

# LIONEL ELECTRIC TRAINS

MODEL RAILROAD ACCESSORIES

LIONEL CORPORATION TINPLATE

[www.lionelcorporation.com](http://www.lionelcorporation.com)

## 400E Steam Locomotive

### Operation Manual

### Contemporary Version



### Compatibility

This engine will operate on any traditional 42" Std Gauge track system, including M.T.H.'s traditional Std Gauge tubular track. It is also compatible with most standard AC transformers. (See page 21 for a complete list of compatible transformers, power packs, and wiring instructions.)



PFA  
Passenger/Freight  
Announcements

**PLEASE READ BEFORE USE AND SAVE**

# Table of Contents

Set-Up Checklist .....	3
Getting Started .....	3
Lubrication .....	3
Priming the Smoke Unit .....	3
Placing the Engine on the Track .....	4
<b>PS 3.0 Enhancements .....</b>	<b>5</b>
Conventional AC/DC Start-up/Shut-down .....	5
Loading Engine Firmware .....	6
LED Lighting .....	6
<b>Modes of Operation .....</b>	<b>6</b>
Conventional AC Operation .....	6
Proto-Sound® 3.0 Conventional AC Operating Instructions .....	7
Activating Proto-Sound® 3.0 Conventional AC Mode Features .....	7
Manual Volume Control .....	8
PFA .....	9
Proto-Coupler™ Operation .....	10
Speed Control .....	11
Locking Locomotive Into A Direction .....	11
Reset To Factory Default .....	12
Automatic Sound Effects .....	12
DCS Operation .....	12
<b>Maintenance .....</b>	<b>13</b>
Lubricating and Greasing Instructions .....	13
Greasing the Gearbox .....	13
Cleaning The Wheels, Tires and Track .....	14
Traction Tire Replacement Instructions .....	15
Proto-Smoke Unit Operation .....	15
LED Lighting (Engine Only) .....	16
Troubleshooting Proto-Sound® 3.0 Problems .....	17
Transformer Compatibility and Wiring Chart .....	21
Additional Features Accessible Of DCS Remote Control System .....	22
Service & Warranty Information .....	23
Limited One-Year Warranty .....	23

## CAUTION: ELECTRICALLY OPERATED PRODUCT:

Recommended for Ages 14 and up. Not recommended for children under 14 years of age without adult supervision. As with all electric products, precautions should be observed during handling and use to prevent electric shock.

## WARNING: When using electrical products, basic safety precautions should be observed, including the following:

Read this manual thoroughly before using this device.

- 1 M.T.H. recommends that all users and persons supervising use examine the hobby transformer and other electronic equipment 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 train set should not be used until properly repaired.
- 1 Do not operate your layout unattended. Obstructed accessories or stalled trains may overheat, resulting in damage to your layout.
- 1 This train set is intended for indoor use. Do not use if water is present. Serious injury or fatality may result.
- 1 Do not operate the hobby transformer with damaged cord, plug, switches, buttons or case.

This product may be protected by one or more of the following patents: 6,019,289; 6,280,278; 6,281,606; 6,291,263; 6,457,681; 6,491,263; 6,604,641; 6,619,594; 6,624,537; 6,655,640.

Rev. \_Lionel No. 400E Steam Engine 5/17/2013

# Set Up Checklist

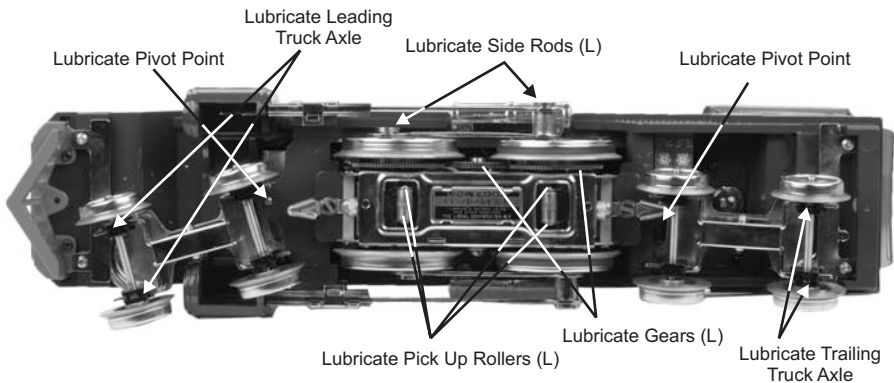
- Lubricate the engine
- Prime the Smoke Unit
- Place the engine on the track
- Apply power to run as described in the Basic Operation section of these instructions.

**You can obtain replacement parts and replacement instructions from the M.T.H. Parts Department** (Order online: [www.mthtrains.com](http://www.mthtrains.com), e-mail: [parts@mth-railking.com](mailto:parts@mth-railking.com), Fax: 410-423-0009, Phone: 410-381-2580, Mail: 7020 Columbia Gateway Drive, Columbia MD 21046-1532).

## Getting Started

### Lubricating the Engine

Lubricate all exposed moving parts before operating using a multi-purpose, plastic-compatible oil (available with M.T.H.'s Maintenance Kit, sold separately) or a light household oil. Follow the lubrication points.



*Fig. 1: Lubricating the Locomotive*

### Priming the Smoke Unit

You should prime the smoke unit with smoke fluid before operating. Add 15-20 drops of smoke fluid from the included pipette through the smokestack, then gently blow into the stack to eliminate any air bubbles in the fluid.

If you choose not to prime the unit with fluid, turn the smoke unit control located under the Locomotive to the OFF position (Full Counter Clockwise Position).

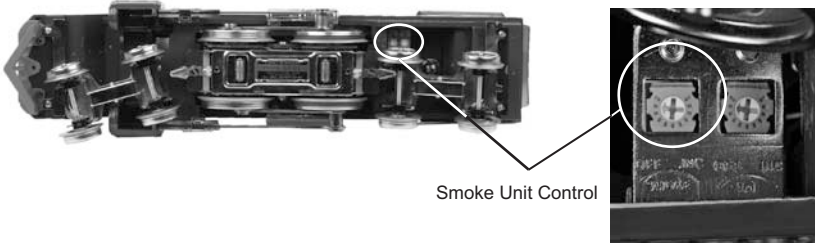
**Running the engine without a primed smoke unit may cause damage.** See the "ProtoSmoke Unit Operation" section of this book for more information on smoke unit maintenance.

Add 15-20 Drops  
Smoke Fluid



**Running the engine  
without a primed smoke  
unit may cause damage**

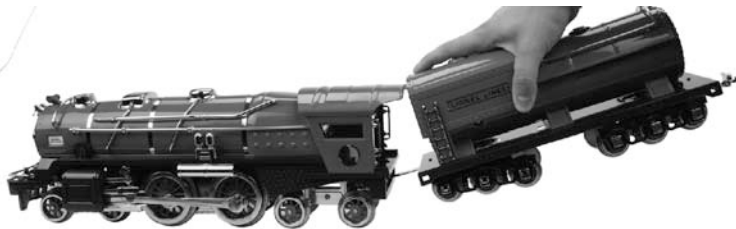
*Figure 2: Adding Smoke Fluid*



*Figure 3: Smoke Unit Control*

## Placing The Engine On The Track

To attach the engine and the tender, slide the hole in the drawbar over the pin under the rear of the cab in the locomotive. At this point you are ready to begin operating your engine.



*Figure 4: Connecting Locomotive to Tender*



*Figure 5: Connected Locomotive and Tender*

## PS 3.0 Enhancements

Here are some of the exciting changes incorporated into your new MTH Proto-Sound® 3.0 Locomotives.

### Conventional (Analog) AC/DC Start-up/Shut-down

Your new MTH PS3.0-equipped locomotive no longer has batteries. It uses Super Capacitors to hold the engine board alive for a short time when you shut off or interrupt track power. Because of this, when you first apply track power to your PS3.0-equipped O Gauge engine, you will notice the headlight comes on but nothing else. This is perfectly normal. The capacitors are charging up during this time. The wait time depends upon how long it's been since you last applied power to the engine. Typically it will take 1-15 seconds to fully charge. **NOTE: The 1-15 second charging wait time ONLY applies to conventional AC track power.**

Once the headlight shuts off, the engine will play its start-up sounds and all the lights will come back on, simultaneously. Smoke too if you have it turned on.

The capacitors hold enough charge to play the full shut-down sounds. Also, the capacitors allow you to operate your engine in conventional mode just like you would any other conventionally-controlled engine. Finally, because there are no batteries, you will notice there is no external charge jack on the engine.

### Loading Engine Firmware

Your new MTH PS3.0-equipped O-Gauge engine affords you the ability to load Engine firmware. Loader version 2.30 or later will allow you to do this. Please refer to the Loader program's instructions for more details. So, as MTH releases new features or updates you will be able to take full advantage without having to ship your favorite engine anywhere. All new updates are available on our website. MTH will make announcements as they are available. Not all updates will apply to all engines.

**NOTE: Requires a TIU w/ version 4.20 or later firmware, and requires Consumer Loader version 2.30 or later.**

## LED Lighting

Gone are the incandescent bulbs. Your new PS3.0-equipped engine has LED lighting. MTH uses various colored LEDs to simulate the correct lighting on your engines from the warm, yellow-orange colored light coming out of an old lantern on your favorite steam engine to the high-intensity halogen lamp on the latest modern diesels, LED's allow for various, correct colors. Also, they require less power and do not emit as much heat as incandescent bulbs.

The small LEDs will last a long time and are designed for replacement by the customer. Even though the headlight bulb looks like an incandescent lamp, it is not. Replacing the Screw Base Globe type LED with an incandescent bulb will cause damage to the PS3.0 circuit board.

## Modes of Operation

### Conventional AC Operation

When using conventional AC power, the engine will respond to changes in track voltage. An increase in track voltage will increase the locomotive speed and a reduction in track voltage will reduce the engine speed.

A short interruption (approximately 1 to 2 seconds) in the track voltage will cause the engine to cycle in the sequence for each track voltage interruption (neutral - forward - neutral - reverse) When power is first applied to the track, the locomotive will be silent for 1-20 seconds and the headlight will be on, indicating the super capacitors are charging (The super capacitors provide power to the sound system during direction changes or intermittent drops in track power due to dirty track or on switches, when operating in conventional mode). When the super capacitors are charged, all the lights will come on and the engine sounds will start up. There should be no movement, as the engine is in neutral. Causing a short interruption of track power by using the direction button on the transformer, or by bringing the throttle to 0 volts and back again, will change the sequence to the forward state. Then increasing the throttle will begin to move the engine forward, and speed will increase as the throttle is advanced.

If there is another interruption in track power the sequence will change to the neutral position again. The engine will remain in the neutral state until there is

another interruption in track power. The next interruption in track power will move the sequence to the reverse state. The engine will now move in the reverse direction. If the power interruption was accomplished by using the direction button and the throttle position was not changed, the engine will run in the reverse direction at the same speed that it was traveling in the forward position.

Subsequent interruptions in track power of 1-2 seconds will continue the sequence rotation. If you happen to interrupt track power for longer than about 2 seconds, the engine will begin its shut down sounds. If this occurs you can cycle the direction sequence again to get back to the direction you wish to move and once the engine starts moving its shut down sounds will stop playing (SEE PAGE 9 (direction cycle phases)).

In conventional AC operation the whistle sound, the bell sound, PFA sounds and other operational functions can be accessed if your transformer has a horn/whistle button and a bell button. By using combinations of button presses, different commands besides blowing the whistle and ringing the bell can be initiated.

## **Proto-Sound® 3.0 Conventional AC Operating Instructions**

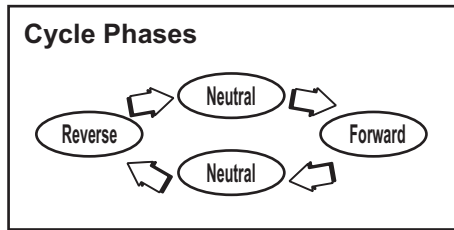
### **Activating Proto-Sound® 3.0 Conventional AC Mode Features**

**Throttle** - To increase or decrease track voltage, and therefore train speed, turn the throttle control knob. Turning clockwise will increase voltage and speed, while turning counterclockwise will decrease voltage and speed. The engine will maintain the speed you set after you release the throttle until you turn it again to change the voltage and speed.

**Bell** - To sound the bell, in an engine equipped with a 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.

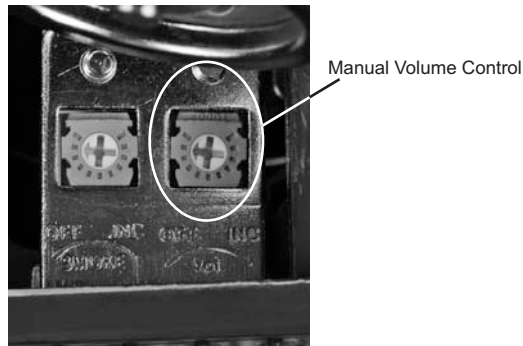
**Horn/Whistle** - To sound the whistle, firmly press the Horn/Whistle button. The whistle will sound for as long as you continue to depress the button. It will stop when you release the button.

**Direction** - Your train is programmed to start in neutral. The train will always cycle neutral-forward-neutral-reverse with each press and release of the direction button. The engine is programmed to restart in neutral each time the track voltage is turned off for 25 seconds or more.



## Manual Volume Control

To adjust the volume of all sounds made by this engine, turn the manual volume control (fig. 7) clockwise to increase the volume and counterclockwise to reduce the volume. Turning the manual volume control completely counterclockwise will turn off all of the engine sounds and announcements.



*Fig. 7: Manual Volume Control*

Proto-Sound® 3.0 features are activated by sequences of Bell and Horn 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 horn or ring the bell, you should tap the buttons very quickly with a 1/2-second pause between button presses. You may need to practice your timing to make this work smoothly.

Timing Chart				
Press Horn Short & Firm	½ Sec. Pause	Press Bell Short & Firm	½ Sec. Pause	Press Bell Short & Firm
Total Time Lapse: 1 ½ Seconds				

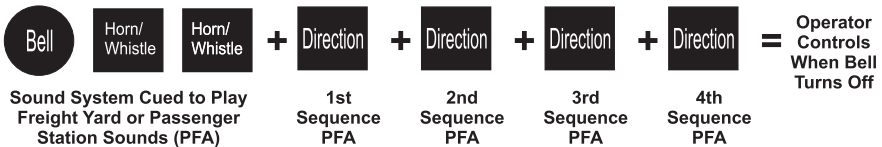
Feature to Be Activated	Button Code:
PFA (Passenger/Freight Announcements)	1 Bell, 2 Horn/Whistles
Fire the Rear Coupler	1 Bell, 3 Horn/Whistles
Fire the Front Coupler	1 Bell, 4 Horn/Whistles
Speed Control On/Off	1 Horn/Whistle, 2 Bells (from Neutral only)
Lock into a Direction	1 Horn/Whistle, 3 Bells
Reset to Factory Defaults	1 Horn/Whistle, 5 Bells (from Neutral only)



## Passenger/Freight Announcements (PFA)

Your engine is equipped with a sound package of either passenger station announcements or freight yard sounds that you can play when you pull into a station or 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 PFA sufficient time to run through each sequence.

- To cue the sound system to play the PFA, quickly but firmly tap the Bell button once followed by 2 quick taps of the Horn button while the engine is moving. Tap the buttons quickly but allow approximately 1/2 second between each press.
- Press the Direction button once to stop the engine. This will trigger the first sequence of PFA. The reverse unit is temporarily disabled so that the train will not move as you use the Direction button to trigger the sounds. Proto-Sound 3.0 has disabled operator control over the Horn and Bell buttons until the full PFA sequence is complete.
- After waiting about 30 seconds for that sequence to run, press the Direction button again to trigger the second sequence of PFA.
- After about 30 seconds, press the Direction button again to trigger the third PFA sequence.
- Again, after allowing about 30 seconds for that sequence to run, press the Direction button one more time to trigger the fourth and final PFA sequence. The PFA will continue and within a few seconds the bell will begin ringing, then the engine will begin moving 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 Horn buttons and can ring the bell or blow the Horn as usual.



## Tips on Using PFA

- You can terminate PFA at any time by turning off power to the track for 15 seconds.
- You do not have to be in Forward to use PFA. At the conclusion of the full sequence, the train will pull away from the station or yard in whatever direction you were going when you activated the feature.
- You can use PFA even if you are double-heading with another engine. If the second engine is not equipped with Proto-Sound® 3.0, you must remember not to leave the throttle at a high voltage level once you have stopped the engine to run the PFA. Otherwise, the engine without PFA will begin vibrating on the track as its motors strain to move the train, since they cannot be automatically disabled during the PFA cycle (or if an original Proto-Sound® engine, PFA are triggered differently and that engine's motor-disable feature will not be active when you run PFA in Proto-Sound® 3.0).
- PFA can be triggered from Neutral. It will operate the same as if triggered while in motion except that, at the conclusion of the PFA, the engine will depart in the next direction of travel, as opposed to the direction it was traveling before entering Neutral.

## Proto-Coupler™ Operation

The Lionel 400E is not equipped with Proto-Couplers. Although the sounds of uncoupling will play in the DCS mode and the Conventional mode, there is no related action of the couplers.

The Lionel 400E is equipped with manual latch couplers that must be coupled and uncoupled by hand.

### Rear Coupler (If Equipped):

To fire the rear coupler, quickly tap the Bell button once followed by three quick taps of the Horn button, allowing approximately 1/2 second to lapse between each quick button press. The sound of the liftbar and air line depletion will play, and the knuckle will be released.



### Front Coupler (Not Included):

To fire the front coupler (if your engine has one), quickly tap the Bell button once followed by four quick taps of the Horn button, allowing approximately 1/2 second to lapse between each quick button press. 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 3.0 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. Because the engine will run more slowly at a given throttle voltage when speed control is on than when it is off, you should adjust the throttle to a lower power level for operation with speed control off to avoid high-speed derailments. When speed control is off, the volume will drop to allow for better low voltage operation.

To turn speed control on and off, put the engine in neutral, then quickly tap the transformer's Horn button one time then quickly tap the Bell button two times, allowing approximately 1/2 second to lapse between each quick button press. Two horn blasts will indicate that the engine has made the change. Repeat the 1 horn, 2 bells code to return it to the other condition. 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.



# Locking Locomotive Into A Direction

You can lock your engine into a direction (forward, neutral, or reverse) so that it will not change 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 crawl (as slowly as it will move without halting), and quickly but firmly tap the Horn button once followed by three quick taps of the Bell button, allowing approximately 1/2 second to lapse between each quick button press. Two horn 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 horn, 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 Default

To override the settings you currently have assigned to the engine and reset it to its factory defaults, while in Neutral tap the Horn button quickly once, followed by five quick taps of the Bell button, allowing approximately 1/2 second to lapse between each quick button press. Two horn blasts will indicate that the engine has made the change.



## Automatic Sound Effects

Certain Proto-Sound® 3.0 sound effects automatically play in programmed conventional mode conditions:

- Squealing Brakes play any time the engine's speed decreases rapidly.
- Cab Chatter plays at random intervals 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.

## DCS - Digital Command System

While the acronyms are close, this is where the similarity ends between DCC and DCS. Yes they are both digital control systems. However, M.T.H. DCS is not DCC. There are several proprietary versions of DCC on the market, but DCS is not one of them. M.T.H.'s DCS System is a proven technology in the O Gauge, One Gauge, and HO Gauge markets. First the power signal in DCS is not the command signal. Next DCS employs a fully functional bi-directional communication scheme opening a vast range of advanced features and yet so simple and intuitive that you can enjoy them. No programming tracks, bits and bytes, or conversion of binary to hexadecimal numbers here. To add an engine in DCS, press "ADD ENGINE". After that, if you want to start your engine just press "START UP" or to turn the smoke unit on or off, just press "SMOKE". No combination of letters or numbers to remember.

Additional details can be found in the DCS manual that accompanies your DCS system or on the MTH Web site, [www.mthtrains.com](http://www.mthtrains.com) With DCS, you can have a whole fleet of MTH PS 3.0 engines on the rails and they will remain shut down until you command them to start up.

# Maintenance

## Lubricating and Greasing Instructions



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

Regularly lubricate all side rods, linkage components and pickup rollers to prevent them from squeaking. Use light household oil and follow the lubrication points marked "L" below. Do not over-oil. Use only a drop or two on each pivot point.

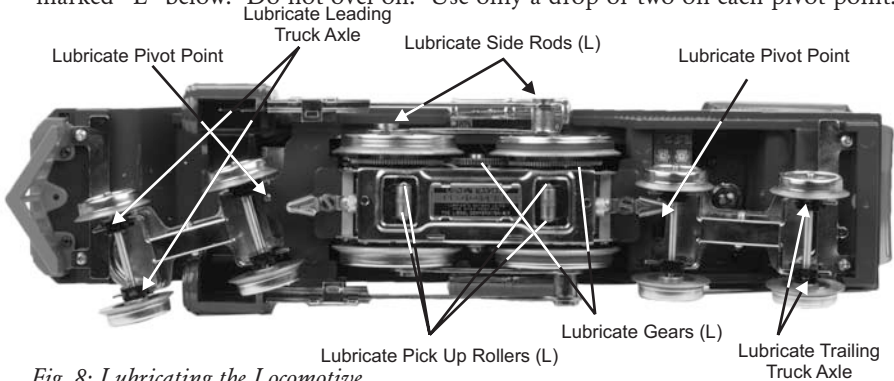


Fig. 8: Lubricating the Locomotive

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 and axles, do the following:

### Lubricating the Drive and Worm Gear

To access the gearbox you will have to remove the two knurled screws on each end of the pickup roller plate. Remove the pickup roller plate by lifting from the motor chassis. The worm gear will be accessible.

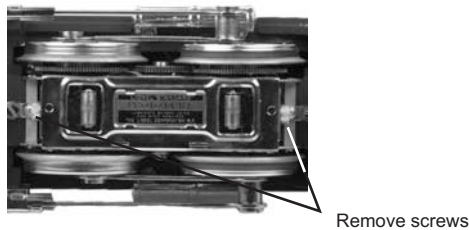


Figure 9: Removing Screws

Lubricate the Drive Gear and Worm Gear with White Lithium Grease. Make sure when replacing Contact Plate that the Plunger Pin makes contact with the Flat Contact Plate.

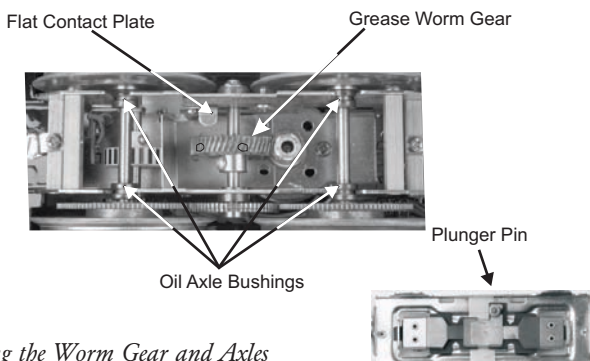


Fig. 10: Greasing the Worm Gear and Axles

## 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 (not rubbing) alcohol applied with a cotton swab.



To clean the track, use RailKing® Track Cleaning Fluid found in Maintenance Kit (30-50010) or denatured (not rubbing) alcohol and a clean rag. 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. Thereafter, keep an eye on the track and clean it when it gets dirty to ensure good electrical contact and to lengthen the life of the tires.

Clean any type of track with this heavy-duty track cleaning block (40-1099). Durable constructed from ABS plastic, the block includes a built-in cleaning pad. For really stubborn track, you can insert sandpaper into the block in just a few quick steps.



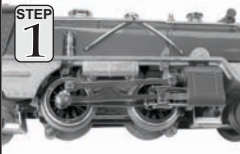
Track Cleaning Block (40-1099)



Maintenance Kit (30-50010)

# Traction Tire Replacement Instructions

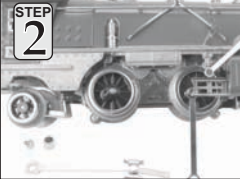
Your locomotive is equipped with two neoprene rubber traction tires on the rear set of flanged drivers. While these tires are extremely durable, they may occasionally need to be replaced.



**STEP 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. These bolts can be loosened with a 5.5 mm nutdriver.

Clean the groove using a cotton swab and denatured alcohol.



**STEP 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.
- Clean the groove using a cotton swab and denatured alcohol.
- 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.
- 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.
- 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.

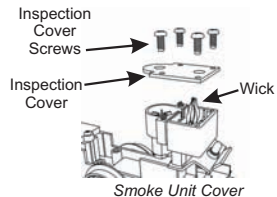
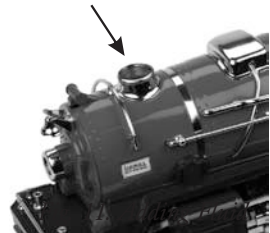
## ProtoSmoke™ Unit Operation

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. We recommend M.T.H. ProtoSmoke fluid (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.
- ! 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 control (Full Counter Clockwise Position) located under the tender body. **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.
- ! 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.

Add 15-20 Drops  
Smoke Fluid

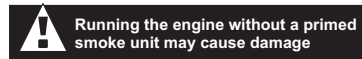


- ! After removing the engine from storage, add another 25 drops of fluid, letting the wick diminish, add another 10-15 drops of smoke fluid or turn the smoke unit off.
- ! When storing the unit for long periods of time, you may want to add about 15 drops of fluid to prevent the wick from drying out.
- ! 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 the boiler shown on Page 33 “Removing the Boiler”. Remove the smoke unit inspection cover from the locomotive's body. After removing the chassis and inspection cover screws, lift the inspection plate away and inspect the wick. If it is darkly discolored and hard, it should be replaced. When priming new wick add 40 drops.

## ProtoSmoke™ Fluid

ProtoSmoke is the recommended fluid for M.T.H. products and can be used in other manufacturers products as well. Choose from 12 different scents: Christmas, Coal, Diesel, Wood Burning, Coffee, Eggs & Bacon, Vanilla, Candy Cane, Barbeque, Pipe Smoke, Cinnamon Roll, and Apple Pie



## LED Lighting (Engine Only)

Gone are the incandescent bulbs. Your new PS3.0-equipped engine has LED lighting. MTH uses various colored LED's to simulate the correct lighting on your engines from the warm, yellow-orange colored light coming out of an old lantern on your favorite steam engine to the high-intensity halogen lamp on the latest modern diesels, LED's allow for various, correct colors. Also, they require less power and do not emit as much heat as incandescent bulbs.



# Troubleshooting Proto-Sound® 3.0 Problems

Although Proto-Sound® 3.0 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@mth-railking.com, 7020 Columbia Gateway Drive, Columbia MD 21046-1532).

## Conventional AC

Starting Up	Solution
Only my headlight comes on, nothing else.	This is normal behavior. The super capacitors are charging and this will take between 1-20 seconds. (see page 7 for more details)
When I first turn the power on, the engine will not begin to run.	This is normal behavior. To prevent accidental high-speed start-ups, Proto-Sound® 3.0 is programmed to start up in neutral anytime track power has been turned off for several seconds. See the "Basic Operation" section for more details.
The engine will not start after I press the Direction button.	You may not be sending enough power to the track to power the engine. Rotate throttle clockwise to increase track power.
Horn	Solution
I can't get the horn to blow when I press the Horn button.	You may be pressing the button too quickly. Try pressing the Horn button more slowly, taking approximately one full second to fully depress the button.
Bell	Solution
I can't get the bell to ring when I press the bell button.	You may be pressing the button too quickly. Try pressing the bell button more slowly, taking approximately one full second to fully depress the button.
Coupler	Solution
When I try to fire the coupler, PFA starts.	You are waiting too long between Horn button presses. See the timing instructions located at the beginning of the "Proto-Sound® 3.0 Operating Instructions" section.
The Proto-Coupler™ won't let the engine uncouple on the fly.	Try lubricating the coupler knuckle and rivet with a dry graphite lubricant.
The coupler does not fire or stay coupled.	The coupler needs to be cleaned. Wipe with denatured alcohol (not rubbing alcohol) and let dry.
Cab Chatter	Solution
Sometimes the Cab Chatter sounds don't play.	Cab Chatter plays only in neutral at random intervals.

<b>Lock-out</b>	<b>Solution</b>
I can't get the engine to run after I power up the transformer. It sits still with the diesel and compressor sounds running. The engine won't lock into forward, neutral, or reverse.	The engine maybe locked into the neutral position. Follow the procedure in the "Lock into a Direction" section to unlock the engine's direction. Engine speed must be below 10 scale mph (approx. 10 volts or less in conventional mode).
<b>Volume</b>	<b>Solution</b>
The sounds seem distorted, especially when the Horn or bell is activated.	Proto-Sound® 3.0 volume is set too high. Turn the volume control knob on the bottom of the chassis counter-clockwise to reduce the volume.
No Sound	Volume is set too low, adjust volume control knob on the bottom of the chassis clockwise to increase the volume or check connector to speaker.
<b>PFA</b>	<b>Solution</b>
Once in PFA, the engine doesn't go into reverse.	So that PFA effects can be as realistic as possible, Proto-Sound® 3.0 disables the reversing unit whenever PFA is enabled. This way the engine remains still at its stop as the operator cycles through the PFA sequences.
When the PFA enters its last sequence the bell automatically comes on	PFA is programmed to start ringing the bell at that point. After approximately 12 seconds, it will automatically turn off.
When PFA is enabled, pressing the whistle and bell has no effect	Because PFA must control various effects in each sequence, Proto-Sound® 3.0 takes control of these sound effects until you exit PFA
I push the direction button but the next sound clip in the sequence does not play or the engine does not come out of PFA after fourth press of the direction button.	Each PFA clip must play for aprox. 30 seconds before PFA will advance to the next step in the PFA cycle. Wait at least 30 seconds in each PFA sound clip before pressing the direction button.

<b>Start-up</b>	<b>Solution</b>
When I apply power to the track my engine doesn't do anything. No lights, no sound, nothing.	This is normal. You have to hit the Start-Up button.
	Check to see if that section of track has power. Use a voltmeter or a lit passenger car, not your tongue.
	Slide the engine a couple of feet in either direction, you may have a bad track section
	Have you got that section electrically isolated with a toggle switch or other device?
I get an error when I hit Start-Up	Have you recently changed the engine address?
	Check if there is power on that section of track the engine is sitting on (there has to be power for the signal to get to the engine and for the engine to be able to hear it)
DCS is polarity sensitive when powered by a DC power supply.	Check the polarity of the DC power supply connected to the Fixed 1 or Fixed 2 Inputs. Shut down power, reverse the inputs and repower DCS. Hitting the startup button on the DCS remote should start up the engine.
	If you have two engines on the track they both may have the same address. Take one of them off the rails and try it again
<b>Sound</b>	<b>Solution</b>
When I press the Whistle Button on my DCS remote or DCS commander the whistle doesn't blow	Check if the playable whistle is active. On the DCS Commander there will be two dashes on the right side of the LCD if it's active. Press "A1" twice to ensure it's turned off. On your DCS remote press the "SPW" button twice to ensure it's disabled
I have no sound on my engine, but my lights are on and it moves just fine	You may have it turned off. Repeatedly press VOL + to bring the Master Volume up
	Did you turn off the ENG Sounds? Press the ENG SND button on your DCS controller.
	Check that you haven't lowered any of the independent engine volumes (Eng Sounds, Bell, Whistle, or Accent)
There's a crackling sound from my engine	Check to see if a screw or some other material has lodged itself in the underside of the engine.
When I run Doppler I can hear the Doppler shift but then the engine sounds fade out and I can't get them back	This is normal. You will need to press the Doppler button again to turn Doppler off. Your engine sounds will now return to normal

<b>Smoke</b>	<b>Solution</b>
My engine isn't smoking at all	Press the smoke button, this will activate the smoke
My engine barely smokes	If you just filled it with the smoke fluid sometimes the fluid can make a seal in the stack. Blow down the stack to clear the air bubble.
	You may have set the smoke to Low. This can be changed from Low to Med to High.
	Check for an obstruction in the smoke stack
	Add 10-12 drops of smoke fluid
<b>Lights</b>	<b>Solution</b>
One of my lights is out.	Check that you haven't turned it off with the DCS controller. You have independent control over lights on your engine
None of my lights are on.	Could be the same reason as "One of my lights is out"
	Is the engine getting power? Check to see if there is voltage on the track or move the engine a few feet in either direction.
<b>Motion</b>	<b>Solution</b>
When I apply power and hit Start-up, my engine powers up but it won't move.	This is normal, dial up the speed on your DCS Remote to make your engine move.
My engine hesitates at slow speeds.	An engine may do this right out of the box if it has not been lubricated. Follow the lubrication instructions. Now go ahead and run it.
	New engines even after they are lubricated may take a little bit to get everything run in. Be a little patient and let it run for a bit. It should clear up shortly after lubricating and running.
<b>PFA</b>	<b>Solution</b>
When I enter PFA all that happens is the bell rings. What do I do?	Press the DIR button. Your engine will stop and begins the arrival sequence. Pressing the DIR button will cycle you through the next 3 PFA sequences
Why does my engine run away all by itself after the PFA is over?	This is normal. The engine will leave the station at the same speed it entered (when hit the PFA button). The speed setting can be changed after the bell stops ringing.
<b>Shut Down</b>	<b>Solution</b>
Okay, I give up. What do I have to do to shut it down?	Well, you can either remove power from the track or press or press Shut-Down. Button on the DCS Remote
<b>Lost or Unknown Address</b>	<b>Solution</b>
I can't call up my engine on the address I believe it to be set at	Delete the engine from your DCS remote, and attempt to re-add it.
	On the DCS Remote, hit Menu → System → Engine Setup → Recover Engine

# Transformer Compatibility and Wiring Chart

Proto-Sound® 3.0 is designed to work with most standard AC transformers. The chart below lists the many compatible transformers. 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. In addition, the chart details how the terminals on these transformers should be attached to your layout.

<b>RECOMMENDED AC TRANSFORMERS</b>					
<b>Transformer Model</b>	<b>Center Rail</b>	<b>Outside Rail</b>	<b>Min/Max. Voltage</b>	<b>Power Rating</b>	<b>Transformer Type</b>
MTH Z-500	Red Terminal	Black Terminal	0-18v	50-Watt	Electronic
MTH Z-750	Red Terminal	Black Terminal	0-21v	75-Watt	Electronic
MTH Z-1000	Red Terminal	Black Terminal	0-21v	100-Watt	Electronic
MTH Z-4000	Red Terminal	Black Terminal	0-22v	390-Watt	Electronic
Lionel 1032	U	A	5-16v	90-Watt	Standard
Lionel 1032M	U	A	5-16v	90-Watt	Standard
Lionel 1033	U	A	5-16v	90-Watt	Standard
Lionel 1043	U	A	5-16v	90-Watt	Standard
Lionel 1043M	U	A	5-16v	90-Watt	Standard
Lionel 1044	U	A	5-16v	90-Watt	Standard
Lionel 1053	U	A	8-17v	60-Watt	Standard
Lionel 1063	U	A	8-17v	60-Watt	Standard
Lionel LW	A	U	8-18v	75-Watt	Standard
Powermaster	U	A	8-18v	135VA	Electronic
All-Trol	Left Terminal	Right Terminal	0-24v	300-Watt	Electronic
Dallee Hostler	Left Terminal	Right Terminal			Electronic
Lionel LW	A	U	8-18v	75-Watt	Standard
Lionel KW	A or B	U	6-20v	190-Watt	Standard
Lionel MW	Outside Track Terminal	Inside Track Terminal	5-16v	50V.A.	Electronic
Lionel RS-1	Red Terminal	Black Terminal	0-18v	50V.A.	Electronic
Lionel RW	U	A	9-19v	110-Watt	Standard
Lionel SW	U	A	Unknown	130-Watt	Standard
Lionel TW	U	A	8-18v	175-Watt	Standard
Lionel ZW	A,B,C or D	U	8-20v	275-Watt	Standard
Lionel Post-War Celebration Series ZW	A,B,C or D	Common	0-20v	135/190 Watt	Electronic

## **Additional Features Accessible With The DCS Remote Control System**

(Additional equipment required)

While conventional mode operation of a Proto-Sound® 3.0 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
- ProtoSmoke™ Variable Output Control - Controls how much smoke each engine outputs and matches smoke to locomotive speed
- Locomotive Lighting Control - Controls locomotive headlights, marker and interior lights, beacon lights, ditch lights, and MARS lights
- Emergency Stop-Single button push stops all Proto-Sound® 2.0 and Proto-Sound® 3.0 engines but does not turn off the input power to the TIU
- One Touch Global Mute/UnMute-Single button mutes or unmutes all DCS-controlled locomotives' sounds
- 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, and Accent Sounds for each Locomotive
- Control up to 99 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, 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

# Service & Warranty Information

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

When you suspect an item is defective, please check the operator's manual for standard operation and troubleshooting techniques that may correct the problem. Additional information may be found on the M.T.H. Website. Should you still require service, follow the instructions below to obtain warranty service. First, e-mail, write, call or fax a M.T.H. Authorized Service Center (ASC) in your area to obtain Repair Authorization. You can find the list of ASCs on the M.T.H. Website, [www.mthtrains.com](http://www.mthtrains.com). Authorized Service Centers are required to make warranty repairs on items sold only from that store; all other repairs may- or may not be done at the store's own discretion. If you did not purchase the item directly from the ASC, you will need to select a National Authorized Service Center (NASC). These centers are compensated by M.T.H. to perform warranty service for any customer whose repair qualifies for warranty service. A list of NASC retailers can be located on the M.T.H. Website or by calling 410-381-2580. Should the warranty no longer apply, you may choose either an ASC or NASC retailer to service your M.T.H. Product. A reasonable service fee will be charged.

**CAUTION:** Make sure the product is packed in its original factory packaging including its foam and plastic wrapping material to prevent damage to the merchandise. There is no need to return the entire set if only one of the components is in need of repair unless otherwise instructed by the Service Center. 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 (if required by the service center, 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 a service technician when contacting the Service Center for your Return Authorization.

Please make sure you have followed the instructions carefully before returning any merchandise for service. Authorized M.T.H. Service Centers are independently owned and operated and are not agents or representatives of M.T.H. Electric Trains. M.T.H. assumes no responsibility, financial or otherwise, for material left in their possession, or work done, by privately owned M.T.H. Authorized Service Centers.

If you need assistance at any time email MTH Service at [service@mth-railking.com](mailto:service@mth-railking.com), or call 410 381-2580.

## Limited One-Year Warranty

All M.T.H. products purchased from an M.T.H. Authorized Retailer are covered by this warranty provided the product was manufactured within five years of the date of purchase. This warranty is for the original purchaser and is non-transferable.

See our website [www.mthtrains.com](http://www.mthtrains.com) to identify an M.T.H. Authorized Retailer near you.

M.T.H. products may be registered online in advance of warranty work at [www.mthtrains.com/warranty](http://www.mthtrains.com/warranty). The original sales receipt and the conditions below must be met regardless of whether the product is registered on the M.T.H. website in order to obtain warranty service.

M.T.H. products manufactured within five years from the date of purchase are warrantied for one year against defects in material or workmanship, excluding wear items such as light bulbs, pick-up rollers, batteries, smoke unit wicks, and traction tires. We will repair, replace, or credit (at our option) the defective part without charge for the parts or labor if the following conditions are met: (1) the item is returned to an M.T.H. Authorized Service Center\* (ASC) or M.T.H. National Authorized Service Center (NASC) or M.T.H. Electric Trains Service Department, (2) was manufactured within the previous five years and (3) was purchased within one year of the original date of purchase from an M.T.H. Authorized Retailer. Products manufactured after the five year cutoff from the date of purchase are not covered under any warranty by M.T.H. Electric Trains. The manufacture date of an item can be verified on the item's detail page "shipping date field" on the M.T.H. website ([www.mthtrains.com](http://www.mthtrains.com)). 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 M.T.H. Authorized Retailer**, which gives the date of purchase. If you are sending this product to an Authorized Service Center, contact that Center for their return authorization.

This warranty gives you specific legal rights, and you may have other rights that vary from state to state. Specific questions regarding the warranty may be forwarded to M.T.H. Directly.

\* Authorized Service Centers (ASC) are only obligated to provide warranty service for any consumer who has purchased the specific M.T.H. item from them that requires service work.

Service Department:  
M.T.H. Electric Trains  
7020 Columbia Gateway Drive  
Columbia MD 21046-1532