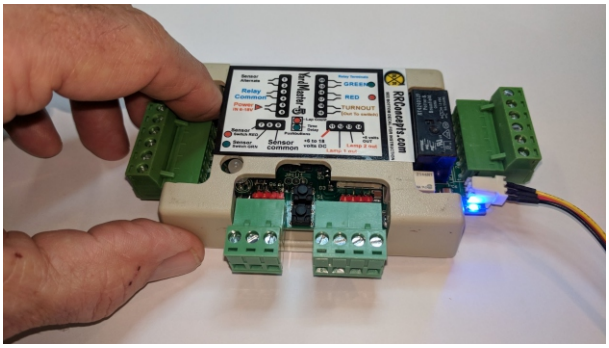
Apr 2019

RR Concepts

YardMaster-5

Turnout (Track switch) Controller
Lamp / LED Driver
Siding Controller
Auto-Reversing Controller
Block Controller



The Swiss Army Knife of Model Train Electronics

This manual contains detailed hookup and programming instructions for the YardMaster-5 Model Train Controller.

Please download additional hookup diagrams from http://www.RRConcepts.com

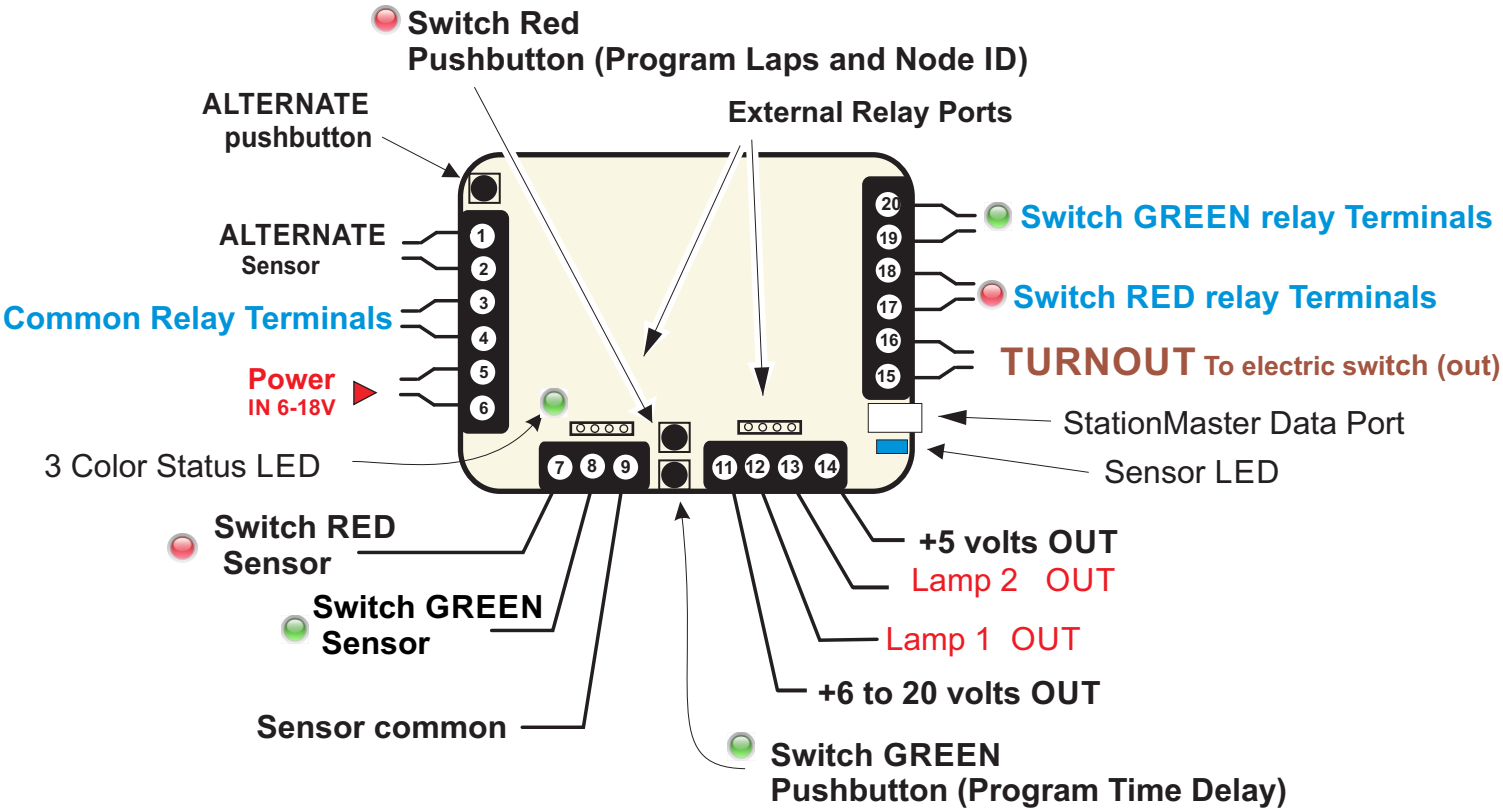
Before we Start- Please do not attach Power wires (from your power pack) to any other terminals except the designated power inputs 3, 4, 5 and 6.

- The YardMaster contains a micro-controller and will be damaged if power is put on any of the sensor terminals.

- Since the YardMaster contains flash memory it will return to the previous state when powered up. The turnouts will be thrown and the on-board relays will return to their previous states.

- Detachable screw-down terminal blocks allow quick-disconnect for long term storage keeping all wires in place.

ONLY ATTACH WIRES WHILE THE POWER IS OFF.

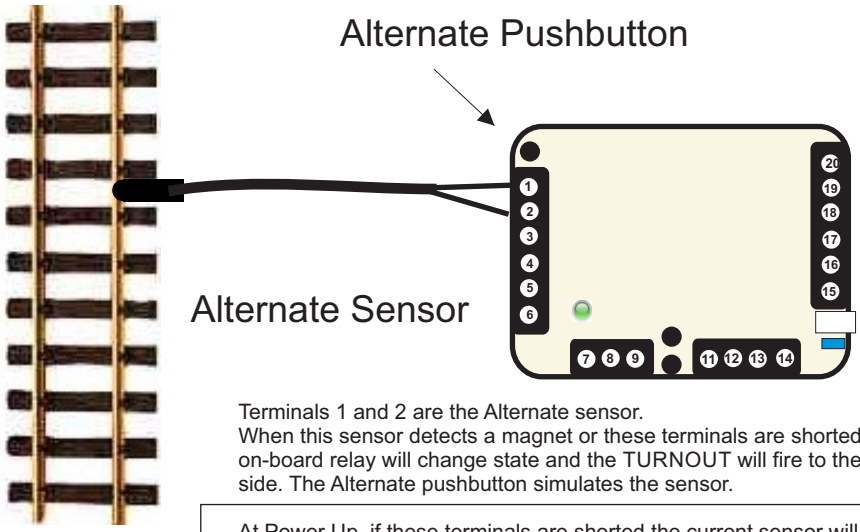


YardMaster-5

Table of Contents

Sensors

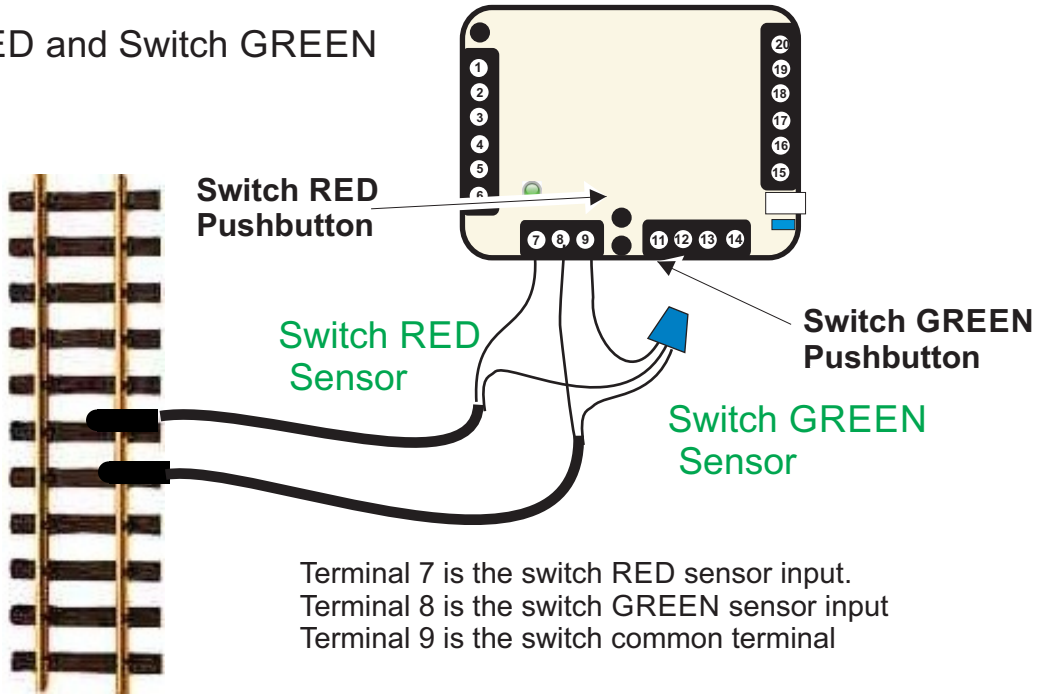
For General Information only. Each hookup diagram will show how to hook these up



Terminals 1 and 2 are the Alternate sensor.
When this sensor detects a magnet or these terminals are shorted the on-board relay will change state and the TURNOUT will fire to the other side. The Alternate pushbutton simulates the sensor.

At Power Up, if these terminals are shorted the current sensor will be enabled and a force RED will occur. When a train is sensed the YardMaster will switch GREEN and perform a time delay.
This is the "no sensor" station stop. See the No Sensor hookup for details

Switch RED and Switch GREEN Sensors



Terminal 7 is the switch RED sensor input.
Terminal 8 is the switch GREEN sensor input
Terminal 9 is the switch common terminal

These sensors will cause the YardMaster to switch to the appropriate side. **Switch GREEN** will cause the **Common Relay Terminals** to connect to the **Switch GREEN relay Terminals,** and **Switch RED** will cause the **Common Relay Terminals** to connect to the **Switch RED Terminals**.
The TURNOUT will also fire in synchronization and the lamps outputs will change.
The Switch RED and Switch GREEN pushbuttons simulate the sensors.

If a time delay has been programmed the YardMaster will switch back to the previous state after the timer has expired.

☞ If the Switch RED sensor is CLOSED on power up, the YardMaster will perform automatic switching (self running mode) using the programmed delay value and these sensors will be ignored.

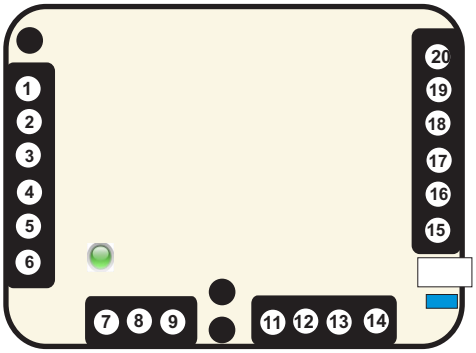
☞ If the Switch GREEN sensor is CLOSED on power up the internal current sensor will be enabled and the YardMaster will ALTERNATE when a train is sensed and then "not sensed". This will occur in a reversing operation when the train enters the diode blocks on the ends of the main reversing line.

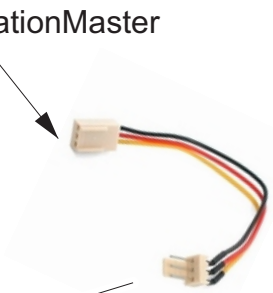
StationMaster Data Cable

The YardMaster obtains power and signals from a data cable when attached to a StationMaster.
The data cable can be in a single or double configuration. The double configuration is used to connect multiple YardMaster systems to a single StationMaster.

The connecting plugs are keyed for correct orientation. The tab on the plug will be on the top when attached correctly.

If the center wire is cut the StationMaster will only provide power to the YardMaster. This sometimes simplifies wiring.





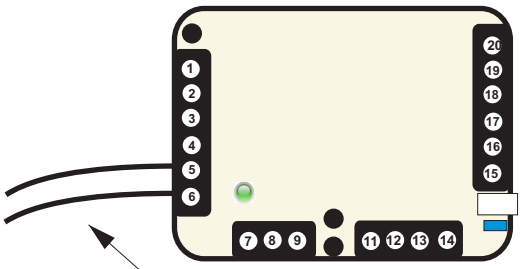
To StationMaster

Single connection cable

To StationMaster

Multiple connection cable for 3 track sidings, 4 track sidings, etc.

YardMaster *Power In* details for stand-alone systems (**Not attached to a StationMaster**)



The YardMaster Power input (Pins 5 and 6) supplies power to the YardMaster controller, power for the Lamps, and power for the TURNOUT outputs.

The YardMaster can operate at voltages from 6 thru 18 volts DC, or 6 thru 12 volts AC. Typically power is obtained from the transformer from either the TRACK terminals or the ACCESSORIES terminals.

In a nutshell, the minimum voltage must be about 6 volts and the maximum voltage is about 18 volts. (AC or DC). Also the minimum voltage required depends upon what is attached to the outputs. For example if LGB turnouts will be controlled then the input voltage must be between 12 and 18 volts. (AC or DC) for the turnouts to fire. Similarly the lamp output voltage will be the same as the input voltage. (Except for the +5 volt LED output which is constant)

ALSO IMPORTANT: When turnouts are attached the AMPERAGE must be sufficient to power them without a voltage drop which would reset the YadMaster. For example a LGB style turnout motor draws about 1 AMP. Two in parallel would draw 2 AMPS so a transformer of at least 2500ma would be required. (2.5AMPS, or about a 50VA transformer or better)

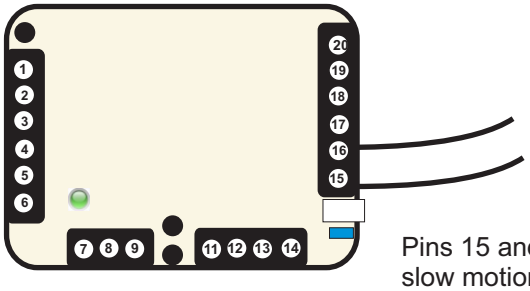
""Wall warts" can also be used to power a stand-alone YardMaster.
An example of a 6VDC "wall wart" is the following part:
(Any equivalent 6VDC wall wart can be used)

"Enercell™ 6V/300mA AC Adapter Model: 273-313 " (Not firing turnouts)

An example of a 12VDC "wall wart" is the following part:
(Any equivalent 12VDC wall wart can be used)

"Enercell™ 12V/1500mA AC Adapter Model: 273-358" (Firing ONE turnout)

Connecting to Electric Switch machines (turnouts)



To 2 wire switch motor.

Pins 15 and 16 are the output signals for 2 wire and slow motion switch machines which inverse the voltage polarity.

These terminals provide power to directly throw switch turnouts.
Up to 4 AMPS of power is available to throw up to 4 LGB style turnouts simultaneously if wired in parallel.
A pulsed DC output of 0.6 seconds is provided to drive the turnouts.
The output voltage is pure DC and is not half wave rectified AC. This provides maximum power output to the turnout.

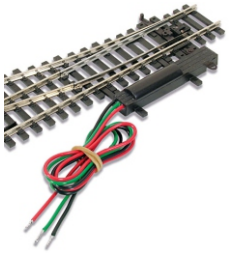
For slow motion switch machines the power is continuous and changes polarity. (Tortoise, Aristocraft, or pneumatic Ea-Ze Air) **Program the YardMaster for slow motion turnouts.**

The output voltage level is directly proportional to the input voltage. For example, a 12VAC input will provide approximately 16VDC turnout voltage, etc. If a short circuit condition is present on these terminals the YardMaster will blink the BLUE LEDs when energized. After a delay the YardMaster will attempt to resume.

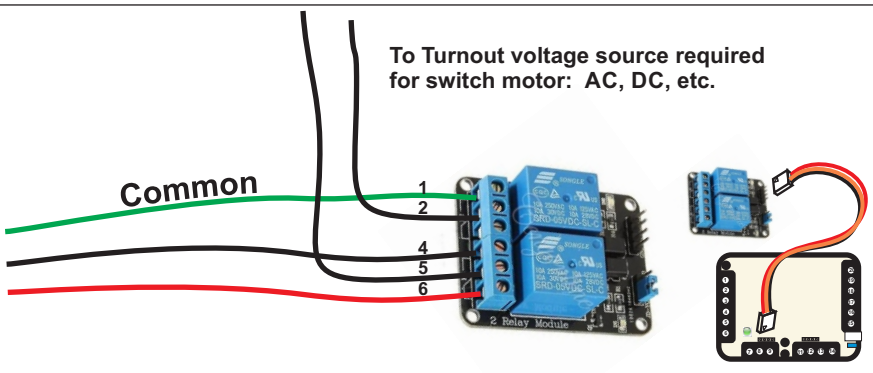
3 wire switch machines.

To control 3 wire switch machines use the Auxiliary relay module us used as shown below. This provides reliable switching of any voltage necessary for the turnout. Some 3-wire turnouts have excessive voltage and current requirements which the Auxiliary relay can handle. A very quick burst of voltage is given to the switch motor which prevents overheating and operates without the need for capacitive discharge units.

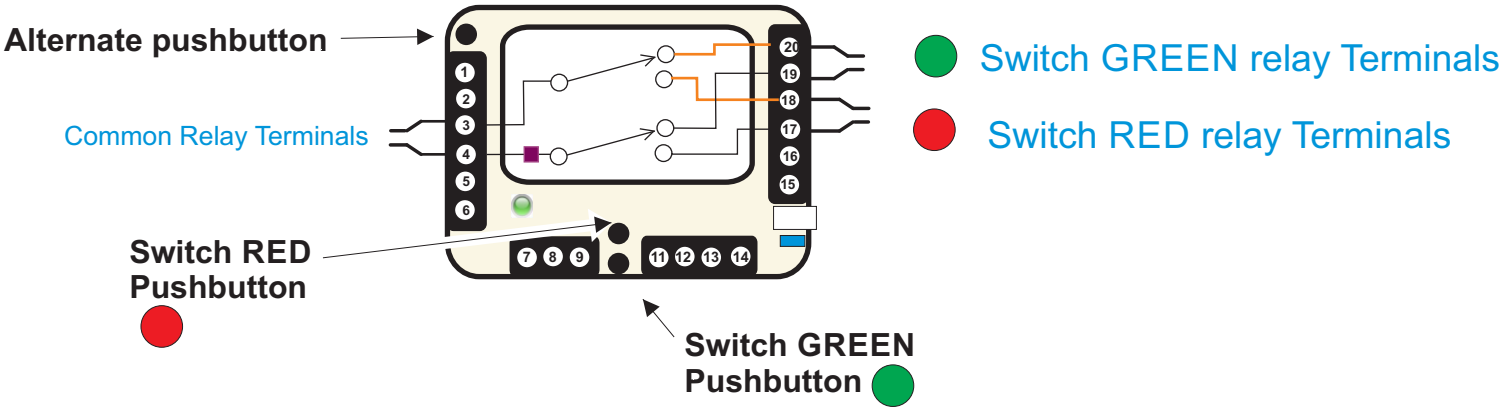
3 Wire Switch Hookup



Peco PL-11 shown



Internal Switching Contacts



The YardMaster contains a DPDT relay which can control up to **8 AMPS** with live voltage, or more than 10 AMPS with no current flowing when the switch occurs.

When the “Switch GREEN” sensor or pushbutton is detected the status LED will turn **GREEN** and the two **Common relay terminals** will connect to the “**Switch green relay terminals**”.
Terminal 3 will internally connect to terminal 20.
Terminal 4 will internally connect to terminal 19.

When the “Switch RED” sensor or pushbutton is detected the status LED will turn **RED** and the two **Switch relay Common** terminals will connect to the “**Switch RED relay terminals**”.
Terminal 3 will internally connect to terminal 18.
Terminal 4 will internally connect to terminal 17.

The Alternate sensor or alternate pushbutton will alternate these contacts.

Since this is a simple relay there are no polarity or voltage restrictions.
(AC, DC or DCC can be switched, and up to 110V).

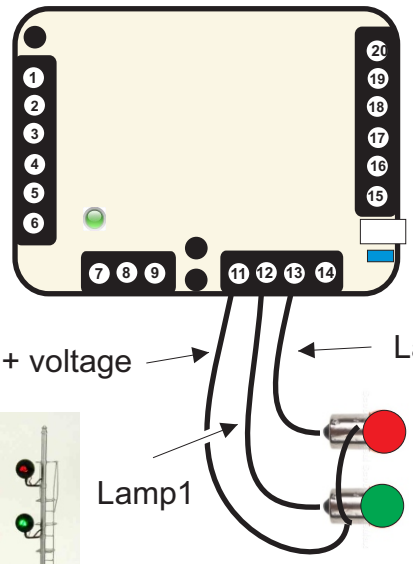
The CURRENT SENSOR is located on terminal 4 and will measure the current entering on that terminal and flowing through the relay. This is only used to sense the train for “no-sensor” hookups.

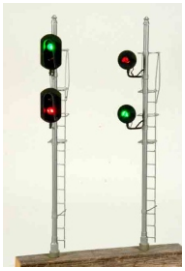
If an auxiliary relay is connected to the AUX relay data port then the auxiliary relay will switch in parallel with the internal relay. This will provide an additional 10 Amp DPDT relay for additional uses.

Signal Lamp Connections

The YardMaster can control both 12 volt lamps and 5 volt LEDs synchronized with the turnouts and relay. When programmed for ***crossing light control*** the lamps will alternately flash when triggered.

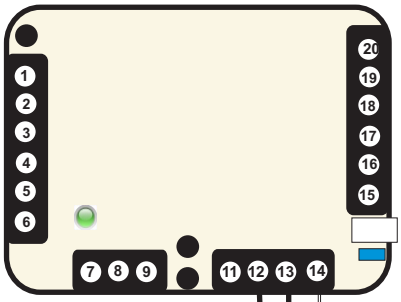
+12V Output

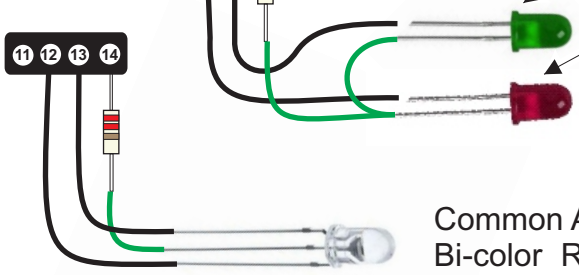




Use this hookup for Shiloh Signal lamps.

LED direct connect





Common Anode
Bi-color RED/GREEN
LED

If the input to the signal lamp is 12 volts use terminal 11 as the common. This terminal provides a constant voltage and the lamp terminals are **grounded** to turn on the lamps.

Pins 12 and 13 are the Lamp output signals. These are open circuit when OFF and grounded when ON.

Note that the lamp output voltage is the same as the input voltage, but converted to DC. For example, a 12 VAC or 12 VDC input will provide a 12VDC lamp output, etc.

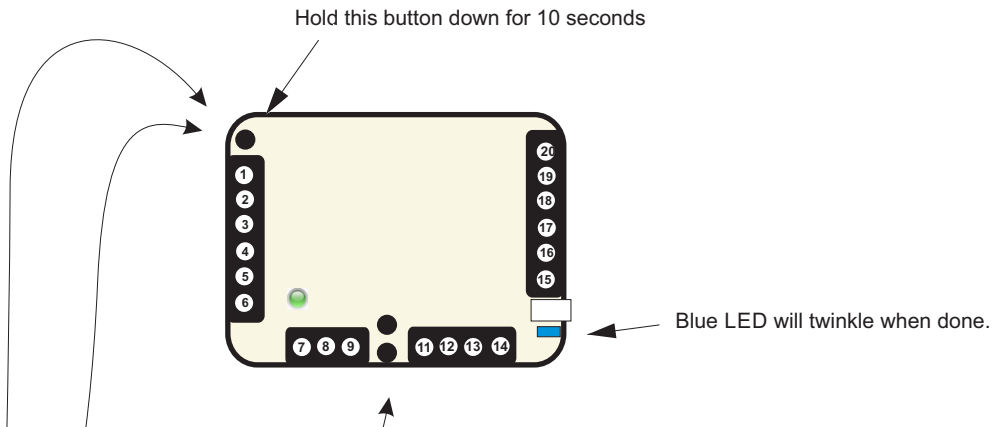
If direct driving LED's use pin 14 as the constant +5 volt voltage source and wire as shown for either separate LEDs or a single dual color LED.
A 220 ohm resistor is required to provide the current limiting and prevent them from damage.

When controlling flashing RR crossing signals use separate red LEDs and program accordingly.

LEDs may be available free from RR Concepts. Check the order page for availability.

Flashing the lamps
Signal lamps will enter a **slow blinking state** after a few minutes to give your RR a very realistic look. ***The YardMaster can be heard "clicking" as the flashing feature is operating.*** See the programming section for details on disabling this feature. Some signal lamps already have built-in electronics to do the flashing so this feature can be turned off if needed by programming a different operating mode.

Factory Reset



To perform a factory reset:

1. Enter Programming Mode: (Remove any jumpers if present)

Press the ALTERNATE button and either one of the Switch RED or Switch GREEN buttons simultaneously.
The YardMaster will display BLUE when in programming mode.

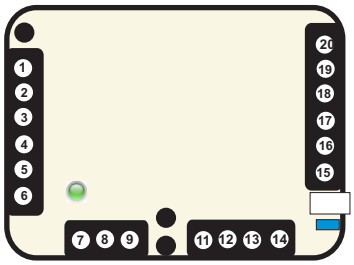
2. Press and hold the ALTERNATE pushbutton for at least 10 seconds. The YardMaster will slowly flash the blue sensor LED many times but keep holding down the button. After a delay the blue status LED will twinkle to indicate a factory reset. Release the button.

A factory reset will set the following:

- Turnout control for LGB style turnouts (electric switches).
- Time delay OFF
- Lap count: 1
- Signal lamp flashing enabled
- Node ID: “1”

.

Programming the Operating Mode



The YardMaster can be programmed to control different types of turnouts (electric switches), or disable the realistic signal light blinking feature.

All programming is stored in flash memory and retained until re-programmed.
To program the YardMaster perform the following:

1. **Enter Programming Mode:**

Press the ALTERNATE and either one of the Switch RED or Switch GREEN buttons simultaneously.
The YardMaster will turn BLUE when in programming mode.

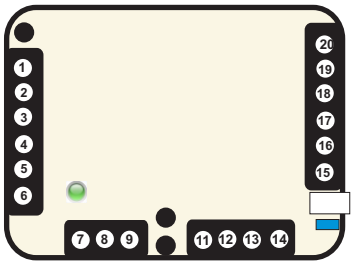
2. **Program the operating mode:**

Press and hold down the Alternate pushbutton for the desired number of blinks**.**
The blink count corresponds to the following table.
To exit programming mode quickly press the Alternate button.

1	**Control LGB style turnouts (electric switches)** This is the default setting after a factory reset.
2	**Control SLOW_MOTION turnouts (electric switches)** These include Tortoise, Aristocraft slow motion, etc.
3	**Synchronize Auxiliary relay to internal relay. (Can not use with 3 wire switch motor control)**
4	**Directly control Railroad Crossing signals** Alternately flash the lamp outputs to directly control lamps or LED's.
5	**Disable signal light flashing for LGB style turnouts.** This is required if the signal lamp already has flashing circuitry.
6	**Disable signal light flashing for SLOW MOTION turnouts.** **Control Pneumatic turnouts by keeping the output voltage on continuously.** This is required if the signal lamp already has flashing circuitry.
7	**Alternate the auxiliary relay when switching to RED** Provides control for bi-direction operations with alternating trains. See hookup.
	Keep pressing the Alternate button for 10 seconds to force a Factory Reset

Programming a Time Delay

Used for
Station stops,
Reversing, or
Signal Light on/off Operations



A time delay will cause the YardMaster to self-trigger after the delay time. Only the GREEN sensor will perform the time delay. When triggered the YardMaster will switch GREEN, perform the delay, and then swich RED. The YardMaster will blink when counting seconds before switching.

If jumpered for “self triggering” the YardMaster will continuously self-trigger using this time delay which can be used for back and forth operations.

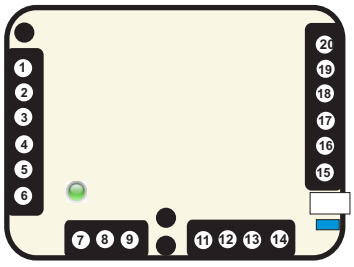
All programming is stored in flash memory and retained until re-programmed.

1. **Enter Programming Mode:**

Simultaneously press the ALTERNATE and either one of the Switch RED or Switch GREEN buttons. The YardMaster will display BLUE when in programming mode.

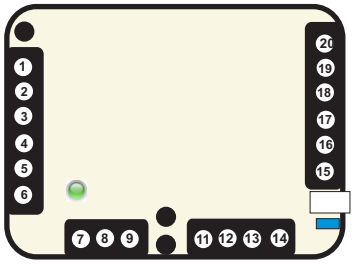
2. **Change the time delay:**

Press and hold the *Switch green* button and count the number of blinks, Release when the desired time delay is programmed. The YardMaster will echo the number. EACH BLINK will correspond to 5 seconds. 5 blinks = 25 seconds, etc.



3. **Quickly press the ALTERNATE pushbutton to exit programming mode.**

Notes: 1. The time delay will not be operational when attached to a StationMaster.
2. To clear the time delay either program for 1 blink or perform a factory reset.



Programming ID number

Only necessary when TWO or MORE YardMasters are attached to a StationMaster.

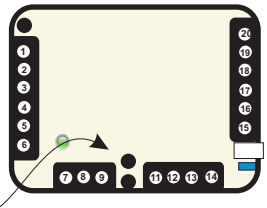
When multiple YardMasters are wired in parallel they must be identified so that they fire in sequence. ***This programming is only necessary when 2 or more YardMasters are attached to a single StationMaster.*** **This programming is not necessary when a single StationMaster is attached to a single YardMaster.** **SEE NOTES**

1. Enter Programming Mode:

Simultaneously press the ALTERNATE and either one of the Switch RED or Switch GREEN buttons. The YardMaster will display BLUE when in programming mode.

2. Program the ID Number:

Press and hold the Switch RED button until the proper number of blinks have occurred.



The programming blinks correspond as follows:

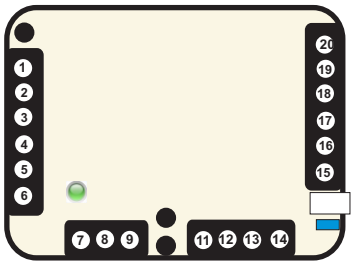
1 blink = Normal operation using sensors. (This is the factory default)
2 blinks = Program as Yardmaster #1 (Automatically set, see below)
3 blinks = Program as YardMaster #2
4 blinks = Program as YardMaster #3
5 blinks = Program as YardMaster #4

4 IDs are possible to allow 4 YardMasters to be wired together.

3. Quickly press the ALTERNATE pushbutton to exit programming mode.

Notes:

1. Unless programmed for an ID other than #1, the YardMaster will Self-Program to ID #1 when attached to a StationMaster. It is not necessary to program for ID #1..



Programming Laps

The YardMaster can be programmed to respond after counting sensors.
The lap counting ONLY occurs on the GREEN channel (terminals 8 & 9) The other channels instantly respond without counting sensors.

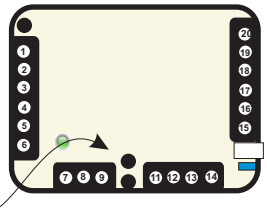
Lap counting will not occur when attached to a StationMaster.
All programming is stored in flash memory and retained until re-programmed.

1. Enter Programming Mode:

Simultaneously press the ALTERNATE and either one of the Switch RED or Switch GREEN buttons. The YardMaster will display BLUE when in programming mode.

2. Program the node ID:

Press and hold the Switch RED button until the proper number of blinks have occurred.



The programming blinks correspond as follows:

1 blink = Normal operation, or 1 lap.
2 blinks = 2 laps
3 blinks = 3 laps
4 blinks = 4 laps

3. Quickly press the ALTERNATE pushbutton to exit programming mode.

Notes:

1. The lap counter will not function when attached to a StationMaster.
2. When attached to a StationMaster this lap number will become the Node ID.
3. To erase the lap counter either program for 1 lap or perform a factory reset.
5. When programmed for maximum laps(6) the “Forced Alternate” feature will be turned on and lap counting will not be done. See the Forced Alternate section for details.

Programming Forced Alternate

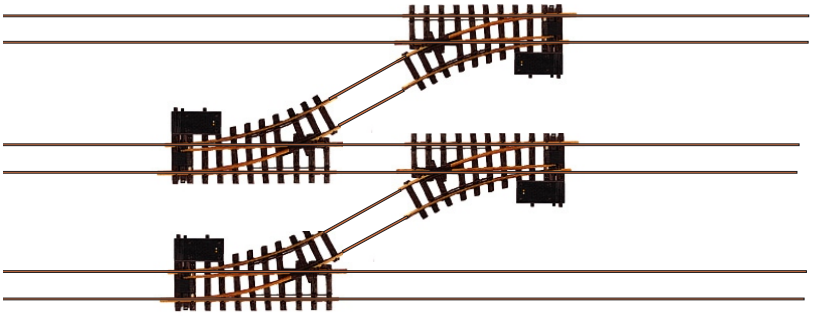
The YardMaster has a “Forced Alternate” feature which allows control of Wyes, Switchbacks, etc.

When the Forced Alternate feature is turned on the *Alternate* sensor will switch to the direction opposite of the most recent *“Switch”* sensor, regardless of the number of times the *Alternate* sensor is hit.

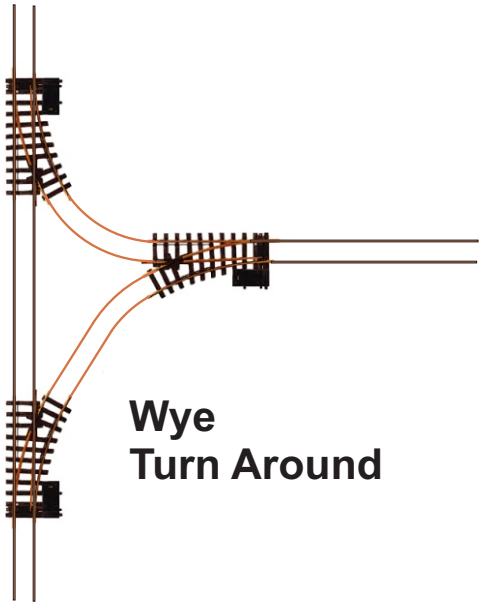
For example, when the *Switch RED* sensor is hit, the *Alternate* sensor will always switch to GREEN, regardless of the number of times it is hit. This allows the turnout to be set correctly for operations where the train reverses and triggers the Alternate sensor a second time.

How to Program Forced Alternate

1. See the previous page for **Programming Laps**.
2. Set the lap count to maximum (6)
3. See the hookup diagrams for actual wire-to-wire connections..

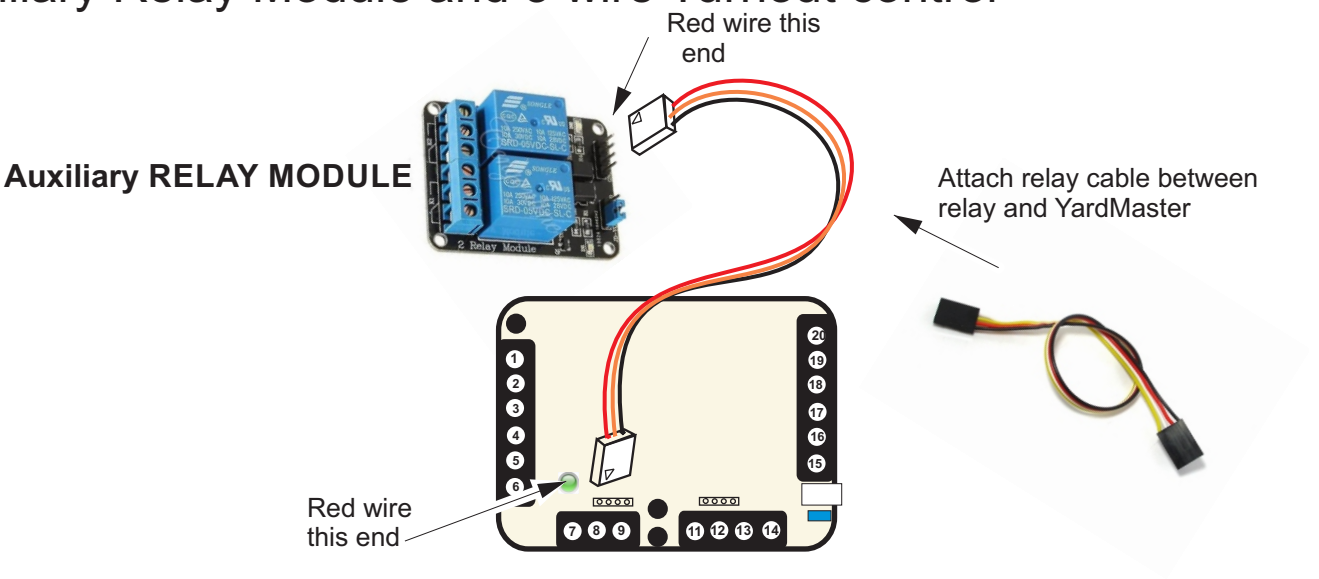


Reversing train Switchbacks



Wye
Turn Around

Auxiliary Relay Module and 3 wire Turnout control



For reference only! Use the hookup diagram for proper usage.

The YardMaster-5 contains data ports to control external DPDT relays for enhanced operations. When an Auxiliary relay module is attached to the external port 1 it can be configured to either control 3 wire turnouts, or switch in synchronization with the YardMaster on-board relay.

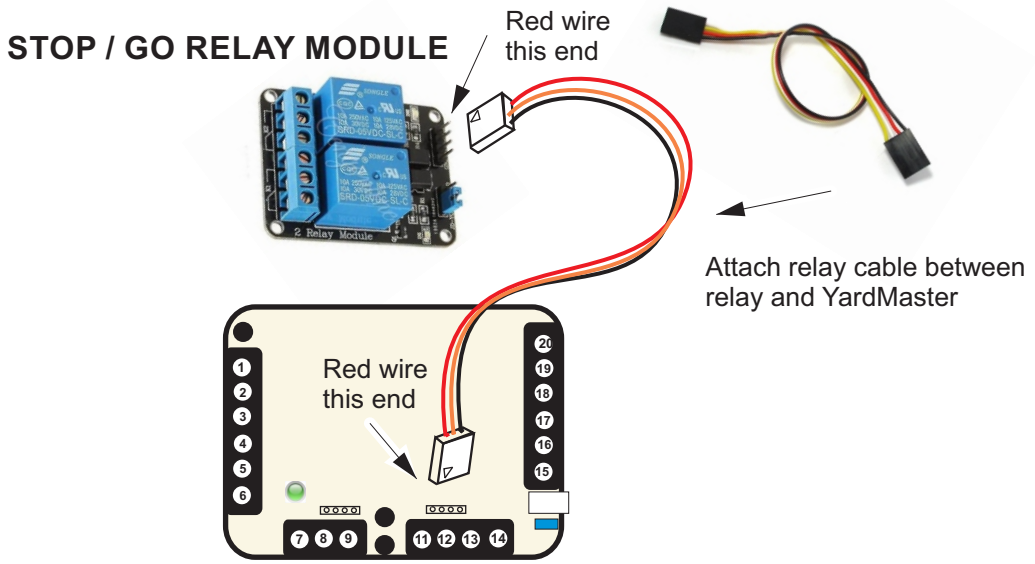
- **The default operation after a factory reset will control 3 wire turnouts sometimes used on N and HO track switch machines.**
  The hookup diagram is shown on page 6. Some 3-wire turnouts have excessive voltage and current requirements which the relay can handle. A very quick burst of voltage is given to the switch motor which prevents overheating and operates without the need for capacitive discharge units.

- **When the YardMaster is programmed for "blink 3" then the Auxiliary relay will switch in synchronizationwith the on-board YardMaster relay**.
  This can provide additional switching capability if needed.

- **When the YardMaster is programmed for "blink 7" then the Auxiliary relay will ALTERNATE every time the YardMaster switches to RED.**
  This is used for reversing track polarity on an alternating trains hookup. (See alternating trains hookup in this manual) This can not be done when using 3 wire turnouts since this relay will control the switch motor.

When attaching the StationMaster relay cable note the location of the red wire and attach as shown. Some cable assemblies have an arrow on the connector on this wire however this is not always true. Use the wire color as the guide. If the relay does not operate then try swapping the connector polarity on the relay.

STOP / GO relay module



For reference only! Use the hookup diagram for proper usage.

The YardMaster-5 contains data ports to control external DPDT relays for enhanced operations. When a stop / go Relay Module is attached to external port 2 it will be automatically sensed on power up. When sensed the YardMaster will blink ORANGE two times. This indicates that the STOP/GO relay module has been detected and the YardMaster will operated differently.

The YardMaster will operate as follows when the relay is detected:

- When an ALTERNATE sensor is triggered the relay will energize for the programmed time delay, and then the alternate function will occur. This allows a time delay station stop.
- When the FORCE RED sensor is triggered the external relay will energize for the programmed time delay only. No other switching will occur. This allows an in-between station stop in a reversing operation.
- When the FORCE GREEN sensor is triggered the force green operation will occur as normal and this relay will not activate.

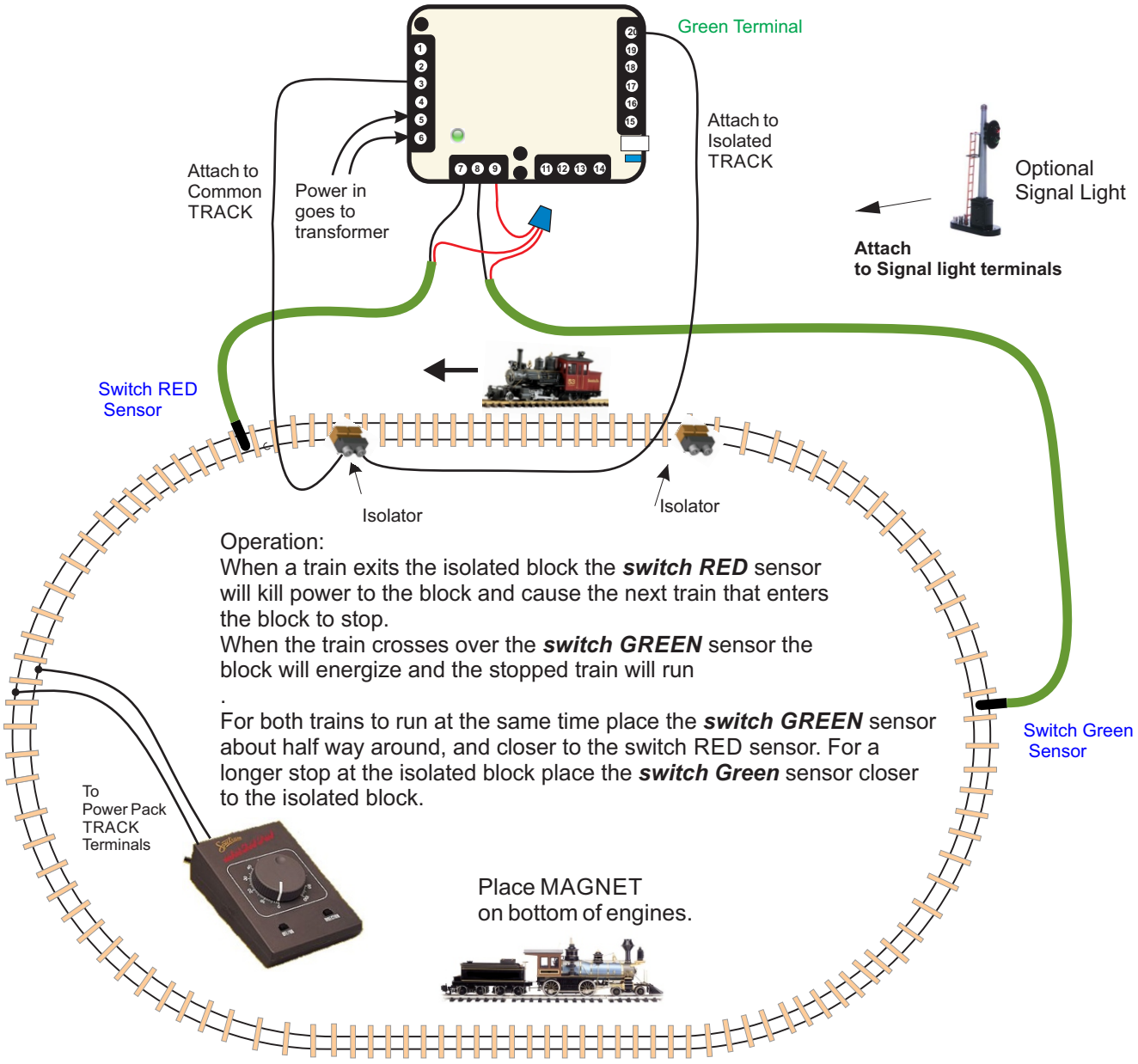
See the hookup diagrams in this manual for exact operations and details.

When attaching the cable note the location of the red wire and attach as shown. Some cable assemblies have an arrow on the connector on this wire however this is not always true. Use the wire color as the guide. If the relay does not operate then try swapping the connector polarity on the relay.

RRConcepts.com

Block Control

2 Trains on 1Track - Block Control Hookup Diagram



For two trains on one track this is all you need to do.

“Power In” can be attached to the track power to supply voltage (DC trains only) or to a fixed 6 volt “wall wart”. See the power page for more details.

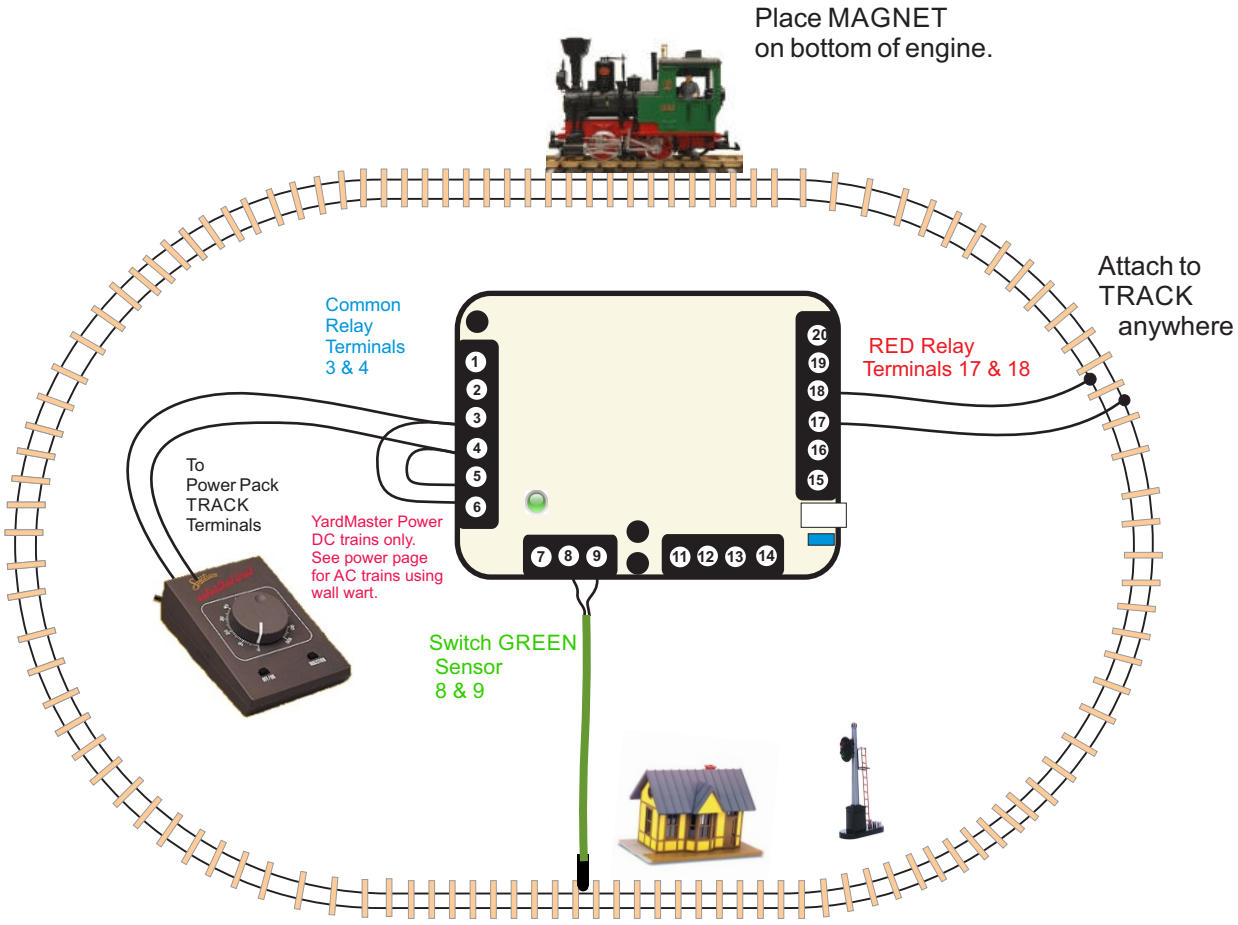
Remove any YardMaster time delays or lap counts if they have been programmed. A factory reset will do this also.

Change the direction of transformer so train runs as shown and adjust the speed as desired. It may be necessary to experiment with the ***switch GREEN*** sensor location to obtain the desired results.

The signal light is optional but adds to the fun.

Station
Stop using sensors

Station Stop Hookup Diagram



Add additional sensors in PARALLEL for additional station stops.

Programming:
* **Set time delay as desired.**
* **Set lap count as desired.**

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

Make sure to program the YardMaster for the desired time delay.

When the power supply is turned on the train should run. If it does not then press the Alternate button. This is a one-time operation since the YardMaster will remember the switch state in memory.

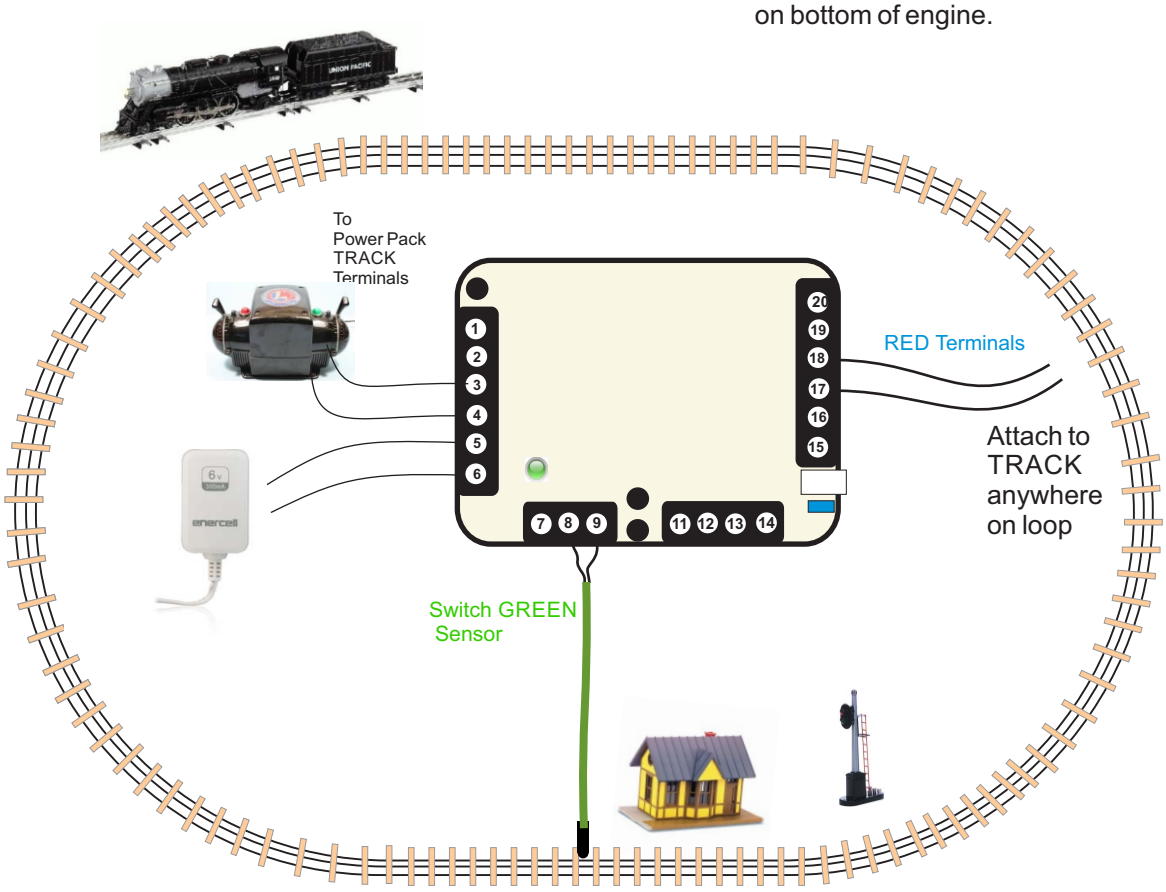
Change the direction of the train as required. The YardMaster will operate in both directions.

Adding a signal light is optional, but adds to the fun. Attach to signal light terminals.

AC trains, Station Stop using sensors

Station Stop Hookup Diagram

Place MAGNET
on bottom of engine.



Add additional sensors in PARALLEL for additional station stops.

Programming:
* **Set time delay as desired.**
* **Set lap count as desired.**

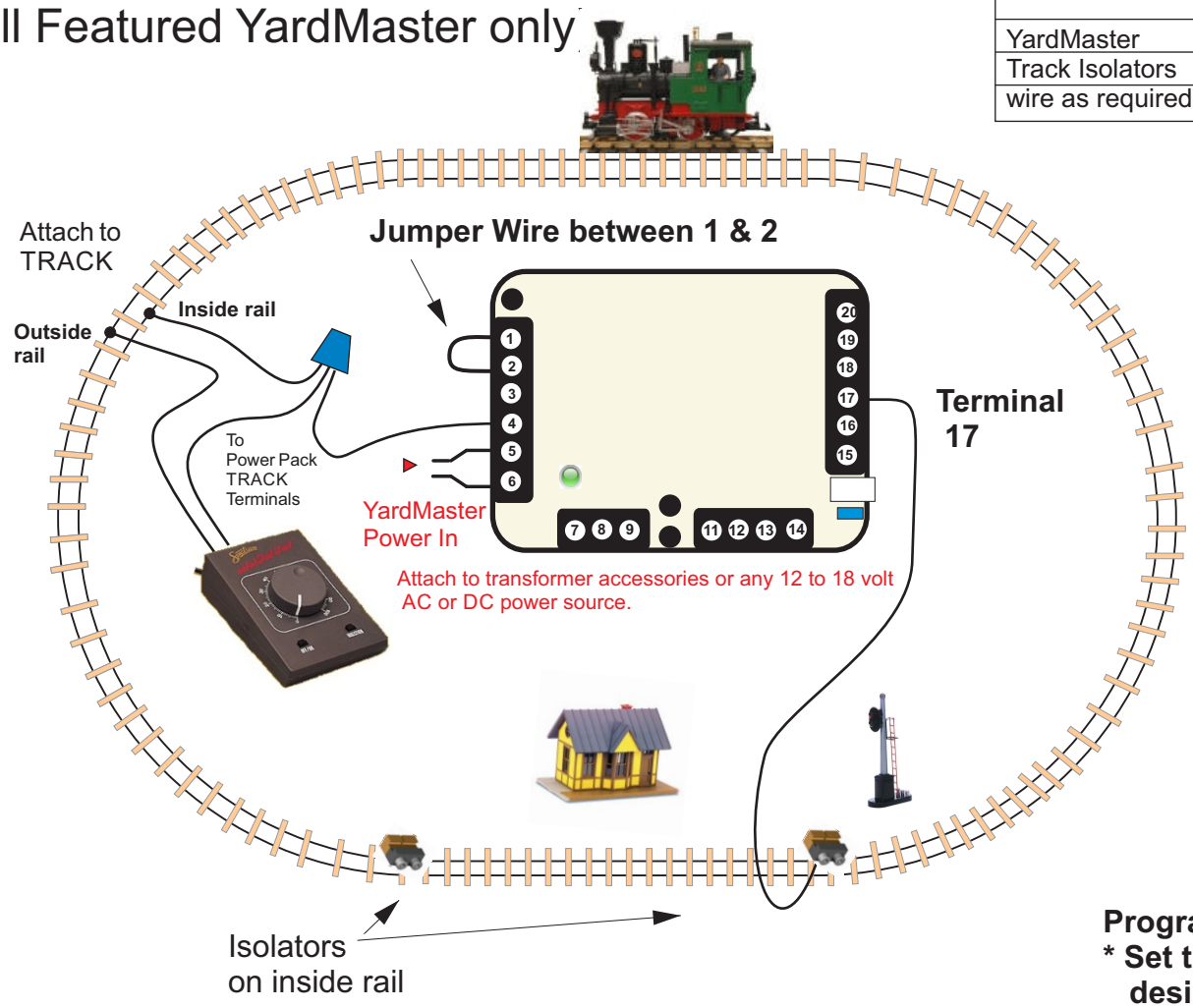
For a simple station stop, this is all you need to do!
Make sure to program the YardMaster for the desired time delay.
When the power supply is turned on the train should run. If it does not then press the Alternate button. This is a one-time operation since the YardMaster will remember the switch state in memory.
Change direction of the train as required. The YardMaster will operate in both directions.

Terminals 3 & 4 connect to the AC transformer, polarity is not important.
Terminals 5 & 6 connect a “wall wart” DC voltage source. The voltage must be between 6 and 12 volts. Polarity is not important.
Terminals 17 & 18 connect to the track, polarity is not important.

Station
Stop NO SENSORS

Station Stop Hookup Diagram with no train modifications (Full Featured YardMaster only

Parts List	
YardMaster	1
Track Isolators	2
wire as required	



Programming:
* **Set time delay as desired.**
* **Set lap count as desired.**

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

Make sure to program the YardMaster for the desired time delay before adding the jumper.

When the power supply is turned on the YardMaster will switch to RED and the train should run. When a train enters the isolated section it will be sensed and the YardMaster will switch to GREEN. The train will stop. After the programmed time delay the YardMaster will switch to RED and the train will run again.

Change direction of the train as required. The YardMaster will operate in both directions.

Adding a signal light is optional, but adds to the fun.

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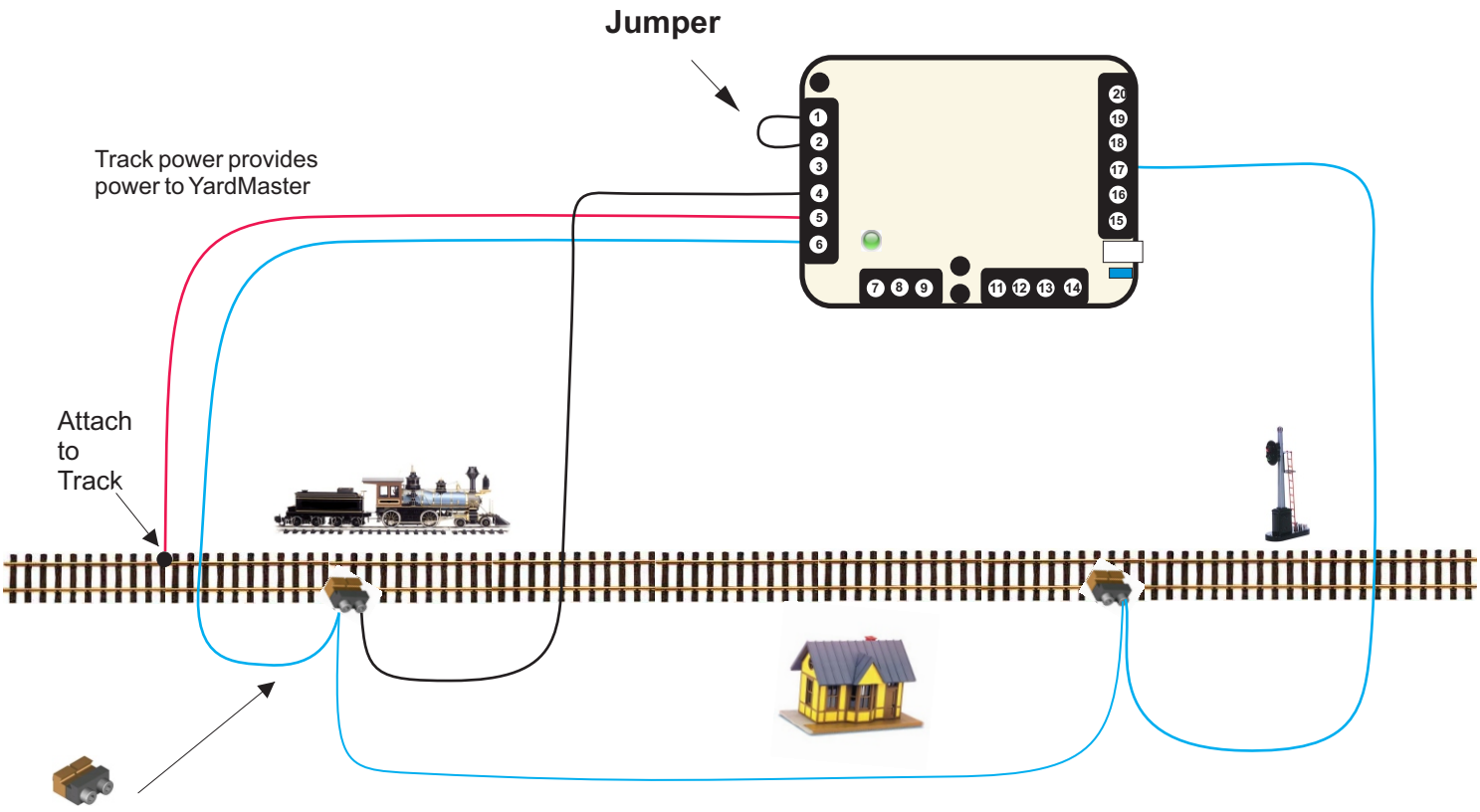
Station Stop No Sensors

Parts List	
YardMaster	1
Track Isolators	2
wire as required	

Station Stop Hookup Diagram for a Remote Track Section

This is basically the same hookup as a standard station stop in a loop however it uses the track power as the voltage input to the YardMaster. Add this to a remote location on your railroad without stringing wires to the remote section. Trains can run in either direction. Track voltage must be 8 volts or more.



AC, DC, or DCC trains can be controlled. The YardMaster will sense a train entering the block and cut track power for the station stop. After the delay the train will continue.

Make sure to program the YardMaster for the desired time delay before adding the jumper..

Program a lap count if desired.

Change direction of the train as desired. The YardMaster will operate in both directions.

Adding a signal light is optional, but adds to the fun.

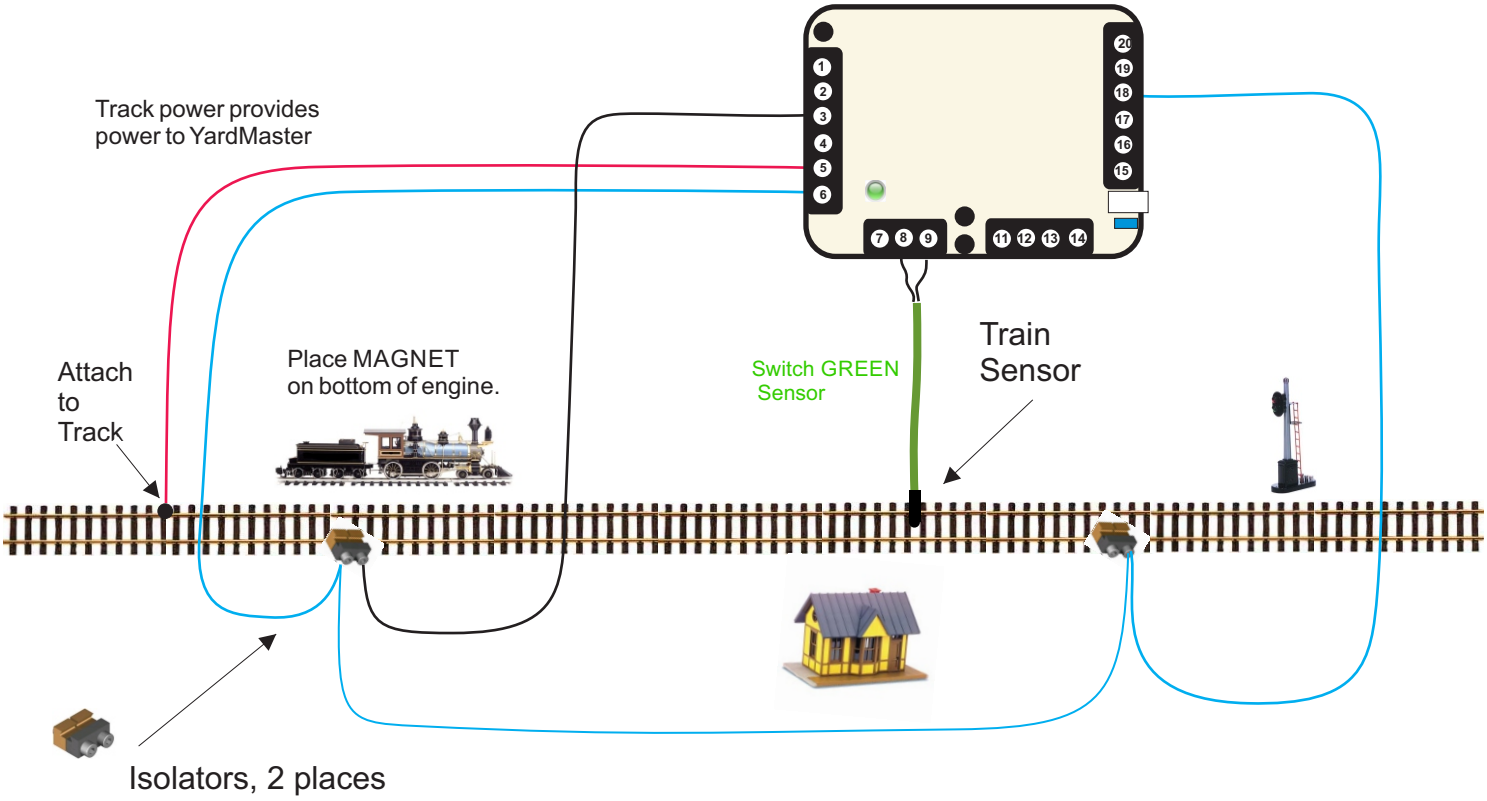
For gradual decelerations and accelerations consider using a StationMaster for a station stop (DC trains only).

Parts List	
YardMaster	1
Track Isolators	2
Train Sensor	1
Train magnet	1
wire as required	

Station Stop Hookup Diagram for a Remote Track Section

This is basically the same hookup as a standard station stop in a loop however it uses the track power as the voltage input to the YardMaster. Add this to a remote location on your railroad without stringing wires to the remote section. Trains can run in either direction Track power must be 8 volts or more..

The sensor provides an exact stopping location. A train magnet is required.



AC, DC, or DCC trains can be controlled.

Make sure to program the YardMaster for the desired time delay.
Program a lap count if desired.

When the power supply is turned on the train should run. If it does not then press the Alternate button. This is a one-time operation since the YardMaster will remember the switch state in memory.

Change direction of the train as desired. The YardMaster will operate in both directions.

Adding a signal light is optional, but adds to the fun.

For gradual decelerations and accelerations consider using a StationMaster for a station stop

.

Smart Turnout

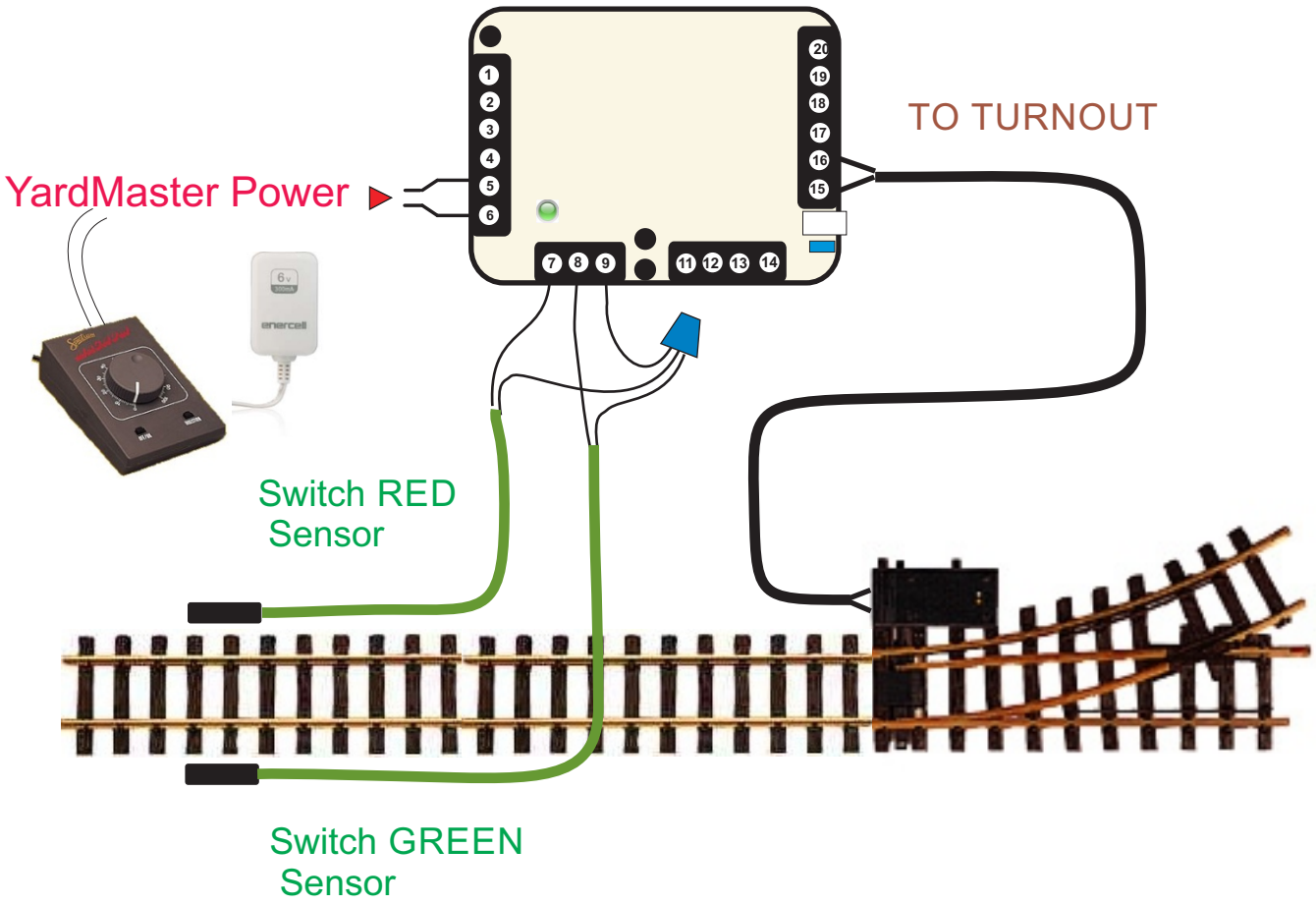
A Smart Turnout will allow one train to go Left, (Passenger train goes into the Station) while the other train goes to the main line. (Freight train does not go into the station).

All trains with the magnet offset to the left will go left, while all trains with the magnet offset to the right will go right.

The smart turnout can also have sensors placed before the turnout to force the points to the correct orientation. (not shown) Magnets are not offset but placed as normal. As the train passes over a sensor the turnout aligns to the proper orientation.

The Smart Turnout works for ALL trains- Electric, Battery and Live Steam.
See power hookup page for input power requirements.

For more fun, the YardMaster can directly drive a signal lamp synchronized with the turnout. See the YardMaster manual for hookup details.



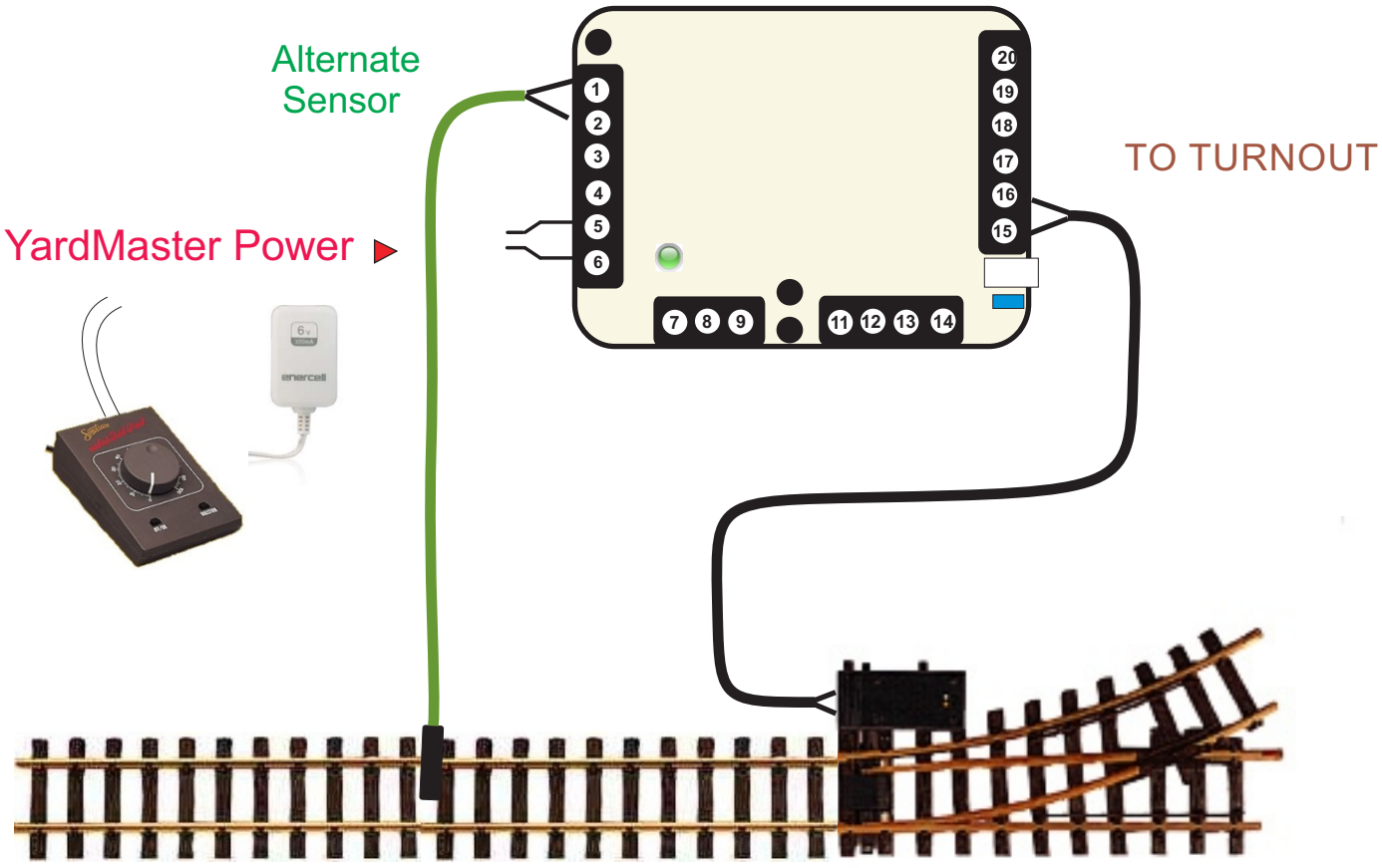
Alternating Paths

In this configuration the train will alternate the turnout each time it crosses over the sensor. Each train that approaches will take an alternate path.

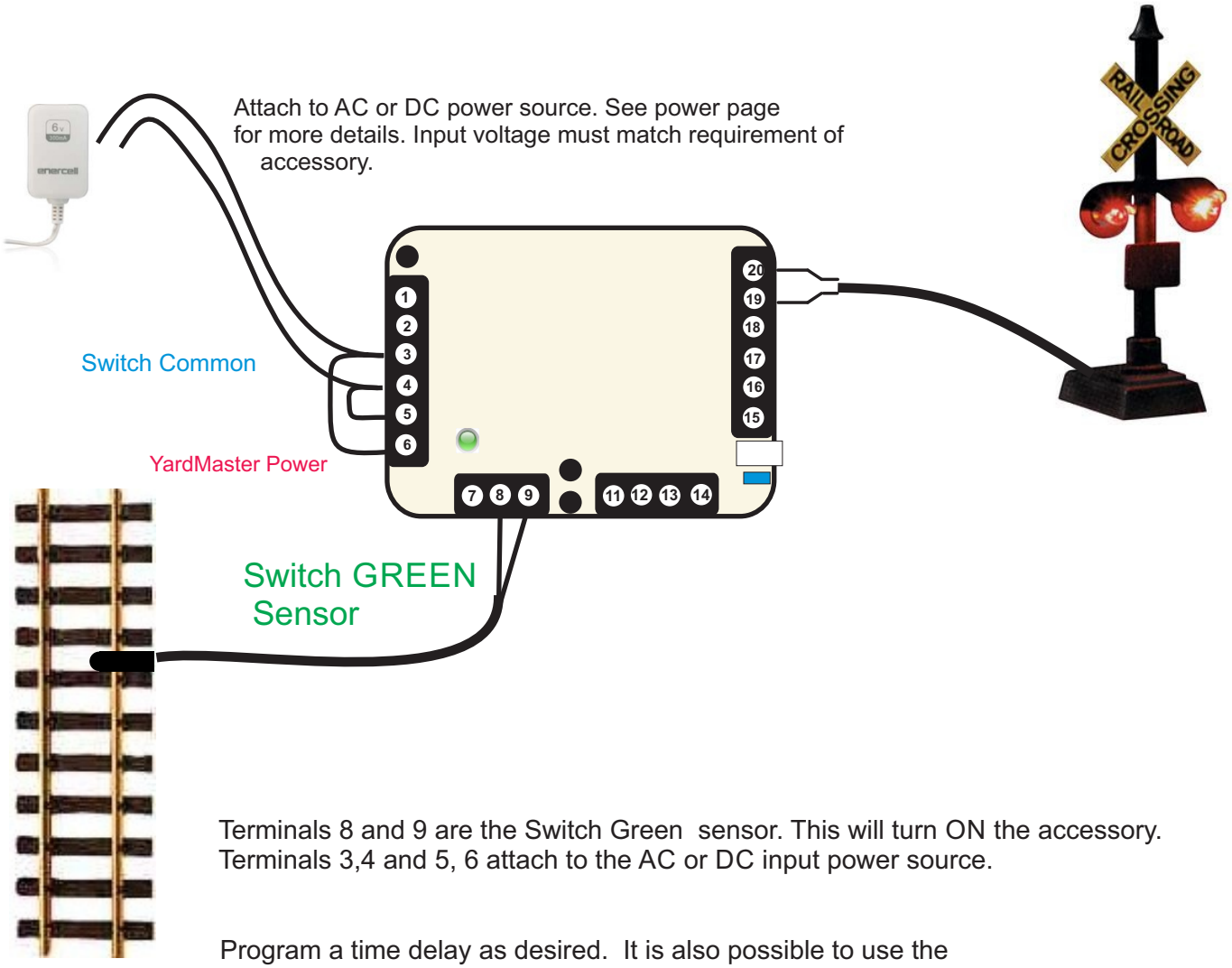
This could be useful for multiple trains that follow each other on the same track.

The Alternating Path hookup will work for ALL trains- Electric, Battery and Live Steam. See power hookup page for input power requirements.

For more fun, the YardMaster can directly drive a signal lamp synchronized with the turnout. See the YardMaster manual for hookup details.



Power on an accessory for a programmed time duration



Terminals 8 and 9 are the Switch Green sensor. This will turn ON the accessory.
Terminals 3,4 and 5, 6 attach to the AC or DC input power source.

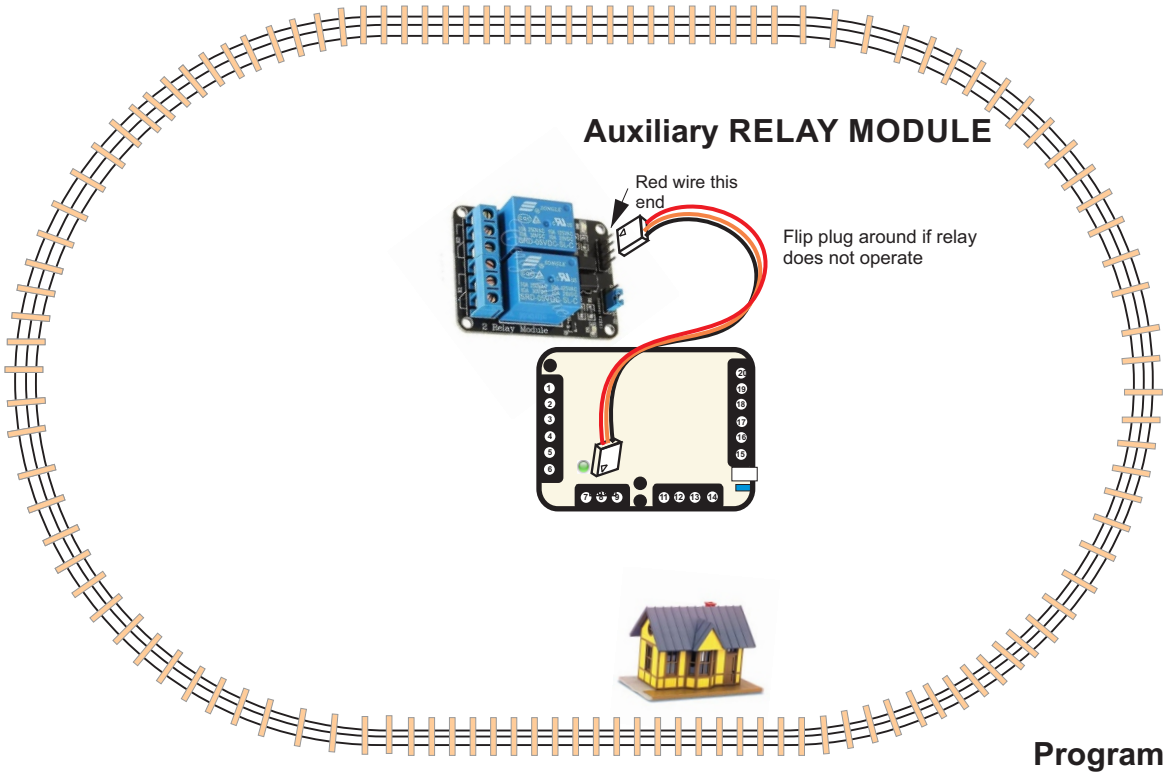
Program a time delay as desired. It is also possible to use the
Switch RED or Alternate sensor to turn off the accessory instead of using a time delay.

When sensor GREEN is sensed the YardMaster will switch power to the
SWITCH GREEN relay terminals and turn on the accessory. After the timer has expired
(or the RED sensor is triggered) the YardMaster will return to the Switch RED state and turn
off the signal light.

Whatever power is applied to terminals 3 and 4 will be switched to terminals
19 and 20 when the YardMaster is GREEN.

Notice that if a Switch RED sensor used instead of a programmed time delay
the train can turn ON the accessory with the RED sensor and then turn OFF the
accessory with the GREEN sensor.

Turn On / Off an Accessory



Programming:
*** Set programming mode BLINK #3**

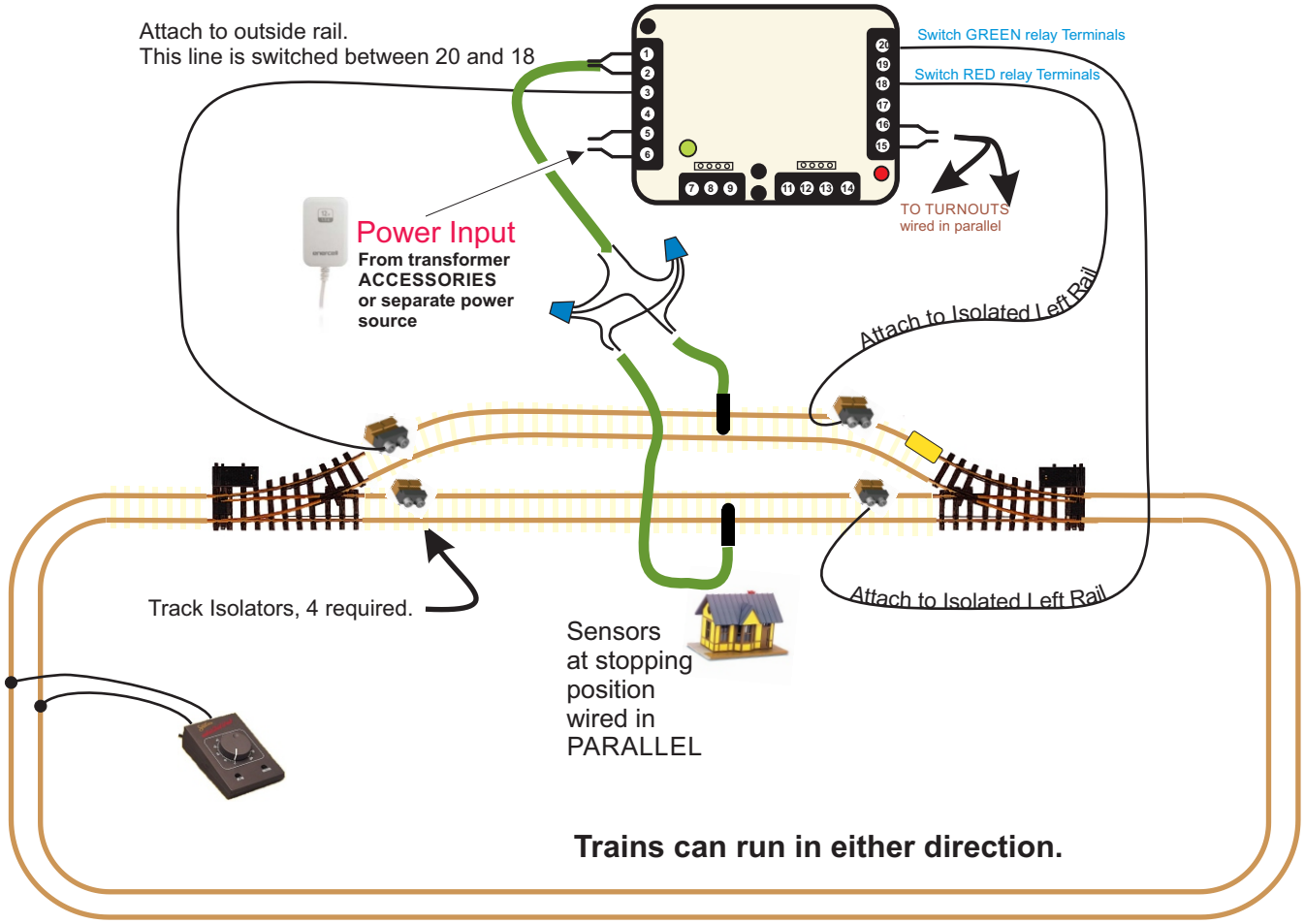
The YardMaster can turn on and off an external electrical accessory using the Auxiliary Realy Module. This is a double pole, double throw 10 AMP relay that will switch as the internal relay switches. This relay can be used for signal lamps, sound modules, fog machines, secondary track control, etc. It can control AC or DC up to 110V. (Be careful!!)

The graphics on the module show the terminal connections.
Pin 1 Normally open pole 1.
Pin 2 Switching pole 1, switches between 1 and 3.
Pin 3 Normally closed pole 1
Pin 4 Normally open pole 2
Pin 5 Switching pole 2, switches between 4 and 6.
Pin 6 Normally closed pole 2.

Parts List	
YardMaster	1
Track Isolators	4
Train Sensor	2
Train magnet	2
wire as required	

Alternating Trains at a Siding, AC or DC Trains

Trains will ALTERNATE without stopping with powered turnouts.



This hookup will allow two trains to alternate. When one train enters a siding it will hit a sensor and cause the YardMaster to switch power to the other siding. There will be no pause, just an exchange of the running train.

Both turnouts are wired in parallel and attached to the TURNOUT terminals of the YardMaster. The exiting turnout can be powered or non-powered. (one direction only. For two directions both turnouts must be powered)

The YardMaster will switch when the train is clear of the sensor. This will prevent the train from parking on the sensor.

The sensors have no polarity. See the power page for input power requirements.

If acceleration, deceleration, or station pause is desired consider using a StationMaster instead of this hookup.

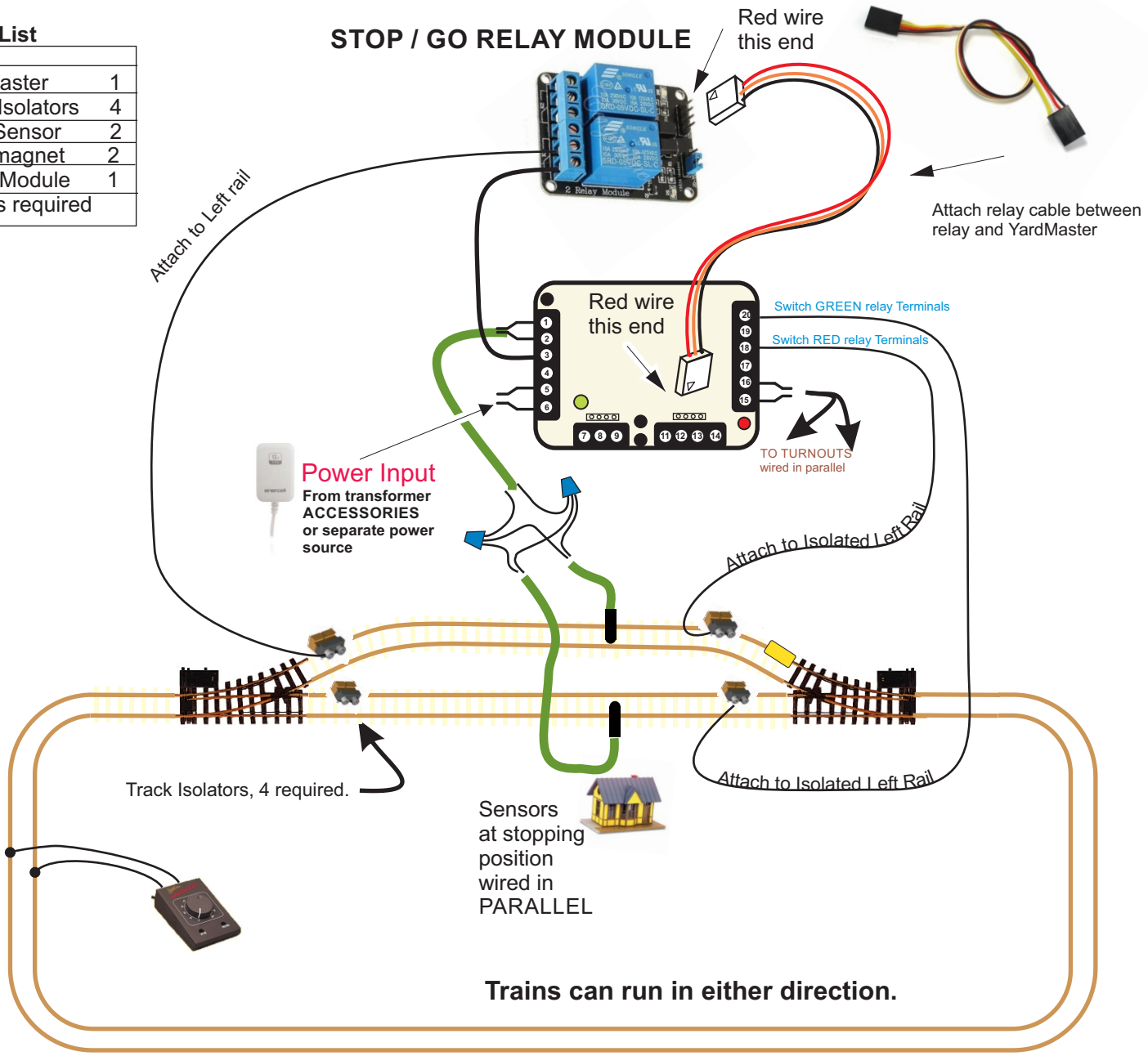
Enhancement Ideas:
1. Program a lap count for each train to do multiple laps before switching.
2. Add a signal light

Alternating Trains with Station Pause for AC or DC Trains

Trains will STOP, PAUSE, ALTERNATE and then GO.

Parts List

YardMaster	1
Track Isolators	4
Train Sensor	2
Train magnet	2
Relay Module	1
wire as required	



This hookup will allow two trains to alternate. When one train enters a siding it will hit a sensor which will stop the train. After the programmed delay the other train will go. This hookup is good for AC or DC trains.

Both turnouts are wired in parallel and attached to the TURNOUT terminals of the YardMaster. The exiting turnout can be powered or non-powered. (One direction only. For two directions both turnouts must be powered)

The YardMaster will switch when the train is clear of the sensor. This will prevent the train from parking on the sensor.

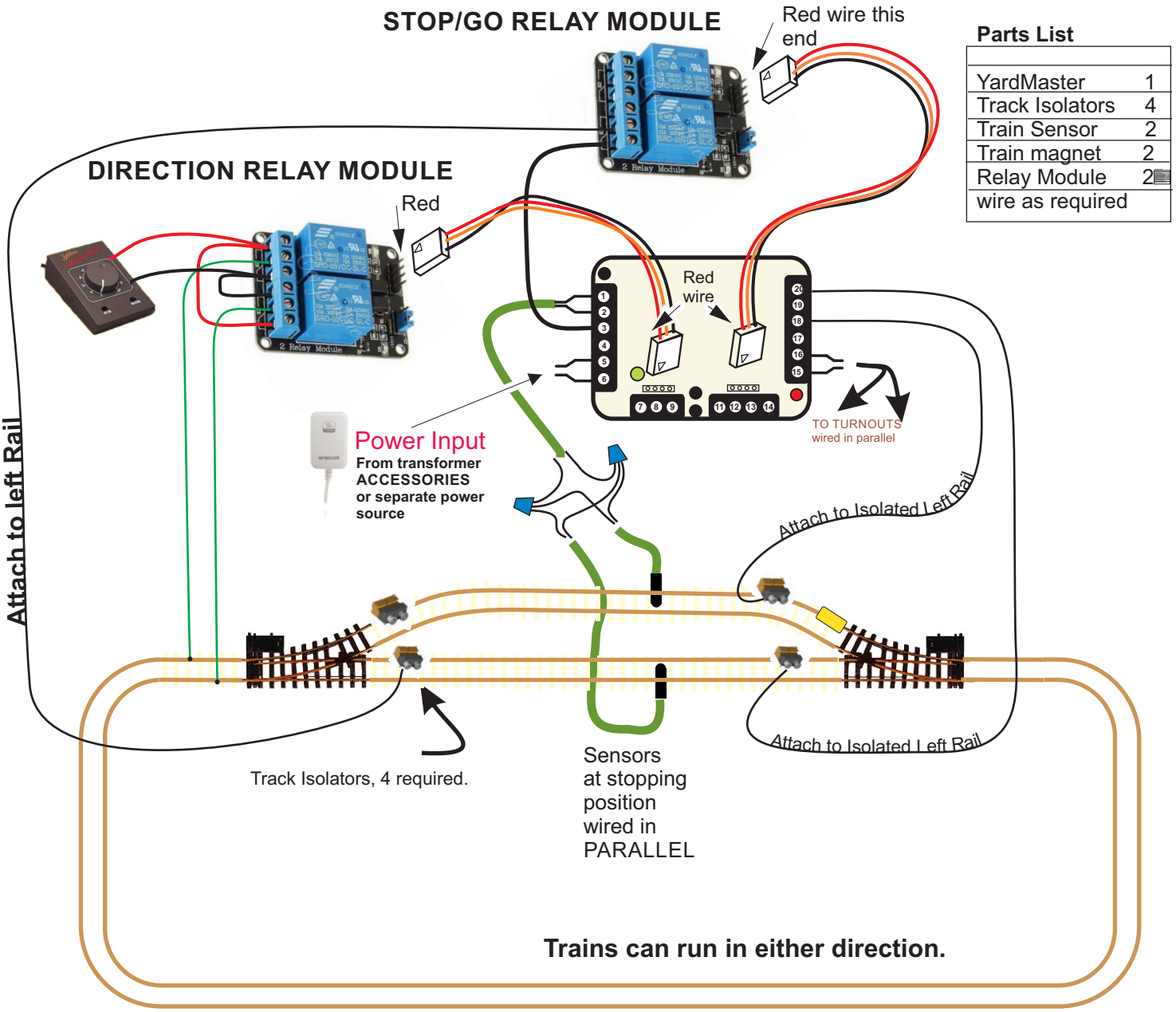
The sensors have no polarity. See the power page for input power requirements.

If acceleration and deceleration is desired (DC trains only) consider using a StationMaster instead of this hookup.

Enhancement Ideas:
1. Program a lap count for each train to do multiple laps before switching.
2. Add a signal light

Alternating Trains in Opposite Directions

Trains will STOP, PAUSE, ALTERNATE and then GO in opposite directions.



Parts List

YardMaster	1
Track Isolators	4
Train Sensor	2
Train magnet	2
Relay Module	2
wire as required	

This hookup will allow two trains to alternate. When one train enters a siding it will hit a sensor which will stop the train. After the programmed delay the other train will go in the opposite direction.
Both turnouts are wired in parallel and attached to the TURNOUT terminals of the YardMaster.
The YardMaster will switch when the train is clear of the sensor. This will prevent the train from parking on the sensor.
The sensors have no polarity. See the power page for input power requirements.

If DC trains are run and acceleration and deceleration is desired consider using a StationMaster instead of this hookup. It is also a much easer hookup.

Enhancement Ideas:
1. Program a lap count for each train to do multiple laps before switching.
2. Add a signal light.

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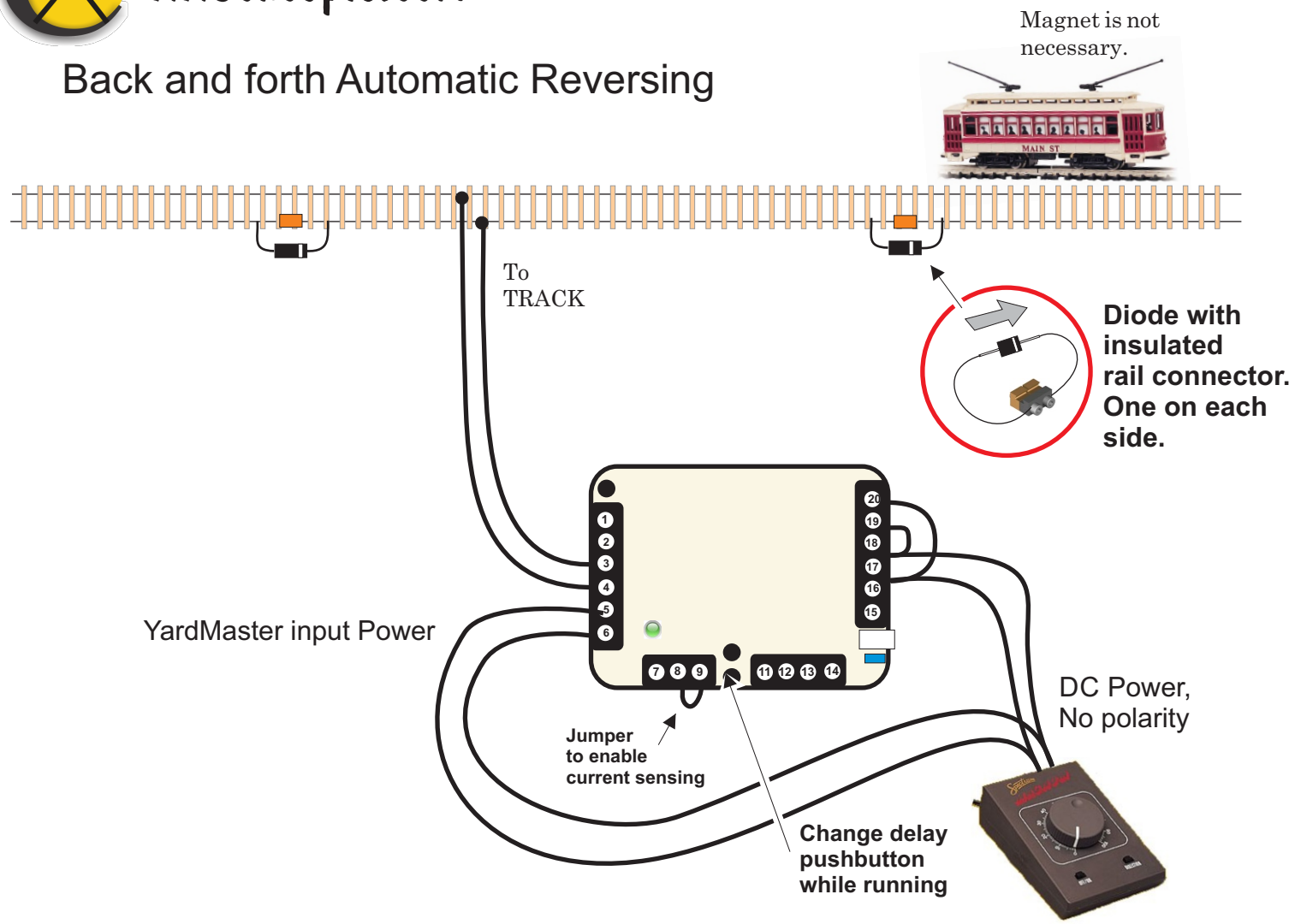
Back and forth Automatic Reversing



The YardMaster can be configured to run a back-and-forth automatic reversing system when wired as shown. Note the use of diode isolator sections on the ends. The train will stop when it reaches these. It is also possible to use LGB 10151 sections in place of these diodes. NOTE: if the train does not stop when entering the diode section then reverse the direction of the diodes. NMRA and LGB operate differently and go different directions for track polarity. Current sensing is used to detect the end of the track.

* **Pins 3 and 4 connect to the track**. Polarity is not important.
* **Pins 5 and 6 connect to the transformer DC track power output to provide power to the YardMaster.**
* **Pin 20 is connected to pin 17, and these two are connected to the DC transformer output.**
* **Pin 19 is connected to pin 18, and these two are connected to the other DC transformer output.**
* **Pins 8 and 9 are shorted together.** This tells the YardMaster to perform automatic switching using a programmed time delay. When powered up with this jumper installed the YardMaster will continuously switch ***if a time delay of at least 2 blinks is programmed.***

One time programming: (1)Remove jumper between 8 and 9 if present and power up. (2) Simultaneously press the ALTERNATE sensor pushbutton and either of the SENSOR pushbuttons. This enters programming mode. (3) Press and hold the SWITCH Green pushbutton for at least 2 blinks. Power down and add a jumper between 8 and 9.

Note that the stops will be abrupt. This will work well for slow moving trains. For gradual acceleration and decelerations, and in-between station stops consider using the StationMaster or StationMaster/Reverser instead. Information is available at http://www.RR-Concepts.com. See the next page for diode slow down options.

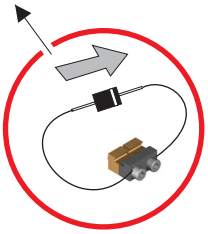
RRConcepts.com

Back and forth Automatic Reversing with in-between station stops.

Magnet on train to trigger sensors.

To TRACK

Add additional sensors in parallel for additional stops

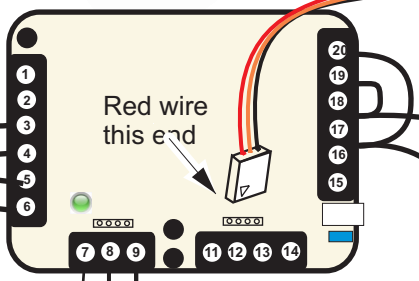


Diode with insulated rail connector. One on each side.

STOP/GO RELAY MODULE

Red wire this end

Attach relay cable between relay and YardMaster



Red wire this end

DC Power, No polarity

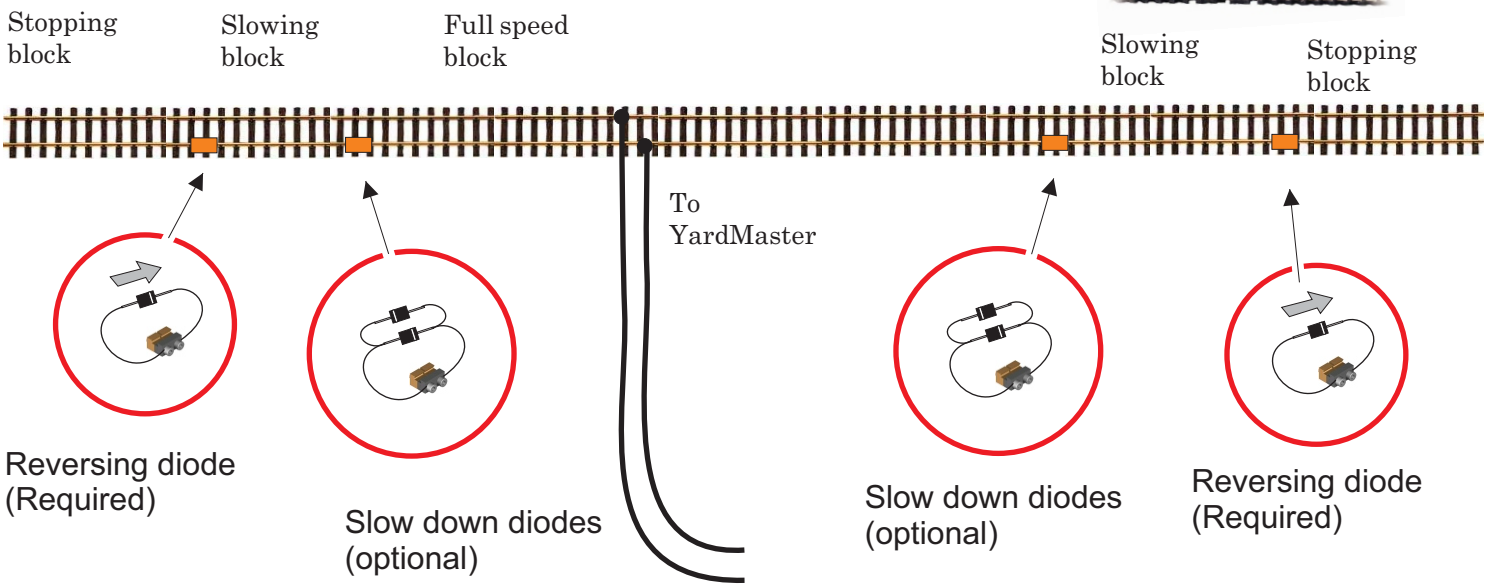
Jumper between 8 and 9 to enable current sensing.

YardMaster input Power

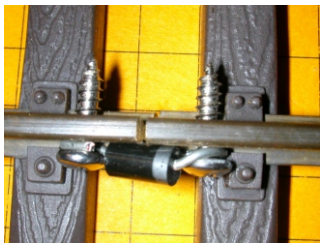
Back and forth Automatic Reversing Slowdown Additions

Hookup detail showing optional diode slow down sections

By adding back to back diode sections the train will slow down when approaching the ends. Add as many slow down diode sections as desired.



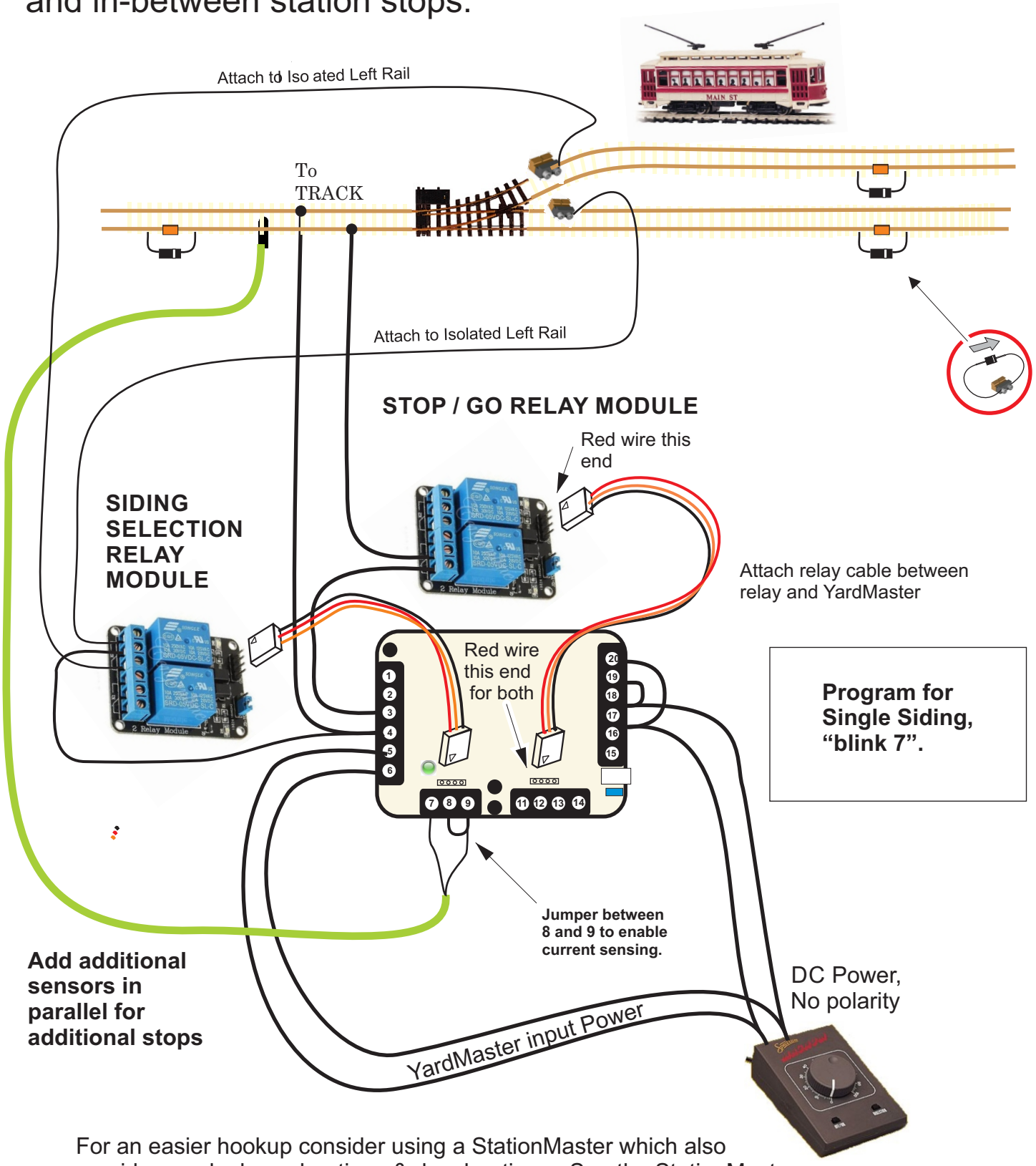
Alternatively diodes can be added directly to rails by using self-tapping screws and 3 AMP diodes. See RailroadConcepts.com to purchase these parts.



1. Attach self-drilling screws.
2. Cut rail between screws with Dremel.
3. Wrap diodes leads around screw heads.
4. Cut protruding screws flush to rails, trim diode leads.

Consider using a StationMaster for an easier hookup

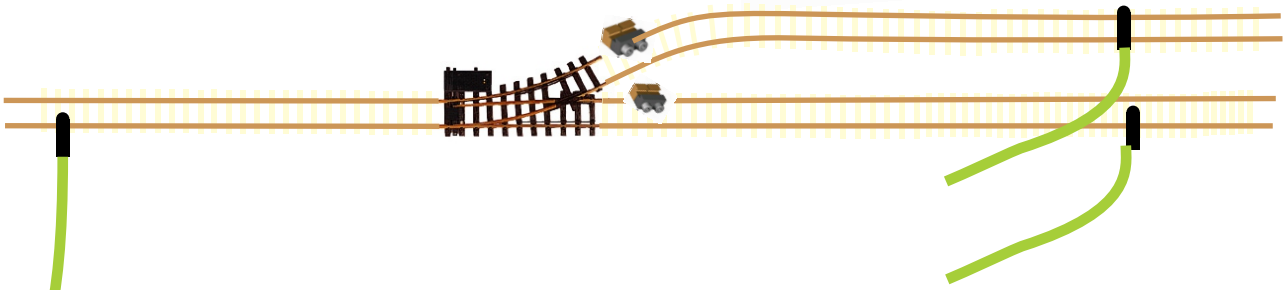
Back and forth Automatic Reversing with a siding, pausing on the ends, and in-between station stops.



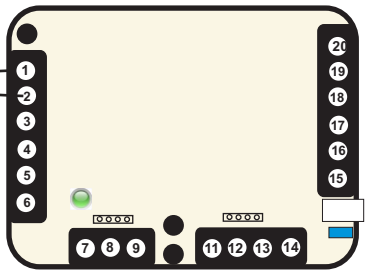
For an easier hookup consider using a StationMaster which also provides gradual accelerations & decelerations. See the StationMaster manual for hookup details. (DC trains only)

Back and forth Automatic Reversing with a siding, pausing on the ends, and in-between station stops.

OPTION: No track modifications



When it is not desirable to add diodes to the track for end-of-track sensing an alternative is to add sensors as shown.
Sensors are placed at the stopping location and wired in parallel.
All sensors are attached to pins 1 and 2 which is the ALTERNATE sensor input.

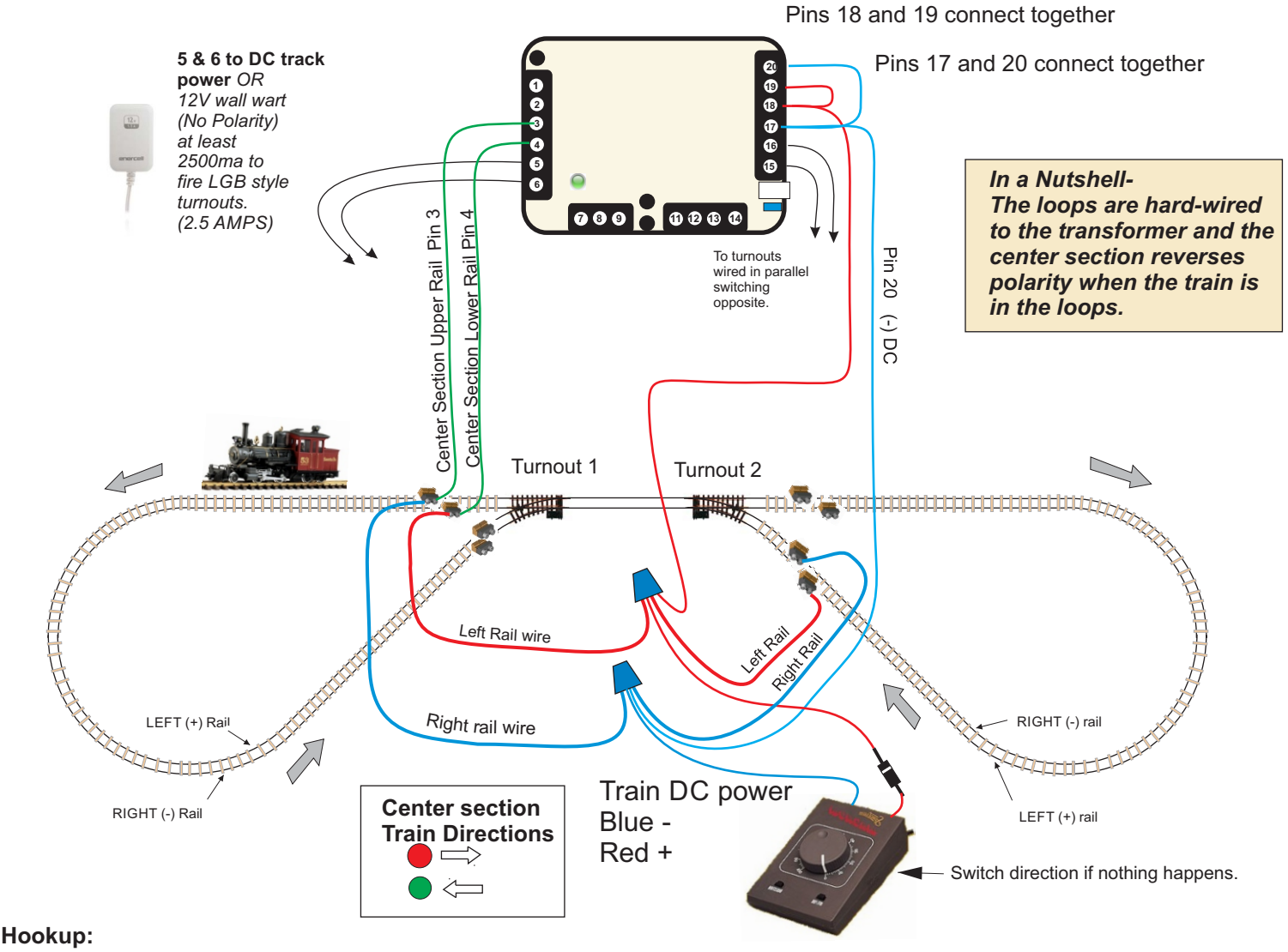


No jumper.

Reversing Loops

Track power connections only

Parts List	
YardMaster	1
Track Isolators	8
Train Sensor	2
Train magnet	1
Protection diode	1



Hookup:

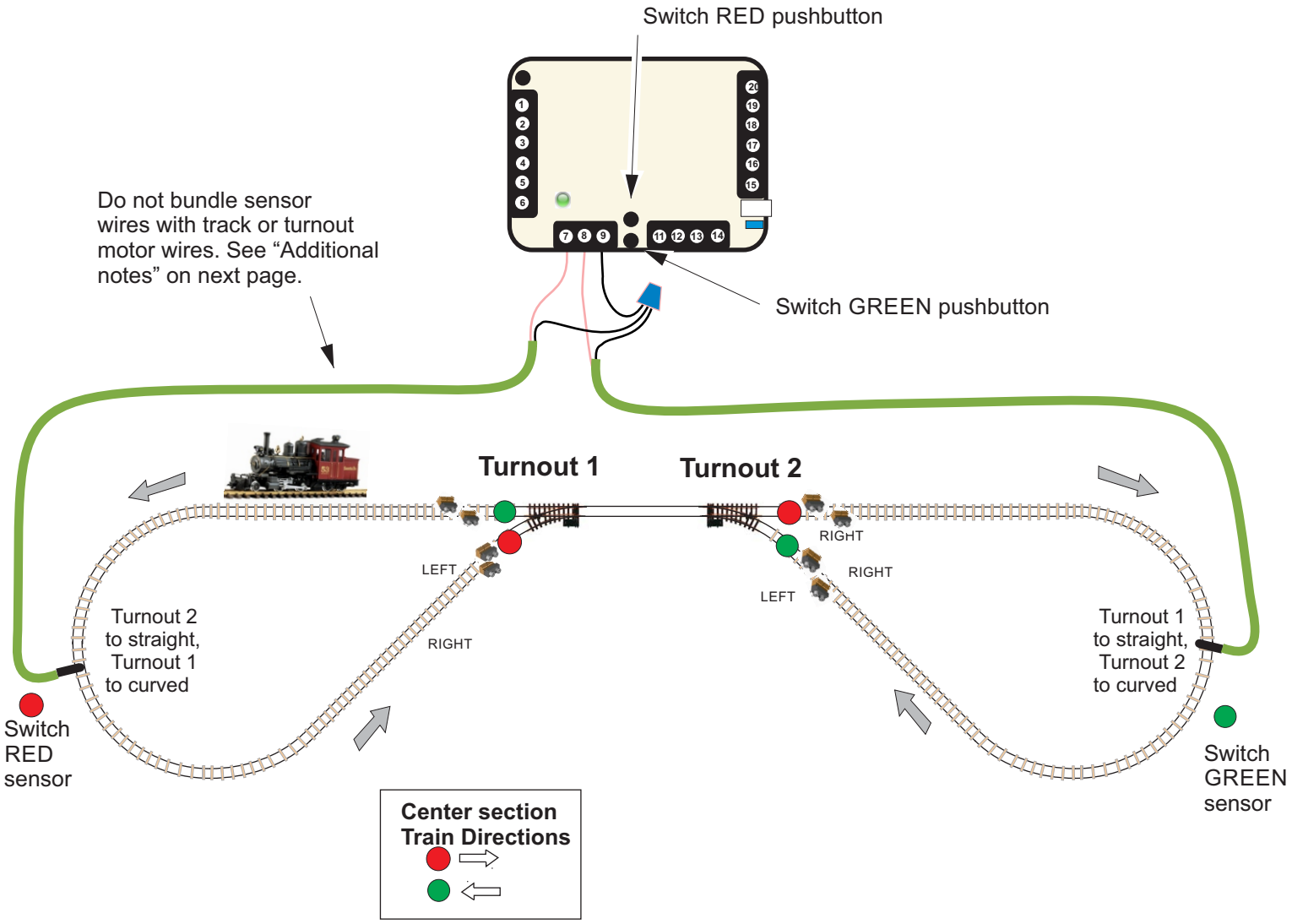
Attach #3 to the isolated center track section, upper rail as shown. (if incorrect there will be a short circuit)
Attach #4 to the isolated center track section, lower rail as shown. (if incorrect there will be a short circuit)
Attach #5 and #6 to a 12VDC power source. Polarity is not important. See power page for more info
Attach #15 and #16 to the turnouts wired in parallel. Turnouts should switch opposite so the train follows the arrows as shown.
Jumper #18 to #19 and attach a wire to the negative power source
Jumper #17 to #20 and attach a wire to the positive power source.
Attach transformer TRACK outputs of transformer to track as shown. Each loop is isolated and hard wired for a certain direction. Make sure the polarity and directions of the trains are as shown. For large scale trains in nautical terms, "*PORT IS POSITIVE*".
For LGB style trains the left rail is always POSITIVE while the right rail is NEGATIVE. *Notice that this is reversed for trains following NMRA standards such as HO, N, etc. and the trains will go the opposite direction as the arrows indicate. If the trains do not follow the directions as shown by the arrows then switch the transformer direction.*

Running the train backwards will cause a short circuit!! The protection diode will prevent this.

Notice that all red wires connect together and all blue wires

Continued on next page =>

Reversing Loops
Sensor connections



Sensors Hookup:
Attach #7 and #9 to the SWITCH RED sensor in the left loop.
Attach #8 and #9 to the SWITCH GREEN sensor in the right loop.

When the sensors are hit by a magnet the turnouts should fire as shown. The colors on the drawing represent the turnout directions when the YardMaster shows these colors. These sensors can be simulated by pressing the RED and GREEN buttons on the YardMaster. Swap the wires in the turnouts as necessary to make this happen.

Notice that the sensors must be 100% reliable or a short circuit will occur. For some commercial applications it is sometimes wise to place 2 sensors in parallel at each switching location slightly offset so that the second sensor will be hit if the first is missed for some reason.

Continued on next page =>

Reversing Loops Operations

Operation
The transformer should be set to the desired speed of the train.

The loops on both ends connect straight to the transformer and trains must travel in the directions as shown. These loops are isolated from the center track section.

When the train goes over the sensor in the loop the turnout will align to receive the approaching train and the track polarity of the center section will reverse. Swap wires to the turnout as needed to make this happen.

Both turnouts will fire since when they are wired in parallel. One will go UP and the other will go DOWN. Make sure the turnouts go to the proper directions or the train will go into the loops in the wrong direction and cause a short circuit.

Polarity is important for all wires except sensor wires and the power wires into the YardMaster (5 & 6). The YardMaster runs on any input polarity.

Setup verification:
Before running the first train push the RED and GREEN buttons on the YardMaster and verify that the turnouts fire and the center section track polarity is set up as shown in the drawing. When RED the turnout should be lined up as described in the drawing, and the center track section should be set so that the train travels to the **right** in the drawing. When green the turnouts fire as described in the drawing and the center section track polarity should be set up so the train travels to the **left**. A voltmeter could be used to test this, (left rail is positive for G scale) or quickly place a train on the track to see which way it wants to go but don't let it enter the loop yet. Reverse the wires to the track if the train is going the wrong direction. Once this is correct use a magnet to "fake" the sensors and verify that the operation is the same.

Cold start up: Place a small train in one of the loops before reaching a sensor. If this is not done then there could be a short circuit as the train enters the center section.

The YardMaster will remember the state when power is removed and return to that state. To make restarting easier after removing the train always stop the train at the same location before turning off and removing the train, or just always place the train in one of the loops **before** the sensor.

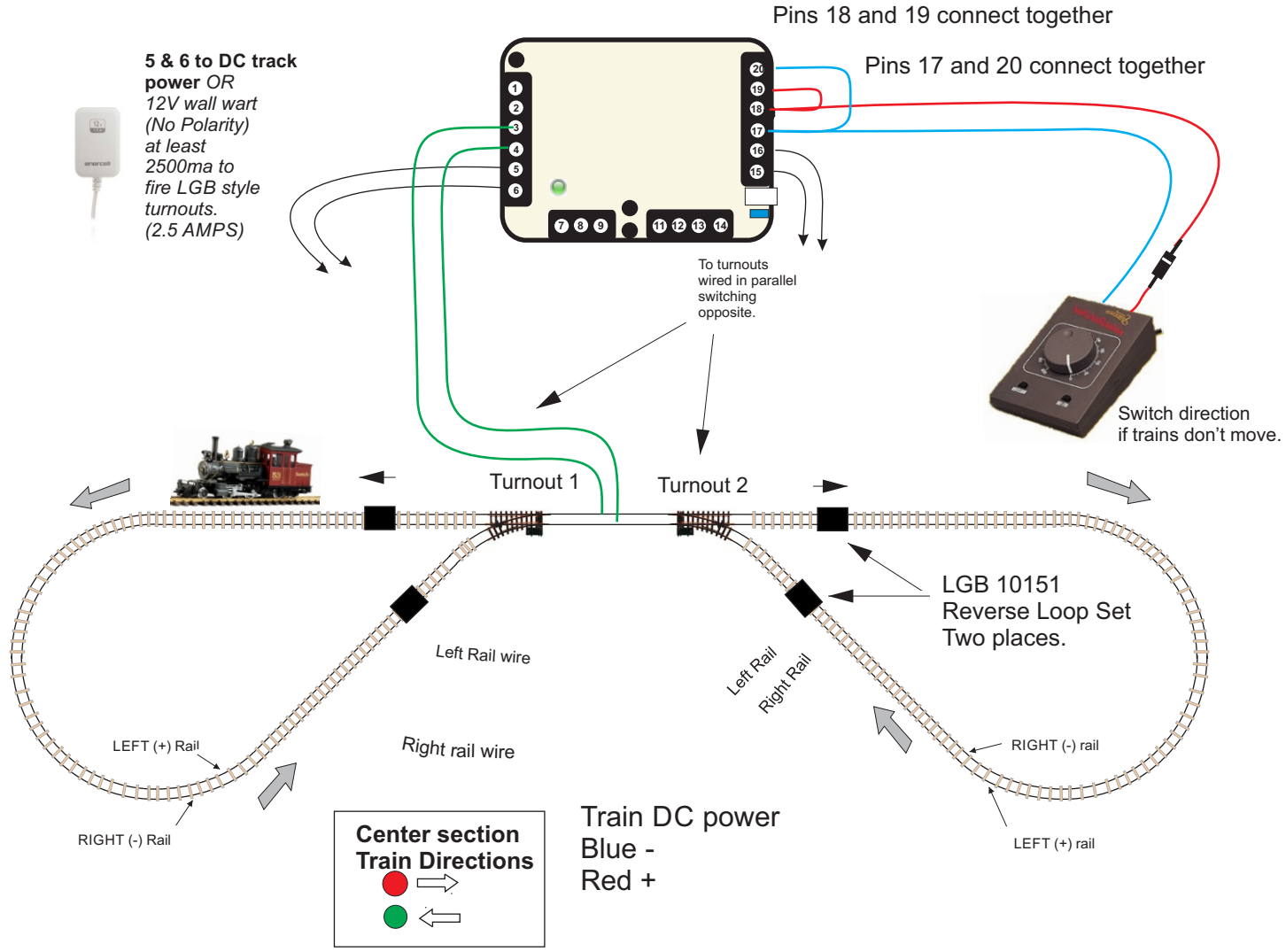
Additional notes:
The sensor operations must be 100% reliable or there will be a short circuit as the train enters the center section. Sometimes a second sensor is desirable wired in parallel with the original sensor and placed slightly offset in case the magnet did not properly align to the first sensor.

Blue flashing after a switch indicates that the YardMaster microcontroller has RESET. This is usually caused by either:
1)The power supply has insufficient current. Firing the switch motors caused a voltage drop which reset the YardMaster.
2) Electrical "noise" has caused a reset. THIS IS COMMON WHEN SENSOR WIRES ARE BUNDLED WITH TRACK OR TURNOUT WIRES. Please make sure the sensor wires are separated from track and turnout motor wires by at least 3 inches.

Reversing Loops- Alternative Hookup

Track power connections using LGB “Reverse Loop” set.

Parts List	
YardMaster	1
Track Isolators	8
Train Sensor	2
Train magnet	1
Protection diode	1



Using the LGB 10151 Reverse Loop set reduces the wiring complexity, but adds to the overall cost by over $100. (This part is not available at RR-Concepts.com)
Trains will also go at a slightly slower speed due to the 1.4V voltage drop in the loops.

Hookup:
Attach #3 to the isolated center track section, upper rail as shown. (if incorrect there will be a short circuit)
Attach #4 to the isolated center track section, lower rail as shown. (if incorrect there will be a short circuit)
Attach #5 and #6 to a 12VDC power source. Polarity is not important. See power page for more info
Attach #15 and #16 to the turnouts wired in parallel. Turnouts should switch opposite so the train follows the arrows as shown.
Jumper #18 to #19 and attach a wire to the negative power source
Jumper #17 to #20 and attach a wire to the positive power source.
Attach transformer TRACK outputs of transformer to track as shown. Each loop is isolated and hard wired for a certain direction. Make sure the polarity and directions of the trains are as shown. For large scale trains in nautical terms, “*PORT IS POSITIVE*”.
For LGB style trains the left rail is always POSITIVE while the right rail is NEGATIVE. *Notice that this is reversed for trains following NMRA standards such as HO, N, etc. and the trains will go the opposite direction as the arrows indicate. If the trains do not follow the directions as shown by the arrows then switch the transformer direction.*

Alternating between 2 loops of track.

When a sensor is triggered track power will switch to the other loop of track.

Note differences in terminals 3,4, 5, and 6 between AC trains and DC trains.

AC trains generate electrical noise which affect the microcontroller, so an external power source must be used.

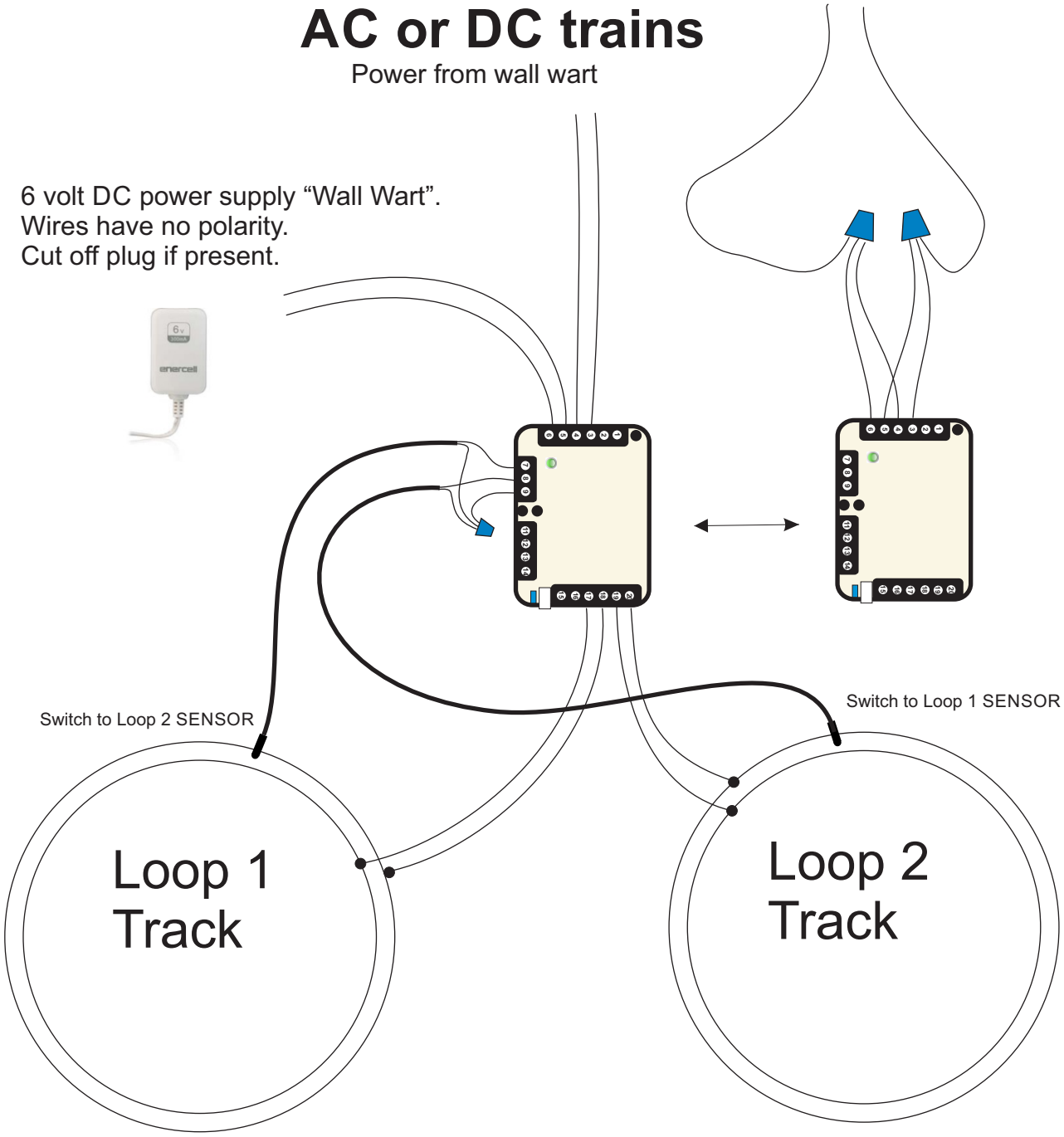
DC trains only

Train power from transformer

AC or DC trains

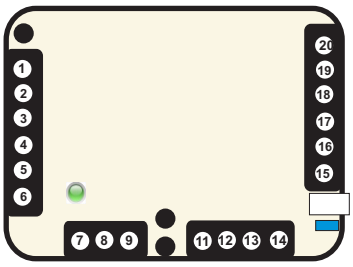
Power from wall wart

6 volt DC power supply “Wall Wart”.
Wires have no polarity.
Cut off plug if present.

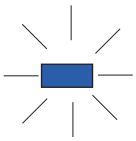


Trains must carry magnets to trigger sensors

LED indicators



Sensor LED



STATUS LED

o The blue sensor LED will flash when any sensor is detected and also when a command is received from a StationMaster.

o When the current sensor is enabled the blue LED will be ON when a train is detected.

Green indicates the YardMaster has switched to GREEN.

Red indicates the YardMaster has switched to RED.

Blue indicates one of the following:
1. YardMaster is in PROGRAMMING MODE
2. Flashing blue: The YardMaster has RESET.
   Operation will continue after 5 seconds.

When flashing RED or GREEN a time delay is in process.
When flashing RED/BLUE and then GREEN/BLUE the YardMaster is self-running due to the RED sensor terminals closed on power up.

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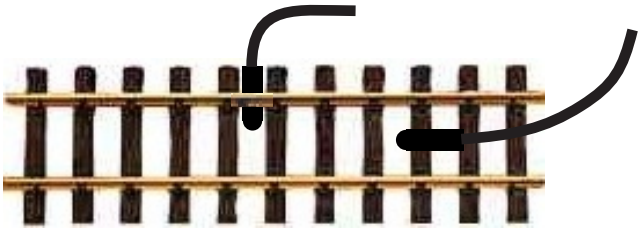
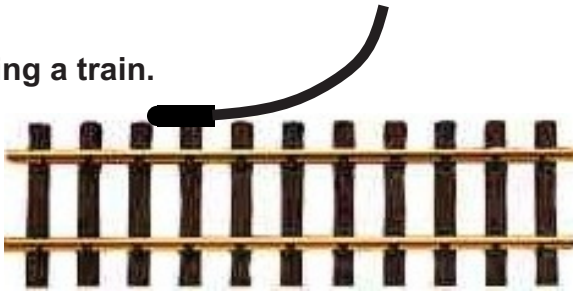
Sensor Placements on Track

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.



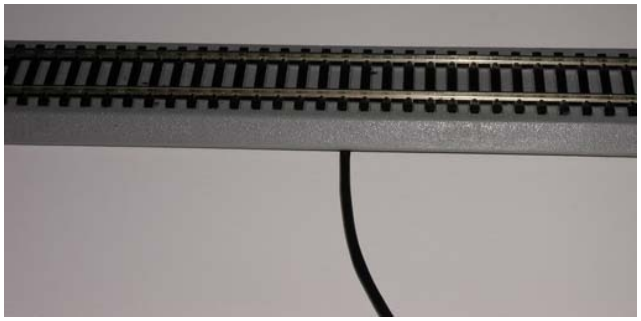
Sensor Placement for identifying a train.



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 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.