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Signal Animator Instruction Supplement

Revised 6/15/07

Introduction

This supplement shows you how to do the following with the ***Signal Animator***:

- Interlock (i.e. force to red) a single head signal with turnout position (use with any version of the ***Signal Animator***)
- Interlock a dual head signal with turnout position (use with any version of the ***Signal Animator***)
- Control 2-light LED-based signals (using the SA-1 version of the ***Signal Animator***)
- Implement a semi-prototypical block signal setup using one ***Signal Animator***, two photocells and two signals.
- Minimizing electrical noise effects from other sources that may cause false triggering of the ***Signal Animator***
- Using an infrared emitter and detector instead of the photocell

Interlocking a single head signal with turnout position

If you locate your signal near a turnout it is desirable (and prototypical!) to interlock the signal with the position of the turnout. What this means is that the signal will be forced to display red when the turnout is not aligned properly for the route the signal protects. Figure 1 below shows how you can use the auxiliary contacts on a switch machine/motor to accomplish this. Many switch machines/motors have one or more sets of "SPDT" (single pole double throw) contacts that you can use. Basically all that is needed here is an "SPST" arrangement. You simply want to have the photocell disconnected from the ***Signal Animator*** when the turnout is thrown for the diverging route (the terminal labeled COM makes contact with the terminal labeled N.O. (Normally Open)). When the photocell is disconnected the ***Signal Animator*** will be tricked into thinking the photocell is covered from light (because the open circuit looks like an infinitely high resistance to it) and will thus display red on the signal. When the turnout is moved from the diverging route to the main route (the terminal labeled COM makes contact with the terminal labeled N.C. (Normally Closed)) the photocell will be reconnected and, if uncovered, the ***Signal Animator*** will delay, turn the signal yellow, delay and finally turn the signal green.

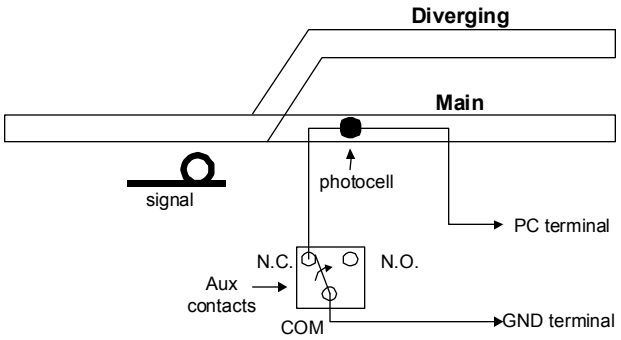


Figure 1

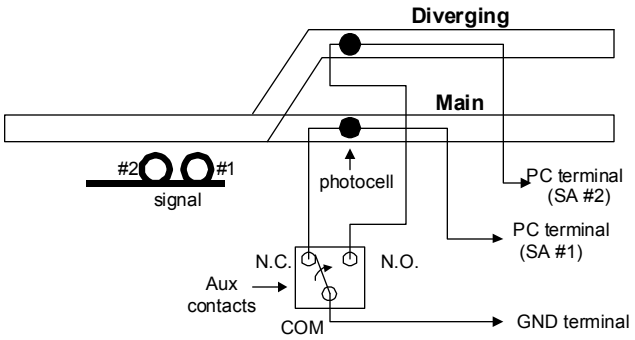


Figure 2

Interlocking a dual head signal with turnout position

If you want to have an even more prototypical signal arrangement near a turnout then you can use a dual head signal along with two ***Signal Animators***. One head or the other will display red since the turnout cannot be aligned for both routes simultaneously! Figure 2 above shows how you can use the auxiliary contacts on a switch machine/motor to accomplish this. You will need one set of "SPDT" (single pole double throw) contacts. The photocell for the diverging route will be disconnected from its ***Signal Animator*** (#2) when the turnout is thrown for the main route (the terminal labeled COM makes contact with the terminal labeled N.C. (Normally Closed)). Similarly, the photocell for the main route will be disconnected from its ***Signal Animator*** (#1) when the turnout is thrown for the diverging route (the terminal labeled COM makes contact with the terminal labeled N.O. (Normally Open)). When the photocell is disconnected the ***Signal Animator*** will be tricked into thinking the photocell is covered from light (because the open circuit looks like an infinitely high resistance to it) and will thus display red on the signal. When the photocell is reconnected, and if uncovered, the ***Signal Animator*** will delay, turn the signal yellow, delay and finally turn the signal green. In the above circuit the two ***Signal Animators*** MUST be supplied with DC power and have their power inputs wired together as shown in Figure 3 below.

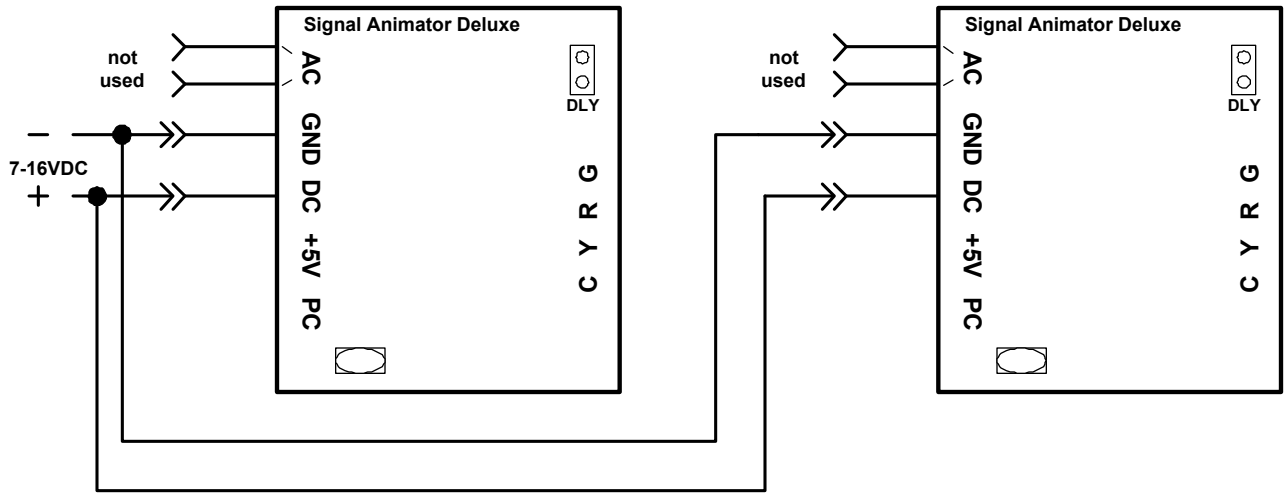


Figure 3

2-light LED-based signals

When using 2-light LED-based signals you will need to add the following circuit to the outputs of the ***SA-1***.

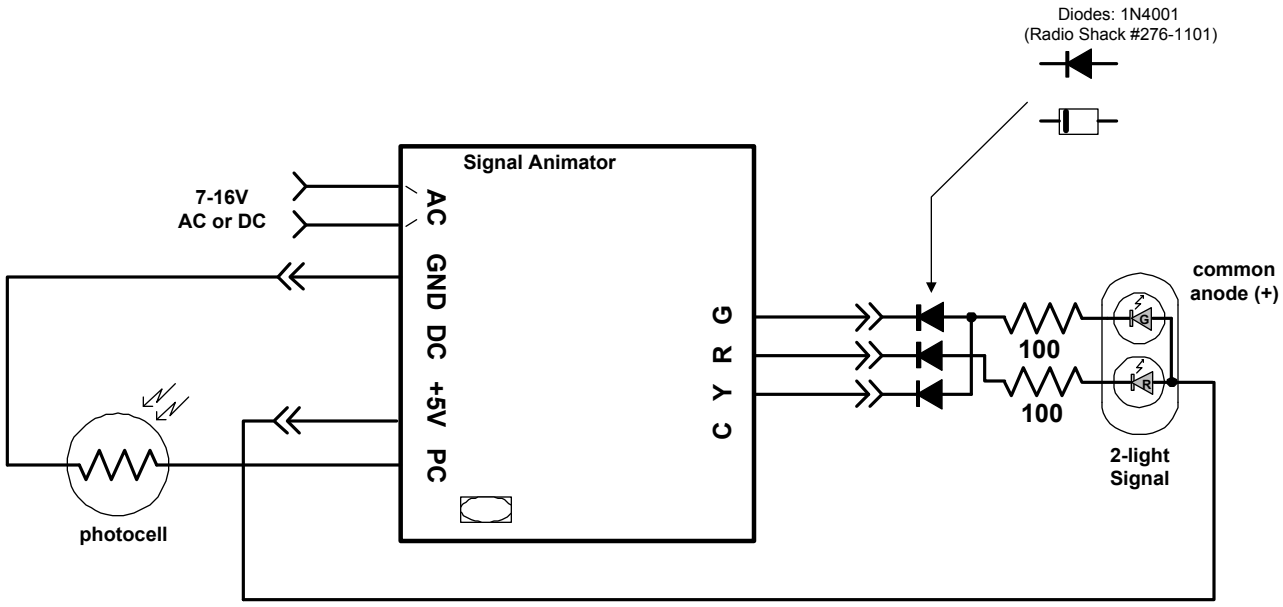
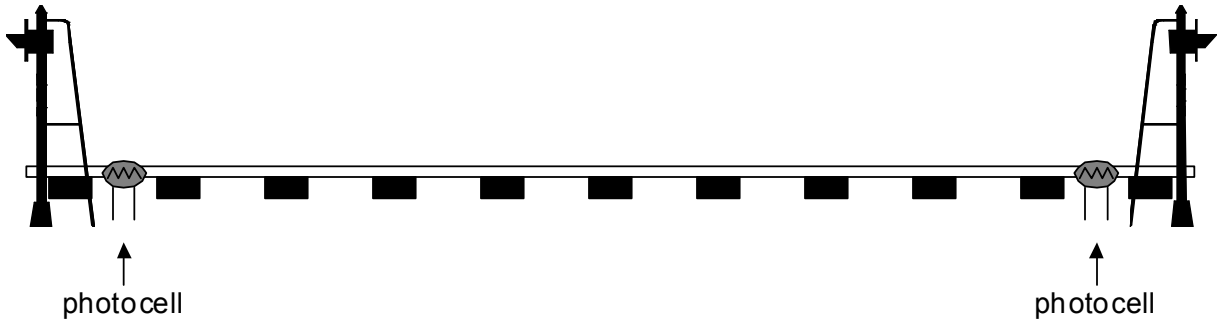


Figure 4

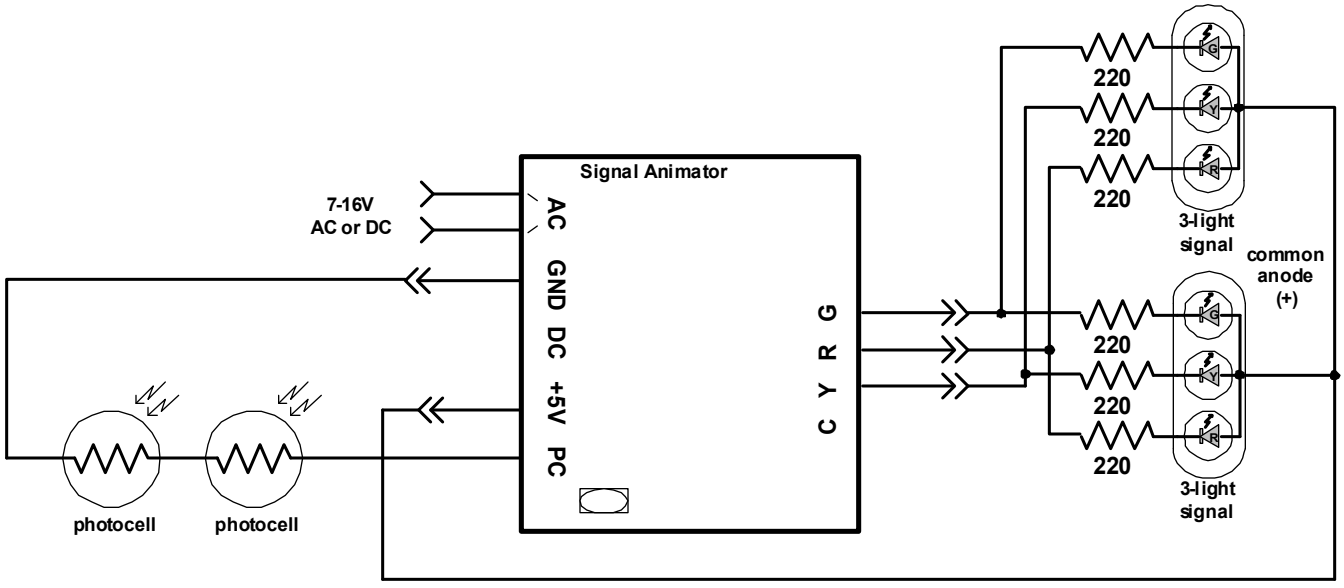
Implement a semi-prototypical block signal setup

It is possible to use a single ***Signal Animator*** to mimic a conventional block signaling setup. As shown in the drawing below this requires a second photocell for train detection and a second signal. As shown you will locate one photocell and one signal at each end of the block. In operation when either photocell is covered BOTH signals will turn red. Once BOTH photocells are uncovered the circuit will begin its selected time delay (10 or 30 seconds). As long as neither photocell is covered before the time delay expires BOTH signals will turn yellow. Again the circuit will begin another time delay and as long as BOTH photocells continue to remain uncovered then BOTH signals will turn green at the end of the second time delay. This signal behavior is categorized as "semi-prototypical" because of the behavior of the second signal that the train passes. In a truly prototypical signal system when the train travels towards the direction the signal is facing the signal would change from red (because the block it was protecting was just occupied by the train!) to green because the block is now clear. The simplistic design of ***Signal Animator*** is such that both signals operate in unison and thus one of them appears to cycle prototypically (i.e. red -> yellow -> green) while the other one appears to cycle semi-prototypically.



The block can be whatever length you decide is appropriate. However, consider the following operational scenario: your shortest train enters the block and covers the first photocell causing the signals to turn red, once it uncovers that photocell it must be able to reach (i.e. cover) the second photocell at the other end of the block BEFORE the time delay has expired. If it does not do so then the signals will turn yellow and the circuit will begin its second time delay. If this delay expires before the train reaches the second photocell then the signals will turn green. Then once the train finally reaches the second photocell the signals will immediately turn red again and cycle through the behavior described in the first paragraph above. Obviously this is not the most desirable signal behavior so space your photocells appropriately to avoid this scenario!

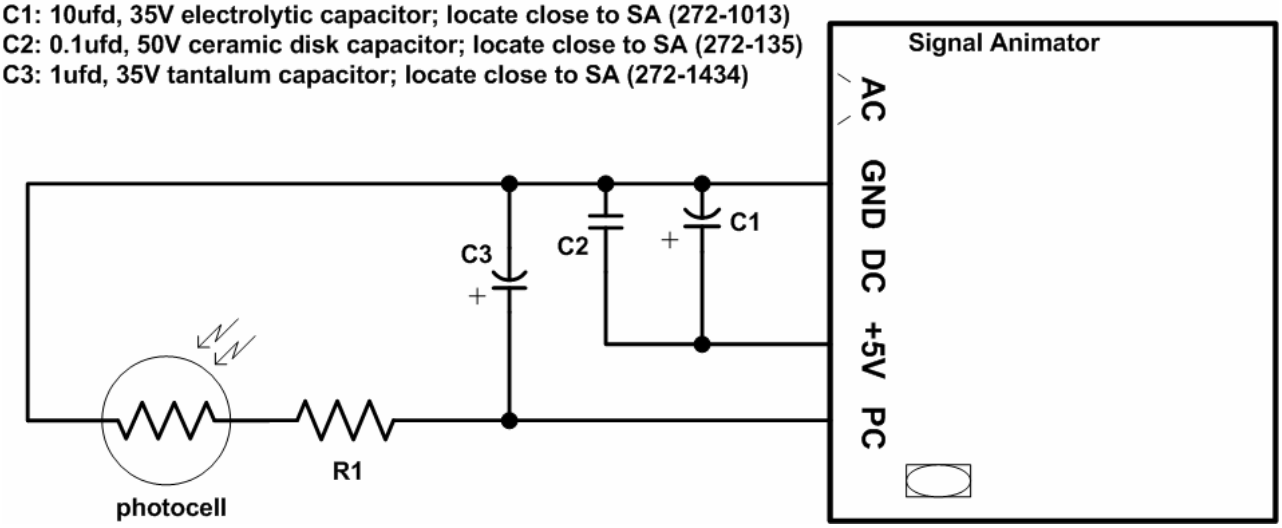
The drawing below shows the wiring for this setup. Although the drawing is based upon version ***SA-1*** of the ***Signal Animator*** and 3-light LED-based signals, you can use any version of the ***Signal Animator*** along with the appropriate signal types. Note that for some versions of the ***Signal Animator***, such as the ***SA-1***, it is necessary to adjust the value of the current limiting resistors when connecting two signal heads together; refer to the specific instructions for the version of the ***Signal Animator*** you'll be using.



Minimizing electrical noise effects from other sources that may cause false triggering

Switch machines, switch motors and electrical uncouplers are notorious for generating electrical noise when they are energized. Such noise can be inadvertently coupled onto the ***Signal Animator's*** photocell connections which can then lead to false triggering of the signal circuit. The first remedy to try is to make sure that wiring for those devices is kept apart from the photocell wiring. This may not always be practical (especially if you're interlocking the signal head(s) with turnout position as described in the beginning of this document). If that's the case, adding decoupling/filter components to the ***Signal Animator*** circuit will usually eliminate the false triggering. The drawing below illustrates what needs to be done. Note that capacitors C1 and C3 are polarized so make sure you connect them correctly; C2 has no polarity. Also, pay attention to the component location as outlined below in the parts list. The numbers in parentheses are Radio Shack part numbers.

R1: 100 ohm, 1/4W resistor; locate close to photocell (271-1311)
C1: 10ufd, 35V electrolytic capacitor; locate close to SA (272-1013)
C2: 0.1ufd, 50V ceramic disk capacitor; locate close to SA (272-135)
C3: 1ufd, 35V tantalum capacitor; locate close to SA (272-1434)



It may also be necessary to add filtering to the power source for the "offending" item. For example, if you are using switch motors powered by a DC (unipolar or bipolar) power source you may need to add filter capacitors to that power source. We suggest a 0.1ufd/50V ceramic disk capacitor (such as C2 above) in parallel with a 100ufd/35V electrolytic capacitor (similar to C1 above, but obviously a higher value). Connect them similar to the way C1 & C2 are connected above (i.e. positive lead to positive power output; negative lead to the negative power output or ground).

Finally, if noise problems still exist you may need to use coaxial cable for the photocell connections. Connect the shield of such a cable to GND terminal on the ***Signal Animator*** and connect the center wire to the PC terminal.

Using an infrared emitter and detector instead of the photocell

It is possible use an infrared emitter and detector pair instead of the photocell for train detection. The wiring for this is shown below (note that input power and signal head connections are not illustrated in this drawing). When the infrared beam is not obstructed from the detector the output of the detector will be approximately 0.2V. When the infrared beam is obstructed the output of the detector will essentially appear like an open circuit to the ***Signal Animator's*** PC input which will be interpreted like a covered photocell.

The value of the current-limiting resistor, R, must be calculated appropriately! Refer to the specification for the IR emitter (IR-E) to find its current consumption (I) and voltage forward (Vf) drop. The resistor value is then calculated using this formula: R = (5 - Vf)/I. For example, if I is 10mA (0.01 Amps) and Vf is 2 volts then R = (5-2)/0.01 = 300 ohms; use a commercially available value such as 330 ohms.