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Revision VRV-3.1-13-240129



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1. SensorFX First Experience

Thank you for deciding to try VR-Vantage and the SensorFX plug-in. VR-Vantage is MAK's line of visualization products. It includes VR-Vantage, a 3D and 2D visualization tool with a focus on information about your virtual battlefield, and the VR-Vantage Toolkit, which gives you the power to customize and build VR-Vantage-based applications.

The SensorFX plug-in was created by JRM Technologies. It provides sensor views for infrared (IR) and night vision goggles (NVG). SensorFX requires that terrain and simulation objects be materially classified so that they can be properly represented. Material classifications have been provided for the VR-Village terrain database. SensorFX 3.1 also supports material classification on demand for terrains configured using an osgEarth *.earth* file. For details, please see the SensorFX section of the *VR-Vantage Users Guide*.

This first experience guide provides a quick guided tour of the SensorFX plug-in. It assumes that you have previously installed and are already familiar with VR-Vantage. It also assumes that you are running on Microsoft Windows. If you have not used VR-Vantage, read *VR-Vantage First Experience Guide* before trying this guide.

To get the full experience you will need:

- VR-Vantage 3.1
- SensorFX
- SensorFX data file
- MAK Data Logger
- The *Raid-SFX-ViewControl-DIS.lgr* logger file

1.1. Install SensorFX

SensorFX is provided as a standard Windows installer and a data package. To install it, just run the installer. Be sure to install it into the version of VR-Vantage for which it was compiled, for example, VR-Vantage 3.1, VC 15. If you are going to use the MAK Data Logger to stimulate VR-Vantage with SensorFX, install it also.

1.2. Start SensorFX with SensorFX

1. On the Start menu, choose **MAK Technologies > SensorFX 3.1 with SensorFX**. The Load Terrain dialog box opens.
2. Select the Load Terrain option.
3. In the Load Terrain list, select *VR-Village.mtf*.
4. Click OK. The terrain loads.

Figure 1. VR-Village terrain, Stealth observer mode



1.3. Explore the SensorFX Plug-in

SensorFX installs four sensors:

- Visual. The Visual sensor displays objects using the naked-eye visual light spectrum.
- MWIR. The Midwave Infrared (MWIR) sensor displays objects using the intermediate infrared spectrum. In guided missile technology, this is the atmospheric window in which the homing heads of passive IR heat seeking

missiles are designed to work. It can be white hot or black hot.

- LWIR. The Long Wave Infrared (LWIR) sensor displays objects using the long wave infrared spectrum. This is the thermal imaging region, in which sensors can obtain a completely passive picture of the outside world based on thermal emissions only and requiring no external light or thermal source such as the sun, moon or infrared illuminator. It can be white hot or black hot.
- NVG. The NVG sensor simulates night vision goggles, which allow images to be produced in levels of light approaching total darkness.

Sensor settings are observer-specific. The default observers have the following sensors:

- Stealth and Out-the-Window: Visual sensor.
- MWIR (SensorFX): MWIR white hot.
- LWIR (SensorFX): LWIR white hot.
- NVG (SensorFX): NVG.

SensorFX starts up with the Stealth observer mode, which uses the Visual sensor (Figure 1 on the previous page). Notice that it is visually richer than the lighting in VR-Vantage without SensorFX.

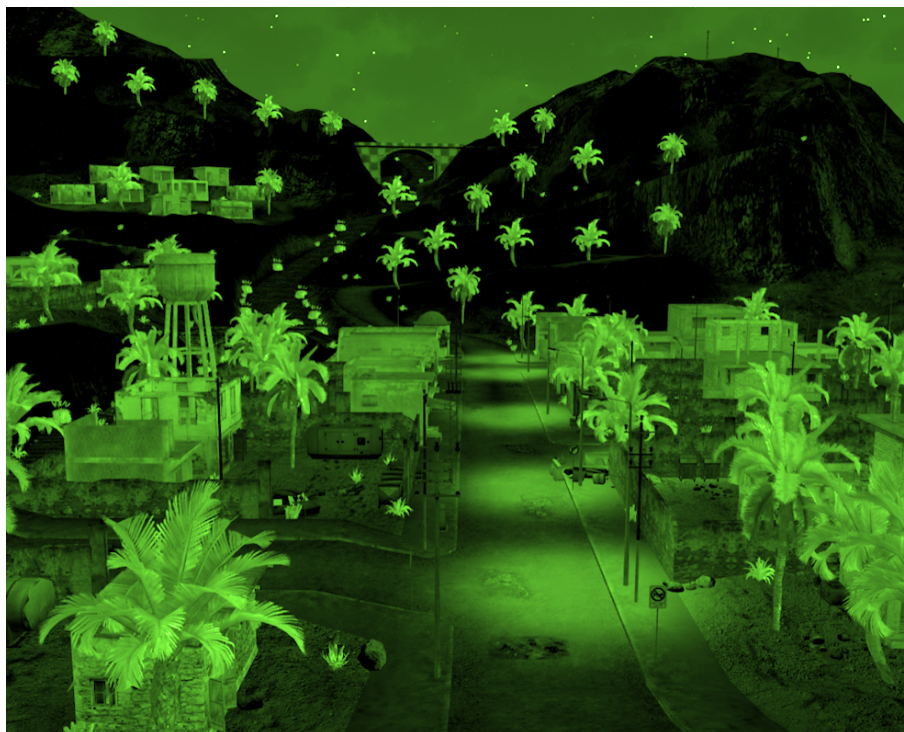
1. In the Observer Settings Toolbar, select MWIR (SensorFX) observer mode. The scene changes to show IR (white hot) (Figure 2). (The first time you select a SensorFX observer mode, it may take a few seconds for the view to change.)

Figure 2. VR-Village-SensorFX terrain, MWIR observer mode



2. In the Observer Settings Toolbar, select LWIR (SensorFX) observer mode. See if you can tell the difference from MWIR.
3. In the Observer Settings Toolbar, select Stealth.
4. Choose **Settings > Scene**. The Scene Settings dialog box opens. Change the time to 10:00 PM. You cannot see much, can you?
5. Select the NVG observer mode.
6. Now you can see the village (Figure 3). Try the LWIR and MWIR observer modes also.

Figure 3. VR-Village-SensorFX terrain, NVG observer mode



1.3.1 View a Simulation

Now let's run the MAK Logger and add some action to the scene. Follow the steps here to start the Logger and connect to the network. We assume that you're using the default port for the Logger and VR-Vantage (3000).

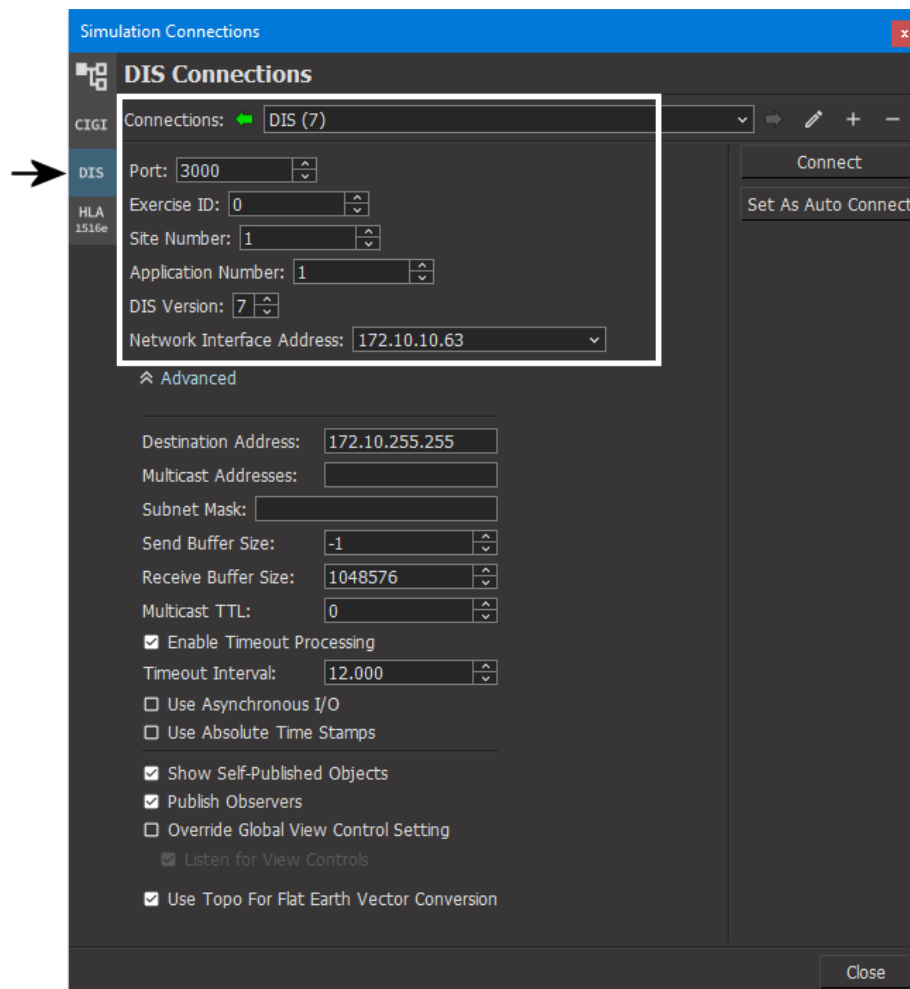
1. On the Start Menu, choose **MAK Technologies > Logger 3.1 DIS**. The Logger starts.
2. Choose **File > Open**. The Open File dialog box opens.
3. Load *Raid-SFX-ViewControl-DIS.lgr*.
4. Click Open.
5. Choose **Play > Toggle Loop at End**. This makes the recording continuously loop back to the beginning when it reaches the end.
6. Choose **Play > Play/Pause**, or click the Play button.

7. Choose **File > Connection**. The Connection dialog box opens.
8. Make a note of the Port, Exercise ID, Site ID, Application Number, and Network Interface Address. You need this information when you connect SensorFX to the simulation network.

Connect to the Simulation Network

1. In SensorFX, open the terrain *MAK Earth (online).mtf*.
2. Set the time back to 10:00 AM and select the Stealth observer mode.
3. Choose **Settings > Connection**. The Simulation Connections dialog box opens.
4. Select the DIS Connections page. The default connection is DIS (7) localhost.
5. In the Connections drop-down list, select DIS (7) (Figure 4).

Figure 4. DIS Connection



6. Enter the Port, Exercise ID, Site Number, Application Number, and Network Interface Address to match the settings in the Logger.
7. Click Connect.
8. Click Close.

View the Simulation

SensorFX takes a few seconds to load model files. Then it starts to display the action in this simulation. The Logger file sends view control messages to SensorFX to control the observer. The initial view controls place the observer over the Ala Moana section of Honolulu, Hawaii. We want to turn off view controls so that we can focus on specific locations.

Disable View Controls

1. Choose **Settings > View Controls**.
2. If the observer is attached to an entity, press **Z**. The observer stops following the entity to which it was attached.

1.3.2 View Thermal Effects at Different Times of Day

In this exercise, you will change the time so that you can see how thermal effects change based on the time of day.

Two common characteristics of thermal sensor simulations are diurnal cycle effects and thermal cross-over. This can be illustrated by changing the time-of-day from daytime to night-time, and observing the changes in the scene intensities. During the day, vegetation like trees and grass appears to be cooler than soils, rocks, and man-made construction materials like asphalt, rooftops, and concrete. Deep into the night, vegetation appears warmer than those other materials. Near sunrise and sunset, scene elements demonstrate a thermal convergence. As a result their apparent temperatures are about the same, and the scene appears to wash out. However, the vehicle hot spots still stand out.

1. Select the LWIR (SensorFX) observer mode. After a few seconds, the scene changes to LWIR. (If you have not done so, turn off view controls and press **z**.)
2. Move the observer to view the warehouse area where the entities in this scenario are located.
3. Choose **Settings > Scene**. The Scene Settings dialog box opens to the Date and Time page.
4. Change the time to different times throughout the day and night. You will see how the “hot spots” stand out at different times of day.
5. The following illustrations show the same scene captured at noon (Figure 5) and 2 AM (Figure 5). Notice how at noon, the hottest part of the scene (in white) is the pavement and the building in the upper left corner. At 1 AM, the hottest part of the scene is the building.

Figure 5. LWIR, white hot, noon

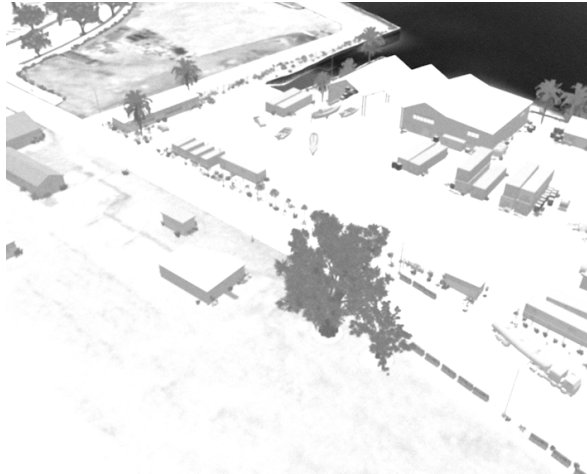


Figure 6. LWIR, white hot, 2 AM



1.3.3 Change Sensor Effects

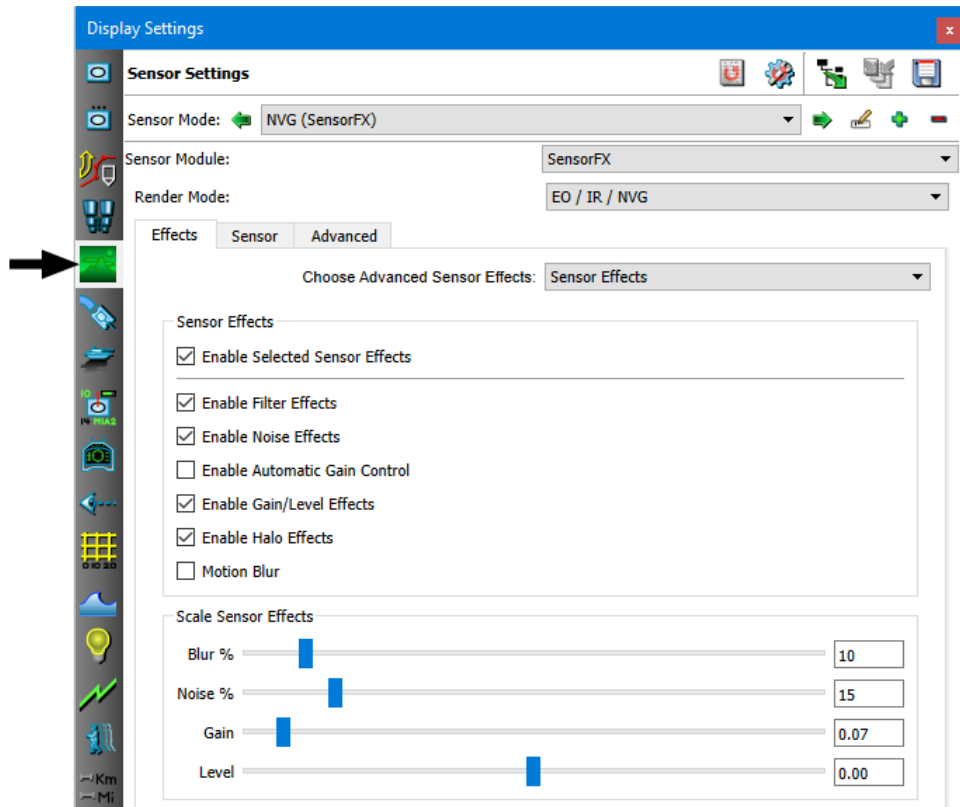
The IR and NVG sensors let you adjust and turn on and off the following effects:

- Blur. The sharpness of the scene.
- Noise. The graininess of the scene.
- Gain. The contrast in the scene.
- Level. The brightness of the scene.

► **To change the sensor effects:**

1. Choose **Settings > Display**. The Display Settings dialog box opens.
2. Select the Sensor Settings page. (Figure 7 shows the settings for the NVG sensor. The settings for LWIR and MWIR are slightly different.)

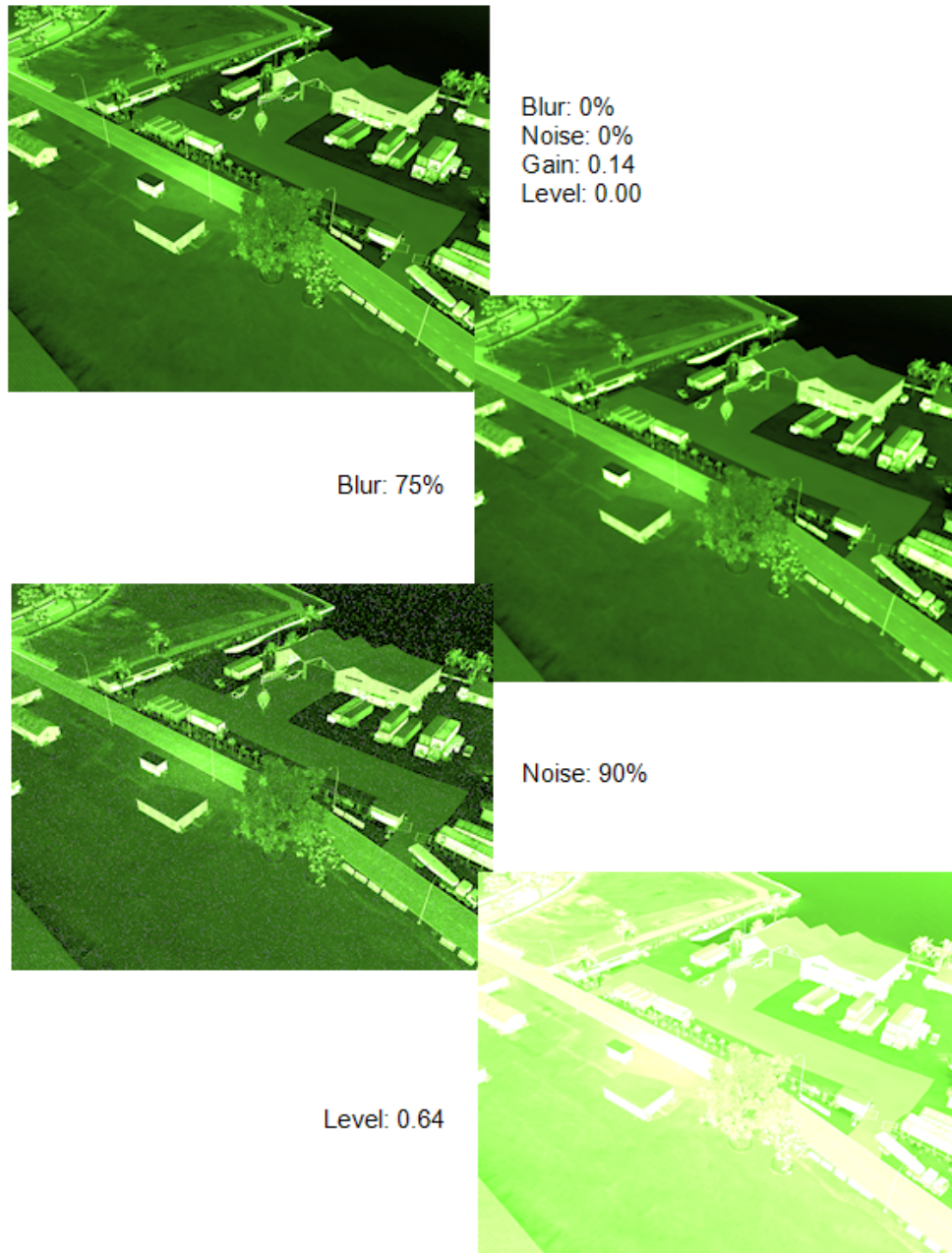
Figure 7. Sensor Settings page, NVG sensor



3. In the VR-Vantage window, change the observer to NVG (SensorFX). (Turn off view controls.)
4. On the Effects tab of the Sensor Settings page, in the Scale Sensor Effects group box, move the sliders for the different effects. Observe the changes to the scene.

Figure 8 shows a scene in NVG (SensorFX) observer mode with different sensor effect settings.

Figure 8. NVG observer mode



White Hot versus Black Hot

So far when we selected an IR observer mode, we have used the default sensor, which is white hot. Black hot inverts the view and all hot spots are black instead of white. Compare Figure 9 to Figure 5 on page 11.

Figure 9. LWIR, black hot, noon



► To switch an IR sensor to black hot:

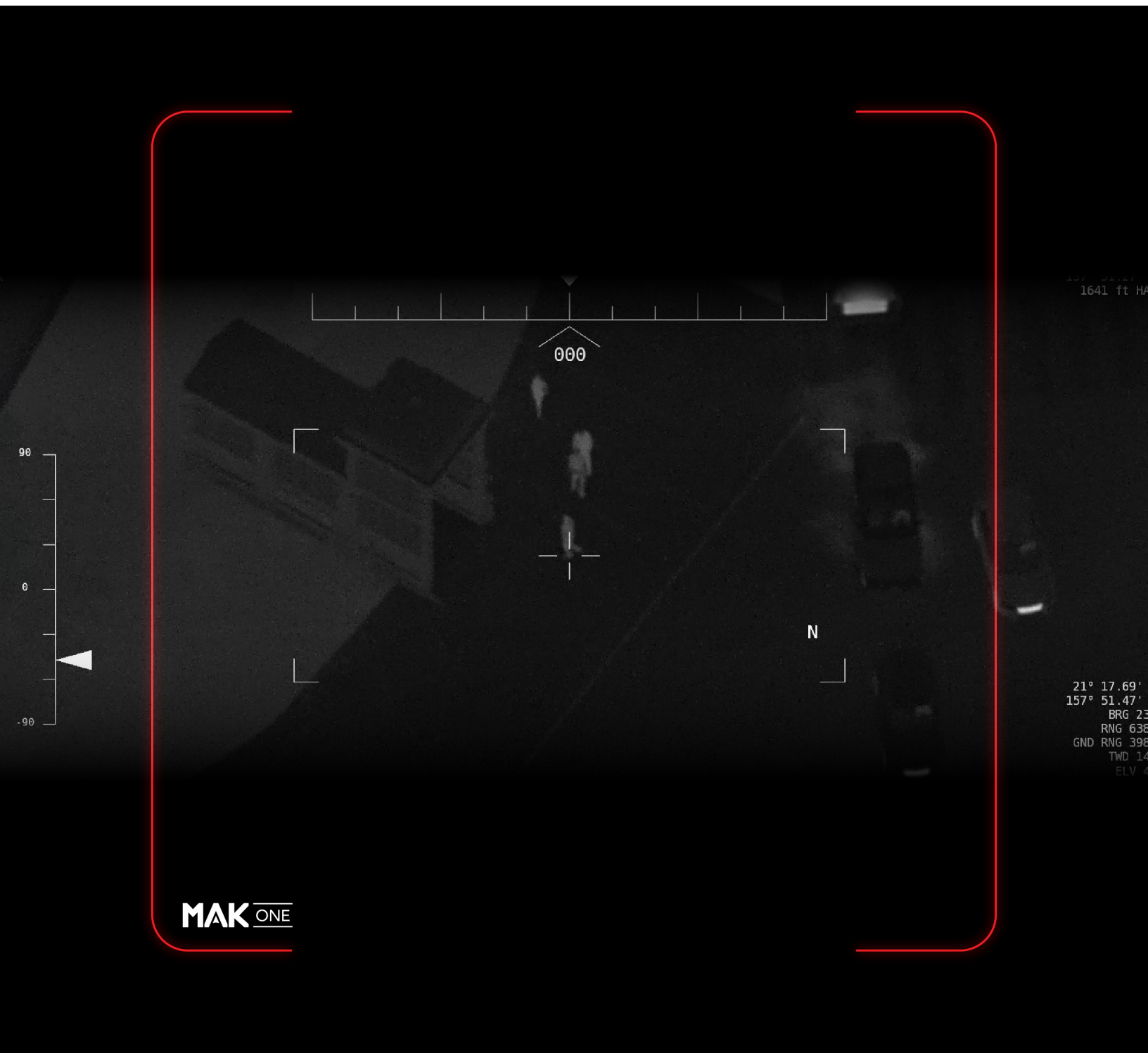
1. Select LWIR (SensorFX) observer mode.
2. Choose **Settings > Display**. The Display Settings dialog box opens.
3. Select the Sensor Settings page (Figure 7 on page 12).
4. In the Sensors list, select the LWIR.
5. On the Effects tab, in the Sensor Effects group box, select Enable Blackhot.

1.4. Learn More

For more information about SensorFX, please see the SensorFX section of *VR-Vantage Users Guide* or SensorFX help.

- To open the *VR-Vantage Users Guide*, on the Start menu, choose **MAK Technologies > SensorFX3.1 Documentation** and then double-click the shortcut to the document. You can also access it from the **Help** menu in SensorFX.
- To open the HTML5 help, in the SensorFX window, choose **Help > Help** or press F1. You can also choose **MAK Technologies > SensorFX3.1 Documentation** and then double-click the link to the SensorFX Help.

Please contact info@mak.com for additional assistance or to provide feedback.



VRV-3.1-13-240129