

# BACHMANN®

## EMD GP40 OPERATING INSTRUCTIONS



Large Scale Modern Diesel Locomotive  
DCC Ready, RC Ready, Sound-Ready, and Onboard Battery-Ready  
1:29 Scale

Congratulations on the purchase of your Bachmann Big Haulers® GP40 Diesel Locomotive! We want to ensure that you enjoy many years of operation with your new model. Please read these instructions carefully and in their entirety before running your locomotive to learn the best operational and maintenance practices for your GP40.

## THE PROTOTYPE



The GP40 was one of the most successful locomotives developed by the Electro-Motive Division of General Motors and was undoubtedly the most popular 4-axle road switcher in the line. More than one thousand examples were delivered between 1965 and 1971, with later variations remaining in production until 1986. The GP40 was powered by an EMD 645E3 16-cylinder engine capable of generating 3000 horsepower. With all later versions included, more than 4000 models would find service on American, Canadian, and Mexican railroads hauling both freight and passengers, and many remain in revenue use today.

### Features:

- advanced non-proprietary plug-and-play circuit board to accommodate the control system of your choice, including conventional DC power, NMRA/NEM DCC, and/or RC operation
- two 2-axle ball-bearing power trucks
- one motor per truck with low amperage draw
- all-wheel pickup and all-wheel drive
- operating diesel smoke unit
- white LED directional headlights, front and rear
- red LED directional marker lights front and rear
- lighted front number boards
- interior cab lighting and interior cab details
- lighted porch safety lights
- solid-metal railings and lift rings
- opening side windows
- engineer figure installed in the cab
- windshield wipers, see-through steps, and MU hose detailing
- brass bell and horn
- operating AAR knuckle couplers
- extra weight for better performance
- factory-installed speaker with wire pigtail to allow easy installation of optional aftermarket sound
- power cables on each end to allow for battery operation or RC control from trailing car
- minimum 6.5-foot diameter curves required

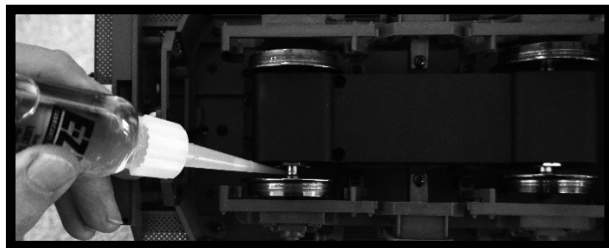
Each locomotive is shipped with several additional parts to be installed at the user's discretion. These include:

- a) sun shades
- b) power plug connector that allows for trailing car battery operation or for two GP40s to be operated together
- c) smoke fluid
- d) PCB05 adapter board with wires

## LUBRICATION PROCEDURES

Just like the prototype, the key to optimum performance from your new locomotive is regularly scheduled maintenance and lubrication. Your locomotive's gearbox will have been factory-lubricated and will not require any additional lubrication before initial operation.

Over time, it is recommended that a drop of light gear oil be applied periodically to each axle's bearing where it enters the gearbox. This is best done by moving the axle to one side, adding a drop of oil, then moving the axle to the other side and adding another drop of oil. This should be repeated for each of the four axles at regular intervals based on the amount of operation your locomotive sees, to ensure continued smooth running.

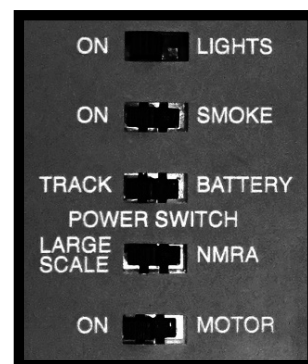


*Note: We recommend that you use Bachmann's line of E-Z Lube® products which include #99984 Light Gear Oil, #99983 Heavy Gear Oil, #99982 Gear Grease, and #99981 Conductive Contact Lube. However, any plastic-compatible lubricants designed for model railroad applications can be used.*

## ELECTRONICS, SMOKE/EXHAUST STACK PANEL SWITCHES

Your GP40 locomotive features totally isolated electronics, which allow for easy installation of the control system of your choice (see your hobby retailer for available options). Switches for toggling control options are found under the smoke/exhaust stack panel along the roof of the locomotive. There are five switches under the Smoke/Exhaust Stack Panel. To access these switches, remove the panel by lifting it from each end. The switches are labeled as follows:

- 1. Lights:** This switch controls the headlights, ditch lights, cab light, and number board lights. When set to *ON* these lights are controlled by the device plugged into the plug-and-play circuit board. When set to *OFF* all of these lights will be turned off.
- 2. Smoke:** This switch controls the operation of the smoke unit. When set to *ON* the smoke unit is controlled by the device plugged into the plug-and-play circuit board. When set to *OFF* the smoke unit is off and will not function. Please ensure that smoke fluid has been added to the smoke unit before turning this switch on.
- 3. Battery/Track Pickup Switch:** In the *TRACK* position, power is fed from the track to the electronics inside the locomotive. In the *BATTERY* position, all track connections are removed and power is fed either through the two screw terminals labeled INPUT BATT1 on the rear of the main circuit board or through the front or rear power plugs if your battery is located in a separate trailing car.
- 4. NMRA/Large Scale Polarity Switch:** In Large Scale, there are two conventions used to control the direction of the locomotive. For left rail positive control (most common), move the polarity switch to the *LARGE SCALE* position. For right rail positive control, move the polarity switch to the *NMRA* position. If your locomotive operates in the reverse direction to other locomotives on your layout, place the polarity switch in the opposite position. The polarity switch is also active in battery mode to allow for a control unit to be placed in a trailing car. Please see the *Adding Aftermarket On-Board Battery/RC Operation* section for more information.
- 5. Motor Switch:** This switch controls the motor. When set to *OFF* the locomotive will not move, but other features, such as smoke or lighting, will continue to function while power is supplied, providing these functions have been switched to *ON*.



## SMOKE UNIT

The Bachmann GP40 comes with a fan-assisted smoke unit that has two parts; the smoke unit and the electronics that control the smoke unit.

To achieve the smoke effect you must add smoke fluid in the smoke unit cavity (the exhaust stack) and turn the smoke switch on. Do not overfill. We recommend using *Bachmann #00251 Smoke Fluid*, however, any brand of model railroading smoke fluid designed for use with Large Scale models will work.

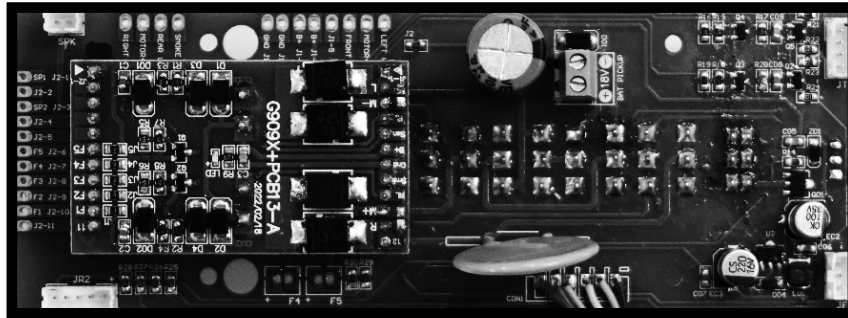
The smoke unit is designed to protect itself from overheating. After running for a while, it will shut off for some time and then restart itself. The air temperature that the locomotive is operating in affects the length of time between shut-offs. The hotter the air temperature, the more frequently the smoke unit will shut down to protect itself. The locomotive will not be affected during these shut-offs and will continue to run normally.

*Note: after adding smoke fluid to the locomotive, make sure to store your model in an upright position to avoid the fluid spilling on the locomotive surfaces.*



## PLUG-AND-PLAY CIRCUIT BOARD

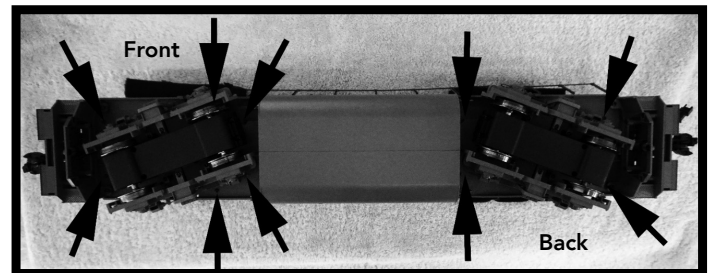
This Bachmann GP40 locomotive comes equipped with a nonproprietary plug-and-play electronic circuit board. This is designed to accommodate your chosen aftermarket plug-and-play products. As delivered, the locomotive has a (DC) Jumper PC Board in this socket and will operate on standard DC-powered track setups without modification. All of the locomotive's lighting functions are on when the (DC) Jumper PC Board is in the socket and the LIGHT switch is ON.



## REMOVING THE BODY SHELL TO ACCESS THE ELECTRONICS

To reach the speaker and PC board, it is necessary to separate the underframe from the body of the locomotive. The body shell is secured to the underframe with 10 Philips-type screws. See the photo below. The black arrows indicate the locations of the screws.

Once the screws are removed, turn the locomotive over and remove the handrails from both sides of the cab. Once removed, gently lift the body shell from the locomotive frame. Unplugging the two plugs between the frame and the body will allow you greater access to the shell.

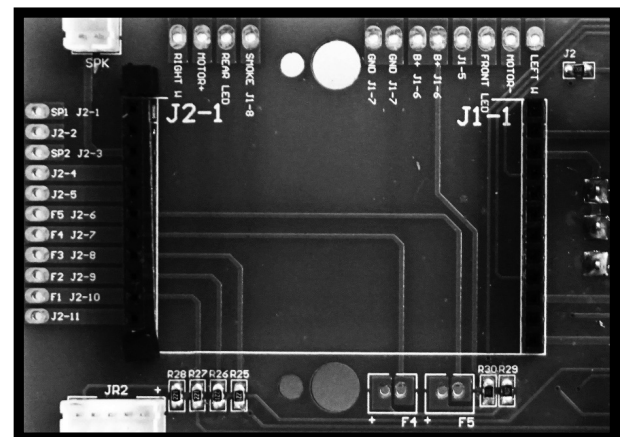


Care should be taken to not damage fragile detail parts such as the steps when handling and turning the locomotive on its roof. The use of a padded locomotive cradle is recommended.

Gently unplugging the wire cable between the locomotive's body shell and the under frame will allow you to move the shell to your workbench for greater access to the interior of the shell.

## PIN DEFINITIONS

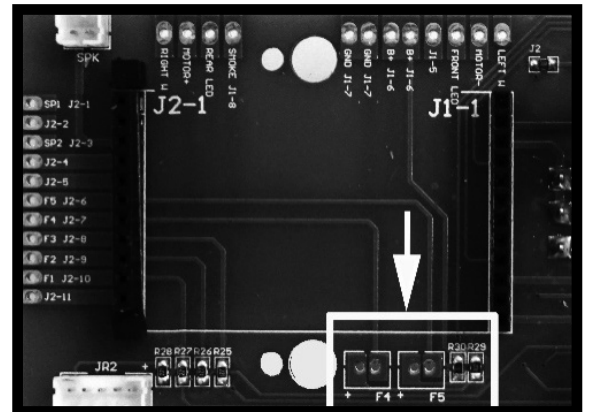
Each pin on the plug-and-play circuit board has a defined purpose as shown in the table on the following page. Each pin is also connected to a solder pad for use with systems that do not support a plug-and-play setup. The J1 solder pads are above the socket and the J2 solder pads are on the left-hand side of the circuit board. The J2 row of pins has a blank key on either end of the row to help ensure that a plug-and-play device cannot be incorrectly inserted.



Pin number J1	Purpose	Pin number J2	Purpose
12	Rail +		Solid Key
11	Rail +	11	Not used
10	Motor +	10	Front Number Boards
9	Rear Locomotive Headlight	9	Cab Light
8	Smoke Unit	8	Porch Safety Lights
7	Locomotive Ground	7	User Installed Right Ditch Light
6	Locomotive Positive	6	User Installed Left Ditch Light
5	Not Used	5	Not Used
4	Front Locomotive Headlight	4	Not Used
3	Motor -	3	Speaker -
2	Rail -	2	Not Used
1	Rail -	1	Speaker +
			Solid Key

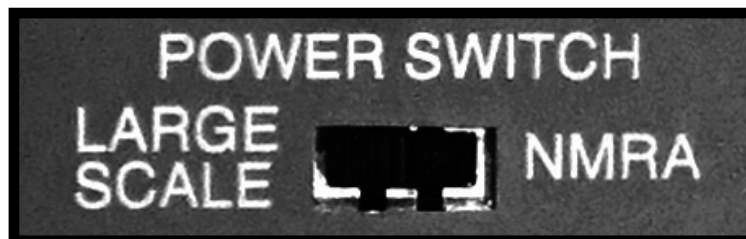
## USER INSTALLED DITCH LIGHTS

Ditch lights came into frequent use in the 1980s and were mandated in 1997. Most GP40s came from the factory without ditch lights but as the years progressed most railroads added them. The Bachmann GP40 has provisions to easily add ditch lights should you desire. On one side of the socket are two sets of solder pads labeled F4 and F5. Each set of pads has one pad for connection to the ground side of an LED and a second pad for the + side of the LED. The + side of these pads is protected with a limiting resistor allowing a direct connection to an LED.

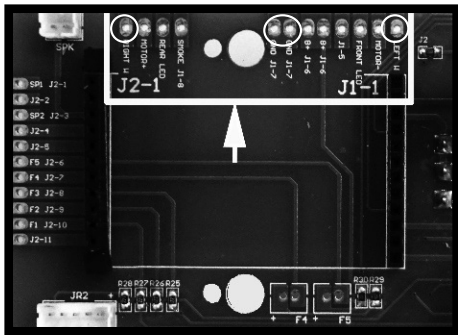


## TRACK-POWERED DC OPERATIONS

To operate your locomotive using track power, leave the (DC) Jumper PC Board in place, make sure that the motor switch is *ON*, the pickup switch is in the *TRACK* position, and the NMRA/Large Scale Polarity Switch is set for its correct position (normally the *LARGE SCALE* position for compatibility with G scale equipment from other manufacturers). In this mode, the locomotive's headlight and markers will be direction-dependent.



## ADDING AN AFTERMARKET SOUND SYSTEM



This locomotive has a speaker mounted underneath the radiator grille. If your sound system is designed for plug-and-play operation, remove the (DC) Jumper PC Board and plug in your sound system. If your sound system does not provide plug-and-play operation, continue to use the (DC) Jumper PC Board and connect the sound system wires to the solder pads labeled *Right W* and *Left W* on the right-hand side of the main PC board.

*Please note: To ensure proper operation, any device connected to the circuit board should have its ground connection made to the locomotive's ground using one of the GND J1-7 pins.*

## ADDING AFTERMARKET TRACK-POWERED NMRA DCC CONTROL

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

If your decoder is not designed for full plug-and-play operation, use the supplied Jumper PC Board with wires (shown here) and attach the wires to your decoder following the instructions that came with your decoder. Note: the decoder's + and - outputs must be connected to the Jumper PC Board's GND and B+ wires to allow the internal lighting to function properly. Holes are provided on the main circuit board near the center of the socket to allow the installation of a zip tie to hold the boards together.



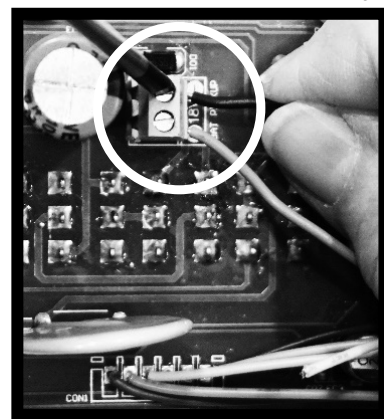
## ADDING AFTERMARKET ON-BOARD BATTERY/RC OPERATION

If your Battery/RC or DCC Direct (wirelessly transmitted DCC) system supports plug-and-play using the plug-and-play circuit board, remove the (DC) Jumper PC Board on the circuit board and replace it with the plug-and-play board of your choice. Connect the batteries to the *Bat Pickup* screw terminals on the locomotive's main circuit board and switch the *Track/Battery* pickup switch to *BATTERY*. Note: If your Battery/RC or DCC Direct system does not provide DC power to the locomotive's ground and B+ connections then it will be necessary to also connect the battery to the J1-7 GND and J1-6 B+ connections to power the locomotive's internal functions. If you wish to house your batteries on the model, you can install them in the locomotive's shell or the fuel tank underneath the locomotive. A convenient hole is provided to allow the wires from a battery in the fuel tank to be connected to the main board. When installing a larger battery in the fuel tank, it may be necessary to remove the plastic center support.

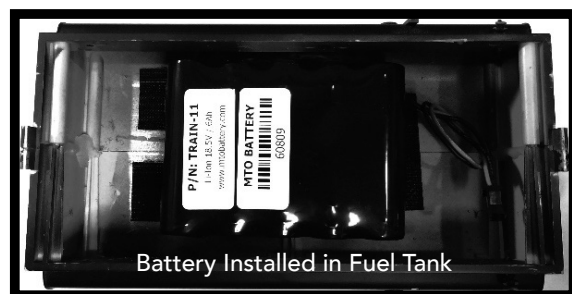
You can also install your batteries in a separate trailing car and connect them to the locomotive using the power plugs next to the front and rear couplers.

If your Battery/RC system does not support plug-and-play operation, use the supplied Jumper PC board with wires and attach the wires to your Battery/RC or DCC Direct system following the instructions that came with your system.

*Please note: The Battery/RC system's + and - outputs must be connected to the Jumper PC Board's GND and B+ wires to allow the internal lighting system to function properly. Holes are provided on the main circuit board near the center of the socket to allow the installation of a zip tie to hold the boards together.*



The NMRA/Large Scale *Polarity Switch* works in both track and battery modes. In *BATTERY* mode, the battery terminals are connected to the Rail + and Rail - terminals on the circuit board (J1-1, 2 and J1-11, 12). The polarity of these terminals can change by the position of the NMRA/Large Scale *Polarity Switch*. This means that any device plugged into the plug-and-play circuit board must protect itself from polarity reversals either through a diode or a rectifier. Please refer to your after-market owner's manual for proper installation.



## TRAILING CAR CONTROL USING THE LOCOMOTIVE'S POWER PLUGS

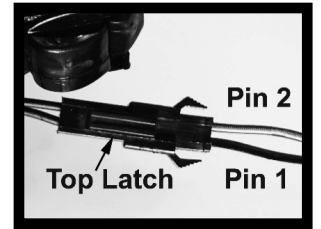
The Bachmann GP40 locomotive has a power plug next to the front and rear coupler. These plugs can be used to provide battery power to the device in the locomotive's plug-and-play circuit board or allow full control of the locomotive using a control system in a trailing car. The locomotive's Battery/Track pickup switch must be set to Battery mode to allow for this style of operation.

The NMRA/Large Scale Polarity Switch can be used to allow control in both elephant-style (same-direction-facing) and back-to-back operations when running multiple locomotives.



## SHARING BATTERY POWER

When sharing power between batteries connected to the locomotive's internal battery terminals and batteries in another locomotive or trailing car, it is important to observe caution to avoid shorts between the batteries. Pin 1 should be used for the negative connection and Pin 2 for the positive connection. Connecting two GP40 locomotives using the supplied power plug connector cable will allow both units to share their battery power.



## HYBRID DRIVE OPERATION

Some control systems use a combination of onboard primary and backup power to provide the locomotive with the control signal transmitted either through the track or via radio control. To install such systems, connect the onboard power ground terminal to J1-7 GND and the onboard power positive terminal to J1-6 B+. If desired, Pin J2-11 can be used to connect the switch to turn on and off the backup power source.

The remaining connections are through the plug-and-play circuit board. These systems also allow for the control signal to come either from the track or from a radio receiver. If using such a system, connect the radio receiver outputs to the BATT1 terminals, and use the Track/Battery pickup switch to select *TRACK* for track control or *BATTERY* for the radio signal.

## GENERAL MAINTENANCE AND SERVICE

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

If your locomotive should need service, please note that our service department is not responsible for repairs to locomotives with aftermarket products installed in the locomotive's plug-and-play circuit board. Any locomotive requiring service should be returned to us as delivered, entirely in the original package AND with the factory-supplied (DC) Jumper PC Board plugged in the plug-and-play circuit board.

Disclaimer: Bachmann Industries Inc. will not be liable for any damage incurred to any locomotive or any other personal property resulting from the use of a third-party battery or any other charging system used to operate this locomotive. To the extent you choose, at your own risk, to use a third-party battery or charging system to operate this locomotive please follow all instructions that accompany either the third-party battery or charging system.

Contact our service department at  
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service@bachmanntrains.com.

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