ¼" x ⅜" stripwood. A piece of ¼"-diameter dowel serves as a handy guide to trace the end profile of the cap, **4**. Use sanding sticks to shape the wood.

After the caps are shaped, attach the three piles (¼"-diameter dowel cut to length) with CA or wood glue. Since the middle piles were glued into a hole drilled in the layout, it was cut longer, **5**. The outer piles were glued directly to the layout table.

Bridge deck and curbs

The bridge deck is a ⅜" x 2" mullion, which is available at most hardware stores and home centers. The mullion is 2" wide, so you'll need a large miter box to cut it.

Prototype ballasted-deck bridges have curbs to contain ballast. To re-create the slight lip between the curb and bridge deck, attach a piece of .020" styrene to

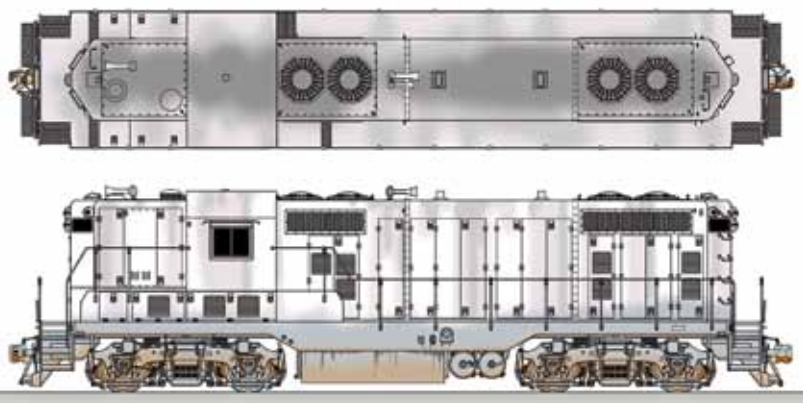
WEATHER WITH AN AIRBRUSH

Though an airbrush is typically associated with painting models, it's also a valuable tool for weathering. Why? Because an airbrush gives you the ability to control air and paint volume (one or both depending on the type of airbrush). These features make it possible to apply weathering coats to large areas and do special-effects techniques like grime streaks and dirt specks.

To weather the Dakota, Minnesota & Eastern (DME) GP40, I used Polly Scale acrylic paints. For regular airbrushing, the manufacturer recommends thinning the paint 10 to 15 percent with distilled water or airbrush thinner. However, for weathering, that formula goes out the window. I generally thin the paint one part paint to four parts 70 percent isopropyl alcohol (distilled water or airbrush thinner will also work). I prefer to build up the weathering colors in light layers. Remember, applying another coat of paint is much easier than cleaning the paint off and starting over.

When weathering, I set the spray pressure between 20 and 30 psi. I also keep a cotton swab soaked in Windex next to the spray booth. I use the cotton swab to clean dried paint off the needle and nozzle between coats.

As with any modeling project, working from prototype photos is ideal. I found photos of Dakota, Minnesota & Eastern GP40s on locophotos.com and rrpicturearchives.net. If you aren't able to find prototype photos, the above illustration is a handy guide for basic locomotive weathering.



Typical diesel locomotive weathering pattern

- **Dirt** – truck frames, wheels, fuel tank, underside of air reservoirs, front and rear pilots
- **Ballast dust** – trucks, wheels, lower body
- **Rust** – brake shoes, springs, equalizers, other moving parts and areas with chipped paint
- **Oily black** – roof and cab, streaks down sides of hood or carbody, various fluid fillers
- **Grimy black** – fan and radiator louvers

Before weathering the DME GP40, I separated the plastic shell from the chassis. Then I removed the cab and carefully popped out the window glazing. I also detached the sill from the hood.

After separating the plastic parts, I washed them in water with a few drops of liquid dish soap. This removed any impurities that might affect paint adhesion.

Once the parts were dry, I was ready to start weathering. I started by spraying the entire shell with three coats of thinned Polly Scale Reefer White, a trick MR's art director Tom Danneman taught me. This gives the vibrant South Dakota State University blue and gold paint a slightly faded look. Apply more coats of thinned white to make the paint look even more sun bleached.

Once all of the weathering colors were applied, I sprayed the entire model with Polly Scale Satin Finish. This not only gives the model a uniform sheen, but it helps protect the weathering.

Produce great ghost lettering

1

With its old lettering rusting through the new paint, the Accurail AT&SF three-bay Center Flow covered hopper adds interest to a freight car fleet.

An Accurail AT&SF three-bay Center Flow covered hopper kit was the starting point for this project, **1**. Since I model a Midwest granger shortline railroad, I'm always on the lookout for interesting prototype grain hoppers. One such car that fit that bill was Atchison, Topeka & Santa Fe American Car & Foundry (ACF) three-bay Center Flow covered hopper no. 314671, **2**. The prototype was repainted in the 1990s, but the large Santa Fe billboard lettering from the car's original paint scheme showed through the new paint.

Low-tech stencil

I first sprayed the Accurail model with Polly Scale Mineral Red to cover the factory-applied lettering. I thinned the paint about 35 percent with Polly Scale Airbrush Thinner to keep it from getting too thick.

Next, I began work on my low-tech stencil. I made two photocopies of the decal-placement guide from Microscale Minical set no. MC-4346 (Santa Fe ACF three-bay covered hoppers). I then taped one of the sheets on a piece of plate glass and cut the stencils using a hobby knife with a fresh no. 11 blade, **3**. The items I made stencils for included the Santa Fe billboard lettering, reporting marks, car capacity data, consolidated lube plates, and notices to close and lock the hopper discharge gates. I also cut a vertical rectangle to represent the automatic car identification labels found on the right end of the hopper. I repeated this process a second time to get stencils for the other side of the car.

I cut the stencils from the paper with scissors, leaving enough room around each stencil for masking tape. I placed the stencils on the car, using my prototype photo as a guide, and held them in place with low-adhesion painter's masking tape (the blue stuff), which doesn't leave adhesive residue on the model.

To the spray booth

To simulate the rusty lettering, I sprayed over the stencils with a blend of Polly Scale Rust and Oily Black, thinned about 50 percent. Once the paint dried, I lightly dusted over it with a mix of Polly Scale Earth, Rust, Oily Black, and Engine Black, thinned as before. I then made one more light pass over the stencils with the Rust and Oily Black to get a mottled look, **4**.