Feb 09 2013

RR-Concepts

StationMaster - REX

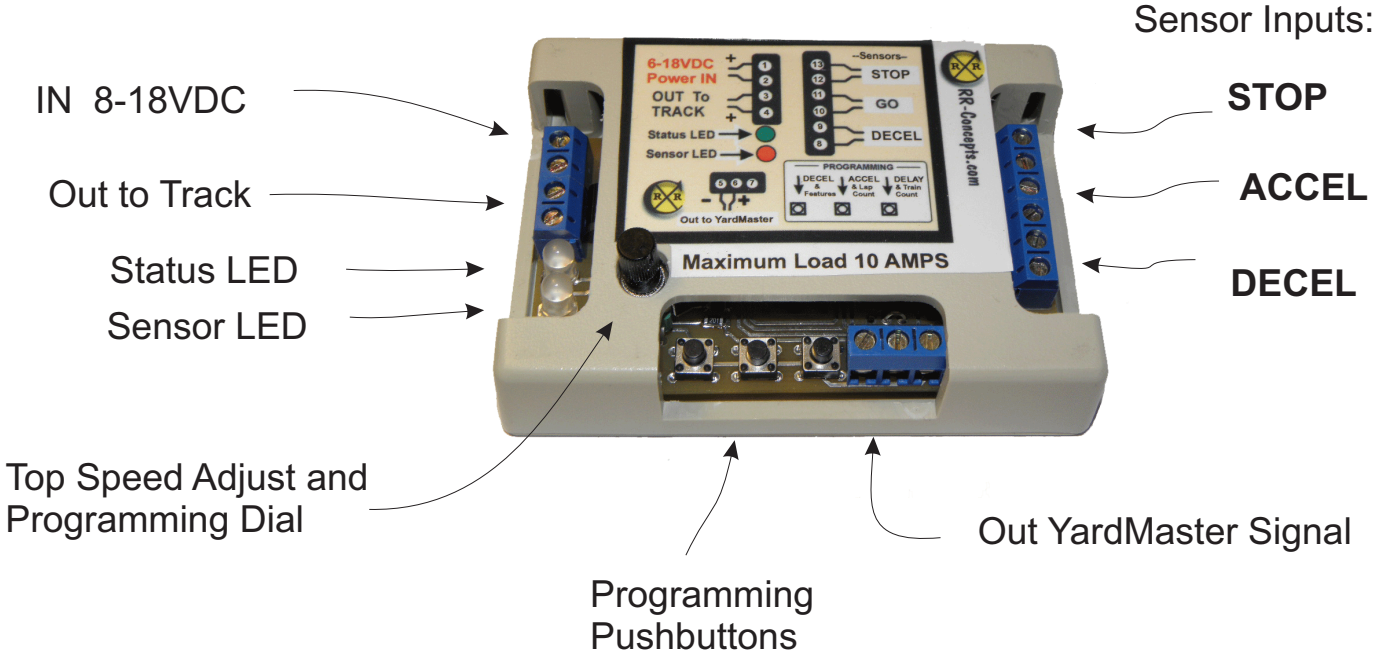
Train Controller

This manual contains detailed hookup and programming instructions for the StationMaster - REX train decelerator.

REX stands for:

* Programmable **R**eversing available.
* **E**asy pushbutton programming.
* E**X**pandable input / output pins can use wireless sensor add-ons.

Before we Start- Please do not attach power wires (from your power pack or transformer) to any other terminals except the designated input pins 1 and 2. Your StationMaster will be damaged if power is put on any of the sensor terminals.
ONLY ATTACH WIRES WHILE THE POWER IS OFF.



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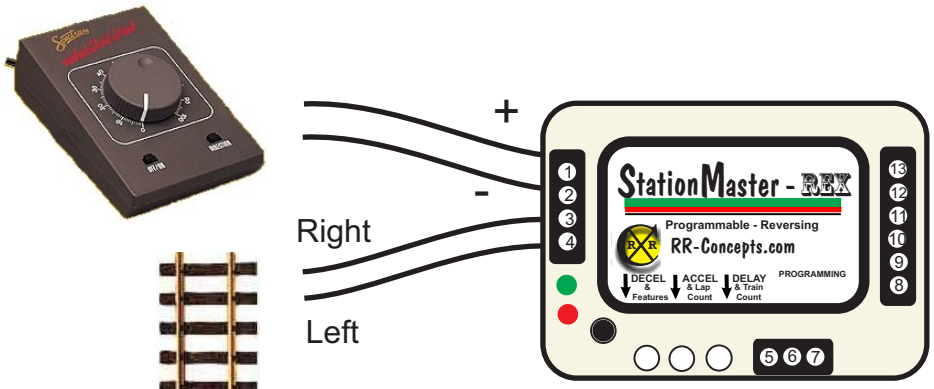
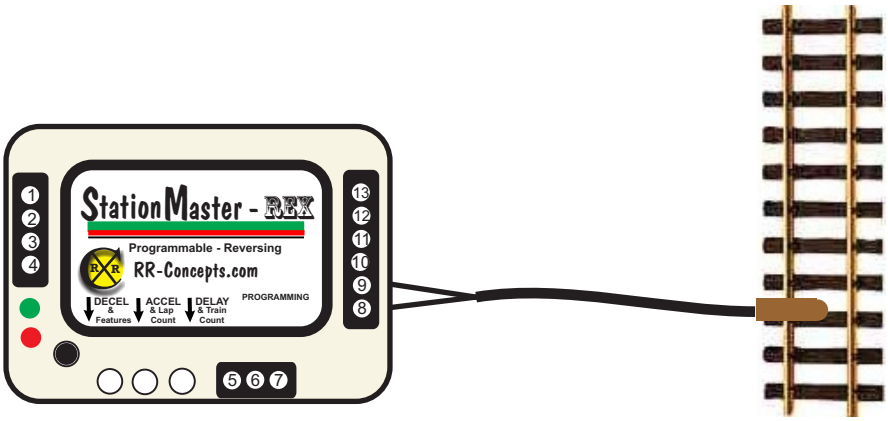
StationMaster Basic Hookup Description

The StationMaster is designed to be installed between the train transformer, and the track.

Attach terminals 1 & 2 to your transformer's DC output (Sometimes labeled as TRACK) or to a constant 12 volt power source. If using a train transformer set the throttle position to the desired top speed of the train. If the StationMaster does not "light up", then reverse the direction on the transformer to change the voltage polarity, or swap these two wires.

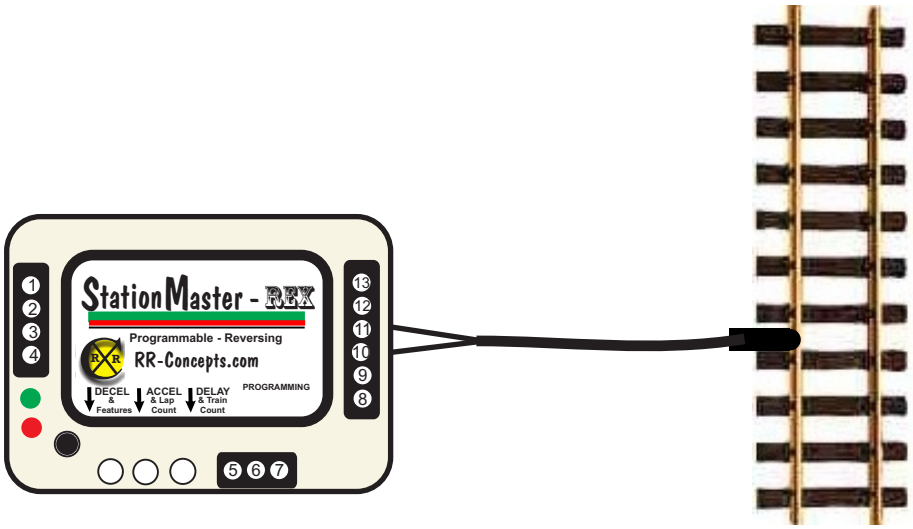


Attach 3 & 4 to your track. This is the controlled output voltage that accelerates and decelerates the train. Pin 3 will be the “common” wire which is the *right rail* for Large Scale trains or the *left rail* for NMRA standard trains.



DECEL Sensor

Terminals 8 & 9 are the start DECEL sensor input.
When these terminals detect a magnet or optical sensor the StationMaster will begin a decelerate, pause, and then accelerate sequence. The RED “Sensor LED” will light up as long as this sensor is detected. By placing multiple reed switch DECEL sensors wired in parallel, you can stop at multiple stations on your railroad. Only one optical sensor can be used on the StationMaster and these are the only terminals that will operate with it. The optical sensor and reed switch sensors can be wired in parallel for multiple station stops. Pressing button #1 will simulate the DECEL sensor operation.



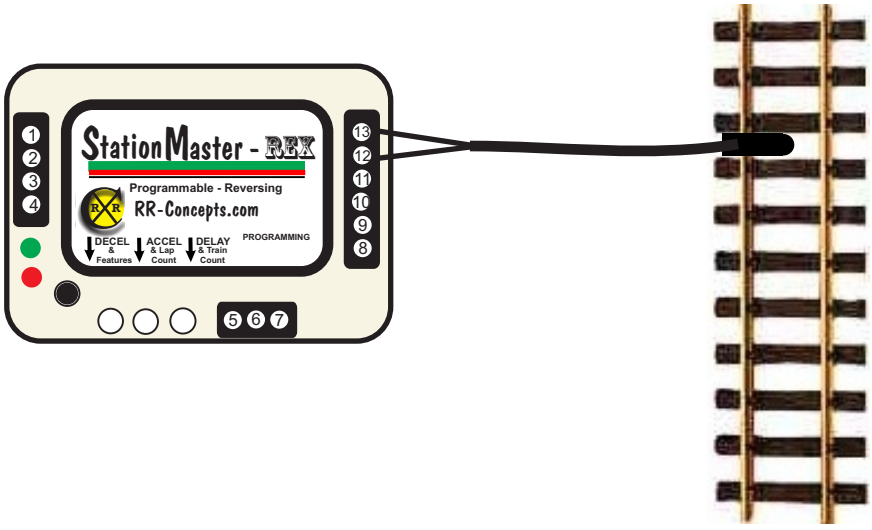
ACCEL Sensor

Terminals 10 and 11 are the optional Start Acceleration sensor inputs.

When this sensor detects a magnet, (these terminals are shorted) the train will start to accelerate.

This sensor is **not** necessary unless using “Block Control” or the **time delay** is set for maximum blinks. (See below).

Pressing button #2 will simulate the ACCEL sensor.



Optional

STOP Sensor

Terminals 12 and 13 are the optional STOP sensor inputs.

When the train is decelerating and this sensor detects a magnet, the train will immediately STOP. This sensor is not necessary unless using *the “Self Adjusting Deceleration” mode.*

Pressing button #3 will simulate the STOP sensor.

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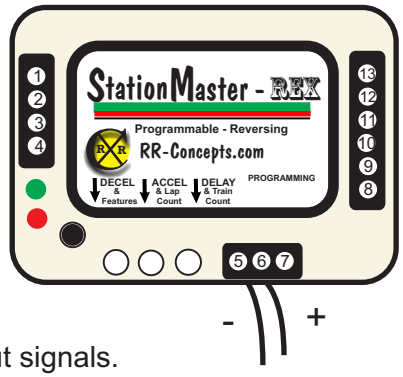
TRIGGER Output Signal

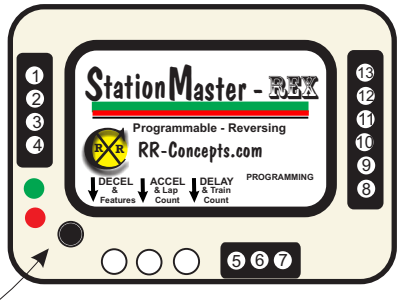


Pins 5 and 6 are the TRIGGER Output signals.

These pins provide a very low voltage **OUTPUT** used to trigger the sensor input of another module. These terminals should only be attached to a YardMaster, SIM, or to another StationMaster's sensor terminals. Note that the polarity of these wires is important. If the trigger does not occur then reverse these two wires.

These terminals are used for advanced hookups, and are not necessary for simple installations. Never touch these terminals to track power.

Top Speed Adjust and Programming Mode



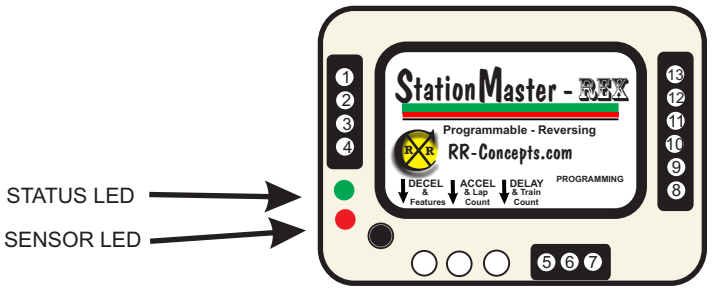
The Top Speed dial provides 2 functions:

1: Adjust the The top "cruising" speed of the train.
2: Enter programming mode.

Top speed adjustment
"Full speed" is clockwise. Turn this dial down as necessary to set the desired cruising speed of the train.
Typically, this dial is set fully clockwise and the train throttle (transformer) is used to set the speed of the train.
If using a fixed DC power supply then use this dial to set the top speed of your trains.

Programming Mode
To enter programming mode turn this dial fully counter-clockwise. Once in programming mode turning the dial slightly clockwise will enter "secondary programming mode" when the green indicator turns on. To exit programming mode turn the dial fully clockwise.

When exiting programming mode the following will automatically occur:
1. The shutdown current will be programmed. (Relays will briefly short the track and measure the amperage consumed)
2. All "self-adjusting deceleration" values will reset.



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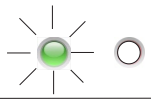
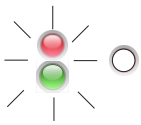
LED indicators

STATUS LED SENSOR LED



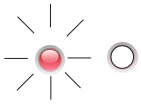
Green flashing: train is **ACCELERATING**.



Fast alternating **Red/Green** Flashing: train is **CREEPING** and hunting for the STOP sensor. If flashing **orange** then the train is CREEPING with the slowest possible speed for that train. (SM has been programmed for maximum deceleration rate which enables the “self-adjusting deceleration” mode)

Green NOT flashing**:** Train is **AT TOP CRUISING SPEED.**

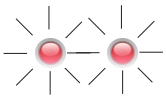
Orange NOT flashing, If nothing is running then a sensor is blocked. If running the StationMaster **will ignore next DECEL sensor** due to lap counting or block control. This is block control.



1. Quick Red flashing: Train is **DECELERATING.** Flash rate indicates rate of deceleration.
2. Red flashing at 1 second rate: StationMaster is performing a **time delay.**

3. Two quick RED flashes at 1 second rate: StationMaster is **waiting for ACCEL sensor** before accelerating**.** (StationMaster Is programmed for infinite time delay)

Sensor RED LED ON or flash: The STOP sensor is detected.
The LED will remain on for as long as the sensor is detected. *If a train is parked on the STOP sensor then the deceleration sensor will be ignored.*



Two Red Blinking LED's indicate a **SHORT CIRCUIT** condition.
Turn the top speed dial to zero and then back to 100%, or turn off power to recover. If condition returns after recovery check for short circuit on the track.

1. Sensor LED solid GREEN indicates secondary Programming mode.

2 Sensor LED GREEN flash indicates a DECEL or ACCEL sensor has been sensed.

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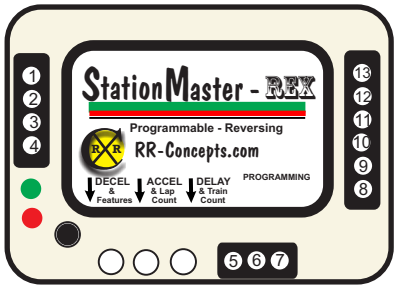

Programming: **Deceleration Rate**

1. Make sure all three sensor inputs are open. (Red LED is off)

2. If the top speed dial is not already at zero, then turn the top speed dial to zero. (fully counter-clockwise.) All LED'S will turn off.

3. Push and hold programming button #1.

4. Watch the status led. Each **RED** blink will increase the deceleration distance. **The fastest deceleration will be with one blink.** (TRAIN Stops sooner) Release the pushbutton when the desired number of blinks have occurred. A typical number is 5. Repeat this procedure if you want a different value. The LED will flash orange when the longest Deceleration rate is set (12 counts).

To program the "**Self adjusting deceleration**" feature hold down the button until the LED flashes orange. When released the StationMaster will blink once. (A STOP sensor will be required. See below for details on the Self Adjusting deceleration)

When finished with all programming turn the top speed dial fully clockwise and then turn down to a desired top speed if needed.

All programming values are stored in flash memory and are retained until re-programmed.

A "FYI" Note on Realistic Decelerations:
For all decelerations the train will decelerate using the programmed value and then decelerate at a much slower rate for the last few seconds until stopped. This provides a very realistic station stop. A STOP sensor encountered during the deceleration will instantly stop the train.

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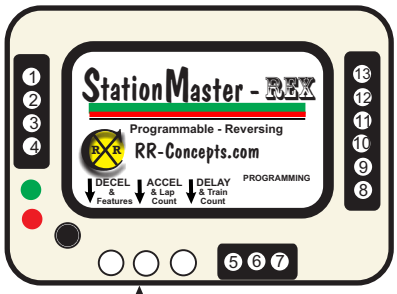
Programming:
Acceleration Rate



1. Make sure all three sensor inputs are open. (Red LED is off)

2. If the top speed dial is not already at zero, then turn the top speed dial to zero. (fully counter-clockwise.) All LED'S will turn off.

3. Press and hold programming button #2..

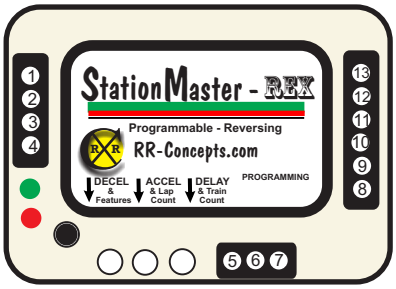
4. Watch the status led. Each GREEN flash will decrease the acceleration rate. <u>The fastest acceleration will be with one blink.</u>
Release the button when the desired number of blinks have occurred.
A typical number is 5. Repeat this procedure if you want a different value.
The LED will blink orange when the longest **acceleration** rate is set
(about 25 counts).

When finished with all programming, increase the top speed dial clockwise to MAX and then down to a desired top speed. All programming values are stored in flash memory and are retained until re-programmed.

<u>A "FYI" Note on Realistic Accelerations:</u>

* For blinks 1 and 2 the train will accelerate with the programmed value. This may be required for some block control operations where a second train is approaching and the first train needs to quickly accelerate to get out of the way.

* For blinks 3 and above the train will creep very slowly out of the station and then gradually increase the acceleration rate as it continues. This provides a very realistic operation and shows off train sound systems with incredible realism.



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Programming: **Pause Time**

1. Make sure all three sensor inputs are open. (red Led is off)

2. If the top speed dial is not already at zero, then turn the top speed dial to zero. (fully counter-clockwise.) All LED'S will turn off.

3. Press and hold programming button #3.

4. Each ORANGE flash will increase the waiting time after a station stop.
A wait time of zero will be with one flash.
Open the terminals when the desired number of flashes have occurred.
Repeat this procedure if you want a different value.

The LED will turn orange when an infinite delay is set (after 10 counts).
When infinite delay is set, then the ACCEL sensor is required to start up the train after a station stop. A fun thing to do would be to connect the ACCEL terminals to a doorbell switch. Your train would patiently wait until someone pushed the button!

When finished with all programming increase the top speed dial clockwise to maximum or to a desired top speed. All programming values are stored in flash memory and are retained until re-programmed.

The number of orange FLASHES will correspond to the following time delays:

1: 0 seconds, no wait.
2: 5 seconds,
3: 10 seconds,
4: 30 seconds,
5: 1 minute,
6: 2 minutes,
7: 5 minutes,
8: 10 minutes,
9: 30 minutes,
10: Infinite, wait for GO sensor. This is for block control operations.

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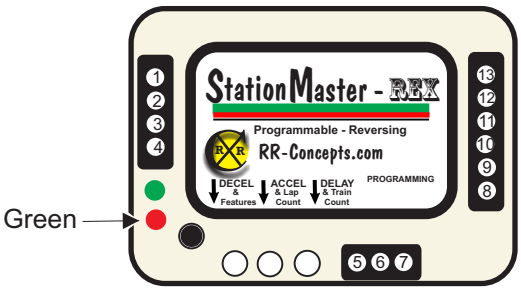

Please go to RRconcepts.com to view an informational video on how to program operating modes.

Programming: Operating Modes

The operating modes of the StationMaster can be programmed as shown:

1. **Enter Secondary Programming mode:** (Skip this step if already in secondary programming mode)

   * Turn the Top Speed dial fully counter-clockwise to enter programming mode (Skip this step if already in programming mode).

   * Turn the Top Speed dial clockwise until the sensor LED turns green. This indicates secondary programming mode.

2. **Press and hold programming button #1** until the desired number of blinks have occurred. Each blink **count** will set or clear a different feature.

When finished do not power off without first turning the dial fully clockwise.

StationMaster Programmable Modes (On echo, Green indicates ON, RED indicates OFF)

Hold button for 1 blink = Simple Reversing Mode, ignore next sensor after reversing.

Hold button for 2 blinks = Fire YardMaster after train has stopped. (Default ON after a factory reset)

Hold button for 3 blinks = Fire YardMaster before acceleration.

Hold button for 4 blinks = Use automatic train detection to start deceleration

Hold button for 5 blinks = Reverse direction before every acceleration. Never ignore sensors.

Hold button for 6 blinks = Only fire YardMaster in forward direction. (only active in reversing modes)

When the button is released the StationMaster will echo the currently programmed features (modes) by blinking the red/green LED 6 times. For example, if "Trigger after train has stopped" has been programmed (button pressed for 2 blinks) and nothing else is programmed then the StationMaster will blink:

blink 1 RED: Reversing mode is OFF.
blink 2 GREEN: Fire YardMaster after stopping ON
blink 3 RED: Fire YardMaster before acceleration OFF
blink 4 RED: Use train sensor to start deceleration OFF
blink 5 RED: Reverse direction before every acceleration OFF
blink 6 RED: Only fire YardMaster in forward direction OFF

Example #2, if "Fire before acceleration" has *also* been programmed, the StationMaster will echo RED - GREEN - GREEN - RED - RED - RED . (#3 is now also green)
Each time a feature is programmed that feature will toggle on or off. (Toggle means the feature will go OFF if currently ON, or ON if currently OFF) A factory reset will re-initialze all values.

To view the currently programmed operating modes quickly press and release button #1 before the RED/GREEN LED blinks. (Must already be in secondary programming mode) The StationMaster will then echo the currently programmed features. **PLEASE DOUBLE CHECK PROGRAMMING. Some hookups will cause short circuits if accidentally programmed for REVERSING operations.**

Note that a factory reset will clear all programmed modes and set blink 2.

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Additional Information on Programming Modes.
(See previous page for programming procedure)

blink 1 = Simple Reversing Mode, ignore next sensor after reversing.

This will allow reversing operations with a DECEL sensor placed at the ends. This can also be used for alternate direction sidings hookup with the DECEL sensor placed on the main line outside of the sidings.

blink 2 = Fire YardMaster after train has stopped.

If programmed for more than 1 train the YardMaster will fire to the next siding after the train has stopped. Note that the StationMaster will automatically set this blink after a factory reset.

blink 3 = Fire YardMaster before acceleration.

If programmed for more than 1 train the YardMaster will fire to the next siding before accelerating.

blink 4 = Use automatic train detection to start deceleration.

When a train leaves the StationMaster controlled track and then is sensed entering the track section again the deceleration will start. Deceleration will start at any time the train Is not detected and then detected again.

blink 5 = Reverse direction before every acceleration

This is similar to blink 1 however the StationMaster will not ignore any sensors.

blink 6 = Only fire YardMaster in forward direction. (only active in reversing mode)

This will allow a reversing operation with sidings on one end.

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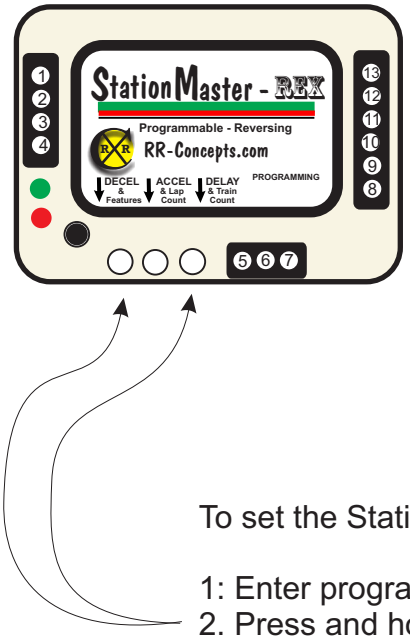

Programming: **Factory Reset**

To set the StationMaster back to factory defaults perform the following:

1: Enter programming mode by turning the top speed dial fully counter-clockwise
2. Press and hold both button #1 and button #3. (If buttons are non-operational then short the DECEL and STOP sensor inputs)
3. The StationMaster will quickly blink orange to indicate factory reset.
4. Save the settings by turning the top speed dial full clockwise to exit programming mode.

Do not power off without first turning the dial fully clockwise.

The factory default settings are:

* Acceleration rate 5 blinks
* Deceleration rate 3 blinks.
* Time delay 5 seconds.
* Train count: 2 (Note: Block control will not be operation until set for 1 train)
* Lap count: 1
* Operating mode (features):

Blink 1 = RED, Simple Reversing: OFF.
Blink 2 = GREEN, Fire YardMaster before accelerating: ON
Blink 3 = RED, Fire YardMaster before decelerating: OFF
Blink 4 = RED, Use train sense to start deceleration: OFF
Blink 5 = RED, Reverse before every acceleration: OFF
Blink 6 = RED, Fire YardMaster only in forward direction: OFF

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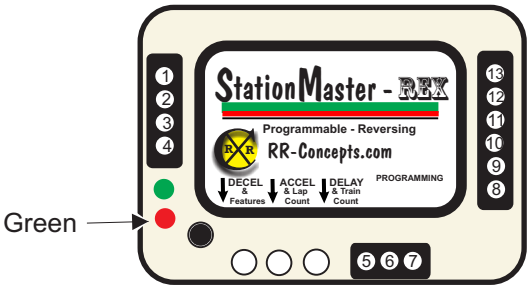
Programming: MULTIPLE LAPS



The StationMaster can be programmed to ignore multiple DECEL sensors to allow running up to 10 laps before stopping. To allow multiple laps, program as follows:

1. Turn the Top Speed dial fully counter-clockwise to enter programming mode (Skip this step if already in programming mode).

2. Slowly turn the Top Speed dial clockwise until the GREEN indicator turns on. This indicates secondary programming mode.
(Skip this step if already in secondary programming mode)

3. Press and hold button #2.

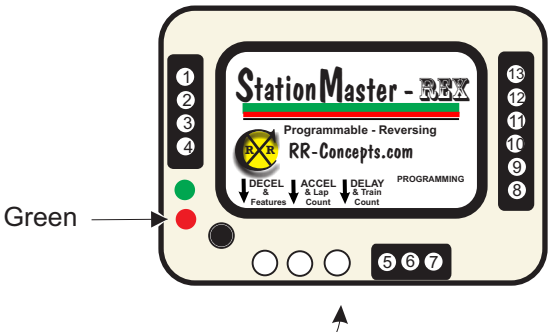
4. Count the blinks while the button is pressed. Release the button when the appropriate number of blinks have occurred.

The number of blinks corresponds to the number of laps the train will do before stopping as shown:

1 blink = 1 lap,
2 blinks = 2 laps
etc...

To verify the programmed value, close briefly close button #2 and count the number of blinks echoed back.

When finished with all programming, increase the top speed dial clockwise to maximum to exit programming mode. All programming values are stored in flash memory and saved until re-programmed again.



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Programming: **Train Count**

The train count is needed for 3 reasons:
1. Perform self adjusting deceleration for up to 5 trains.
2. Send proper signals to attached YardMasters to correctly fire turnouts.
3. Allow running in a block-control mode. (Must be set for 1 train)

For example, a 3 track siding using 2 YardMasters wired in parallel would have a train count of 3, since 3 trains will be controlled.

Programming:

1. Make sure all three sensor inputs are open.

2. If not already in programming mode turn the top speed dial to zero. (fully counter-clockwise.) All LED'S will turn off.

3. Turn the top speed dial to about ***half position.*** This enables the secondary programming options. The sensor LED will turn GREEN to indicate secondary programming mode. (Skip this step if already in secondary programming mode)

4. Press and hold button #3.

5. Watch the status led. Each orange flash counts the number of running trains.

Release the button when the desired number of flashes have occurred.
The number will be echoed back when the button is released..
Repeat this procedure if you want a different value.

To verify the programmed number, briefly press button #3 one more time and count the number of blinks that are echoed back.

When finished with all programming, increase the top speed dial clockwise to MAX, and then down to a desired top speed if necessary.
All programming values are stored in flash memory and saved until re-programmed again.

NOTICE: A factory reset will set the train count to 2. Block control will not be operational until set for 1 train.

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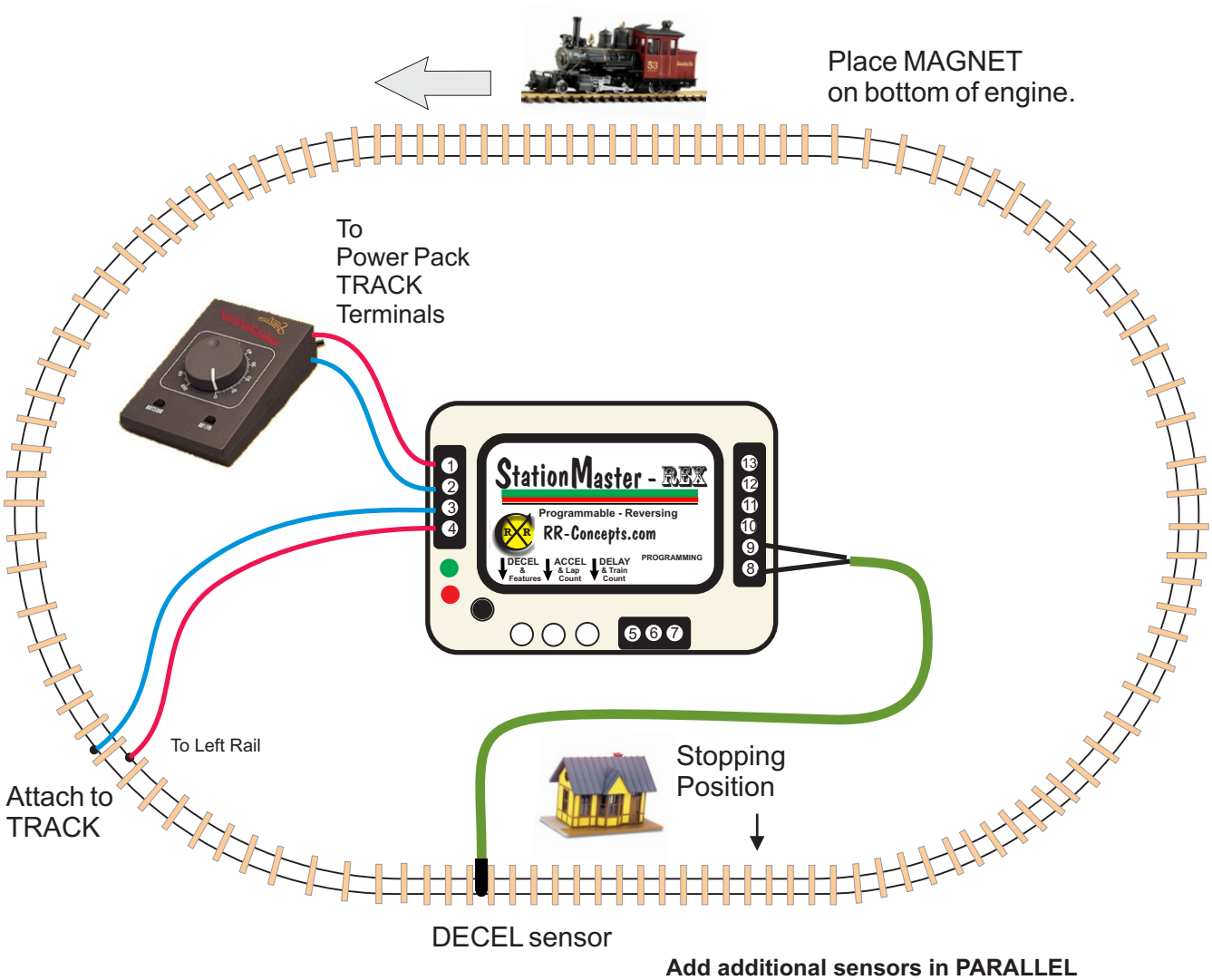
Basic Hookup Diagram for Automatic Station Stops with Deceleration/Acceleration using standard train sensors.



Add additional sensors in PARALLEL for additional station stops.

For a simple station stop, this is all you need to do!

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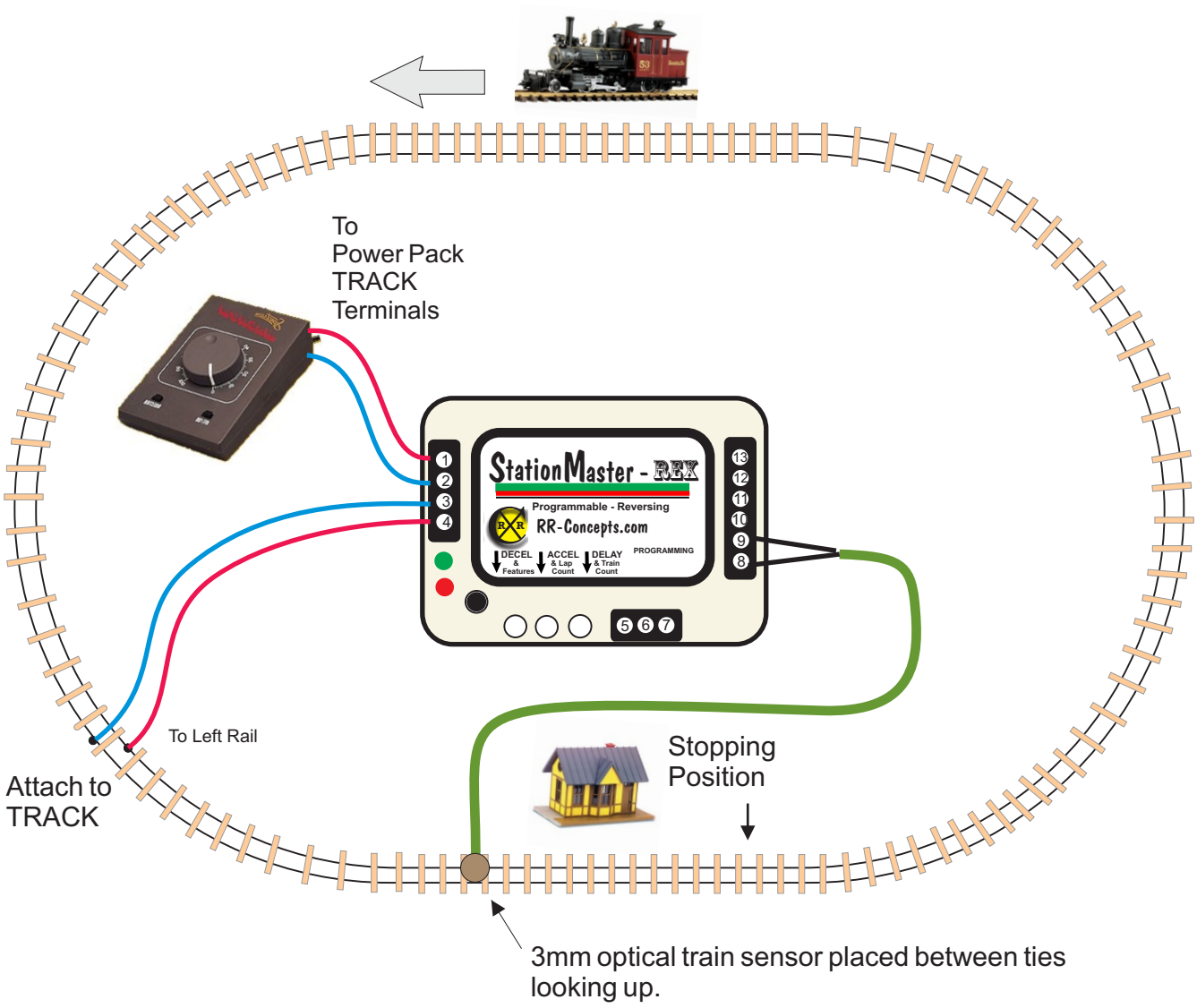
Basic Hookup Diagram for Automatic Station Stops with Deceleration/Acceleration using the optical train sensor.



For a simple station stop, this is all you need to do

The optical sensor operates both indoors and outdoors but will not operate in complete darkness.

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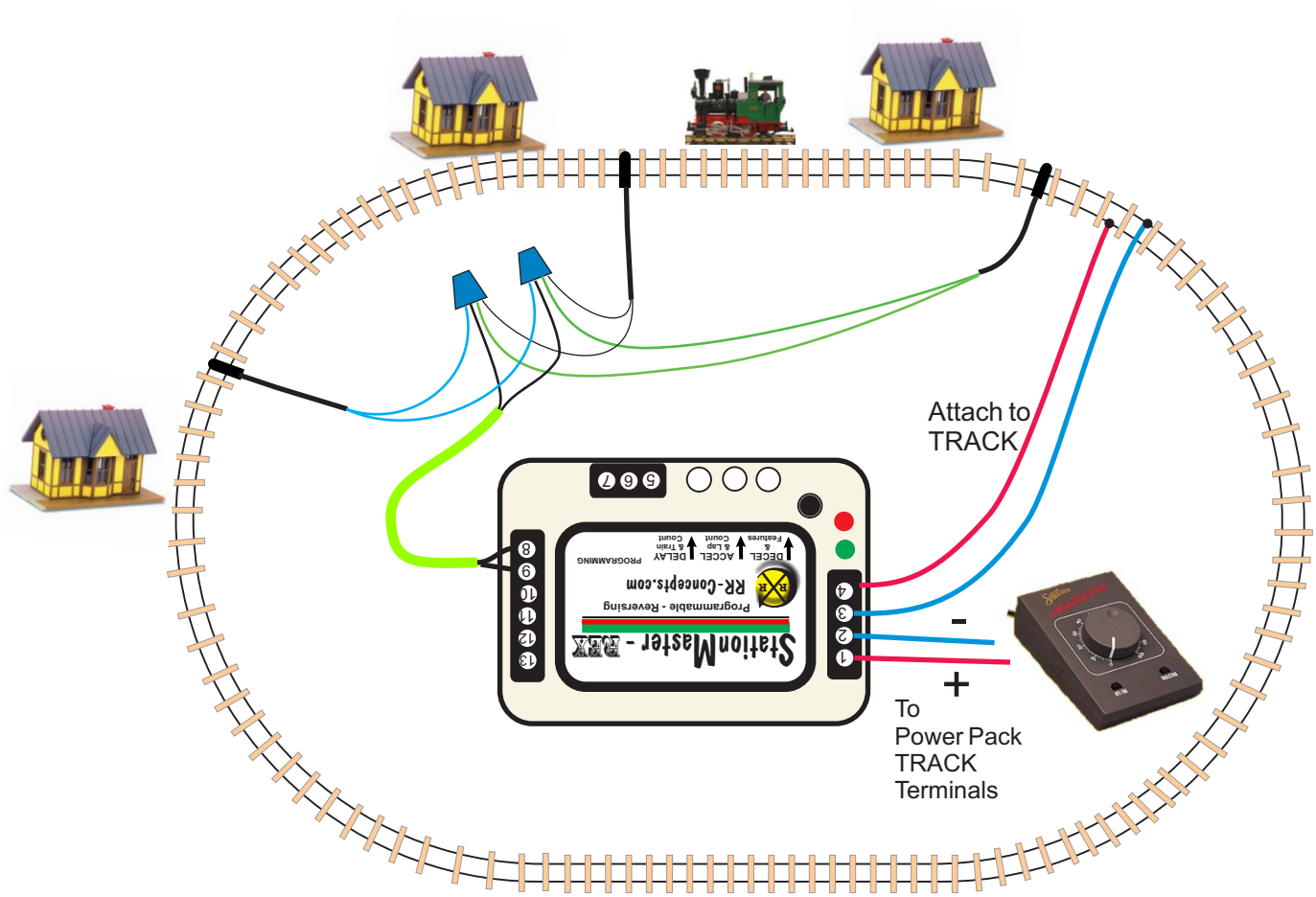
Multiple Station Stops

Your train can stop at many stations on the loop by adding DECEL sensors in parallel.



Every sensor that the train passes over will cause a declerate/pause/accelerate sequence.

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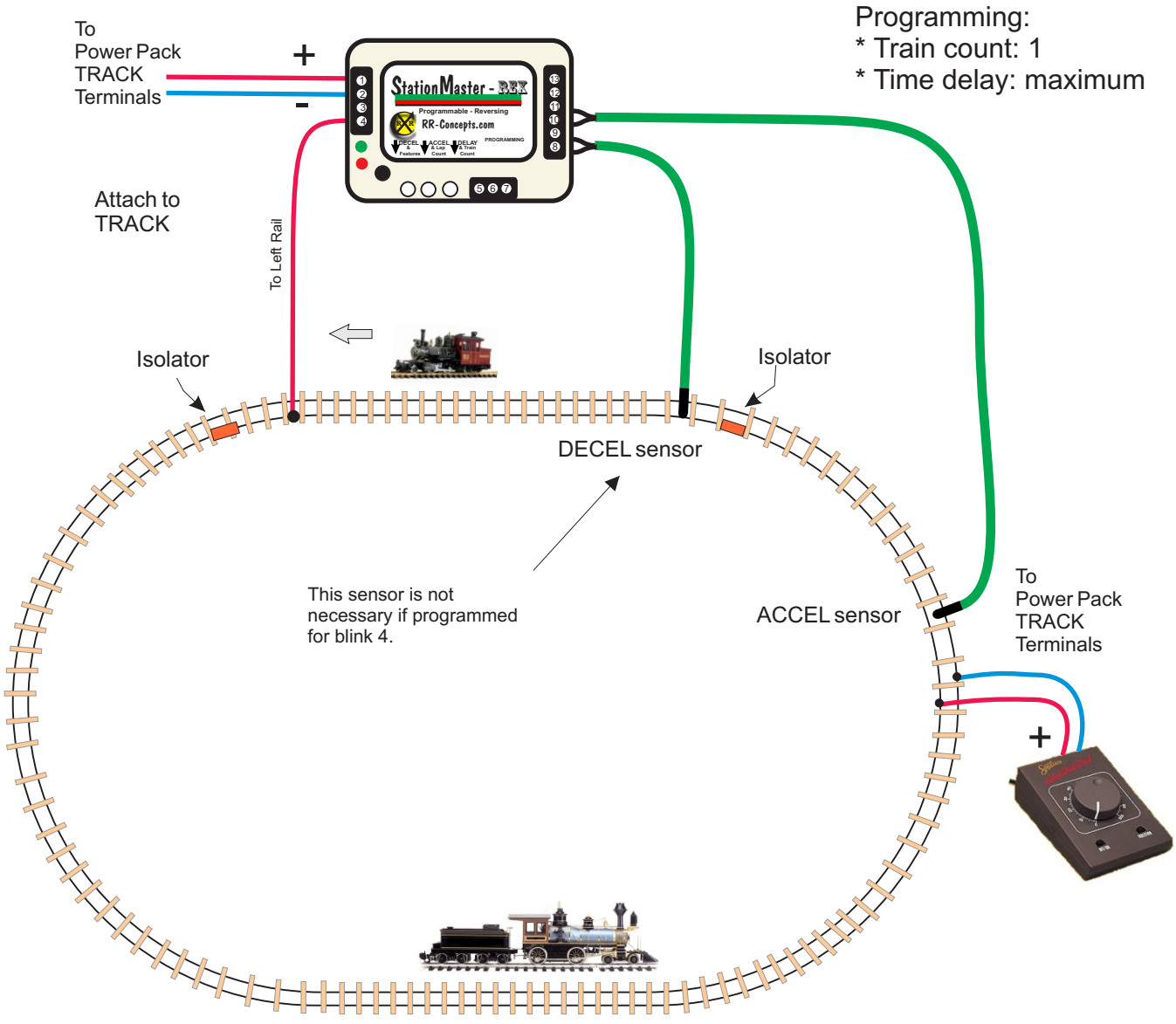
Block Control

For 1 or 2 Trains on 1 track with gradual Decelerations and Accelerations.



Hookup Notes:

1. Your train may not stop if the second train is too close. (ACCEL is hit before DECEL)
2. When the train decelerates it must stop before reaching the 2nd isolator..
3. If the train is slowing or stopped, then the second train will tell it to “go” when it hits the ACCEL sensor. Move the location of this sensor to fit your track.
4. The TIME DELAY must be programmed for MAXIMUM. (No time delay desired)
5. Location of ACCEL sensor must allow stopped train time to accelerate and exit before 2nd train enters the siding.
5. This hookup can run with 1 train or 2 trains. (1 train will never stop)

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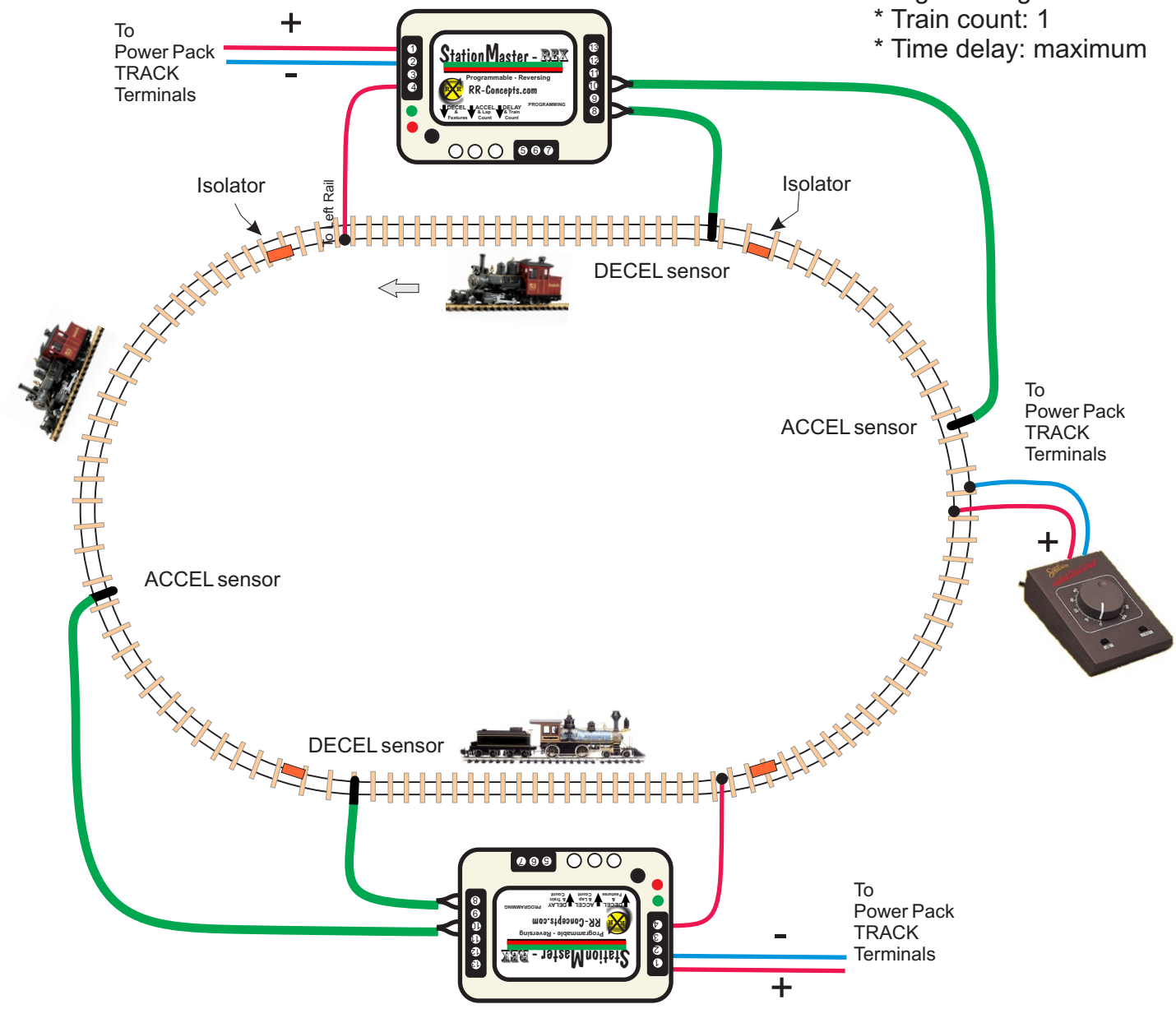
Block Control

For 1, 2, or 3 Trains on 1 track with gradual Decelerations and Accelerations using StationMasters.

Programming:
* Train count: 1
* Time delay: maximum



Hookup Notes:

1. Your train may not stop if the second train is too close. (ACCEL is hit before DECEL)
2. When the train decelerates it must stop before reaching the isolators.
3. If the train is slowing or stopped, then the second train will tell it to “go” when it hits the ACCEL sensor.
4. The TIME DELAY must be programmed for MAXIMUM. (No time delay desired)
5. Location of ACCEL sensor must allow stopped train time to accelerate and exit before 2nd train enters the siding.

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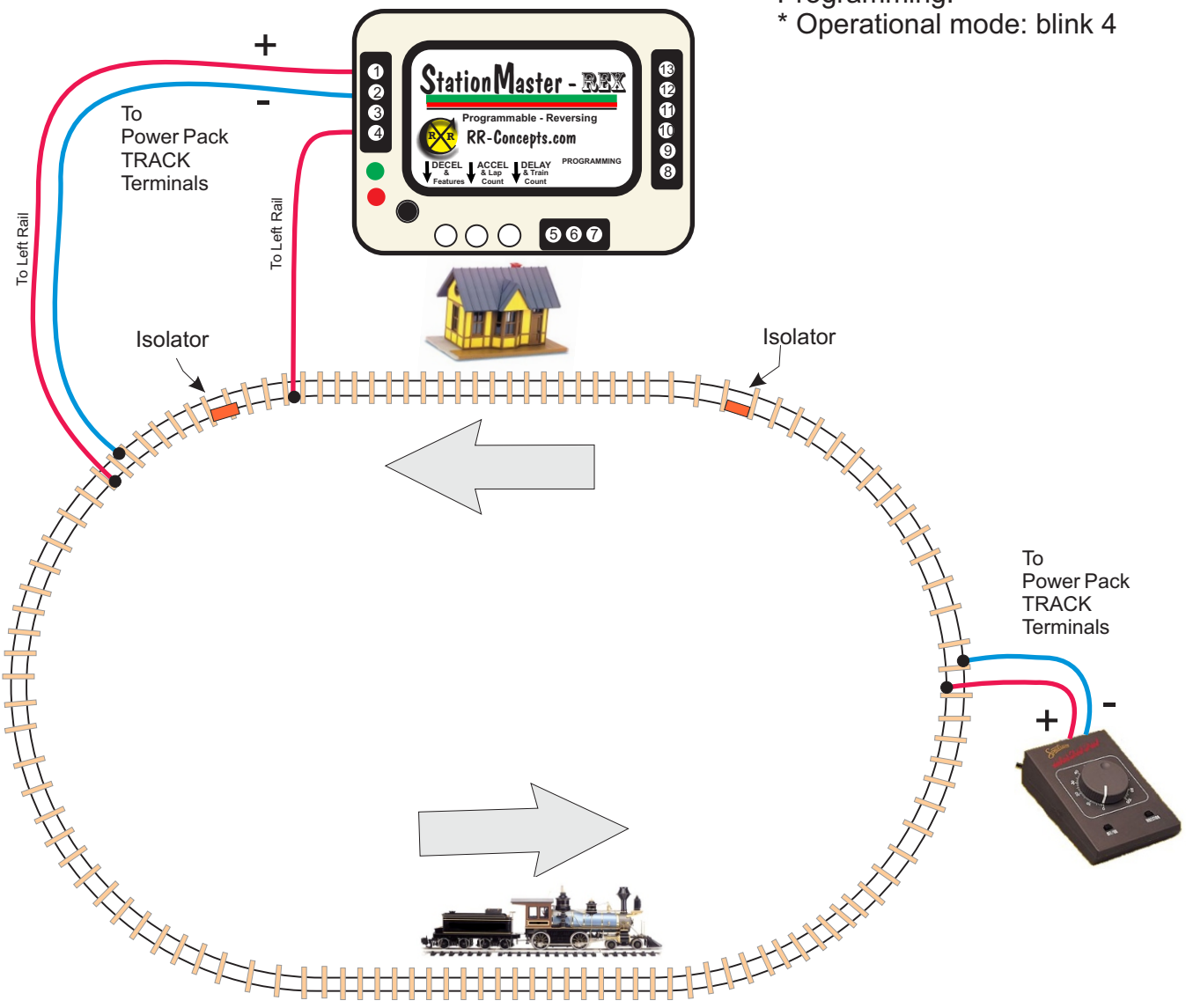
Station Stop Without using Magnets or Sensors

featuring gradual Decelerations and Accelerations.

Programming:
* Operational mode: blink 4



Hookup Notes:
1. Isolated section must be long enough to allow train to decelerate and accelerate.
2. Train can only go in one direction.
3. Allowing train to enter from wrong direction will damage StationMaster unless protection diode is used.
4. Program StationMaster for “blink 4”.
5. Program time delay as desired.
6. No magnets and no sensors are required
7. Station stop can be located at a remote location on your railroad far from the transformer.

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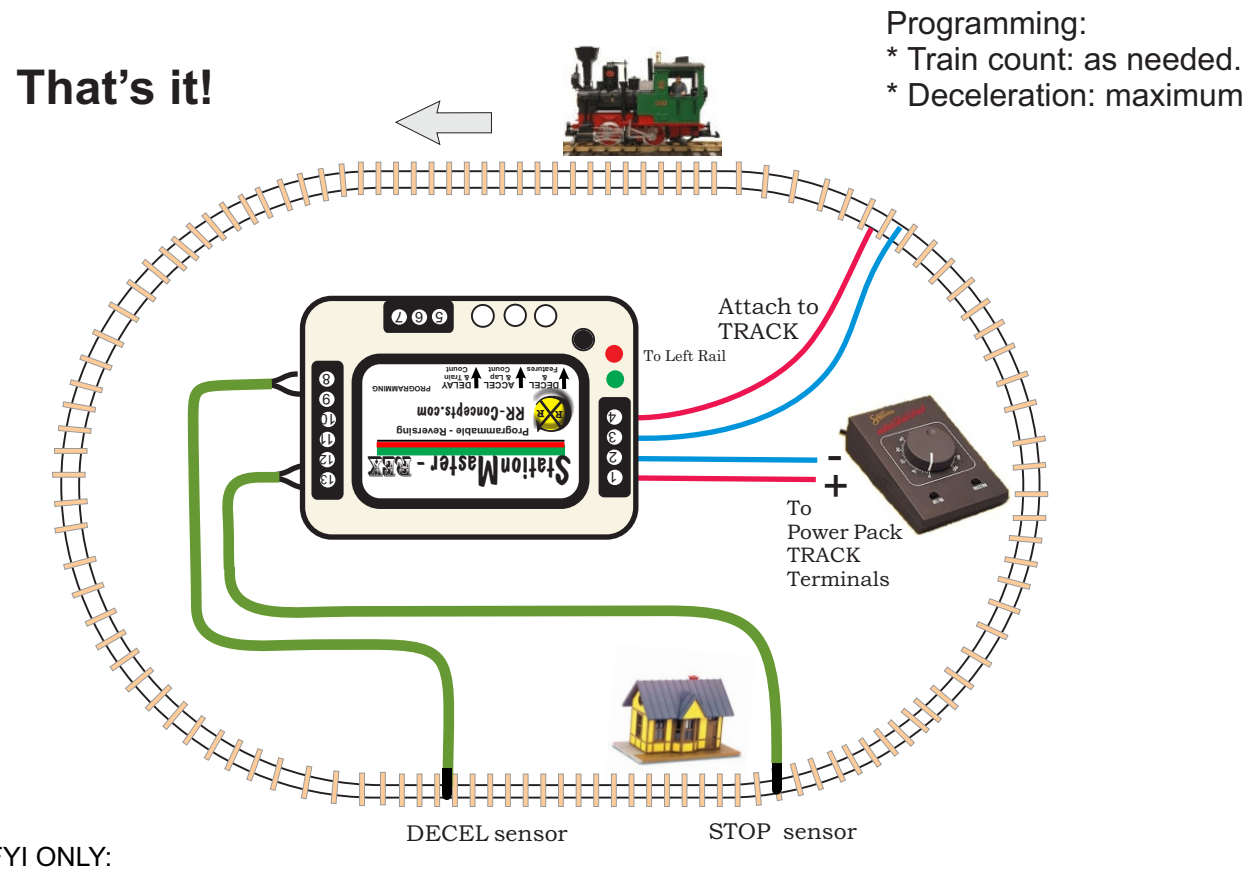
Self Adjusting Deceleration for Incredible Realism

A unique and extremely realistic feature of the StationMaster is “Self Adjusting Deceleration”. By using both a DECEL sensor and a STOP sensor the StationMaster will self-program itself for the most optimum and realistic deceleration profile. Programming your StatiionMaster to use “Self Adjusting Deceleration” is very easy:

1. Program your **deceleration** to **MAXIMUM**. (Press button #1 in Programming mode until it blinks orange)
2. Place the **DECEL** and **STOP** sensors on your track as shown. The distance between sensors should be between 3 and 10 feet. (longer is better)



FYI ONLY:

When “Self Adjusting Deceleration” is turned on the trains will self-adjust each lap until the optimum deceleration is found. The trains will decelerate and then slowly creep into the station in a very realistic manner.

When a train stops short while entering the siding then just wait.. after 20 seconds of no motion it will accelerate so that it eventually reaches the STOP sensor. This will happen ONE TIME ONLY.

The StationMaster will determine the absolute slowest that each train can travel and then record this speed. To determine this minimum speed it must go slower each time until it eventually stops the train. Stopping short of the sensor only happens once, but is necessary to see how slow each train can run. Once this is done all decelerations will be extremely realistic.

Up to 5 different deceleration profiles can be done for 5 different trains. Slow trains can run next to fast trains and each stop perfectly, Use the “train count” to set the number of trains that will be run.

More detailed information on the self-adjusting deceleration is available online at http://www.rr-concepts.com/StationMasterDocumentation.shtml

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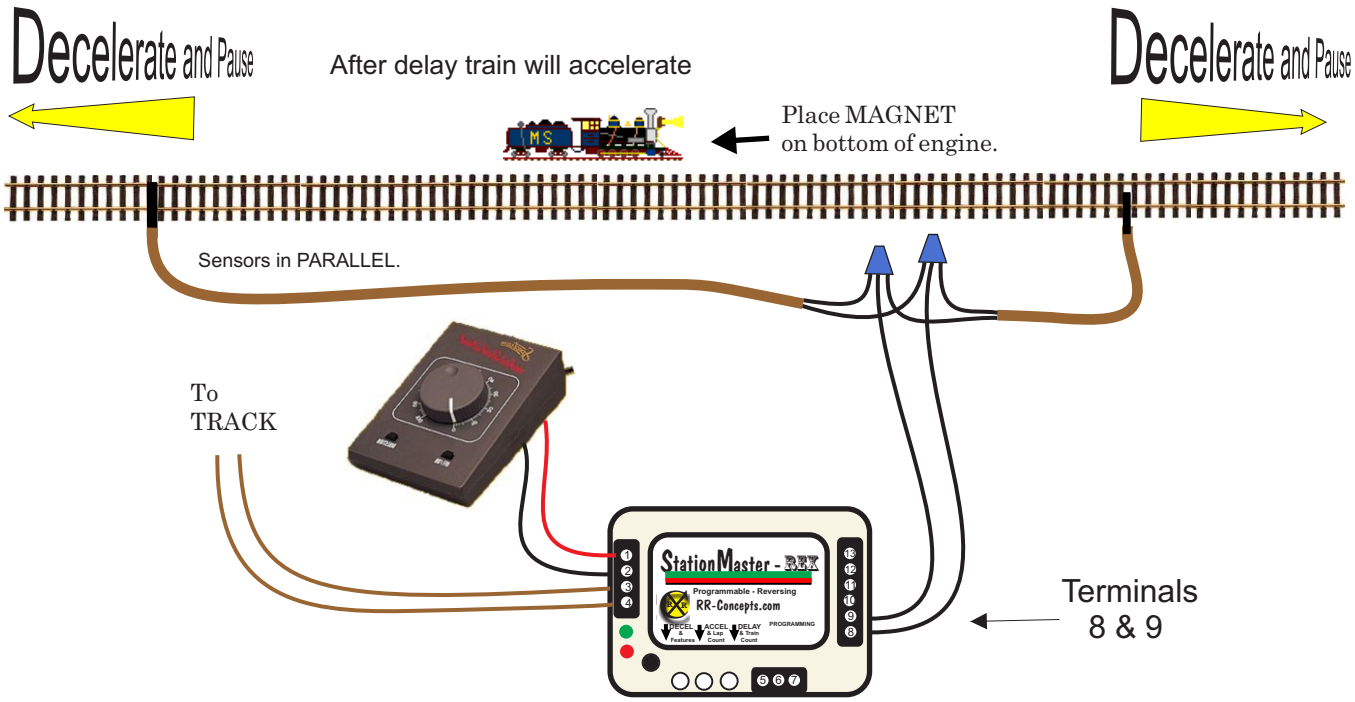
Extremely Realistic Reversing Operations

When programming Mode ***blink 1*** is set the StationMaster will reverse before every acceleration and ignore the next sensor it encounters after a reversal. This will allow reversing operations with full acceleration and deceleration. This hookup can also use the self-adjusting deceleration mode if programmed.

A sensor must be placed on the extreme ends to signal the StationMaster to begin the deceleration / pause / acceleration sequence. To operate without sensors and use end-of-track sensing consider using the StationMaster/Reverser instead of the StationMaster.



HOOKUP:

(1)(2) To Power Pack DC TRACK Terminals.
If StationMaster does not turn on reverse direction on transformer.

(3)(4) To Track

(8)(9) To sensors wired in parallel.

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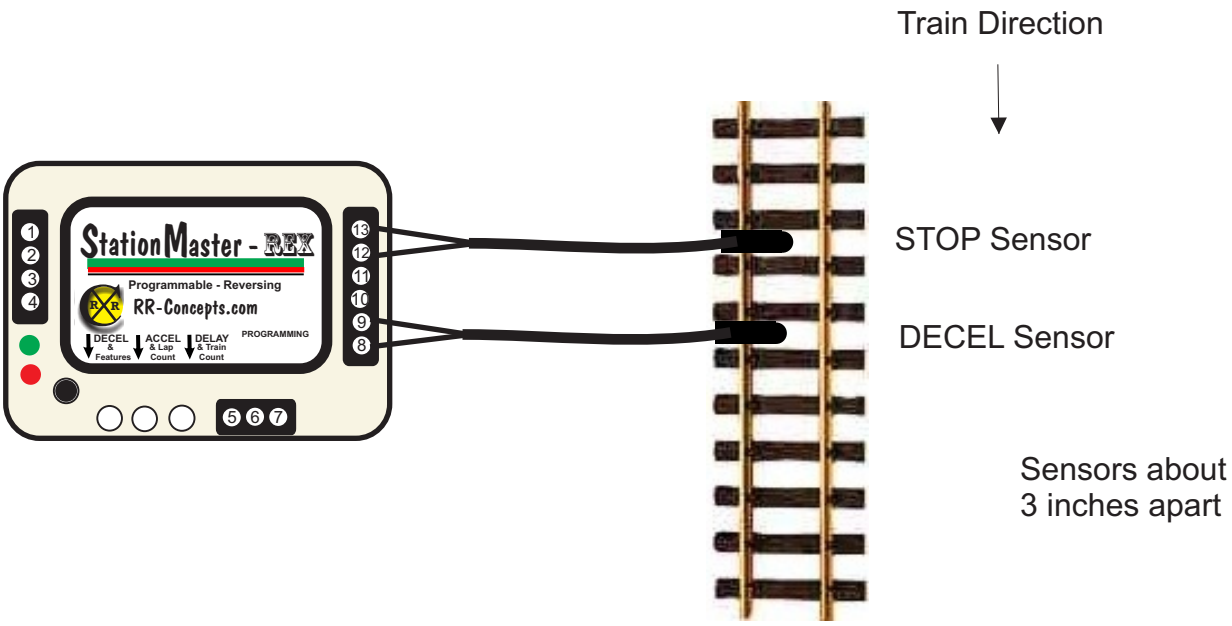
Advanced hookup

“Justa Station Stop”

When the StationMaster is hooked up in a reversing or alternating trains arrangement and an addition station stop is desired without reversing direction, preforming self-adjusting, or signaling the YardMaster then “Justa Station Stop” is desired.

“Justa Station Stop” uses a fixed deceleration and acceleration profile but uses the programmed time delay. The direction will not reverse and the YardMaster will not be signalled.

When the STOP sensor is triggered and then followed by the DECEL sensor within 5 seconds then the StationMaster will perform “Justa Station Stop”.



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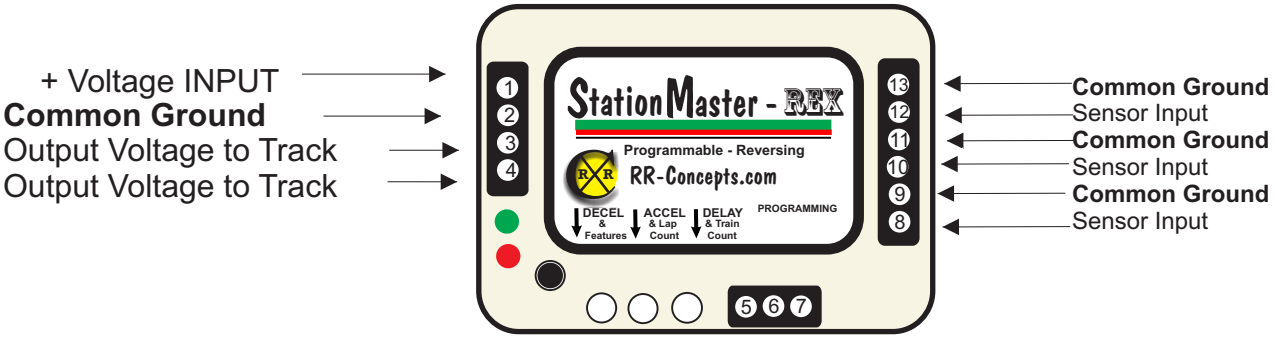
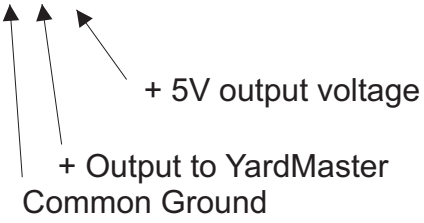
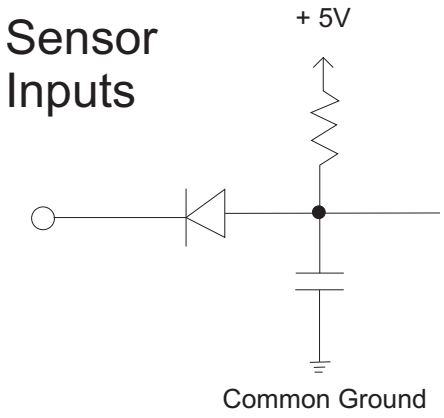
Electrical Details

For reference only

The locations of the common grounds could be useful for some wiring harnesses.







Non-Documented Features

The StationMaster contains a software controlled micro-controller. Additional customer-driven features, special functions, and enhancements have been added to the software which are not documented in this manual. A current list and description of these features is available online. Please go to RRConcepts.com for additional info.

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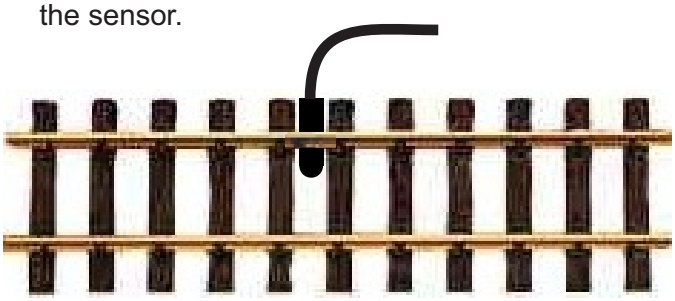
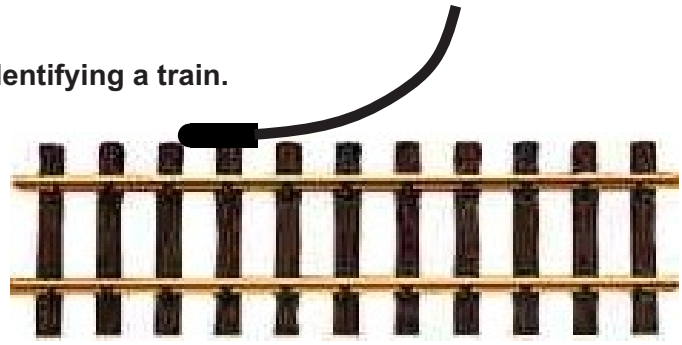
Sensor Placements on Track

The suggested sensor placement on track is shown below with the train magnet installed in the center of the train. Best sensing is done with the magnet passing over the tip of the sensor.



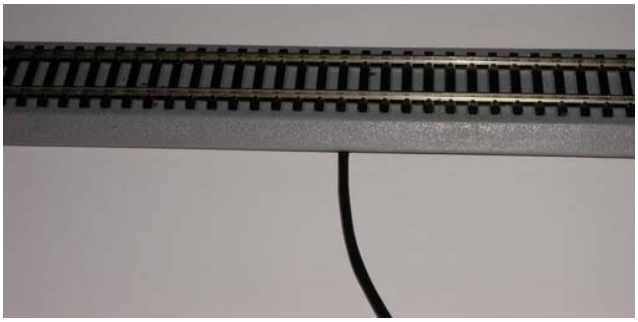
Sensor Placement for identifying a train.



Offset the train's magnet to the same side as the sensor as shown.

For example,
passenger trains have the magnet offset to the right and freight trains have the magnet offset to the left side.

Sensor placement for HO EZ track is under the roadbed.



Other scale trains can place the sensors where appropriate. Very small sensors are available which do not have the waterproof housing. These smaller sensors can be used for N, HO, etc. Contact RR Concepts for these sensors.

WARRANTY
Your StationMaster is warranted, and guaranteed operational for 1 year. It will be repaired or replaced at no charge within that time period. Contact http://www.RR-Concepts.com for additional information.