LOGIC RAIL™
TECHNOLOGIES
21175 Tomball Pkwy
Suite 287
Houston, TX 77070

"Sophisticated Model Railroad Electronics"

Phone: (281) 251-5813
email: info@logicrailtech.com
http://www.logicrailtech.com

Grade Crossing Pro

Application Note: Complex crossings

Revised 7/11/12

Introduction

This application note describes how to use the ***Grade Crossing Pro*** (**GCP-IR or GCP**) for complex crossings. We define a complex crossing as one having one or more turnouts included within the crossing zone. This ranges from a simple arrangement where there's a turnout at the far end of the crossing zone to the more complex situation where there's a double crossover between a double track mainline. In this application note, for the sake of simplicity, all other wiring (power, signals, etc) is NOT shown so please refer to the GCP/GCP-IR instructions for those details. Although there are many track arrangements shown in this application note we may not have covered your exact situation or detection type (infrared vs. photocell). If this is the case and you cannot extrapolate from one shown, then please contact us and we'll help you!

Here are the track arrangements covered in this application note:

- Siding on one side of a crossing (using photocells)
- Far end double track (using photocells)
- Single track going into a double track crossing (using photocells)
- Single track going into a double track crossing (using infrared)
- Double track mainline with a single crossover at the crossing (using photocells)
- Double track mainline with a single crossover at the crossing (using infrared)
- Double track mainline with a double crossover (using photocells)
- Double track mainline with a double crossover (using infrared)
- Double track mainline with a double crossover and two spur tracks (using photocells)

Siding on one side of a crossing (using photocells)

There are two options for this arrangement. In the first option (Figure 1) it is assumed that you don't have any spare auxiliary contacts on the turnout's switch machine/motor. There are additional photocells required which MUST be wired as shown in the diagram below. Since the photocells are wired in series they behave in a "OR" function; in other words, a particular photocell input (e.g. PEF) will be activated when either photocell (e.g. EF1 or EF2) is covered. There is an operational caveat here. The GCP will operate prototypically as long as no train is covering the photocells on one track while another train is traversing through the detection area on the other track.

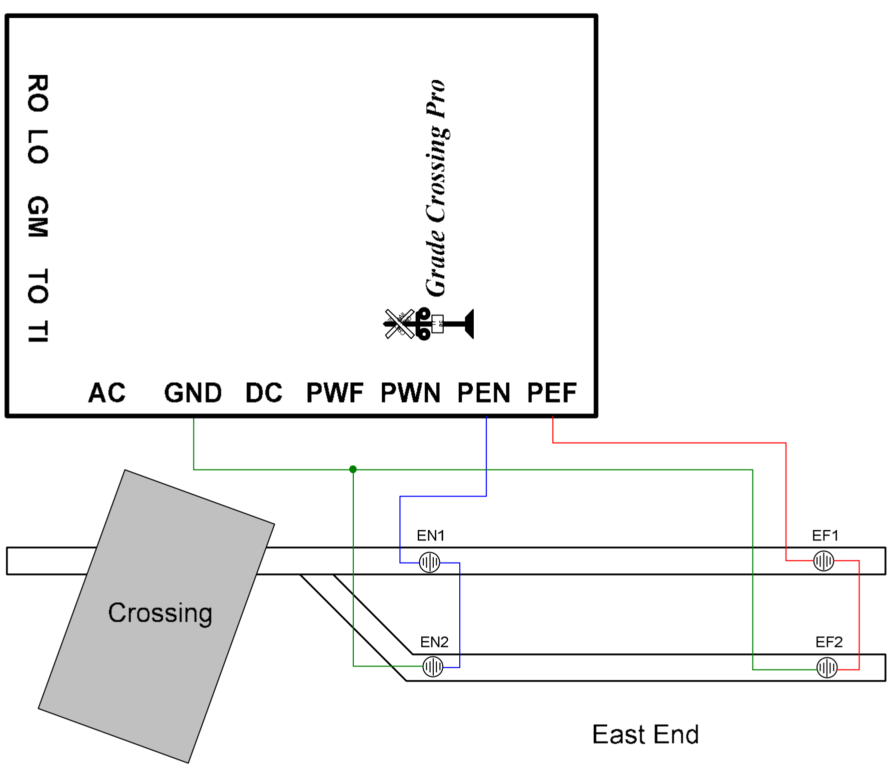

Figure 1

In the second option (Figure 2) you will use one set of SPDT auxiliary contacts on the turnout's switch machine/motor. The SPDT contacts are used to disable the FAR photocell on the track that is NOT selected by the turnout. For example, if the turnout is thrown for the straight route the EF2 photocell will be disabled (shorted out). As such you can have a train "parked" on the unselected track (but still not covering the EN photocell on that track) and not have the signals flash until the turnout is thrown for that route. There are additional photocells required which MUST be wired as shown in the diagram below. The NEAR photocells are wired in series so they behave in an "OR" function; in other words, the PEN photocell input will be activated when either photocell (EN1 or EN2) is covered.

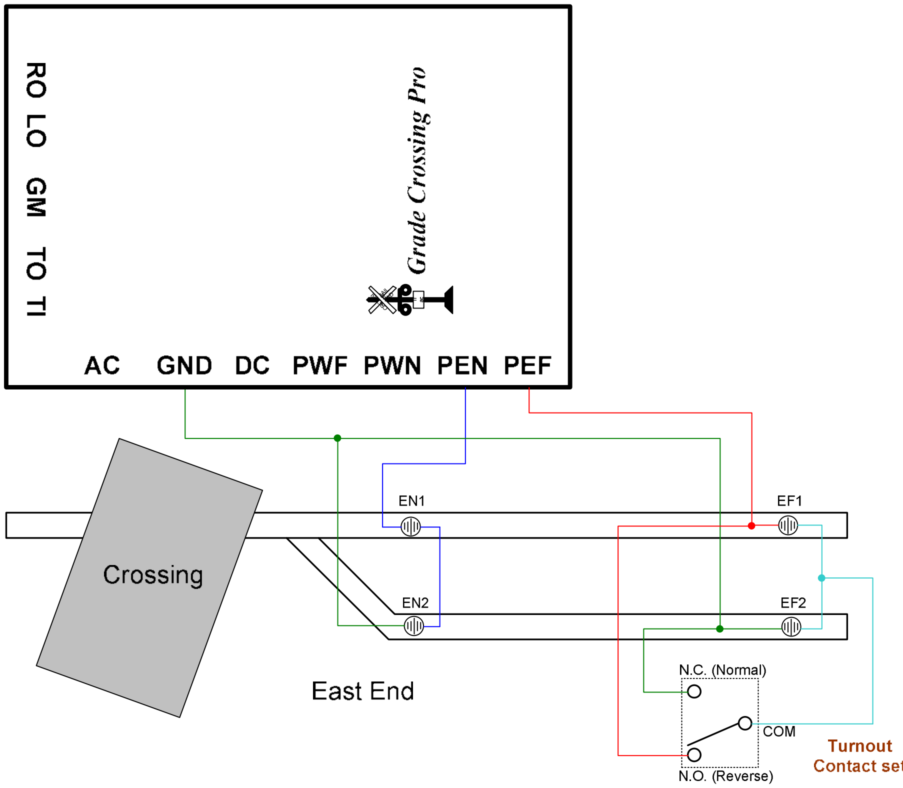

Figure 2

Far end double track (using photocells)

In this arrangement (Figure 3) you will use one set of SPDT auxiliary contacts on the turnout's switch machine/motor. The SPDT contacts are used to disable the FAR photocell on the track that is NOT selected by the turnout. For example, if the turnout is thrown for the straight route the EF2 photocell will be disabled (shorted out). As such you can have a train "parked" on the unselected track and not have the signals flash until the turnout is thrown for that route. There is one additional photocell required which MUST be wired as shown in the diagram below.

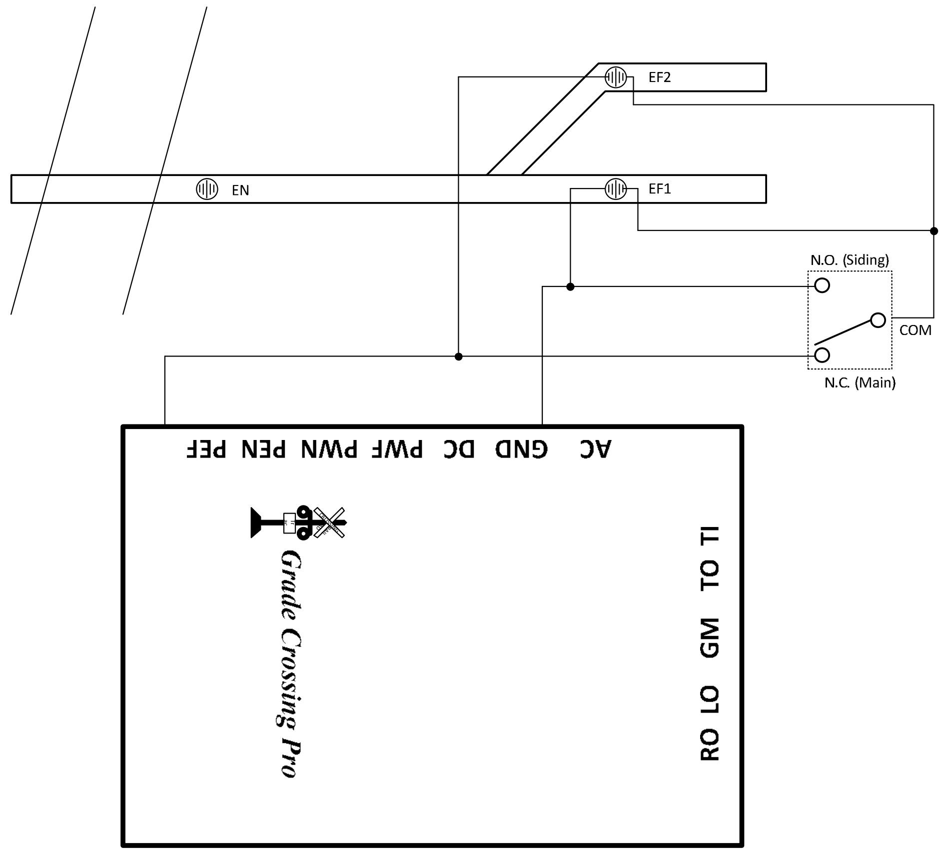

Figure 3

Single track going into a double track crossing (using photocells)

In this arrangement there is a turnout at the far West end of the crossing zone. Two GCPs are required and both are wired according to the standard instructions. This includes the "cascading" connection where the siding GCP's TO terminal is connected to the mainline GCP's TI terminal. You will need to use an SPDT set of auxiliary contacts on the turnout's switch machine/motor. The wiring shown in Figure 4 is in ADDITION to the standard photocell wiring for EACH GCP! When the turnout is Normal (mainline) the PWF photocell for the siding GCP will be shorted out to ground which eliminates it from being sensed by the siding GCP. The same is true when the turnout is Reversed with respect to the PWF photocell for the Mainline GCP. Locate the two PWF photocells in the single track area right where the turnout converges into the single track. For proper operation the turnout position should only be changed when there is no train anywhere within the detection zone.

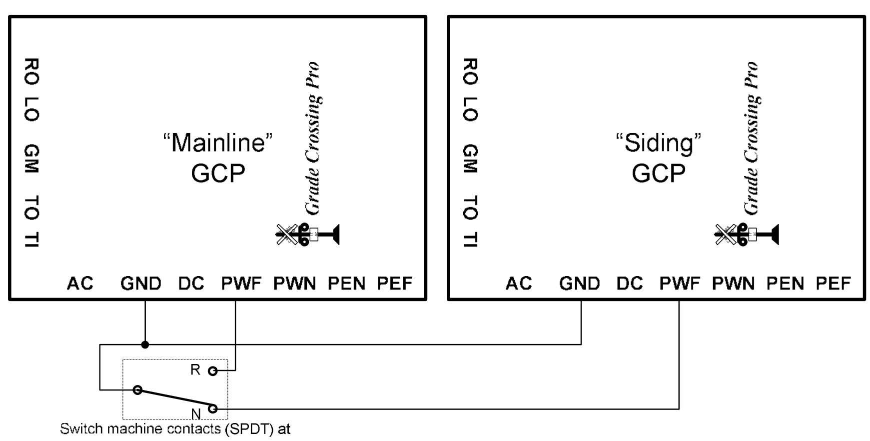

Figure 4

Single track going into a double track crossing (using infrared)

In this arrangement (Figure 5) there is a turnout at the far West end of the crossing zone. Two GCP-IRs are required and both are wired according to the standard instructions. This includes the "cascading" connection where the siding GCP-IR's TO terminal is connected to the mainline GCP-IR's TI terminal. In order to handle this situation you will need an SPDT set of auxiliary contacts on the turnout's switch machine/motor. The contacts will connect the West Far IR detector (blue lens device with black and blue wires) to the GCP-IR associated with the selected route. That way the GCP-IR for the unaligned route will not respond! All IR emitters (clear lens; depicted here as) are wired in parallel, each with its own 180 ohm resistor, to the associated GCP-IR. All but the WF IR detector (blue lens; depicted here as) are wired according to the GCP-IR instructions. The Normal position is when the turnout is aligned for track 1 while the Reverse position is when the turnout is aligned for track 2. The turnout MUST be in the appropriate position BEFORE a train enters the "zone of detection" (i.e. defined by the far detectors) and MUST REMAIN in that same position until the train CLEARS the zone of detection.

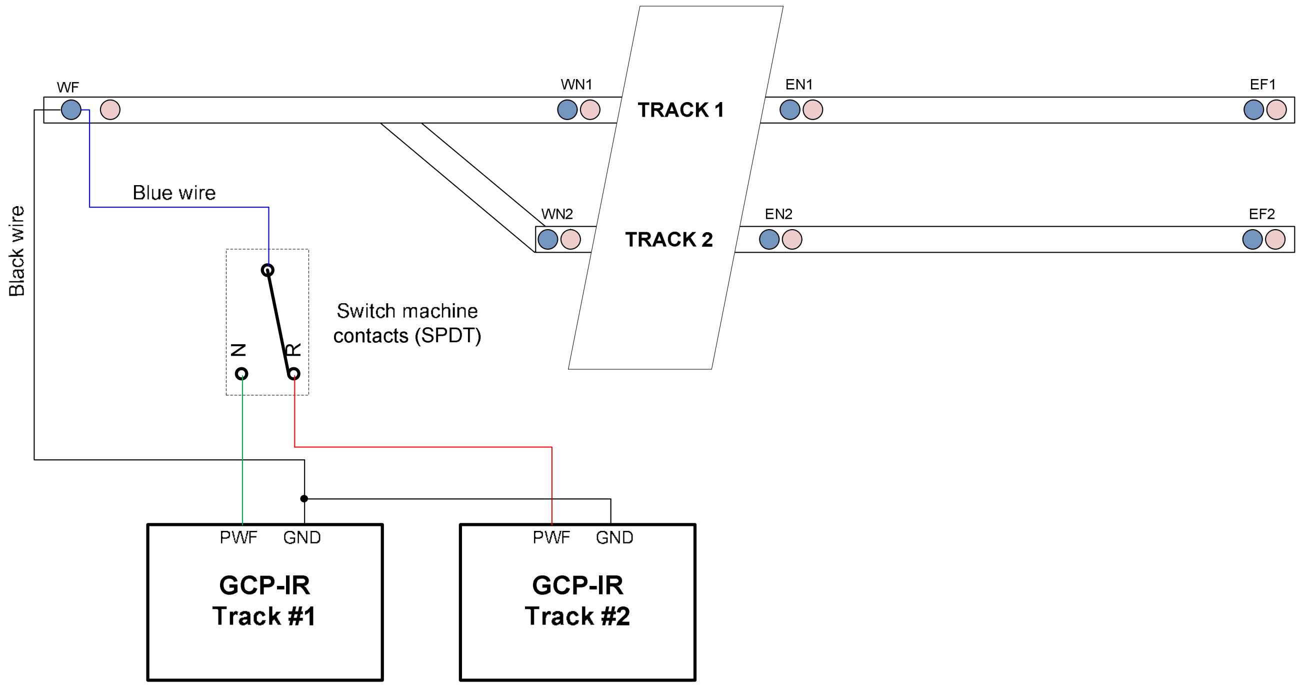

Figure 5

Double track mainline with a single crossover at the crossing (using photocells)

In this arrangement (Figure 6) there is a single crossover between two tracks at the crossing. Two GCPs are required and must include the "cascading" connection where the GCP #2's TO terminal is connected to the GCP #1's TI terminal. In order to handle the situation where a train crosses over between tracks it is necessary to add more photocells (WF1b, WX, and EX). These will prevent GCP #1 from getting "confused". Photocells WN1 and WX are wired in series and connected accordingly to the PWN input of GCP #1. Photocells EN1 and EX are wired in series and connected accordingly to the PEN input of GCP #1. Photocells EF1, WN2, EN2 and EF2 are wired normally per the standard GCP instructions to their respective GCP. You will need to use either two sets of SPDT auxiliary contacts from the turnout switch machines/motors or use a DPDT type switch with NO center off position. The Normal position is when trains stay on the straight route. The Reverse position is when trains crossover from one track to the other. The turnouts or DPDT switch MUST be in the appropriate position BEFORE a train enters the "zone of detection" (i.e. defined by the far photocells) and MUST REMAIN in that same position until the train CLEARS the zone of detection. It IS okay to have two trains traveling through the crossing simultaneously AS LONG AS they stay on the same track throughout the zone of detection.

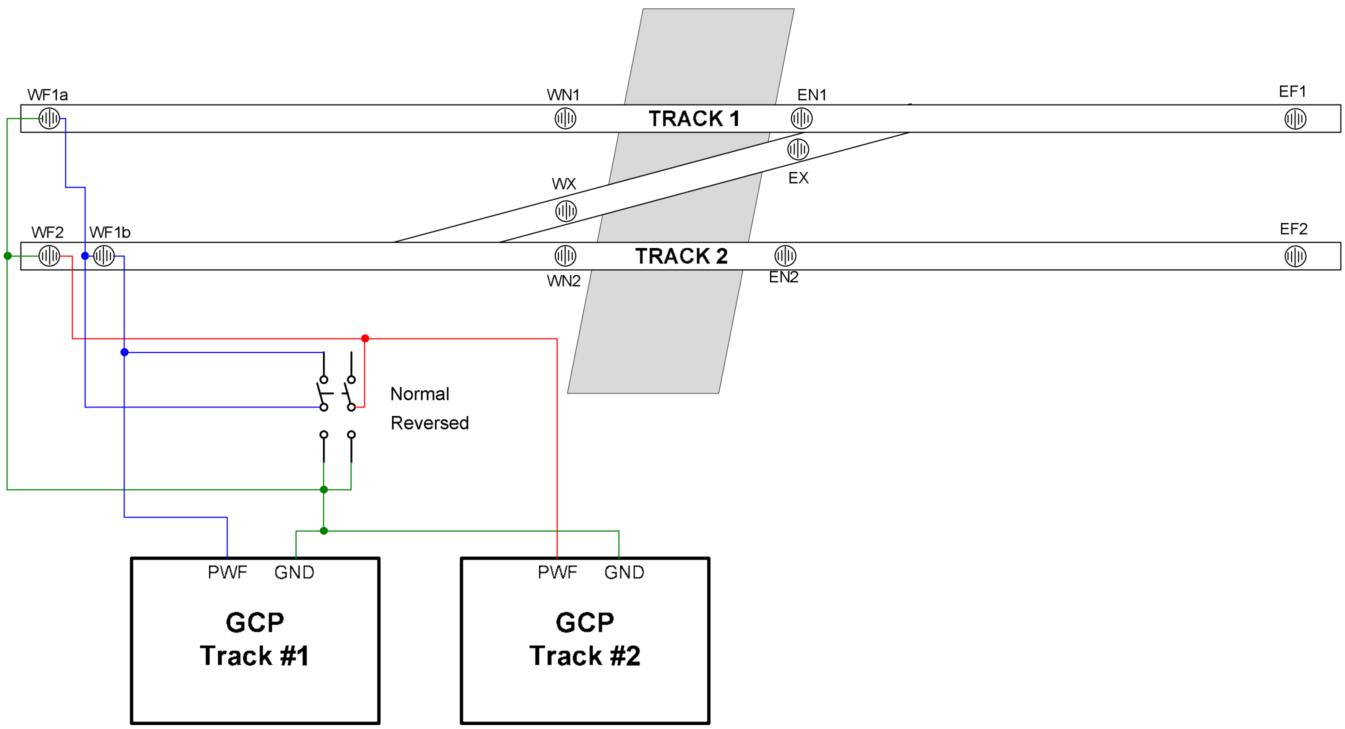

Figure 6

Double track mainline with a single crossover at the crossing (using infrared)

In this arrangement (Figure 7) there is a single crossover between two tracks at the crossing. Two GCPs are required and must include the "cascading" connection where the GCP-IR #2's TO terminal is connected to the GCP-IR #1's TI terminal. In order to handle the situation where a train crosses over between tracks it is necessary to add more IR sensor sets (WF2b, WX, and EX). These will prevent GCP-IR #2 from getting "confused". You will need to use either one set of SPDT auxiliary contacts from the turnout switch machines/motors or use an SPDT type switch with NO center off position. The Normal position is when trains stay on the straight route. The Reverse position is when trains crossover from one track to the other. The turnouts or SPDT switch MUST be in the appropriate position BEFORE a train enters the "zone of detection" (i.e. defined by the far detectors) and MUST REMAIN in that same position until the train CLEARS the zone of detection. It IS okay to have two trains traveling through the crossing simultaneously AS LONG AS they stay on the same track throughout the zone of detection. All IR emitters (clear lens; depicted here as ○) are wired in parallel, each with its own 180 ohm resistor, to the associated GCP-IR. The IR detectors (blue lens; depicted here as ●) are wired as described below. IR detectors WF1 and WF2b are wired in a special way as shown to the left. IR detectors WN2 and WX are wired in parallel and connected accordingly to the PWN input of GCP-IR #2. IR detectors EN2 and EX are wired in parallel and connected accordingly to the PEN input of GCP-IR #2. IR detectors WF2a, EF2, WN1, EN1 and EF1 are wired normally per the standard GCP-IR instructions to their respective GCP-IR.

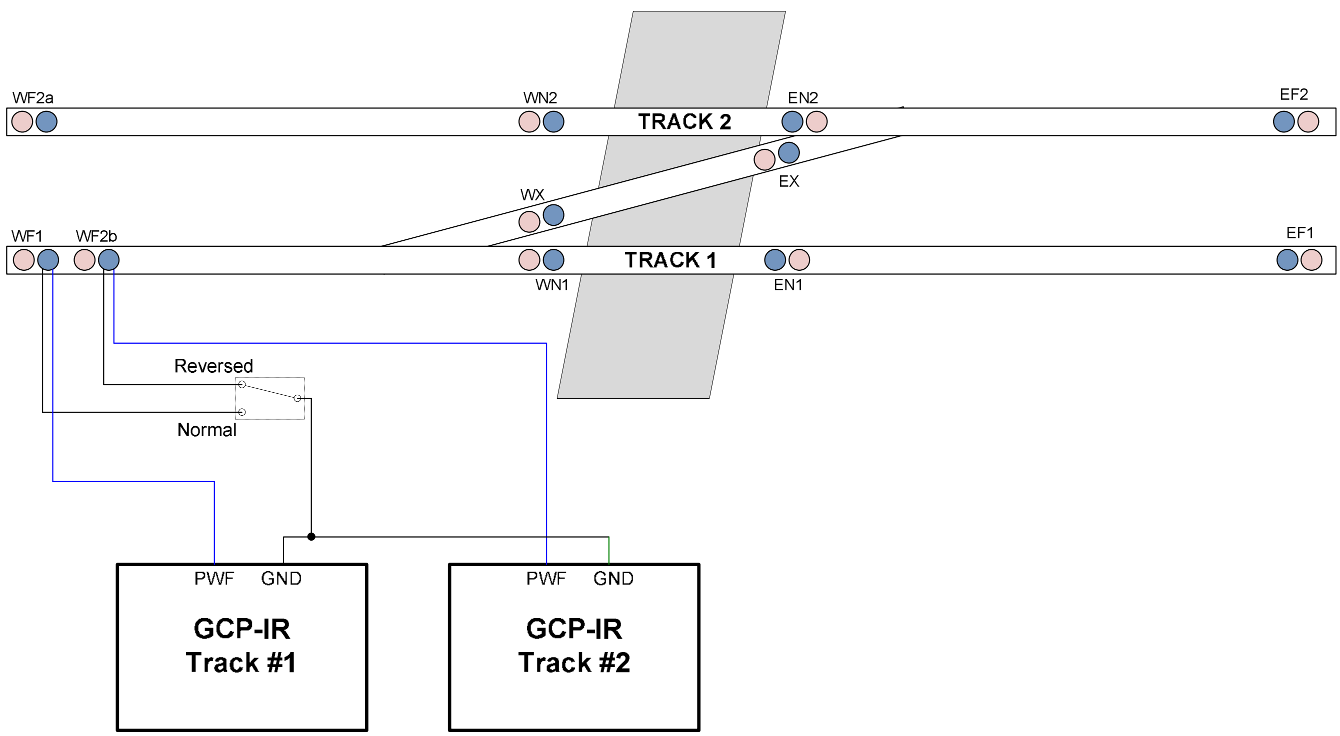

Figure 7

Double track mainline with a double crossover (using photocells)

In this arrangement (Figure 8) there is a double crossover between two tracks at one side of the crossing. Two GCPs are required and must include the “cascading” connection where the GCP #2’s TO terminal is connected to the GCP #1’s TI terminal. In order to handle the situation where an Eastbound train crosses over from one track to the other it is necessary to add two additional photocells (WF1b, WF2b). These will prevent the GCP on the originating track from getting “confused” when the train moves onto the destination track. Refer to the standard GCP instructions for wiring the remaining photocells. You will need to use either two sets of SPDT auxiliary contacts from the turnout switch machines/motors or use a DPDT type switch with NO center off position. The Normal position is when trains stay on the straight route. The Reverse position is when trains crossover from one track to the other. The turnouts or DPDT switch MUST be in the appropriate position BEFORE a train enters the “zone of detection” (i.e. defined by the far photocells) and MUST REMAIN in that same position until the train CLEARS the zone of detection. It IS okay to have two trains traveling through the crossing simultaneously AS LONG AS they stay on the same track throughout the zone of detection.

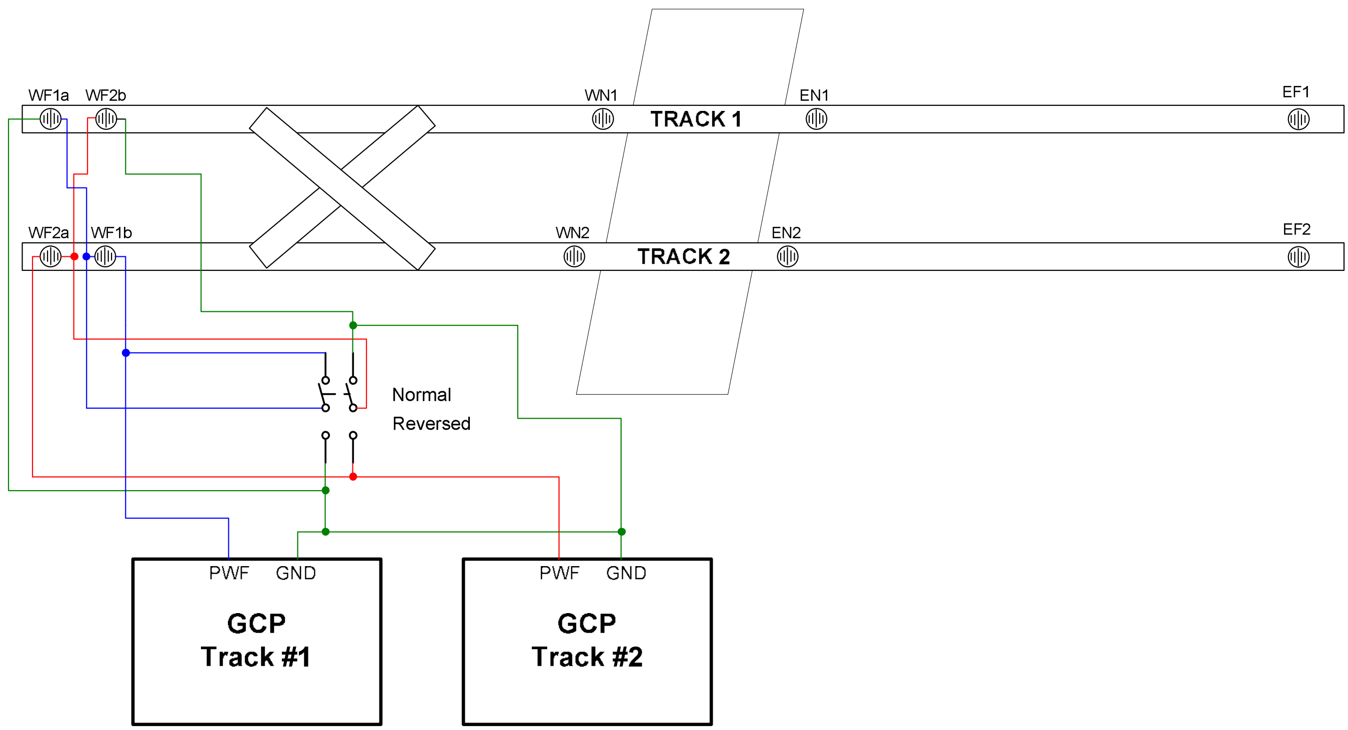

Figure 8

Double track mainline with a double crossover (using infrared)

In this arrangement (Figure 9) there is a single crossover between two tracks at the crossing. Two GCPs are required and must include the “cascading” connection where the GCP-IR #2’s TO terminal is connected to the GCP-IR #1’s TI terminal.

In order to handle the situation where a train crosses over between tracks it is necessary to add more IR sensor sets (WF1b, WF2b). These will prevent the GCP-IR on the originating track from getting “confused” when the train moves onto the destination track. You will need to use either one set of SPDT auxiliary contacts from the turnout switch machines/motors or use an SPDT type switch with NO center off position. The Normal position is when trains stay on the straight route. The Reverse position is when trains crossover from one track to the other. The turnouts or SPDT switch MUST be in the appropriate position BEFORE a train enters the “zone of detection” (i.e. defined by the far detectors) and MUST REMAIN in that same position until the train CLEARS the zone of detection. It IS okay to have two trains traveling through the crossing simultaneously AS LONG AS they stay on the same track throughout the zone of detection. All IR emitters (clear lens; depicted here as ○) are wired in parallel, each with its own 180 ohm resistor, to the associated GCP-IR. The IR detectors (blue lens; depicted here as ●) are wired as described below. The four West Far IR detectors are wired in a special way as shown to the left. The remaining IR detectors are wired normally per the standard GCP-IR instructions to their respective GCP-IR.

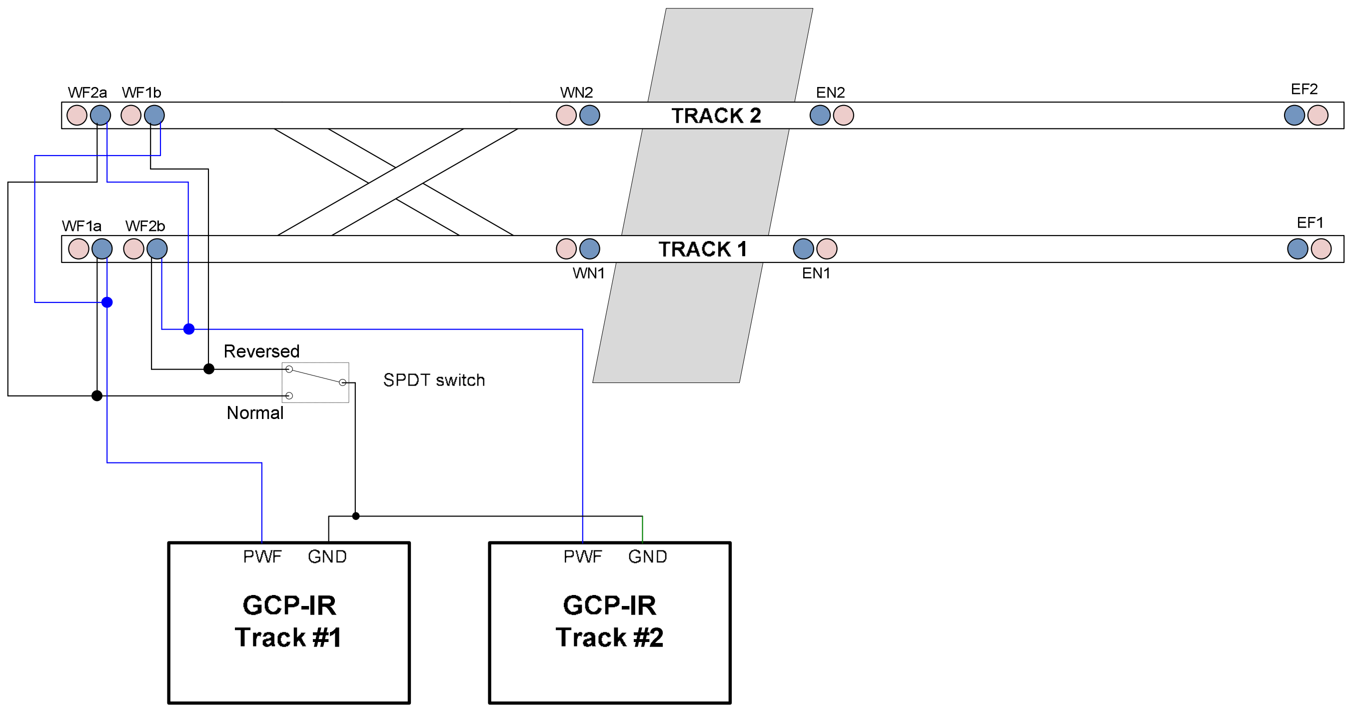

Figure 9

Double track mainline with a crossover and a third track (using photocells)

In this arrangement (Figure 10) there is a double crossover between two tracks at one side of the crossing along with two spur tracks! Two GCPs are required and must include the "cascading" connection where the GCP-IR #2's TO terminal is connected to the GCP-IR #1's TI terminal. You will need to use multiple sets SPDT auxiliary contacts from the turnout switch machines/motors. The Normal position is when trains stay on the straight route. In order to handle the situation where a train crosses over from one track to the other it is necessary to add 2 additional photocells (WF1b, WF2b). These will prevent the GCP on the originating track from getting "confused" when the train moves onto the destination track. Similarly, extra photocells (WF1c, WF2c, WN2c, EN2c, and EF2c) are required to handle the spur tracks. The switch machine/motor auxiliary contacts are used to short out the photocells for the UNALIGNED track/path. For proper crossing signal sequencing you MUST have the turnouts (TO_A, TO_B) and the crossover in the desired position BEFORE any train enters the detection zone (defined as the area bounded by the FAR photocells); Failure to do so won't cause any damage but it might make the crossing signals sequence improperly (i.e. shutoff later than expected).

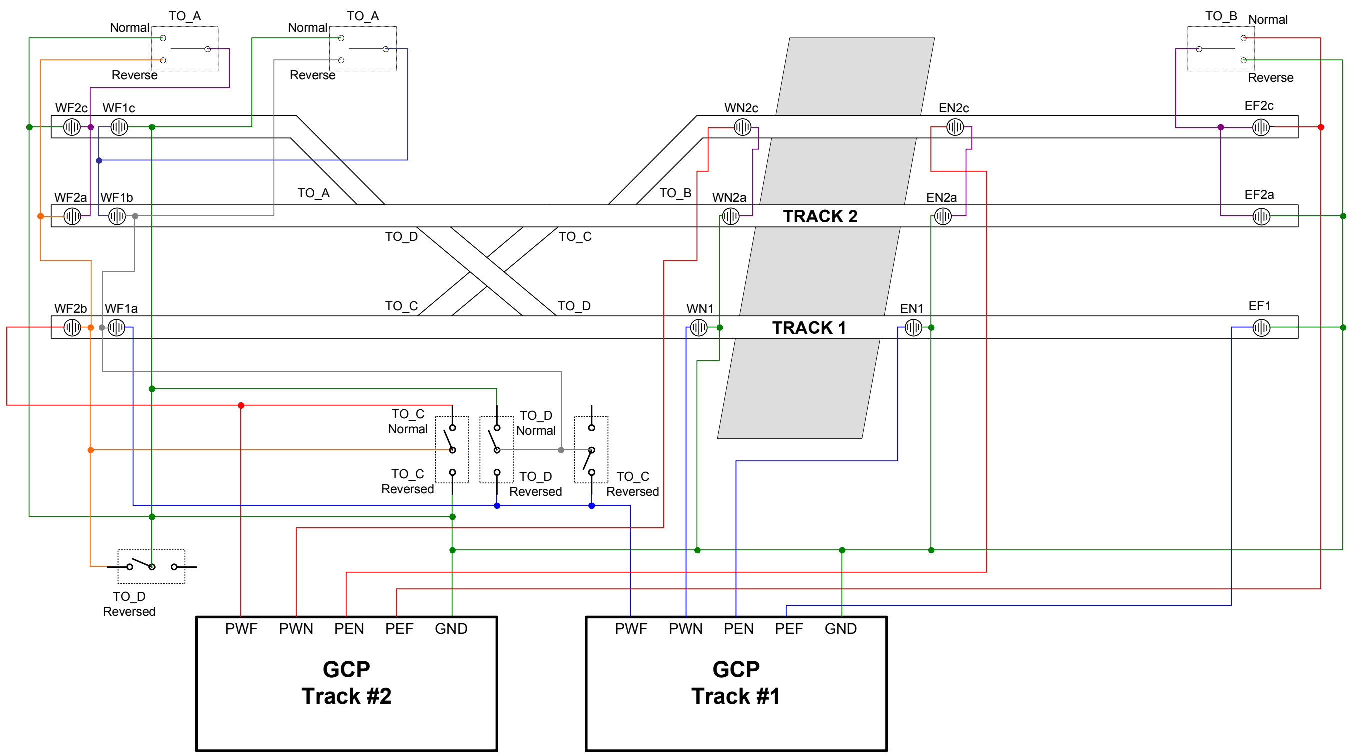

Figure 10

Technical Support

If you need further assistance with this application please do not hesitate to contact us by phone, mail and email; our contact information can be found on the top of Page 1.