



HO TRAINS THAT DO MORE

**READY-TO-RUN** sets

THE COMPLETE SOLUTION

Easy to Setup, Easy to Use, Easy to Expand

## F-3 Freight Set

(PS3)

ENGINEER'S GUIDE

Congratulations! You've just received the most feature-rich and technically advanced HO set ever produced! This highly detailed model includes a broader range of features than you'll find on any other HO scale diesel set, including; smooth performance from a three-scale-mile-per-hour crawl to full throttle; "cruise control" for steady speeds regardless of curves, switches and grades; Power Supply With Powerful Remote Control; 3-Car Freight Consist, and a full range of sounds recorded from a variety of F-3 prototypes. If you're looking for modern motive power that's accurately detailed, smooth running, and a great deal of fun to operate, it doesn't get any better than this.



Passenger Station Announcement



Freight Yard Sound

PLEASE READ THE MANUAL BEFORE USE AND SAVE  
WWW.MTHHOTRAINS.COM

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## **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.

- 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.
- Do not operate your layout unattended. Obstructed accessories or stalled trains may overheat, resulting in damage to your layout.
- This train set is intended for indoor use. Do not use if water is present. Serious injury or fatality may result.
- 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.

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# Set Up Checklist

- Assemble RealTrax®
- Connect the Power Supply
- Lubricate the engine
- Place the engine and cars on the track and couple them together
- Apply power to run as described in the Connecting the Power Supply & Installing the DCS Remote Commander set section of these instructions

## Set Includes

Diesel Engine  
3 Freight Cars



## Tools Needed

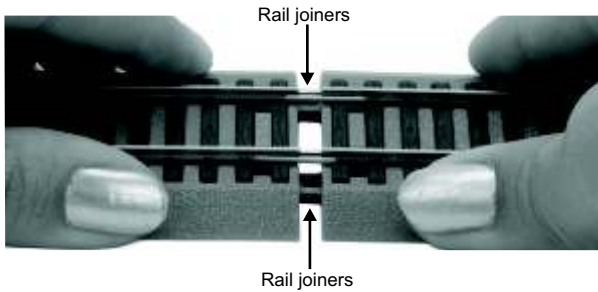
(2) AA Batteries for  
DCS Remote  
Commander Remote



**You can obtain replacement parts and replacement instructions from the M.T.H. Parts Department** (Order online: [www.mth-railking.com](http://www.mth-railking.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, ).

# Assembling HO RealTrax

1. Begin by placing two pieces of HO RealTrax on any flat surface. (If you intend for your layouts final assembly to be on a non-flat surface, such as carpet, it is recommended that you first assemble your track in sections on a tile or hardwood surface)
2. Using your fingertips, maneuver each rail so that it can be easily inserted into the piece of adjoining track-as shown in the diagram below. Disregard the locking mechanism at this point; concentrate only on connecting the rail joiners.



3. After making sure each piece is inserted properly into the opposite rail joiners, press the two pieces together until the ends of the roadbeds are touching one another. To insure that the two pieces of track are accurately locked, run your finger gently over the track and make sure the areas of connection are smooth, if not try reconnecting the pieces.



Wire harness is already attached to the rerailer track section. (See above)

# Lubricating the Engine

Lubricate the axles before operating using light machine or household oil, (available with M.T.H.'s Maintenance Kit (#30-50010) , sold separately) apply a very small amount to all axle points as shown.

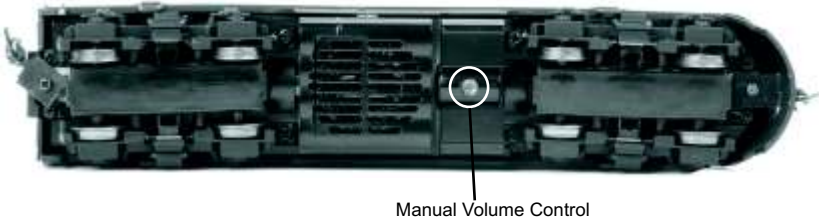


# Coupling the Engine and Cars

Our couplers are designed for realistic operation. Place the engine and cars on the track and couple them together.

# Manual Volume Control

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

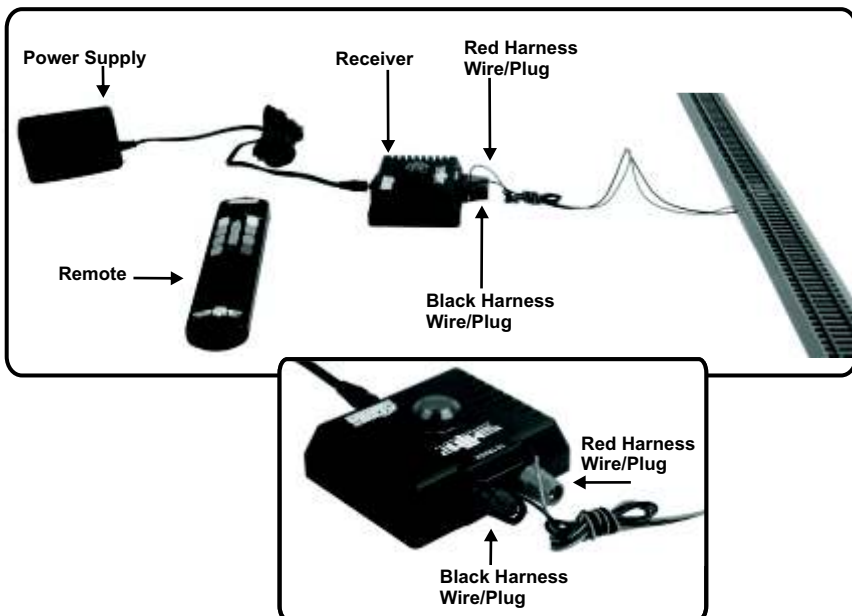


## Connecting the Power Supply & Installing the DCS Remote Commander Set

Your set comes with M.T.H.'s latest DCS System, the DCS Remote Commander. The DCS Remote Commander includes a handheld Remote which communicates with a Receiver powered by a UL approved Power Supply to provide an easy-to-use, safe power source for your new train set. To install the DCS Remote Commander and Transformer please use the following instructions:

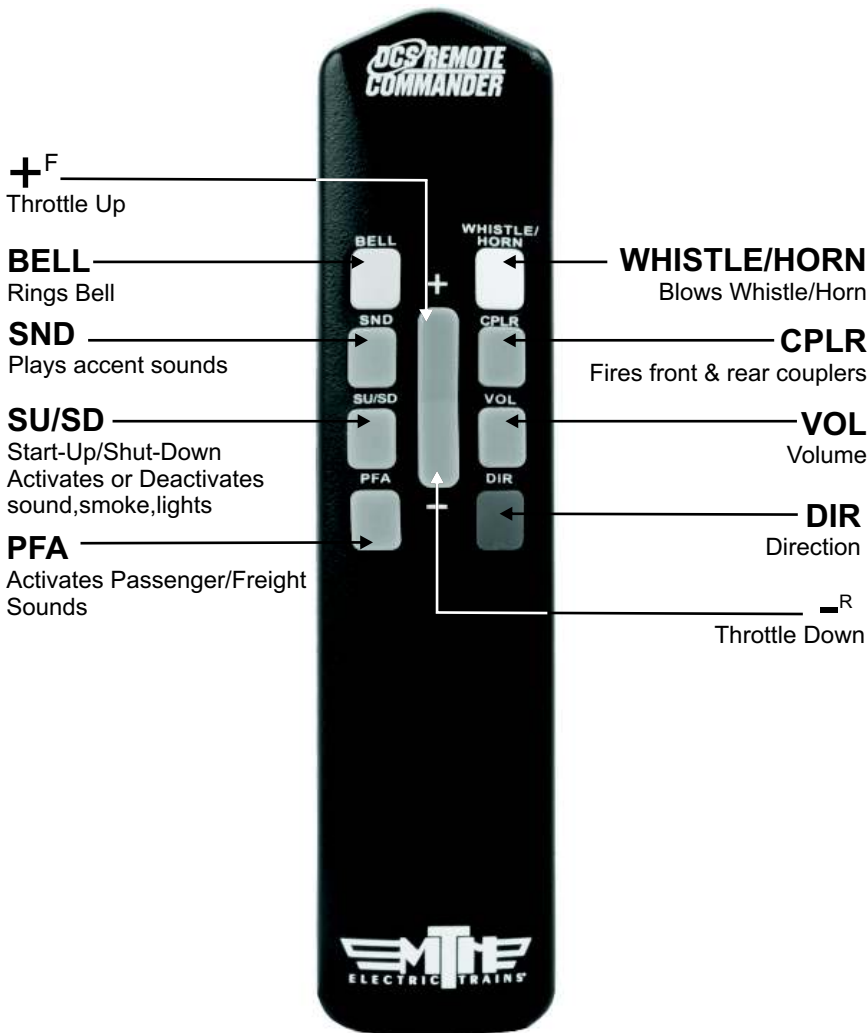
1. Ensure the Power Supply is unplugged.
2. Install two AA batteries (not included) into the Remote. You will need a small screw driver.
3. Plug the Power Supply barrel jack into the port labeled "Power" on the Receiver. Attach the wires from the track terminal section (see page 6) to the remote receiver red and black plugs.
4. Make sure that the engine and cars are properly assembled and coupled on the track and then plug the Power Supply into any 110 volt AC wall outlet. You will know that you have power to the receiver and the track if you see the green LED atop the Receiver come on. Subsequent pushes of any buttons on the remote will cause the green LED atop the Receiver to blink, indicating it is receiving the signal.

See Illustrations Below



# Basic Operation

After making sure everything is properly assembled, aim the Remote at the Receiver and press the SU/SD Button on the Remote. (\*\* NOTE - Because this is an infrared line-of-sight remote, you must aim the remote at the receiver in order to send signals to the track. \*\*). Once pressed the Engine start up sound will begin as well as the lights and smoke unit will turn on. Now press the + end of the Remote's Throttle Control and the train will start to move forward. Each time you press the + end of the Throttle Control the train will move faster and faster. Please see the Operating Buttons Using the Handheld Remote for more information on using the Remote to operate the train.



**Note:** You cannot use this Remote and Receiver with pre-1997 versions of Proto-Sound™ or with Proto-One™, Proto-Plus™, Proto-Deluxe II™ engines, whatever the date.

## Operation Buttons Using the Remote Handheld

**START UP/SHUT DOWN (SU/SD)**- Pressing this button will start your engine. Its lights, sound and smoke (if equipped) will turn on when pressed once and off when pressed again (if the train is already on).

**Throttle Control (+ and -)** (center rocker)- After START UP, quickly pressing and releasing the + end of the Throttle Control allows you to increase the speed of your locomotive in 1mph increments. Holding the + end of the Throttle Control down without releasing it will bring the engine up to top speed in about 7 seconds. Pressing and holding the – end of the Throttle Control for about 7 seconds will allow you to gradually bring your speed down until your engine reaches a complete stop. Quickly pressing and releasing the + or – end of the Throttle Control will increase or reduce your locomotives speed by 1 mph increments.

**PFA** – Pressing this button will activate the Passenger or Freight announcements on your engine. Pressing it again will shut the feature off. (See the instructions later in this manual for the PFA operational sequence.)

**BELL** – Pressing and releasing this button will turn on the bell sound in your engine. Press and release the button again to shut it off.

**Whistle/Horn** – Pressing and holding this button will play the whistle or horn sound on your engine. Release the button and whistle sound will decay just like the real thing. Also, depending upon how long you hold the button, once you release it the engine will play up to three different whistle endings

**CPLR** – Pressing the button will activate the operating coupler sound and functions. Within 2 seconds of pressing the CPLR button you must then press either the + (front coupler) or – (rear coupler). Doing so will trigger the coupler sound effect. (**See Optional Operating Coupler Section in these instructions**)

**VOL** – Selecting the volume button and then pressing either the + or – allows you to set your engine at any volume you desire.

**SND** – Pressing the sound button once will initiate a host of different idle sound effects on your engine. These randomly generated idle sound effects only work when the train is in a neutral or stopped position.

**DIR** – Pressing this button will bring your engine to a gradual stop and then sit at 0mph in the opposite direction it was traveling. After the engine has come to a complete stop, press the + end of the Throttle Control to start the engine moving in the opposite direction and to increase its speed.

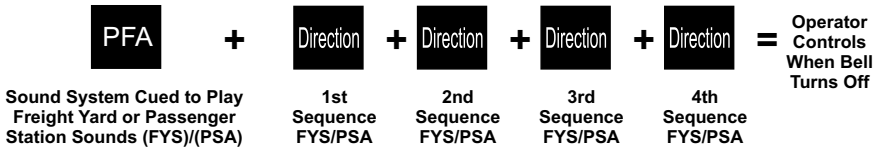
**Note:** If your locomotive is so equipped, the smoke unit is not controlled by this remote. In order to turn the smoke unit off/on you must first disconnect power from the track, manually turn the smoke unit control to the “OFF” or “ON” position, full counter-clockwise or some degree of clockwise position, and reapply power. (Small screwdriver may be required for this operation)



## 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, press the PFA Button on the remote.
- 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 pressing the PFA Button on the remote.
- 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.
- 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.

## 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.

## Reset to Factory Defaults

From the factory your engine is set to run with the DCS Remote Commander System on Engine Address 1. If for some reason your engine address changes, the engine must be reset to factory default in order to operate from your DCS Remote Commander. The factory defaults cannot be reset with a DCS Remote Commander. You must use a DCS system, a DCS Commander, or see your local dealer. When using a DCS Commander or a DCS System, follow the reset instructions in those device's operating manuals.

## Automatic Sounds

The following sound effects automatically play in your engine:

**Squealing Brakes:** This sound plays anytime the engine speed decreases rapidly.

**Cab Chatter:** This sound play when the engine idles in neutral.

**Engine Start-up and Shut-down:** This sound plays when the engine is initially powered on or is powered off for five seconds or more.

# Maintenance

## 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 (30-50051) 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.



Track Cleaning Block (40-1099)

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.



Maintenance Kit (30-50051)

## Lights

As you read on, you'll notice there are no instructions for replacing light bulbs in your diesel. That's because there aren't any. We use specially designed and controlled LEDs to create realistic lighting effects that occur automatically. Again, **NO PROGRAMMING!!** Just come to a stop and watch as the headlight dims automatically in accordance with rule 17. Of course, as you pull away, the headlight returns to it's fully bright, yet warm, glow. We even included a light in the cab so the engineers can see to do their jobs!

# Lubricating the Engine

Lubricate the axles before operating using light machine or household oil, (available with M.T.H.'s Maintenance Kit (#30-50010) , sold separately) apply a very small amount to all axle points as shown.

Your gearbox is properly greased at the factory and probably never needs service however, if you run excessive hours pulling heavy loads, it's a good idea to re-grease the gearbox using M.T.H. gear grease or equivalent. You can remove the gear box cover by releasing one of the end locking tabs using a small flatblade screwdriver.



## DCS Remote Commander Troubleshooting Guide

The following Guide will help you trouble shoot your M.T.H. HO engine. This guide is for the DCS Remote Commander mode of the engine.

<b>Symptom</b>	<b>Solution</b>
Engine has no sound	Ensure SU/SD has been pressed. Press the VOL button then press <b>+</b> on the throttle control to raise the volume
Engine's coupler will not fire (Operating Coupler must be installed) (See page 18)	1. Ensure the model has coil-wound proto-couplers. 2. Press the CLPR button then press <b>+</b> or <b>-</b> on the throttle control within 2 seconds to fire the front ( <b>+</b> ) or rear ( <b>-</b> ) coupler.
Engine only plays first PFA sequence sounds	Press the DIR button to cycle through all four PFA sequences.
Engine Volume is not adjusting when the throttle control is pressed	Press the VOL button then press <b>+</b> or <b>-</b> on the throttle control within 2 seconds to raise or lower engine volume.
Idle sounds are not playing when the SND button is pressed	Engine must be standing still to play the Idle Sounds
Engine does nothing when Start-Up is pressed	Engine address must be 1. The engine must be reset to factory defaults using either a conventional transformer (I.E. Z-1000) or a DCS System or a DCS Commander. See Page 11.
Green light on receiver is not flashing when a button is pressed on the handheld remote	Replace the batteries in the handheld remote with two fresh "AA" batteries. Be sure the remote is generally pointing toward the receiver base within 20 feet.

**WARNING – DO NOT CONNECT AC POWER TO THE TRACK WHEN OPERATING AN HO ENGINE. PERMANENT DAMAGE WILL OCCUR TO THE ENGINE.**

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

<b>Cab Chatter</b>	<b>Remedy</b>
Sometimes the Cab Chatter sounds don't play.	Cab Chatter plays only in neutral at random intervals.
<b>Volume</b>	<b>Remedy</b>
The sounds seem distorted, especially when the whistle 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.
<b>FYS/PSA</b>	<b>Remedy</b>
The FYS/PSA sounds occasionally repeat themselves.	Proto-Sound® 3.0 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.
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/PSA is programmed to start ringing the bell at that point. After approximately 12 seconds it will automatically turn off.

<b>FYS/PSA</b>	<b>Remedy</b>
When FYS/PSA is enabled, pressing the whistle and bell buttons has no effect.	Because FYS/PSA must control various effects in each sequence, Proto-Sound® 2.0 takes control of these sound effects until you exit
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.

# Learn More About Your M.T.H. HO Locomotive

Your new HO Diesel Engine is equipped with the exclusive M.T.H. Proto-Sound® 3.0 digital sound and control system. In plain English, this means your locomotive contains state-of-the-art electronics providing realistic digital sounds, precisely controlled speed in increments of 1 scale mile per hour, and much, much, more.

## Compatibility

The Proto-Sound® 3 system is universally compatible with track power and/or signal combinations including analog DC (regular DC power pack), DCC (NMRA Digital Command Control), or DCS (MTH Digital Command System). Simply set your Engine on the rails, apply any one of these power/signal sources, and move out! The Proto-Sound® 3.0 system automatically senses the track environment and adapts accordingly. No hidden jumpers, switches, magic wands, or programming required!!! A vast array of realistic operation is automatic when the Engine is run on analog DC. You can expand access to features in a DCC environment. Experience the most your new locomotive has to offer in the simple to use yet powerful world of DCS. **To be clear, DCS is NOT a proprietary version of DCC, as some other manufacturers offer. DCS is a comprehensive layout control system designed with one primary goal: make model trains do amazingly realistic things using a simple and intuitive controller. We put the complexity on the inside, and the fun in your hands!**

## Digital Sound

Your Proto-Sound® 3 (PS 3) equipped Engine contains over 100 individual recordings. These recordings are played back dynamically at appropriate times to create a symphony of realism for your ears. Hear the diesel roar automatically intensify or lighten when speeding up or slowing down, listen to the sounds of brakes squeaking and squealing as you come to a stop, or enjoy the random conversations of railmen working as your model sits at idle.

Your HO diesel includes built-in realistic horn sound effects, including forward (two blasts) and reverse (three blasts) signalling and crossing signal sounds, all available with one-touch control from a DCS controller or through any DCC controller capable of accessing up to F28.



## Digital Control

In standard analog DC mode, your model still operates under digital control. The PS 3 advance speed control system converts track voltage into digital speed commands. Your model will run smoothly and consistently at any speed regardless of load, hills, or curves. If you are a DCC user, you'll quickly learn to appreciate the precision of our speed control and linear speed curve. DCS users will enjoy the added benefits of controlling speeds in increments of 1 scale mile per hour displayed on DCS controllers or easily changing acceleration and deceleration rates independently without any discussion of bits or bytes. **To be clear, DCS is NOT DCC.**

## Lights

As you read on, you'll notice there are no instructions for replacing light bulbs in your diesel. That's because there aren't any. We use specially designed and controlled LEDs to create realistic lighting effects that occur automatically. Again, NO PROGRAMMING!! Just come to a stop and watch as the headlight dims automatically in accordance with rule 17. Of course, as you pull away, the headlight returns to it's fully bright, yet warm, glow. We even included a light in the cab so the engineers can see to do their jobs!

## More...

In analog DC operation, just flip the track polarity or direction switch at any speed and watch your Engine gradually come to stop, turn on the appropriate directional lighting, and smoothly accelerate back up to speed. No other HO locomotive has features like these. There are so many more things to learn and enjoy about M.T.H. HO Engines, we could write a book. But, that's no fun. So, if you haven't already done so, flip to the Quick Start Guide and let's set up and use your new train set.

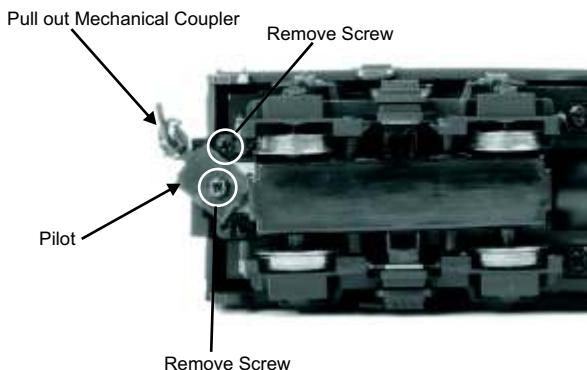
## Optional Operating Coupler (sold separately Item No. 80-10003) Installing Couplers

Your locomotive can be equipped with remotely controllable scale proportioned operating Proto-Couplers that can be triggered from any DCC controller or the M.T.H. DCS Digital Command System. Both the front and rear couplers can be individually triggered. These couplers will not work in conventional operation with magnetic arms.

### Removing The Mechanical Couplers From The Chassis

To remove the mechanical couplers you must first remove the 2 screws that secures the coupler in place.

Then pull out the mechanical coupler from the pilot



### Installing The Remote Control Proto-Couplers

The separate sale (80-10003) Remote Control Proto-Couplers comes with the below parts:



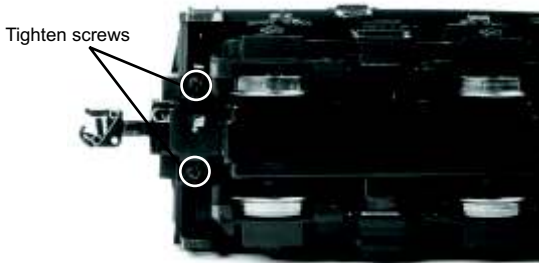
After you have removed the mechanical couplers you are now ready to install the Remote Control Proto-Couplers. Follow the instructions below.



2. Line up CENTER mounting hole in coupler pocket with mounting hole on chassis.



3. Tighten in place using 2 screws in the proto-coupler part bag.

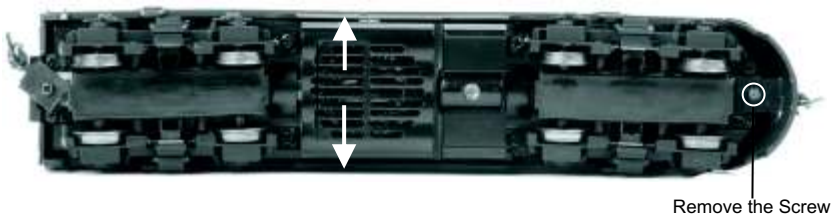


4. Remove the body

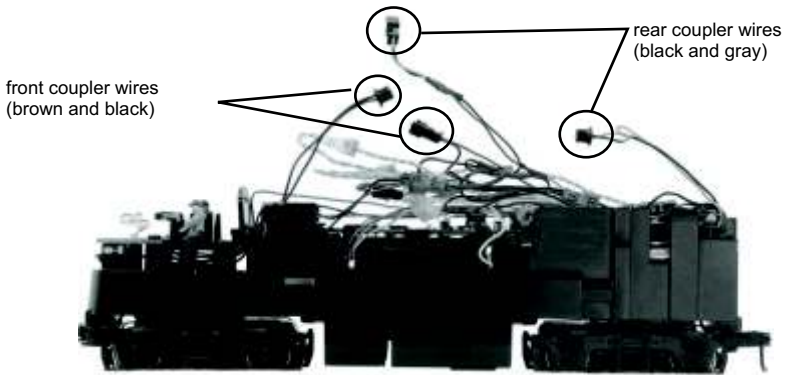
-You must first remove the front locomotive coupler in order to pull the body off of the chassis.

-Remove the screw shown below

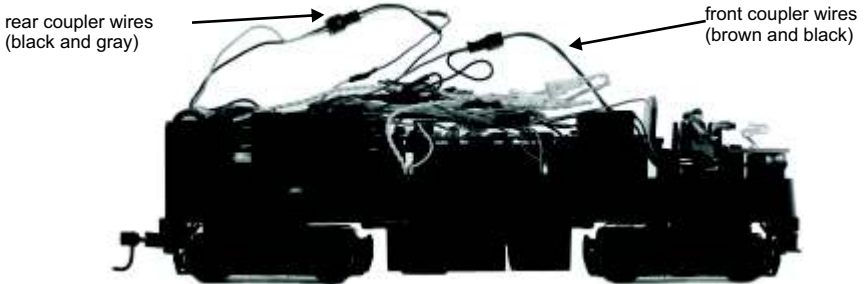
-Then slightly pull the body outward of engine in order to slide the body off.



5. Locate front coupler wires and rear coupler wires.



6. Connect wires to have control of the couplers.



7. Place Body onto Chassis.

# Features and Operation

Your new M.T.H. HO Diesel Engine has more features and operating capabilities than any HO engine ever built by any manufacturer.

## Modes of Operation

There are 3 modes of operation with different levels of features accessible in each. We refer to them as analog DC, DCC, and DCS. Here's a little more explanation before we get into the features of each mode.

### Analog DC

This is when there is nothing connected to the rails except a conventional DC power pack. These power packs generally have at least one variable output controlled by a throttle of some sort and a means of reversing DC polarity on the track to change the direction of your engine.

### DCC or Digital Command Control

DCC is a popular digital command control scheme wherein the track power is also a digital control signal. That is, using a DCC controller, you can communicate with multiple engines and have them all moving at different speeds or moving in opposite directions on the same track at the same time. The power/command signal remains constant and engines are “commanded” to perform as desired. M.T.H. is new to DCC but, we recognize it's importance to many HO operators. So, we loaded our engine with more DCC features easily accessible to the operator than any HO engine ever built previously. You DCC guys are in for a real treat!

Please note, when making setting changes in DCS or DCC, such as address, please wait a minimum of 5 Seconds after removing power to insure the settings are stored in the engines memory. Reapplying power in less than 5 Seconds may result in losing the setting changes.

## **DCS or Digital Control System**

While the acronyms are close, this is about where the similarities between DCS and DCC end. 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 friend, this is NOT one of them. M.T.H.'s DCS system is proven technology in the O and One gauge markets and now, we've brought its power and simplicity it to you.

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, is so simple and intuitive, you can enjoy them! No programming tracks, bits and bytes, or conversion of binary to hexadecimal numbers here! To add an engine in DCS, just press "ADD ENGINE." After that, If you want to start your engine, just press "START UP" or, to turn the sound on or off, just press "SOUND." No combinations of letters or numbers to remember! We think you're really going to like this!

Please note, when making setting changes in DCS or DCC, such as address, please wait a minimum of 5 Seconds after removing power to insure the settings are stored in the engines memory. Reapplying power in less than 5 Seconds may result in losing the setting changes.

Your set comes with M.T.H.'s latest DCS System, the Remote DCS Commander. The simple to use handheld communicates with a receiver box powered by a UL approved power supply.

# Operation with other Power Supplies and Controllers

## Analog DC

### Running the Engine

Set the engine on the rails, and apply DC power using any 16 Volt DC power supply. Refer to the Set-Up section of this guide for instructions on how to lubricate the engine.

As you increase power, at about 6 volts, the lights and sounds will come on. Keep going on up to about 8 and she'll move out! About 16 volts DC is adequate for prototypical speeds however, your engine can handle up to 24 volts DC.

### Changing Direction

If you flip the direction (polarity) switch on your power pack while the engine is moving, it will gradually slow to a stop, and slowly accelerate back up to speed in the opposite direction. You can also change direction the old fashioned way by reducing throttle until the engine stops, flip the direction switch, and then increase throttle again.

If you switch track polarity too slowly, the engine may stop abruptly and not move in the reverse direction. This is normal. There is a feature we call “anti-jack rabbit” that prevents the engine from taking off at high speeds when high voltage is applied to the track instantly. Some direction switches have a “dead” spot where the power is completely off during polarity changes. This can invoke the anti-jack rabbit feature. The solution is to flip the direction switch more quickly.

### Speed Control

Your engine is equipped with speed control. This feature is always active, even in analog DC mode. Your engine constantly measures track voltage and converts this to a digital speed command. You should notice the speed remains constant up and down grades, around curves, and with varying loads. This is no accident.

## Sounds

In this mode, sound are pretty much automatic. If you're moving, you'll hear diesel sounds.

When your sitting at idle, there may be some maintenance done. You could hear someone calling for help on the radio. Don't worry, all of this and more is just a normal part of everyday operations.

When your moving at a pretty good clip and you reduce the throttle quickly, you may hear the brakes squeak and squeal as the engineer applies them. Of course, they'll stop when the engine does.

If things get too noisy, just locate the sound volume pot under the rear roof adjust the volume from maximum down to off, whatever suits you. Turn it counterclockwise to reduce the volume or clockwise to increase it. Refer to page 7 for volume pot location.

## Lighting

Now, this is an illuminating section (we couldn't resist). Your model is equipped with a headlight, marker lights, operating ditch lights, and cab interior light.

The first thing to know about the lighting is there aren't any bulbs. It's all LEDs so, if you look for a section on how to replace them, you won't find it. You should never have to.

As with sounds, in analog DC mode, lighting operation is fully automatic. They're always on and behave appropriately.

The headlight functions under rule 17 and dims when stopped for a time or while backing up. Of course, just as you begin to move forward, it goes bright to show the way.

The cab light is always on so the engineer can always see clearly.



# DCC Digital Command Control

Now, if your operating in this mode, you may very well know more about DCC than we do so, we're going to stick to telling you about our engine in this operating environment. First of all, in DCC mode, we brought all the features of analog DC along and of course, added to them. Your new engine has more user features than any DCC engine ever built. Some of them are even ahead of the world of DCC!!

## Running the Engine

Set the engine on the rails, and apply DCC power. Refer to the Set-Up section of this guide for instructions on how to connect the boiler and tender.

The first thing you will notice is the engine does absolutely nothing! Don't panic. This is by design. M.T.H. HO engines never do anything in command mode until told to do so, regardless of what brand DCC controller you use. In this way, you could have a fleet of M.T.H. HO engines on the rails and they will remain shutdown until you command them to start up.

## F3 Start up/Shut Down

Select engine address 3 (factory default), press the F3 (Start Up/Shut Down) key, and your engine will start-up. Lights, sounds, ACTION!!! Roll the throttle and away you go. Our models are compatible with 14, 28, and 128 speed steps. We strongly recommend 128 because in this mode, speed steps correspond directly to scale speeds. That is, speed step 10 = 10 smph, speed step 47 = 47 smph, etc. You get the idea. When your done, press the F3 key again, your engine will shut down.

To be clear, pressing F3 when the engine is shut down will start it up. Pressing F3 when the engine is started up will shut it down. Pretty clever, eh?

## Sounds

As in analog DC mode, the default sound arrangement is automatic. So, you can just run your engine and its sounds will follow the action. But, you operate in DCC for a reason. You want access to more features, right? Well, depending upon the capabilities of your DCC controller, you now have access to a range of sound features including bell, horn, PFA, engine sounds on/off, master volume, Doppler, and more.

Here's a brief description of commonly used sound features.

### **F1 Bell**

Toggles bell sounds on/off. Listen to the last half ring of the bell when it stops!

### **F2 Horn**

Blows the horn, for as long as it's on. There are several different ending signatures depending on how long you hold the button down. Check it out!

### **F3 Start-up/Shut-down**

### **F4 PFA**

PFA in MTH lingo stands for passenger and freight announcements. Since your engine provides freight service, you'll hear freight yard sounds.. PFA is a very popular sound feature that's a staple in almost all MTH products. We had to give you this!

There are 4 sound sequences or segments in PFA. You advance through them at your command. Each segment has a minimum time of ~10 seconds but more sounds play the longer you listen.

When running the engine, simply press the F4 key to activate PFA. When you bring the engine to a stop, the arrival sequence will play. You can remain in this segment as long as you like.

Press F4 again, and advance to disembarking sequence. Again, you can listen to this sequence as long as you like.

Press F4 again, and advance to the embarking sequence. Again, you can listen to this sequence as long as you like.

Press F4 again, and advance to the departure sequence. After a short period the engine will automatically pull out and resume the speed and direction of when you entered the feature. The bell will ring for a short while and then turn off automatically.

## **F6 Master Volume**

This command cycles through 9 volume settings from off to max. Each press advances to the next cycle. Unlike the F6 engine sounds command, when the master volume is set to off, no sounds can be heard.

If your DCC controller has more F functions, you can access even more features. Check out the complete list in the chart at the end of this section.

## **Lighting**

As with other feature categories, lighting in DCC mode operates just like analog DC with regard to rule 17, constant brightness and directional behavior. See that section for details. DCC provides some additional control to suit your preferences.

### **F0 Headlight (also toggles Ditch Lights)**

Toggles the headlight on/off.

### **F5 Lights (Ditch and Number Board)**

Toggles all lighting on/off, including Marker and Classification LED's. When on, all lighting behaves automatically as described elsewhere. When F5 is off, all lighting is off.

### **Flashing Ditch Lights**

Your locomotive is equipped with flashing ditch lights that flash when the horn is blown. The engine must be moving in order for the lights to flash when the horn is blown. Prototypically, when one presses the forward or reverse signal the engine would be sitting still (the signal is to warn anybody on the track that the locomotive is getting ready to move). Consequently, the ditch lights would not flash. However, you can trigger the forward and reverse signals to play when the engine is moving. In that scenario the ditch lights would flash. The ditch lights will also flash when the crossing signal F12 is activated.

## More DCC

Okay, we've walked you through the basic features and functions available in DCC (F0..F8) but, there is much, much more. In fact, we've filled up functions F9 through F28. Some controllers are available today that provide easy access to F9 through F12 however, we don't know of any that allow you to press a button for F13 through F28. When the DCC controllers expand to include these functions, your MTH HO engine will be waiting. Here is a list of the F9 through F28 functions present in your engine with a brief description of how they work.

### **F9 Forward Signal**

Plays 2 short horn toots to signal the engine is moving forward

### **F10 Reverse Signal**

Plays 3 short horn toots to signal the engine is moving in reverse

### **F11 Coupler Slack**

When sitting still, arms the system to play the sound of coupler slack being pulled out as the engine moves.

### **F12 Grade Crossing**

### **F13 One-Shot Doppler (On/Off)**

### **F14 Extended Start UP**

Plays a longer, more detailed and realistic start up sound sequence.

### **F15 Extended Shut-down**

Plays a longer, more detailed and realistic shut down sound sequence.

### **F16 Rev Up**

Increases the diesel revs. Each press of F15 runs the revs up another notch. There are 8 settings.

### **F17 Rev Down**

Decreases the diesel revs. Each press of F16 lowers the diesel revs a notch.

### **F18 Engine Sounds (On/Off)**

### **F19 Horn Blast**

Plays a single short horn blast so you can make up your own signal patterns.

### **F20 Coupler Close**

Plays the sound of 2 couplers crashing together and closing.

### **F21 Feature Reset**

Resets the engine back to factory defaults with the exception of the address.

**F22..F24 Idle Sounds 1 - 4.**

Plays what we call idle recipes 1 through 4. These sound sequences play randomly when the engine is at idle but if you have these F functions, you can trigger them whenever you like.

**F26 Brake Sounds**

Toggles brake sounds between auto and off. They are on by default but you can turn them off.

**F27 Cab Chatter**

Toggles random voices between auto and off. They are on by default but you can turn them off.

**F28 Clickety Clack (On/Off)**

Toggles the sounds of sustained speed inside a passenger train between auto and off. This sound is off by default but you can turn it on (auto). Once on, if you maintain a steady speed of ~30 smph or higher for more than 30 seconds, the effect automatically turns on.

Please note, when making setting changes in DCS or DCC, such as address, please wait a minimum of 5 Seconds after removing power to insure the settings are stored in the engines memory. Reapplying power in less than 5 Seconds may result in losing the setting changes.

## DCC “F” FUNCTION LIST

### F Key Function

- F0 Headlight (also toggles Ditch Lights)
- F1 Bell
- F2 Horn
- F3 Start-up/Shut-down
- F4 PFA
- F5 Lights (Ditch and Number Board)
- F6 Master Volume
- F7 Front Coupler
- F8 Rear Coupler
- F9 Forward Signal
- F10 Reverse Signal
- F11 Coupler Slack
- F12 Grade Crossing
- F13 One-Shot Doppler (On/Off)
- F14 Extended Start-up
- F15 Extended Shut-down
- F16 Rev Up
- F17 Rev Down
- F18 Engine Sounds (On/Off)
- F19 Single Horn Blast
- F20 Coupler Close
- F21 Feature Reset
- F22 Idle Sequence 1
- F23 Idle Sequence 2
- F24 Idle Sequence 3
- F25 Idle Sequence 4
- F26 Brake Sounds (On/Off)
- F27 Cab Chatter (On/Off)
- F28 Clickety Clack (On/Off)

### **CV Description** (Program On Main, POM Only)

- 1 Short Address 1-127
- 3 Acceleration Rate 1-25 smph / sec (4 smph / sec is the default)
- 4 Deceleration Rate 1-25 smph / sec (4 smph / sec is the default)
- 17 & 18 Extended Address (upper bits must be set to 1)
- 29 Enter 38 to set extended address to engine cab number or  
Bits 5 = ext.addr; bit 1 = speed / direction method
- 49 Short Address (controllers that prohibit addr POM)
- 50 & 51 Extended Address (controllers that prohibit addr POM)
- 55 Reset - Sends value = 55 to CV55 on address 55 (Do not assign  
address 55 to any engine as an engine address)

# DCS Digital Control System

As you may have gathered by now, DCS is an M.T.H. exclusive Digital Control System that provides easy access to dozens and dozens of features in our models. We developed DCS to provide a powerful and advanced model train control system that was simple and enjoyable to use. We've accomplished that goal. DCS further expands the features available far beyond that of DCC. After all, in DCC, we only had a limited number of "F" commands to fill.

As with DCC, we'll leave the detailed "how-to" system explanations to the DCS system manuals. What you should know are all the cool features your engine has built-in, waiting for you to experience.

## Running the Engine

Once the DCS system is connected to your track and powered up by a DC Power Supply (even though DCS can be controlled by AC and DC power supplies, your M.T.H. HO locomotive will ONLY run on DC power), you simply place your engine on the rails, press "ADD ENG" and the system will scan the track and automatically upload your engine into the controller. At this point, you can press "START UP", roll the throttle and pull out! That's it!

## Speed Control

DCS engines are controlled in scale miles per hour (smph) and increments of one. So, that means if you dial up 10, your engine will smoothly accelerate to 10 smph. There is no need to select a speed step setting, there's only one precise linear control at scale speeds. See, powerful yet simple.

## Sounds

### Independent Volume Settings

Using DCS, you independently adjust the bell, horn, engine, and accent sounds volume. This is like a mixer so you can set up the engine fit your specific tastes and sense of realism. Oh, they all move relatively up or down with the master volume settings.

### Doppler Loop

You can either press the Doppler button on the remote to activate what we refer to as "one-shot" Doppler or, using DCS, you can program a Doppler loop that will peak at the same point on your layout, over and over.

### Custom Sounds

You can fire any of 10 individual sound bites pre-loaded into your engine. These are typically, diesel idling sounds. Each one at the press of a single button. You can also make voice or other audio recordings and play them back on command with ease.

### **Proto-Dispatch**

Press the “MIC” (microphone) button on your DCS remote and speak. Your voice will be digitized and played out of the model in real-time. Talk about station announcements!

### **Proto-Cast**

Another MTH exclusive, you can connect any audio source with a line output to the DCS TIU and send music, train sounds, or anything you like down the rails to be played through the engine as it moves along the track. Your holidays may never be the same!

## **Lighting**

As with everything in DCS, this becomes a little more than obvious. Pressing the “HEADLIGHT” button turns off the directional headlight and reverse light (if equipped). Pressing the Interior light will turn off the cab interior light.

### **Flashing Ditch Lights**

Your locomotive is equipped with flashing ditch lights that flash when the horn is blown. The engine must be moving in order for the lights to flash when the horn is blown. Prototypically, when one presses the forward or reverse signal the engine would be sitting still (the signal is to warn anybody on the track that the locomotive is getting ready to move). Consequently, the ditch lights would not flash. However, you can trigger the forward and reverse signals to play when the engine is moving. In that scenario the ditch lights would flash. The ditch lights will also flash when the crossing signal is activated. The flashing ditch light operation can be further modified under DCS Control. Refer to the DCS manual for more details.



## Analog DC

<b>Start-up</b>	<b>Solution</b>
When I apply power to the track my engine doesn't do anything. No lights, no sound, no nothing.	Check to see if that section of track has power. Use a voltmeter or a lit passenger car.
	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?
<b>Sound</b>	<b>Solution</b>
I have no sound from my engine, but my lights are on and it moves just fine.	Check the volume pot on your locomotive. Full CW = Max volume
There's a crackling sound from my engine	Check to see if a screw or some other material hasn't lodged itself in the underside of the engine body.
<b>Lights</b>	<b>Solution</b>
One of my lights is out	Most likely you had been running the engine in DCC or DCS mode and toggled that light off. Put it back into one of those modes and turn that light back on. The engine will remember that when you run it again in Conventional DC.
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 to the track my engine starts up (lights and sound) but it won't move	Lower the track voltage then raise it again. The engine should start moving. If you apply greater than 9VDC quickly the engine will just set there. Lowering it below 9VDC then raising it will get the engine moving
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

## DCC

<b>Start-up</b>	<b>Solution</b>
When I apply power to the track my engine doesn't do anything. No lights, no sound, no nothing.	Did you press F3 yet? F3 on your DCC handheld will start your engine up.
	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?
<b>Sound</b>	<b>Solution</b>
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 F7 to cycle through the volume levels (there are 9 levels, 0-max)
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 F12 button again to turn Doppler off. Your engine sounds will now return to normal

## DCC

<b>Lights</b>	<b>Solution</b>
One of my lights is out	Check your F keys. F0 is the headlight (also controls the Back-up light) and F5 will toggle the Cab light
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>
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>
I hit F4 to start PFA but the engine just keeps ringing its bell, that’s all it’ll do	Bring the engine speed to 0. You will now hear the station arrival sounds (pretty cool, huh?). Pressing F4 will cycle you through the PFA sequence (check out the PFA section of the manual for more)
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 you hit F4 the first time). You can not control the speed of your engine while it’s leaving the station, until 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 F3 again

## DCS (Remember, it's NOT DCC)

<b>Start-up</b>	<b>Solution</b>
When I apply power to the track my engine doesn't do anything. No lights, no sound, no 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 track 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)
	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
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 the DCS remote should start up the locomotive.
<b>Sound</b>	<b>Solution</b>
I have no sound on my engine, but my lights are on and it moves just fine	Check that you haven't lowered any of the independent engine volumes (Eng Sounds, Bell, Whistle, or Accent)
	Check that you haven't lowered any of the independent engine volumes (Eng Sounds, Bell, Whistle, or Accent)

## DCS (Remember, it's NOT DCC)

<b>Sound</b>	<b>Solution</b>
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.
<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>
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
	Check to see if you have any kind of binding on the side rods. There may be a chunk of your favorite, perfectly scaled pine tree stuck in there.
<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

# 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 trouble-shooting 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.mth-railking.com](http://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). 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 Authorized M.T.H. Retailer are covered by this warranty. See our Website [www.mthtrains.com](http://www.mthtrains.com) to identify an M.T.H. Retailer near you.

M.T.H. products are warrantied 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 repair, replace, or credit (at our option) the defective part 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 are not covered under this warranty.

Items sent for repair must be accompanied by a return authorization number, a description of the problem, and a **copy of the original sales receipt from an Authorized M.T.H. Train Merchant**, which gives the date of purchase. 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