LOGIC RAIL™ TECHNOLOGIES

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Grade Crossing Pro

- Infrared detection upgrade

Instructions

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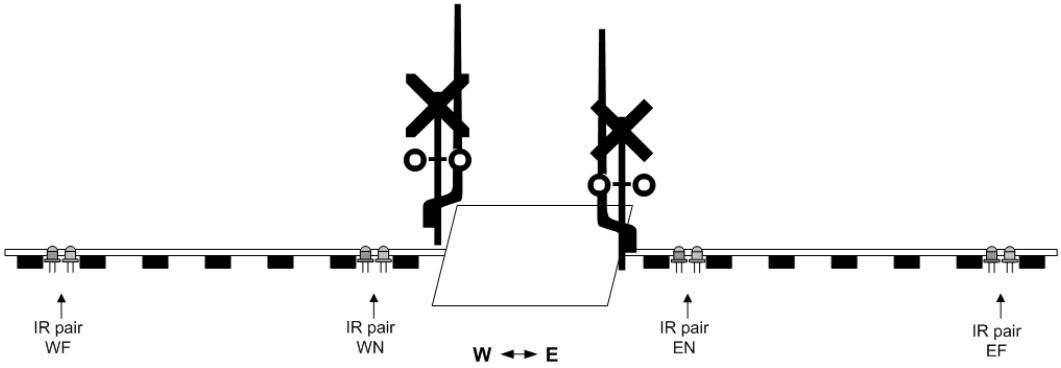
Getting started

Thank you for purchasing a ***Logic Rail Technologies*** product! Please familiarize yourself with all the instructions prior to installing this board.

This Infrared (IR) upgrade kit for the ***Grade Crossing Pro*** (**GCP**) supplements the original instructions for the GCP. The instructions herein describe the installation of the IR components. Four pairs of Infrared (IR) emitters and detectors are used for bidirectional train detection. Detection is achieved when the IR beam from the emitter reflects off the underside of the train back down to the detector. **Despite the use of infrared components you could still encounter false triggering from overhead lighting. This is usually eliminated with angled sensor mounting (Figure 1c) and/or proper sensor sensitivity adjustment (page 2). This version of the GCP must be powered from either a 7-9V AC or 9-12V DC power source (such as our 12VPSR). Do NOT exceed these limits!** The layout of the signals and IR components is illustrated below.



Installing the GCP replacement chip

The main chip (the one with the colored dot on it) on the GCP must be replaced with the one that has "INV" on it. First, carefully pry the existing chip out of its socket using a flat blade screwdriver. Be VERY careful when doing this so that you do not damage the socket or circuit board. Next, carefully insert the replacement chip in the socket while making sure that the pins do not bend or fold underneath the chip. Make sure that the writing on the chip is in the same orientation as the ***Grade Crossing Pro*** name on the circuit board!

TrueLamp2 (Lamp Persistence)

Beginning with version 3.0 of the main GCP chip we have enhanced our TrueLamp feature which provides realistic fading in and out of signals while flashing. This feature is turned on or off using the LP switch on the circuit board.

Switch Name	Meaning when OFF/OPEN	Meaning when ON/CLOSED
LP	No Lamp Persistence (TrueLamp2)	Lamp Persistence (TrueLamp2) enabled

This feature can be used with either LED-based or bulb-based signals. Note that due to the technical nature of how this is accomplished, it may potentially shorten the life of bulb-based signals; there are no concerns with LED-based signals!

Mounting and wiring the IR components

The IR components should be mounted between the rails. Drill two 11/64" holes, approximately ¼" apart, through the ballast, roadbed, and sub-roadbed. For the smaller scales this drilling may end up hitting the ties. Take your time so you don't mangle them! Figure 1a illustrates the suggested placement of the IR components between the rails; you may also locate them a tie apart from each other (Figure 1b). Insert the leads of one IR emitter (white and black wires) into one of the holes (it doesn't matter which one!) from the top of your layout. Repeat for the IR detector (blue and black wires). The tops of the components should sit no higher than the top of your ballast for optimal IR performance; in some cases (e.g. false triggering) it may be necessary to locate the components a little below the ballast line. You can extend the leads with similar (or larger) wire. We recommend soldering and insulating these connections. We also recommend using terminal blocks/strips since you'll have multiple DC and GND connections to make. Once you have wired the IR components and verified their operation you may wish to put a dab of white glue or silicone caulk where the wires exit the holes underneath the layout. This will help to

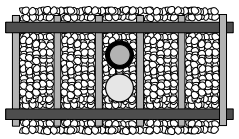


Figure 1a

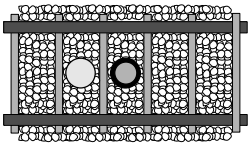


Figure 1b

hold the components in place; make sure you don't get any substance (e.g. ballast or glue) on the top surface of the IR components as this may prevent them from operating properly. **Figure 1c is a variation of Figure 1b. In this case the IR components are mounted at an angle to each other. The benefit of this method is reduced false triggering from overhead light and increased detection reliability in smaller scales or irregular bottoms on rolling stock.**

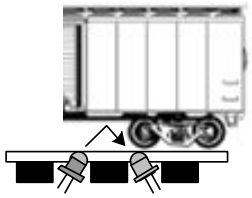


Figure 1c

Figure 2 below illustrates the wiring for one set of IR components (shown for sensor location "WN"). Use the same wiring scheme for the three remaining sensor locations (WF, EN, EF). Four 180 ohm 1 Watt resistors are included with this kit. **WARNING: The 180 ohm 1 watt resistor may become hot to the touch – take care so that you don't burn yourself!** When properly wired the emitter will have a very faint red glow coming from it. You can also look at the emitter through a digital camera and see the infrared light! **For safety reasons do NOT point the IR emitter directly into your eye or stare at the IR emitter!!!**

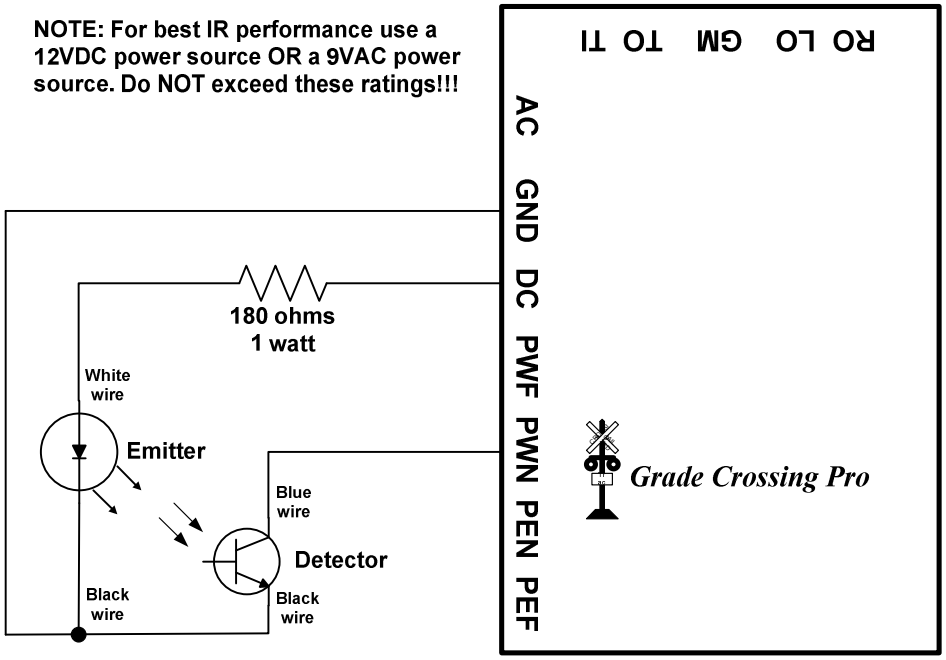


Figure 2 – IR component wiring

Sensor sensitivity setup

You can adjust the sensitivity of each sensor on the circuit board using a small slotted head screwdriver. Along one each of the board are four potentiometers (or "pots") that are labeled "WF", "WN", "EN" or "EF". The GCP supports a SETUP mode to make this adjustment process easier. To enable this mode, you must have the switch labeled SETUP in the ON/CLOSED position. In this mode the signals and gates will not operate. The GCP circuit board contains a red LED near the configuration switches; this LED will assist you in setting the sensor sensitivity. Now follow these steps:

1. Remove all obstacles that may be covering the sensors.
2. Turn all four adjustment pots fully clockwise and verify that the red LED is off.
3. Place a piece of rolling stock over sensor WF. Insert the blade of the screwdriver (from the edge of the circuit board, not from the center of the board) into the WF adjustment pot. Turn the screwdriver counter-clockwise (left) until the red LED turns on.
4. Move the rolling stock away from sensor WF and verify that the red LED turns off. If it stays on then turn the screwdriver slightly clockwise (right) until the red LED turns off. Verify that when the rolling stock covers sensor WF the red LED still turns on. Turning the adjustment pot more counter-clockwise increases the vertical range of detection.
5. Repeat steps 3-4 for the three remaining pots.
6. Exit SETUP mode by putting the SETUP switch in the OFF/OPEN position. The crossing signals should now operate properly. You may wish to repeat this procedure with any other layout lighting conditions you operate under (e.g. "daytime" vs. "nighttime").

Power

The GCP accepts 7-9V AC or 9-12V DC power. Power consumption when used with LED-based signals is approximately 390mA; power consumption when using bulb-based signals is approximately 430mA. If you are only using a single GCP then use the TWO AC terminals to provide power (polarity doesn't matter). CAUTION: Most AC or DC accessory terminals on your throttle/power pack exceed 12V and cannot be used with the GCP! However, you can use those power sources in conjunction with our 12VPSR which will provide 12V DC. If you are using more than one GCP you can power them all from a single 9-12V **DC** source as shown in Figure 3 below.

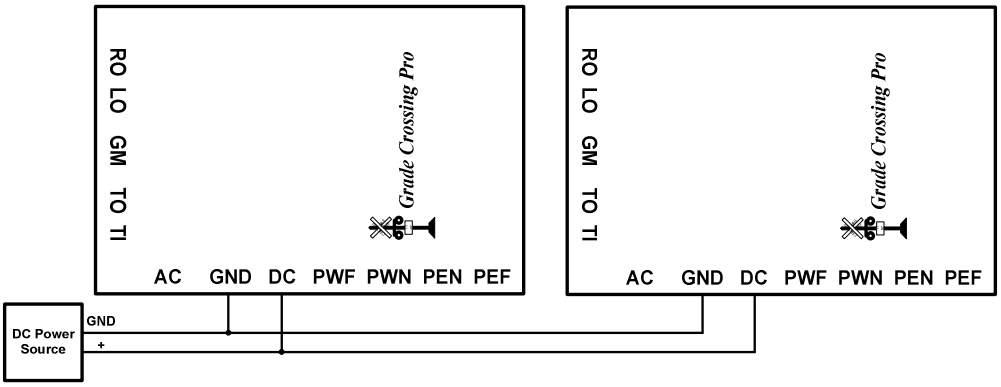


Figure 3 – DC power

Multi-track grade crossings

There is an obvious tendency to just add additional sensors to handle additional tracks when you have a multi-track grade crossing. The problem with this implementation is that the GCP cannot differentiate between two trains traveling in opposite directions on different tracks. As such it could easily get "confused" and not provide the prototypical sequencing (i.e. the action starts when the train covers a far sensor and the action stops when the train clears the near sensor on the other side of the crossing). If you will have multiple trains traveling through the crossing area (with outer boundaries defined by the far sensors) at the same time then you must use one GCP for each track. See the next section for details on how to cascade multiple GCPs. **IF you operate your trains such that only ONE train can possibly go through the crossing area at a time then you CAN simply add additional sensor sets (available from us) for the additional tracks.** In this implementation you will wire the additional sensors the same way you did for their counterparts on the first track (i.e. per Figure 2). So for example, the blue wire from ALL of the WN detectors will connect to the PWN terminal on the GCP.

Troubleshooting

If your signals do not flash when a particular sensor is activated then you can perform the following tests. First, perform the sensor setup routine previously described. If one or more of the sensors does not function properly then you know it is faulty. If the sensors are OK then you might have a problem with the GCP, the signals, or the wiring between them.

If the red LED on the GCP board stays lit when the GCP is in SETUP mode then there is a problem with: sensor sensitivity, sensor wiring, or one of the chips on the GCP. First, double-check your sensor wiring. A missing sensor connection (missing wire or open circuit) will be interpreted by the GCP as a cleared sensor. A shorted sensor (i.e. blue and black wires touching) will be interpreted by the GCP as an activated sensor. Next, put the GCP in SETUP mode (see page 1) and turn all four sensor sensitivity pots completely counter-clockwise (left). If the red LED goes out then simply complete the sensor setup process continuing with Step 3 on page 4. If the red LED is still lit then the problem is either a bad sensor or a faulty chip on the GCP.

You can determine if the GCP sensing chip is working correctly by TEMPORARILY disconnecting all blue sensor wires from the GCP. If the red LED on the GCP is lit then its sensing chip is faulty (read on below for details on replacing it). If, on the other hand, the red LED on the GCP is now dark then connect each sensor input (PWF, PWN, PEN, PEF) to GND, ONE sensor input at a time. An activated sensor appears to the GCP like a connection to GND so you are, in effect, mimicking an activated sensor with this test. If the red LED does NOT come on each time you make that temporary connection (make sure you try all four sensor inputs!) then you have a faulty chip.

The chip that "processes" the sensor inputs is located closest to the photocell sensitivity pots. This chip is labeled "LM339". Replacements are available from us or you can purchase one from stores such as Radio Shack (part number 276-1712). To replace the chip you will need to gently pry it out of its socket using a flat blade screwdriver. Take great care when inserting the replacement chip so that you don't bend any of its pins underneath it. Make sure the text on the chip has the same orientation as the name "Grade Crossing Pro" on the circuit board.

Still having problems?! Please contact us for further assistance!

Warranty

This product is warranted to be free from defects in materials or workmanship for a period of one year from the date of purchase. ***Logic Rail Technologies*** reserves the right to repair or replace a defective product. The product must be returned to ***Logic Rail Technologies*** in satisfactory condition. This warranty covers all defects incurred during normal use of this product. This warranty is void under the following conditions:

1) If damage to the product results from mishandling or abuse.
2) If the product has been altered in any way (e.g. soldering).
3) If the current or voltage limitations of the product have been exceeded.

Requests for warranty service must include a dated proof of purchase, a written description of the problem, and return shipping and handling ($6.00 inside U.S./$10.00 outside U.S. - U.S. funds only). Except as written above, no other warranty or guarantee, either expressed or implied by any other person, firm or corporation, applies to this product.

Technical Support

We hope the preceding instructions are sufficient for answering any questions you might have about the installation of this product. If you require technical support first contact your place of purchase for assistance. If you still need further assistance then please do not hesitate to contact us by phone, mail and email; our contact information can be found on page 1.