WARRANTY INFORMATION

TDP & Associates guarantees the StationMaster to be free of component and manufacturing defects for a period of one year after date of purchase. If a defect occurs return the product to TDP & Associates for service. TDP & Associates will repair or replace the StationMaster at its discretion at no charge during the warranty period. This warranty excludes damage due to abuse, such as but not limited to failure to properly install the unit, applying excessive input voltage to the unit or failure to provide protection against input over current with a fuse or circuit breaker.

TDP & Associates will make non-warranty repairs to the StationMaster at reasonable and fair rates.

All warranties on this product are limited to refund of purchase price or repair or replacement of this product at the sole discretion of TDP & Associates.

In the event that this product is not installed or used in accordance with the manufacturer’s specifications any and all warranties either expressed or implied are void. Except for what is expressly stated in this section there are no warranties, express or implied, including but not limited to any warranties of merchantability or fitness for a particular application.

TDP & Associates, Inc. reserves the right to make changes to this product’s design or specifications, and/or to make improvements to this product at any time, without obligating TDP & Associates to install these changes, additions or improvements on previously manufactured products.

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TDP/NJI StationMaster

The StationMaster is an auto-reverse controller with optional station stop capability. Unlike most other auto-reverse controllers the StationMaster uses a state of the art DC motor controller integrated circuit instead of a mechanical relay. By using this technology it makes it possible to slow the train or trolley down as it approaches the station stops. The technology used also allows the motor to be operated with much less power than straight DC controllers. No power pack is required to set the speed of the train. The speed is set with a potentiometer on the StationMaster board. Power for the StationMaster can come from any AC or DC power supply of 12V to 18V with sufficient current to operate the desired train.

Up to three intermediate station stops can be set up. The basic kit has one sensor cable that has the left and right endpoint sensors on it as well as one station stop’s sensors. Two additional station stops can be added by adding another sensor cable (sold separately).

The StationMaster uses optical sensors that need visible light to operate. They are supplied on pre-wired cables that are ten feet in length. No soldering, cutting or splicing of wires is required if the end points and station stops are located within 10’ of the StationMaster board.

Contents of the Kit

- StationMaster Board
- Sensor cable

Power Requirements

The StationMaster requires a power supply of 12V – 18V AC or DC capable of supplying 100 ma plus the current needed to operate your train or trolley. The StationMaster will use less current to operate your train, so in most cases a 12V AC power supply rated for 1A will provide enough current for all N scale and most HO scale applications. The maximum current the StationMaster is rated for is 2A.
Precautions

Care must be taken to ensure that you do not short out the StationMaster board or the sensors during installation. Do not place the circuit board on the rails when you are working on it, and make sure that the rails are not powered when installing the sensors. Touching a sensor or the StationMaster board to a powered rail will probably damage the sensor and/or the StationMaster board.

**DO NOT USE A DCC EQUIPPED LOCOMOTIVE WITH THE STATIONMASTER!**

How it Works

The StationMaster will control a trolley or commuter run on your layout in a realistic manor. When the StationMaster is set up properly the train will not stop suddenly as with other auto-reverse controllers. The train will seem to glide to a controlled stop at each station. This is done by using two sensors at each station stop. The sensors are placed at each end of the station platform. When the train approaches the platform and crosses the first sensor the StationMaster will slow the train down to a user selectable ‘slow’ speed, and when it reaches the second sensor the train will stop in a smooth manor. Since there is only one sensor at each end, when the train encounters the end sensor it will stop in a smooth manor (without the ‘slow down’ period as at a station stop). Of course the smoothness of operation also depends upon the quality of the train or trolley you are using. An engine with a flywheel, for example, will slow more smoothly than one without a flywheel (but it will also run further past the stop sensor, so sensor placement may need to be modified). The smoothness of the mechanism is also very important. A cheap mechanism will not perform well with the StationMaster. Most often the minimum speed at which the cheap mechanisms will operate are too fast.

The StationMaster has programmable station dwell times (how long the train waits at the platform during a stop). Each station stop, and the end reversal times can be independently set to last from 1 second to about four minutes. So, for example, you can have your train stop at station stop #1 for 30 seconds when the train is traveling to the left, and when it is coming back to the right it can stop for only 15 seconds. The left end could also be programmed to wait for three minutes while the right end can be programmed for only two minutes. The factory default setting is 3 seconds for all stops.

In many cases a train or trolley will not run in reverse at the same speed as it does in forward. The StationMaster can be set up to compensate for this too.
Running Characteristics

There are three jumpers that have not been mentioned yet. They are ‘Brake’, ‘PFD1’ and ‘PFD2’. These jumpers are installed only over one post as the board is shipped from the factory. If you want to try to change how your engine operates (acceleration/deceleration, smoothness etc.) you can try installing any or all of these jumpers across both posts. One word of caution here, by installing these jumpers your directional headlights may not function correctly (both the front and rear headlights may be on when the train is running).

Quick Start Guide

1) Connect an appropriate AC or DC power supply to the ‘POWER’ connector, but do not plug in the supply yet
2) Connect the leads from the track to the ‘TRACK’ connector
3) Connect the sensor cable to the ‘END’ connector with the red stripe toward the ‘1’ printed on the board
4) Install the two end sensors in holes near the ends of the track. The ‘END’ sensors are the two sensors closest to the red stripe on the wire (see figure 2).
5) Ensure that the other two sensors (for the first station stop) are in a well lit area or are installed in the track at the first station platform.
6) Place your train on the track in the middle of the run.
7) Apply power to the StationMaster.
8) If the train does not start moving, turn the ‘Speed’ control clockwise until the engine begins to move. If the engine doesn’t begin to move see the troubleshooting section.
9) Once the engine is moving wait for it to reach one of the end sensors. The engine should stop, and then reverse direction. If the engine stops for 3 seconds and then begins to move in the same direction power everything down and reverse the two wires in the ‘Track’ connector. Go back to step 6 and start again.
10) If the engine failed to stop at the end sensor please see the sensor troubleshooting section.

The StationMaster has a special mode of operation for multi-tracked commuter operations. If you set up a dog-bone loop of track that doesn’t require reversing then the system can be configured to properly operate this too:

You will be limited to only one station stop on a basic StationMaster kit and two station stops with the addition of the expansion kit (it is really two & four station stops when you think in terms of stops on each track of the double tracked center section).

The StationMaster Board

Connections

Referring to figure 1, the sensor cables are connected to the right side of the board on the pins marked ‘END’ and ‘STOP’. The sensor cable that will be used for the end points and station stop #1 will be connected to ‘END’. There is a ‘1’ printed on the board (lower right corner of ‘END’). The connector of the sensor
cable should be installed with the red stripe on the cable toward the ‘1’ printed on the board. There will be four jumpers installed on the ‘STOP’ connector. If you will be using the additional two stops then you will need to remove these jumpers (save them though!) and install the station stop sensor cable in the same way as the ‘END’ cable (red stripe toward the ‘1’).

The power supply is connected to the connector labeled ‘POWER’. There is no polarity associated with the power connector. The track is to be connected to the ‘TRACK’ terminals. **Since the StationMaster is capable of operating at up to 2 amps of current TDP strongly recommends the addition of an in-line fuse of the appropriate size to protect the StationMaster and power supply in case of a short circuit.** When you power up the unit with a train on the track, the train will begin moving. If the train stops when it reaches the end sensor and then continues in the same direction you must reverse the wires connected to the ‘TRACK’ terminals. Do this by first powering down the unit, reversing the wires and then applying power to the unit.

The sensors on the ‘END’ and ‘STOP’ cables are assigned as shown in figure 2:

![Figure 2](image)

Operation

The StationMaster will shut off if it encounters a short circuit between the rails. This can happen when placing the train on the track while the StationMaster is powered up, or from a number of other reasons like placing a tool across the track. The StationMaster must be powered down for 15 – 20 seconds to recover from this condition. This can also occur in the case where the train stalls at one of the stops for a long period of time. Causes of stalling can be dirty track, a ‘sticky’ spot in the gears, or attempting to run at too low a speed. Usually a nudge will get the train moving, but if that doesn’t work try powering down the Stationmaster as mentioned above. As was mentioned previously, if the StationMaster and the engine are ‘cold’ they will run slower until the engine and StationMaster warm up. This can also seem like the engine has stalled. In this case you will need to increase the speed of the engine enough so that it will start moving when both the StationMaster and engine are cold.

If your engine moves but ignores the end sensors please make sure that the cable with the end sensors is plugged into the ‘END’ connector and that the red stripe on the cable is installed closest to the ‘1’ printed on the StationMaster board.

If it doesn’t seem like you can get enough speed out of the StationMaster board, first you should make sure that both J1 and J2 are installed across both of the posts on the board. This will provide you with the maximum available power for the train. If you still cannot get enough speed out of your train make sure that the ‘slow’ control is centered and LED3 is lit. If the train is still moving too slowly you may need to get a higher voltage and/or higher current power supply. Do not exceed 18V or 2A when trying different power supplies.
sensor for the length of time you want the station stop to be. Either LED1 or LED2 will flash, corresponding to a ‘left’ or ‘right’ sensor being covered. The LED will flash at a rate of about once a second. When you uncover the sensor the time that the sensor was covered will be recorded and stored in memory. When you uncover the sensor all three LEDs will light. Once these go out (after about 5 seconds) you may proceed to the next sensor. Once all stops have been programmed, power down the StationMaster and remove the ‘PROG’ jumper. You can now place the train on the track and power the StationMaster up again. It will now operate normally.

Commuter Loop Operation

The commuter loop mode is enabled by installing a jumper across the ‘MODE’ terminals. This jumper disables the reverse function and turns the left and right end sensors into another pair of stop sensors. In this mode if the train runs in the wrong direction reverse the connections at the ‘TRACK’ terminals on the StationMaster board.

Tips and Troubleshooting

Sensors

The sensors will react to visible light, but that light must have some inferred (IR) content. The sensors will have a hard time working well in rooms lit solely with cold florescent lighting. ‘Daylight’ florescent lights will work better. Incandescent lighting works the best. The new ‘compact florescent’ lights being used to replace the good old ‘light bulb’ tend to be very cold and may not provide enough light of the correct wavelength to operate the sensors.

If you are having trouble with the sensors you can test them as outlined in the setup instructions. You simply need to apply power to the StationMaster with no train on the track (and the ‘PROG’ jumper must be removed, if it was installed). If the expansion cable is not being used the four jumpers that were installed on the ‘STOP’ connector must be in place. The jumpers should be installed across the pairs of pins labeled ‘L’ and ‘R’ (four jumpers total). To simplify things, an expanded system should be tested one cable at a time. Unplug one of the sensor cables and install the four jumpers mentioned above. Once one cable is verified and/or fixed, test the other cable by removing the jumpers, plugging the cable in again, removing the working cable and install the four jumpers on that connector. With the board powered up and configured properly LED1 and LED2 should be out. If either LED1 (any ‘LEFT’ sensor) or LED2 (any ‘RIGHT’ sensor) is lit it indicates that at least one of the sensors does not have enough light shining on it, or that the sensor has become ‘open’ (this means a wire has broken or the sensor was damaged by touching a live rail during installation). Since there are four sensors on the basic system and only two LEDs it will take some detective work to determine which sensor is the culprit. However, since the LEDs do not come on simultaneously, if LED1 and LED2 go on at the same time it means there is an open wire somewhere with the wire not longer intact.

Sensor Installation

The sensors are labeled ‘left’ and ‘right’ in figure 2. Though the system will work just fine if you mix up the physical directions of the sensors, setup and operation will be much easier to understand if you follow the convention of setting up your system as shown in figure 3. You should then place the ‘left’ sensors to the left of the mental picture and the ‘right’ sensors to the right of this picture as shown in figure 3.

The above diagram shows the basic system. If you are using an expanded system just add additional station platforms and install the sensors in the same way as the one shown. The order of the station stops is not important.

The exact placement of the sensors may require some adjustment for ideal operation. Since the StationMaster will slow the train smoothly at the stops the sensors need to be placed ahead of the planned stopping point. Since the ideal placement will depend upon the speed and acceleration/deceleration of your train you may need to adjust the sensor locations during installation. For a good place to start, try at least two engine lengths from the end stop bumpers and one engine length from the desired stopping point at the station stops. When placing the sensors for the station stop, consider the sensor as the ‘stop’ sensor. When you install the sensors near the end of the platform it should be about an engine length from the end of the platform. You will be placing one sensor at each end of the platform, several inches from the ends as the engine will over-run the sensor’s position as it glides to a stop.

The sensors are meant to be installed from below the layout. Drill a #20 hole (5/32” is close but slightly small) from above the layout, between two ties on the centerline of the track (make sure nothing is below the hole before drilling!). Then insert the sensor up from underneath the layout until the top of the sensor is level with the ties (not the rails!). You may need to use a toothpick to help push the sensor up through the subroadbed and roadbed if the hole is ‘tight’. Use a piece of masking tape on the underside of the layout to hold the sensor in place. Do not use glue as some glues will harm the lens of the sensor and other glues will short out the sensors.
If you do not want any station stops you will need to short out the two ‘stop’ sensors on the END cable. If you will NEVER want to use the station stop feature you can cut the sensor off the wires, strip some insulation from the wires and twist them together to short out the unwanted stop sensors. If you may want to use the stops in the future then you can either mount the unused sensors where they will be lit all the time or wrap some bare wire around the base of the sensor (where the sensor is soldered to the wires). This procedure also should be applied to an unused set of stop sensors in an expanded system too.

Setup

Once you have the sensors installed in the track and have connected the track to the track terminals on the StationMaster, you can connect the StationMaster up to an appropriate power source. Since the StationMaster is capable of operating at up to 2 amps of current TDP strongly recommends the addition of an in-line fuse of the appropriate size to protect the StationMaster and power supply in case of a short circuit.

The first thing to check is the sensor operation. Apply power to the StationMaster with no train on the track. If all the sensors are hooked up correctly and there is enough light on the sensors LED1 and LED2 should be out. If LED1 or LED2 are on then at least one of the sensors does not have enough light on it or the cables are hooked up incorrectly. LED1 will light if any ‘left’ sensor is covered while LED2 will light if any ‘right’ sensor is covered. If LED 1 & 2 are out you can now test each one in turn by covering the sensor and looking for the appropriate LED to light. Note here that a finger may not be enough to cause the sensor to trip. A piece of heavy cardstock or opaque plastic should be used to ensure the sensors work. If your sensors do not work correctly then refer to the troubleshooting section on sensors.

If LED3 is not lit you should adjust the ‘SLOW’ control until it is lit. This should occur at the center of its movement. Turn the ‘SLOW’ control with a small screwdriver until LED3 lights (an appropriately chosen ‘straight’ blade screwdriver actually works best). This adjustment is the forward/reverse trim setting. By setting the ‘SLOW’ control so that LED3 is lit the StationMaster will apply the same speed to each direction of travel. This is the place to start from.

Power down the StationMaster and then place your train on the track. When power is applied to the StationMaster, the train on the track will begin moving provided the speed control on the StationMaster board has been turned up sufficiently (the factory setting is full slow so most trains will not move). Turn up the ‘SPEED’ control with a small screwdriver until your train begins to move. The train will move to the first endpoint sensor it encounters (ignoring all station stops). It should then pause and reverse direction. If the train continues in the same direction simply reverse the wires connected to the ‘TRACK’ terminals on the StationMaster board (power down the board before swapping the wires!). After the train reverses at the end sensor the StationMaster will begin full operation, making all station stops.

The train or trolley’s speed is set using the potentiometer labeled ‘SPEED’ on the StationMaster circuit board. There are also two jumpers directly associated with the full speed setting (JP1 & JP2). Due to the extreme variety of equipment to be controlled these jumpers will allow you to change the sensitivity of the speed control. If both jumpers are installed across both posts (factory default) the speed setting will be as coarse as possible. Higher current engines will require this setting. Removing one or both of these jumpers will increase the adjustment range for lower current engines and reduce the overall top speed (but high current engines may not move at all). Turning the speed control clockwise will increase the speed while turning the control counterclockwise will slow the train. Turn the potentiometer up until the desired speed is achieved. Note that as the train and StationMaster warm up a bit the speed will usually increase a little. Also note that some mechanisms do not run as well in reverse as they do in forward, which may result in a noticeable difference in forward and reverse speeds. Set the desired speed to the slow direction of travel as we can compensate for the direction that moves fastest at a later time.

The StationMaster allows you to set the amount the train will slow down as it approaches the station. To do this you will need to install two jumpers on the board while the train is moving. You must also install them in a specific order. Install the ‘PROG’ jumper first, followed by the ‘MODE’ jumper. The train may slow down quite a lot depending upon where the ‘SLOW’ control is currently set. Adjust the speed of the train to the speed you desire the train to move as it is approaching the stop. When in this setup mode the train will ignore all station stops but it will still reverse at the endpoints. If your train shows a difference in speed between forward and reverse, make this adjustment when the train is going in the slower direction. Once you are happy with the slow speed remove the ‘MODE’ jumper, wait about 5 seconds and then remove the ‘PROG’ jumper.

You can now balance the speed difference. Tuning the slow control from its center position (when LED3 is lit) will cause the train to slow down in one direction when turned clockwise and the other direction when turned counterclockwise. When the train is moving in the faster direction turn the ‘SLOW’ control until the train is moving at the same speed as it does in the slow direction. The ‘SLOW’ control should be in this position as this is an ‘active’ adjustment, just as is the speed adjustment. The train will respond to changes in these controls during normal operation. If at some time later you decide to slow the train’s speed overall, you should only need to adjust the ‘SPEED’ control. The slow speed will be reduced proportionally, as will the speed balancing effect. If you slow the train too much with the ‘SPEED’ control you may need to readjust the slow speed as the train may not move at the current slow setting.

Once you have all the station stops working and the speeds set you can program the end point and platform dwell times (the length of the station stops). To do this you need to power down the StationMaster and remove your train from the track. Install a jumper across the pins labeled ‘PROG’ before applying power to the StationMaster. Apply power. All three LEDs should be out. If any LEDs are on or flashing at this time there is a problem with the lighting. To set the dwell times for each stop (including the endpoints), simply cover the corresponding