FLUKE®

FlukePlus HP Story

Application Note

Hewlett Packard Singapore, established in 1970, is the parent corporation's Asia Pacific & Japan headquarters. It hosts the Singapore, Southeast Asia and Asia Pacific sales offices, R&D centers, manufacturing, financial services, logistics and fulfillment operations for a wide spectrum of HP products and solutions. Over half of the 6000 employees hold professional degrees and a third are engaged in high-end manufacturing or R&D work.

While the high value manufacturing operations are located in Singapore, the more labor intensive operations such as Printed Circuit Board Assembly (PCBA) and final assembly of HP printers and scanners are completed in Malaysia.

HP Singapore manufacturing support teams travel frequently to the Malaysian manufacturing sites to ensure smooth rollout of new models. They oversee pilot production runs and proper execution of regular engineering changes, and they help the manufacturers debug PCBA or final assemblies that didn't pass particular test stations, to reduce work-in-progress (WIP) inventory.

During new product rollouts, the team develops new fixtures for the In-Circuit Test (ICT) automated test equipment to weed out manufacturing or component defects in the PCBA, the key component for product quality and reliability. These ICT fixtures are debugged together with the first few pilot-run PCBAs to verify that signals at various test points are correct and that the test program works as intended.

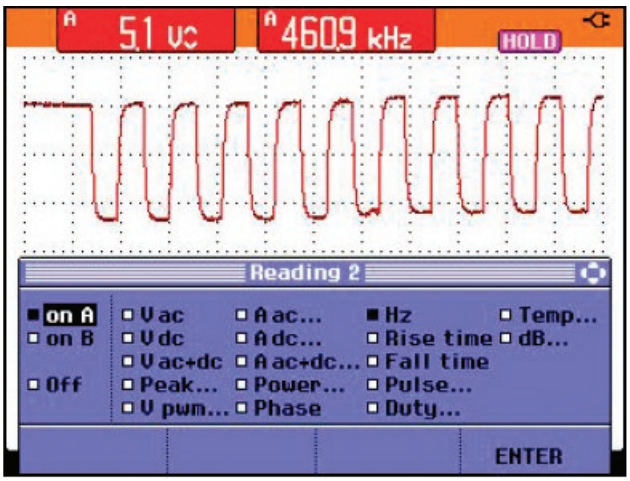

Figure 1: Peak-to-Peak voltage and frequency are measured simultaneously.

To help them troubleshoot and debug the test and rollout process, the HP Singapore team acquired four Fluke 199C ScopeMeter® test tools. The three-in-one (oscilloscope, multimeter and recorder) instrument, backed by 200 MHz and 2.5 GS/s sampling has proved invaluable. Portability is equally important: Since the ScopeMeter tool looks like a personal tool, it's no trouble bringing it across the border into Malaysia, whereas bench instruments require a tax invoice and an inspection by suspicious customs officers.

The fully automatic connect-and-view feature makes troubleshooting straightforward. The team member presses the [AUTO] button to set the ScopeMeter instrument in the "Auto" mode and connects the voltage probes to the test point. Any repetitive signal will appear steadily on screen, (when there's no fault in the circuit boards) allowing the user to make quick decisions by looking at the wave shape and the amplitude and frequency measurements. Another useful tip is to set the ScopeMeter instrument to provide simultaneous peak-to-peak voltage and frequency readouts, so that the signal amplitude and frequency can be quickly verified at one go.

Figure 1 shows a typical result screen.

The team also uses the ScopeMeter memory to capture, store, and replay up to 100 screens during a visit. That way, if an unexpected change in the signal occurs during a test, the team member has ten seconds to hit the [REPLAY] button on the ScopeMeter instrument, scroll back through the saved screens, and examine what occurred. Most digital oscilloscopes are only equipped with "Single-shot" capture which requires special setup.

For intermittent problems, the team uses "Pass/Fail" testing, allowing the ScopeMeter instrument to monitor the signal. When deviations occur, the ScopeMeter instrument automatically saves the waveform to memory—up to 100 times. Chee Seng is one of the manufacturing support engineer who uses this feature regularly. One example is to confirm the quality of the pen carriage digital encoder waveform. It is a quad State, incremental encoder signal used to determine the position of the carriage, which is critical to print quality. Any contamination, dent, scratch, etc. on the encoder strip affects the accuracy of the encoder reading, and deteriorates the printout quality. Worst case, it can jam up the carriage or cause the carriage to lose count and send error message on the printer. If the encoder count accumulated error becomes too great, it will drive the carriage to bang on the walls of the printer. Figure 2 shows the ScopeMeter instrument with "Pass/Fail" envelopes created to track any deviations between two simultaneous encoder signals. If any portion of the signal traces (red for channel A and blue for channel B) leave the envelope, the ScopeMeter instrument triggers and stores the deviated waveforms.

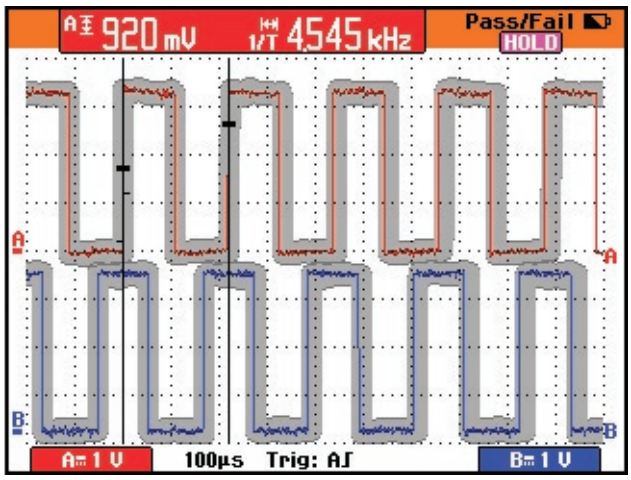

Figure 2: ScopeMeter screen shots showing envelopes created over two encoder signals.

When it comes to debugging ICT fixtures, the floating inputs on the ScopeMeter instrument allow it to connect to the PCBA under test without interfering with the virtual grounding of the In-Circuit Testers, such as the HP3070 series. That's an important difference from most bench oscilloscopes, where the probe ground is almost short-circuited to the socket outlet ground. Once the probe ground of any of these bench oscilloscopes is connected to PCBA ground conductor, the ICT tester will report a violation of the virtual ground. The test program will terminate prematurely and prohibit any further testing or debugging.

To the manufacturing support teams, the Fluke 199C has served their needs well as it also has the multimeter functions for day-to-day troubleshooting needs. Together with the user friendly features and portable packaging, they could not ask for more of a test tool like the Fluke 199C.

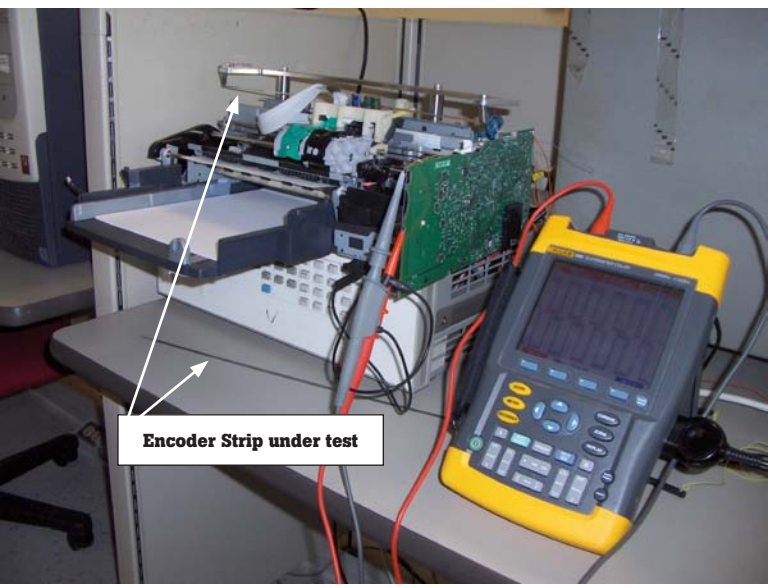

Figure 3: Carriage Encoder Test Fixture.

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