NICOM

Computerized station for testing night vision devices

Fig. 1. NICOM test station

BASIC INFORMATION:

MIL standards present recommendations for a simple, non-computerized test stations for testing NVDs. Such recommendations are logical because these standards were created decades ago when when computers were not available for metrology applications. Next, there have always been pressure from military users for creations of compact, simple test stations. Therefore, so far simple, non computerized stations totally dominate market of equipment for testing night vision devices. Typical Inframet test stations (NVT, NVS, NV14, NV20) are also non-computerized stations.

NICOM is a first commercially available computerized station for expanded testing night vision devices. In detail, this station enable expanded testing of great majority of night vision devices (all night vision goggles, all night vision monooculars, and night vision sights/binoculars of field of view over about 10º). NICOM station enables not only expanded testing of night vision devices but recording of measurement results and recording of images generated by tested devices. The latter function is a big advantage over typical non-computerized test stations.

NICOM test station station is an optimal choice for quality control of manufacturing line, research projects, and for acceptance tests.

NICOM test station is the most advanced station from NV series stations offered by Inframet for testing night vision devices. The test methods used by the NICOM station are mostly based on recommendations of the MIL series military standards.

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Why computerized test station?

Lack of computerized stations for testing night vision devices can be considered as one of many reasons of difficulties in effective, accurate evaluation of night vision devices.

We must remember that humans can very well compare quality of several images seen at the same time but have big problems to evaluate quality of images seen at different moments of time. Therefore big variability of indications of team teams during resolution measurement of night vision devices or image intensifier tubes occur frequently. Modern computer technology could help to improve accuracy of resolution measurements.

Computerized test stations can enable measurement of important objective parameters like modulation transfer function MTF and signal to noise ratio SNR. These parameters cannot be measured by typical non-computerized stations.

Further on, use of computer technology in testing NVDs can potentially reduce differences between methodology of testing NVDs and methodology of testing electronic imagers like thermal imagers, and visible/NIR cameras. Nowadays, there is basically no major technical obstacles to use well matured methodology of testing visible/NIR cameras also for testing NVDs. This scenario would potentially enable easy comparison of performance of NVDs and low light TV cameras.

How NICOM stations works?

NICOM test station works as an image projector that project images of standard targets into direction of tested night vision device. The latter device distorts projected image that is later evaluated by human observer or with help of more objective measuring tools (luminance meter, high-res video camera, or digital still camera).

Light source

MIL standards recommend to use a calibrated tungsten filament lamp of 2856K color temperature as a radiation source. It is technically difficult to develop a reliable, long life, 2856K color temperature tungsten filament light source that enables regulation of light intensity in wide range. Therefore typical test stations for testing night vision devices offered on market are built using a single LED light source. Such test stations are calibrated to simulate 2856K color temperature light source for one specific type of night vision device (typically built using Gen 3 tubes and Class A filter). Measurement accuracy significantly deteriorate when night vision devices of different type are tested.

NICOM test station is built using more advanced concept. The station is built using two switchable light sources: halogen bulb of 2856K color temperature source and a monochromatic LED light source. Halogen source is used during measurement of photometric parameters; monochromatic LED source during measurement of imaging parameters. Therefore NICOM station enables accurate measurement of photometric parameters (like brightness gain) of all types of night vision devices. Next, NICOM station can be checked and re-calibrated by advanced photometric laboratory because the stations use classical photometric light source. At the same time life time of the test station was significantly extended due to use of halogen source only for measurement of photometric parameters.

Test capabilities

NICOM test station is optimized for testing night vision goggles (bino and mono) and night vision monoculars of FOV about 40º . However, NICOM test station can be also optionally used for testing night vision sights/binoculars of FOV over 10º.

NICOM test station enables measurement (or checking) of a long list of parameters that can be divided into six main groups

1. Typical tests: resolution (center, peripheral, high level), screen quality (dark spots), brightness gain, field of view,
2. Maintenance checks: Operational defects (shading, edge glow, flashing,/flickering/intermittent operation, emission points); Cosmetic defects (Dark Spots, Bright Spots, Fixed-Pattern Noise, Chicken Wire, Image Disparity, Output Brightness Variation, Image Distortion),
3. Binocular tests: collimation error, gain disparity,
4. Expanded tests: Minimal Resolvable Contrast, magnification and EBI (option).
5. Electrical tests: power consumption, current,
6. Advanced tests: MTF, SNR.

NICOM test station enables recording of test results and video recording of images generated by tested night vision devices. Special software that enables presentation of recorded videos from several tested NVDs at the same time at PC screen is a part of NICOM test station.

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SPECIFICATIONS

Modules	NICOM base module (different versions), LP1 luminance probe, LP2 luminance probe, set of exchangeable adaptors, PS1 power supply, BC12 beam combiner, BC21 beam divider, NVC high-res video camera, NDC digital camera, frame grabber, PC, TAS-NV computer program, Nicom Display computer program
Light Sources	1) 2850K color temperature polychromatic source, 2)LED 590 nm (or 680 nm) monochromatic light source
Illuminance range of light sources	from at least 2 10^{-5} lx to 200 lx
Regulation resolution	10 µlx (at low intensity range)
Regulation type	continuous (any value can be set within the regulation range)
Regulation mechanism	manual
Regulation stability	better than 2% of the set value
Aperture of built in collimator	66 mm
Collimator resolution	At least 50 lp/mrad
Type of tube holders	exchangeable holders for different types of NVDs
Targets	Set of exchangeable targets
Range of luminance probe	0.01-100 cd/m^2
Output readout	PC monitor
Control method	manual: Light knob, Target knob
Power	230 -110 VAC 50/60 Hz
Operating temperature	5°C to 40°C
Units	Metric (US - option)
Mass	35 kg
Dimensions	680×660×1480 mm

*specifications are subject to change without prior notice

VERSIONS

NICOM test station can be delivered in form of a set of different versions of different test capabilities. The versions differ in range of tested NVDs and in range of test capabilities.

Two types of NVDs can be tested:

1. Goggles and monoculars (all typical devices of of FOV about 40º)
2. Sights/binoculars (only devices of FOV > 10º).

Next, the following options are possible for test range:

1. Typical tests: resolution (center, peripheral, high level), screen quality (dark spots), brightness gain, field of view,
2. Maintenance checks: Operational defects (shading, edge glow, flashing,/flickering/intermittent operation, emission points); Cosmetic defects (Dark Spots, Bright Spots, Fixed-Pattern Noise, Chicken Wire, Image Disparity, Output Brightness Variation, Image Distortion),
3. Binocular tests: collimation error, gain disparity,
4. Expanded tests: Minimal Resolvable Contrast, EBI, magnification.
5. Electrical tests: power consumption, current,
6. Advanced tests: MTF, SNR.

Definitions of available versions of NICOM are presented in Table 1.

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Tab. 1. Definitions of code used to describe versions of NICOM test system

Version code	Range of tested NVDs	Test capabilities
A1	Goggles and monoculars (FOV about 40º)	Basic test range
A2	Goggles and monoculars (FOV about 40º)	Basic test range + Binocular tests
A3	Goggles and monoculars (FOV about 40º)	Basic test range + Binocular tests+Expanded tests
A4	Goggles and monoculars (FOV about 40º)	Basic test range + Binocular tests+Expanded tests+Electrical tests
A5	Goggles and monoculars (FOV about 40º)	Basic test range + Binocular tests+Expanded tests+Electrical tests+Advanced tests
A6	Goggles and monoculars (FOV about 40º)	As in A5 but additional adapter that enables measurement of resolution of image intensifier tubes
A6	Goggles and monoculars (FOV about 40º)	As in A6 but additional measurement of luminance gain of image intensifier tubes
B1	1)Goggles and monoculars 2)Sights/binoculars of FOV > 10º)	Basic test range
B2	1)Goggles and monoculars 2)Sights/binoculars of FOV > 10º)	Basic test range + Binocular tests
B3	1)Goggles and monoculars 2)Sights/binoculars of FOV > 10º)	Basic test range + Binocular tests+Expanded tests
B4	1)Goggles and monoculars 2)Sights/binoculars of FOV > 10º)	Basic test range + Binocular tests+Expanded tests+Electrical tests
B5	1)Goggles and monoculars 2)Sights/binoculars of FOV > 10º)	Basic test range + Binocular tests+Expanded tests+Electrical tests+Advanced tests
B6	1)Goggles and monoculars 2)Sights/binoculars of FOV > 10º)	As in A5 but additional adapter that enables measurement of resolution of image intensifier tubes
B7	1)Goggles and monoculars 2)Sights/binoculars of FOV > 10º)	As in A6 but additional adapter that enables measurement of luminance gain of image intensifier tubes

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