

MS systems

Testers of multi-sensor surveillance systems



Fig. 1. Photo of the MS 300 test system

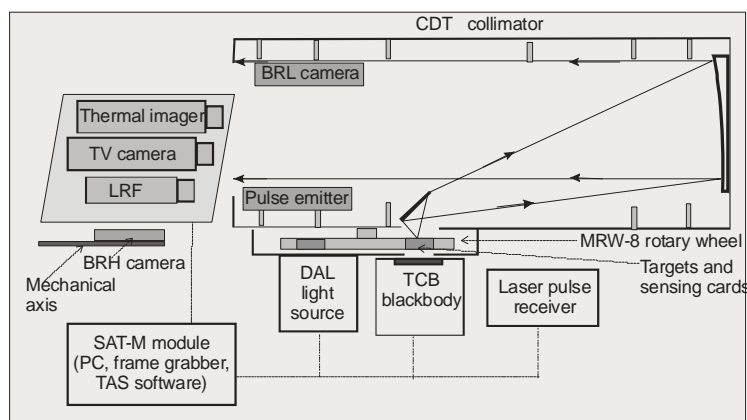


Fig. 2. Block diagram of the MS series test system

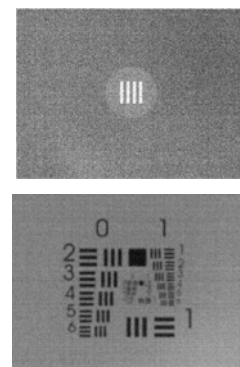


Fig. 3. Images generated by MS system

BASIC INFORMATION:

The MS series test systems are test systems optimized for task of extensive testing and boresighting of modern multi-sensor surveillance systems (thermal imagers, TV cameras, LLLTV cameras, laser range finders, laser pointers/illuminators) at laboratory/depot conditions. The MS test systems are modular test systems built using modules from other more specialized test systems: big reflective collimator, differential blackbody, and set of IR targets from MS system for testing thermal imagers, calibrated light source and set of visible targets from TVT system for testing TV cameras, set of sensing cards, laser radiation meter, pulse simulator from LT system for testing laser range finders, and boresighting cameras from JT system for boresighting of electro-optical surveillance systems.

The MS test system is one of the most technically sophisticated test systems offered by Inframet. It is recommended for testing high value multi-sensor surveillance systems (payloads) used for long range surveillance in air, naval and ground applications.

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FEATURES:

- Extensive range of tests of thermal imagers, TV cameras (both day level and night level cameras), laser range finders and other laser systems
- Excellent tool for boresighting (both reference optical axis and to reference mechanical axis)
- Aligning accuracy to reference optical axis is limited only by angular size of a single pixel in image generated by tested imaging sensors
- High accuracy of boresighting to reference mechanical axis (uncertainty below 0.15 mrad)
- Semi-automatic measurement of most parameters
- High optical aperture of the collimator: typical 300mm, and optionally 400mm.
- Modern compact design optimized for testing multi-sensor surveillance systems.

SPECIFICATIONS

Collimators

Model	CMS 300, CMS 400
Collimator type	reflective, off-axis
Aperture	CMS 300: 300mm; CMS 400: 400mm
Focal length	CMS 300 – 2000mm CMS 400 – 2500mm
Spectral range	0.4-15 μ m
Spatial resolution	not less than 160 lp/mrad
Coating	aluminum – collimating mirror, protected silver-flat mirror
Transmittance	0.92@3-5 μ m, 0.94@8-14 μ m
Field of view	CMS 300HR : 1.7° CMS 400HR : 1.4°
Dimensions	CMS 300: 410x 420x 2120 mm CMS 400: 550x 530x 2330 mm
Mass	CMS 300: 38 kg CMS 400: 64 kg

Rotary wheel

Model	MRW-8
Number of holes for targets	8
Control type	motorized, digital
Wheel emissivity	0.97±0.01
Dimensions	380× 350×100 mm
Mass	5 kg

Targets

Model	M54
Diameter	54 mm (for wheel holes)r
Emissivity	0.97±0.01
Type	Set of twelve 4-bar targets, edge target, cross target

Blackbody

Model	TCB-2D
Aperture	50× 50 mm

Differential temperature range	-25°C ÷ + 75 °C
Absolute temperature range	0°C ÷ +100°C
Set point and resolution	1 mK
Emissivity	0.97±0.01
Temperature uniformity	<0.01 °C at $\Delta T < 5^\circ C$
Response time	10°C step < 60sec
Regulation stability	±2 mK @ $\Delta T = 10^\circ C$
Temperature uncertainty	(T-25°C)*2+15 [mK]
Computer control	RS-232 (USB 2.0)
Power supply	115-230VAC 50/60Hz
Operating temperature	+5°C ÷ +45°C (non condensing)
Storage temperature	-10°C ÷ +60 °C
Dimensions	160× 230×180 mm;
Mass	5 kg

Light source

Model	DAL-DN
Work modes	1) polychromatic halogen bulb 2850 K color temperature source 2) polychromatic warm white LED 3) monochromatic LED 590 nm light source
Illuminance range	Mode 1) 0.2 mcd/m ² - 3 kcd/m ² (0.04 mcd/m ² - 600 cd/m ² with neutral filter) Mode 2) 0.6 mcd/m ² - 3 kcd/m ² or 0.2 mcd/m ² - 600 cd/m ² (neutral filter) Mode 3) Dynamic >3 000 000 :1
Regulation resolution	up to 0.01 mcd/m ² (at low illuminance range)

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Regulation type	continuous (any value can be set within the regulation range)
Regulation mechanism	manual (option: motorized)
Regulation stability	better than 1% of the set value
Active aperture diameter	40 mm
Type of light level indication	digital display

Visible targets

Targets	Set of five variable contrast USF 1951 targets, edge target, distortion target, gray scale target
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Laser test set

Parameter	Value
Pulse energy	Yes (only for mono-pulse LRFs)
Divergence angle	Yes

Distance measurement accuracy	Yes
Receiver sensitivity tests	Yes
Testing laser illuminators and laser pointers (beam divergence, power)	Yes
ER (extinction ratio)	Yes
Sensitivity spectral range	0.9-1.6 μ m
Measurement pulse energy range	0.2-100mJ
Pulse width range	4 - 100 nsec
Pulse Repetition Frequency	0.1 Hz – 4kHz
Measured divergence angle range	0.2 to 4 mrad
Divergence angle resolution	0.05 mrad

Versions of MS systems

MS test systems are modular test systems. The MS series systems can be delivered in form of different versions of different configurations and of different test capabilities.

The basic division of MS series system is based on output aperture of the collimators (see Tab. 1).

Tab. 1. Division of MS series systems based on the collimator aperture

System code	Collimator output aperture
MS 300	300 mm
MS 400	400 mm

Collimator aperture is only one of a series of technical parameters that should be determined to optimize MS system for required applications. We need also to determine:

- A. Test range of thermal imagers
- B. Test range of TV cameras
- C. Light conditions for testing TV cameras
- D. Test range of testing laser range finders/designators
- E. Boresighting capabilities
- F. Acceptable electronic image formats of tested imagers
- G. Optional software.

Therefore combinations of additional seven digits plus collimator aperture code are used to compose precise codes that describe different available versions of MS test system in the form MS X(aperture code) ABCD-GEF. Definitions of the codes are shown in Tab. 2. As we see in this table changing digits from 1 to 4 we increase test capabilities of MS test system but also increase its cost.

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Tab. 1. Definitions of the codes used to describe versions of MS test system

	A	B	C	D	E	F	G
C o d e	Testing thermal imagers	Testing TV cameras	Simulated light level	Testing LRFs	Boresight	Acceptable electronic image formats	Optional software
1	Basic: MRTD, focus	Basic: Resolution, focus	Day/Bright night Range: 0.05 lx to 3000 lx	Beam divergence, focus	No	Analog video (PAL or NTSC), FireWire, USB 2.0	No
2	Typical: MRTD, MTF, SiTF, NETD, FPN, non uniformity, distortion, FOV	Typical: resolution, distortion, FOV, sensitivity, SNR, NEI, FPN, non uniformity, 1/f, responsivity function	Night Range: 0.03 mlx to 2 lx	Pulse energy (for only mono-pulse LRF), beam divergence, range measurement accuracy, receiver sensitivity	Boresighting of thermal imagers, TV cameras and LRFs to reference optical axis	Additionally: CameraLink or GigE, or LVDS	Simterm -
3	Expanded: as in point 2 but additionally MDTD, PVF, SRF, ATF, NPSD, 3D noise, dead pixels, 1/f noise	Expanded: as for level 2 but additionally MRC measurement	Day/Night Range: 0.03 mlx to 3000 lx	As in point 3 but additionally measurement of ER (extinction ratio) – simulation of field performance	As in point 1 but additionally boresighting of thermal imagers, TV cameras and LRFs to a reference mechanical axis		Simterm, Mosot, Movis
4	As in point 2 but additional targets or custom designed targets ¹	Ultra expanded: as in level 3 but additionally 3D Noise model, PVF, NPSD		As in point 4 but additionally testing laser illuminators, pointers (beam divergence, optical power)			
5							

MS-300- 2212-13 describe a version of MS test system of collimator aperture 300 mm capables to carry out typical range of tests of thermal imager, typical range of tests of TV cameras (day conditions are simulated), basic checking of laser range finders, boresighting of thermal imager/TV camera/laser range finder to a reference optical axis. The tests are to be carried out for imagers with standard analog video output. Optional support software: Simterm, Mosot, Movis) is delivered.

¹ – typical quantity means: a set of twelve 4-bar targets chosen from a line of single 4-bar targets presented at Inframet website, edge target, distortion/FOV target, alignment (cross) target. In case of expanded test capabilities there are additional targets: set of six circular targets. Targets outside this list are treated as optional or custom designed targets.

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³ – for this version two frame grabbers are delivered: typical analog/digital capable to accept Analog video (PAL or NTSC), Fire-Wire, USB 2.0 and additional digital frame grabber capable to accept one of the following formats: CameraLink or GigE, or LVDS

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