American Innovations®

How We Test Bullhorn® Remote Monitoring Units

Abstract

We subject our remote monitors and other products to many tests before we'll consider them to be built Bullhorn tough. This technical brief explains the following four:

- **Radio frequency radiation.**
- **Environmental.**
- **Shock, vibe and drop.**
- **Highly accelerated life.**

Because our remote monitors and other products undergo a series of harsh tests, we're confident that they'll operate as designed even in severe conditions such as high heat, freezing cold, heavy rain or radio frequency interference. Read on to learn about four of the tests that we perform, and that we believe all remote monitors should undergo.

Radio Frequency (RF) Radiation Tests

After being installed in the field, remote monitors are often exposed to electromagnetic radiation from broadcast towers, high-voltage power lines, rectifiers, or other systems that communicate via satellite or cellular networks. To make sure that Bullhorn units operate correctly in the presence of this interference and that they don't emit electromagnetic radiation themselves, we subject them to two types of RF radiation tests: radiated emissions and radiated immunity.

To perform the radiated emissions test, we place a unit inside an RF anechoic chamber – a room with walls covered in radiation-absorbent material that prevents RF radiation from entering or leaving. The floor of the chamber is equipped with a rotating platform and a table on which we place the unit. Then we turn the unit on, rotate it, and use a fixed-position antenna to detect any RF radiation that it may be emitting (see Figure 1). During the radiated immunity test, we do the opposite. The setup is the same, only this time the antenna emits radiation rather than detecting it.

How We Test Bullhorn® Remote Monitoring Units

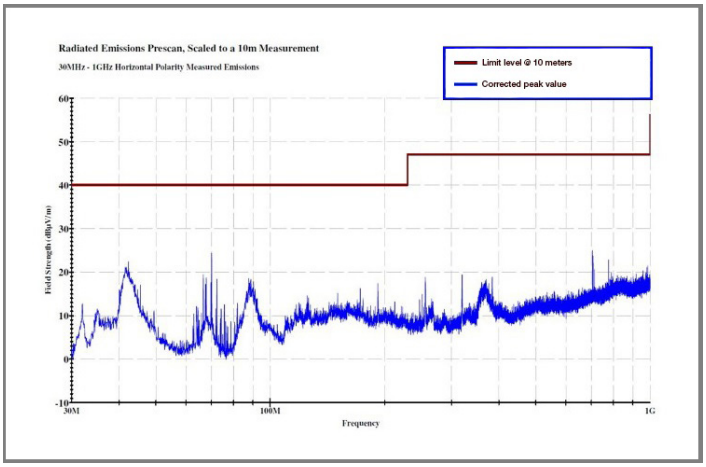

Figure 1: Radiated emissions test results showing that product emissions (blue line) are within the acceptable threshold (red line)

Environmental Tests

Bullhorn remote monitors are used everywhere from Lucky, Louisiana to Nikiski, Alaska to the Mojave Desert area in Baker, CA. One way we test their ability to stand up to the harsh environmental conditions typical of these locations is by using an environmental simulation chamber. We place the unit inside the chamber, with various probes attached so that we can measure its performance while inside (see Figure 2). Next, we use the chamber to freeze the product to negative 40 degrees Celsius and then heat it to 70 degrees Celsius, with varying degrees of humidity. This tests product functionality during non-condensing humidity conditions. As an extra measure, we also subject the product to temperature and humidity conditions similar to those that typically occur in a day/night cycle, as these may cause condensation to form on the inside of the unit.

Figure 2: AI products being tested to make sure they aren't affected by condensation

In addition to the temperature and humidity tests, we often subject our units to a spray test, which simulates conditions like driving rain and flooding. During this test, we use a high-pressure device to spray water on all sides of the unit for 2-3 minutes each. In some cases, we may also submerge the unit in 1 meter of water for 30 minutes. If no water enters the product during either test, we may assign the unit an Ingress Protection rating such as IP66, which means that it won't be affected by high-pressure water jets coming from any direction.

Finally, all of our products are extensively tested in the field to catch any environmental conditions that we haven't predicted or that can't be simulated indoors.

How We Test Bullhorn® Remote Monitoring Units

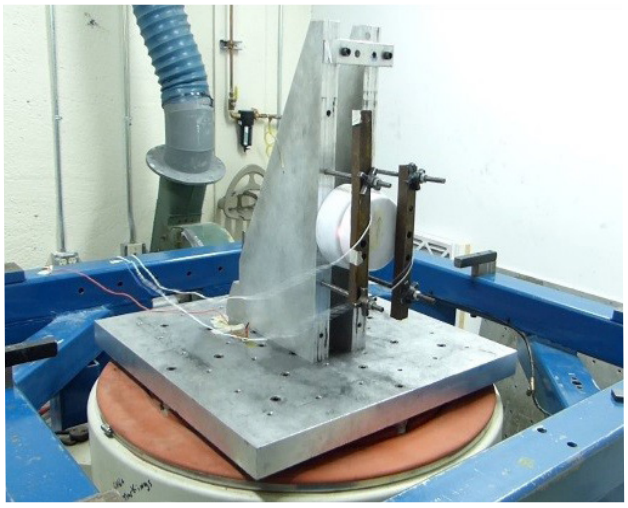

Figure 3: An AI product being tested to make sure it can withstand conditions like a rough ride in a pickup truck

Shock, Vibe and Drop Tests

The shock, vibe and drop tests make sure that our units can't be damaged by rattling around in a vehicle, from vibration due to passing trains or trucks, or by being dropped.

For the shock and vibe tests, we attach a unit to an electrodynamic shock and vibration shaker (see Figure 3). This device shakes the product for an extended period of time with varying frequency and intensity. We determine the frequency and intensity of the shake by using a profile based on the expected use case, such as sitting in the back of a pickup truck on rough roads or in the back of a delivery truck.

We conduct the drop test just as you might imagine. We drop a unit from a height of 1 meter onto a surface our customers are likely to encounter in the field, such as concrete or wood. We drop the unit onto at least six different points such as top, bottom, side, etc. Then we perform the test again with the product in its packaging. During the second test, we drop the unit 24 times into all edges, points, and sides of the shipping container.

Highly Accelerated Life Testing (HALT)

HALT is a set of methodologies we use to ruggedize the design and production of our products. The basic idea is to break the product quickly, which allows us to identify weak areas. Then we adjust the product to handle more stress and break it again. We repeat this process until we find a fundamental limit of the technology. HALT methodologies include applying extremely high and low temperatures using cryogenic chambers that can transition temperature quickly. Another HALT methodology is applying random six-axis, high-energy vibrations that simultaneously excite each individual component of the unit that's being tested. Figure 4 shows a unit undergoing preparation for a HALT test.

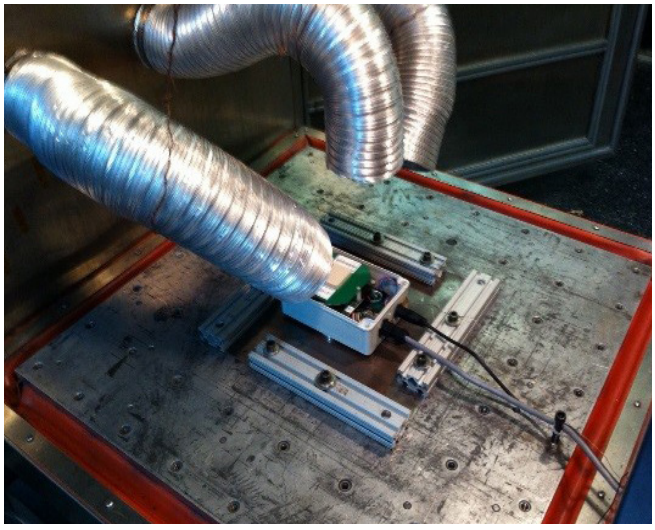

Figure 4: An AI product undergoing HALT to find and fix weaknesses during development

How We Test Bullhorn® Remote Monitoring Units

Summary

HALT, RF radiation tests, environmental tests, and shock, vibe and drop tests are just some of the ways we make sure that our products deserve the Bullhorn name. Using these tests, we're able to find and fix product deficiencies during the development process. We're also able to make sure that our units aren't affected by extreme temperatures or radio frequency interference, and that they can withstand conditions like a rough ride in a pickup truck.

For More Information

Contact

For more information, email us, call us at **800-229-3404**, or visit us online at **aiworldwide.com**.

Products

Learn more about our Bullhorn remote monitoring units or Allegro Field Data PC.

Services

Expect relentless service from our American Innovations team.

- Approximately 98 times out of 100, a highly qualified professional will answer your very first phone call and handle your questions. No call backs; no phone tag.
- We set you up for success with product training, offered at your place of business or ours.
- Technical support is provided by NACE-certified professionals via phone and email.

About American Innovations

American Innovations (AI) protects people and the environment by helping our customers safely and efficiently manage the world's energy infrastructure. We deliver proven compliance solutions to virtually every oil and gas transmission pipeline company in North America – from the field to the office. We provide an integrated family of hardware, software and professional services backed by relentless customer service. Our products include: Bullhorn® Remote Monitoring, MicroMax® Current Interrupters, Allegro Field Data PC™, PCS™ compliance software, and Risk Intelligence Platform (RIPL™) software. AI also provides a wealth of professional services including data migration, risk analysis, high consequence area (HCA) analysis, and regulatory compliance consulting.

American Innovations®

Proven compliance solutions. Relentless service.

aiworldwide.com

12211 Technology Blvd. • Austin, TX 78727

800-229-3404 • info@aiworldwide.com