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## J.P. Freeman Laboratories Product Review

# SUBJECT:
# RedShift 1000 Series Thermal Imaging Video Surveillance Camera

Traditional high definition day/night color cameras provide excellent outdoor images for video surveillance applications under a wide range of lighting and normal weather conditions. However, when the ambient illumination falls below the operating sensitivity range (typically 0.005 lux with an F1.2 lens) thereby producing poor lighting conditions, the surveillance images become unacceptable and noisy. Further, in fog, smog, dust, snow, heavy rain and other bad weather environments the image scene may become totally obliterated through the severe attenuation of the visible spectrum components. Utilization of an alternative thermal camera technology that selectively captures the longer wavelength thermal radiation emitted routinely by warm bodied targets such as humans and animals, and also by inanimate objects such as cars and trucks, could however provide an effective surveillance solution in these conditions. The thermal energy emitted by these targets characteristically penetrates the harsh environmental conditions outlined above with substantially less attenuation through absorption and scattering, allowing thermal cameras to pick up clear images. Also, the use of thermal cameras provides the substantial benefit of allowing target detection in total darkness.

Visible light and near infrared radiation to which modern day commercial video cameras and their imaging sensors are responsive have spectral components that lie between 0.4 to 1.1 microns while the wavelengths of the thermal energy of interest lie between 7.5 and 15 microns. The latter therefore go undetected. Until recently, the only camera technology that worked satisfactorily at these thermal wavelengths utilized cameras with cryogenically cooled imagers, and carried a cost of between $5,000 and $50,000. Their use is therefore limited to military or very sophisticated industrial applications that can afford the high unit cost.

RedShift Systems, a spin-off from its parent company, Aegis Semiconductor, has developed breakthrough technology which allows good resolution thermal imaging from mass production video camera electronics without resorting to expensive cooling systems. The technology utilizes patented “Thermal Light Valve” (TLV) technology which converts the incoming thermal image in the 8-14 micron spectrum into a “CMOS sensor visible image” that can be detected with standard off-the-shelf CMOS imagers that are widely used in today’s white light sensitive video cameras. The result is a thermal camera design that is currently almost an order of magnitude less expensive than its cooled imager counterpart. The price is expected to decline to less than $1,000 as the product matures.

Typically, a RedShift thermal TLV-equipped camera provides a 240 x 180 pixel image resolution with 150 mK sensitivity with a spectral response of 8-14 micron. The output is in the NTSC/PAL format at 30 frames per second. Power requirements are 12 volt DC. The operating temperature range is -10 to +50 Celsius. Start up time is about 5 seconds from initial power up.

The approximate range to detect and identify target activity in the field of view using a camera equipped with an IR lens having a 17 x 12 degree image field is:

| | | |
|---|---|---|
| **Human** | Detect presence | 750 ft. |
| | Identify target type | 300 ft. |
| **Vehicle** | Detect presence | 1500 ft. |
| (6ft x 8ft) | Identify target type | 700 ft. |

These specifications are not as good in terms of image resolution or sensitivity as those currently available in the in best cryogenically cooled thermal cameras, but Freeman Laboratories expects significant performance improvement to occur as the TLV product matures.

The RedShift thermal camera, although more expensive than conventional color day/night cameras on a unit comparison basis, may produce a total installed cost at savings to the user. The reason is that the installation of a conventional system with additional lighting and the ongoing operating and maintenance costs using the visible and/or near IR scene illuminators required for satisfactory outdoor video images using standard cameras, is projected to be significantly more expensive. An equivalent system using a mix of thermal and conventional cameras where no additional outdoor lighting is required would be less expensive.

Thus Freeman Laboratories suggests that integrated security system design and installation companies consider the RedShift camera technology for outdoor Day/Night applications in environments providing enterprise and campus wide personnel protection and object tracking, as well as parking lot and site perimeter protection. The use of the RedShift thermal camera has the added advantage of providing good imaging capability in bad weather situations when conventional cameras are unable to perform satisfactorily.

Other potential applications in the security surveillance environment that companies should investigate lie in the fire and life safety area. For example, thermal technology can confirm the presence of both fast and slow burning fires in facilities housing combustible materials, process plants and lumber yards.

David S. Terrett 9-06-05