

WHITE PAPER

AFC: A Hidden Problem in Urgent Communications

How Automatic Frequency Control Can Create a 'False Sense of Security' for Two-Way Radio Users





Introduction

This white paper will provide a comprehensive overview of how a poorly maintained radio can be affected by AFC (Automatic Frequency Control) and a simple solution to rectify the problem for public safety and government personnel, who rely on their two-way radios to be operational ready at all times, no matter the situation.

The Importance of AFC

What is Automatic Frequency Control

In radio equipment, Automatic Frequency Control (AFC), also called Automatic Fine Tuning (AFT), is the process of tuning a resonant circuit or oscillator automatically in response to an internal control loop or external signal to the desired frequency or channel designation. This automatic process (AFC) assists in temporarily keeping the radio transmitter/receiver on frequency.

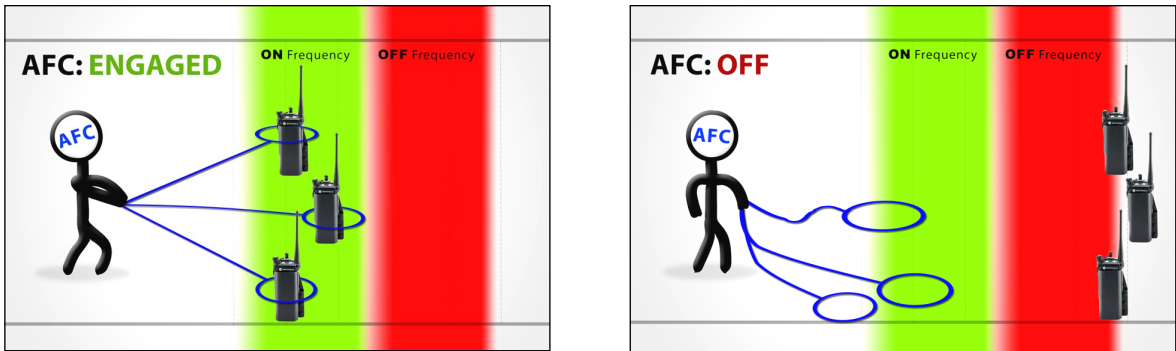
How AFC Affects Radio Communication

In today's market, the two major manufacturers of two-way radios have an embedded technology in them which aids in adjusting frequency error or frequency misalignment. This embedded technology is known as AFC.

Portable and mobile radios contain a crystal oscillator to keep them on frequency. These reference oscillators tend to drift over time due to variables, such as the aging of electronics, battery power,

temperature, environment, and mounting conditions. The effect of these variables can lead to the drift or detuning of oscillators which in turn degrades the ability to capture or transmit a radio signal accurately.

A poorly aligned radio often requires multiple attempts to affiliate/register with the network before AFC engages, unnecessarily taxing the system.

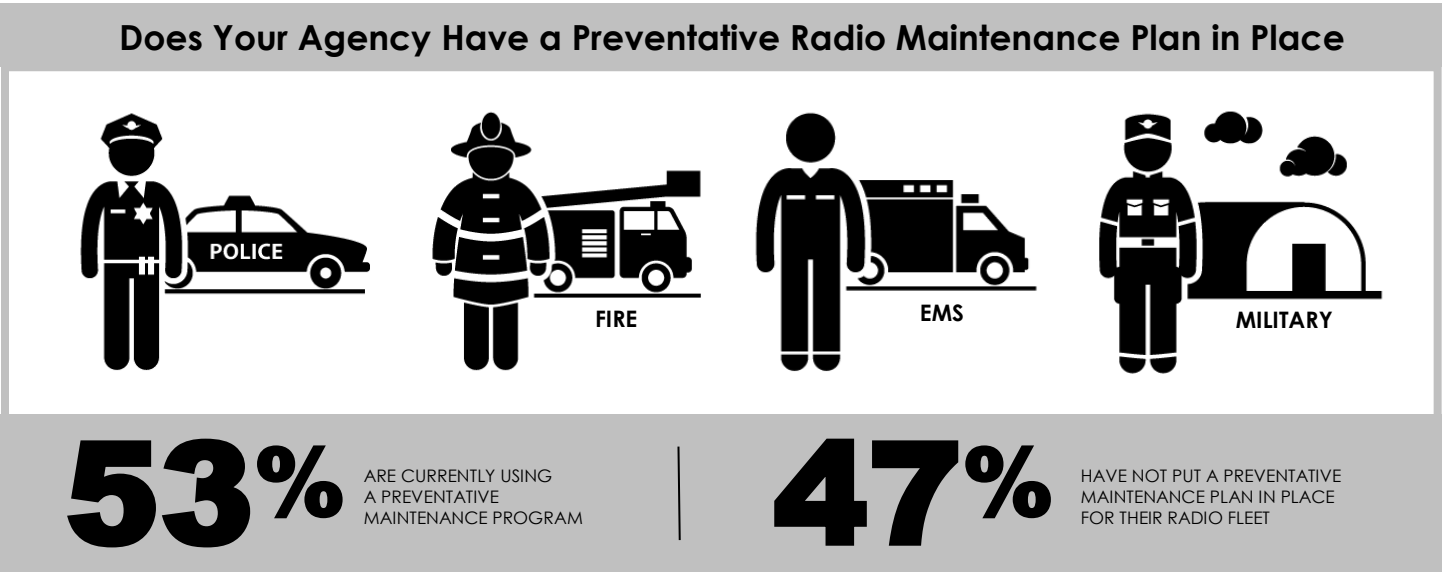


Although AFC helps radios to continue to communicate, it can only temporarily correct a certain amount of oscillator drift; 1000 Hz or 1500 Hz depending on the manufacturer. A low battery will also abruptly disengage AFC. Once the drift exceeds a certain threshold value, the embedded process will no longer attempt to correct the problem, thereby resulting in a hard failure.

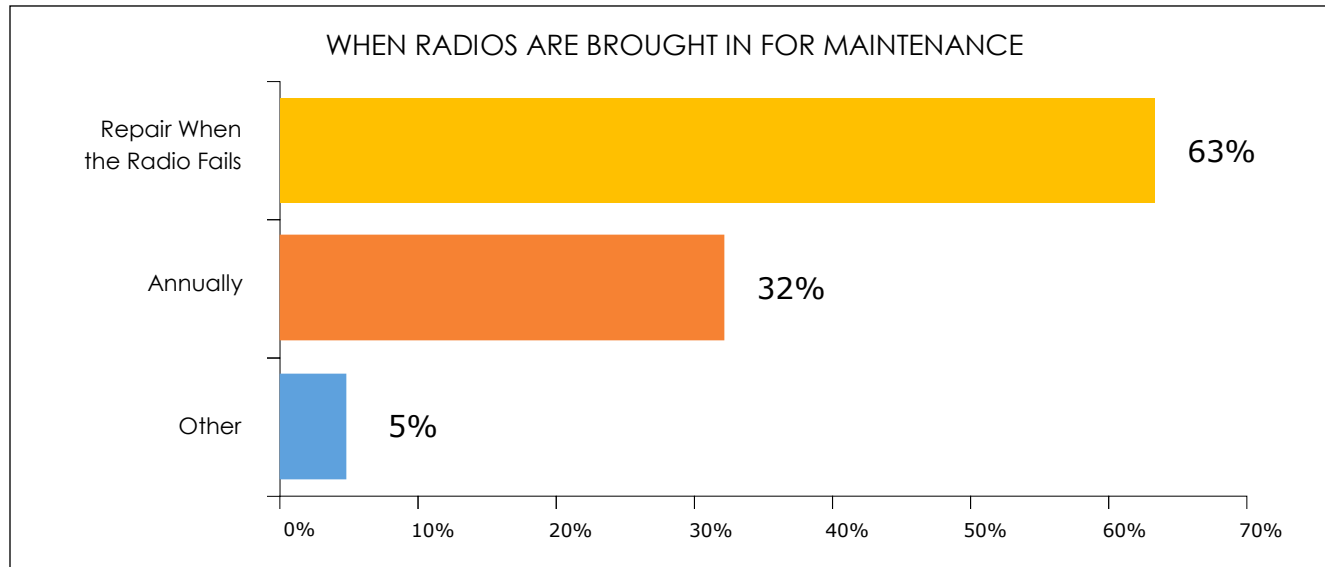
Make Maintenance a Priority

Proper maintenance can ensure connectivity to the network, maximizing the radio's effective range and prolong the life of it. The best way to ensure this is to have radios PM'd (preventative maintenance) on an annual basis or per the manufacturer's recommended intervals.

LocusUSA recently conducted a blind survey to show the growing trends among public safety and government agencies in regards to providing annual radio maintenance for their fleets. Some of the results were surprising. Of 300 respondents surveyed 53 percent indicated their agency currently has a preventative radio maintenance plan in place, where 47 percent do not.



Another question asked to survey participants was how often were their radios brought in for maintenance. Thirty-two percent are using an annual maintenance program, while 63 percent do not have one and choose to take a *fix it when it fails* approach.



The best way to guarantee peak performance of a radio is to keep it well-maintained, much like you would do with a regular oil change for your car to help the engine run with optimum efficiency.

Cutting-Edge Technology is the Key



When your fleet has thousands of radios, it can be cost and time prohibitive to bring each one in for maintenance every year. Statistics have shown that 75 to 85 percent of radios on a Land Mobile Radio (LMR) network typically operate within specifications when only 15 to 25 percent require attention.

A Healthy Radio is a Reliable One

There is a more proactive approach public safety agencies can use to maintain their radios, instead of taking a reactive one.

By utilizing state-of-the-art technology to detect a problem radio long-range over-the-air (OTA) by monitoring and evaluating its transmitting waveform without any user intervention or impact to the network. This process identifies, analyzes, and verifies frequency error and misalignment of poorly performing radios. A technician will be able to review the measured key metrics and schedule radio repairs on a priority basis and not wait until one fails.

This unique technology can improve first responders ability to hear and be heard during an emergency when they are needed the most.



Look Towards the Future

For public safety, mission-critical communication is vital during an emergency when seconds count. If a radio is receiving regular, routine preventative maintenance, it is less likely to have any problems with AFC not engaging or frequency error which will cause radio failure.

Learn how public safety and government organizations can benefit from proactive preventative radio maintenance, visit www.locususa.com/products/diagnostx.

Sources

1. "Automatic Frequency Control", Wikipedia, https://en.wikipedia.org/wiki/Automatic_frequency_control
2. DiagnostX AFC Meter, LocusUSA, <https://www.locususa.com/products/diagnostx/afc-meter>
3. LocusUSA Public Safety Feedback Survey 2018, <http://survey.constantcontact.com/survey/a07efs9arl2jng1ssz9/a002jo09dnf0/questions>

About LocusUSA

LocusUSA is an engineering and software development company located in Melbourne on the Space Coast of Florida since 2001. It is a leader in radio frequency (RF) capture for radio analysis and location. The ability to capture and analyze the actual waveform of a radio transmission led to the development of DiagnostX, a patented system that can measure the alignment and operating characteristics of a radio, hands-free over-the-air in real-time without user intervention.

LocusUSA supports government customers across the United States and Canada on the local, state and federal levels with this first-of-its-kind, proactive tool, ensuring the optimal performance of a radio system.

