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Introduction

These trains and transformers were manufactured approximately 90 years apart, but the basic principles involved in their operation are the same. If you were to move each train to the opposite track, the transformers could power them. In the early 20th century, some transformers, like this Lionel model, were provided with extra long wires and screw-type plugs to be inserted in an overhead lightbulb socket.

The wonderful hobby of model railroading traces its roots almost to the beginning of railroads themselves, and it achieved great popularity in the years between the two World Wars and during the 1940s and 1950s. Throughout those years (as well as during the 1960s through '80s, when public interest in toy trains suffered a decline), one basic piece of equipment made running the trains easy: the alternating current transformer.

This device required only a pair of wires connected to the track to convert household power into low voltage current suitable for running the miniature electric motors in the locomotives. Even very young children could enjoy these fascinating toys in relative safety without adult assistance.

A powerful reason for the appeal of electric trains is the opportunity to expand a basic train set into a miniature railroad by adding extra track, turnouts (commonly called *switches*), and various kinds of accessories. Add to that the possibility of running two, three, or more trains, and it isn't difficult to keep interest high. But unfortunately, as a train layout grows in size, and its components multiply, the need for more complex wiring grows exponentially.

One major problem involves operating two trains independently. If two locomotives are placed on the same track, they both receive current from the same transformer at the same time. If the direction button is pressed, both engines will stop and reverse simultaneously. If they are out of sync with each other, one might be in reverse while the other goes forward, causing an inevitable collision. And if the whistle/horn button is pressed, both engines will sound off at once.

Block systems and command control

Modelers solved this problem by dividing a layout into electrically isolated lengths of track, called *blocks*, each of which is controlled by a toggle switch. A layout may be divided so that different parts of the main line and each siding can be turned on or off, allowing a train on a siding to be unaffected by another train running on the main line. Each block may also have a separate transformer, allowing two or more trains to be operated independently in their own blocks of track.

The block system was the most efficient method for wiring a layout for many decades, until the advent of command control in 1994. Lionel called its system TMCC, or TrainMaster Command Control. In its most basic form, it consists of a rectangular PowerMaster unit wired to the ground circuit of the layout and a handheld unit with throttle and control buttons for speed, direction, whistle (horn), and a variety of other functions.

Lionel TMCC and Legacy command control components include a ZW-L Transformer, Legacy Command set, PowerMaster unit, and TMCC remote.

This system can be configured to operate most O gauge locomotives, but in order to take advantage of all the TMCC features, such as remote control uncoupling anywhere on the layout, it is necessary to purchase a locomotive equipped with a digital receiver onboard. The major advantage of command control is that two TMCC-equipped locomotives, each with an individual address code, may be operated independently on the same block of track simply by punching a code into the handheld controller.

With command control, it is no longer necessary to divide a layout into individual blocks. Just two wires between the transformer and the track are all that is needed—if all your locomotives contain TMCC electronics.

TrainMaster Command Control was a big step forward in toy train operation, and it has been licensed to both Atlas and Weaver for use in their locomotives. In 2000, MTH (Mike's Train House) Electric Trains introduced DCS (Digital Command System), a competing product that offered advanced features not included in Lionel's product. Lionel countered with its Legacy system in 2006, which is compatible with original TMCC locomotives and also has extra features for operating locomotives in the Legacy line.

The MTH and Lionel systems both operate well, and they are proving popular with model railroaders having an interest in digital technology. While TMCC and DCS are not fundamentally compatible, they each have limited ability to operate the other company's equipment.

Both DCS and Legacy offer a host of operating possibilities too extensive to describe here, including impressive onboard sound systems, pinpoint speed control, and remote operation of accessories, all accessed from the handheld unit. It seemed at first that the need for complicated block wiring would soon be as extinct as the dodo bird and that every model railroader might embrace the new technology. But block wiring is still preferred by many toy train enthusiasts who now use digital command control, as well as by those who prefer to run their trains solely with conventional transformers. Operators use conventional wiring for a variety of reasons, including these:

- Command control is expensive, adding from \$100–\$200 to the price of each locomotive, in addition to the cost of the basic system and its peripheral equipment.

Two or more trains will operate independently on the same track with a command control system, as shown by these trains in Lionel's Legacy line.

- Command control works perfectly when added to a layout that is divided into blocks, so operators can enjoy both methods of operation.
- Advanced features found in modern locomotives, including directional lighting, sophisticated sound systems, and reduced start-up speeds, do not require command control to operate.
- Many toy train enthusiasts, especially those who collect vintage equipment, still enjoy operating their engines with a conventional transformer. To some, the old-fashioned hands-on feel of a ZW throttle handle somehow seems more appropriate when running a prewar *Blue Comet* or a postwar Santa Fe diesel than scrolling through the menus of a handheld controller.

There is evidence that some companies are beginning to recognize that there are still many operators who are not interested in converting to the new technology. For a number of years, Atlas, MTH, and Lionel installed command control technology in most of their medium-priced and premium locomotives. Only their lower-priced trains, those with lesser cosmetic detail and fewer features, lacked command control electronics.

However, a new trend is appearing. Lionel has begun reissuing updated versions of classic designs from the 1940s and '50s without command control. Perhaps even more significant, Lionel's Signature Edition Catalog features a number of highly detailed scale locomotives, both steam and diesel, which previously would have been offered only with TMCC. But now purchasers have the option of buying these premium engines without TMCC at a lower price. Clearly the company recognizes that there are still many toy train enthusiasts who operate their trains with just a basic transformer.

Another notable trend by Atlas O, Lionel, and MTH is an increasing emphasis upon so-called starter sets, featuring low-priced locomotives with three or four cars prepackaged with a loop of track and a transformer. Such sets are aimed primarily at the toy market, rather than at serious model railroaders and are designed to attract younger buyers and parents looking for quality toys for their children. As was true decades ago, however, such starter sets can become the genesis for a lifelong interest in model trains and may cultivate the desire to add more equipment for increased fun. If a layout is wired using the methods described in this book, these starter trains will never become outdated and consigned to the shelf.

Therefore, this book is for everyone, no matter how they choose to run their trains. It describes the tried-and-true method of block wiring, which we will call conventional wiring, and which is fully compatible with any three-rail electric trains manufactured in the past hundred years. It is equally compatible with a command control system that can be added at any time without making changes to the basic wiring.

We begin the journey with an overview of basic electricity in Chapter 1.

The power posts on this modern transformer are clearly identifiable by their red color.

train transformer reduces the 110-volt household current to a much more useful and safer maximum of 18–20 volts.

There is a fundamental difference between the electricity produced by a battery and that which is available in our homes, although for practical purposes it has no effect on how we think about the way our trains operate. A battery produces *direct current* (DC), in which the flow of energy always travels in one direction, from the negative pole to the positive pole. Household power is *alternating current* (AC), which in North America reverses direction 60 times each second. It is easier to understand the diagrams in this book if we continue to think of the current as flowing in one direction from one pole to the other. We call the source pole Power and the destination pole Ground (labeled P and G in the figures).

The 20 volts generated by the secondary coil of a transformer causes a toy train motor to run very fast. In order to control the speed of a train, we need a means for varying the amount of voltage that reaches the track. Virtually all transformers made from the late 1930s until today's electronic units achieved this speed control through a device called a *rheostat*.

The speed control handle of a transformer (the throttle) is attached to a metal roller or flat wiper that moves back and forth across the secondary coil, **5**. Depending upon where it contacts the coil, it taps a greater or lesser amount of voltage to control the speed of the train, which is called *variable voltage*. (Modern transformers achieve the same sort of variable voltage control electronically rather than mechanically, but the end result is the same.)

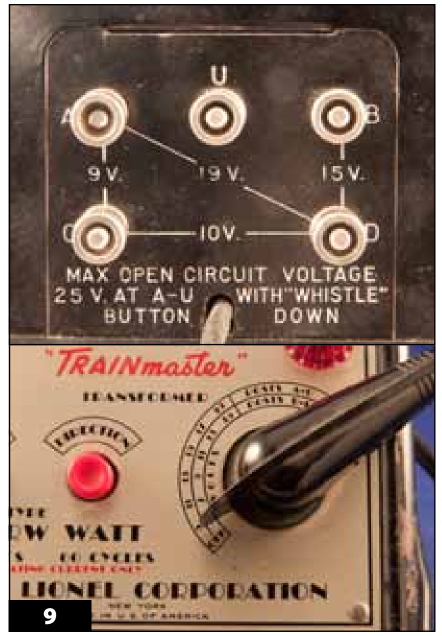
Small transformers, such as the one in photo **1**, have only two posts to which wires may be connected. One post is the ground connection, wired to one end of the secondary coil, and the other post is connected to the rheostat roller. The voltage produced is lower when the roller is near the ground connection and higher when it moves away from the ground. Some large transformers have two rheostats and two throttle handles, and they can run two trains simultaneously at different speeds in separate blocks of track.

Larger transformers also have additional posts for connecting wires to operate accessories. These posts are usually wired to fixed points on the secondary coil to provide various levels of fixed voltage, **6**. On the right side of the figure, you'll see two such fixed voltage ranges: the 12-volt circuit is suitable for some types of accessories, and the 8-volt circuit is good for lighting lampposts and buildings. The combination of these two voltages (8 + 12) equals the overall capacity of the secondary coil (20 volts).

Some transformers, such as those in Atlas train sets and Lionel's ZW, also have variable voltage posts for accessories. The voltage is adjusted by control dials or levers mounted on the cases.

Watts and volt-amps

The capacity of a transformer to perform work is commonly measured in units called *watts* (named after James



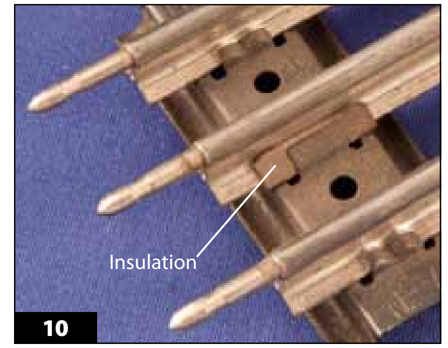
On the back of this Lionel RW Transformer (top), the letter U designates the throttle. On the top of the transformer, the label on the throttle dial shows the voltage available with posts AU and BU.

Watt, who developed the reciprocating steam engine near the end of the 18th century and made railroading possible). In general, watts are a measure of the reserve amount of power available from a particular device, such as a stereo amplifier, a microwave oven, or a toy train transformer.

To understand how a watt functions, imagine turning on a water faucet in the sink. If the handle is turned on all the way, a substantial stream gushes out. Then, turn on all the faucets in the house, and you will find the flow of water at each location is reduced.

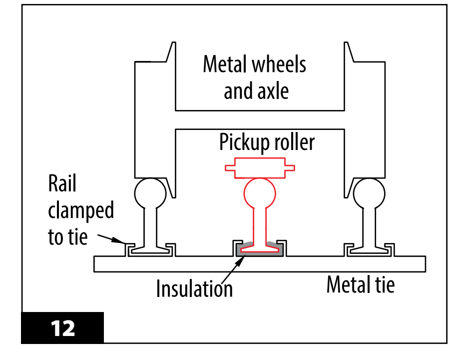
A small transformer with small internal coils produces relatively modest wattage—enough to operate one locomotive, a few lights, and one or two accessories, but that's all. If you overload it with too much equipment, it's like turning on too many faucets at once. There isn't enough power to go around, and everything slows down. This is an inherently unsafe condition called an *overload*.

The transformers that come with inexpensive train and trolley sets may produce as little as 20–40 watts. They can run the equipment they come with, but they allow little opportunity



On this 50-year-old section of Lionel O gauge track, the middle rail is also clamped to the ties but is separated from them by pieces of thin fiber insulation.

Lionel lockons make wiring attachments easy, but they don't resemble anything found on a real railroad.



Resting on the outer rails, the metal wheels are in contact with the ground side of a circuit. The middle rail is insulated.

for expansion. Larger starter sets have 80- to 100-watt transformers, which have more reserve power for extra accessories. For running multiple trains and powering layouts with many lights and accessories, you will need high-output transformers with bigger coils. The largest transformers on today's market produce between 400 watts of power (MTH Z-4000) and as much as 720 watts (Lionel ZW).

Using current terminology, the power reserve of most transformers, such as those sold by Lionel and MTH, is rated in watts. Atlas refers to an 80-watt capacity when describing its transformer in the company's Industrial Rail starter sets. However, on the unit's metal identification plate, the capacity is stated in volt-amps (VA). For all practical purposes, 1 watt equals 1 volt-amp. Mathematically, a single watt is any ratio of amps times volts that equals 1. For example, a power source that produces 6 volts at .1666 amps equals 1 watt. In the case of a transformer, the terms watts and volt-amps are interchangeable—an 80-watt transformer is also an 80 VA transformer. (A distinction is made between the two terms when applied to computer equipment, but that is of no consequence to the circuits described in this book.)

Choosing a transformer

Lionel and other manufacturers such as American Flyer and Marx sold vast numbers of transformers of all sizes during the two decades following World War II. They are amazingly durable, and many model railroaders (including myself) still use them. However, if you are just starting out in the hobby, I do not recommend them for the following reasons:

- While there is little that can go wrong with a transformer's main circuit, the internal wiring can deteriorate over time and create a safety hazard. Other internal components may need servicing or replacement, such as the rheostat roller or wiper and the circuit used to blow whistles and horns. Such repairs require specialized knowledge and should be entrusted only to experienced personnel.
- Older transformers are less safe than their modern counterparts. Many lack an on/off switch and must be unplugged after use, which is easy to forget, especially by children.
- Circuit breakers in vintage transformers are slow to react to an overload or short circuit, which is another safety concern. Some models lack a circuit breaker entirely and are prone to overheating if overloaded. Modern transformers react almost instantaneously to an overload, which is a major safety advantage. Equally important, an overload or a short circuit may damage the electronic circuits in modern locomotives and accessories if the circuit breaker is slow to react.
- Older transformers are inefficient and deliver somewhat less than their rated power capacity. A modern 100-watt transformer has significantly greater capacity than a 100-watt unit from the 1950s.
- The majority of older transformers have a whistle/horn button, but they lack a second one to operate the bells and other sound features in some modern locomotives. A separate bell button is also required to operate the remote control couplers and other functions on MTH Protosound locomotives.

Three manufacturers of train sets offer safe and efficient transformers in various price ranges for any size train layout, **7**. Even those transformers packaged with starter sets can provide advanced features. Atlas packs an 80-watt unit with its starter sets as well as in some sets sold by Williams by Bachmann. In addition to the throttle, this transformer has a separate variable voltage circuit for accessories and buttons for direction, whistle/horn, and bell. The variable voltage circuit is an especially valuable feature, as it allows you to control the speed of the motors in some accessories. The transformer's capacity is sufficient for any medium-size layout with one large or two small locomotives and a variety of accessories.

In addition to a compact 100-watt transformer, MTH makes a 400-watt unit (Z-4000) that has two separate throttles and two fixed voltage posts, plus duplicate bell and whistle/horn controls. The Z-4000 has an internal power supply with amp and volt meters for each of the two throttles and a programming button for use with the DCS command control system.

Lionel sells an 80-watt model and also a modern version of its famous

Placing transformers in phase

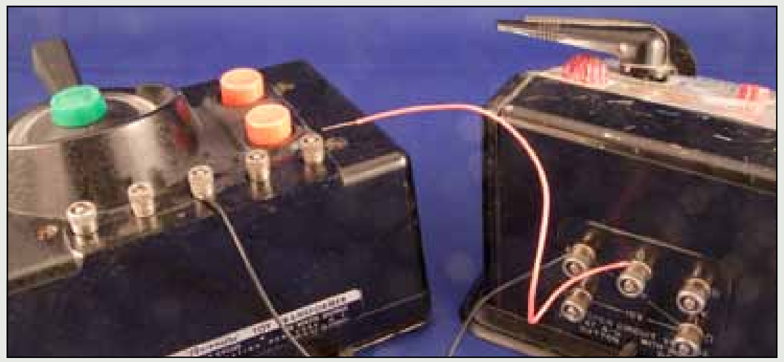
North American households are provided with alternating current, in which the positive and negative poles alternate 60 times each second. In order to use two transformers together on one layout, the current reaching them both must alternate in unison, a condition called *being in phase*. If they are out of phase, it creates a perpetual overload.

Modern transformers have polarized wall plugs, in which one blade of the plug is wider than the other. They cannot be plugged into the wall socket incorrectly, and because the internal wiring of transformers is standardized across the industry, they will always be in phase with each other. However, if you use transformers that lack polarized plugs, such as those made by Lionel or American Flyer some decades ago, there's a 50–50 chance that they will be out of phase when plugged in.

To place two vintage transformers in phase, connect a wire from the ground post of one to the ground post of the other. (See chart on page 13 to identify ground posts.) Connect a wire to the throttle post of one of the transformers. Plug in the two transformers and advance the throttles of both of them to about the halfway point (12–14 volts). Briefly touch the free end of the power wire to the throttle post of the second transformer. If there is a strong spark, the transformers are out of phase. Unplug one of the transformers and rotate its wall plug 180 degrees before plugging it back in. Now repeat the process of touching the power wire to the throttle post. There should be no spark, which means the transformers are in phase. Both may now be wired to a common ground. When phasing a modern transformer and a vintage one, only the plug on the older model will be reversible.

Most older transformers do not have an on/off switch and must be unplugged when not in use. To avoid having to phase them every time you plug them back in, you can paint a small white dot next to the left blade of each plug to remind you which way to insert them into the wall socket. Or an even better way is to plug them both into a power strip with an on/off switch, so that they will never have to be unplugged.

Modern transformers have polarized wall plugs (right) with one blade wider than the other. They can only be plugged into a wall socket one way. Vintage transformers do not have polarized plugs (left) and can be inserted into a wall socket with either blade in either slot.



To test if transformers are in phase, touch the free end of one transformer's power wire to the throttle post of the second transformer. If there is not a strong spark, the transformers are in phase.

By painting a small white dot next to the left blade of a plug, you'll know how to insert it correctly into the wall socket.

which are beyond the scope of this book. Command control systems are constructed from sophisticated solid-state electronics that may be easily damaged by overload conditions, including especially short circuits. It is essential that they be protected with fast-acting circuit breakers, such as those contained in modern transformers. If you are using an older model transformer, such as an original Lionel ZW or one of the other Lionel or American Flyer post-war units, install an external circuit breaker or a fast-blow fuse rated at 15 amps between the transformer and the DCS unit or between the transformer and the track when using TMCC or Legacy.

The next step in wiring a model railroad involves placing the toggle switches and other controls in a logical arrangement on a control panel, which is discussed in Chapter 6.

1

Organizing a control panel

The heart of a model railroad is its control center, the place where an operator can command the speed of the trains, choose the routes they will follow, and access features such as sound effects, uncoupling, and accessory activation, **1**.

There are various ways to construct a control panel. Whichever method you choose, it is important that the controls be organized in a logical pattern so that they can be identified quickly and easily. When two trains are approaching the same junction, you don't want to guess at which switch to throw in order to avoid a collision.

Easy-to-use controls make operating a layout more fun.

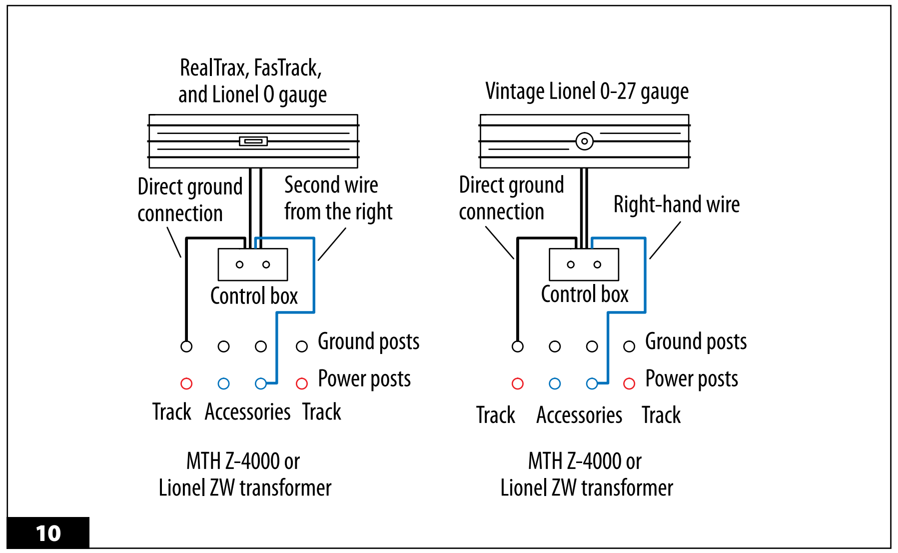
Operating cars give the trains a purpose such as the delivery of various kinds of freight.

Push a button and watch the brakeman signal to the engineer with his lantern.

case, it uses track power. There are a few disadvantages to this, however. The locomotive cannot be shut down but must stand in neutral while freight is delivered, although with today's modern reverse units, this isn't a serious problem. You must also adjust the voltage going to the track to the proper level to make the freight operation move at a realistic speed—again, not a major inconvenience. But if you use TMCC or DCS command control, there will be a full 18 volts of current in the track at all times, which is too much for most operating cars.

There are two persuasive reasons for wiring the operating track section directly to an accessory voltage post of the transformer rather than to track power. If you connect to the transformer, the operating cars will always receive the same level of voltage, regardless of what is happening with trains elsewhere on the layout. Secondly, these track sections are often located at a distance from the control panel, requiring you to splice extra wire in between the track and the control box.

The left diagram in figure **10** shows the connection to fixed or adjustable voltage posts for most operating track sections, including MTH RealTrax, Lionel FasTrack, and vintage Lionel O gauge track. Disconnect the power wire (shown in blue) from the track and attach it to the fixed or variable voltage post. The left wire is the ground wire. You can connect it to the transformer or to the ground bus wire anywhere on the layout.



Using these methods to wire operating track sections allows you to reduce the amount of wire needed by almost half.

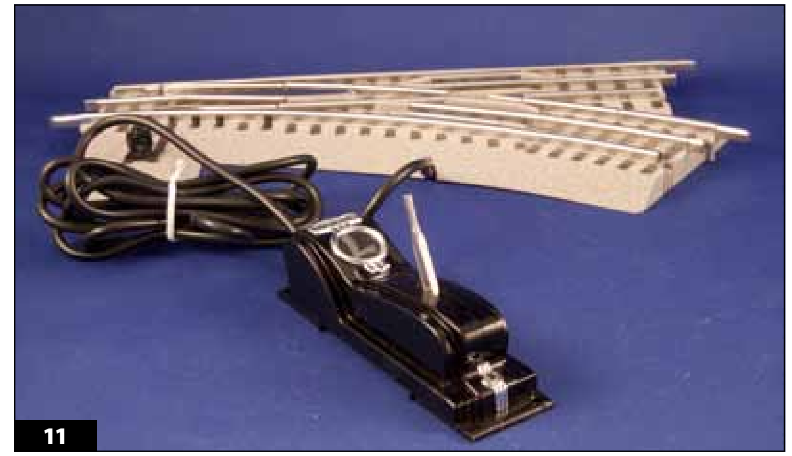
If you are using Lionel O-27 operating track sections from the late 1940s through the 1960s, use the wiring scheme shown in the right diagram of figure **10**. The power wire is the one at the extreme right.

Choose an appropriate accessory post, such as the 14-volt post on an MTH Z-4000 Transformer. Most operating cars work well with this voltage, although there are exceptions. For example, 14 volts will make the little figure in most Lionel milk cars deliver the cans too quickly, usually knocking them over. On a Lionel ZW or Atlas transformer, you can adjust the accessory voltage to whatever level works best for each car. Milk cars perform well at about 11–12 volts.

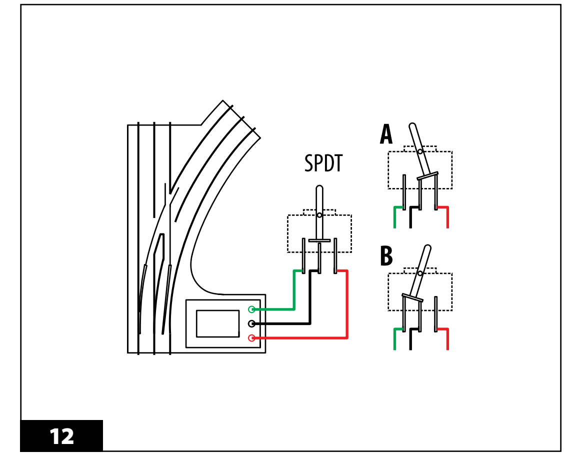
Remote control turnouts

Like operating track sections, turnouts may be used without any modifications to the wiring. The only disadvantages are the very large size of their control boxes and the need to splice extra wire into the cables that connect the control boxes and the turnouts to each other when they are far from the control panel.

The control boxes for Lionel FasTrack turnouts, **11**, and MTH RealTrax turnouts are easy to use, especially by children, but they take up an enormous amount of room on a control panel, especially if you have a large number of them. They are far too big to incorporate into a graphic control panel. You can substitute an SPDT toggle switch for the control box.

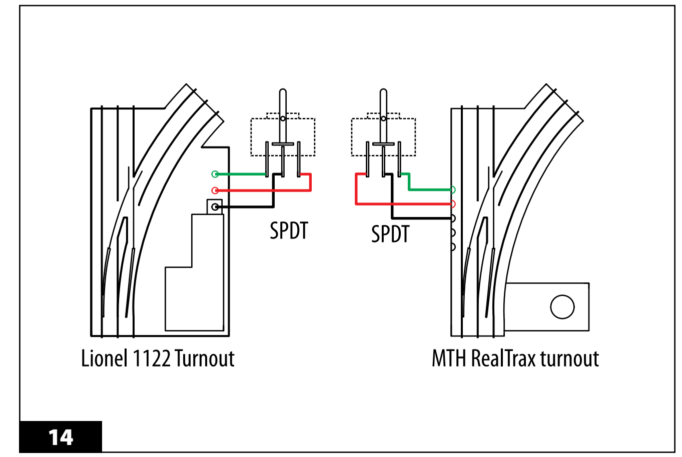


Turnout control boxes can overwhelm a control panel.



Pushing the switch to A moves the rails to the curved position and pushing it to B moves them straight.

Most turnouts, including this 1941 O-27 gauge model, have three wire connection points.



You can follow these diagrams to wire older Lionel and modern MTH turnouts.

Choose the momentary contact, or spring return-to-center, type of SPDT switch. The handles on these switches are fitted with internal springs. If you press them in either direction, they return to the center position when you release them. Current passes through them only when the handles are held down. When wired as shown in figure **12**, pressing the switch one way turns the rails to the straight position, and pressing the switch the other way turns the rails to the curved position. (See Chapter 6 for more about switches.)

Virtually all toy train turnouts are wired in the same way, with just three wires needed to make the rails move. Most draw power from the track, although some, like Lionel's 022 model introduced in the 1930s and the MTH RealTrax unit, can be attached to a fixed voltage post. There are three binding posts on most of these turnouts, and with few exceptions, the middle post is the ground, and the two outer posts are for the straight and curved positions of the rails.

The Lionel pre-World War II 1121 Turnout in photo **13** is typical of this type. On this particular model, the left post is for the curved position and the right post is for straight. Connect these posts to the SPDT switch as shown in figure **12**. This diagram shows the internal connections of the SPDT switch. When you push the handle of the switch one way (A), a ground connection is made between the middle post and the left post (red), and the turnout moves to the curved position. When you move the switch the other way (B), the right post (green) is grounded.

Lionel's 1122 O-27 Turnouts, made from the late 1940s through the 1960s (and produced ever since under different catalogue numbers), have the posts arranged slightly differently. The ground post is located next to the box that covers the mechanism and is mounted on a shiny rectangular metal plate for identification. The wiring pattern for these switches is shown at left in figure **14**.

At right in figure **14** is the wiring diagram for an MTH RealTrax turnout. Note that there are two additional posts on the MTH product where wires may be attached, **15**. These connections are for fixed voltage, and are explained fully in the instructions that come with each turnout.

Now let's save some wire. This will work with all of the turnouts described in this chapter as well as with most of the premium switch machines shown in Chapter 10. Instead of running all three wires from the control panel to

9

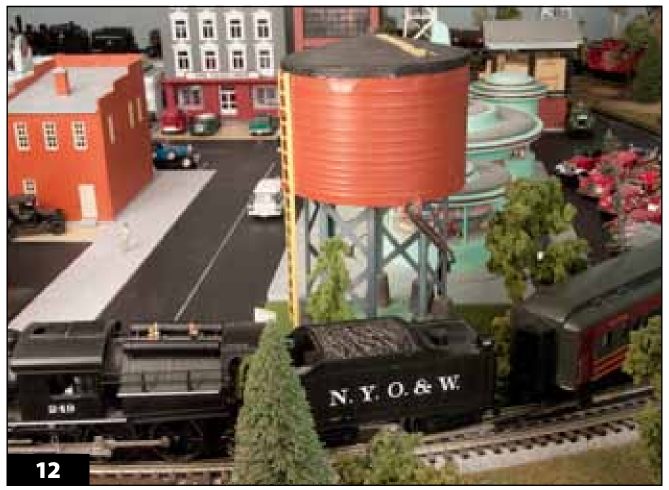
Adding firemen and vehicles around the MTH House on Fire makes it an even more realistic scene. Because of possible stray droplets, locate this building away from any scenery that might be damaged by water.

10

An electronic circuit operates the chase lights that create a variety of patterns on the sign for this MTH bus station. Here, the lights are being lit from top to bottom.

11

Lionel's Ford Auto Dealership is a large two-wire accessory that features two motorized turntables with rotating cars.



12

Filling the tender with water, pre- and postwar American Flyer style, takes place as a solenoid lowers the spout with the push of a button.

Operate action accessories on the main transformer. Most motorized action accessories will not overload the main transformer (the one used to run trains). The reason for this is simple. When you are operating log or coal loaders, magnetic cranes, and similar accessories, your attention is focused on them and not on the trains, which are usually standing still at that time. This reduces the load on the transformer considerably. There is no reason not to connect this type of accessory to the fixed or variable voltage accessory posts on the main transformer rather than the auxiliary transformer.

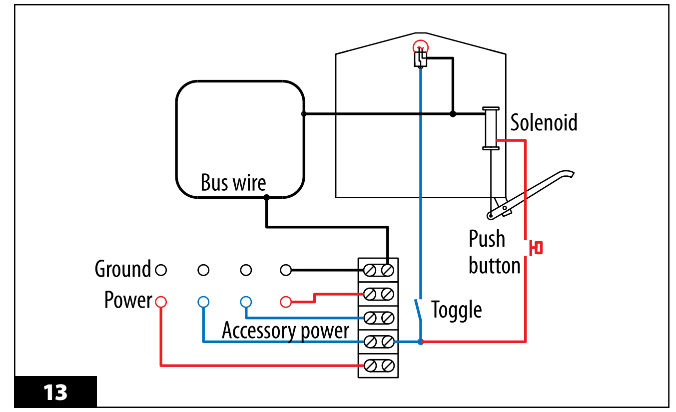
Replace accessory switches. In most cases, replace the switches and push buttons that come with accessories with miniature toggle switches and push buttons from an electronics supply store. This results in a much neater, more compact control panel. The exceptions are any accessories with unusual wiring requirements that have complex control boxes. While it is always possible to replace these controls with generic switches and push buttons, it is often not worth the effort. Unless you have a large number of this type of accessory, a few oversized control boxes shouldn't take up too much room.

Two-wire accessories

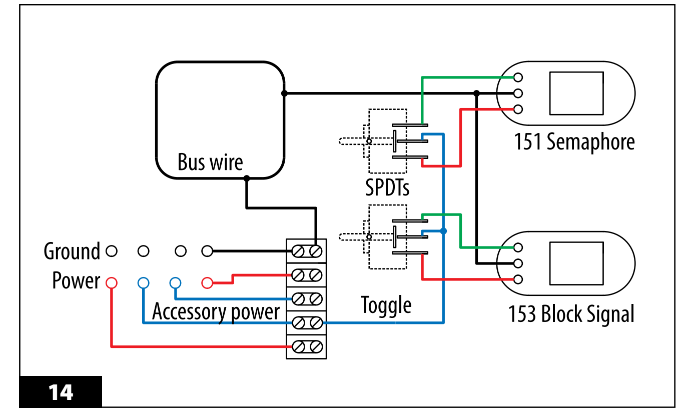
All operating accessories require both power and ground connections, and for many of them, this is all that is needed. You simply ground them to the nearest bus wire and run a power wire to a toggle switch or push button on the control panel and then to the barrier strip connected to an accessory post on the transformer (see Chapter 5).

Figure **3** shows a lamppost wired through a barrier strip to a ZW or Z-4000 transformer. If this is an auxiliary transformer used for accessories only, the track power posts will not be connected to the track. Instead, they can be used as additional variable voltage posts for accessories with differing voltage needs.

If you have several lampposts and buildings with lightbulbs inside, it isn't necessary to run separate wires to each one. Simply connect them all to one power wire, **4**. If lamps and buildings are closer to the bus wire than they are to each other, use separate ground wires as shown at letters A. If



Whenever there is power, the bulb stays lit, and the spout only lowers when a button is pushed. The toggle switch turns off the light.



These installations, which use an SPDT toggle switch, show how to wire accessories for manual operation.

15

What may be the smallest operating toy trains in the world circle the tracks in Lionel's Mid Town Models hobby shop.

16

Wire connectors masquerade as fire hydrants toward the rear of the hobby shop.

they are closer to each other, connect the ground wires together as shown at letters B.

If you want to control the lampposts and the building lights separately, you will need two toggle switches and two separate power wires, **5**.

There are many two-wire accessories available, such as the Lionel Ice Depot, Lionel Playground, MTH House on Fire, and MTH Greyhound Bus Station. These accessories may be connected in the same manner as the lampposts and buildings, but you will need a separate power wire and switch or push button for each, so they can be operated independently, **6**.

The house on fire, bus station, and playground are connected to the same circuit. As they are meant to operate continuously, they are also wired through toggle switches.

Lionel Ice Depot. The Lionel Ice Depot consists of an elevated structure with a ramp, on which simulated blocks of ice slide down to a worker holding a long-handled sweeper, **7**. A motor moves the figure toward a refrigerator car, and a metal bar opens the roof hatch on top of the car, so the ice can drop inside. I wired a push button for the Ice Depot so that I can easily control the timing of the delivery of each block of ice. The Ice Depot is wired to one of the track power circuits, which allows an operator to use the throttle handle to control the speed at which the animated worker delivers the ice. The throttle handle on this auxiliary transformer is not used for track power to run the trains. Almost all two-wire accessories may be wired in this manner.

Lionel Playground. Lionel sells a number of animated scenes like the playground, with its rotating merry-go-round, tilting seesaws, and moving swings, which are activated by magnets in the base, **8**. Other models in the series include carnival midway scenes—a miniature golf game, test-your-strength he-man, pony ride, and tug-of-war. You can also buy two lumberjacks sawing wood and two scenes with a flickering campfire, one surrounded by hobos and the other in which a family enjoys a cookout next to their travel trailer. There's even a gentleman who tips his hat to a lady while his dog irrigates a nearby tree trunk (Mr. Spiff and Puddles), and a man taking a bath in a wooden barrel (Rub-a-Dub-Dub).

MTH House on Fire. The MTH House on Fire is an especially realistic accessory, **9**. It contains a smoke unit, a water pump, and a bulb that glows red to simulate a fire inside. When activated, smoke pours out of the roof and