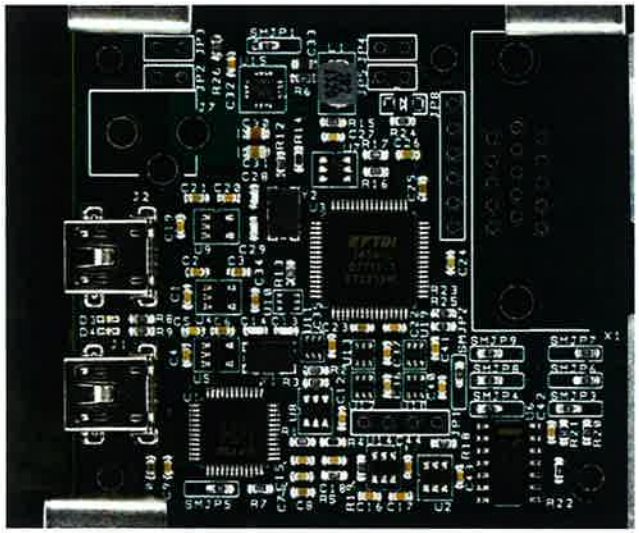
Today's modern automobiles are jammed full of electronics as they play a roll in the safety, entertainment and navigation parts of the cars' functions. Microprocessors, sensors and other electronics are inside the car, underneath the bonnet, inside tyres as well as other locations.

On average, the modern automobile has 50 plus CPUs and more than 100 million lines of code for the various control, entertainment and safety systems. The modern automobile is truly complicated.

The BMW SUV IDrive, for example, is chalked full of such goodies, including gesture recognition. The Honda 2017 CR-V has road departure mitigation, adaptive cruise control, rear cross traffic monitor, a blind spot information system, auto high-beam and many, many other features. The main dash display features a 17.9cm touchscreen display audio interface with Apple CarPlay and Android Auto connectivity platforms, giving smartphone features and functions.

The door locking system has automatically locking capability which functions so that when the driver leaves the vehicle, when the key distance from the vehicle exceeds two metres for two seconds, and when no other key is detected inside the vehicle, it automatically locks. All of these gadgets require electronic hardware and subsystems, all of which can go awry.

The problem with these ever increasing levels of sophistication is that car manufacturers are adding features at a faster rate than the miniaturisation and reliability test plans are able to keep up with. In the end more rework, repair or replacement of devices in these subsystems will take place.



Automated optical inspection post rework can help assure the correct device was replaced

In the automobile industry, some of the micro miniaturisation and hence rework challenges do not accelerate at the same rate as they do in other markets.

"This is because it is difficult to implement technology that will remain viable for the ten-plus year lifespan of the average car," said Susie Inouye, research director and principal analyst at market research firm Databeans.

The environment, which can range in temperature from -40 to +250°C, is one big reason that the device geometries cannot be maintained. The demands put on the device relative to shock withstand potential also require extremely durable mechanical designs.

Electronics need to be high in reliability to be placed in a modern automobile. Vehicles, compared with other end use markets, have more challenging operating specifications.

"Cars have to operate in extreme outdoor temperatures and are expected to have a life of up to ten years and over 100,000 miles of use," said David Alexander, principal automotive technology analyst at ABI Research.

Electronic components have to be tested to withstand vibration and meet very demanding quality standards. In many cases, the electronics are embedded in some type of epoxy or are conformally coated to protect the boards operating in this kind of environment. The removal and replacement of these coatings provides a challenge for those performing rework in the auto industry.

Dashboard of 2017 Honda CR-V

Challenging automotive industry requirements put pressure on the PCB automotive rework market. Expectations of absolute part traceability, 100 per cent assurance of correct part placement and perfect soldering operations are putting constraints on the auto rework services market.

Since many of the rework projects are manual in nature, part traceability is also a manual process. This means remembering to log the serialisation information and correctly transcribing the information for correctness are key.

Part placement can be assured with AOI (automated optical inspection) equipment. If it is a single rework location then it will take longer to load and unload the part than perform the actual inspection. This requirement adds time and cost to the rework process. Ideal, consistent soldering conditions, especially if there is hand soldering going on, cannot be assured with most equipment.

There are a lot of commercial pressures surrounding the cost of rework as well as the quality and documentation expectations from automotive suppliers. Essentially, the auto industry wants aerospace-like quality and quality control systems at a low end IPC Class I assembly prices.

The rework service providers need to understand the PPAP process and have the infrastructure for QS9000 and or AS-9100 approvals. The ever-increasing price pressure on the rework of the assemblies based on the alternative of building new hundreds of thousands or even millions of printed circuit board assemblies means the point at which it is cheaper to throw the entire module away rather than rework a component on the PCB is pretty low.

Bob Wettermann is principal at contract rework and repair company Best