RailBoss 4
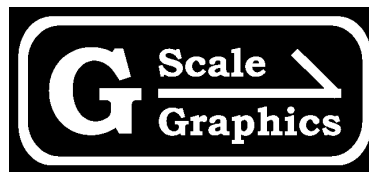
Basic & Plus

The Next Generation of

2.4GHz R/C
for Large Scale Trains

Operation and Installation Manual

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Contents

Overview

RailBoss 4 Basic

is an electronic speed control designed specifically for controlling large scale trains using a small hand-held 2.4GHZ transmitter. It provides all of the basic speed control and sound functions you would expect.

- Precise speed control with selectable rates for switching or prototypical acceleration (momentum)
- Speed matching via min/max throttle limits
- Directional lighting outputs for lamps or LEDs (with no external resistors)
- Four sound trigger outputs
- User programmable
- Kid's transmitter (optional)

Many aspects of the throttle are programmable to match your specific needs; i.e. double-heading locos, realistic response, and speed limiting for children.

The 2.4GHz radio system has no frequencies or channels to worry about. *Your* transmitter controls *your* receiver (or receivers) and no one else's. The radio interference generated by the electric motors powering our locos is no longer a problem. Radio range is excellent and the transmitter easily fits in a shirt or pants pocket.

Integrated receiver/electronic speed control and hand-held transmitter

A powerful micro-controller handles all of the control logic and sends signals to a 5 amp motor driver, which is enough to handle most locomotives pulling a full train. Typical current draw for one loco motor is less than 1 amp.

Directional lighting outputs are provided for incandescent lamps and/or LEDs without the need for added resistors.

User programmable options give you control over many of the operating parameters, without a computer.

In addition to controlling speed via Faster/Slower buttons, the 6-button transmitter can also control loco direction, sound triggers, un-couplers, momentum on/off, track whistle on/off, station stops on/off, and more.

A 2-button Kids' Transmitter is also available, which allows them to blow the whistle/horn, sound the bell, and start the train from a station stop. They have fun. Your train stays on the tracks!
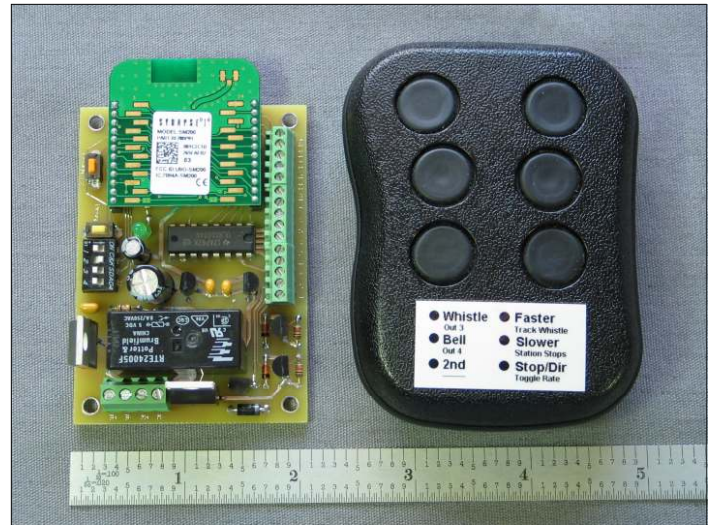
RailBoss 4 Plus

has all of the Basic RailBoss functions plus these:
- Automated station stops with statistical control via track magnets
- Automatic spacing of multiple trains running on the same loop (RB4 20 and later software)
- Low battery warning and cutoff for Lithium-Ion and Li-Po battery packs
- Statistical control of the track activated whistle
- Two Phoenix un-coupler outputs

Automate your layout with automated station stops, back 'n forth trolley operation, or **multiple trains running on the same loop with automatic train separation** (Multi-Train for RB4 20 and later software). Gain control over your track magnet triggered whistle. You decide when and how often it is activated.

A low battery warning function for use with today's lithium battery technologies (Li-Ion & Li-Po) lets you get the train back home before it stops dead somewhere out on the layout due to the protection circuit built into the battery pack.

Locomotive Hardware consists of a **RailBoss 4 Rx** (combined control board and receiver, 3.2" X 2.0"), and an optional reed switch for automated station stops (the Bell reed from your sound system can be used for both station stops and the bell).

The Handheld Transmitter can be used to control your entire fleet of locos, any one at a time. Or multiple transmitters can be used to run multiple trains at the same time.

To complete your battery power conversion, you will also need to provide a power on/off switch, charging jack, battery pack, and battery charger. To make this task easier, we recommend our "Battery Conversion Module", which contains a power on/off switch, charging jack, and fast acting fuse. This simplifies the wiring and eliminates most of the soldering. It also provides power distribution to your sound board and other accessories. We also have cables available for: battery connections, and loco to tender or trailing car to loco (2 wire or 4 wire).

The Radio System

RailBoss 4 uses a new high-tech 2.4GHZ system designed for industrial use. The range is excellent, up to 250 ft., and in most cases still works when the loco is hidden from view.

The radio in each transmitter and each locomotive is actually a transceiver, so bidirectional communications between every radio is possible. When running in "Multi-Train" mode, all locos are in constant communication with each other to report their track position. In fact, if you have multiple locomotives running, the system will act as a mesh network, relaying signals via the most reliable radio path to your loco.

One transmitter can be used to control your entire fleet of locos, any one at a time. Just turn on the loco you want to run, and the others off.

Each **RailBoss 4 Rx** "learns" a transmitter and will only respond to that transmitter and no others. Press the salmon colored button on the **RailBoss 4 Rx**. The LED and front headlight will start blinking. Press the Stop key on the transmitter until the LED stops blinking. They are now linked together. If you routinely need to pass control of a locomotive from one transmitter to another, this can be done without accessing the **RailBoss 4 Rx** by mounting a remote push-button on your locomotive (see wiring diagram).

Multiple transmitters can be used to run more than one train at a time, without interference. There are no channels or frequency selections to worry about.

Interference from locomotive motors or other radio/noise sources is not a problem. No filters or special antenna placement is required.

The 6-button handheld transmitter uses a long lasting replaceable CR2032 coin cell battery. There is no on/off switch. It is always ready to use, and only transmits while a button is pressed.

The RailBoss Rx Control Board

The **RailBoss 4 Rx** is a combination control board and radio transceiver. Transmitter commands control a powerful (and silent) PWM (pulse width modulation) motor driver designed to allow nice slow prototypical speed control of your locomotive. Adding momentum to the throttle enhances the prototypical operation. Momentum is fully programmable, and can be turned on and off via the transmitter to assist with switching operations.

RailBoss 4 Rx operates over a wide range of battery input voltage (7-25V, i.e. 2-6 Lithium cells, or 7-16 NiMh/NiCad cells). The battery input is protected from damage due to reverse polarity.

RailBoss 4 Rx has directional lighting outputs capable of driving incandescent lamps or LEDs without the need for user supplied resistors. Lamps are powered from the battery voltage. LEDs are powered from a current source
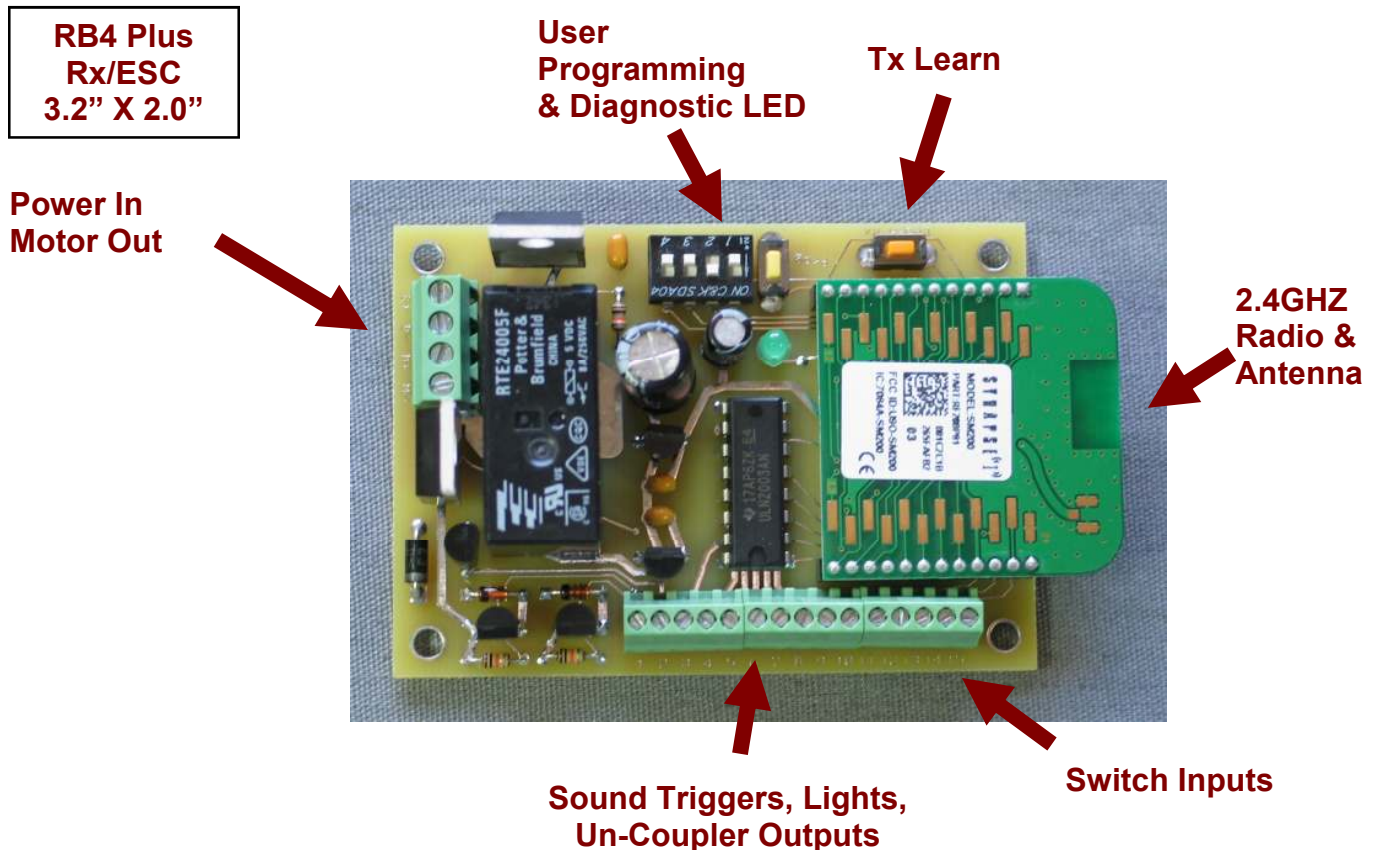
built into the RailBoss 4. The front and rear lights follow the direction of the locomotive. The front light is also used as feedback to the operator during programming procedures and low battery warning.

Four sound trigger outputs can be controlled from the transmitter.

Switch inputs are provided for automating station stops, control of the track activated whistle, and remotely learning a transmitter.

A DIP switch, push-button and LED provide simple user programming for many different functions.

The integrated 2.4GHZ radio receiver and antenna provide excellent operating range.

RB4 Plus Rx/ESC 3.2" X 2.0"

User Programming & Diagnostic LED

Tx Learn

Power In Motor Out

2.4GHZ Radio & Antenna

Sound Triggers, Lights, Un-Coupler Outputs

Switch Inputs

Kid's Transmitter

An optional Kid's TX is available to let your kids have some control without wrecking the train! **(RB4 40 and later software)** The left button will sound the horn/whistle and the right button rings the bell. Pressing either button while the train has made an automated station stop will make it leave the station. You still have full control using your full 6-button transmitter.

Of course the kids may just keep pressing the buttons as fast as they can, so user programmable parameter 8 allows you to lockout the buttons for X seconds before they will work again. (Teaches them patience.)

Learn the Kid's TX by pressing the Tx Learn button on the RB4 board and then press either the Whistle or the Bell button on the Kid's TX.

Installation

<u>**Track Power to Battery Power Conversion**</u>
All track powered locomotives are very simple, electrically. Track power is picked up from the rails via pickups and usually connected directly to the motor. Sometimes there are switches in the circuit to reverse polarity or turn off track power. These connections need to be modified in order to properly connect the battery powered driver board.

Converting to battery power consists of these basic steps.

1. **Determine battery voltage requirements.**
   Before you disturb any wiring, run your locomotive at the fastest speed you like to run on your layout and measure the track voltage. Add at least 2 volts to this measurement to account for low batteries and driver losses. If using NiCad or NiMh batteries, round this value up to the nearest 1.2v increment, and you have the number of cells you need. For lithium cells, round up to the nearest 3.7v increment.

   For example: Track voltage measures 11.6V at speed. (11.6 + 2)/ 3.7 = 3.7. Rounding up to 4, you will need a 4 cell Lithium-Ion battery pack. 4 X 3.7V = 14.8V. (14.8V is a popular value for steam locomotives. Many critters can run on 12V. Diesels usually require 18V or more).

2. **Disconnect the track power pickups.**
   By isolating your locomotive from track power, you can run more than one locomotive on the same track at the same time, either battery powered or track powered. If you don't do this, your battery will be directly connected to your track power supply, resulting in damage. Note that in doing this, you have also removed power from all lighting circuits, smoke units, and any other accessories that were running from track power. For battery power, smoke units are usually not used due to the high current requirements that will quickly drain the battery pack. Understanding existing wiring and/or circuit boards without documentation can be difficult. You may choose to just remove it all and wire directly to the things you can see and understand.

3. **Find a direct connection to the motor.**
   The output of the controller needs to be connected directly to the motor. All other control boards and switches should be removed from the circuit. Depending on the design of the locomotive, this may be an extremely simple process, or it may be difficult. Some motor blocks make it very simple. You will find two pairs of wires. One set goes to the track pickups, and the other goes to the motor. You can verify which pair goes to the track pickups using a continuity checker or ohmmeter. Track pickups will have continuity from one pin to one set of wheels. The motor will read a small resistance value across the two wires (e.g. 18 ohms). Simply disconnect the track pickup pair and connect the motor pair to the controller.

4. **Install the discrete components and wire them together**
   (battery pack, power on/off switch, fuses, charging jack, controller, Receiver, and lights)
   Installing the new components is a packaging exercise. Where will it all fit? Space for the battery pack and control board and receiver is usually the biggest consideration. For smaller locos you may need to install some of all of the system in a trailing car. The G-Scale Graphics "Battery Power Conversion Module" makes installation easier in many cases by putting the on/off switch, fuse, and charging jack all one small circuit board with screw terminals to eliminate soldering.

<u>**Wiring**</u>
Always use stranded wire and tin the ends with solder prior to making any connections. Wiring for the power input and motor output circuitry on the terminals marked B+,B-,M+,M- needs to be heavier gauge wire (20 or 22 Ga.) Any wiring connections or splices not directly connected to a component must be covered. Use heat shrink tubing or wire nuts are more reliable than tape.

<u>**Skills**</u>
All connections to the RailBoss Control can be made via screw terminals. However, basic wiring and soldering skills may be required to make proper connections to the power on/off switch and charging jack. Some drilling and minor fabrication or modifications to the unit under conversion may also be required.

<u>**Tools & Materials**</u>
A low wattage soldering iron, side cutters, needle-nose pliers, wire strippers, a 1/16" or 5/64" slotted screwdriver, resin core solder, 22 Ga. Wire, and heat shrink tubing are recommended to properly complete the wiring. A suitable drill and double-sided foam tape may be useful for mounting components.

Installation of the RailBoss Control Board

The RailBoss board can be mounted most anywhere, but allow space for access to wiring, and no metal should be in contact with the board. The power components (large metal tabs) will get hot, so keep them out of direct contact with plastic. Holes in the corners of the board can be used for screws and/or PCB stand-offs. Make sure the stand-offs don't touch any circuit board components. Or double-sided foam tape on the bottom side of board can be used to secure the board to a plastic surface. Handle the board by the edges, avoiding direct contact with the circuitry. Static electricity can damage the components. Try to ground yourself by touching something metal prior to handling the board. Refer to the wiring diagrams at the end of this manual.

Power Input (Battery)

The RailBoss Control will not function below 7v input at terminals B+, B-. Reverse polarity will not cause damage, but the RailBoss will not operate. ***This product is not intended for track power applications where polarity reverses.***

The higher the battery voltage the more heat the RailBoss will produce. Voltage in excess of 25V may damage circuit board components. Battery packs of 7 to 16 NiMh/NiCad cells or 2 to 6 Lithium-Ion/Polymer cells are suitable.

When making wiring connections to the battery pack, use extreme caution to avoid shorting the leads together. Do not connect the battery to the circuit until all other wiring has been completed. The battery pack should have a quick disconnect connector for safety and ease of replacement.

The power on/off switch can be located on the floor under the loco. If you have a critter, the charging jack can also be floor mounted, since you will probably take it off the track for charging. For a full size locomotive and/or tender, you may want to locate the charging jack on the end of the car to enable charging in place on the track. The switch in the charging jack isolates the battery from all other electronics when a jack is plugged in, regardless of the position of the power on/off switch. Note: A G-Scale Graphics "Battery Conversion module" will greatly simplify the power input wiring and provide screw terminals for connections.

A 5-amp fuse in-line with the battery input is recommended. This is also included in the G-Scale Graphics "Battery Conversion module".

Motor Output

Connect directly to the motor. All other unknown circuitry should be disconnected from the motor. A maximum of 5 amps continuous current is available from the board. *Warning! At max current the power transistors on the board (metal tabs) will be extremely hot. Enough to burn you if touched, or melt any plastic they come in contact with.*

At power-up the motor output will provide a voltage to the motor that is positive on terminal M+, negative on M-. This is intended to be the forward direction of the locomotive.

Outputs for Lighting and other devices

Lamps: Terminal 1 provides battery power for Incandescent lamps. So the voltage rating of your lamps must match the battery voltage. When battery voltage exceeds the lamp rating, use a resistor of appropriate value in series with terminal 1. Multiple lamps may be connected in parallel, but total current draw for terminals 3,4,5,6,7, or 8 should not exceed 250 ma each. Terminals 9 and 10 should not exceed 750 ma each.
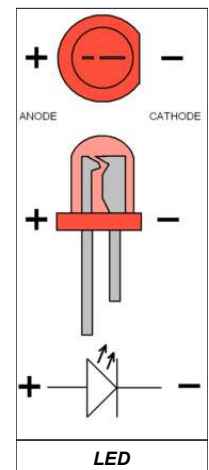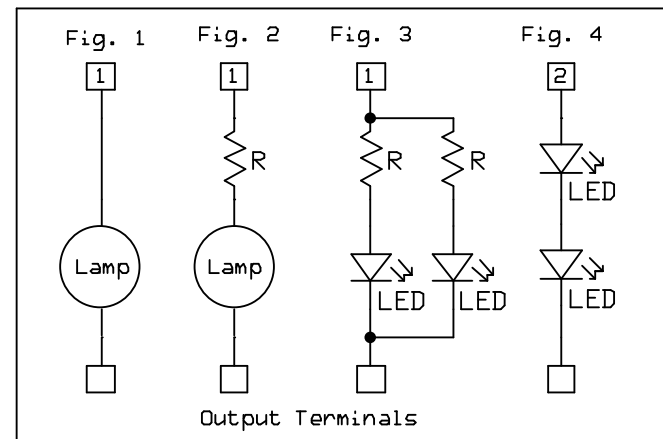
LEDs: Terminal 2 provides an 11ma current source for LEDs. No current limiting resistors are required. Connect LEDs; terminal 2 to the anodes(+), and terminals 3 and 4 to the cathodes(-) of the forward and reverse LEDs respectively. Multiple LEDs can be connected in series.

Fig. 1 Fig. 2 Fig. 3 Fig. 4

Output Terminals

Sound Triggers

Outputs are provided for up to four sound triggers to a sound board. These are open collector outputs that pull the sound board input low to common (ground) to trigger the sound. The battery common (-), connected to both the RailBoss and the sound board is the return path. The T1 output needs to be connected to the whistle and T2 to the bell in order for the RailBoss automation to work properly. T3 and T4 can be anything you like, 250ma max. *Wiring diagrams for specific sound systems are available on our website.*

The Whistle trigger is playable; i.e. the whistle will sound as long as you hold the button down. The Bell trigger and T3,T4 triggers can be either momentary or latched via user programming options.

High Current Outputs at terminals 9 and 10.

These terminals are primarily for use with Phoenix Un-Couplers. The output is momentary, and designed specifically for use with Phoenix Sound Un-Couplers. However, they can be user programmed for latched operation, making them suitable for lights, relays, etc; anything with a maximum load of 750 ma. (Again—Warning: Latched operation with Un-Couplers attached will destroy them.)

Reed Switches

The bell reed switch at terminal 12 is required for automated stations stops. The whistle reed switch at terminal 11 is only required when using the RailBoss to modify the behavior of your sound board when using track magnets. The same two reed switches can operate both the RailBoss and your sound board. (See Operation section)
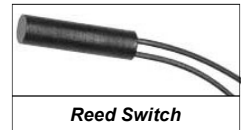
Reed Switch

Reed switches must be installed within 1/4" of track magnets, in either a horizontal or vertical orientation. You can usually mount them on the underside of a truck in the horizontal position parallel with the track. Silicone adhesive works well. Or, they can be vertically mounted through a 1/4" diameter hole in the floor of the vehicle. Do not mount the reed switch below the level of rail tops, as it will hit the rails in turnouts.

Setup and Testing

The on-board green LED can be used to check out your wiring and most of the board functions. This should be all you need to get going, but if you are still having problems and you have a volt-ohm meter you can also take the measurements indicated below.

Power-up (RailBoss LED ON)
When power is first applied to the board, the LED should be ON. This tells you the power input polarity is correct and the RailBoss Control's power supplies are working. Measure +3.2 +- 0.2 VDC at terminal 14+, 15-. If there is a problem, check the voltage and polarity at terminals B+, B-. It should measure between +7.0 and +25.0 VDC.

Transmitter / Receiver Setup
There are no channels or frequencies to worry about. Your receiver will only respond to your transmitter, and no others.

Each receiver must "Learn" the transmitter it is expected to respond to. This only needs to be done once, or whenever reassigning a receiver/loco to a new transmitter. Press the salmon colored button next to the receiver on the **RailBoss 4 Rx** (or use the remote learn button). The LED and front headlight will start blinking. Then press the Stop key on the transmitter until the LED stops blinking. They are now linked together.

The transmitter is powered by a CR2032 coin cell battery, accessible by removing the 3 screws on the back. Pressing any key on the transmitter should cause the RailBoss LED to blink off. If it doesn't check the transmitter battery. It should measure at least 2.5V. A new battery measures 3.0V.

Outputs
At RailBoss power-up, direction is set to "forward". The Front Light should be ON (if connected) and the Reverse Light should be OFF. When changing direction with the transmitter (by holding the Stop button), you may hear the relay on the RailBoss click. In reverse, the Reverse Light should be ON, and the Front Light OFF. Direction can only be changed while stopped. If the loco is operating backwards from this, reverse the motor wiring at M+,M-.

Sound trigger outputs momentarily switch low (battery -) upon activation. *Wiring diagrams for specific sound systems are available on our website.*

<u>Reed Switches</u>
Closing the reed switch with a magnet, or by moving the loco over a track magnet, will cause the LED to turn off while the contacts are closed. If not, check the wiring.

Manual Operation

Power-Up
At power-up, the locomotive will be stopped, ready to proceed forward. Momentum is off (fast rate), station stops are disabled and auto track whistle is enabled.

Setting Direction
Pressing the Stop/Dir button while stopped will change the direction of the loco. Observe the front light of the loco to determine present direction. The loco will power up per User Programming parameter 5. Normal power-up is in the forward direction. When consisting locos, you may need to set this for reverse on power-up for a loco facing backwards.

Directional Lighting
Front Light is only ON in forward, Rear Light is only ON in reverse.

Setting Speed
The Faster and Slower buttons will change the speed setting. Momentary presses for small speed changes, or hold the button down to ramp speed up or down. Min and Max Speed settings are set in Throttle Programming mode. The default settings are Min Speed = 0% battery voltage, and Max Speed = 100% battery voltage.

Momentum/Fast Rate
"Momentum" is a delayed response to a change in speed setting. This simulates the slow response of a heavy train. Toggle the rate from fast to momentum, and vice versa, by pressing "2nd, Stop/Dir". When toggled, immediate user feedback is provided via the Whistle (Fast Rate) or the Bell (Momentum). Use the fast rate for a quicker response during switching moves.

Emergency Stops
Holding the Stop button while running will make a quick stop, but not instantaneous. This avoids gear damage due to the real momentum of the train.

Manually Triggering Sounds from the Transmitter
The Bell and Whistle triggers are accessible directly using the "Whistle" and "Bell" buttons. Out 3 and Out 4 require use of the 2nd key and Whistle (Out 3) or Bell (Out 4). The Bell and Out 3,4 can be programmed for momentary or latched operation. The Whistle/Horn will continue to trigger as long as the button is held down, allowing you to "Play" the whistle on some sound systems (Software revision 40 and later). In order to use the manual sound triggers, the sound trigger outputs must be connected to your sound board.

Automated Whistle/Horn Triggers from Track Magnets
The track activated whistle can be toggled on/off from the transmitter. This is useful when the automated whistle gets annoying or you just want quiet operation. Toggle the track whistle on or off using 2nd key and Faster buttons. When toggled, immediate user feedback is provided via the whistle. if enabled, the whistle will sound. If disabled it will not. When enabled, track magnets will sound the whistle according to the User Programmed setting in parameter 2.

Automated Station Stops
Automated station stops can also be toggled on/off from the transmitter using 2nd key and Slower buttons. When toggled, immediate user feedback is provided via the bell. if enabled, the bell will sound. If disabled it will not. When enabled, station stops will occur per User Programmed setting in parameter 3.

Throttle Programming
You can program the min and max throttle speeds (voltage). Most motors require more than 0 volts to get moving, so if you set the min speed just slightly less than what it takes to make the loco move, you will eliminate the delay in getting the loco moving. Max speed setting is useful for setting a safe maximum speed to avoid derailments when children are operating the loco.

To enter throttle programming mode, hold the 2nd key, Slower, and Stop buttons down until the LED starts flashing at a fast rate. You will now have full speed control from 0 to 100% battery voltage.

To set min speed, use the Faster button to just barely get the loco moving. Then use the Slower button to just Stop it. Press Bell to save the min speed (Speed must be less than 50% battery voltage).

To set max speed, use the Faster and Slower buttons to run the loco at the desired speed. Press Whistle to save the max speed setting (Speed must be greater than 50% battery voltage).

To return to default throttle settings (min speed = 0% voltage, max speed = 100% voltage), press the 2nd key to save the default settings.

Press the Stop button to save the setting and exit throttle programming mode. LED will stop flashing. Note: Only one setting, either Min or Max can be set at one time. Exit to save, then re-enter for the second setting.

Speed Matching of Locos
Use Throttle programming min speed to ensure that both locos start at the same time. Then adjust User Parameter 4 to get the same acceleration from each loco. Note: If the top end speeds of each loco differ greatly, this may not work satisfactorily. (The Max speed adjustment won't help with speed matching).

Diesel Consists
Diesel consists often require one more of the locos to be facing backwards from the front loco. Use programming parameter 5 to reverse the polarity of the reverse facing loco. It will then power-up in reverse. One transmitter can then control both locos (or more) properly.

Assigning the Transmitter to a New Locomotive
This is easily accomplished using a remote Learn button (see wiring diagram). Simply press the remote learn button (or the PCB mounted learn button on the RailBoss 4 board), then press the Stop button on the transmitter you want to control that loco with.

Low Battery Voltage Warning for Lithium Batteries
When NiMh or NiCad batteries start running down, they usually give a noticeable decrease in speed before giving out completely. Plenty of time to get the train back home or to the desired charging location.

With lithium batteries, things are different. They need protection from over discharge, so many lithium-ion battery packs have a built-in protection circuit that shuts off the battery when it discharges to a predetermined voltage. This happens with no warning, and your train stops instantly; in the tunnel or on the mountain, etc. Lithium-polymer batteries don't usually have the built-in protection, but must have some protection to avoid damage.

The purpose of the low voltage warning function is to give you full run-time on your battery pack, but warn you when you have only a few minutes left to get the train back to the desired location under power.

Low Voltage Warning: The throttle setting is automatically reduced by 50%, the Front Light starts flashing, and you won't be able to increase speed using the Faster button. To restore full control, stop the loco using either the Slower button or the Stop button. You may now return your train to a safe place. The LED will continue to flash reminding you the battery is very low. This setting is programmable via DIP switch parameter 7. It may take some experimentation to get the desired result; i.e. X minutes of run time before the battery circuit shuts you down.

Hard Cutoff: If the battery voltage falls below 3.0 volts per cell, the RailBoss will shut off power to everything it has control of (motor and lights). However, the sound system and other accessories may still be drawing power. This setting is intended for use with Lithium-Polymer batteries, or Lithium-Ion batteries without built-in protection.

This function can be disabled or customized using DIP switch parameters 6 and 7: i.e. number of cells and voltage level.

Warning: Neither the Low Voltage Warning nor the Hard Cutoff will function until programming parameter 6 is properly setup. It is the user's responsibility to determine the proper number of lithium cells in the battery pack being used and select the proper option, thus enabling both functions.

These functions serve as a warning only! It the user's responsibility to intervene promptly after the warning and safely disconnect the battery pack to avoid damage.

RailBoss 4
Transmitter Commands

Single Key Function
2nd Key function

Examples:
   Press "Bell" key once to sound the bell.
   Press the "2nd Key", followed by the
   "Bell" key to Toggle Station Stops.

Whistle - Press momentarily to sound the Whistle/Horn (Sound trigger 1) or hold for sound systems with "playable" whistles/horns.

Bell - Press momentarily to sound the Bell
      (Sound trigger 2)

Faster - Press momentarily to bump speed up. Hold down to ramp speed up.

Slower - Press momentarily to bump speed down. Hold down to ramp speed down.

Stop/Dir - Press momentarily or hold to perform a Quick Stop while running. Or while stopped, press momentarily to change direction.

2nd - Press momentarily, followed by another key to perform the secondary function.

2nd, Whistle - Sound Trigger 3 or Output 3

2nd, Bell - Sound Trigger 4 or Output 4

2nd, Faster - Toggle the Track activated whistle. Enabled, the whistle sound per User Parameter 2. Disabled it is quiet. *Note: Whistle can always be sound manually via a single key press of the Whistle button. Whistle will sound when toggled to "enabled".*

2nd, Slower - Toggle automated Station Stops. Enabled, station stops will occur per User Parameter 3. Disable for continuous running. Bell will sound when toggled to "enabled".

2nd, Stop - Toggle the momentum rate; either fast for switching or slow per User Parameter 4 for prototypical speed changes. Bell will sound when toggled to "enabled".

Throttle Programming -
   Enter Throttle Programming mode by holding down the **2nd, Slower, and Stop buttons** until the LED and Forward head light start flashing.

   Use Faster/Slower Buttons to control speed (0 to 100%)
   Press Whistle to set the Max Speed (must be greater than 50%)
   Press Bell to set the Min Speed (must be less than 50%)
   Press 2nd to reset throttle to full range (0 to 100%)

   Press Stop button to exit and save changes at any time. LED will stop flashing.

Learn TX - Press the Learn button on the RailBoss 4 Rx. LED will start flashing. Then press Stop on the transmitter. LED will stop flashing.

Whistle
Out 3

Faster
*Track
Whistle*

Bell
Out 4

Slower
*Station
Stops*

2nd

Stop/Dir
*Toggle
Rate*

RailBoss 4 Transmitter

With Out 3/4 on the Left
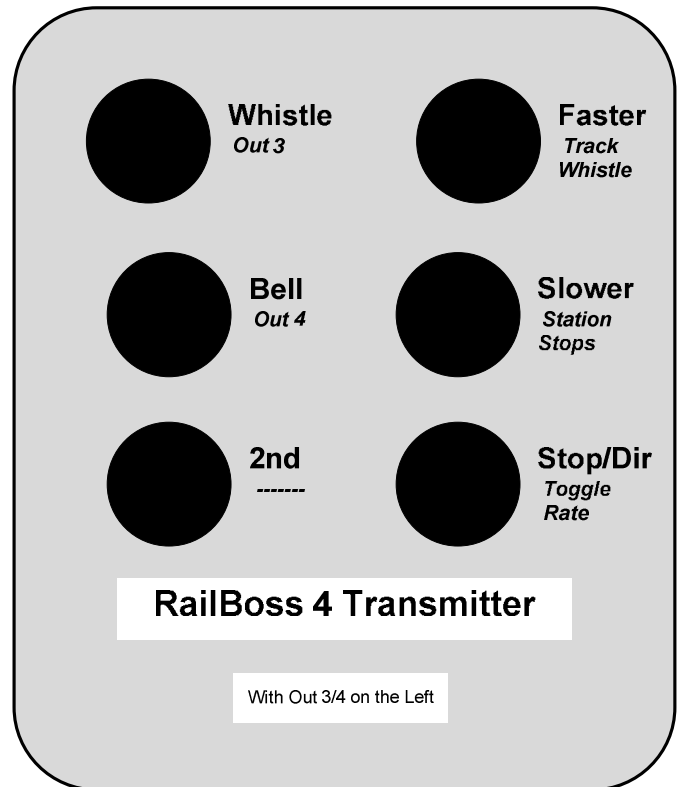
Trouble Shooting
Manual Operation

- The PCB LED and lights turn off as soon as I turn on the RailBoss ...

  The RailBoss is shutting down due to low battery voltage (less than 3.0 volts per cell).

  Recharge or replace the traction battery.

  Disable or reprogram the Low Voltage Warning parameter (6) for the proper battery size. In order to do this, you will need to enter the User Programming mode right after power-up, before the LED goes out. Set parameter 6 for Option 1 (disabled), or the proper voltage for your battery pack.

- Nothing seems to be working …

  Pressing any button on the transmitter should cause the RailBoss LED to blink off. If not, check the transmitter battery. It should be 2.5V or greater (3.0V for a new battery).

  Check the power. The RailBoss LED should be ON. You should measure between 7 and 25 volts DC applied to terminals B+, B- .

  You should measure 3.2 volts DC on terminals 14(+), 15(-)

  Verify all wiring connections.

Whistle
Track Whistle

Faster
Out 3

Bell
Station Stops

Slower
Out 4

2nd

Stop/Dir
Toggle Rate

RailBoss 4 Transmitter

With Out 3/4 on the Right
(Older models)

Out 3/4 on the Right is the original label configuration. You may now choose which side you want the Out 3/4 functions to operate on via User Programming Parameter 9. (but the label may read wrong).

- The transmitter doesn't work at all.

  Did the receiver successfully "Learn" the transmitter?

  Open the transmitter case and make sure the battery and radio module are full seated.

  The battery should measure at least 2.8 volts (3.0 volts nominal).

  Replace the battery with a CR2032 coin cell battery.

- Erratic throttle behavior? Reset throttle to default full range values using throttle programming procedure (See Throttle Programming).

- The loco doesn't start moving until I hold the Faster button for a long time.

  The voltage is ramping from 0 volts to that required to move the loco. You can eliminate this dead time by programming the Min Speed setting to a higher value. (See Throttle Programming).

- The loco starts moving as soon as I turn it on.

  Program the Min Speed setting to a lower value.

- The locos runs in reverse at power up, even though the front light is ON.

  Reverse the wires at the motor output, terminals M+ & M- .

  Check setting for Direction Control parameter 5.

- The loco won't run as fast as I like even though I keep trying to increase the speed setting …

  Maximum speed is determined by your battery voltage or the Max Speed setting. You need more cells/voltage or you may need to restore the default throttle programming settings.

Automated Operation

An automated station stop slows down the train, waits at the station for a predetermined time, then accelerates back to its original running speed. Station stops add interest to your open house or public displays.

Automated operation is easily achieved with the RailBoss R/C Control. You just need to add a reed switch to your locomotive and place some track magnets on your layout.
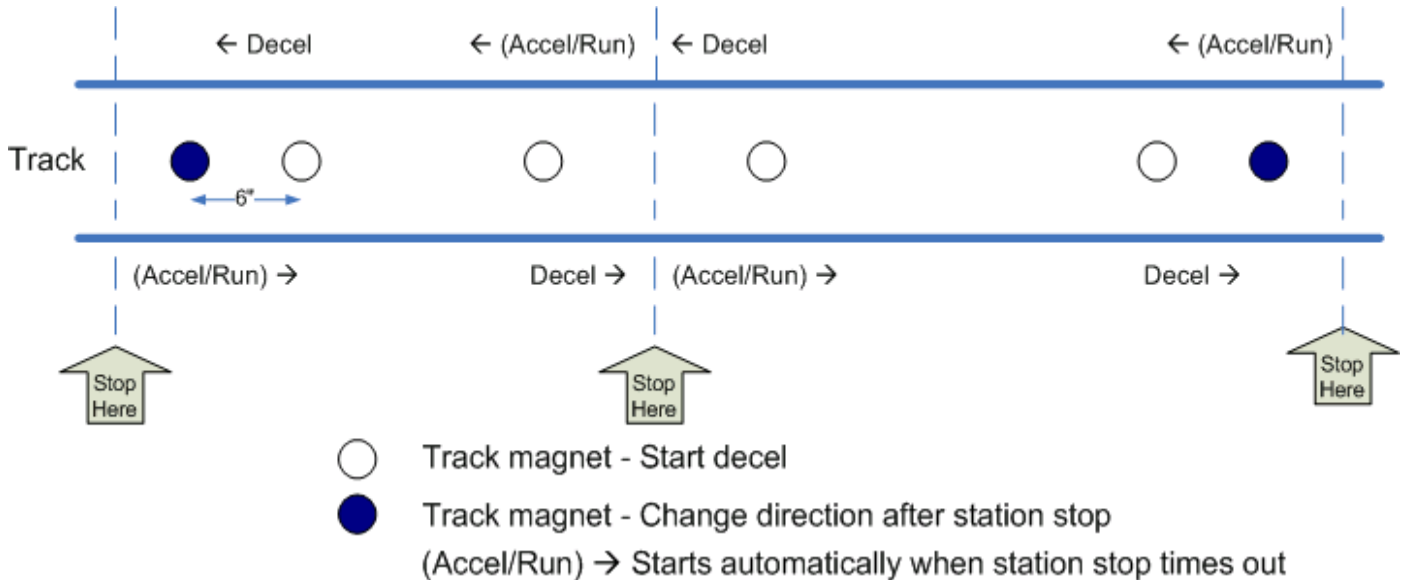
Automated station stops are initiated by a track magnet placed ahead of the station. The magnet initiates deceleration to a stop. You can make as many stops as you like, one magnet per station. When running in both directions, two magnets per station are required, one for each direction. Place the magnets such that the loco stops at the same location when running from either direction. The magnet in front of the locomotive when leaving the station will be ignored.

The distance the magnet is located from the station will depend on your running speed. Some trial and error will be required to find the proper location and/or speed.

Automated reversing is accomplished using a second magnet placed about 6" after the decel magnet. This second trigger will cause the loco to depart the station in the opposite direction. Magnet spacing requirements vary with speed of the loco. 12" or greater is a good starting point. As long as the second magnet is crossed prior to coming to a full stop, it should work. *Caution: Provide end of track bumpers or wheels chocks, just in case.*

Radio Shack 1/2" round ceramic magnets make good track magnets. They can be glued to the top of a rail tie or placed between the ties. Any magnet of suitable size and strength can be used. But they must be located no more than 1/4" from the reed switch passing overhead. Track magnets mounted higher than the rail tops will be susceptible to damage by track cleaners and snow plows. We recommend using movable magnets (next page).

Station stops are enabled or disabled from the transmitter while the train is running (see Button Command Summary). During a station stop, transmitter commands are disabled. However, you can give a Faster speed command to leave the station early. Station stops are enabled at power-on.

Sound Systems
"But I already use magnets to trigger my sound system!" You may have existing track magnets used to trigger the bell and whistle of your sound system. For example; whistle magnet on the right, bell on the left. RailBoss can share these same magnets fairly easily. Install your RailBoss reed switch on the same side you use to trigger the bell. The bell will ring as you approach the station, and the whistle will still blow in your favorite locations.

There are several ways to connect your reed switches. A reed switch at terminals 12,13 is required for automated station stops. The reed switch will also trigger the bell (if so desired) via the bell sound trigger output to the sound

board. The whistle reed switch can remain connected to your sound board, in parallel with the RailBoss sound trigger, and it will operate as normal.

The whistle reed switch at terminals 11,13 triggers the sound board via the whistle sound trigger. The advantage here is, the RailBoss has some optional randomization functions, which will only sound the whistle a certain percentage of the time the reed switch passes over the track magnet. The result? No more repetitive whistle blowing, lap after lap. It reduces the overall noise, and makes things less predictable.

Movable Magnets

Being able to easily move your magnets to new track locations makes it much easier to set up your station stops, or change things as the need arises. If you just place a loose magnet in between ties, the metal of the loco may pick it up as it passes. Glue your magnets to a strip of styrene as shown. When placed under the rails, the magnet will stay in place. Magnet can be on the left or right by simply rotating the strip.

LGB/Piko track magnets also work very well.
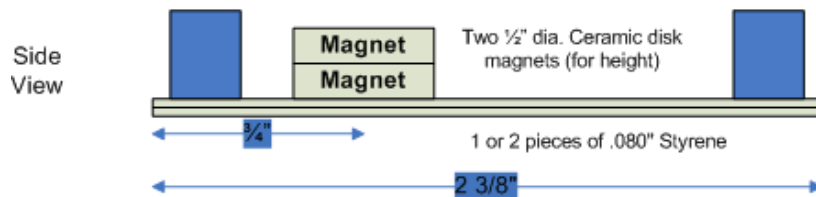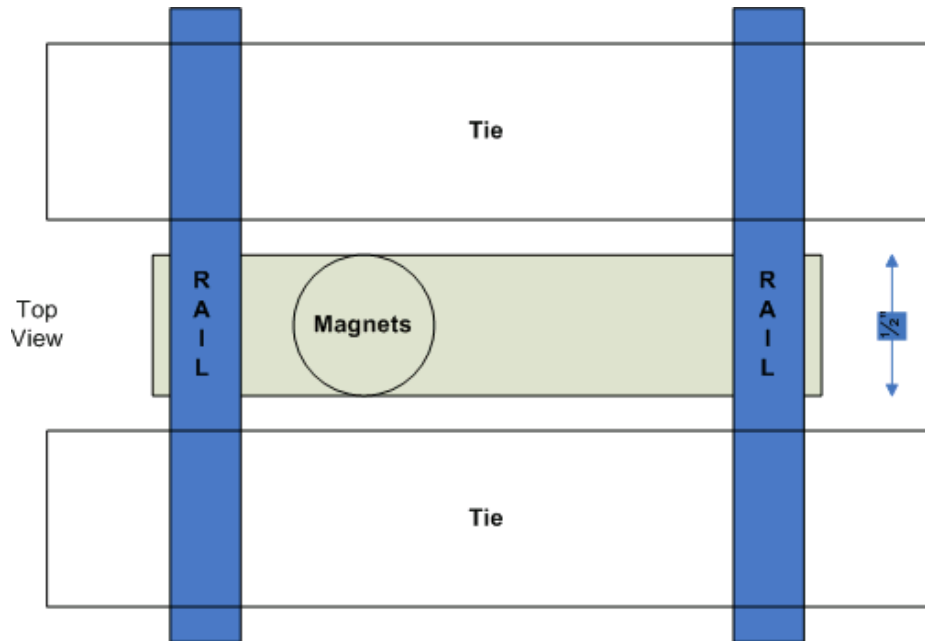
Trouble Shooting Automated Operation

- Make sure you have enabled station stops from the transmitter.
- Loco fails to stop after crossing a single decel magnet. Verify proper installation of reed switch and magnet.
- If the loco fails to reverse after *crossing* two magnets, the magnets are too close together and/or the loco speed is too fast. *(Hence the need to protect the end of point-to-point track with a bumper or derail).*
- The loco will also fail to reverse if the magnets are too far apart and/or the loco is running too slow. It will cross the first magnet, but stop prior to the second, and treat it as a station stop.
- If you can't get the loco to make a proper intermediate station stop in both directions after making the above adjustments, it may be due to excessive grade of the track. Intermediate station stops work best with a flat approach from both directions but should tolerate 3% grades.
- The location of the station stop changes over time. Magnet locations are only precise for one given speed setting. As the battery discharges, the loco will slow somewhat, even though the speed setting has not been changed. This effects the stopping distance after a magnet trigger.

Multi-Train

Run

Run

Train

Train

(W) **Bell Magnet (Left side), Triggers Station Stop.**

(W) **Whistle Magnet (Right side), Releases Train from Station Stop.**

Run Section: One or more trains, as track length permits.

Wireless Communication between trains reports track position.

(B)

(B)

Run

Station Stop

Train

Decel

Accel
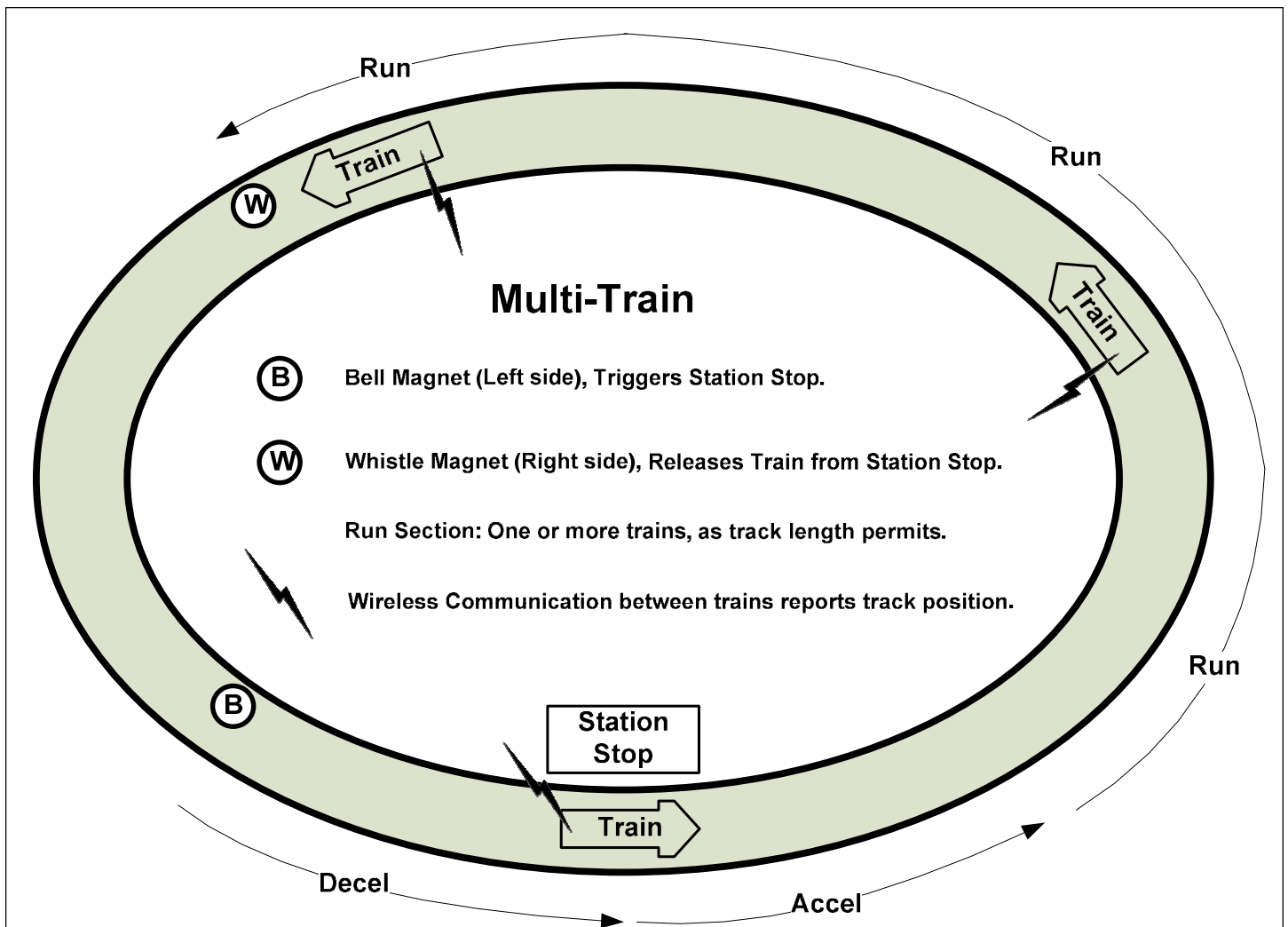
Multi-Train (Automatic Train Separation)

Run two or more trains on the same loop, making random station stops, unattended. Each train will make station stops as programmed in User Parameter 3. When a train stops at the station, it will remain there until another train releases it by passing over a whistle magnet. This timed release of trains prevents faster trains from overtaking slower trains. Of course the trains speeds should be matched fairly close for the best operation.

How can this be done without wires? Each locomotive is constantly reporting its track position to the others via radio. The track magnets tell the loco where it is.

Since the trains will be making random station stops, they may or may not stop on each lap. When they skip the stop, they will catch the train ahead much sooner. When the lead train senses the train behind is too close, it is forced to skip the station stop, and the train behind is forced to make a station stop, getting everything back in sync.

How often your trains stop at the station, and how often they get close to each other depends on the setting in Parameter 3, position of the track magnets, and the length of track available in the "Run" section, and how many trains you are trying to run.

More than one Whistle magnet may be used, but the station release will be determined by the first one encountered. Only one station stop per loop. When operating trains on more than one loop, with station stops on each loop, only one of the loops can be operating in Multi-Train mode.

A stop command from the transmitter will only stop the one train it is bound to. If you encounter a problem, stop each train using its own transmitter.

A single train running in Multi-Train mode will make timed stations stops until a second Multi-Train loco is powered up. Then the train will wait at the station for a release command at the whistle magnet by the second train.

Once properly setup, you can enjoy running multiple trains for hours with no intervention. This of course assumes no derailments, no low battery warnings, no interference from little hands, etc. You still need to pay attention to your trains.

You can tell when a train is forced to skip a station stop, as the bell will sound, but the train will keep going. If the train is in the middle of slowing down for a stop when told to skip, it will automatically return to running speed.

Trouble Shooting Multi-Train Operation

- Station Stops must be enabled. Press 2nd, Bell until you hear the bell. Station stops are enabled at power -up.

- User Parameter 3 must be set for a Multi-Train option; 6 thru 9.

- If you stop a train with the Transmitter, it will NOT start again automatically. You should stop all trains until the problem causing the stop has been cleared.

- You need enough track length in the run section to handle the number of trains you are running without them catching each other, no matter what the station stop % is set to. Increasing the station stop % to 100% will allow more trains to run with reduced risk.

- The first whistle magnet (release magnet) must be far enough away from the station stop, such that a train not making a station stop will not run into a train leaving the station, plus some extra running space.

- Each train should have the same accel/decel settings for station stops; User Parameter 1.

- Make any necessary speed adjustments only while in the "run" section. If you make a speed change during a station stop accel or decel, speed control reverts to manual mode, and you will need to get the train back to running speed from the transmitter.

- If you operate Sound Trigger 3 or 4 while in this mode, you may accidently put that train into manual mode. This happens if the RB4 misses the 2nd key, and thinks you gave a Faster command, instead of the 2nd, Faster commands.

User Programming via the DIP Switch & Yellow Button

Some of the operating parameters of the RailBoss Plus can be modified to meet your individual needs. No programming is necessary to get your system up and running, only to modify it, if so desired.

User configurable parameters can be programmed using the 4-position DIP switch, yellow on-board push-button switch, and on-board LED. The DIP switch selects the parameter to be programmed, and the LED flashes the currently selected option. See the programming chart following this discussion for specific instructions.

Parameter 0
Station Stop Dwell Time
The elapsed time spent from a full stop at the station to departure.

Parameter 1
Station Stop Accel/Decel Time
The time it takes to decelerate to a full stop after crossing the station stop magnet. Use this adjustment not only to make the stop look prototypical, but also to match the characteristics of other locomotives making station stops using the same magnets. Thus, you don't have to move the magnets for each locomotive.

Parameter 2
Whistle Operation via Reed Switch
The reed switch at terminals 11&13, triggers the output at terminal 5. By connecting your whistle/horn reed switch to the RailBoss, instead of directly to the sound board, the RailBoss can now control its operation. The whistle/horn, especially the grade crossing whistle, gets pretty annoying in a hurry if it sounds every X seconds, lap after lap, all day long at your open house. This parameter allows you to control the percentage of time, that it actually sounds;. e.g. at the 50% setting, after crossing the whistle magnet 10 times, the whistle will have only sounded about 5 times. The triggers are random events, and thus very unpredictable, adding character, and a bit of mystery to your layout.

Parameter 3
Station Stops & Bell Operation via Reed Switch
The reed switch at terminals 12&13, initiates a station stop, if enabled from the transmitter, and also triggers the output at terminal 6, normally connected to the bell trigger of you sound board. Like the random whistle function described in Parameter 2, you can randomize your station stops, adding interest for you and your visitors.

Note: When operating in point-to-point trolley mode, using the reversing magnets, you must have parameter 3 set for 100%. Otherwise, the loco will run off the end of the track, as the RailBoss will ignore the magnets X% of the time. Multi-Train operations require options 6 thru 9.

Parameter 4
Throttle Momentum
This parameter sets the amount of momentum applied to the throttle when the momentum function is turned ON. "Momentum" is the length of time it takes to accelerate or decelerate while holding down the Faster or Slower buttons.

Parameter 5
Direction Control
Loco normally runs in the forward direction at power-up. Set this for reverse at power up to run a loco backwards in a consist with other locos.

Parameter 6
Number of Battery Cells
This enables low battery warning and determines the basic voltage of your battery pack; 3.7 volts per cell.

Parameter 7
Low Battery Warning Voltage
This setting finely tunes the warning voltage. Trial and error will determine the best setting. Record the elapsed time between the warning and actual shutdown due either the battery pack protection or the RailBoss hard cut-off. Adjust this parameter for perhaps 10 minutes between warning and shutdown.

Parameter 8

Kid's Transmitter Delay

Buttons won't work for X seconds after performing a function. Reduces the noise and annoyance factor when small children that just keep pressing the buttons.

Parameter 9

Out 3/4 Transmitter Key Configuration

Outputs 3 and 4 can be configured to operate from either the left side of the TX, under the Whistle and Bell keys, or on the right side, under the Faster and Slower keys. We've found that using the left side for these functions may avoid inadvertent speed changes. This option also allows for backwards compatibility with older transmitters, labeled for the right side.

Parameter 10

Bell Configuration

This can be set for a momentary output to trigger a fixed length bell sequence, or a latched output which will toggle the bell on or off with each key press.

Parameter 11/12

Out 3/4 Terminal Configurations

Output 3 and 4 can be configured for 4 different functions: Momentary Sound triggers (Terminal 7,8), Latching Lights on/off (Terminals 7,8 - 250 ma max), Latching Lights on/off (Terminals 9,10 - 750 ma max), or Phoenix Un-Couplers (Terminals 9,10). Out 3 activates both terminal 7 and 9. Out 4 activates both terminal 8 and 10. In most cases you will only make one wiring connection to for Out 3, and one for Out 4.

Parameter 11 configures terminals 7 and 8 for either momentary sound trigger operation, or latching lights operation. Parameter 12 configures terminals 9 and 10 for either momentary Phoenix Un-Coupler operation, or latching lights.

Warning: If you have a Phoenix Un-Coupler connected to terminals 9 or 10, and you select Parameter 12 Latching, you will instantly destroy the Un-Coupler. Use Momentary only for Phoenix Un-Couplers (the default option).

User Programming / DIP Switch Programming Procedure

User configurable parameters can be programmed using the 4-position DIP switch, on-board yellow push-button switch, and on-board LED.

Enter Programming Mode

Hold the yellow button (next to the DIP switch) down on the RailBoss board until the LED goes out. Release the button. The LED will begin flashing the option code of the selected parameter.

Select Parameter

Select the parameter you wish to view or program using the DIP switch. (the white square indicates position of the switch; e.g. for parameter 0, all switches are in the down or off position.

View Current Option Code

The LED will repeatedly flash the option code for the currently selected parameter; e.g. two flashes followed by a pause indicate option 2.

Change the Option Code

Momentarily press the push-button during the pause to advance the option to the next higher number, until you get the desired number of flashes.

Save the Option Code

During the pause between code flashes, press and hold down the push-button for about 4 seconds until the LED goes off. Upon release, the LED should stay on solid. This saves the option code and exits User Programming. The new option will now be active.

Exit Programming Mode

To exit programming mode without saving any changes, turn off RailBoss power.

Option	Parameter 0 - Station Stop Dwell Time
1	10 secs
2	20 secs
3	30 secs
4	40 secs
5	50 secs
6	60 secs

Option	Parameter 1 - Station Stop Accel/Decel
1	Slowest
2	Slow
3	Medium
4	Fast
5	Fastest

Option	Parameter 2 - Whistle Operation from Reed Sw.
1	100% (Always triggers)
2	50%
3	40%
4	30%
5	20%
6	0% (Disabled)

Option	Parameter 3 - Station Stops & Bell from Reed Sw.
1	100%(Always triggers, Trolley Mode)
2	75%
3	50%
4	25%
5	0% (Disabled)
6	100% - Multi-Train
7	75% - Multi-Train
8	50% - Multi-Train
9	25% - Multi-Train

Option	Parameter 4 - Throttle Momentum
1	20 secs 0 to 100% Slowest
2	15 secs
3	10 secs
4	6 secs Fastest

Option	Parameter 5 - Motor Direction
1	Normal - Powers up in Forward
2	Reverse - Powers up in Reverse

Option	Parameter 6 - No. of Lithium Battery Cells (3.7V ea.)
1	Disable Low Battery Warning
2	2 Cells, 7.4V
3	3 Cells, 11.1V
4	4 Cells, 14.8V
5	5 Cells, 18.5V
6	6 Cells, 22.2V
7	7 Cells, 25.9V

Option	Parameter 7 - Low Battery Warning Voltage
1	Least run time after warning
2	
3	
4	
5	
6	
7	Most run time after warning

Option	Parameter 8 - Kid's Transmitter Delay
1	0 Secs
2	5 Secs
3	10 Secs
4	15 Secs
5	20 Secs

Option	Parameter 9 - Out 3/4 TX Key Configuration
1	Out 3/4 Left side
2	Out 3/4 Right side

| Option	Parameter 10 - Bell Trigger Configuration
1	Momentary
2	Latched

Basic and Plus models

Plus models Only

Factory settings

Option	Parameter 11 - Out 3/4 Terminal 7/8 Configuration
1	Momentary 7 / Momentary 8
2	Momentary 7 / Latched 8
3	Latched 7 / Momentary 8
4	Latched 7 / Latched 8

Option	Parameter 12 - Out 3/4 Terminal 9/10 Configuration
1	Momentary 9 / Momentary 10
2	Momentary 9 / Latched 10
3	Latched 9 / Momentary 10
4	Latched 9 / Latched 10

Warning: Use only "Momentary" for Phoenix Un-Couplers. "Latched" will destroy them instantly!

The DIP switch sets the Parameter Number. Each switch, when turned on, has a different value. When added together, they give you the parameter number. *But don't worry! All you need to do is look at the pictures, and set the switch accordingly.*

Switch position 1 has a value of **1**
Switch position 2 has a value of **2**
Switch position 3 has a value of **4**
Switch position 4 has a value of **8**
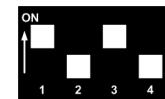
The setting shown here is set for parameter 5: Switch 1 = 1 + Switch 2 = 0 + Switch 3 = 4 + Switch 4 = 0: Total = 5

The number of LED flashes indicates the Option Number for the selected Parameter.

Note: If your RailBoss 4 board has only 3 switch positions, just assume position 4 is set to Off. The switch settings for Parameters 0-7 are valid for your board.

RailBoss 4 - Hardware Specifications
RailBoss 4 Board Revision "B"

Mechanical
>
> RailBoss 4 ESC/Receiver Board
> Physical Size: PCB – 3.2" X 2.0", Max component height – 1.0".
> User Connections: Screw clamp terminal strips accept individual wires, 30 to 20 AWG.
> > Requires a 1/16" or 5/64" slotted screwdriver
> Antenna: The rounded portion of the PCB that sticks out slightly
>
> RailBoss 4 Transmitters
> 2.4GHZ radio with internal antenna: 3 1/4" X 2 1/2" contoured case.
> Adult = 6 buttons, Kid's = 2 buttons

Electrical
>
> Power Input from battery pack (Terminals B+,B-)
> > 7V min to 25V max
> > > 7-16 NiMh/NiCad cells (1.2V per cell), Nominal 8.4V to 19.2V
> > > 2-6 Lithium-Ion or Lithium-Polymer cells (3.7V per cell), Nominal 7.4V to 22.2V
> > Reverse polarity protection (prevents damage, but will not operate)
>
> Power Consumption (PCB only, no motor load, no lights)
> > Forward motor direction: 33 ma
> > Reverse motor direction: 102 ma
>
> Motor Output (Terminals M+, M-)
> > 5 amps max, continuous, over the full input voltage range (7-25V)
> > PWM (Pulse Width Modulated), 20 KHZ
> > Polarity reversal via relay contacts
> > Max amplitude: Battery voltage minus driver loss
> > Max voltage loss across driver: < 0.4V @ 1.0A, < 1.5V @ 5A

Control Inputs - normally open, momentary close to common
> Bell/Station stops, Terminals 12,13
> Whistle, Terminals 11,13
> Remote Learn, Terminals 14,15

Control Outputs - Terminals 3,4,5,6,7,8. Open collector, switch to common, Max load = 250 ma
> Directional Lighting, Terminals 3,4
> > LED / Lamp Drivers from battery voltage, Terminal 1
> > LED current source from Terminal 2 = 11 ma
> Triggers: T1-T4,
> > Whistle (T1) is "playable", i.e. stays on as long as the TX button is held
> > Bell (T2) is momentary or latching
> > T3 & T4 are momentary
> High Current Terminals 9,10
> > Phoenix Un-Coupler driver (momentary pulse)
> > Latched output, Max load = 750 ma

Radio Rx and Tx
FCC,IC,CE certified and approved.
2.4GHZ, Direct Sequence Spread Spectrum, motor noise and interference tolerant, built-in antenna.
Range: Up to 250 ft.
TX battery: CR2032 coin cell

Battery Power Accessories (available from G-Scale Graphics)
> Battery Conversion Module; (built-in Power on/off Switch, Charging Jack, 5A fuse, power distribution)
> Power On/Off Switch: Sub-Miniature w/short handle, SPDT (On-On), 3A, 28 VDC
> Charging Jack: 2.5mm I.D., 5.5mm O.D., 5A, w/switch (mating power plug: Radio Shack #274-1573

Warranty - 12 months from date of purchase. Post warranty repairs can be made for a modest fee.

2.4GHZ RailBoss R/C Product Comparison

Control System	RailBoss 4 Basic	RailBoss 4 Plus	Hobby RailBoss Basic	Hobby RailBoss Plus
2.4 GHZ (Note 1) Radio Transmitter	6-Button Handheld Tx	6-Button Handheld Tx	4 or 5 Channel Hobby Stick Radio	4 or 5 Channel Hobby Stick Radio
Rx / ESC Configuration	Integrated ESC/Rx	Integrated ESC/Rx	Separate Rx & ESC	Separate Rx & ESC
Radio Components	Transmitter and Receivers supplied by G-Scale Graphics	Transmitter and Receivers supplied by G-Scale Graphics	Transmitter and Receivers must be purchased separately	Transmitter and Receivers must be purchased separately
Speed Control	Push Buttons	Push Buttons	Proportional Stick	Proportional Stick
Tx Control Range	Excellent	Excellent	Excellent	Excellent
Momentum Control	X	X	X	X
Sound Triggers	4	Note 3	Note 2	4
Directional Lighting	X	X	Note 2	X
Kid's TX	X	X		
Two Train Operation From One Tx			X	X
Low Lithium Battery Warning		X		X
Automated Station Stops		X		X
Auto Multi-Trains on Same loop		X		
Random Track Whistle		X		X
Dual Phoenix Un-Coupler Outputs		Note 3		

Note 1) The radio systems used in each of our RailBoss R/C systems operate at 2.4GHZ. However, they are NOT compatible with each other. The RailBoss 4 control board may only be used with a G-Scale Graphics RailBoss 4 Transmitter, and the Hobby RailBoss boards may only be used with 3rd party hobby transmitters and receivers.
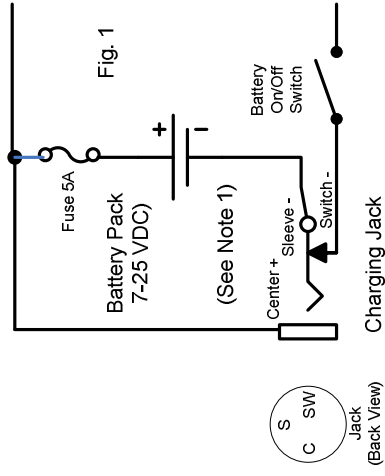
All of our 2.4GHZ radio transmitter are "bound" to the receivers. No channel or frequency selections to worry about. No motor noise suppression or special antenna placement required. You can control all of your trains from the same transmitter (one at time for the RailBoss 4, one or two at a time with the hobby radios). You can double head, or you can control individual trains with individual transmitters. It is your choice.

Both the RailBoss 4 and Hobby transmitters have a range of up to 250 ft., and usually no problems with obstacles.

Note 2) 2 outputs are available for any combination of sound triggers or lighting. User programmable.

Note 3) 2 of the outputs are available for any combination of sound triggers, un-Couplers, latched drivers. User programmable.

RailBoss 4 - Wiring Diagram

Fig. 1

Battery On/Off Switch

Fuse 5A

Battery Pack 7-25 VDC)

+ −

(See Note 1)

Center + Sleeve −

Switch −

Charging Jack

Jack (Back View)

S SW
C

Battery Conversion Module

(See Note 1)

+ −

Battery Pack 7 - 25 VDC

Power In + B+
Power In - B-
Motor Out + M+
Motor Out - M-

RailBoss 4

Motor

(Note 3)

B+ Voltage Source

Current Source

Rev LED

Fwd LED

Fwd Lamp

Rev Lamp

1
2
3
4
5 T1-Whistle
6 T2-Bell
7 T3-Sound/Lights 3
8 T4-Sound/Lights 4
9 Un-Coupler/Lights 3
10 Un-Coupler/Lights 4
11 Whistle Reed Switch
12 Bell/Station Stop Reed Switch
13 text Common
14 Remote Learn TX
15 Common

(Note 5)

(Note 4)

Phoenix Un-Coupler

Phoenix Un-Coupler

RailBoss 4 Plus (Note 5)

Notes

1) The circuit in Fig 1, or variations of it, may be substituted for the Battery Conversion Module. An external fast acting fuse is recommended.
Power input is protected from reverse polarity damage, but the RailBoss will not operate.

2) Optional: A Momentary SPST (normally open) push-button switch may be used for remote TX learning, when changing locos.

3) Do not connect the RailBoss Motor output directly to a Sierra Sound board (others are OK). You must use an RCS SSI-12V5 isolation board. The RailBoss Bell and Whistle outputs are compatible.

4) Sound trigger outputs do NOT require a separate ground or common connection to the sound board. That path is completed through the battery input wiring.

5) Terminal 7 and 8 can be used as sound triggers or light drivers. Terminals 9 and 10 can be used for Phoenix Un-Couplers or lamp drivers. Out 3 on the TX will activate both terminals 7 and 9. Out 4 will activate both terminals 8 and 10.

6) RailBoss 4 Plus model: Includes terminals 9 thru 15 functions and the Low Battery Warning function.