INFRARED COLLISION AVOIDANCE UNIT (ICA)

The Infrared Collision Avoidance Unit (ICA) is used to automatically prevent trains from colliding where two tracks intersect. Using Infrared (IR) sensors the ICA detects trains as they approach an intersection from all directions and stops any train if it determines there is going to be a collision. Only when the intersection is clear will a train giving way be allowed to proceed.
The ICA is not designed to work with DCC.

What you should have
1 x Sidetracked Electronics Infrared Collision Avoidance Unit (ICA).
4 x Infrared (IR) sensors
1 x User manual.
4 x Mounting screws and standoffs

About this manual
Text written in *ITALICS* in this manual represents text as it is written on the ICA.

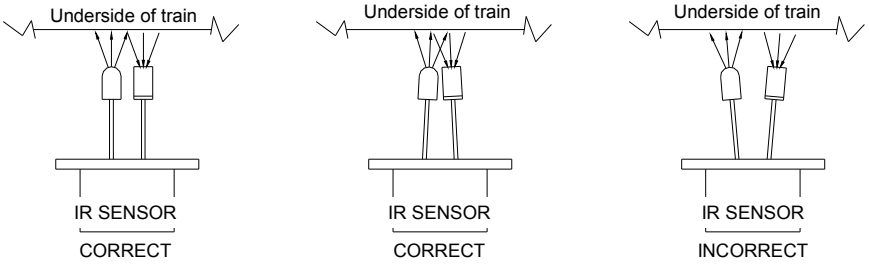
Operation
When you apply power to the ICA, if a train is not detected over any of the IR sensors it will assume there is no train within the intersection area. If a train is over one of the IR sensors when you apply power to the ICA it will assume the train is entering the intersection area. It is recommended that you always have trains completely outside the intersection area before applying powering to the ICA.
Whenever a train is detected at any of the four IR sensors the *STATUS* LED on the ICA will come on.
When there is no trains within the intersection area both tracks are active. As trains approach the intersection the ICA will give the right of way to the first train it detects. It doesn't matter which side a train approaches the intersection from as long as it always exits out the other side i.e. a train cannot enter the intersection area, stop between the two IR sensors and then reverse out the way it came. Once a train has been detected entering the intersection area the ICA will not stop the train on the other track until it reaches the IR sensor leading into the intersection. This ensures that trains always stop at the same location regardless of whether the locomotive is pulling or pushing the train.
Two seconds after the train with the right of way exits the intersection area the train giving way will have power reapplied to its track allowing it to proceed. The reason for the two second delay is that as a train passes over the IR sensor it is possible for the ICA to momentarily stop detecting the train. This could be because of an irregular surface under the train causing the IR beam not to reflect properly or the gaps between the carriages where there maybe no reflective surface at all. By having the delay it compensates for the time the train may go undetected ensuring that the train giving way will only be allowed to continue on its journey when the intersection is truly clear.

Installing IR Sensors

Each IR sensor performs two functions. The first is to detect a train as it enters or exits the intersection area and the second is to stop a train if the other track in the intersection is occupied. The IR sensors should be placed at locations on the track where you would like trains to stop when the other track in the intersection is occupied.

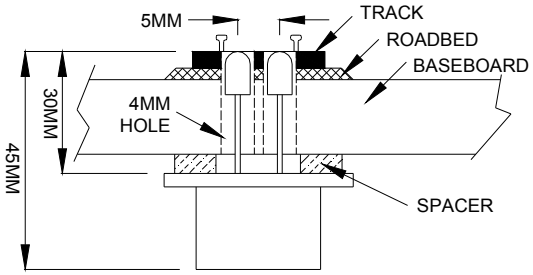
NOTE: Trains may not stop immediately the IR sensor detects it. Depending on the speed that the train is travelling when power is cut from the track determines how far the front of the train will run past the IR sensor. It is important to keep this in mind if you are placing the IR sensors close to the intersection as trains may over run the sensor enough to obstruct the other track in the intersection.

There is two parts to each IR sensor, a transmitter and a receiver. When mounting an IR sensor make sure that these two components are pointing directly up or slightly bent in towards each other. The train acts like a reflector when it passes over the IR sensor so if they are pointing away from each other the train may go undetected.



It is recommended that the IR sensors are mounted under your layout and pushed up between the sleepers in the centre of your track. Drill two 4.0mm (5/32 inch) holes with 5mm between their centres or make a 4.0mm x 9.0mm slot, being careful not to damage the track. Screw the IR sensor in place, adding a spacer if necessary so that the top of the IR sensor sits level with the top of your ballast or sleepers.

IMPORTANT: Make sure nothing covers the top of the IR sensor and that the rubber tubing that surrounds one of the sensors stays intact once the IR sensor has been installed. Do not apply any heat to the rubber tubing as it my distort and affect the operation of the sensor.



Wiring IR Sensors to the ICA

The ICA has four IR sensors connected to it, each one requires three wires. Pins *1*, *2* and *3* on the sensor terminal blocks on the ICA must be wired to pins *1*, *2* and *3* on each IR sensor respectively.

Wiring Track Power to the Intersection

From the controller used to operate the train on track 1, wire from one terminal directly to one of the rails on track 1. The second terminal on the controller needs to be wired to the input terminal *IP1* on the ICA. Finish the wiring for track 1 by wiring from output terminal *OP1* on the ICA to the other rail on track 1.

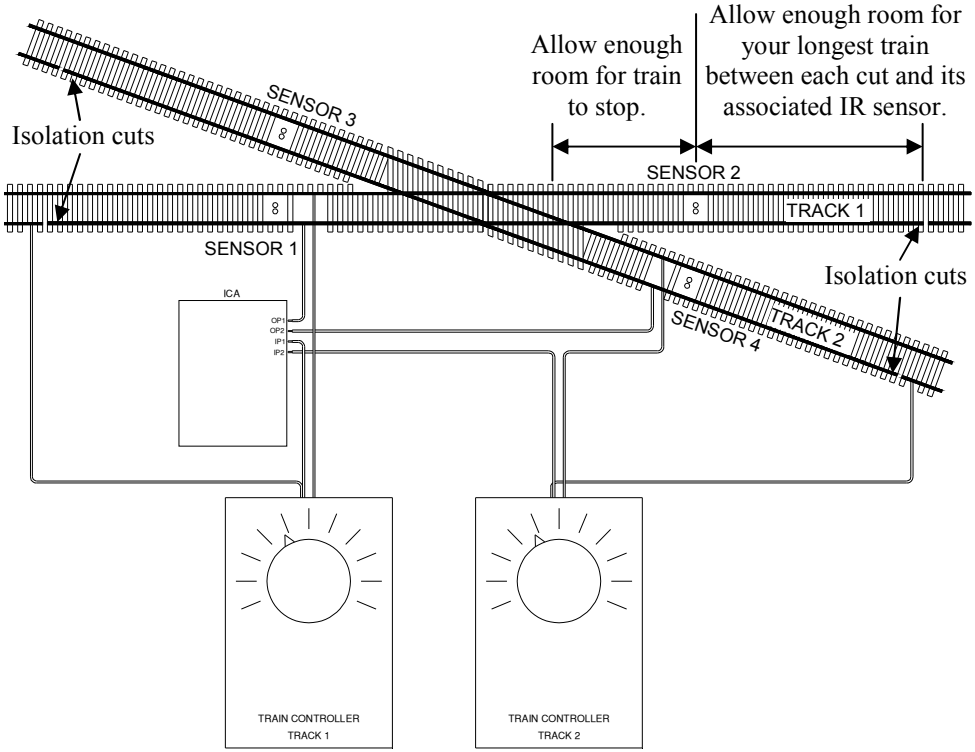
Track 2 is wired exactly the same way. From the controller used to operate the train on track 2, wire from one terminal directly to one of the rails on track 2. The second terminal on the controller needs to be wired to the input terminal *IP2* on the ICA. Finish the wiring for track 2 by wiring from output terminal *OP2* on the ICA to the other rail on track 2.

Isolating Intersection Tracks

In most cases you will only be running a single train on each track passing through the intersection so it may not necessary to isolate the tracks within the intersection area.

If you would like the ICA unit to switch power on and off to the two sections of track that make up the intersection without disrupting train operation on other parts of your layout then you will have to isolate sections of track within the intersection area.

Cut track 1 in two locations on the same rail on either side of the intersection. Likewise cut track 2 in two locations on the same rail on either side of the intersection. Each cut on the rails must be in a position that allows sufficient room between the cut and its associated IR sensor to fit your longest train.



Wiring Power to the ICA

You require a 9V DC power supply capable of supplying a maximum of 80mA for each ICA unit you have connected to it. Ensure that you connect the 9V (+ positive) wire from your power supply to the *+9V* terminal on your ICA and the ground (- negative) wire from your power supply to the *GND* terminal.

Interfacing the ICA to other Equipment

Output terminals *OP4* and *OP5* are open collector outputs that can be used to interface the ICA to other electronic equipment. *OP4* will be activated (pulled low) when a train has been detected entering the intersection area on track 1. *OP4* will stay active until the train clears the IR sensor on the other side of the intersection by two seconds. This output could be used to control a signal indicating that trains approaching the intersection on track 2 must stop.

Likewise *OP5* will be activated (pulled low) when a train has been detected entering the intersection area on track 2. *OP5* will stay active until the train clears the IR sensor on the other side of the intersection by two seconds.

Controlling Train Speed

The ICA does not control the speed of the trains on track 1 and 2, this is done by external DC train speed controllers connected to input terminals *IP1* and *IP2* on the ICA. The ICA simply turns the power to the track on and off .

The ICA is not designed to work with DCC.

Specifications

Dimensions:	68mm (width) x 86mm (depth) x 30mm (height)
Supply Voltage:	9V DC
Supply Current:	80mA
Maximum Relay (Track) Voltage:	30V
Maximum Relay (Track) Current:	2A

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