

# RAILKING 2-8-4 BERKSHIRE STEAM ENGINE OPERATING INSTRUCTIONS



This RailKing 2-8-4 Berkshire Steam Engine is produced in detailed Die-Cast Metal and operates on O-31 track. This RailKing Steam Engine contains state-of-the-art electronics with many built-in automatic features for incredibly realistic operation. Despite these advanced features, the locomotive is easy to operate with any compatible standard AC transformer (see the compatibility chart on page 18), and is completely compatible with most other 3-rail locomotives, rolling stock, and accessories.

This locomotive is equipped with Proto-Sound 2.0 with Digital Command System (DCS). This new system will allow you to operate your locomotive in Command mode (when used with the DCS Remote Control System, sold separately) or Conventional mode. Conventional operating features are described in the following pages, while the **DCS operating features are covered in the set of operating instructions that accompanies the DCS equipment.** Conventional Mode operation of this locomotive is much simpler than operation of original Proto-Sound engines. For your own safety and that of your equipment, please read the instructions before you operate this engine.

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## Set Up

There are a few simple steps you must take before operating this RailKing steamer.

1. You should prime the operating smoke unit with smoke fluid before operating. Add 15-20 drops of smoke fluid through the smokestack, then gently blow into the stack to eliminate any air bubbles in the fluid. See Fig. 4 on pg. 12.
2. If you choose not to prime the unit with fluid, turn the smoke unit switch located under the tender to the OFF position (Fig. 5 on pg. 12). Running the engine without a primed smoke unit may cause damage. See the “ProtoSmoke Unit Operation” section of this book for more information on smoke unit maintenance.
3. You should lubricate all side rods and linkage components and pickup rollers to prevent them from squeaking. Use light household oil and follow the lubrication points marked “L” in Fig. 2 on pg. 10. Do not over-oil. Use only a drop or two on each pivot point.
4. Put your engine on the track and insert the reverse unit plug that extends out of the tender into the receptacle at the back of the engine. **WARNING: DC NOT CONNECT THIS ENGINE TO A TENDER FROM ANOTHER ENGINE; IT MAY CAUSE SERIOUS DAMAGE TO YOUR MODEL.** Look at the bottom of the engine and tender where each will have a color-coded stamp. If they match you may connect those two pieces; if not, don't.
5. Connect the draw bar between the engine and tender. If there are two holes in the draw bar, the hole located farthest from the tender is for the minimum track operation, such as O-31 circles of track. The second hole is for O-72 or larger operation.

At this point, you are ready to begin running your engine.

# Basic Operation

## Transformer Controls

Use the operation buttons on your transformer as described below.

**Throttle** - Throttle up the power to your track. Then put the engine into motion by either firmly pressing the Direction button on your transformer or remote once or dropping and advancing the throttle to put the engine in forward.

**Horn/Whistle** - To sound the whistle, firmly press the Horn/Whistle button. The whistle will sound for as long as you continue to depress the button. It will stop when you release the button. The horn will have a different ending depending upon whether you hold the button for less than 3, 4, or 5 seconds.

**Bell** - To sound the bell, firmly press and release the Bell button. To turn the bell off, press and release the Bell button again. The bell will continue to ring from the time you turn it on until you press and release the button again to turn it off.

**Direction** – Your train is programmed to start in neutral. To put the engine into forward again or to put it into reverse, to put it into neutral, firmly press and release the Direction button on your transformer. Just as you must stop your car between forward and reverse, this engine will not go directly from forward to reverse; it goes into neutral between directions. If the train has been moving forward, the first press of the Direction button will cycle the train from forward into neutral, the second press into reverse, the third press back into neutral, and the fourth back into forward. To prevent accidental high-speed start-ups, this engine is programmed to restart in neutral each time the track voltage is turned off for 10 seconds or more.

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**Manual Volume Control** – To adjust the volume of all sounds made by this engine, turn the master volume control knob located under the tender clockwise to increase the volume and counter-clockwise to decrease the volume (see Fig. 1).



Figure 1. Proto-Sound 2.0 Volume Adjustment Knob

# Proto-Sound 2.0 Operating Instructions

**This manual contains the operating instructions for Proto-Sound 2.0 in conventional mode only. Instructions for accessing DCS command mode features accompany the DCS Remote Control System equipment**

Because Proto-Sound 2.0 is an all-new system developed by M.T.H.'s own research and development team, it operates differently from original Proto-Sound. Most Proto-Sound 2.0 features are automatically enabled, and the reset state has been eliminated, so there is no need to program features as with original Proto-Sound. Although the new system is easier to operate than original Proto-Sound, you should read these instructions thoroughly before using Proto-Sound 2.0 features in order to prevent harm to yourself or your equipment.

## **Activating Proto-Sound 2.0 Conventional Mode Features:**

Proto-Sound 2.0 features are activated by sequences of Bell and Whistle button pushes described below. Please read the full descriptions of each feature before using it. To use these buttons to activate features rather than to blow the whistle or ring the bell, you should press the buttons for a shorter time (½ second); you may need to practice your timing to make this work smoothly.

## **Freight Yard Sounds (FYS):**

Your engine is equipped with a sound package of freight yard sounds that you can play when you pull into a yard. **Each sequence described below will play as long as it is left on, randomly generating sounds, but be sure to allow approximately 30 seconds between the button pushes described below to allow the FYS sufficient time to run through each sequence.**

1. To cue the sound system to play the FYS, quickly but firmly press the Bell button once followed by 2 quick presses of the Whistle button while the engine is moving.
2. Press the Direction button or drop and advance the throttle once to stop the engine. This will trigger the first sequence of FYS. The reverse unit is temporarily disabled so that the train will not move as you use the Direction button to trigger the sounds, and Proto-Sound 2.0 has disabled operator control over the Whistle and Bell buttons until the full FYS sequence is complete.
3. After waiting about 30 seconds for that sequence to run, press the Direction button again to trigger the second sequence of FYS.
4. After about 30 seconds, press the Direction button again to trigger the third FYS sequence.
5. Again, after allowing about 30 seconds for that sequence to run, press the Direction button one more time to trigger the fourth and final FYS sequence. The FYS will continue, and within a few seconds, the engine will start and move out on its own at the current throttle setting, in the same direction it was traveling when you began the sequence. Once the bell turns off, the operator regains control of the transformer's bell and whistle buttons and can ring the bell or blow the whistle as usual.

***Note: The engine will move based on the current throttle setting. Verify the throttle is set correctly before the engine begins to move.***

## Tips on Using FYS

- You can terminate FYS at anytime by turning off power to the track for 15 seconds.
- You do not have to be in Forward to use FYS. At the conclusion of the full sequence, the train will pull away from the station in whatever direction you were going when you activated the feature.
- You can use FYS even if you are double-heading with another engine regardless of whether the second engine is equipped with a Proto-Sound 2.0 FYS module. If the second engine is not equipped with FYS at all, you must remember not to leave the throttle at a high voltage level once you have stopped the engine to run the FYS. Otherwise, the engine without FYS will begin vibrating on the track as its motors strain to move the train, since they cannot be automatically disabled during the FYS cycle. If the second engine is equipped with Proto-Sound FYS, you may choose to disable it when used in double-heading operations, so you will not experience competing FYS sounds. To disable FYS in an original Proto-Sound engine, see the operating instructions for that engine.

## Proto-Coupler® Operation

This locomotive is equipped with a coil-wound Proto-Coupler for remote uncoupling action. Because the Proto-Coupler is controlled through the Proto-Sound 2.0 microprocessor, it does not require an uncoupling track section or modification to your layout to function. Use the codes listed below to fire the coupler.

### Rear Coupler:

To fire the rear coupler, press the Bell button once followed immediately by three pushes of the Whistle button. The sound of the liftbar and air line depletion will play, and the knuckle will be released.

### Speed Control:

M.T.H. engines equipped with Proto-Sound 2.0 have speed control capabilities that allow the engine to maintain a constant speed up and down grades and around curves, much like an automobile cruise control. You can add or drop cars on the run, and the engine will maintain the speed you set.

While the engine is programmed to start with the speed control feature activated, you can opt to turn it off. This means the engine's speed will fall as it labors up a hill and increase as it travels downward. It is also affected by the addition or releasing of cars while on the run.

**To turn speed control on and off**, put the engine in neutral, then press the transformer's Whistle button one time then immediately press the Bell button two times. Two whistle blasts will indicate that the engine has made the change. Repeat the 1 whistle, 2 bells code to return it to the other state. **You will want to do this during the initial neutral upon start-up if you ever couple this engine to another engine that is not equipped with speed control to avoid damaging the motors in either engine.** Each time you shut down the engine completely, it will automatically turn speed control on.

## **Lock into a Directional:**

You can lock your engine into a direction (forward, neutral, or reverse) to prevent it from changing directions. To do this, put the engine into the direction you want or into neutral, to lock it into neutral, run it at a very slow speed (< 10 scale mph), and quickly but firmly press your remote's Whistle button once followed immediately by three presses of the Bell button. Two whistle blasts will indicate that the engine has made the change. The engine will not change direction (including going into neutral) until you repeat the 1 whistle, 3 bells code to return the engine to its normal condition, even if the engine is kept without power for extended periods of time.

## **Reset to Factory Defaults:**

To override the settings you currently have assigned to the engine and reset it to its factory defaults, while in Neutral press the Whistle button once, followed immediately by five quick pushes of the Bell button. Two whistle blasts will indicate that the engine has made the change.

## **Automatic Sounds:**

Certain Proto-Sound 2.0 sound effects automatically play in programmed conventional mode conditions:

**Squealing Brakes** play any time the engine's speed decreases rapidly.

**Cab Chatter** plays when the engine idles in neutral.

**Engine Start-up and Shut-down** sounds play when the engine is initially powered on or is powered off for five seconds or more.

# Maintenance:

## Lubrication and Greasing Instructions

The engine should be oiled and greased in order to run properly.

You should regularly lubricate all side rods and linkage components and pickup rollers to prevent them from squeaking. Use light household oil and follow the lubrication points marked “L” in Fig. 2. Do not over oil. Use only a drop or two on each pivot point.

*Figure 2. Lubrication Points on the Engine*

The locomotive’s internal gearing was greased at the factory and should not need additional grease until after 50 hours of operation or one year, whichever comes first. To access the gear box, do the following:

1. Turn the engine upside down.
2. Remove the Phillips screw (marked “GREASE”) located at the third set of drivers (counting from the front of the engine).
3. Use a grease tube dispenser to put a small amount (approx. 1-2 ml.) of lithium-based grease into the gearbox.
4. Replace the screw.

You should also grease the leading and trailing locomotive truck tongues to enhance their ability to slide on the chassis. Follow the grease points shown on Fig. 3.

*Figure 3. Greasing Points on the Engine and Body Mounting Screws*

## **Cleaning the Wheels, Tires and Track**

Periodically check the locomotive wheels and pickups for dirt and buildup, which can cause poor electrical contact and traction and prematurely wear out the neoprene traction tires. Wheels and tires can be cleaned using denatured alcohol (not rubbing alcohol), which can be found in home improvement stores, applied with a cotton swab.

Occasional cleaning of the track will also help to ensure good electrical contact and prolong the life of your engine's tires. To clean the track, use a clean rag and denatured alcohol (not rubbing alcohol). Unplug the transformer and wipe the rails of the track, turning the rag frequently to ensure that you are using clean cloth on the rails.

## **Traction Tire Replacement Instructions**

Your locomotive is equipped with two neoprene rubber traction tires on the rear set of flanged drivers. While these tires are extremely durable, you may need to replace them at some point.

1. Remove the side rods (the rods that connect each drive wheel to the other) from the wheels in order to slip the new tire over the grooved drive wheel. This screw can be loosened with a 5mm nutdriver.
2. Make sure the old tire has been completely removed from the groove in the drive wheel, using a razor blade or small flathead screwdriver to pry away any remains.
3. Slip the new tire onto the wheel. You may find it useful to use two small flathead screwdrivers to stretch the tire over the wheel.
4. If you twist the tire while stretching it over the wheel, you will need to remove and reinstall the tire. Otherwise your engine will wobble while operating.
5. Make sure the tire is fully seated inside the groove. Use a razor blade to trim away any excess tire that doesn't seat itself inside the groove properly.

One set of replacement tires is included with the model. Additional tires are available directly from the M.T.H. Parts Department (phone: 410-381-2580; fax: 410-423-0009; e-mail: [parts@nth-railking.com](mailto:parts@nth-railking.com); mail: 7020 Columbia Gateway Drive, Columbia MD 21046-1532).

## ProtoSmoke<sup>®</sup> Unit Operation

This steam locomotive contains a smoke unit that outputs smoke through the smokestack on the boiler of the engine. The smoke unit is essentially a small heating element and wick that soaks up and then heats a mineral oil-based fluid that emits a harmless smoke. The smoke is then forced out of the stack by a small electric fan.

With a few easy maintenance steps, you should enjoy trouble-free smoke unit operation for years.

- When preparing to run this engine, add 15-20 drops of smoke fluid through the smokestack (see Fig. 4). We recommend M.T.H. ProtoSmoke, Seuthe, LGB, or LVTS fluids (a small pipette of ProtoSmoke fluid is included). Do not overfill the unit or the fluid may leak out and coat the interior engine components.

*Figure 4. Add Smoke Fluid*

- If you choose not to add the fluid (or have already added the fluid but choose to run smoke-free), turn off the smoke unit switch located under the tender body (see Fig. 5). Failure either to add fluid to the unit or to turn it off may damage the smoke unit heating element and/or wicking material.

- When the smoke output while running the engine begins to diminish, add another 10-15 drops of smoke fluid or turn the smoke unit off.

*Figure 5. Smoke Switch*

- When storing the unit for long periods of time, you may want to add about 15 drops of fluid to prevent the wick from drying out.

- After removing the engine from storage, add another 25 drops of fluid, letting the wick soak up the fluid for 15 minutes prior to operation.

If you experience poor or no smoke output when the smoke unit is on and has fluid, check the wick to see if it has become hard, blackened, and unabsorbent around the heating element. Remove

*Figure 6. Smoke Unit Inspection Cover*

the smoke unit inspection cover from the smoke unit's body (see Fig.6). After removing the chassis and inspection cover screws, lift the inspection plate away and inspect the wick. If it is darkly discolored and hard (see figure 7), it should be replaced.

You can obtain replacement wicks directly from the M.T.H. Parts Department.

*Figure 7. Examples of a wick in poor condition and in good condition.*

## **Locomotive Light Bulb Replacement**

To replace the light bulb in the locomotive, follow these instructions and see the diagrams below:

Remove the locomotive boiler from its chassis as shown in Figure 3. Once the body has been removed, rotate the headlight bulb counter-clockwise as seen in Figure 8 to remove.

To replace the fire box light, unplug the wires from its harness, push the bulb down through the bracket, replace and reassemble.

To replace the light in the tender, unscrew the four screws holding the tender shell on. Unplug the wires from its harness and replace the bulb, reassemble

You can obtain replacement bulbs directly from the M.T.H. Parts Department.

*Figure 8. Replacing the Headlight and the Fire Box Light*

## Self-Charging Battery Back-Up

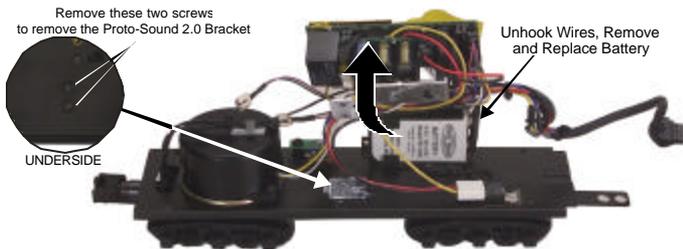
The special NiCad 7-cell 8.4v self-charging battery in this engine improves performance at any speed. It ensures that power to the sound system will remain on during directional changes, or when traveling over dirty track or switches. The self-charging battery system is automatically turned on or off whenever track power is turned on or off.

Track power (when applied) recharges the battery, which should last for up to five years, and the special NiCad battery is a dry battery that should not leak or cause any damage to your engine. However, even this special battery will eventually wear down and need to be replaced. When you notice that your engine sounds seem distorted or garbled at low voltages or become silent when power from the transformer is turned off, test the battery to determine whether it should be recharged or replaced.

Put the engine in neutral and leave the track voltage at 12 volts for 15 minutes

If the garbled or distorted sounds are reduced, the battery charge has run down and can be recharged. Do this by leaving the engine in neutral with track voltage at 12 volts for 6-7 hours so the battery can fully recharge (if your engine has a smoke unit, be sure it is turned off). Or you can remove the battery (*as shown in figure 9, below*) and charge it in any standard slow charge battery recharger, following the recharger's directions.

If the sounds are not improved at the end of the 15 minute test charge, the battery must be replaced (*as shown in figure 9, below*). Contact the M.T.H. Parts Department (phone: 410-381-2580; e-mail: [parts@mth-railking.com](mailto:parts@mth-railking.com); mail: 7020 Columbia Gateway Drive, Columbia MD 21046-1532) for a replacement battery. A standard 9v alkaline battery can be substituted until your replacement arrives, but since alkaline batteries cannot be recharged, it will eventually wear down. Do NOT use a 6-cell 7.2v battery like those found in most convenience stores.



*Figure 9. In order to easily get to the battery, temporarily remove the Proto-Sound 2.0 Boards by removing the two screws in the bottom of the tender. Replace the Battery, and reassemble in reverse.*

## **Troubleshooting Proto-Sound® 2.0 Problems**

Although Proto-Sound 2.0 has been designed and engineered for ease of use, you may have some questions during initial operation. The following table should answer most questions. If your problem cannot be resolved with this table, contact M.T.H. for assistance (telephone: 410-381-2580; fax: 410-423-0009; [service@nth-railking.com](mailto:service@nth-railking.com), 7020 Columbia Gateway Drive, Columbia MD 21046-1532).



## **Compatibility**

This engine will operate on any traditional O-31 or larger O Gauge track system, including M.T.H.'s RealTrax<sup>®</sup> or ScaleTrax<sup>™</sup> or traditional tubular track. It is also compatible with most standard AC transformers. (See page 18 for a complete list of compatible transformers and wiring instructions.)

## **Transformer Compatibility and Wiring Chart**

Note that many of the operational commands described in these instructions require a bell button, so if your transformer does not have its own bell button, you should consider adding one to get the full benefit of the system.

## **Additional Features Accessible with the DCS Remote Control System:**

While conventional mode operation of a Proto-Sound 2.0 engine yields wonderfully realistic sound and several train control features, command mode operation allows the user to access a world of command functions never before accessible to O Gauge railroaders. With the addition of the DCS Remote Control System (including a DCS remote handheld and Track Interface Unit), users gain many advanced features, including:

- **DCS Proto-Speed Control**-Establishes desired locomotive speed in scale miles per hour increments via a thumbwheel control and allows operator to set maximum speed and acceleration/deceleration rates.
- **Locomotive Lighting Control**-Independently controls locomotive headlights, marker and interior lights, and ditch lights.
- **Emergency Stop**-Single button push stops your trains (but does not turn off track power).
- **One Touch Global Mute/UnMute**-Single button mutes or unmutes all DCS-controlled locomotives' user-defined actions, including sound, lights, and smoke.
- **Proto-Dispatch Operation**-Public Address-like feature allows users to speak through locomotive speaker during operation.
- **Proto-Cast**-Allows users to play audio recordings through locomotive speaker during operation.
- **Proto-Doppler Sound Effects Set Up**-Users can configure locomotive for Doppler Operation, including setting distance points for Doppler start, repeat, and stop modes.
- **Independent Volume Control of Engine Sounds, Bell, Horn & Whistle** for each Locomotive .
- **Control up to 50 different DCS-equipped locomotives at one time with multiple TIUs.**

- Proto-Effects™ Set Up-User can select individual Proto-Effects™ operations to be active or inactive, including cab chatter, train wreck sounds, coupler sounds, and wheel clickety-clack sounds.
- Direction Control Set Up-User can set initial individual start-up direction (start in forward or reverse) for double-heading operations.
- Locomotive Consist Set-up-User can determine locomotive values for consist make-ups, allowing multiple locomotives belonging to a consist to operate together.
- Query Locomotive Information-User can query locomotive programming to learn locomotive address and engine data information, including scale miles traveled.
- User Can Query, Set and Operate Track and Accessory Interface Units for Programming Digital Command Operations for up to 250 Accessories and 250 Individual Switches.
- User Can Script, Record and Playback Train Routes.

## CAUTION: Electrically Operated Product:

Not recommended for children under 10 years of age. M.T.H. recommends adult supervision with children ages 10 - 16. As with all electric products, precautions should be observed during handling and use to reduce the risk of electric shock.

**WARNING:** When using electrical products, basic safety precautions should be followed including the following:

- Read this manual thoroughly before using this device.
- M.T.H. recommends that all users and persons supervising use examine the hobby transformer periodically for conditions that may result in the risk of fire, electric shock, or injury to persons, such as damage to the primary cord, plug blades, housing, output jacks or other parts. In the event such conditions exist, the transformer should not be used until properly repaired.
- As with all electrical appliances, this product should not be left in operation when unattended





# Service & Warranty Information

## How to Get Service Under the Terms of the Limited One-Year Warranty

For warranty repair, do not return your product to the place of purchase. Instead, follow the instructions below to obtain warranty service as our dealer network is not prepared to service the product under the terms of this warranty.

1. First, write, call or FAX M.T.H. Electric Trains, 7020 Columbia Gateway Drive, Columbia, MD 21046, (Tel 410-381-2580; FAX No.: 410-423-0009; e-mail: [service@nth-Railking.com](mailto:service@nth-Railking.com)), stating when it was purchased and what seems to be the problem. You will be given a return authorization number to assure that your merchandise will be properly handled upon its receipt.

2. CAUTION: Make sure the product is packed in its original factory packaging including its foam and plastic wrapping material so as to prevent damage to the merchandise. The shipment must be prepaid and we recommend that it be insured. A cover letter including your name, address, daytime phone number, e-mail address (if available), Return Authorization number, a copy of your sales receipt and a full description of the problem must be included to facilitate the repairs. Please include the description regardless of whether you discussed the problem with one of our service technicians when contacting M.T.H. for your Return Authorization number.

3. Please make sure you have followed the instructions carefully before returning any merchandise for service.

## Limited One-Year Warranty

All M.T.H. products purchased from an Authorized M.T.H. Train Merchant are covered by this warranty.

See our website at [www.nth-railking.com](http://www.nth-railking.com) or call 1-888-640-3700 to identify an Authorized M.T.H. Train Merchant near you.

M.T.H. products are warrantied for one year from the date of purchase against defects in material or workmanship, excluding light bulbs and traction tires. We will repair or replace (at our option) the defective part without charge for the parts or labor, if the item is returned to M.T.H. Electric Trains within one year of the original date of purchase. This warranty does not cover damages caused by improper care, handling, or use. Transportation costs incurred by the customer are not covered under this warranty.

Items sent for repair must be accompanied by a return authorization number, a description of the problem, and a copy of the original sales receipt from an Authorized M.T.H. Train Merchant, which gives the date of purchase. Call 410-381-2580, fax 410-423-0009, or e-mail the Service Department at [Service@nth-railking.com](mailto:Service@nth-railking.com) to obtain a return authorization number.

This warranty gives you specific legal rights, and you may have other rights that vary from state to state.

Service Department  
M.T.H. Electric Trains  
7020 Columbia Gateway Drive