Optek IR Sensor Installation

A conversation with Gregg Fuhriman

Question: In talking with others in our group, the issue, and potentially the difficulty, of installing optical detectors in completed modules has become a sticking point. Can you share your experience of installing these in Glen Frazier and other completed modules? Any tips or suggestions?

Reply: I too had reservations about this until I just dove in and did it ... turns out its not all that difficult. Here is how I did it on Glen Frazer, to mount the Optek OPB704W sensor. This was going through cork roadbed and blue foam. Going through a plywood module top is a different story; perhaps Gary Green can explain how he that.

Before installing the Optek sensor, you may want to mount a connector of some sort onto its 4 wires, for modularity and ease of replacement should it ever fail. Also, the wires are sort of short, so extending them is likely required.

Also before installing, it is possible to bevel the sides of the sensor housing down away from the window, narrowing the visible portion of the sensor to more closely match a track tie width. Do not remove material right up to the window though! Leave a thin portion of the housing along the edge of the window to block stray light from leaking in.

1. Buy a set of the #11-sized saw blades from Micro-Mark. I think I used the finest-toothed blade in a standard Xacto knife handle.

2. Choose the tie where the sensor is going to go (make sure there is clearance under it, e.g. no frame member in the way, etc.), and carefully cut out the central section using the saw blade. This is the most difficult part and requires a fine touch and a bit of patience. The opening needs to be slightly wider than the tie, and the tie ends must be angled (undercut) to match the profile of the sensor. You may lose a bit of ballast, but it will be patched up later.

3. Form the hole through the module top (working from above and below as needed) to fit the sensor profile and size. This may require hand saws, files, knives, whatever. It's OK if the hole ends up slightly oversized, but make it as small as possible, especially at track level.

4. Test fit the sensor by pushing it up through the hole from below. The goal is to have it fit snugly, square, flat, and centered in the selected tie, with the sensor surface flush with the top of the tie. Keep test fitting and adjusting the hole until the goal is met.

5. When you have a good fit, install the sensor in its final position, and shoot some expanding insulation foam from below, into the gaps around the sensor. Try not to use too much so the foam does not leak up onto the top of the sensor or surrounding track. Hopefully the hole profile at track level is tight enough to prevent this. You have time to make any final positioning adjustments as the foam sets up. This type foam can be removed fairly easily, should the sensor need to be replaced for some reason. I do not recommend using glue (latex liquid nails, etc.) as it becomes quite hard and therefore very difficult to remove cleanly.

6. Once the foam is dry, use a small piece of masking tape to cover the sensor window. Carefully repair the ballast next to the sensor; if you have bevel it, the ballast will come right up against the window. Of course make sure no ballast is on top the sensor window. Once the ballast is dry, if you desire, weather the track so everything matches again. Remove the tape from the window once all the messy work is done.

That's it ... now just connect the sensor to the optical detection circuit.

MY ADDITIONAL COMMENTS:

I'll add some comments to Gregg's just in case there's another plywood nut there:

Most important...whatever work it is to install the IR detectors is worth the trouble! It's very disappointing to install detection and then to have a block go clear when there's still a long train in the block and only the engines have exited the block. And there's nothing more rewarding than to have the current and IR detection working in concert to provide block occupancy that "sees" the whole train. As much as I complained while installing the detection, I would do it again in a heartbeat. Install IR detectors at present or future block boundaries without delay. I'm confident that you won't be disappointed.

My sensors were retrofitted into a "completed" module (track in, ballasted, in operation for some years).

I followed Gregg's recommendation to install a connector on the sensor wires and I made certain that I provided for a good service loop in the wires leading to the Heathcote PCB. The connector allowed me to install the sensor and the PCB more easily and also gave me the ability to disconnect the sensor for debugging and testing.

I beveled the sensor as Gregg recommends. It ends up only slightly wider than a Walther's code 83 tie. My bevel ends in almost but not quite a knife edge adjacent to the IR window. I masked the IR window at this point. Thinking that the remaining housing next to the window might not be fully opaque, I painted the housing surface on the bevel with black paint just in case it might help.

On my plywood top, after cutting away the center of the tie where the sensor was to go, I "marked" the location by drilling a small hole through the subroadbed (module top) so I could identify the location from underneath. The small hole served as a locator for the Forstner drill used in the next step.

I purchased a Forstner drill bit large enough to accommodate the full width of the sensor, marked the proper drilling depth on it with some high adhesion masking tape, and carefully drilled out most of the thickness of the plywood so that only a relatively thin layer of the plywood remained (I tried for 1/8") under the cork roadbed. This was a scary process, but it worked out OK. Then from the top, I cut the cork out with a knife and proceeded to remove the thin layer of plywood as required to allow me to push the sensor into position. Because I was working with plywood

subroadbed, I had to work harder than Gregg to open up the slot, and I used more aggressive tools. It took some real thought and care not to damage the rail and adjacent ties. As you can imagine, the slot wasn't pretty, but you can only tell that from underneath now.

Since I was working with plywood and could knock the sensor out if it failed, I glued the sensor in place using epoxy glue. The glue helped to fill the spaces between the sensor body and the slot so that ballast didn't leak through when it was added around the sensor. I managed to cut the ties a bit wider than needed, so I filled the gaps between the sensor body and the tie "ends" with a putty like Squadron Green (I use an auto body putty that works well), shaped it as best I could and painted it so that it looked like I had cut the ties to exactly the correct length. Re-ballasting wasn't any harder than it always it.

I made the mistake of placing the sensors *exactly* at the location of the rail gaps separating the blocks. When I cut the tie to accommodate the sensor, I lost the structural integrity of the tie strip needed to hold the rail in place adjacent to the gap. This matters on Shandin because all the sensors are located on curves and the rail seems never to lose it's desire to straighten out. I had to do a lot of jimmying and ACCing to successfully stabilize things. In the future, I'll offset the sensor several ties one way or the other from the rail gaps, even on straight track.

The LED on the IRDOT is very useful. Don't fail to keep it in place. I tuned the resistor on the PCB so that it's time delay (how long before it turns off when nothing is detected) matches the time delay of the current detectors I use (DCCODs).