

## TT-HUD™

Head-up Display Test Module for TrueTest™ Software

### Applications

- Evaluate augmented projections generated by head-up display (HUD) systems
- Use with a Radiant ProMetric® Imaging Colorimeter (16 or 29MP) or Photometer (16, 29, or 43MP) with 200 mm lens
- Measure absolute luminance and chromaticity in projected images
- Test image clarity, distance, and position; characterize image distortion and other effects



Software module with tests for evaluating the quality of HUD system projections

### Benefits

- Quickly apply pre-defined tests for advanced HUD measurement
- Software test sequencing and API device integration to control display test images in conjunction with software analyses, enabling automated production-level testing
- Apply tolerances and obtain pass/fail data to enable in-line quality control
- Supports Society of Automotive Engineers standard requirements for HUD measurement (SAE J1757-1) and methodology (SAE J1757-2)
- Single test suite captures luminance, chromaticity, and dimensional measurement data for analysis

Radiant Vision Systems TrueTest™ Software provides a comprehensive set of tests for image analysis within a flexible framework that enables evaluation using a single test, or multiple tests in sequence. Test sequencing and pass/fail reporting functionality make TrueTest the ideal software package for production environments. TrueTest Software can be combined with any Radiant ProMetric® Imaging Colorimeter or Photometer to create a complete testing system for light and color measurement or machine vision.

The TT-HUD™ module for TrueTest Software provides a test suite to efficiently perform light, color, and dimensional measurements used to evaluate the quality of augmented projections, such as those emitted by head-up display (HUD) systems.

The TT-HUD software module includes:

- **Light Measurement**  
*Characterize luminance, chromaticity, and evaluate values including contrast and uniformity.*
- **Image Distortion**  
*Characterize distortion of the projected image using Distortion Dot Grid and Distortion Line Grid Analysis.*
- **Modulation Transfer Function (MTF)**  
*Includes line pair algorithms to evaluate image clarity.*

# TT-HUD™ System Requirements

- ProMetric Imaging Photometer (16, 29, 43MP) or Colorimeter (16 or 29MP)
- 200 mm lens
- Windows® 7 to 10, 64 bit
- 3.0 GHz and 8 cores
- 16-32 GB RAM
- Dual-monitor video output
- Ethernet 100/1000 port

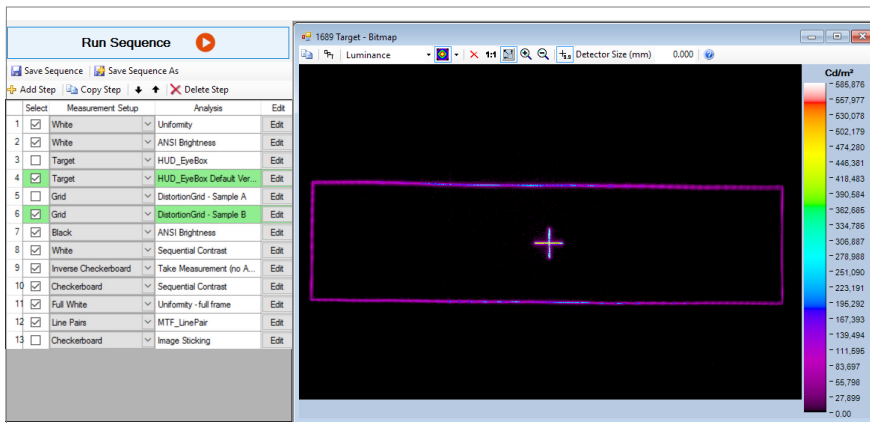
# Test Library

TT-HUD includes tests for HUD quality and defect detection, including:

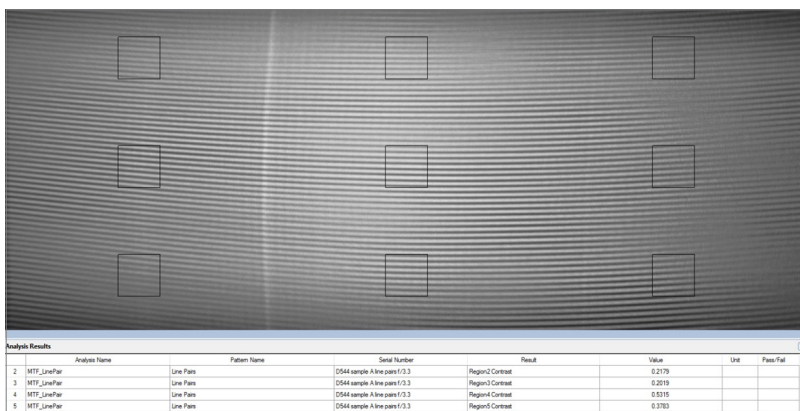
- ANSI Brightness
- ANSI Color Uniformity
- Checkerboard Contrast
- Chromaticity
- Compare Points of Interest
- DFF Image Sticking Analysis
- Diagonal Checkerboard Analysis
- Distortion 9 Point
- Distortion Dot Grid
- Distortion Line Grid Analysis
- Eyebow
- Field of View
- Ghosting Analysis
- Image Export
- MTF Line Pair
- Particle Defects
- Pixel Defects
- Points of Interest
- Sequential Contrast
- Uniformity
- Warping Analysis

Captures dimensional measurements for projected image size and x,y position. Software converts camera focal distance to real distance units to test image location.

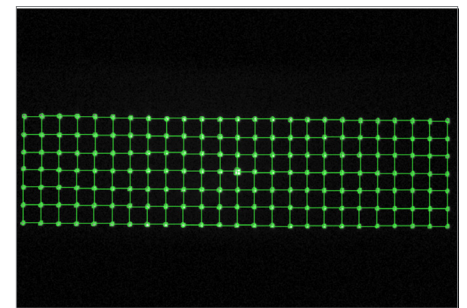
## Examples of TT-HUD analyses:



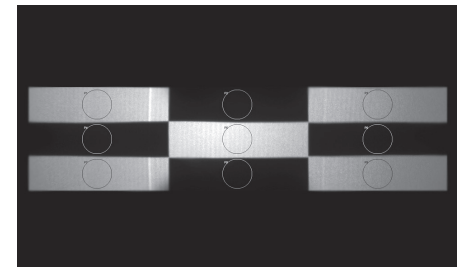
Apply tests separately or in sequence to evaluate all critical display quality parameters. Using a TrueTest Software device interface, TT-HUD can integrate with the HUD system to control display test images in conjunction with the test sequence for production-level automation.



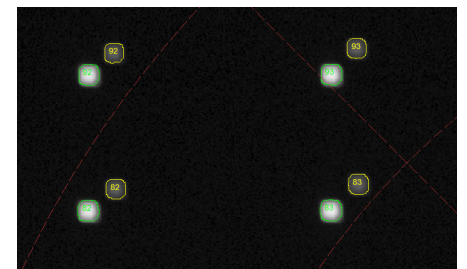
Modulation Transfer Function (MTF) line pair algorithms calculate contrast at different spatial frequencies to determine image clarity. Testing is done using horizontal and vertical pairs of black and white lines.



Test distortion using Distortion Dot Grid to measure the spatial offset between dots of the primary image and a test pattern.



Measure values between black and white areas of the HUD projection using Checkerboard Contrast to test contrast.



Detect duplicate projections caused by ghosting effects using Ghosting Analysis.