IR Window Installation Overview

Fig. 1: IR Windows mounted in switchgear

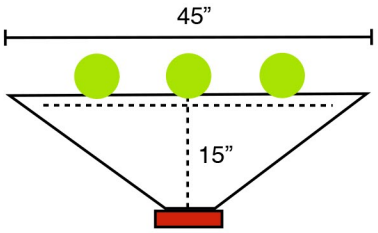

Figure 2: Field of view through an IR window. 3 fuses at a depth of field of 15” are clearly visible through a single window.

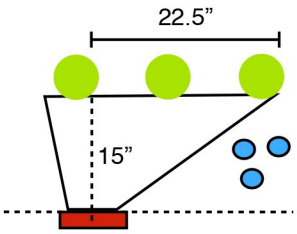

Figure 3: Field of view through an IR window around an obstruction in the cabinet

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Installation of infrared (IR) windows can appear, at first, to be a complex issue:

- Where should I install the windows?
- How do I optimize placement and viewing area?
- How many windows will I need?
- How much will I be able to see?

The 3X Rule of Thumb:

Luckily, it is much easier than it would at first appear. Working in the thermographers favor are three rules of thumb:

1. As the distance between the target and the viewer (“depth of field”) increases, the viewable area (“field of view”) through the IR window increases. Think of watching a ball game through a knot hole in a fence.
2. Typical IR camera lenses have a 24º field of view. (Note: some specialty lenses are available providing up to 90º field of view.)
3. Cameras can be angled up to an additional 30º from perpendicular (30º “angle of incidence”) relative to the IR window, while maintaining a high degree of accuracy. Therefore, targets do NOT have to be located directly behind the IR window. (Note: an angle that is steeper than 30º will tend to change the emissivity/reflectivity value of the target object.)

To estimate the field of view through an infrared window, we recommend using the *Rule of 3X*: Multiply the depth of field by 3X. The result is roughly what is visible through a 3” window -- side to side and up and down.

Example: in Figure 2, a thermographer wishes to monitor 3 fuses that are located 15” behind an enclosure panel (where the window would be mounted). Based on this depth of field, the thermographer will be able to view 45” x 45” area through the window. Put another way, the thermographer will be able to view roughly 22.5” to all sides from the center of a point directly behind the window. As long as the furthest target fuses are not further than 22.5” to the right of left of the window, the thermographer will have no problem seeing all phases.

What About Obstructions?

You will want to be aware of obstructions. If there are phase dividers, you will be unable to see all phases with one window. In this case, use 2 windows, each straddling a phase divider: window #1 will allow imaging of Phase A and Phase B; while window #2 will be used to monitor Phase B and Phase C.

In Figure 1, you will notice that the windows are mounted off-center. The three phases in this equipment are equally spaced and centered in the cabinet -- but the cables dropped along the right side of the interior of the cabinet. The position of the cables would have blocked visibility of the C Phase if the window was located in the center of the panel. Therefore, the installer located the windows off-center, so the thermographer could see behind the cables to view the C Phase, knowing that the 3X multiplier would allow them to view 22.5” from to the side.

Cut Cardboard Before Steel

One helpful trick is to cut a large piece of cardboard with a 3" x 3" hole and 4" x 4" hole. When the gear is open, you will be able to position the cardboard cutouts along the plane of the enclosure, look through the holes at up to a 30 degree angle to see what the window will allow you to shoot. This is a GREAT way to get a feel for estimating the quantities and positions of the windows.

Note: the information in this summary offers general guidance for positioning IR windows. Some applications might require unique considerations.