RR Concepts

Self-Adusting SHUTTLE

Back-N-Forth Controller

V2

The RR Concepts SHUTTLE can perform hands-off, back-and-forth operations using realistic accelerations and decelerations. Using end of track sensing, no programming or adjusting is needed. Just place the train on the track and power up.

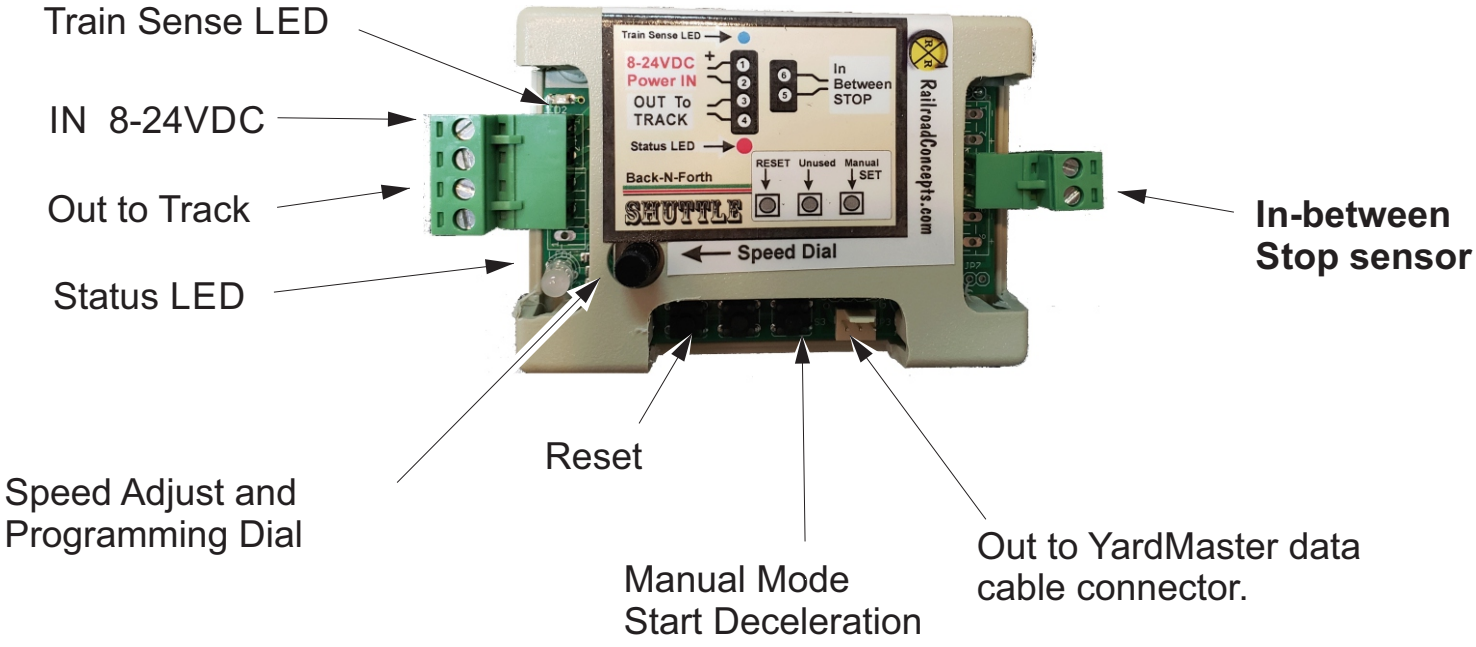
The RR Concepts SHUTTLE can control DC trains or DCC trains when used with a *PWM to DC conversion unit.* Any scale train can be run in manual mode, however automatic mode may not perform reliably with Z or N scale trains.

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 SHUTTLE will be damaged if power is put on any terminal other than 1 and 2.

ONLY ATTACH WIRES WHILE THE POWER IS OFF.

Quick-connect terminals allow easy swap-out and removal of the electronics while leaving the wires in place. The RR Concepts Magnet/Screwdriver tool is recommended for wire-up and testing.

See decal on bottom for Instructions



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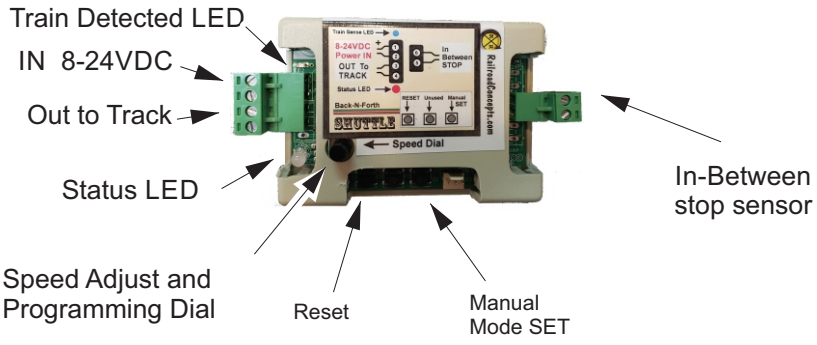
Self-Adjusting SHUTTLE

Hookup Instructions

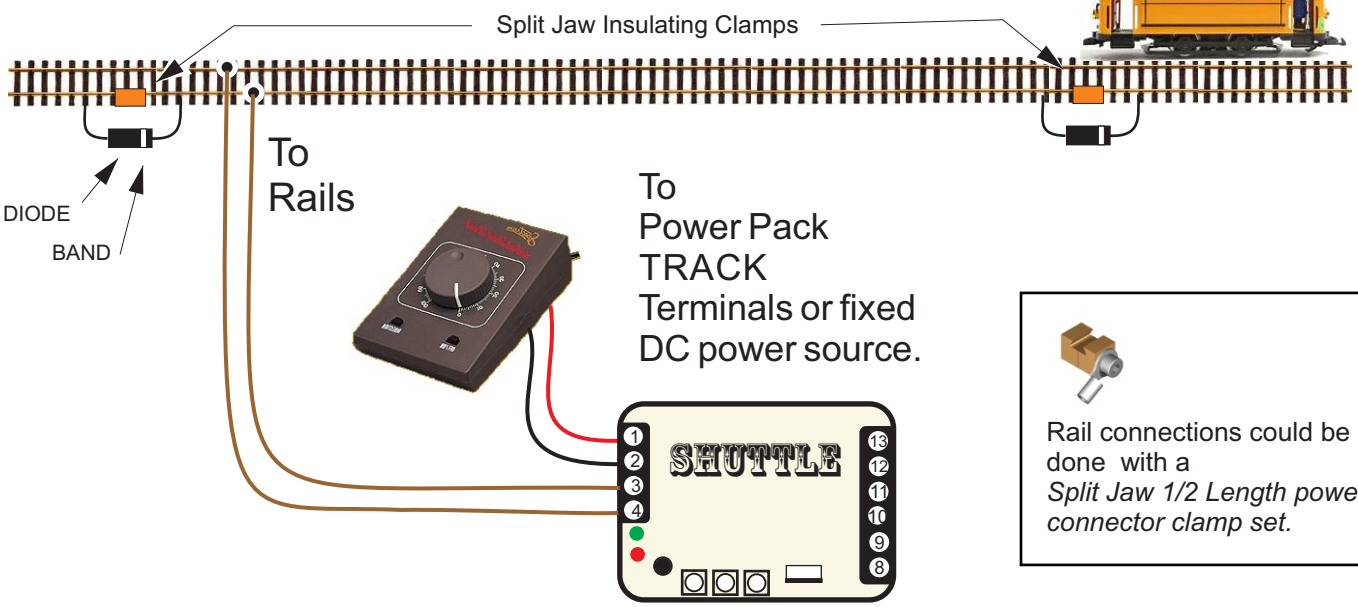
The Shuttle works with all DC trains, or DCC trains when a PWM to DC converter is installed. AC trains cannot be controlled.

Shuttle CONNECTIONS and CONTROLS



See the bottom label for operating instructions.

Hookup for Self-Adjusting Accelerations and Decelerations



Rail connections could be easily done with a *Split Jaw 1/2 Length power connector clamp set.*

Hookup Instructions:

1) Attach terminals 1 & 2 to the transformer, TRACK output.

2) Attach terminals 3 & 4 to the rails. No polarity.

3) Attach diodes to the end sections as shown above. This is where the train will stop. Replace the brass connectors with insulating clamps and diodes. Note the band on the diode. There must be a gap in the rail where the isolator is located. If the train does not stop after passing the diode then reverse the diode so the band is on the other side.

4) Turn the transformer up to the desire speed of the train. If the desire speed is very slow the Shuttle will not be able to operate. In this case, turn the transformer up to a faster speed and use the top speed dial to slow down the train.

5) Sit back, and watch! The Shuttle will run back-and-forth, self-adjusting each time until a perfect run is obtained. It might stop short, or run too fast, but will settle in to a nice run after a few cycles.

See the online manual for in-between stops, super smooth operations, alternating trains, changing the acceleration and deceleration rates, and more.

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Self-Adjusting
SHUTTLE

Operations

Fully Automatic Mode:

Instructions: Let the train run and watch!
Here's what is happening inside the box:

Learning Mode:
After a factory reset the Shuttle will be set for Automatic mode. After each power up the Shuttle will run the train back-and-forth for three times, measuring the distance between the ends. If no train is sensed for the first 10 seconds, then the Shuttle will reverse and run in the other direction. This could be the case where the train starts up in a diode section. While in learn mode the blue LED will be on.

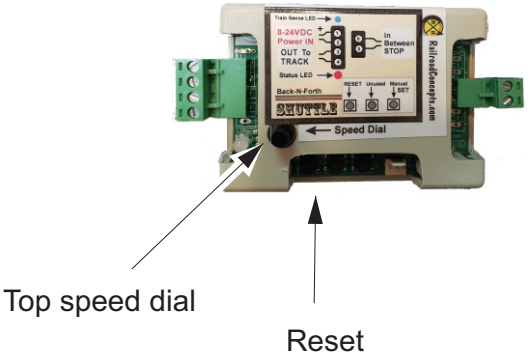
Running Mode:
After learning is complete the Shuttle will self-adjust ***each time*** until a perfect run is obtained and the train is running realistically. The self-adjusting allows anyone to change the speed of the train and the Shuttle will self-adjust to the new speed. The train may stop short a few times, or come to the ends faster than expected, but the Shuttle will eventually run perfectly and realistically. When running automatically the green, red, and orange LEDs will turn on.

Creeping Into the Ends:
When approaching the ends, the Shuttle will decelerate the train and then creep until reaching the end. The length of time for creeping is determined by the deceleration rate. A faster deceleration will result in a shorter creep, while a slower deceleration (more blinks) will creep longer. Adjust to what looks good since each train or trolley will behave differently.

Top Speed Adjustment:
The top speed of the train is set by either adjusting the transformers throttle, or by using the top speed dial. In some trains the lights and smoke will stay on when running slowly if the transformer throttle is set high and the top speed dial is used to slow down the train.

Button #1 will reset the Shuttle and start the learning process again. This is not a factory reset, but only a "start over" operation.

Notice that not all trains will run perfectly while in automatic mode. Because the Shuttle uses "current sensing" to see the trains, some trains with very small motors may not reliably run. If the creeping speed set by the Shuttle is very fast, or the trains never reach the ends after dozens of runs, then Manual Mode can be used.



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Self-Adjusting
SHUTTLE

Operations

Manual Mode:

Sometimes Automatic Mode cannot operate the trains due to very small motors which the Shuttle cannot reliably sense. Manual Mode allows complete control and will operate with all trains. Manual mode also allows setting a very slow creep into the diodes for all trains using the speed dial.

When in Manual Mode, the Shuttle will stay in manual mode after each power up and never enter automatic mode until Automatic mode is reset by pressing button #1, or performing a factory reset.

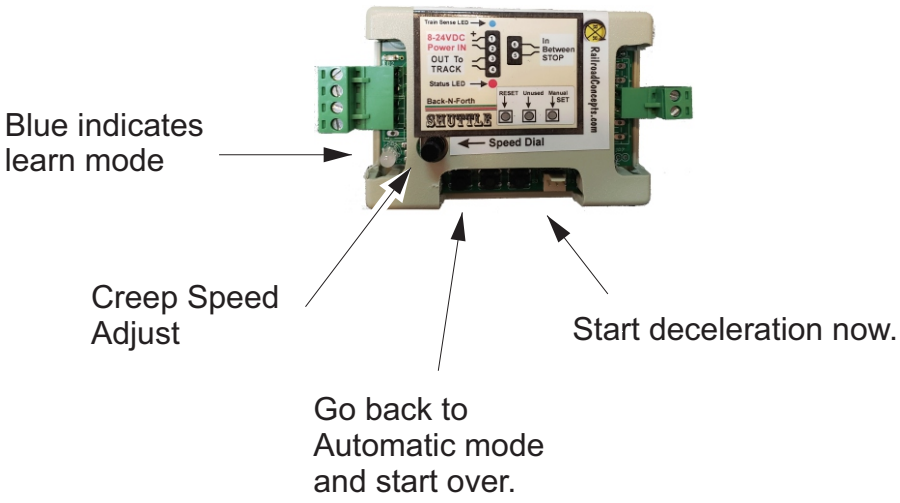
To Run in Manual Mode:
- Press button #3 when the train reaches the location where the deceleration should start.
- Repeat after reversing for three cycles. This location is typically 2 or 3 feet before the diode.

LED indicators:
The large Blue LED will be on when button #3 needs to be pressed. If the train is in the diode section and not moving, then the Shuttle is waiting for button #3 to be pressed. Press the button to reverse and continue.

When running normally (Showing Green), button #3 can be pressed at any time to set a new deceleration location. Press the button if the deceleration should start earlier or later.

For super-realistic control, the top speed dial can be used to set the creeping speed into the diodes. Adjust to what looks good. If set too low then the train might stop before reaching the ends.

To exit manual mode and return to automatic mode, press button #1.



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Input Power

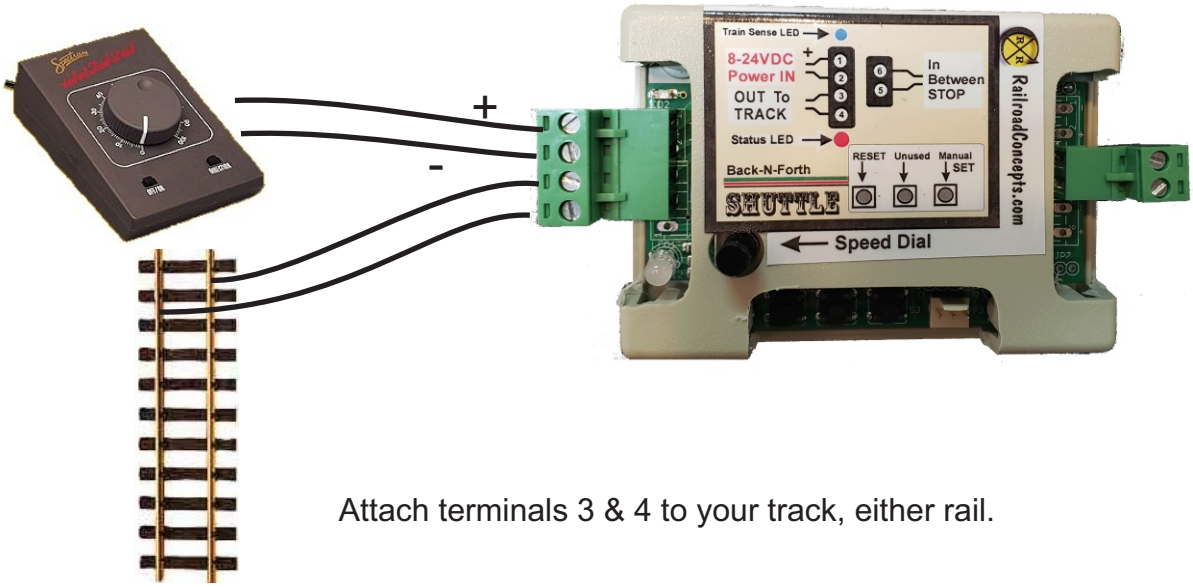
The Shuttle is usually installed between the train transformer and the track, however a fixed DC power source could also be used. The Shuttle can accept voltages up to 18 volts, however a high-power version is available which can accept up to 24 volts.
In all cases the voltage should be pure DC and not “pulsed” or PWM. Some electronic speed controllers use pulsed voltage which may not be compatible with the Shuttle. Please use a “PWM to DC converter” if a pulsed transformer is used. If there is a momentum switch on the transformer then it is using a pulsed operation.

Variable Speed Transformer Hookup:
Attach terminals 1 & 2 to your transformer's DC output (Sometimes labeled as TRACK) and set the throttle to the running speed of the train. If the running speed of the train is very slow (under 8 volts), then turn up the throttle on the transformer and use the top speed dial on the Shuttle to reduce the train speed. ***If the Shuttle does not light up then reverse the direction on the transformer.***

Fixed Voltage Source Hookup:
Since the Shuttle controls the speed of the train, a variable speed transformer is not required and a fixed DC power source could be used. Usually a 12 volt DC power source is a perfect solution and these can be obtained quite inexpensively. Attach the voltage source to pins 1 and 2 and use the top speed dial on the Shuttle to set the running speed of the train. If the Shuttle does not light up then reverse the wires on pins 1 and 2.

Output Conenction

Connect terminals 3 and 4 to the track, either rail.



Attach terminals 3 & 4 to your track, either rail.

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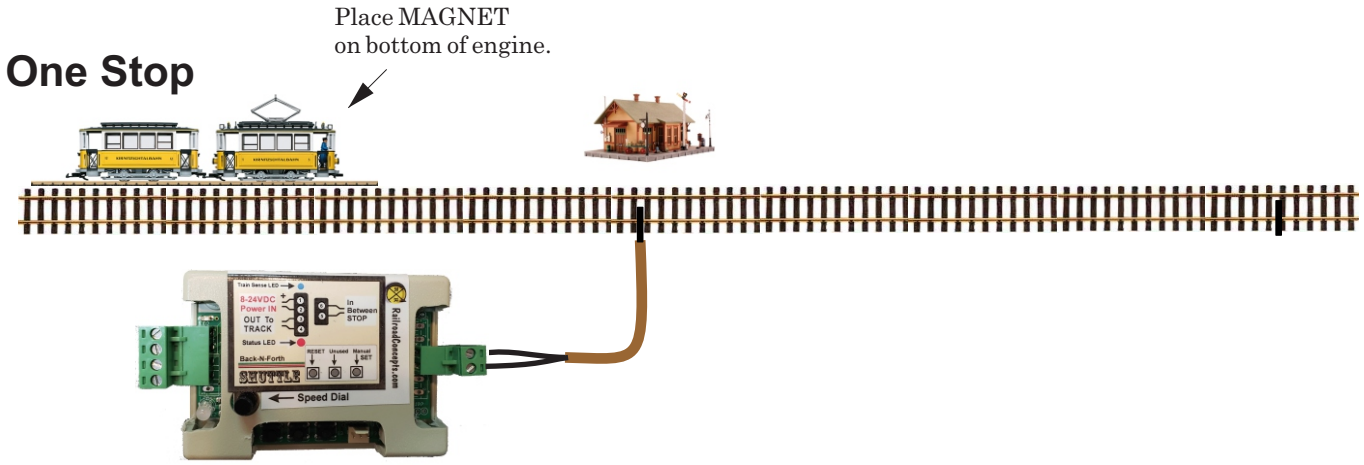
In-Between Station Stops

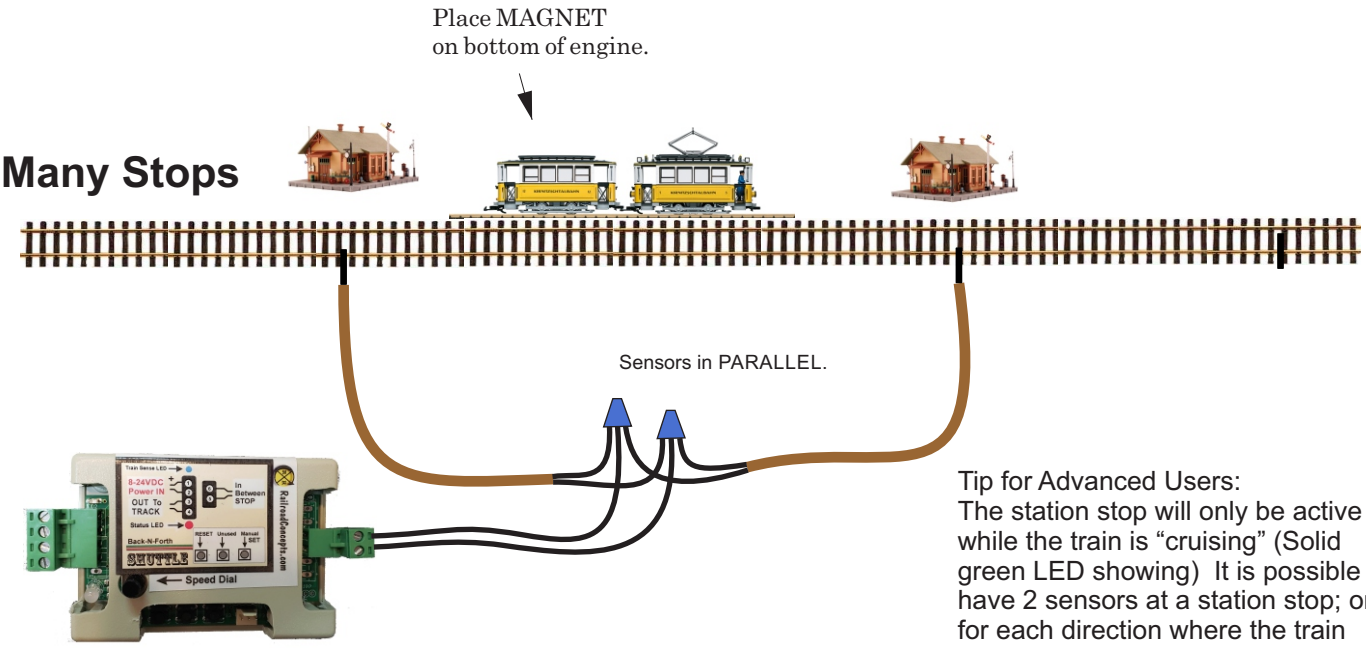
For in-between stops, attach a sensor to the in-between stop terminals. When the magnet on the train triggers the sensor the train will pause at the station.
For more than one stop add more sensors in parallel.

Note that The deceleration rate is rapid and the time duration for the stop is fixed. This allows the train to stop at approximately the same location for each direction.

One Stop



Many Stops



Tip for Advanced Users:
The station stop will only be active while the train is “cruising” (Solid green LED showing) It is possible to have 2 sensors at a station stop; one for each direction where the train stops between them. The 2nd sensor encountered would be ignored while the train is accelerating.

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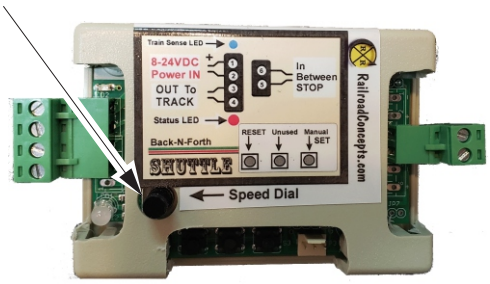
Top Speed and Programming Mode Dial



The Top Speed dial provides 3 functions:

1: Adjust the top "cruising" speed of the train when in automatic mode.
2: Reduce the “creeping speed” when running in manual mode.
3: Enter programming mode.

Automatic Mode ***Top speed*** adjustment
“Full speed" is clockwise. Turn this dial down as necessary to set the desired cruising speed of the train. This is only necessary when using a fixed voltage power supply or when a very slow top speed is desired.

Typically, this dial is set fully clockwise and the train throttle (transformer) is used to set the speed of the train.

Manual Mode ***Creep Speed*** adjustment
When in “Manual Mode” turn this dial down to reduce the creeping speed of the train as it enters the diode sections.

Programming Mode
To enter programming mode turn this dial fully counter-clockwise. The blue Train Detect LED will “twinkle” to indicate “programming mode”.
To exit programming mode turn the dial fully clockwise.

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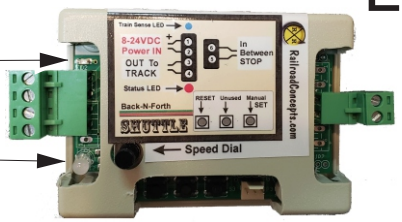
LED indicators



Status LED White. Train is running to an end for the first time. In-between stops will hot happen. If a train is not sensed after10 seconds the Shuttle will reverse.

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Status LED Blue Not Flashing:
Automatic Mode: Shuttle is performing the learn operations.
Manual mode: button #3 must be pressed to set location where deceleration will start.

Status LED Blue Flashing once a second: Shuttle is performing a time delay operation and is still self-adjusting. (See orange flashing)

Status LED Green:
Flashing: Train is accelerating.
Not Flashing: train is "cruising".

Status LED Red Flashing: Train is decelerating and operating normally.

Status LED Orange flashing quickly: Train is creeping into the diode section.

Status LED Orange flashing once a second: Shuttle is performing a time delay with self-adjusting completed.

Status LED Red and blue blinking indicates a SHUTDOWN due to an **over-current** or **stalled t**rain. To recover: Turn power off then back on ***or press and hold button #1.*** If the condition returns after recovery then check for a short circuit on the track or turn off the shutdown feature.

Train Sense LED Train Sense LED indicates a train is sensed. When ***twinkling*** the Shuttle is in programming mode. Turn the top speed dial clockwise to exit programming mode.

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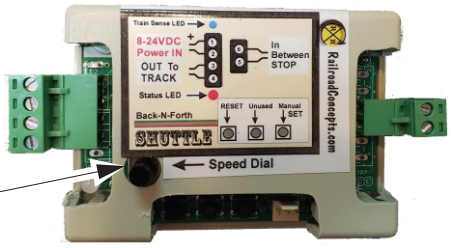
Programming: **Deceleration Rate**



Fully counter clockwise

1. Make sure a train is not on the in-between stop sensor.

2. If the top speed dial is not already at zero, then turn the top speed dial to zero. (fully counter-clockwise.) The Blue "Train Detected" LED will "twinkle"

3. Push and hold programming button #1.

4. Watch the status led. Each RED blink will decelerate slower. 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.

One blink corresponds to a 3 second deceleration rate. Each additional blink adds 1 second. For example, a blink count of 5 would result in a deceleration rate of 8 seconds.

In Automatic mode the deceleration rate will also determine the creeping time. A longer deceleration will allow the train to creep for a longer duration before entering the stops.

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.

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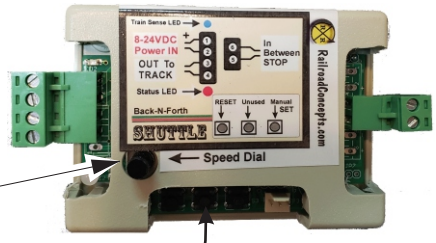
Programming: **Acceleration Rate**



Fully counter clockwise

1. Make sure a train is not on the in-between stop sensor.

2. If the top speed dial is not already at zero, then turn the top speed dial to zero. (fully counter-clockwise.) The blue train Detected LED will “twinkle”.

3. Press and hold programming button #2..

4. Watch the status led. Each GREEN flash will accelerate slower.
<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.
One blink corresponds to a 3 second acceleration time. Each additional blink adds 1 second. For example, a blink count of 5 would result in a acceleration rate of 8 seconds.

When finished with all programming, turn the top speed dial fully clockwise.
All programming values are stored in flash memory and are retained until re-programmed.

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

* For blinks 1 thru 9 the train will accelerate smoothly with the programmed value. This is typical for trolleys.

* For blinks 10 and above the train will creep very slowly out of the station for a few seconds and then accelerate up to full speed.
This will only work with longer lengths of track where the train runs for 30 seconds or more.

* 10 blinks will creep for 5 seconds.
* 11 blinks will creep for 10 seconds.
* 12 blinks and up will creep for 15 seconds.

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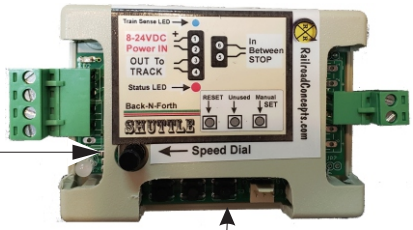
Fully counter clockwise



Programming: **Pause Time**

1. Make sure a train is not on the in-between stop sensor.

2. If the top speed dial is not already at zero, then turn the top speed dial to zero. (fully counter-clockwise.) The blue train Detected LED will “twinkle”.

3. Press and hold programming button #3.

4. Each ORANGE flash will increase the pause time on the ends.
A pause time of zero will be with one flash.
Release the button 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 13 counts).
When infinite delay is set, the “In Between Stop” terminals are required to start up the train after stopping.
A fun thing to do would be to connect the In between stop terminals to a doorbell switch. Your train would patiently wait until someone pushed the button! Motion sensors are another possible way to start the train.
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 15 seconds
5: 20 seconds
6: 30 seconds
7: 1 minute
8: 2 minutes
9: 5 minutes
10: 10 minutes
11: 30 minutes
12: 60 minutes
13: Infinite, wait for in-between stop sensor.

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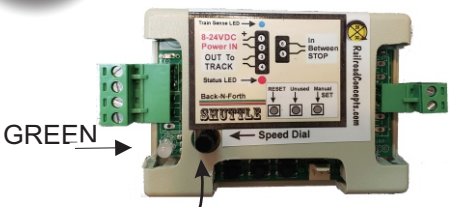

Programming: Advanced Settings

HOW TO PROGRAM:

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 *slowly clockwise* until the LED turns green. This indicates secondary programming mode. This should be about half-way.

2. **To view the currently settings, quickly press button #1.**
   To program a new setting, press and hold programming button #1 until the desired number of blinks have occurred. The Shuttle will echo the programmed settings when released.
   A green blink indicates the setting is ON, while a red blink indicates the setting is off.

Each blink will set or clear a different feature. If currently ON it will turn off. If ON it will turn OFF.

Programmable Settings: (Any or all of these or all can be programmed independently)

Hold button for 1 blink = Resume Running on power up. Do not perform the learn operation on power up and resume all settings from last time.
Note: Manual mode will always perform resume running.

Hold button for 2 blinks = Super Realistic "Slow Creep" mode. Automatic mode only.
The Shuttle will determine the absolute slowest speed that the train can achieve when entering the diode sections.
This will take many more cycles to "dial in", but the result will be a very slow creep into the diode sections. The train will stop short many times but will always go into the diode sections after a pause.

Hold button for 3 blinks = Disable the shutdown. This is sometimes needed when a very small transformer is used which causes false shutdown errors. Notice that the Shuttle could be damaged if the shutdown is disabled while using a large power source.

Hold button for 4 blinks = Send signals to a pair of YardMasters to perform a double siding three train operation.

When the button is released the Shuttle will echo the currently programmed settings with four blinks of either red or green.

For example, if "Resume Running on Power Up" has been set (one blink) and nothing else, then the Shuttle will echo

blink 1 GREEN: "Resume Running" is ON.
blink 2 RED : "Super Realistic Slow Creep" is OFF.
blink 3 RED: "Disable the shutdown is" OFF
blink 4 RED: "Double Siding" control is OFF.

A factory reset will erase all settings.

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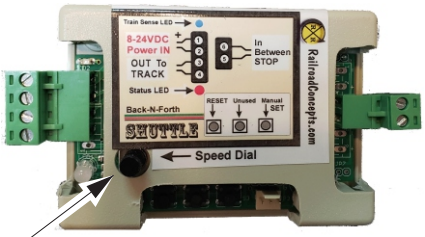
Programming: **Factory Reset**



Fully counter clockwise

To set the Shuttle 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 at the same time, then release buttons.

3 Turn the top speed dial fully clockwise to exit programming mode.

The factory default settings are:

* Acceleration rate 2 blinks
* Deceleration rate 3 blinks.
* Time delay 10 seconds.
* Train count: 1
* Operating modes:

Blink 1 = RED, Resume Running OFF.
Blink 2 = RED, Super Realistic Slow Creep: OFF.
Blink 3 = RED, Disable overload shutdown: OFF.
Blink 4 = RED, Three train reversing siding control: OFF.

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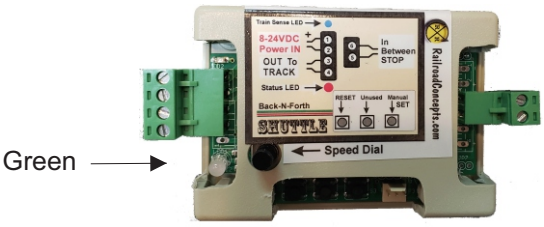
Programming: **Train Count**



The train count is only needed when a YardMaster is attached. A train count will instruct the Shuttle to do the following:

1. Manage different creeping speeds for up to 3 trains when wired in a siding hookup .
2. Send proper signals to an attached YardMaster to correctly fire turnouts.

A factory reset will set this to 1 train.

Programming:

1. Make sure a train is not on the in-between stop sensor.

2. If not already in programming mode, turn the top speed dial to zero. (fully counter-clockwise.)

3. Slowly turn the top speed dial clockwise until the LED turns GREEN. This indicates secondary programming mode. (Skip this step if already in secondary programming mode)

4. Press and release button #3 quickly to see the current setting, or press and hold button #3 for the desired number of blinks to set a new train count.

After the button is released the train count setting will be echoed back. Repeat this procedure if you want a different value.

When finished with all programming, turn the top speed dial clockwise.

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

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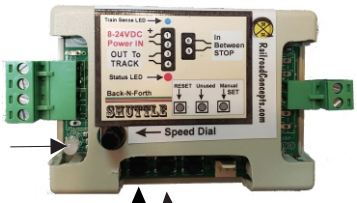

-Manual Mode only-

Programming:
Fixed Top Speed

When in **Manual Mode**, (button #3 was pressed while running) the top speed dial is used to adjust the creeping speed into the stops.

When a fixed voltage DC transformer is used, the top speed of the train can be programmed to slow down the train. This value is retained until changed, or reset after a factory reset. This setting has no affect in Automatic mode.

HOW TO SET A TOP SPEED:

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

   * Turn the Top Speed dial fully counter-clockwise to enter programming mode
   The blue "Train Detected" LED will "twinkle"

   * Turn the Top Speed dial ***slowly*** clockwise until the LED turns Green and then **BLUE.**
   This indicates tertiary programming mode.

   * After 3 seconds the currently programmed speed will be put on the track and the train will run.

2. **Press and hold button #1 to decrease the speed, or button #2 to increase the speed.**
   Watch the train and choose a value that works. The speed changes slowly so keep holding down the buttons.

3. When the train enters the stops, press button #3 to reverse directions.

4. After a good speed is determined, turn the top speed dial fully clockwise to exit programming mode. This speed value will be stored in flash memory.
   A factory reset will clear the value.

Point to Point Reversing With a Siding

Two trains back-and-forth reversing, alternating.

Requires an isolator on each siding, and diodes on each end.

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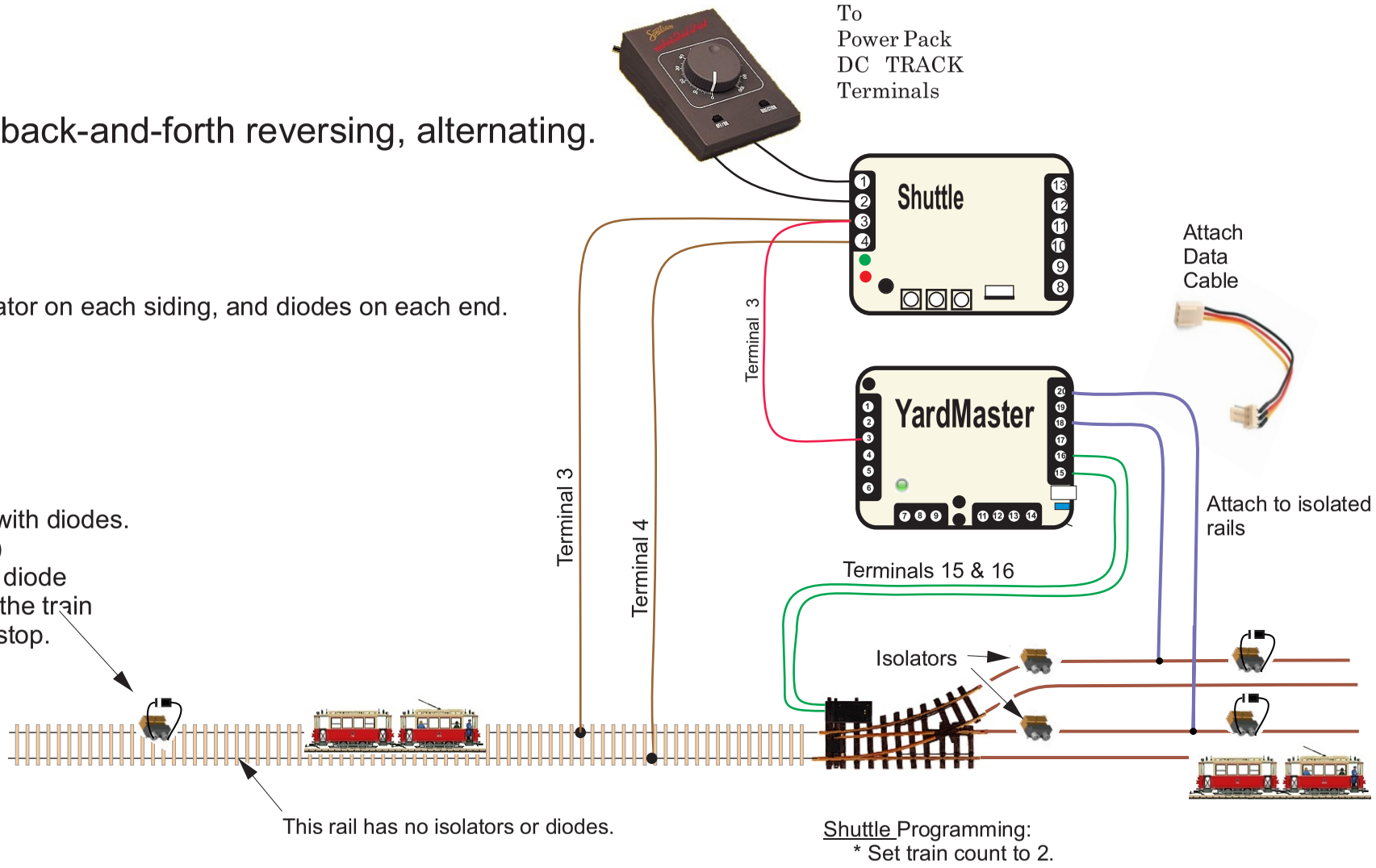

The YardMaster will only fire when the train is going “forward”.
If the turnout switches on the wrong end then swap ALL the wires in Shuttle pins 3 and 4.

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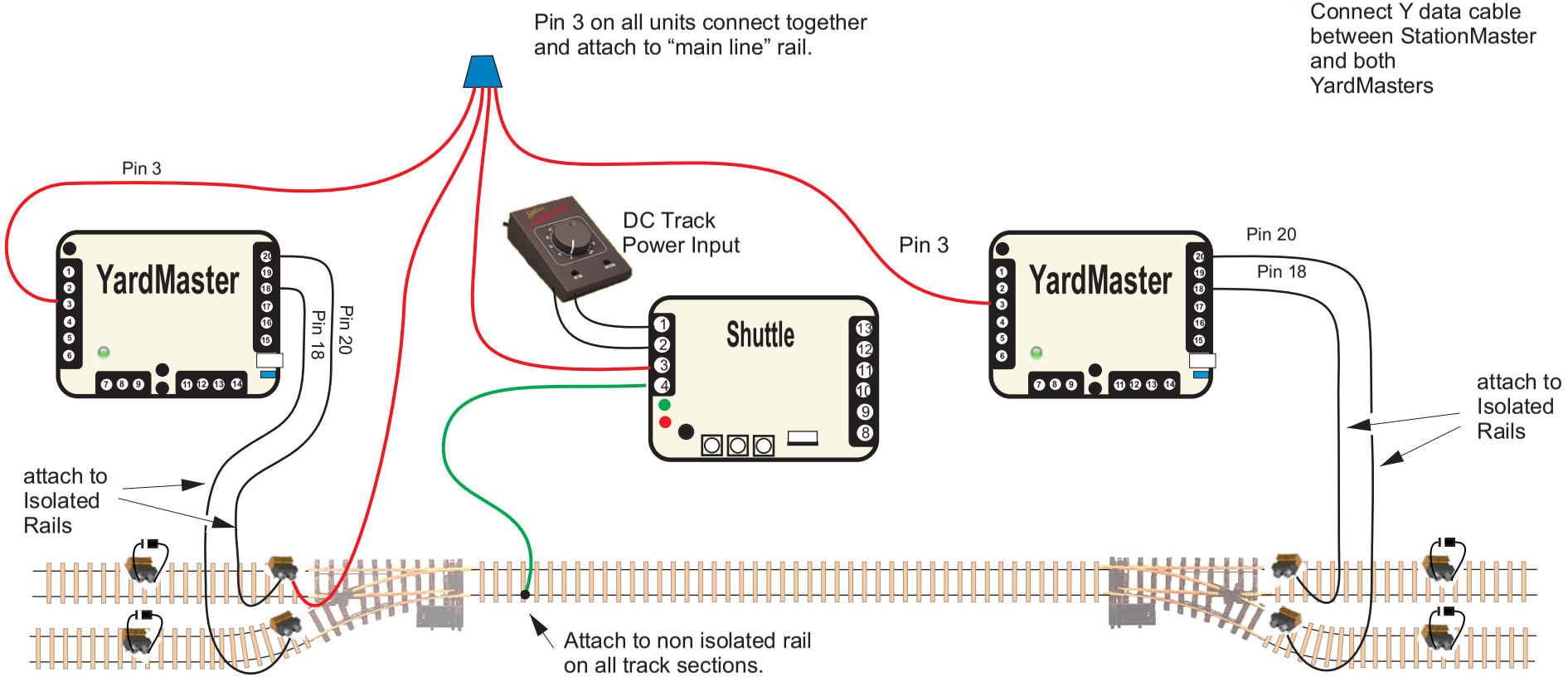
Reversing with Sidings on both Ends.
3 Trains running with acceleration & deceleration.

Two trains will be parked in sidings and one train will travel to the other side. After that train stops the adjacent train in the siding will travel to the location where the previous train left. This operation is repeated so that all three trains will travel back and forth.

Programming:
Set programming blink 4 to enable “double siding” operation.

Parts Required:
1 Shuttle.
2 YardMasters.
4 Diode Isolators.
4 Track Isolators.
1 Y Data Cable

Connect Y data cable between StationMaster and both YardMasters



03/31/2015

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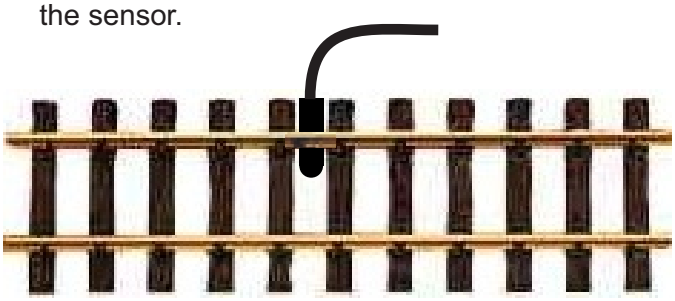
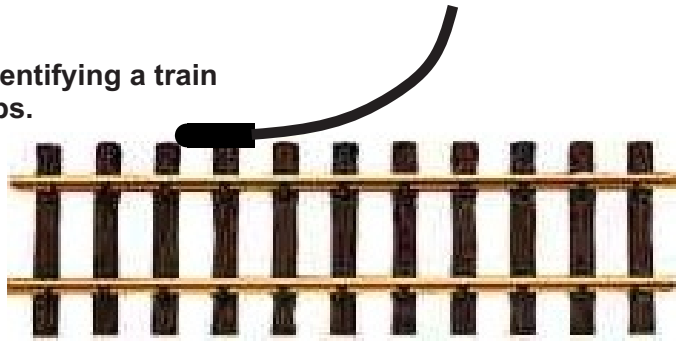
Sensor Placements on Track

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 for multiple train hookups.



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.