



GG-1 Electric Engine

OPERATOR'S MANUAL (3V PS-2)

Compatibility

This locomotive is capable of operating on AC or DC output power supplies (See page 22 & 23 for a complete list of compatible transformers and wiring instructions.) and indoors or outdoors. MTH does not recommend operating the locomotive in inclement weather and strongly suggests that it not be left out in the elements. The locomotive will negotiate an R2 G-Gauge curve track or switch. Additional features may be utilized when controlling the engine with MTH's Digital Command System (DCS).



Passenger Station Announcement

PLEASE READ THIS MANUAL BEFORE USE AND SAVE
WWW.MTHTRAINS.COM

Table of Contents

Set Up Checklist.....	3
Lubrication.....	3
Checking the Battery.....	3
Basic Operation.....	4
Pantograph Installation.....	4
Basic Operations.....	5
AC Operations.....	6
Volume Control.....	7
Automatic Operating Pantographs.....	7
Conventional/ Command Mode.....	8
Classification/Marker Lights.....	10
Proto-Sound 2.0 Operating Instructions.....	11
Activating Proto-Sound 2.0 Conventional Mode Features.....	11
Freight Yard Sounds (FYS)/ Passenger Station Announcements (PSA).....	11
Proto-Coupler™ Operation.....	12
Speed Control.....	13
Locking Locomotive Into A Direction.....	13
Reset To Factory Default.....	14
Automatic Sound Effects.....	14
Maintenance.....	15
Lubricating and Greasing Instructions.....	15
Cleaning The Wheels, Tires and Track.....	16
Traction Tire Replacement Instructions.....	16
Headlight Replacement Instructions.....	17
Self Charging Battery Back-Up.....	18
Troubleshooting Proto-Sound® 2.0.....	19
Transformer Compatibility and Wiring Chart.....	22
Recommended DC Power Supplies.....	23
Additional Features Accessible with the DCS Remote Control System.....	24
Service & Warranty Information.....	25

CAUTION: ELECTRIC TOY:

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.

Set Up Checklist

- Lubricate the locomotive
- Prime the smoke unit
- Check to see whether the battery needs to be charged for full sound effects
- Apply power to run as described in the Basic Operating Section of this manual

Lubrication

You should lubricate the engine to prevent it from squeaking. Use light household oil and follow the lubrication points marked "L" in Fig. 1. Do not over-oil. Use only a drop or two on each pivot point.



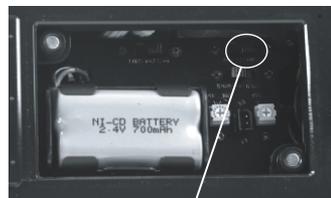
Figure 1. Lubrication Points on the Locomotive

Checking the Battery

You may find, if your locomotive was built several months before you set it up, that the rechargeable battery has run down and needs to be charged before operating. If you notice that the sounds are garbled, test and charge the engine as described in the "Self-Charging Battery Back-Up" on page 18.

Pantographs

WARNING: The Automatic Operating Pantographs must be unlatched or the on-off switch must be set to OFF before power is applied to the engine.



Pantograph On-Off Switch

Figure 1a. Pantograph On-Off Switch

Pantograph Installation

The pantographs are packed in the compartments in the top of the styrofoam box lid. One pantograph is stored in each of the compartments in the lid. Carefully remove the pantographs from the compartments and install them on the top of the body shell. Please note that each pantograph has two small arms extending from the bottom. These arms are used to raise and lower the pantographs. To insure proper operation the arms must position between the 2 sliding blocks that can be seen in the slots on the top of the body shell.

To install the pantographs, place the engine on the track and apply power. If you are using the MTH DCS system you will need to initiate the start up function. After the pantograph motors go through the initialization the sliding blocks for the rear pantographs should be apart. If they are not completely separated, move the blocks away from each other using a small jeweler's screwdriver, then install the pantograph as described below.

Installation

To install the rear pantograph, gently collapse one of the pantographs and place it in the location for the rear pantograph. Be sure that the small arms on the bottom of the pantograph fit in between the slots between the sliding blocks, then align the center pin and the four insulators, before applying downward pressure to seat the pantograph in place. The rear pantograph should now be at maximum height. If not the hold down latch may be engaged. To disengage the hold down latch, hold on to the base of the pantograph and gently pull up on the contact slider.

To install the front pantograph reverse the direction of the engine (using the control transformer, power pack or the DCS Remote) so that the rear pantograph collapses. Then make sure the sliding blocks for the front pantograph are spread apart and install the front pantograph using the same procedure as the rear pantograph.

If the pantographs are installed properly, at each direction change the down pantograph will raise and then the raised pantograph will lower. This insures that at least one pantograph is in contact with the overhead catenary. This is important if you are operating using catenary power. If both pantographs loose contact with the catenary the engine will loose power.

Basic Operation

DC Operation

Features such as the bell, horn, coil coupler etc; can not be accessed when using a DC type power supply.

Apply power to the engine by increasing the throttle so that the track voltage is approximately 8 volts. At this point the engine will power up, but will not move. Slowly increase the throttle and the engine will begin to move.

Direction changes can be made by switching the direction button without adjusting the throttle. When the direction switch is changed the engine will slow down, stop, then gradually speed up in the opposite direction to the previous throttle setting. The throttle can be changed during this operation to adjust the speed. Or the throttle can be used to reduce the track voltage until the engine stops, then change the direction switch and increase throttle to the desired speed.

DCS Operation

The engine can be operated with the DCS System using either AC or DC input voltage.

All features and functions are available in the DCS mode with either input voltage.

DCS Polarity Switch

When operating in the DCS mode the engine must be oriented so that the rail with the DC + or the AC High is making contact with the wheel on the left side of the locomotive.

Since this would limit the engine facing one direction all of the time, MTH has incorporated a DCS Polarity switch. As a result the engine does not have to always face the same direction based on the track wiring.

Make sure that the DCS Polarity switch is in the correct position before attempting to add the engine to the DCS Remote.

If the DC + or the AC High is wired to the rails on the left side of the engine, the DCS Polarity switch should be in the forward position.

If the DC + or the AC High is wired to the rails on the right side of the engine, the DCS Polarity switch should be in the position towards the rear of the engine.

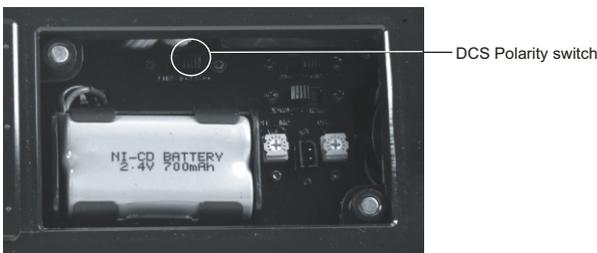


Figure 2

AC Operation

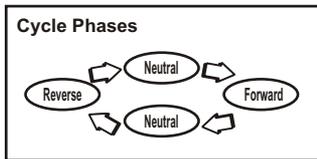
The Throttle knob controls how fast your train will travel. Turn the throttle knob up 1/2-way, until the engine lights shine bright. Put the engine into motion by pressing the Direction button on your transformer once. (hold it for approximately 1 second)

If the engine does not begin to move as soon as you firmly press the Direction button, you may not have sent enough voltage to the track to make the train move. Turn the throttle up a bit higher until the train begins to move.

Basic Operation

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 Horn/whistle, firmly press the Horn/Whistle button. The horn or 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 Control

The Manual controls are located under removable roof hatch

Manual Volume Control

To adjust the volume of all sounds made by this engine, turn the manual volume control knob (shown below) clockwise to increase the volume and counter-clockwise to decrease the volume.

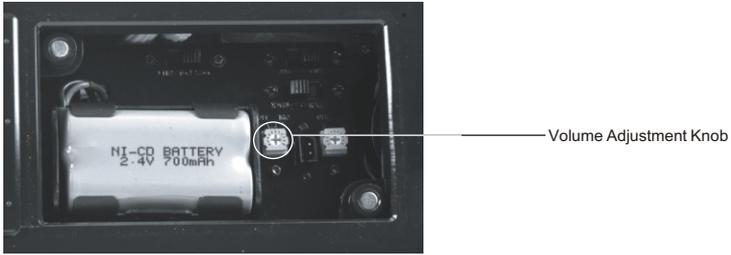


Figure 3. Manual Volume Adjustment Knob

Automatic Operating Pantographs

Your MTH electric type engine is equipped with Automatic Operating Pantographs. The Automatic Operating Pantographs must be unlatched before power is applied to the engine. To unlatch the pantographs, hold the base of the pantograph and gently pull up on the contact slider.

The rear pantograph should open to its full height. The front pantograph should rise slightly to unlatch, but remain collapsed.

Power Selection

The Automatic Operating Pantographs can be used to obtain power AC or DC from an overhead cantenary system. In order to obtain power from an operating overhead cantenary move the selector switch from the track position to the pantograph position as shown in figure 4.

To insure good conductivity of the pantograph, the blackening on the top of the contact slide should be removed. This can be accomplished by using a track cleaning pad to remove the blackening.

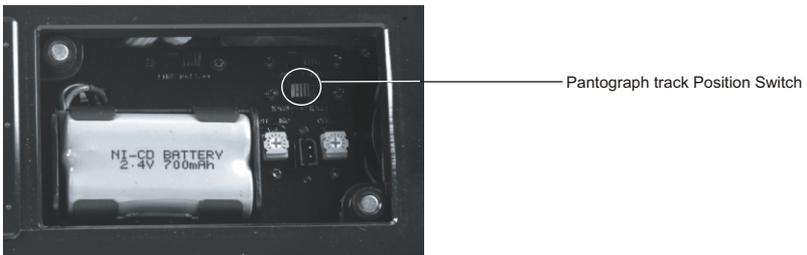


Figure 4

Conventional Mode

When power is applied in conventional mode the pantographs will go through an orientation check. This will make sure that the rear pantograph is raised and the front pantograph is lowered.

When the direction of the locomotive is reversed the front pantograph will rise, then the rear pantograph will lower. This is to insure that at least one of the pantographs is in contact with the cantenary at all times. This action takes place in the neutral state. When the engine is moving, the trailing pantograph on the engine should be up and the leading pantograph should be down.

The pantographs will alternately rise and lower with each direction change of the locomotive. The “F” printed on the side of the locomotive shell denotes the front of the locomotive

Command Mode- Automatic Operation

The pantographs can be operated automatically or manually when using the M.T.H. DCS Digital Command System. The START UP function must be initiated for the pantographs to operate in command mode. After the startup function has completed, the pantographs will go through an orientation check. This will make sure that the rear pantograph is raised and the front pantograph is lowered.

When the direction of the locomotive is reversed the front pantograph will rise, then the rear pantograph will lower. This is to insure that at least one of the pantographs is in contact with the cantenary at all times when cantenary power is used..

Every time the direction button is pushed, the pantographs will alternately rise and lower.

Command Mode- Manual Operation

Using the DCS handheld, each pantograph can be raised and lowered individually by pressing appropriate softkeys (buttons S1 through S5).

Softkey Operation for Operating Pantograph Engines

New Softkeys displayed when an operating pantograph engine is loaded into the remote are as follows (requires Remote code version 3.10 or higher):

FBS – This plays the Boiler Start-up sound
FPR – This plays the Pressure Release sound. The Pressure Release sound is timed to run with the smoke unit and will run at a random duration each time this softkey is pressed

MAN – This selects Manual mode for operating the pantographs. See the F and R descriptions on the next page.

Conventional Mode

WhenF -- Commands the front pantograph up. If it's already up this button will not do anything

F ↓ - Commands the front pantograph down. If it's already down this button will not do anything

R ↑ - Commands the rear pantograph up. If it's already up this button will not do anything

R ↓ - Commands the rear pantograph down. If it's already down this button will not do anything

Auto – This commands the pantographs to run in Automatic mode. In this mode the pantographs will operate based on the direction the engine is running. Every Direction button press on the DCS remote handheld or an AC transformer will cause the pantographs to change their orientation. NOTE – The default operation of the operating pantographs is Auto mode. Also, the default orientation of the pantographs is that when the engine is in the forward direction the rear pantograph is up and the front one is down.

IMPORTANT – Ensure your pantographs are NOT locked down like they would be for shipment prior to pantograph operation.

Manual operation using DCS requires DCS Software Version 3.1 which can be downloaded for FREE from . DCS systems using software versions 3.0 or earlier will only have automatic pantograph operation when running under DCS command mode.

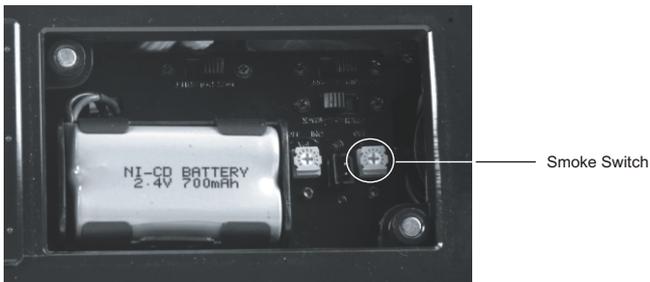


Figure 5

If you are using the pantographs for picking up power from an operating overhead centenary system in lieu of track power through the center rail pickup rollers, be sure that at least one of the pantographs is in contact with the cantenary at all times. If both pantographs lose contact with the overhead cantenary, the engine will lose power and not operate until one of the pantographs remakes contact with the cantenary or the selector switch is moved back to the track position.

Classification / Marker Lights

Your MTH GG-1 is equipped with bi-color LEDs for the classification and marker lights. The leading end of the engine will display green classification lights and the trailing end of the engine will display red marker lights. When the direction of the engine is changed the color of the lights will change accordingly.

Smoke Unit

Your MTH GG-1 is equipped with a smoke unit to simulate the steam exhaust from the onboard steam generator used for heating the passenger cars. Unlike the MTH Gauge 1 steam and diesel locomotives smoke units, which have a constant smoke output, the GG-1, smoke unit has intermittent smoke output.

After power is applied to the engine in conventional mode and after the START UP sequence in DCS mode, there is burst of steam and the sound of the boiler being lighted.

When the engine has sitting idle for awhile and while the engine is running there will be random busts of steam expelled. This simulates the safety valve on the boiler opening to release pressure so the boiler does not become over pressurized.

Proto-Sound® 2.0 Operating Instructions

This manual contains the operating instructions for Proto-Sound 2.0 in conventional mode only using AC and DC track power. Instructions for accessing DCS command mode features accompany the DCS Remote Control System equipment.

Activating Proto-Sound 2.0 Conventional Mode Features With AC Track Power:

Proto-Sound 2.0 features are activated by sequences of Bell and Horn/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 horn/ whistle 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 Whistle Short & Firm	1/2 Sec. Pause	Press Bell Short & Firm	1/2 Sec. Pause	Press Bell Short & Firm
Total Time Lapse: 1 1/2 Seconds				

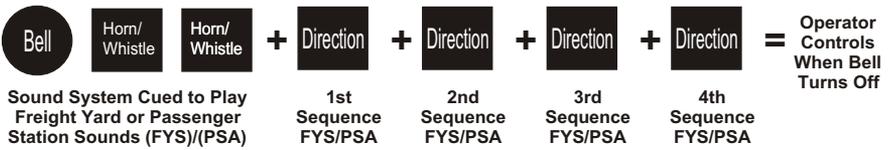
Feature to Be Activated	Button Code:
Freight Yard or Passenger Station Sounds	1 Bell, 2 Horn/Whistles
Fire the Rear Coupler	1 Bell, 3 Horn/Whistles
Fire the Front Coupler	1 Bell, 4 Horn/Whistles
Speed Control On/Off	1 Horn/Whistle, 2 Bells (from Neutral only)
Lock into a Direction	1 Horn/Whistle, 3 Bells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

Freight Yard Sounds (FYS) or Passenger Station Announcements (PSA):

Your engine is equipped with a sound package of either freight yard or passenger station sounds that you can play. **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/PSA sufficient time to run through each sequence.**

- To cue the sound system to play the FYS/PSA, quickly but firmly tap the Bell button once followed by 2 quick taps of the Horn/Whistle 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 FYS/PSA. 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 Horn/Whistle and Bell buttons until the full FYS/PSA sequence is complete.
- After waiting about 30 seconds for that sequence to run, press the Direction button again to trigger the second sequence of FYS/PSA.
- After about 30 seconds, press the Direction button again to trigger the third FYS/PSA 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 FYS/PSA sequence.

- The FYS/PSA 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 Horn/Whistle buttons and can ring the bell or blow the horn/whistle as usual.



Tips on Using FYS/PSA

- You can terminate FYS/PSA at any time by turning off power to the track for 15 seconds.
- You do not have to be in Forward to use FYS/PSA. 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/PSA even if you are double-heading with another engine. If the second engine is not equipped with Proto-Sound 2.0, you must remember not to leave the throttle at a high voltage level once you have stopped the engine to run the FYS/PSA. Otherwise, the engine without FYS/PSA will begin vibrating on the track as its motors strain to move the train, since they cannot be automatically disabled during the FYS/PSA cycle (or if an original Motor-Sound engine, FYS/PSA are triggered differently and that engine's motor-disable feature will not be active when you run FYS/PSA in Proto-Sound 2.0).
- FYS/PSA can be triggered from Neutral. It will operate the same as if triggered while in motion except that, at the conclusion of the FYS/PSA, the engine will depart in the next direction of travel, as opposed to the direction it was traveling before entering Neutral.

Proto-Coupler™ Operation

This locomotive is equipped with one or more coil-wound Proto-Couplers for remote uncoupling action. Because Proto-Couplers are controlled through the Proto-Sound 2.0 microprocessor, they do not require an uncoupling track section or modification to your layout to function. You can fire a coupler from neutral or while in motion. Use the code shown below (and in the chart on page 6) to fire the coupler(s).

Rear Coupler:

To fire the rear coupler, quickly tap the Bell button once followed by three quick taps of the Horn/Whistle 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:

To fire the front coupler (if your engine has one), quickly tap the Bell button once followed by four quick taps of the Horn/Whistle 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.

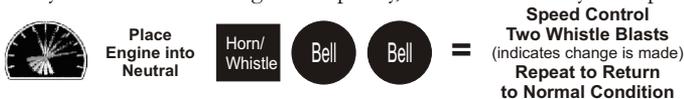


Speed Control:

M.T.H. engines equipped with Proto-Sound 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. 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/whistle button one time then quickly tap the Bell button two times, allowing approximately 1/2 second to lapse between each quick button press. Repeat the 1 horn/whistle, 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.



Lock 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/Whistle 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/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 horn/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 tap the Horn/Whistle 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/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 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.

Operation With DC Track Power

The bell, the whistle, the Proto Coupler, PSA / FYS and other Proto-Sound 2.0 features are not accessible when using DC track power in the conventional mode. The chuffing sound will operate according to the speed of the locomotive. The direction of the locomotive is controlled by the track voltage polarity. Raising the track voltage to 8 - 9v will power up the electronics in the engine. After the engine has gone through the START UP sequence, slowly increase the throttle setting to your desired speed. If the power is raised too quickly or if a voltage greater than 10v DC is applied to the engine at power up the engine will not move. This is to prevent a runaway engine in the event of an instantaneous power interruption.

If the engine is not going in the desired direction, is in conflict with the direction of other engine on your track, you can reverse the direction of the MTH GG-1 by changing the position of the DCS Polarity switch, located under the removable roof hatch.

Once you have the engine's direction orientated to your operation, regular direction changes can be initiated by changing the position of the direction button on the DC power pack.

When the switch position of the direction switch on the power pack is changed, the engine will slowly coast to a stop, and then accelerate in the opposite direction to the speed dictated by the track power.

If you desire, the track voltage can be reduced by using the throttle setting until the engine stops, then change the position of the direction switch on the DC power pack, then slowly increase the throttle setting to your desired speed.

Maintenance

Lubricating and Greasing Instructions

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

Regularly lubricate all axles and pickup rollers to prevent squeaking. Use light household oil, such as that found in M.T.H.'s maintenance kit. Do not over oil. Use only a drop or two on each pivot point.



Body Mount Screws

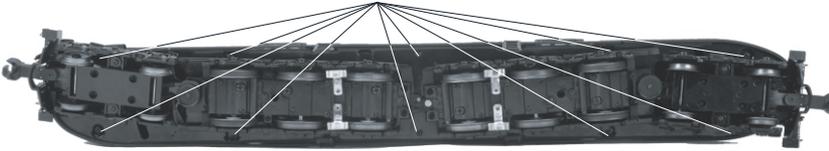


Figure 6. Body Removal Screw Locations

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. Follow the greasing instructions below. Note that in some tightly packed engines you may need to move internal components temporarily in order to access the gears.

1. To access the gear box, remove the cab from the chassis by unscrewing the body mount screws as seen in Figure 64 and lifting the cab from the chassis.
2. Once the cab is removed, remove the trucks by unscrewing the black Phillips motor mount screw located on the underside of the drive trucks (see Fig. 6).
3. Once the motor mount screw has been removed, pull the motor away from the truck block and lightly coat the motor worm gear and bronze drive gear (in the truck block) with grease.
4. Reassemble the truck and motor, being careful not to pinch any wires between the truck block and motor mount.
5. After repeating the procedure for the other motor, reassemble the chassis and body, being careful that the wire harnesses are not caught between the chassis and body, and reinstall the body mount screws.

Lubricate the outside truck block idler and drive gears with grease. Use the diagram shown in Figure 7 below as a guide and add grease to the points marked.

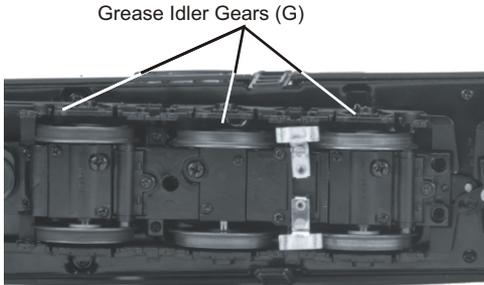


Figure 7. Greasing The Idler Gears

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). Durably 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)

Headlight Replacement Instructions

The locomotive's headlight is controlled by a constant voltage circuit in the engine. The headlight is easy to remove and replace when it burns out. The bulb has a quick disconnect plug that attaches the bulb harness to a connector terminal inside the body shell.

Replacement bulbs are available directly from the M.T.H. Parts Department. (Order online: www.mth-railking.com, e-mail: parts@mth-railking.com, Fax: 410-423-0009, Phone: 410-381-2500, Mail: 7020 Columbia Gateway Drive, Columbia MD 21046-1532,).

Follow the body removal instructions found in the Lubrication and Greasing Instructions.

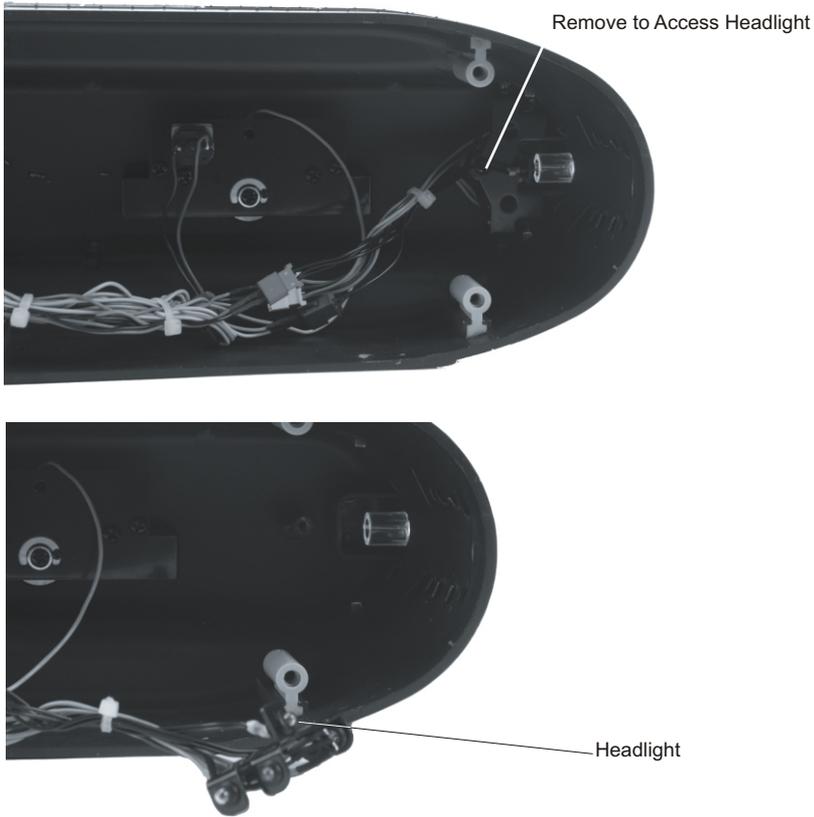


Figure 8. Removing the Headlight

Self Charging Battery Back-up

The special NiCad 2.4v self-charging battery recharges continuously during train operation and should last for up to five years. The battery is a dry battery that should not leak or cause any damage to your engine. Depending upon when your engine was built, it may need to be charged right out of the box. If 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.

Test: Put the engine in neutral and leave the track voltage at 10-12 volts (high enough for the lights to shine brightly) for 15 minutes.

Recharge: If the sounds are improved at the end of the 15-minute test charge, the battery charge has run down and can be recharged. There are a number of ways you can do this:

- Leave the engine in neutral with track voltage at 10-12 volts for 6-7 hours so the battery can fully recharge (if your engine has a smoke unit, be sure it is turned off).
- Use M.T.H.'s battery charger (Item 50-1019 sold separately) that plugs into a wall outlet and a special port under the engine to recharge the battery overnight without leaving it on the track.

Replace: If the sounds are not improved at the end of the 15-minute test charge, it is time to replace the battery. Available through M.T.H. Parts.

DO NOT substitute alkaline batteries for these NiCad batteries. Using alkaline batteries in this system can result in damage to the PS 2.0 circuit board and/or the batteries.

****Do not use alkaline batteries for testing or checking purposes for the 3-Volt PS2 boards. Using alkaline batteries will damage the 3-Volt battery charging circuit.****

Battery Charger Port

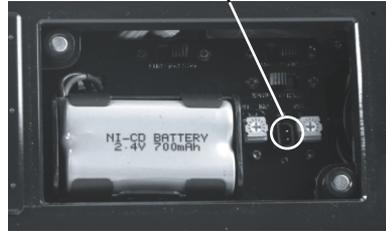


Figure 9. Battery Charger Port location.

Disconnect Battery And Slide Out Of Bracket



Figure 10. Battery Location.

Troubleshooting Proto-Sound® Problems With AC Track Power

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 (www.mth-railking.com, e-mail: parts@mth-railking.com, Fax: 410-423-0009, Phone: 410-381-2500, Mail: 7020 Columbia Gateway Drive, Columbia MD 21046-1532,).

Starting Up	Remedy
When I first turn the power on, the engine will not begin to run. I have to turn the throttle off and then on again to get the engine to operate.	This is normal behavior. To prevent accidental high-speed start-ups, Proto-Sound 2.0 is programmed to start up in neutral anytime track power has been turned off for several seconds.
Whistle/Horn	Remedy
When I press the whistle/horn button, the bell comes on instead.	Reverse the transformer leads.
I can't get the horn to blow when I press the whistle button.	You may be pressing the button too quickly. Try pressing the whistle/horn button more slowly, taking approximately one full second to fully depress the button.
Bell	Remedy
When I press the whistle button, the bell sounds.	Reverse the transformer leads.
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.
The bell won't work on a separate bell button.	Check the wiring of the separate button.
Coupler	Remedy
When I try to fire the coupler, FYS/PSA starts.	You are waiting too long between whistle button presses.
The Proto-Coupler won't let the engine uncouple on the fly.	Try lubricating the coupler knuckle with a dry graphite lubricant. Do NOT use oil.
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	Remedy
Sometimes the Cab Chatter sounds don't play.	Cab Chatter plays only in neutral at random intervals.
Lock-out	Remedy
I can't get the engine to run after I power up the transformer. It sits still with the engine sounds running.	The engine is locked into the neutral position. Follow the procedure in the "Lock into a Direction" section.
The engine won't lock into forward, neutral, or reverse.	Engine speed must be below 10 scale mph (approx. 10 volts or less in conventional mode).
Volume	Remedy
The sounds seem distorted, especially when the whistle or bell is activated.	Proto-Sound 2.0 volume is set too high. Turn the volume control knob on the bottom of the chassis counter-clockwise to reduce the volume.
Battery	Remedy
The engine will not leave the initial neutral setting.	Check to be sure the battery is installed and fully charged. See the "Self-Charging Battery Back-Up" section.
I get no sounds when the engine shifts between directions.	The battery may be dead or need to be charged. See the "Self-Charging Battery Back-Up" section.
After I turn off my transformer, my engine continues to make sounds before quitting.	Proto-Sound 2.0 is designed to continue to sound for a few seconds after power to the track has been shut off.
FYS/PSA	Remedy
The FYS/PSA sounds occasionally repeat themselves.	Proto-Sound 2.0 has a built-in random number generator that randomly selects each sound clip to play. Because there are a limited number of sound clips available in each FYS/PSA sequence, it is probable that some of these sound clips will be repeated from time to time.

FYS/PSA	Remedy
Once in FYS/PSA, the engine doesn't go into reverse.	So that FYS/PSA effects can be as realistic as possible, Proto-Sound 2.0 disables the reversing unit whenever FYS/PSA is enabled. This way the engine remains still at its stop as the operator cycles through the FYS/PSA sequences.
When the FYS/PSA enters its last sequence the bell automatically comes on.	FYS is programmed to start ringing the bell at that point. After approximately 12 seconds it will automatically turn off.
When FYS/PSA is enabled, pressing the whistle and bell buttons has no effect.	Because FYS must control various effects in each sequence, Proto-Sound 2.0 takes control of these sound effects until you exit FYS/PSA.
I push the direction button but the next sound clip in the sequence does not play or the engine does not come out of FYS/PSA after fourth press of the direction button.	Each FYS/PSA clip must play for approx. 30 seconds before FYS/PSA will advance to the next step in the FYS/PSA cycle. Wait at least 30 seconds in each FYS/PSA sound clip before pressing the direction button.

Transformer Compatibility and Wiring Chart

Proto-Sound 2.0 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.

RECOMMENDED AC TRANSFORMERS					
Transformer Model	Center Rail	Outside Rail	Min/Max. Voltage	Power Rating	Transformer Type
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

* Conventional Mode Only

Recommended DC Power Supplies

Proto-Sound 2.0 is designed to work with most standard DC power supplies and AC transformers. The following charts lists the recommended DC and AC transformers. Note that many of the AC operational commands described in these instructions require a bell button, so if your AC 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. DC transformers employing PWM (pulse width modulation) should not be used with the separately sold DCS system.

Transformer Model	Min/Max. Voltage	Power Rating	Transformer Type
MRC Controlmaster 20	0-20v	100 Watt	Electronic
PH Hobbies PS5	0-20v	100 Watt	Electronic
PH Hobbies PS10G	0-20v	180 Watt	Electronic
BridgeWorks Mag-15	0-24v	300 Watt	Electronic
BridgeWorks Magnum 200	0-24v	300 Watt	Electronic
BridgeWorks Magnum 400	0-24v	300 Watt	Electronic
BridgeWorks Magnum 1000	0-24v	300 Watt	Electronic
LGB Jumbo 50101	0-24v	240 Watt	Electronic

Additional Features Accessible With The DCS Remote Control System

(Additional equipment required)

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
- 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 trains but does not turn off the 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, 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 M.T.H. Electric Trains or 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.mth-railking.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) or contact M.T.H. Electric Trains directly. NASC Dealers 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, or call 410 381-2580.

Limited One-Year Warranty

All M.T.H. products purchased from an Authorized M.T.H. Retailer are covered by this warranty. See our Website to identify an Authorized M.T.H. Retailer near you.

M.T.H. products are warranted for one year from the date of purchase 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 replace or credit (at our option) any defective item with a manufactured suggested retail price of \$279.95 or less (excluding all motive power and electronic items), if the item is returned to an M.T.H. Authorized Service Center (ASC) or M.T.H. National Authorized Service Center (NASC) within one year of the original date of purchase. For any item with an MSRP greater than \$279.95 (including all motive power and electronics), We will repair, replace or credit (at our option) the defective item without charge for the parts or labor, if the item is returned to an M.T.H. Authorized Service Center (ASC) or M.T.H. National Authorized Service Center (NASC) 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 to ship the product for warranty service 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. Retailer stating 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.

Service Department
M.T.H. Electric Trains
7020 Columbia Gateway Drive
Columbia MD 21046-1532
410-381-2580
service@mth-railking.com

ProtoSmoke

ProtoSmoke is the recommended fluid for M.T.H. products and can be used in other manufacturers products as well. Choose from 12 different flavors.

