

AUTOMATIC REVERSE with TIMED STOP AT ENDS with Memory & Momentum Start/Stop. General overview instructions.

Getting started:

Review the drawing for the operation that you would like to use. Then mount the units with #6 screws. Choose an appropriate location for the components and secure them properly. Then proceed to wiring the units up after reading these instructions first

Basic Wiring:

For best connections, stranded wire should be used in the barrier strips (screw clamp connectors on the board). #22 - 24 awg wire can be used to wire the 12VPS output to the other Trak-xxx units. Heavier wire can always be used but is not necessary. Generally, heavier wire is used to the track. For higher current operation, #16 - #12 is suggested. Lower track power wires can be #16 - #20 but we would not suggest anything smaller than #20.

Install stranded wires by stripping insulation back 3/16", place wire in barrier strips rectangular hole, run screw down to clamp in position. Make sure that the wires do not short to adjacent terminals either from stripping too much insulation off or by not getting all of the strands into the clamp!

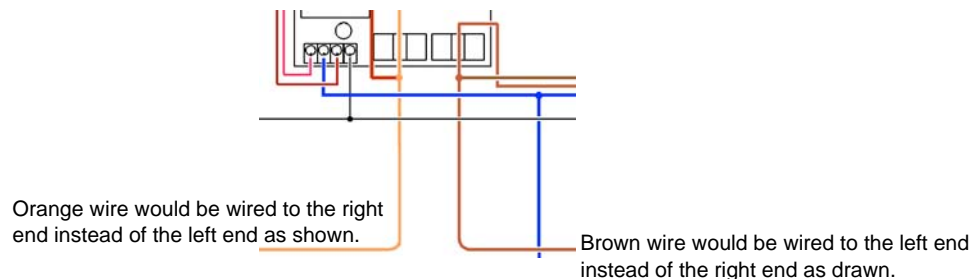
Standard wiring practices:

All wires crossing each other only connect when a DOT / CIRCLE is shown. Wire colors are shown for convenience. The wire color also changes to signify the passing of it through a sense coil even though it is still the same wire. This helps in troubleshooting the wiring as well as the initial wiring.

Dashes & other line patterns are used to clarify different wires used.

GAP - a "GAP" (cut rail to provide an air "GAP" or use insulated plastic rail joiners, wood is not recommended) is placed on one rail as shown.

"G" gauge equipment is reverse that of other gauge's, i.e. the track power convention is left rail "+" = the forward direction. This drawing is drawn for "G" operators. Therefore, when operating other DC type trains, wiring needs to be reversed from that shown for the "must STOP / REVERSE" ends for other operators. If you run off the ends due to no reversing of track power and not due to the lack of a proper stop time set on the MO-1 board, you have to reverse the end wiring. To do so merely reverse the "Brown" and "Orange" wire end positions connected to the track. Everything else stays the same!



All DC Back-N-Forth operations:

require DC (polarity reverse) track operation.

are best to start running between the slow down sections. But you are not required to do so. When starting in an end or slow down section, it may take double the start time to get going properly.

require a few seconds of time from leaving one stop location and arriving at the next stop location!

long lengths of track between locations does not affect the operation, very short lengths that the engine / trolley transverse in a short time are not recommended.

Stop Time must be quick enough to prevent the trolley / engine from running off the end. If you speed up the trolley, the time to stop will increase because it is running faster!

Start Time can be however long you want the acceleration to full track voltage to be. If there is not enough distance between the end of the Slow down / Speed up section or other Stop location, then full track voltage (set by the Track Power input voltage / speed setting) will not be achieved due to too short of a time to travel the distance between stopping locations.


It is suggested to start with the Stop Time potentiometer set full CW for the fastest stop. Then adjust it accordingly after that.

This system has memory so that whenever it is turned off and back on, it will still remember the previous direction. It is not important where the trolley/engine is when powering up but it is important that the track power throttle remains in the correct direction. If it is not correct, the MO-1 will not work and the end reverse will go off the track!

MO-1, item 567, will first power up with it's RED LED turned on. After the control signal is cleared it will then gradually apply power to the track according to the "Start" potentiometer setting. Turning either potentiometer CW will make the time less. CCW will increase time. The RED LED will fully illuminate when the output is off and will change it's intensity as the output voltage changes.

Track Power (DC) polarity must be set as shown. If it is backwards, MO-1 will not operate. Proper polarity wiring is indicated by the MO-1's RED LED illuminating upon first powering the unit up. The MO-1 receives it's power from the Track Power source.

Items included with this unit:

- | | |
|---|---|
| 1 - 12VPS, item #369 (provides regulated 12 volts DC to the electronics) | 1 - Trak-DTT, item #565 (provides the detection and stop timing) |
| 1 - Trak-DTRL, item #566 (provides polarity reversing), | 1 - Expansion Relay, item #555 (provides extra contacts) |
| 1 - MO-1, item #567 (provides momentum control) | 2 - #222 two pin UltraMiniature 6" wiring harnesses |
| 1 - 100 ohm, 2 watt resistor (can also use a Ballast Lamp Assembly, item #538). Symbol used in drawings (no polarity to these): |  |

The resistor can be seen wired to the Expansion Relay board.

Operational items to be aware of when using and setting up this Back-N-Forth with the MO-1. This has been made to assist you in trying to troubleshoot any problems you might have when operating or setting up the track sections during installation.

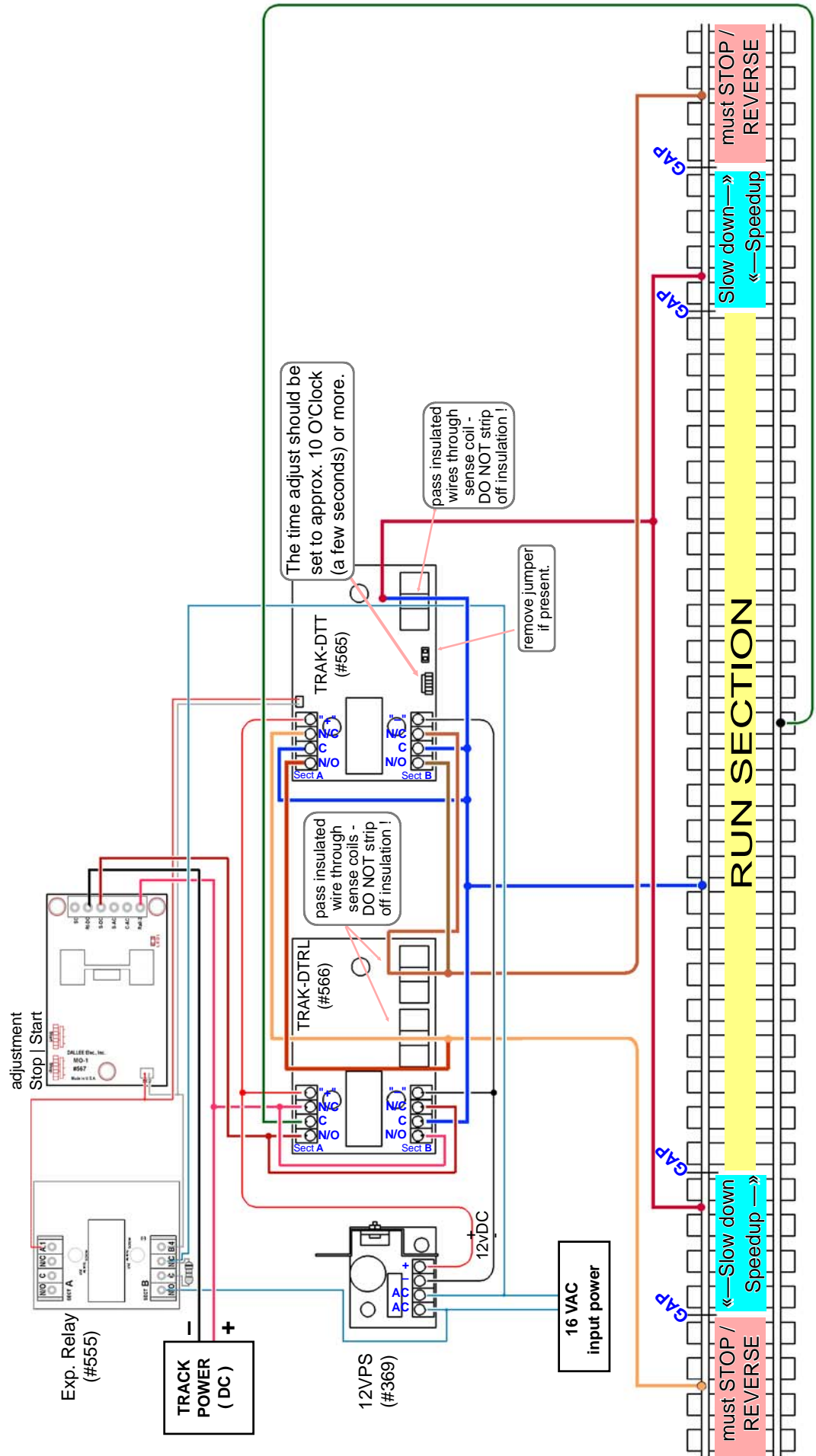
It is necessary to understand the sequence of events, when properly installed with proper timing set, in order to trouble shoot any problem that you might experience. So what follows is the sequence of events of the various components. Proper operation is indicated by the LED's located on each board. If starting in the center section, the only LED that will probably come on is the MO-1 LED. That happens whenever power is initially placed to the unit (if it doesn't, it's a pretty good indicator that the polarity from the track transformer is not correct). The power to the track will gradually come on based upon the MO-1 setting. When progressing to either of the "Slow Down / Speed Up" section you will see the Trak-DTT's LED come on. Then the MO-1's LED will also gradually come on as well as the track power gradually turn off. Your engine / trolley should traverse into the "STOP / REVERSE" section before coming to a stop. After the time set on the Trak-DTT has expired it's LED will turn off and the MO-1 LED will gradually turn off indicating the restoration of track power. Almost at the same time, the Trak-DTRL will have an LED come on indicating that a sense has occurred in the "STOP / REVERSE" section and reversing the polarity of the track power. Your engine / trolley will then traverse out of the "STOP / REVERSE" section and through the "Slow Down / Speed Up" section and into the main "RUN SECTION". It will travel to the opposite end at which time the cycle will repeat itself with the opposite LED activating on the Trak-DTRL. You can power down this unit with the trolley / engine in any area, but it is best to do so when it's not in any end or stop section.

Troubleshooting:

- 1 - First and foremost, the most prevalent problem that exists is the lack of proper power to supply the 12VPS so that it can do its job. The input power to this needs to be at least 25VA and between 15 to 18 volts AC (16vAC is typically used and a standard AC voltage). Item #690 provides more than adequate power for this. It is also best not to use the same power that is powering the track or other trains operating. The transformer (power pack) that supplies the track power should not change voltage output over too wide of a range from when the engine / trolley is running to when it's sitting still. While it's not a real problem, it will cause a false trigger of the MO-1 and result in stopping in areas that are not to be stopped in.
- 2 - the "RUN SECTION" has to be long enough to have at least 5 seconds of time between the left hand and right hand "Slow Down / Speed Up" sections. This means that after the last item that draws current leaves the first sense section that the opposite sense section has to have at least 5 or more seconds before the first item that draws power enters it! Failure to have enough time will cause the Trak-DTT to not properly reset for the next sense time. If you require that short of a time between, then a second Trak-DTT must be utilized for each "Slow Down / Speed Up" section.
- 3 - "Slow Down / Speed Up" sections should be as long as the first item that draws track power enters the section. This is due to the fact that the first truck, even with all wheel pickup, might not be picking up power enough of the time to indicate that it indeed entered the section. By making it encompass the entire item, then there is no question that it did not trigger the Trak-DTT.
- 4 - the Trak-DTT performs the stop timing. If track power is interrupted by bad engine pickups or dirty track, then the Trak-DTT could trigger again. This doesn't cause any problems other than having your engine sit for more time than it normally would. In normal operation you first enter into the "Slow Down / Speed Up" section which is what triggers the activation of the Trak-DTT. The Trak-DTT trigger also enables the MO-1 to allow for the gradual reduction of track power. When the Trak-DTT's time is up, it disables the MO-1 which causes the gradual increase of track power. When track power is re-enabled and a slight amount of current flows, The Trak-DTRL sets the proper direction and the engine / trolley begins to move out of the end section and proceeds to the "Slow Down / Speed Up" section. This time when the engine / trolley progresses through this section, nothing appears to happen. But what did happen is that the Trak-DTT's current flow through the sense coil has ceased allowing it to start the next time. During the activation of the Trak-DTT, the Expansion Relay is also activated which connects the 100 ohm resistor to the 16 volts AC and provides a holding current for the Trak-DTT so that it will not retrigger when track power is restored. In lieu of the resistor, you can use the Ballast Lamp Assembly, item #538. By doing so, you will have the lamp come on whenever you enter the Trak-DTT's timing area.
- 5 - STOP / REVERSE triggers will function normally on most all DC type track power. Everything works better using unfiltered or PWM type track power. However, if using filtered DC power, you may want to loop the wire that feeds through the sense coils on the Trak-DTRL. Otherwise you may see a slight creep in the wrong direction when power is being re-applied to the track via the MO-1 in the "STOP / REVERSE" trigger sections. There is no harm done, but to increase the sensitivity of the Trak-DTRL, a second loop can be placed in the sense coil. This will increase its current sensitivity causing it to reverse its relay (which is what controls the direction of the engine / trolley) in the "STOP / REVERSE" sections before any discernable movement occurs. To do a second loop, just pass the wire through the sense coil, loop it back to the entrance of the wire and pass it through a second time. Then connect it to where it's going.
- 6 - The MO-1 is susceptible to fluctuating power supply power. This is the track power supply. As touched in part 1, if the track voltage varies a lot from no load (not running) to full load (running), then the MO-1 may falsely trigger as though the Trak-DTT has triggered it. You can tell if this is the case by just looking at the indication LED's. If the MO-1 LED is on (when at a partial or full stop) and the Trak-DTT's LED is off, then the MO-1 was triggered by the track power fluctuations. Fluctuations will normally occur during running on dirty track. Large fluctuations occur when the power transformer cannot hold the voltage very steady during these times. That is what causes a false trigger. Be sure to have your track, engine / trolley wheels clean and their pickups clean as well (whatever is wiping the wheel to bring the power into the engine / trolley). If your finding this to be a problem and have tried a better, higher VA, power pack then you may want to try placing a thin oil (such as clipper oil) on the rails will alleviate most, if not all, of the intermittent operation since it helps to move the dirt aside allowing better track pickup throughout the operation.

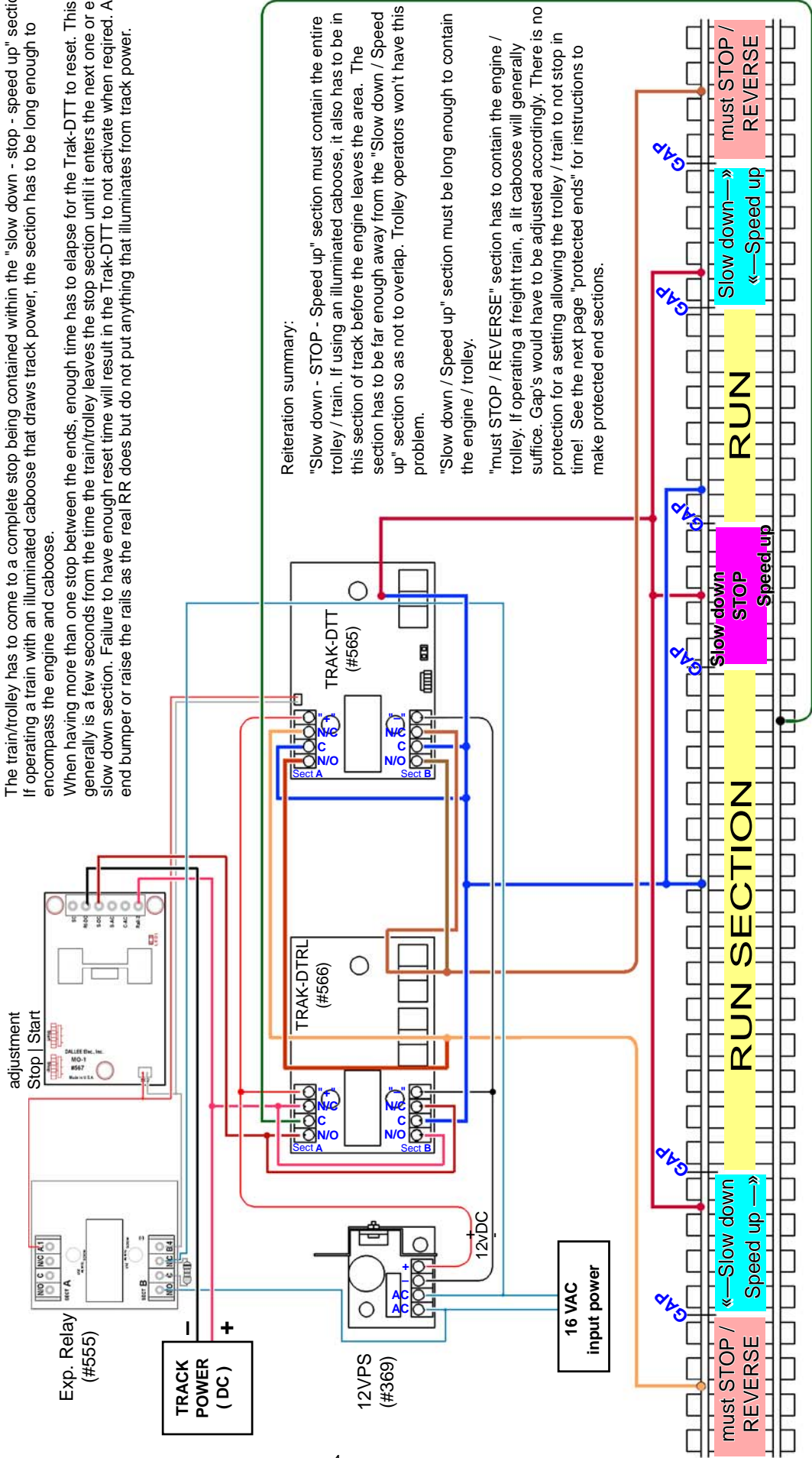
Remember, the Trak-DTT should have its potentiometer set to at least 10 o'clock or further clockwise. Otherwise the time will be too short for proper stopping and starting.

AUTOMATIC REVERSE with TIMED STOP AT ENDS with Memory & Momentum Start/Stop.



AUTOMATIC REVERSE with TIMED STOP AT ENDS with Memory & Momentum Start/Stop and Momentum Start/Stop between ends.

All connections and explanations as found on the first main page apply to this drawing.
 Although only one stop between has been shown, multiple can be made in the same way.
 The train/trolley has to come to a complete stop being contained within the "slow down - stop - speed up" section. If operating a train with an illuminated caboose that draws track power, the section has to be long enough to encompass the engine and caboose.
 When having more than one stop between the ends, enough time has to elapse for the Trak-DTT to reset. This generally is a few seconds from the time the train/trolley leaves the stop section until it enters the next one or end slow down section. Failure to have enough reset time will result in the Trak-DTT to not activate when required. An end bumper or raise the rails as the real RR does but do not put anything that illuminates from track power.



Reiteration summary:

- "Slow down - STOP - Speed up" section must contain the entire trolley / train. If using an illuminated caboose, it also has to be in this section of track before the engine leaves the area. The section has to be far enough away from the "Slow down / Speed up" section so as not to overlap. Trolley operators won't have this problem.
- "Slow down / Speed up" section must be long enough to contain the engine / trolley.
- "must STOP / REVERSE" section has to contain the engine / trolley. If operating a freight train, a lit caboose will generally suffice. Gap's would have to be adjusted accordingly. There is no protection for a setting allowing the trolley / train to not stop in time! See the next page "protected ends" for instructions to make protected end sections.

Momentum Start/Stop with protected ends.

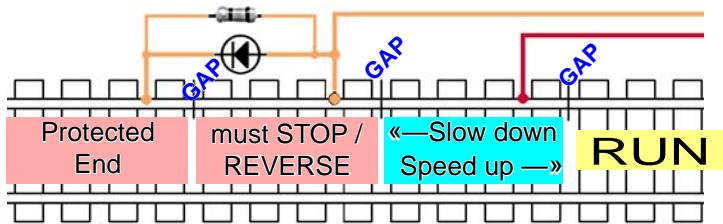
All connections and explanations as found on the other pages apply to this drawing. Since this drawing only deals with protected ends when using the MO-1 unit, that is all that is shown in large detail. This can be applied to any of the back-n-forth drawings utilizing the MO-1 unit. A full drawing example is shown at the bottom of the page.

By creating another section beyond the normal stop section a guaranteed stop is performed regardless of the speed entering the previous section of "must STOP / REVERSE". However, if you are running too fast, you may still possibly exceed the length of track in the "Protected End" section. When entering the "Protected End" section, power is removed from the track via the diode. A resistor or ballast lamp, item 538, must be used to enable detection of a load for the track power to reverse

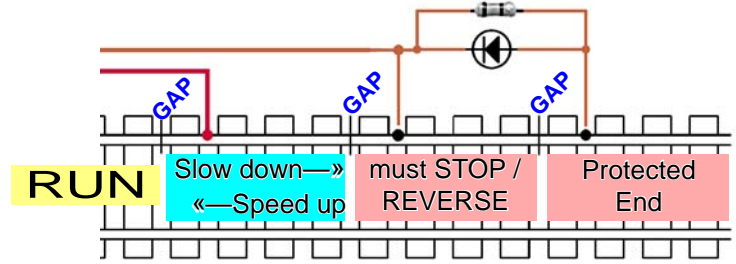
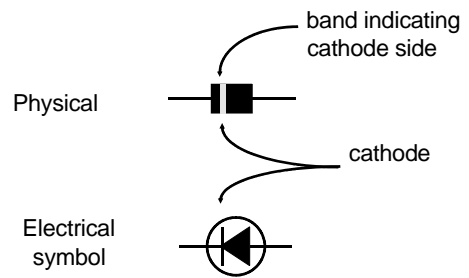
when the engine / trolley is fully into this section alone. The value of the resistor will vary as per the type of track power you are using. For "G" operators, we suggest a 22 ohm 2 watt resistor (item 504). Others may need the same, a higher value, or use the ballast lamp. When using a resistor the value has to be high enough to not operate the engine / trolley when it is to be stopped but low enough to operate the Trak-DTRL sense circuitry.

Remember, each section between the gaps needs to be long enough to hold the engine / trolley. By not making it long enough proper triggering of the units may not occur due to track power pickups not picking up from each truck at the same time (intermittently).

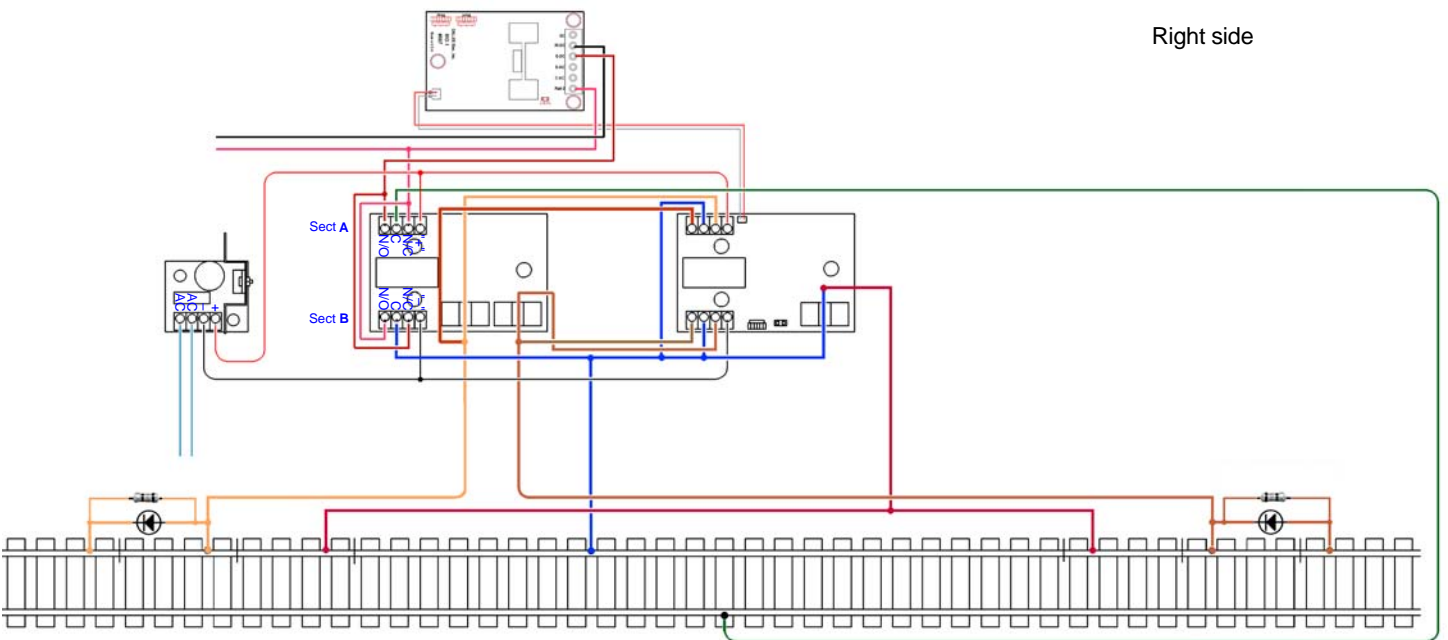
G operators and others requiring a high track current should use item 375 diodes (6 ampere). Low current operators can use item 374 (1 ampere) diodes.



Left side



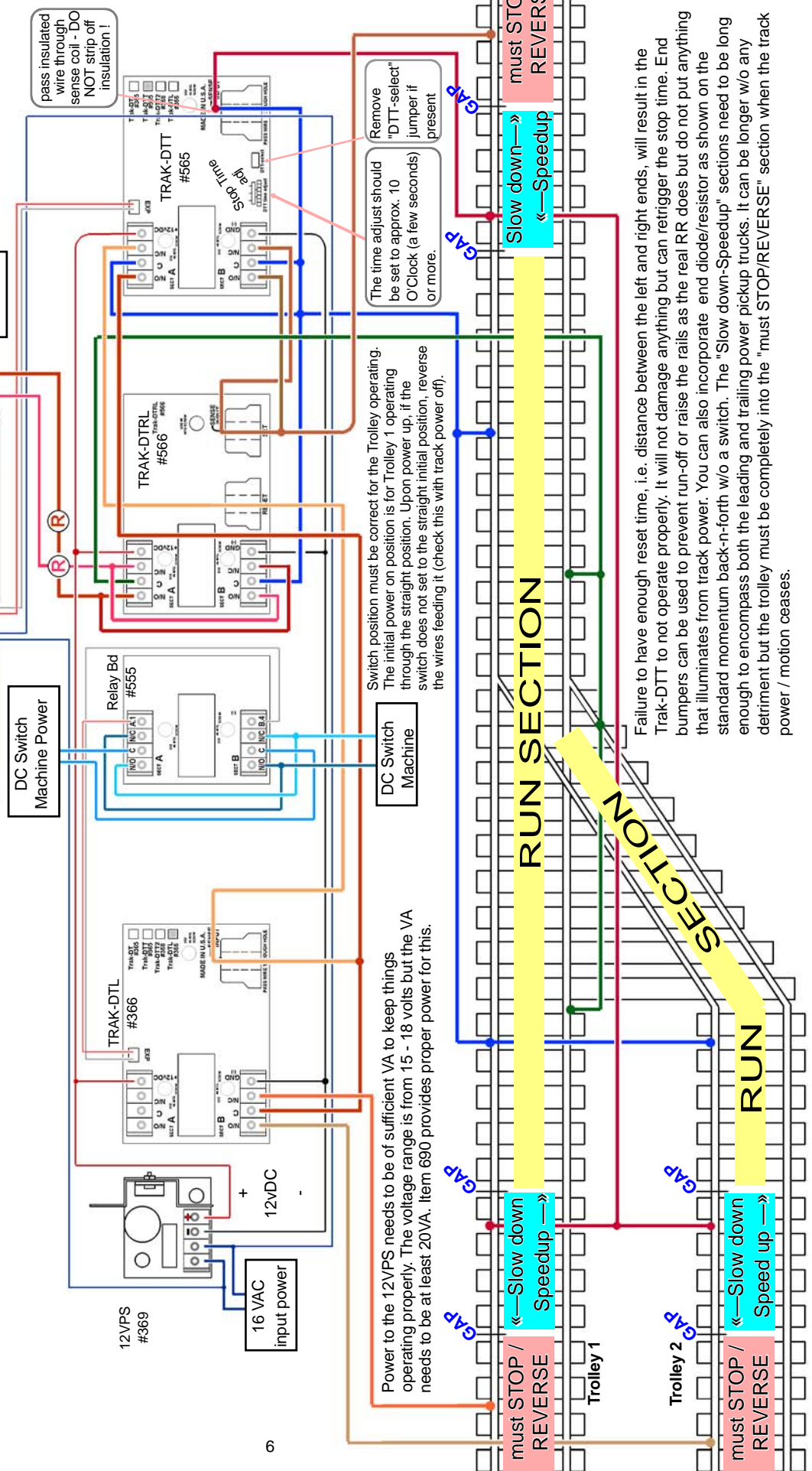
Right side



AUTOMATIC REVERSE of Two Trolleys with TIMED STOP at ENDS, Memory & Momentum Start/Stop.

If you run off of the ends (and momentum does work), you will need to reverse the pinkish red and dark red wires between the MO-1 and Trak-DTRL (upper connections marked "R"). This is due to the NIMRA and "G" standards being opposite of each other.

Trak-DTL controls which trolley operates. It also controls the Relay Bd which operates the switch machine by controlling the polarity to it. The Trak-DTRL will only operate upon current sense after the stop time has been completed by the Trak-DTT and track power has resumed via the MO-1. This is also when the Trak-DTL's sense operates and changes to the opposite Trolley and throws the Switch. This is why when turning power off, both trolley's need to be in the left "must STOP/REVERSE" section since the startup position of the Trak-DTL will be set upon power becoming restored to the track via the MO-1.



AUTOMATIC REVERSE of Two Trolleys with TIMED STOP at ENDS, Memory, Momentum Start/Stop, plus Stops between ends.

Trak-DTL controls which trolley operates. It also controls the Relay Bd which operates the switch machine by controlling the polarity to it. The Trak-DTRL will only operate upon current sense after the stop time has been completed by the Trak-DTT and track power has resumed via the MO-1. This is also when the Trak-DTRL's sense operates and changes to the opposite Trolley and throws the Switch. This is why when turning power off, both trolley's need to be in the left "must STOP/REVERSE" section since the startup position of the Trak-DTL will be set upon power becoming restored to the track via the MO-1.

The "must STOP/REVERSE" sections and "Slow down-STOP-Speed up" section has to be long enough to encompass the leading and trailing power pickup trucks. It can be longer w/o any detriment but the trolley must be completely into these sections when the track power / motion ceases.

If you run off of the ends (and momentum does work), you will need to reverse the pinkish red and dark red wires between the MO-1 and Trak-DTRL (upper connections marked "R"). This is due to the NMRA and "G" standards being opposite of each other.

