

FEATURES OF THE *SPECTRUM*® 1:20.3 2-6-0 LOCOMOTIVE

This Large Scale model has many advanced features not offered by any other manufacturer of model trains, including:

- advanced nonproprietary plug-and-play electronic printed circuit board to accommodate the control system of your choice, including conventional DC power, NMRA/NEM DCC, and/or RC operation
- powerful precision-balanced can motor connected to an all-metal gearbox and gears with appropriate gear reduction for a six-wheel drive system with superior performance at realistic speeds
- fully operating Stephenson valve gear with operating piston valves, crosshead pumps with piping (per prototype), Johnson bar, and linkage
- fully equalized locomotive suspension system to provide super-smooth operation on uneven track
- electrical pickup from all drive wheels and both tender trucks
- two optical sensors, one in each cylinder, give you the option of adjusting the timing and count of steam chuffs
- factory-installed speaker with wire pigtail to allow easy installation of optional aftermarket sound
- two switches behind the smoke box door allow you to choose whether the headlight/ashpan flicker and smoke generator are turned off or controlled by the device in the advanced nonproprietary plug-and-play socket
- easy access to switches in the tender for motor power on/off and choice of track pickup or battery power operation according to NMRA or Large Scale railroading practices
- realistic coal or wood load in the tender per prototype
- strap or wood pilot per prototype
- option for either body-mounted or truck-mounted coupler height
- metal frame, drivers, hangers, driver leaf springs, siderods, piston rods, valve guides, guide rods, handrails, and piping
- brass-plated metal whistle
- machined brass pop valves and bell with metal clapper
- separate sanding lines
- cab details
- LED headlight
- load-synchronized LEDs in firebox and ashpan for realistic fire glow
- complete backhead detail including steam gauge with piping, throttle, sight glass fittings, and operating firebox door
- engineer and fireman figures

2-6-0 FEATURES

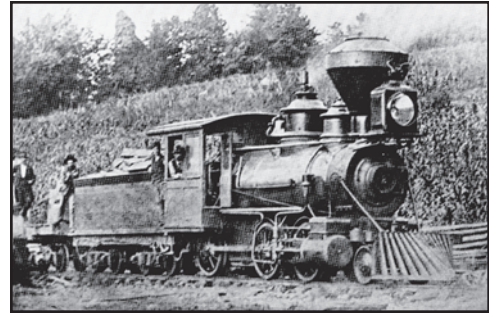
Your Bachmann 2-6-0 is a precision 1 to 20.3 scale model with many features and details found on the prototype (see facing page).



(Courtesy of Nevada State Railroad Museum)

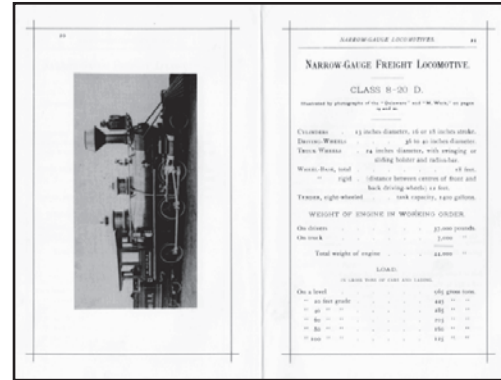
2-6-0 MOGUL HISTORY

Following the American Civil War, the reunited nation focused on the development and settlement of the areas west of the Allegheny Mountains and the Mississippi River. There was a strong movement towards a standardized track gauge for the railroads of the land, aimed at simplifying cross-country travel and transportation of goods. As the new standard gauge of 4' 8-1/2" began to take hold, a faction emerged promoting the cost-efficiency of 3' narrow gauge railroads.



Arguments were made for both points of view, but a single event in United States history gained international attention for the narrow gauge railroads. In 1876, the city of Philadelphia, the cradle of liberty, hosted an enormous Centennial Exhibition on the grounds of Fairmount Park. The Exhibition was to be a showcase of American industry and culture, and an opportunity for the United States to position itself as a world power in economics and politics.

The Exhibition also provided proponents of three-foot narrow gauge railroads an opportunity to make their case. They argued that a narrow gauge railroad was more economical to construct because it required less grading, and that the lighter rail and ties were less costly. The smaller engines and rolling stock were also touted as being less expensive than their standard gauge counterparts. It was advertised and promoted that a narrow gauge railroad could be built for one half the cost of a standard gauge line. Therefore, to facilitate the movement of people throughout the Exhibition grounds, a three-foot narrow gauge railroad was constructed. It was double-tracked for its entire 3.5-mile length and was made up almost wholly of curves and grades, in order to run near all the principal buildings on the Exhibition grounds.



This little railroad came to be known as the West End Passenger Railway. Several locomotive manufacturers, such as Danforth, Dixon and Porter Bell, supplied motive power, but a pair of Baldwin locomotives, including a Class 8-18 D 2-6-0 named the "Delaware," were the standout performers. Along with a Baldwin Class 8-18 C 4-4-0, the "Delaware" 2-6-0 operated for 287 days of daily combined service hauling 4,000,000 of the Exhibition's 8,000,000 visitors for 16,000 passenger miles.



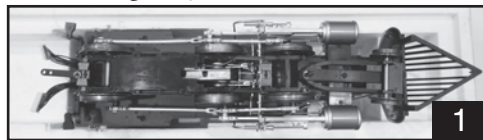
The Bachmann *Spectrum*[®] Narrow Gauge 2-6-0 is based on a Baldwin catalog design from this period. The 2-6-0 went on to play a key role in the development and growth of U.S. narrow gauge railroads. Because most narrow gauge lines were lightly constructed with a minimum amount of grading, they tended to follow the contours of the ground they were crossing. The 2-6-0 provided reliable freight and passenger service over these difficult and haphazard rights of way. They normally ran at speeds of 15 to 20 miles per hour, but under ideal conditions, were capable of 35 to 40 miles per hour.

Over the years, the Baldwin 2-6-0 served narrow gauge lines throughout the world. The 2-6-0 locomotives were the largest of their day and thus were considered the “kings of the railroad” or “moguls.” The third set of driving wheels provided more tractive effort than the 4-4-0, making the 2-6-0 ideally suited for freight haulage. The 2-6-0 offered a flexible suspension that provided for stability on America’s rough and rapidly built trackage. For many years locomotives of this type were used for nearly every variety of service throughout the USA. Many served right until the end of the steam era.



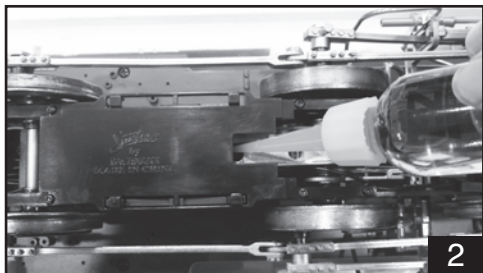
LUBRICATION PROCEDURES

Just like the prototype, the key to optimum performance from your new locomotive is regularly scheduled maintenance and lubrication. As it comes from the factory, your new locomotive's gearbox will have been lubricated and will not require any additional lubrication prior to operation. However, the running gear and other parts *will* require lubrication before your locomotive goes into service for the first time on your railroad. Failure to perform this initial lubrication may result in damage to your locomotive and also poor operating performance. The product designers and engineers at Bachmann Trains have designed your new locomotive so that lubrication can be performed in a few simple steps. **There are, however, many moving parts and metal-to-metal connections, just like a real steam engine, so it's important to take your time and lubricate all of them thoroughly.**

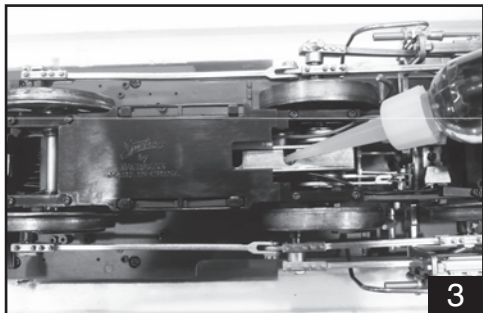


PLEASE NOTE: We recommend that you use Bachmann's line of E-Z Lube® products, which includes Light Gear Oil, Heavy Gear Oil, and Gear Grease. However, any plastic-compatible lubricants designed for model railroad applications can be used.

To properly service your locomotive, you need to put it in a position that allows you to easily access the wheels, axles, and Stephenson valve gear. You can place the foam top from your locomotive's packaging upside down on a sturdy flat surface and rest the locomotive on a towel placed over the foam top (figure 1). Or you can sit in a chair and rest the engine in an upside-down position on your lap between your legs. You will be working from the front of the locomotive and moving toward the rear. *Before you start, remember that over-lubrication can also cause damage to your locomotive, so please use all lubricants sparingly.*



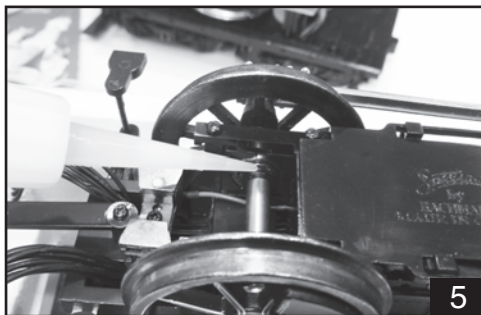
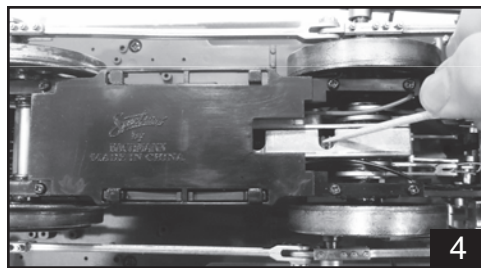
To begin, take your Bachmann *E-Z Lube*® Heavy Duty Gear Oil and place 1 or 2 drops on the motor drive shaft. You can reach it through the rear lubrication port on the bottom of the gearbox (figure 2).



Next, put a drop or two of heavy-duty plastic compatible gear oil into the access port just behind the front drive axle (figure 3).

While in this same area, place a small amount of *E-Z Lube*® Heavy Duty Gear Grease into the gearbox through the access hole and onto the main gear. This lubricant won't "sling off" or dissipate at high running temperatures. The best method to apply this material is by using a thin wooden applicator such as a toothpick or dowel (figure 4).

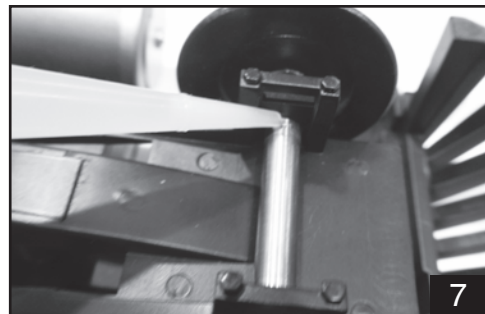
Going back to Heavy Gear Oil, put a drop of oil on each side of the sprung pillow block bearings (6 places), where each drive axle rests in the locomotive frame (figure 5).





Then put a drop of oil on each of the bearing surfaces on the Stephenson valve gear, which is just next to, and in front of, the gearbox (figure 6).

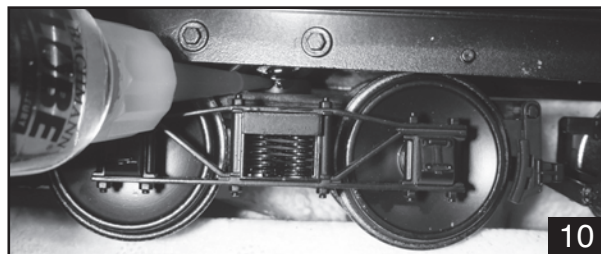
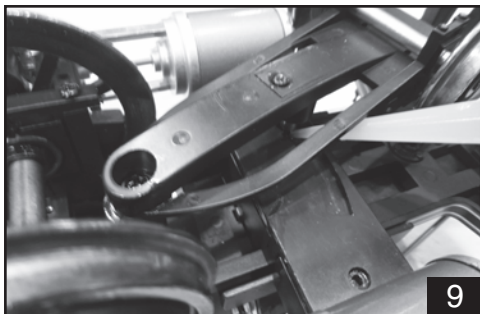
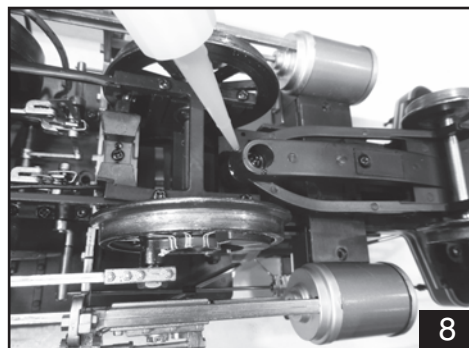
Moving on to the lead truck, add a drop or two of oil to each bearing surface, where the wheel axle passes through the truck side frames (figure 7).

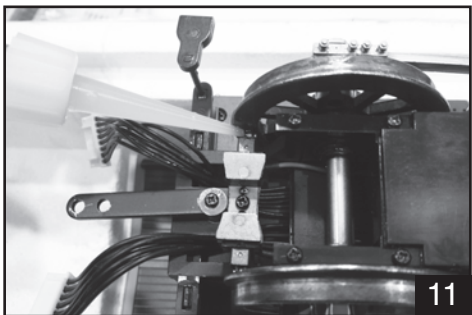


And be sure not to forget the lead truck pivot point, where it attaches to the locomotive frame just in front of the lead driver (figure 8).

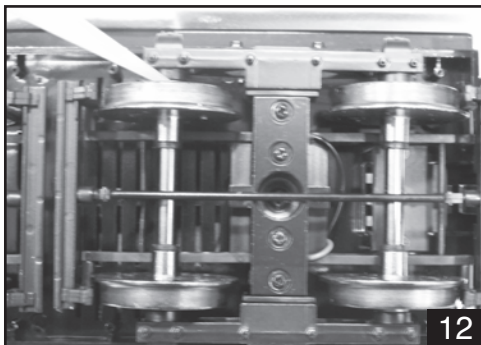
Also, put a drop of oil on the plunger where it contacts the underframe. This will help it move easily in either direction (figure 9).

Finally, put a drop of oil on the bearing surface between the tender and the tender trucks (figure 10).





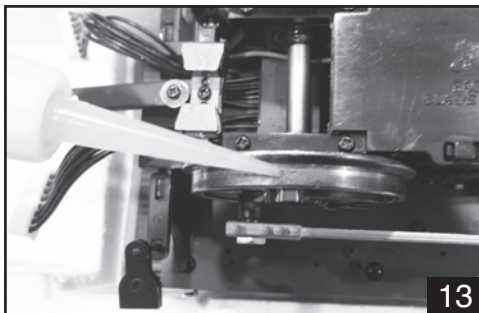
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CONDUCTIVE LUBRICANT

When operating outdoors, under high temperatures and other environmental conditions, there is a lot of friction, wear and evaporation. Friction is metal's worst enemy. Bachmann *E-Z Lube*® Conductive Contact Lubricant enhances electrical conductivity, and will decrease the amp draw of your locomotive. Just put one drop on the electrical pick-up behind each of the drive wheels (figure 11) and on the end of each axle of the tender truck wheel sets where it enters the sideframe (figure 12). Also put a small drop on each wheel tread (figure 13).



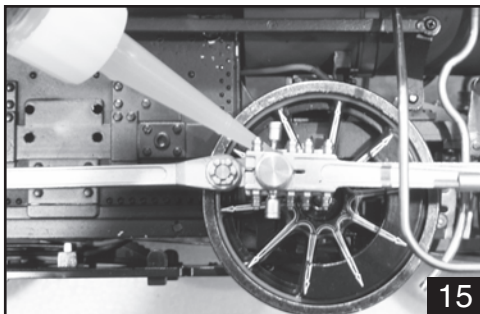
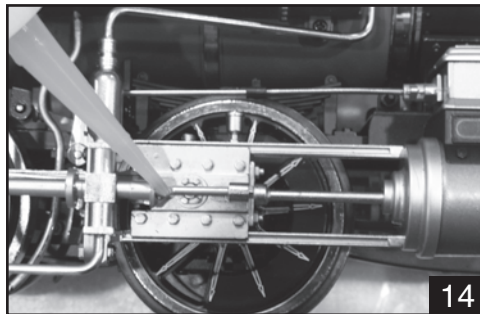
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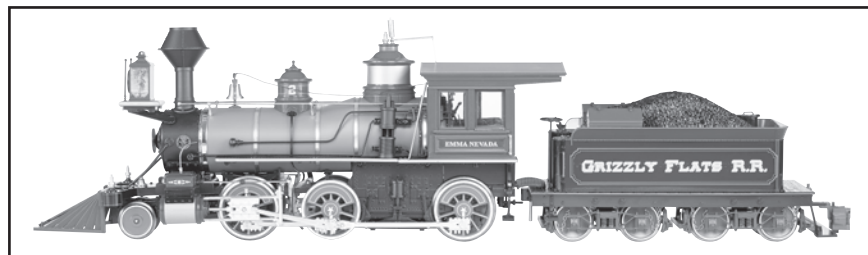
As a side note, you should perform this electrical conductive maintenance every 5 to 6 hours of operation or as needed.



VALVE GEAR LUBRICANT

Bring the locomotive and tender to an upright position and lubricate the valve rod, piston rod, valve guides (figure 14), crosshead pump (if so equipped), and crank pins (figure 15) with a small drop of oil. Don't forget to do both sides of the locomotive, and remember, **DO NOT OVER LUBRICATE.**



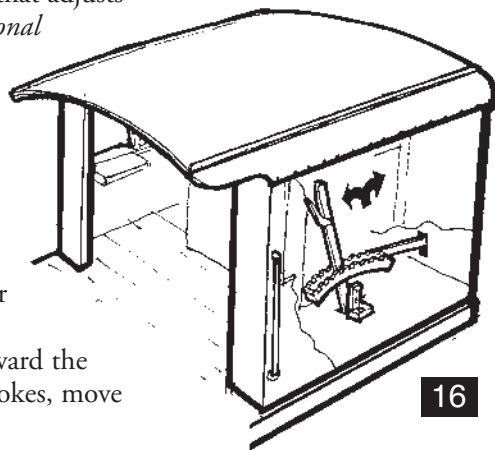


Now your *Spectrum*® locomotive is ready for track testing and many years of pleasant enjoyment. To break in your locomotive, we recommend that you run it with a light load at slow to medium speeds, checking to see that everything on the locomotive is operating properly. *This is the way prototype locomotives were brought into service.*

OPERATION OF VALVE GEAR LINKAGE

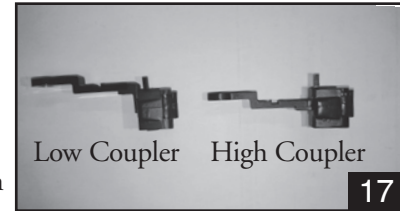
The locomotive is equipped with a Johnson bar (reversing lever) that adjusts the valve linkage and valve stroke. *The adjustments are representational only, and do not affect the actual operation of the locomotive.*

To access and move the reversing lever, open the cab door on the engineer's side of the locomotive. Using your fingers inserted through the cab door and window (one each side), locate the Johnson bar. (See figure 16 showing a cutaway view of the cab interior.) The Johnson bar can be adjusted by pulling up slightly and then moving it forward or backward as desired; the valve gear adjusts accordingly. (Moving the bar toward the smoke stack represents forward motion of the locomotive. Moving the bar toward the coal bunker represents reverse motion.) For the longest piston strokes, move the Johnson bar either all the way forward or back.



CHANGING COUPLERS

As it comes from the factory, your locomotive has a coupler mounted to the rear end beam on the tender. The coupler height for this coupler is set to the low height used in Bachmann's *Big Haulers*® line. If desired, you can raise the coupler to the NMRA height by replacing the low height coupler with the high coupler provided in the parts bag (figure 17).

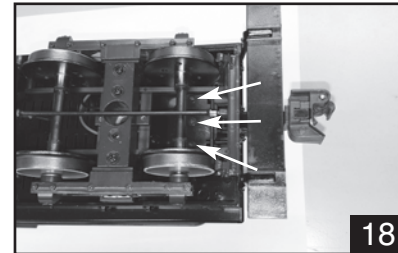


To change the coupler, unscrew the tender's rear truck and move it forward out of the way. Next remove the three screws holding the coupler shaft to the tender. Replace the low-height coupler and shaft with the high-height coupler and shaft and reinstall the three screws (figure 18). Note: when re-installing the coupler shaft be sure to reinstall the coupler shaft centering spring.

Once the desired coupler is in place and working, reinstall the rear truck of the tender.

ELECTRONICS

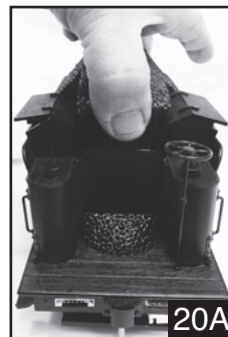
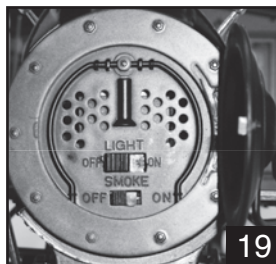
Your locomotive features totally isolated electronics, which allow for easy installation of the control system of your choice (see your hobby retailer). Switches are found in two locations: in the smoke box behind the smoke box door and in the tender underneath the coal load.



Smoke Box Switches

There are two switches behind the smoke box door (figure 19) that control the following:

- operation of the headlight, ash pan glow, and firebox flicker
- operation of the smoke generator



Each switch has two positions: ON and OFF. In the ON position, the function listed above is controlled by the device installed in the plug-and-play socket. In the OFF position, the function will be off no matter how power is supplied to the locomotive.

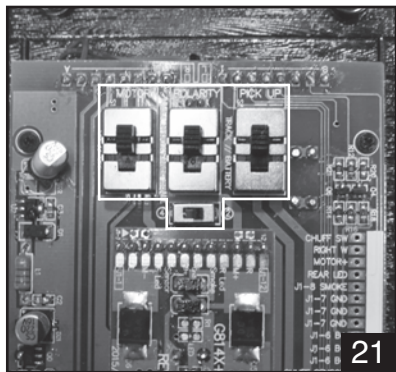
Control Switches in the Tender

To access the tender control switches, remove the coal load or wood by lifting it up from the front of the tender (figures 20A and 20B). There are four electrical control switches mounted on the main PC board in the tender. The following descriptions of the locations are by looking at the tender from the back (figure 21).

1. Motor Switch (left-hand side tender front): This switch controls the motor. When “Off,” the locomotive will not move but the other features of the locomotive (such as smoke or lighting) will continue to function when power is supplied to the locomotive.



Front of Tender



Back of Tender

2. Track Polarity Switch (middle tender front): In Large Scale, there are two conventions used to control the direction of the locomotive. For left rail positive control (the most common in use), move the polarity switch to the “Large Scale” position. For right rail positive control, move the polarity switch to the “NMRA” position. If your locomotive operates in the reverse direction to other locomotives on your layout, place the polarity switch in the opposite position.

3. Pickup Switch (right-hand side tender front): In the “Track” position, track power is fed from the track to the electronics inside the locomotive. In the “Battery” position, all track connections are removed and all the power is fed through the two screw terminals labeled “INPUT BATT1” on the engineer’s side rear of the main circuit board.

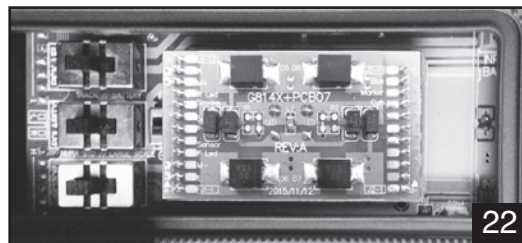
4. Chuff Switch (below polarity switch): The chuff switch is used to select either 2 or 4 chuffs per driver revolution.

Plug-and-Play Socket

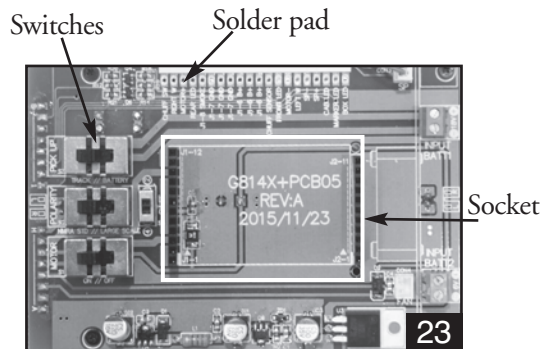
This Bachmann locomotive comes equipped with a nonproprietary plug-and-play electronics socket. This socket is designed to accommodate aftermarket plug-and-play products (contact your hobby retailer for more information). As delivered, the locomotive has a (DC) Jumper PC Board in the socket (figure 22).

Pin Definitions

Each pin on the plug-and-play socket has a defined purpose and is labeled on the socket under the (DC) Jumper PC Board. Each pin is also connected to a solder pad for use with systems that do not support plug-and-play (figure 23). The table on the following page provides the purpose for each pin. The J2 row of pins has a blank key on either end of the row to help ensure that a plug-and-play device cannot be incorrectly inserted. See the following chart for pin locations.



Shown with (DC) Jumper PC Board in place

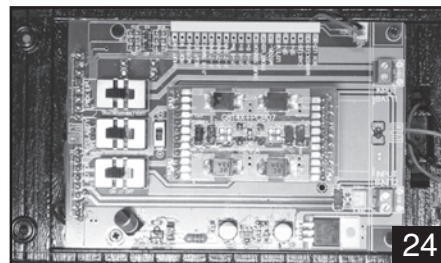


Shown with (DC) Jumper PC Board removed

Pin number J1	Purpose	Pin number J2	Purpose
12	Rail +		Solid Key
11	Rail +	11	Not used
10	Motor +	10	Firebox Flicker
9	Rear Light on Tender (if so equipped)	9	Not used
8	Smoke Unit	8	Not used
7	Locomotive Ground	7	Not used
6	Locomotive Positive	6	Not used
5	Chuff Trigger 1	5	Train Bus –
4	Front Locomotive Headlight	4	Train Bus +
3	Motor –	3	Speaker –
2	Rail –	2	Not used
1	Rail –	1	Speaker + Solid Key

Track-Powered DC Operations

To operate your locomotive via track power, leave the (DC) Jumper PC Board in place (figure 24), make sure that the motor switch is “On,” the pickup switch is in the “Track” position, and the track polarity switch is set for its correct position (normally the “Large Scale” position). In this mode, the locomotive headlight and rear light will be direction dependent. When the locomotive is going backwards, the rear light will be on at full brightness and the front headlight will be dimmed. The switches behind the smoke box door can be used to turn on and off various additional functions in the locomotive.

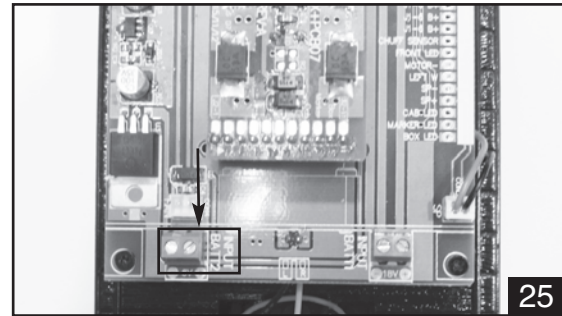


Adding an Aftermarket Sound System

This locomotive has a speaker mounted in the bottom of the tender with a wire pigtail to make adding an optional sound system easier. It is also designed so that the lighting and chuff circuits are active before the locomotive moves. If your sound system is designed for plug-and-play operation, remove the (DC) Jumper PC Board and plug in your sound system. If your sound system does not provide plug-and-play operation, continue to use the (DC) Jumper PC Board and connect the sound system wires to the solder pads labeled “Right W” and “Left W” on the right-hand side of the main PC board in the tender.

Locomotive Chuff

This locomotive has an optical chuff sensor in each cylinder that can be used to provide a prototypically correct chuff trigger for your sound system. A simple switch is used to select for two chuffs or four chuffs per revolution of the drivers. The switch is located in the front center of the tender (see figure 21).



To use the locomotive's internal chuff, connect the sound board chuff connections to the main PC board solder pads "Chuff Sensor" and "GND."

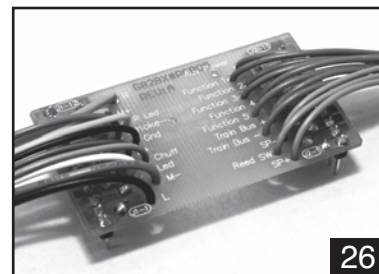
When used with DC track power, the optical sensors are electronically activated before the locomotive begins to move. If desired, your sound system's "+" and "-" low voltage outputs can also be used to directly power the locomotive's chuff circuits using the "INPUT BATT2" screw terminals at the left center rear of the main PC board in the tender (figure 25). These terminals have a voltage input from 5 to 14 volts DC. Refer to your sound system for more instructions on properly connecting it to the locomotive.

Note: This connection is not needed for either DCC or RC with battery operation as power for the chuff circuit is provided by the device in the plug-and-play socket.

Adding Aftermarket Track-Powered NMRA DCC Operation

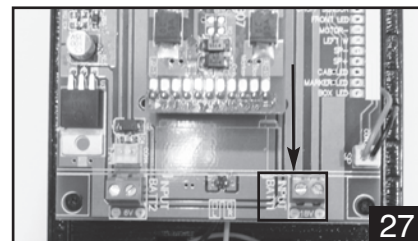
If your NMRA-compliant DCC decoder is designed for full plug-and-play operation with the plug-and-play socket, remove the (DC) Jumper PC Board and replace it with your plug-and-play decoder.

If your decoder is not designed for full plug-and-play operation, use the supplied (DC) Jumper PC Board with wires (figure 26) and attach the wires to your decoder following the instructions that came with your decoder. Note: the decoder's “+” and “-” outputs must be connected to the (DC) Jumper PC Board to allow the internal lighting and chuff system to function properly.



Adding Aftermarket On-Board Battery/RC Operation

If your Battery/RC or DCC Direct system supports plug-and-play using the plug-and-play socket, remove the (DC) Jumper PC Board in the socket and replace it with the plug-and-play board of your choice. Install the batteries in the tender next to the main PC board or in a trailing car. Connect the batteries to the “BATT1” battery screw terminals on the tender’s main circuit board (figure 27) and switch the “Track/Battery” pickup switch to Battery (see figure 21).





If your Battery/RC system does not support plug-and-play operation, use the supplied (DC) Jumper PC Board with wires and attach the wires to your Battery/RC or DCC direct system following the instructions that came with your system. Note: the “+” and “-” outputs must be connected to the (DC) Jumper PC Board to allow the internal lighting and chuff system to function properly.

An alternate installation approach if your Battery/RC system does not support plug-and-play operation is to connect the motor outputs of your RC system to the “INPUT BATT1” battery screw terminals (see figure 27). Should you wish to control the locomotive’s individual lighting and smoke functions, follow your specific manufacturer’s instructions for connection of these functions to the locomotive’s control system’s function inputs.

Hybrid Drive Operation

Some control systems use a combination of on-board primary and backup power to provide the locomotive with the control signal being transmitted either through the track or via radio control. To install such systems, connect the onboard power ground terminal to "J1-2 GND" and the onboard power positive terminal to "J1-6 B+."

The remaining connections are through the plug-and-play socket. These systems also allow for the control signal to come either from the track or from a radio receiver. If using such a system, connect the radio receiver outputs to the “BATT1” terminals, and use the “Track/Battery” pickup switch to select “Track” for track signal or “Battery” for radio signal.





GENERAL MAINTENANCE AND SERVICE

By establishing a regular lubrication and general maintenance schedule, you can have a lifetime of fun, performance, and satisfaction with your locomotive. Do not use any liquids or solvents to clean this locomotive; use a soft, lint-free cloth or cosmetics brush. Also, don't leave your locomotive unattended outdoors overnight or in inclement weather.

Be sure to fill out and send in your warranty card. You can check out all of Bachmann's other Large Scale products at your local hobby retailer or at www.bachmanntrains.com.

If your locomotive should need service, please note that our service department is not responsible for repairs to locomotives with aftermarket products installed in the locomotive's plug-and-play socket. Any locomotive requiring service should be returned to us as delivered, entirely in the original package AND with the factory-supplied (DC) Jumper PC Board plugged in the plug-and-play socket.

**Contact our service department at:
Service Department
Bachmann Industries, Inc.**

**1-800-356-3910 (toll-free in the U.S. and Canada only) or 215-533-1600 (for all countries)
between 8:00 AM and 4:00 PM Eastern Time.
www.bachmanntrains.com**

