

Spectrum[®]

1:20.3 LARGE SCALE K-27 STEAM LOCOMOTIVE



INTRODUCTION

Thank you for purchasing Bachmann's large scale model of the Denver & Rio Grande Western's K-27 locomotive. Bachmann is proud to present the *Spectrum*® K-27 as the next leap forward for large-scale model railroading.

K-27 locomotives underwent numerous changes in their 50 years of service life, so no two were exactly alike. Bachmann chose to replicate different road numbers at different times. Therefore the details, paint scheme, cab, and tender shell of each version are specific to a certain time in its service career.

Details:

- outside frame with solid die-cast counterweights
- snow plow and doghouse on selected models
- bronze pop valves, bell, and whistle
- smoke stack spark arrestor
- numerous die-cast parts, including operating piston valves and Walschaert valve gear, side rods, dual air pumps and generator, flickering firebox
- complete locomotive brake rigging and brake shoes
- operating Johnson bar, reach bar controls, adjustable valve gear
- complete boiler backhead detail including numerous gauges, piping, throttle, and brake stand
- operating clamshell firebox door
- cab awnings, hatches, and windows that open
- detailed sand lines, piping, nut, bolt, and washer details, and detailed rivets throughout

- diamond safety tread deck plate
- removable detailed coal load
- fully detailed trucks with operating journal box lids
- tender brake hanger, brake shoes, air hoses, and coupler cut lever
- body mounted die-cast scale knuckle couplers for both front and rear couplers
- longer coupler shanks included for operation on tight radius
- die-cast offset shank couplers also included for use with other popular brands of narrow gauge couplers

Mechanical:

- fully equalized locomotive suppression as on the prototype, including individually sprung drivers, trailing truck, and floating gear box
- complete die-cast frame and chassis
- custom built 19.1 volt motor with ball bearings and brass machined flywheel

- dual helical cut gears
- all brass gears to ensure durability
- double lead stainless steel worm with thrust bearing to provide superior durability and eliminate locomotive surge
- ball bearing supported worm gear to provide superior durability
- prototypical Rushton radial trailing truck
- designed for operation on 8 foot or greater diameter track

Electronics:

- open and nonproprietary plug-and-play electronics interface to accommodate the control system of your choice, including DC, NMRA DCC, and radio control/battery operation
- designed for a maximum of 24 volts DC, battery, or NMRA DCC operation
- heavy duty plugs and wiring throughout
- current limited constant lighting for
 - direction activated front and rear headlights
 - operating smoke unit
 - operating classification lights
 - operating cab light
 - operating firebox flicker

- three-position switches with center "off" for DCC or DC operation of:
 - smoke unit,
 - cab light
 - firebox, and classification lights
- all-wheel driver and tender electrical pickup
- easy access to electronics inside tender
- three switches in tender to choose
 - track or battery power pickup,
 - operation according to NMRA or large scale model railroading practices
 - motor power on/off switch to allow stationary operation with lights on
- designed for the installation of aftermarket sound systems
- optical sensors in cylinders for accurate sound synchronization
- chuff sensors selectable for 2 or 4 chuffs per revolution
- battery screw terminals for easy installation of RC systems
- space designed for installation of batteries for RC operation

HISTORY OF THE PROTOTYPE

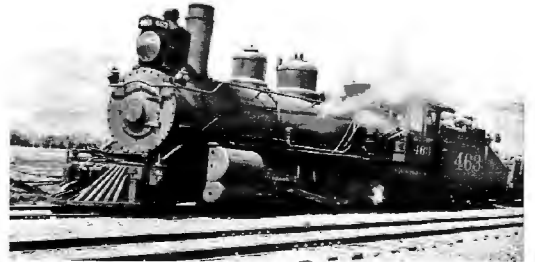
As the 19th Century came to a close, the Denver & Rio Grande's narrow gauge lines in Colorado and New Mexico had settled into the role of feed lines to the railroad's standard gauge lines. The narrow gauge hauled ores, coal, lumber, oil, farm products, and general merchandise that were an important source of revenue.

The railroad had begun to replace much of the rolling stock with new and larger cars as the smaller freight cars strained under increasing traffic demands. Locomotives, however, were another matter. The D&RG had not purchased any new narrow gauge locomotives since 1887. The older, smaller engines still in service struggled to manhandle the freight and passenger traffic over the line's 4% grades and 24 degree curves. It was common for trains to require three or four of the Class 400 2-8-0s to move just 100 tons of freight.



In 1901, the D&RG mechanical department sought a remedy for this problem. They solicited design specifications for a locomotive of a size and capacity to handle at least twice the tonnage of the 2-8-0s then in use. Early in 1903, the railroad selected Baldwin Design Specification W4213 and ordered 15 locomotives. They would be assigned road numbers 450 to 464. These locomotives would be unlike anything yet built for American narrow gauge. They were outside frame 2-8-2s with Vauclain compound cylinders and sloped back tenders for better visibility. Compound cylinders were in vogue at this time, as they were supposed to provide smoother running and more fuel efficiency.

The new locomotives were designated as Class 125. In preparation for their arrival, the Denver & Rio Grande began laying heavier rail on many of its lines. While they were being broken in after delivery in April, 1903, it was observed that the new engines had a tendency to “waddle” as they moved down



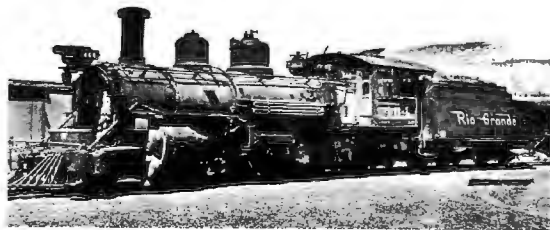


the track. They were soon given the nickname “Mudhen,” after the Coot duck, which had a similar gait.

The Class 125's compound cylinders and small tenders soon proved inadequate for the demands of mountain railroading. At times, as many as half of them were in the shops for repairs. In 1907, the railroad converted the first locomotive, number 458, to a simple engine by replacing the 17-inch by 22-inch cylinders with D-slide valve steam chests. This experiment was a tremendous success, and by January, 1912, all of

the remaining compounds (except number 456) had been changed to simple engines. Additional improvements were made over the next three years, including the addition of a second air pump, flange lubricators, electric headlights, generators, and new smokestacks. In 1918, larger rectangular tender tanks were fabricated in the railroad's Burnham shops. All the while, the Mudhens' operating territory continued to expand as further track improvements were made on many of the narrow gauge branches.

Starting in 1923, the Denver and Rio Grande began to apply piston valves and Walschert valve gear to the Mudhens as they rotated into the shops for repairs and maintenance. As they emerged, they were given the now familiar designation of K-27 Class. Over the next few years, most of the Mudhens were upgraded to the new cylinders and valve gear as well as new cross compound air pumps and boiler tube pilots.



Between 1927 and 1928, superheating was added to the K-27's specifications. Many trainmen with experience on both the narrow and standard gauge lines considered the superheated Mudhens to be the finest riding and running engines on the entire Denver & Rio Grande system.

Like many businesses of the day, the Denver & Rio Grande Western narrow gauge was hit very hard by the Great Depression in 1929. Many K-27s experienced long periods of inactivity. In 1939, the four Mudhens that had not received piston valves and Walschert valve gear were cut up for scrap. Also, the D&RG traded number 455 to the Rio Grande Southern for ditcher 030. That left the D&RG with a total of 10 remaining K-27s. In December of 1941, numbers 458 and 459 were sold to the Nacionales de Mexico, dropping the roster to eight Mudhens.

World War II brought a flurry of activity to the narrow gauge. The K-27s were put to hard use, with all of the remaining eight locomotives in service almost daily. When the war ended in 1945, business on the narrow gauge began to spiral downward again, and the end was in sight for many locomotives on the system, including the K-27s. One by one, the Mudhens succumbed to the scrapper's torch until only two remained. Fortunately, they are both with us today. Number 464 operates regularly on the Huckleberry Railroad in Flint, Michigan, and Number 463 is on the Cumbres and Toltec Railroad in her native Colorado and New Mexico.

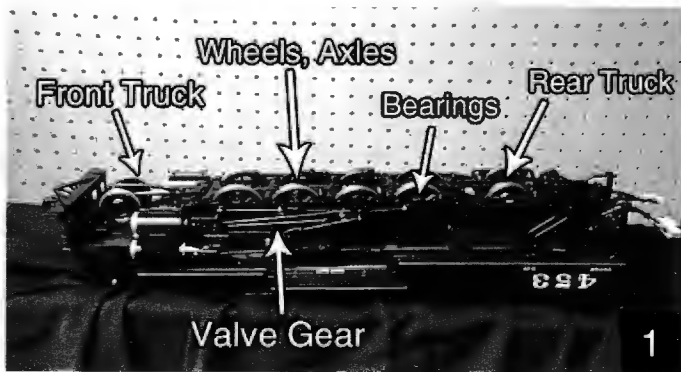
LUBRICATON AND MAINTENANCE

The key to continued optimum performance from your K-27 is regularly scheduled maintenance. Your new K-27's gearbox was lubricated at the factory. However, the running gear will require lubrication before you run it for the first time. Failure to perform this initial lubrication may result in damage to your locomotive. So please follow the lubrication procedure carefully.

You should lubricate your K-27 after every 10+ hours of actual running time, or as needed. The product engineers at Bachmann designed the K-27 in such a way that only a few simple steps are needed to prepare it for operation.

We recommend high quality lubricants designed for operations outdoors, such as Bachmann's line of *E-Z Lube*® products. To begin, be sure to choose a large, flat, sturdy surface on which to work. Use the foam top from the K-27's packaging as a cradle for your locomotive. Next, turn the locomotive upside down and gently place it in the foam cradle so you can easily access the wheels, axles, and valve gear (as shown in figure 1).

Begin lubrication at the front of the locomotive and work towards the rear, starting with the front





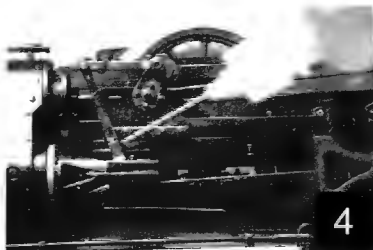
truck. From there, move on to the valve gear, axles, springs, bearings, and wheels, and finish with the rear truck (figure 1).

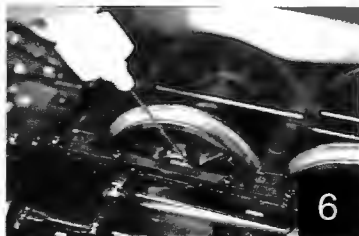
NOTE: There are lots of bearing surfaces on the K-27 running gear. Be sure to take your time and lubricate all of them. For the purposes of

illustration we are only going to lubricate one side of the running gear. Don't forget to lubricate both sides.

Beginning with the front truck, use heavy viscosity oil to lubricate the plunger and points where it contacts the locomotive frame (figure 2). This will help it to move easily in either direction. Next lubricate the axles where they pass through the truck side frames. Finally put a drop of heavy oil on the pivot point where the truck attaches to the frame (figure 3).

Moving on to the double hung valve gear, use heavy viscosity oil to lubricate all of the bearing surfaces where metal contacts metal (figure 4). There are a lot of them, so take care to get them all. Remember to lubricate the valve gear on the other side as well. Next, put a small drop of heavy





viscosity oil on the bearing surfaces of the operating springs and their hangers (figure 5). The next step is to lubricate the driver axles where they pass through the frame axle bearings (figure 6). Using heavy oil, be sure to lubricate each axle on both sides of the frame and

behind the counterweights. Also, put a drop of heavy oil on each side of the sprung axle bearings where they are seated in the frame, as shown by the arrows (figure 7).

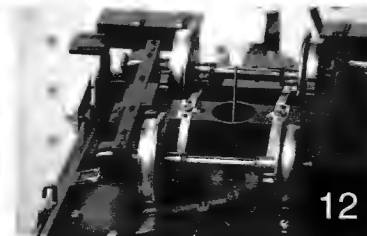
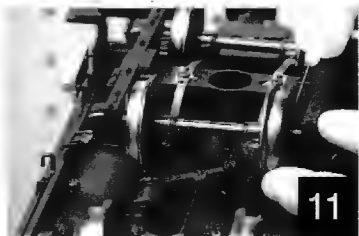
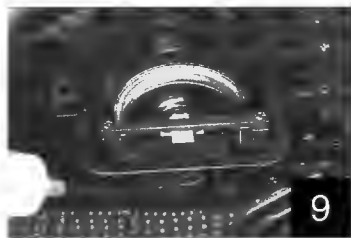
Before you move on to the rear truck, put a drop of conductive contact lube and electrical enhancer on the end of each driver axle where it enters the frame (figure 8). Also, put a drop of the electrical conductor enhancer on each of the driver wheel treads.



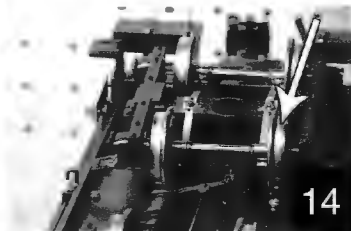
When you're finished with the driver axles, it's time to lubricate the rear truck. First, put a drop of heavy viscosity oil on each of the journal hanger bearing surfaces (figure 9). Next, put a drop of heavy oil on the ends of the axle and the friction pad on the truck side frame (figure 10).

Now it's time to move on to the tender trucks. First, put a drop of heavy viscosity oil on the end of each wheel axle where it enters the truck side frames (figure 11). Then put a drop of heavy oil on each of the

truck bolsters where they are joined to the tender frame (figure 12). The last step is to put a drop of conductive contact lube and electrical enhancer on the pickup wipers where they contact the tender truck axles (figure 13) and on the tender wheel treads (figure 14).



Again, be sure to lubricate both sides of the running gear. By establishing a regular lubrication schedule, you can have a lifetime of fun, performance, and satisfaction with this locomotive model. Remember, this locomotive performs best on curves with a minimum 8' diameter.



ELECTRONICS

The K-27 is the first Large Scale locomotive with totally isolated electronics, which allows for easy installation of the control system of your choice.

There are two set of switches; the lighting switches behind the smoke-box door at the front of the locomotive, and the control switches underneath the coal load in the tender on the main PC board.



Smoke Box Switches

There are three switches behind the smokebox door at the front of the locomotive (figure 15).

- Smoke – Controls the smoke unit
- Cab light – Controls the cab light
- M.L. & F.F. – Controls the classification lights and firebox flicker

Each switch has a DCC position, a DC position, and a center off position.

- DC position: In the DC position the specified function is always on.
- DCC operation: In the DCC position the specified function is controlled through the socket on the main PC board in the tender.
- OFF position: In the OFF position the specified function is always off.

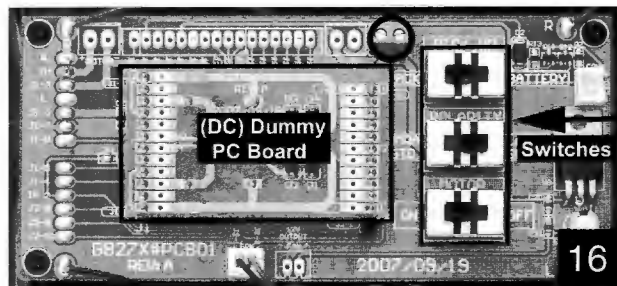
Tender Switches

There are three switches on the main PC board in the tender (figure 16). To access these switches pull up on the front panel on the tender (figure 17) and remove the coal load (figure 18).

Pick Up Switch (top): In the “Track” position, track power is fed from the tracks through the track Polarity switch 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 just to the left of the Pick Up switch (circled in figure 16).

Track Polarity Switch (middle): 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) switch the Polarity switch to the “Large Scale” position. For Right Rail positive control, switch 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.

Motor Switch (bottom): This switch controls the motor. When “Off” the locomotive will not move, but the lighting and other features of the locomotive, such as smoke or lighting, will continue to function.



Plug-and-Play Socket

The Bachmann K-27 comes equipped with an open and non-proprietary plug-and-play electronics socket. This plug-and-play socket is designed for after market plug-and-play products (contact your hobby retailer for more information). As delivered, the K-27 is set up for DC operation.



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Track Powered DC Operations

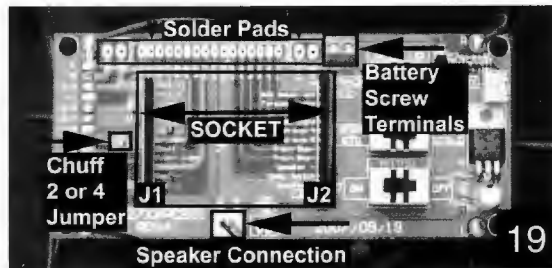
The K-27 is factory-equipped with a (DC) Dummy PC Board plugged in the plug-and-play socket. To operate the K-27, leave the (DC) Dummy PC Board in place, make sure that the Motor switch is “On”, the Pick Up switch is in the “Track” position, and the track Polarity switch is set for its correct position (normally the “Large Scale” position). In this mode, the locomotive headlight and the tender rear light will be direction dependent. Control of smoke and other lighting functions can be obtained via the switches behind the smoke box door.

Replacing the (DC) Dummy PC Board

To replace the (DC) Dummy PC Board with a plug-and-play system of your choice, simply lift out the (DC) Dummy PC Board and carefully insert the replacement plug-and-play PC board in the empty socket (figure 19, 20). The J1 row of pins (towards the front of the tender) and the J2 row of pins (towards the rear of the tender) on the socket must be aligned properly with the replacement plug-and-play PC board.

Pin Definitions

Each pin on the plug-and-play socket has a defined purpose and is labeled on the socket under the (DC) Dummy PC Board. Each pin is also connected to a solder pad for use with systems that do not support plug-and-play. The following table 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 can not be incorrectly inserted.



Pin number J1	Purpose	Pin number J2	Purpose
12	Rail +	12	Solid Key
11	Rail +	11	Not used
10	Motor +	10	Firebox Flicker
9	Rear Light on Tender	9	Classification Lights
8	Smoke Unit	8	Cab Light
7	Locomotive Ground	7	Not used
6	Locomotive Positive	6	Not used
5	Chuff	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

Adding an Aftermarket Sound System

If your sound system is designed for plug-and-play operation, remove the (DC) Dummy PC Board, plug in your sound system, and install a 3" speaker in the speaker location beneath the main PC board in the tender. To aid in this installation, a pair of wires from the speaker connection on the main PC board in the tender to the speaker is provided. If your sound system does not provide plug-and-play operation, continue to

use the (DC) Dummy PC Board in the tender and connect the sound system wires to the solder pads on the engineer's side (right hand side of tender if looking forward) of the main PC board in the tender.

To install a speaker in the tender first remove the tender shell. To remove the tender shell:

1. Remove the two screws at the front of the tender underneath the coal load.
2. Remove the single screw under the rear hatch on the top of the tender shell.
3. Carefully lift off the tender shell.

The speaker is intended to be mounted underneath the main PC board. To gain access to this area, remove the four screws on the four corners of the main PC board and carefully move the main PC board to one side.

To install the speaker, solder the speaker connector wires to the speaker terminals (the J2-1 wire is connected to the speaker's + terminal) and use the four mounting screws to secure the speaker to the tender floor. **The speaker should not touch the main PC board when reinstalled in the tender.**

Once the speaker is installed, replace the four screws on the main PC board removed above, plug in the speaker to its connection on the main PC board in the tender, and reinstall the tender shell.

The K-27 is designed to support either two or four chuffs per revolution. From the factory, four chuffs per revolution is selected. For two chuffs per revolution, remove the chuff jumper connection, which is labeled JP1.

Adding Aftermarket Track-Powered NMRA DCC Operation

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

Some decoders do not support all of the functions contained on the J2 connection. In this case, follow the decoder manufacturer's instructions for connecting the decoders auxiliary functions to the solder pads on the engineer's side of the main PC board (right hand side of tender if looking forward).

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) Dummy PC Board and replace it with the plug-and-play board of your choice. Install the batteries in the tender, connect the batteries to the battery screw terminals on the plug-and-play socket and switch the Pick Up switch to "Battery."

If your Battery/RC system does not support plug-and-play operation, then the simplest conversion is to connect the motor outputs of your RC system to the battery screw terminals. Should you wish to control the locomotive's individual lighting and smoke functions, follow the specific manufacturer's instructions for connection of the K-27 functions to the control system's function outputs.

Hybrid Drive Operation

Some control systems use a combination of on-board primary or backup power to power 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 J1-7 and the onboard power positive terminal to J1-6. The remaining connections are through the plug-and-play socket or soldered directly to the solder pads on the engineer's side (right hand side of tender if looking forward) of the main PC board in the tender. 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 battery screw terminals, and use the Pick Up switch to select "Track" for track signal or "Battery" for radio signal.

Thank you again for purchasing the Bachmann Spectrum K-27 2-8-2 locomotive. 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.

GENERAL MAINTENANCE AND SERVICE

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

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 K-27's plug-and-play socket. Any locomotive requiring service should be returned to us as delivered, *entirely in the original packaging AND with the factory-supplied (DC) Dummy PC Board plugged in the plug-and-play socket.*

Contact our service department at:

**Service Department
Bachmann Industries, Inc.
1400 East Erie Avenue
Philadelphia, PA 19124
1-800-356-3910
www.bachmanntrains.com**



BACHMANN INDUSTRIES, INC.
1400 East Erie Avenue
Philadelphia, Pennsylvania 19124 USA
Tel: 215-533-1600
Fax: 215-744-4699
www.bachmanntrains.com

UNITED KINGDOM

Bachmann Europe PLC.
Moat Way, Barwell
Leicestershire LE9 8EY
UNITED KINGDOM
Telephone: 44-1455-841756
Fax: 44-1455-841787
www.bachmann.co.uk

GERMANY

Bachmann Europe PLC.
Niederlassung Deutschland
Am Umspannwerk 5
D-90518 Altdorf Bei Nürnberg
GERMANY
Telephone: 49-9187-9722-0
Fax: 49-9187-9722-22
www.liliput.de