FLUKE®

Marine systems innovator uses ScopeMeter® testing to keep its sights on the target

Application Note

Power Quality

Case Study

Measuring tool: Fluke 199C ScopeMeter® Test Tool

Operator: Erik Ahlin, Kollmorgen Electro-Optical

Tests performed: signal testing; comparative amperage waveforms; resistance, continuity; high voltages

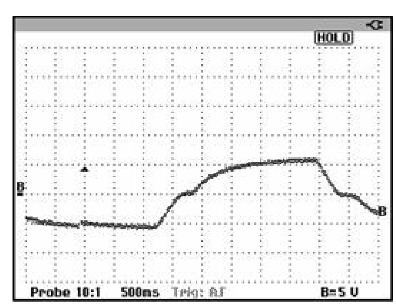
At Kollmorgen Electro-Optical, the Optical Sight System is playing a pivotal role in the modernization of the US Navy, where the sophistication of the vessels' day and night vision capabilities in rugged environments is critical to national security.

Erik Ahlin of Kollmorgen tests and troubleshoots stabilized platforms for electro-optical tracking and information systems. "Had I not had a chance to play with the Fluke ScopeMeter® test tool, I probably would be using a benchtop scope," said Ahlin. Ahlin is currently involved in making new systems field-ready, and the enabling technology is the stabilized platform, essentially the "eyes" of a vessel's information system.

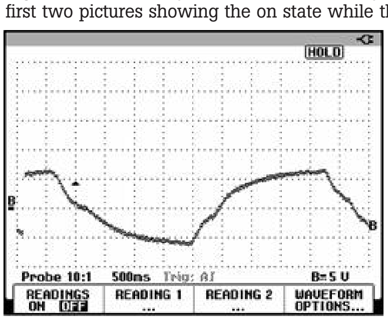
Stabilized platforms, says Ahlin, are tasked with stabilizing the vessel's optical sights as the vessel bobs up and down, "in much the same way as a human being on snow skis maintains his optical stability—keeping the length of the ski slope in focus regardless of how his speed, or snow drifts, or headwinds challenge him."

Ahlin and his colleagues test a system against its operating profile before shipping it for field deployment, and the shipyard tests the system more extensively before integrating it with the rest of the on board systems. "I was in the field debugging and troubleshooting an issue that a customer reported with one of our systems, and I found the ScopeMeter to be indispensable." Ahlin relies on the ScopeMeter for 'wringing out" cable, testing resistance, and checking continuity, among other tests. "It's great to have a single tool that I can use to examine all aspects of a dynamic signal—and without having to drag around a power cord and find a source of ac power."

Figure 1. This testing sequence compares signals with the gyro on and off with first two pictures showing the on state while the last two show the off state.



Looking at the torquer



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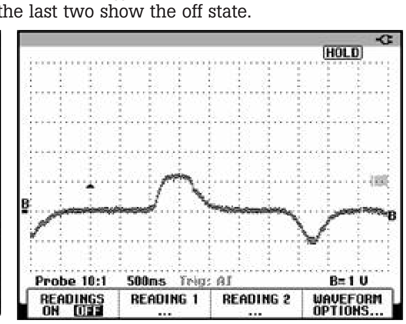
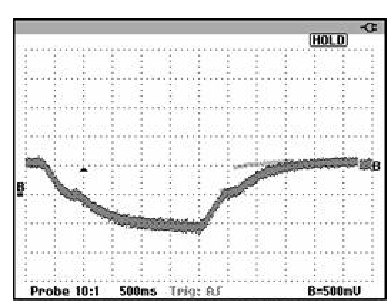


Looking at the error



Looking at the error

The eyes have it

A Kollmorgen stabilized system is equipped with a ranging device—essentially an optical system that resides near the top of the ship's structure. Its purpose is to obtain optical information about subject matter in the ocean. "It's like a pair of remote-control binoculars," says Ahlin, "where someone in a remote location can work to gather and integrate information from this and other systems. The system provides the optical stability, but the operator provides the intelligence for pertinent information. "For example, the operator may determine that the object is a shipping vessel, or he may identify other features that tell a different story."

"We are a small piece of the pie," says Ahlin. A critical component of that 'small piece of the pie" is a feedback signal provided by an error amp. "An error amp provides feedback to keep the optical system properly aligned. Essentially it tells the system where it is, and where it wants to be." As an analogy, he says, consider looking off in the distance in search of a blue balloon. "If you look out and focus on a red balloon, the feedback would lead your mind to say 'turn your head and look at the blue balloon.'" As the ship rocks, the error amp continuously feeds back information resulting from the rocking of the ship so that it can provide data to the optical system for stability."

Your documents, please

"It's critical to monitor both the inputs and outputs of the error amp," says Ahlin. "This is a prime example of where the ScopeMeter proves its value. We measure, collect and drop these error amp waveforms into the computer, where we can annotate them."

At Kollmorgen Ahlin prepares 'embedded documentation' before a system is certified for field deployment. "As an example, we probe analog signals, save the waveforms to the ScopeMeter's memory, and load them directly into a Microsoft Word document on a computer. That enables us to document the waveform – its states, information on the inputs and outputs, and critical waveform components." He says this process might be used for either a known-good system or malfunctioning system. Documenting a known-good unit is often a requirement for acceptance testing as a unit is initially deployed. In a malfunctioning system, it is important to document what parts of the waveform are bad—and why—as well as how to correct the problem.

Ahlin says he and his colleagues have used a variety of scopes to document waveforms, but with mixed results. "The Lab View, on some scopes, is a tool for saving waveforms for documentation, but it's often cumbersome. As a remedy, a colleague of mine resorted to writing a Visual Basic application to extract waveforms and save them on a computer. But the ScopeMeter's FlukeView application is very clean and works without a hitch. It's—I hate to use the word 'intuitive'—but it's neat and straightforward. It works the way one would expect it to."

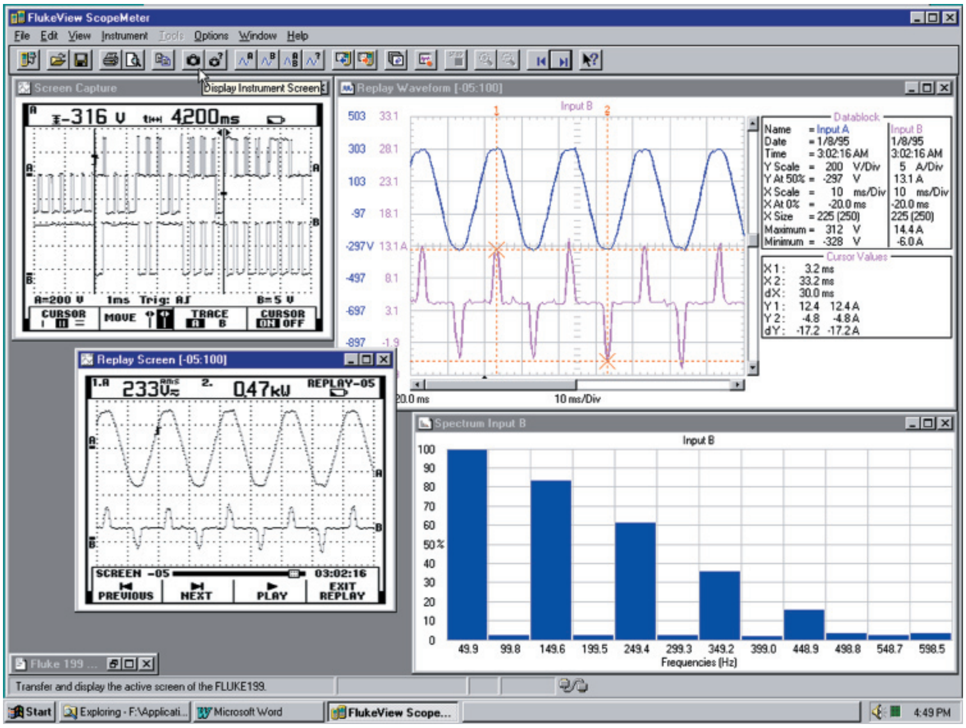


Figure 2. ScopeMeter's FlukeView application transfers waveforms, harmonics, and other measurement data to the PC for documenting, archival, and analysis.

Floating away

An often overlooked application for a battery-powered scope, says Ahlin, is high-voltage measurements that could damage an electrically grounded, ac-powered scope. Most oscilloscopes can perform only single-ended voltage measurements; that is, measurements of signals referenced to earth ground. Wiring within the probe connects the probe's reference lead to the shell of the BNC. Plugging the probe into the scope causes the reference lead to become electrically common with the scope's chassis, and the power cord's ground conductor connects the chassis to earth ground.

"If I need to look at a small signal on top of a very large potential—several kilovolts or so—I can't hook the equipment to earth ground without risking damage to it," says Ahlin. "If I'm troubleshooting a PFC bus, the PFC side is typically not referenced to ground. And so, if I want to look at signals on transistor-based switching elements, I need to float the scope."

One way to float an ac-powered scope, he says, is to place a transformer between the scope and ground. "Basically, the ground floats on the transformer. The goal is to isolate the equipment from ground. But that's not necessary with a battery-operated scope. By its nature it can be operated without a reference to an earth ground."

For Ahlin the ScopeMeter has become an essential tool of the trade. He resorts again to his skiing analogy: "Just as a skier won't hit the slopes without goggles, I won't dive into my testing and troubleshooting of stabilized platforms without my ScopeMeter."

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