The Idiot Light on Your Radio

RCC Aug 2008 - Don Unruh, NX7J

Many of us are old enough to remember the introduction of the “idiot light” on automobiles during the 1950s. Car manufacturers had typically put gauges on dash board instrumentation such that you could see engine coolant temperature, oil pressure, and charging rate to the battery. These gauges were not calibrated in terms of specific values, but provided a relative indication of what was going on with your car. As an example, you could not tell what the coolant temperature was, but you could tell if it was running cool, average, or hot. It was also a good predictor of when you could turn on the heater and not have it blow cold air.

During the 1950s, most manufacturers replaced these gauges with warning lights which would activate if a specific set-point was exceeded. These lights had the advantage of calling the driver’s attention to the problem, but did nothing to provide any insight into what was actually going on under the hood of the car. These warning lights were dubbed “idiot lights” by the public since you did not have to know anything about the car in order to know that something had gone wrong. Perhaps the term “idiot-proof lights” could also have been used except that, as everyone knows, no one has ever been able to perfect an idiot-proof device.

The idiot light controversy seems pretty irrelevant today as we see modern engines fitted with computers that generate error codes to tell the mechanic when something has gone wrong. However, it is interesting to note that the temperature gauge has returned to most car dash boards. I guess there are some things that cannot be replaced by good old human logic coupled to an analog gauge.

In many respects the amateur high frequency transceiver has evolved to a metering system and tuning system that is also more automatic. That automation, although different from that on a car, has also made it more difficult for the operator to see changes that are indicative of developing problems. For example, the semi-conductor final is essentially a low impedance output device compared to the high impedance output associated with a tube final. In a tube final it was necessary to match this high impedance output to the 50 ohm, low impedance of the antenna system through the use of selected variable capacitances and inductors. Typically a “pie” network was used with a parallel capacitor followed by a series inductor and then followed by another parallel capacitor. The settings of these impedance components were generally relatively constant, day-to-day, for any given frequency and antenna combination. If conditions changed in the final or the antenna, the impedance matching now required retuning – alerting the operator that something had gone wrong. Those changes might also be reflected on where the final “dipped”, again suggesting a potential problem.

Today, the modern semi-conductor final has no user adjustable tuning components to match the antenna. Since most antennas are not a perfect 50 ohm match, an automatic antenna tuner in the rig is typically provided to compensate when needed. These tuners have no external readable settings, so it is not possible to have any real indication of changes taking place in the system.

The progression of automation in rigs relative to tuning and the complexity of modern gear essentially precluded operator construction and maintenance of rigs. This situation is responsible for the emergence of a new label for hams: “appliance operators”.

We have gotten used to having the radio think for us, that it is not uncommon to hear embarrassed hams acknowledge that their low signal strength was in fact due to being on the “wrong antenna” – one designed for use on a different ham band.

Some hams that I know have taken a proactive approach to monitoring the operation of their station. They measure and record antenna impedance through the use of an antenna analyzer periodically for frequencies of interest. They record collector current for the final as well as gain settings on drive and audio transmit audio adjustments. Periodic review of these settings can highlight changes before break-downs occur. It is also interesting to see how antenna impedance changes with soil moisture content and extent to which foliage is developed on trees. If your rig is equipped with a monitor CRT, it is possible to view the “Christmas tree” pattern to see how fully modulated your signal is. Perhaps someday this will be expanded to give you warning lights when interharmonic distortion exceeds 5%, second harmonic signal components become less than 40 db below the fundamental output, your power output exceeds the legal limit, or signal bandwidth exceeds 3 KHz.

Why would a supplier of amateur radio equipment provide extensive “idiot light” monitoring? Perhaps like many soft-ware derived features the motivation simply comes down to the fact “because they can”. Perhaps the FCC will eventually require it. Perhaps we will have reached a new point on the idiot proof/appliance operator graph that demonstrates that we truly need these features. Given some of the signals heard on the air today, I suspect that we may already have reached that point.

Then again, many of these features - imagined or real - may indeed be worthless. As George Carlin once said, “I turned up the brightness control on my TV, but found that it didn’t work!”

Oops! I hope you got all of that; I just discovered I was on the wrong antenna.