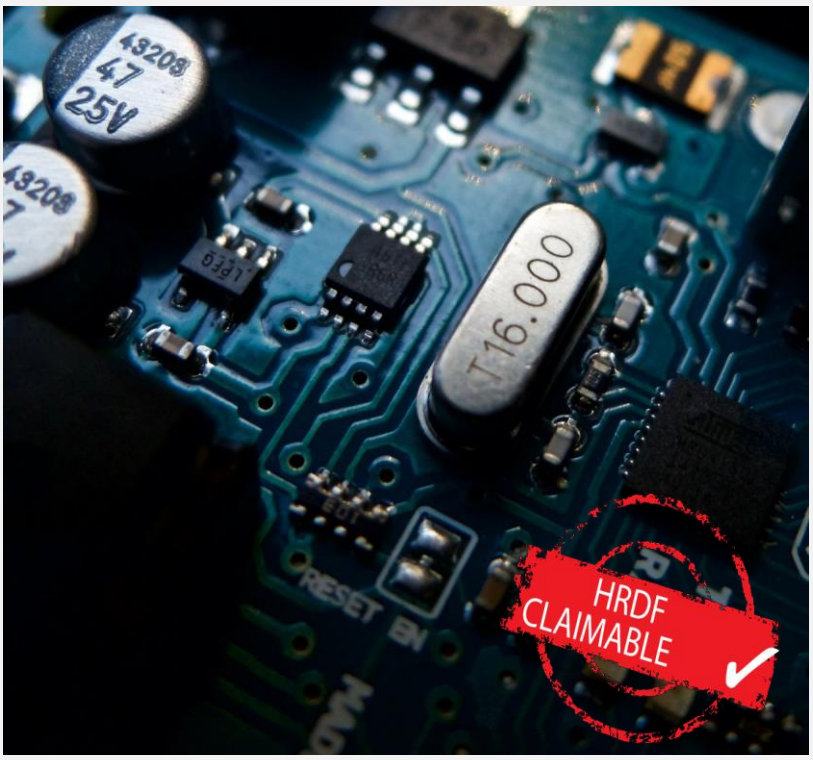
HRDF
MALAYSIA

REGISTERED
TRAINING PROVIDER

Industrial Electronic Troubleshooting and Debugging Techniques with Digital Storage Oscilloscope

(A Two-Day Intensive Training Program)



A proprietary training program
designed & conducted by:

tekmark®
since 1994

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Industrial Electronic Troubleshooting and Debugging Techniques with Digital Storage Oscilloscopes

As circuit designs become more complex, engineers need tools to help find and diagnose problems quickly. This training program is designed to help engineers to **discover problems** quickly, **capture events of interest**, **gain insight**, **analyze** the circuit behavior and **solve the problem**: all by using a digital storage oscilloscope.

Discover the Problem

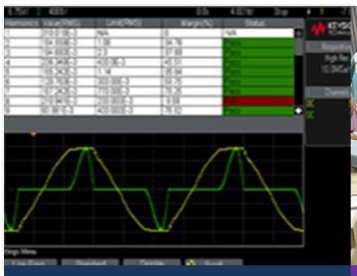
Capture the Event of Interest

Analyze & Debugging the Problem

1. WHAT WILL YOU GAIN OUT OF THE TRAINING PROGRAM?

Nurturing Tomorrow's Engineers, Today. This training program is specially crafted to provide experienced lecturers, engineers, and lab technicians with valuable updating on the latest and forthcoming electronic developments. At the same time, through its careful structure, it will also give those with less experience an indispensable grounding in the fundamentals of an oscilloscope for debugging & troubleshooting and ways in which it can be implemented successfully.

After completing this program, participants will be exposed to:



Fundamentals of Operating a Digital Storage Oscilloscope

Hands-on Troubleshooting Workshop

Identify & Debug Electrical Design Issues

Real Life Industries Case Studies

2. WHO SHOULD PARTICIPATE

Lecturers, Lab Technicians, Engineers and Students who would like to be equipped with the state of the art measurement technique and troubleshooting skill in the electronic measurement world.

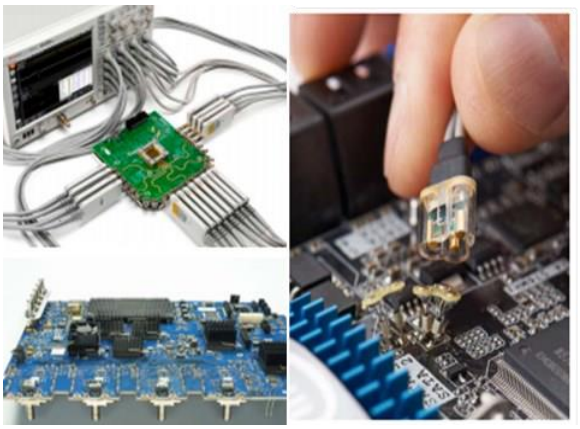
3. PRE-REQUISITE(S)

A basic understanding of electronics knowledge on voltage, current, resistance, power and related electronic parameters is recommended.

4. WHY OSCILLOSCOPE

Digital Storage Oscilloscopes (DSO) are a critical tool for making voltage and timing measurements on today's analog and digital electrical circuits. A lot of newly recruited engineers, lab technicians will discover that an oscilloscope is the one measurement tool that they will use more than any other instrument to test, verify, troubleshooting your designs.

Even while studying, an oscilloscope is one of the most commonly used measurement tool to test, verify lab assignments and designs. Unfortunately, only a handful of students fully grasp on how to use an oscilloscope. Random twisting and pressing of knobs and buttons until the desired image appears on the scope screen are most common.



To uncover information like frequency, noise, amplitude, rise- fall-time or any other signal Integrity characteristics, the use of oscilloscope is essential. Oscilloscopes are an important tool in any electrical engineer's lab. They allow us to see electric signals as they vary over time, which can be critical in diagnosing and troubleshooting.

5. TRAINING PROGRAM OUTLINE

The Program is designed in a 30:70 ratio, with 30% focusing on theory, while the remaining 70% will be hands-on workshop format. Key elements of oscilloscope technology and measurement principle will be taught on theory session. Whereas on the hands-on session, participants will be exposed to tutorial labs carefully designed to maximize engagement. Participants will be able to strengthen their understanding on oscilloscope measurement methodology and how to perform measurement accurately during hands-on session. Real life case studies will be taught through the workshop and theory sessions.

THEORY:

- Oscilloscope introduction and theory of operation
- Specification overview and selection considerations
- Understanding oscilloscope accessories and processing tools

HANDS-ON:

- Compensation for better measurement accuracy
- Initial setup, screen display walk-through, and instrument controls
- Troubleshooting case-studies

FUNDAMENTAL MEASUREMENT LAB

Lab 1. Compensating passive 10:1 probes
Lab 2. Default Setup and autoset
Lab 3. Basic waveform capture
Lab 4. Triggering CH1 signal with CH2
Lab 5. External Triggering
Lab 6. Automatic parametric measurements
Lab 7. Zoom Timebase to perform gated measurements
Lab 8. Fast Fourier Transform (FFT) operation
Lab 9. Generating signals with built-in waveform generator [-G only]

TROUBLESHOOTING CASE-STUDIES LAB

Lab 10. How to debug infrequent event in noisy clock signal
Lab 11. How to capture transient signal during switch bounce or circuit power-on.
Lab 12. How to identify glitches when the signal is under-sampled?
Lab 13. How to identify phase difference between two signals?
Lab 14. How to properly trigger on a non-repetitive signal like pseudo-random sequence signal

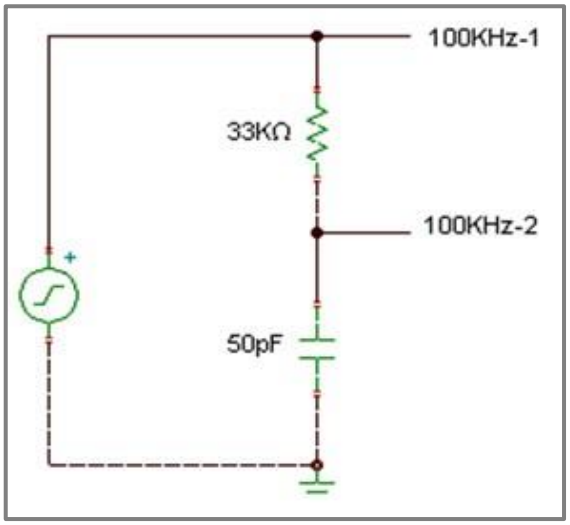
6. TRAINING WITH QUICKSTART BOARD AND KEYSIGHT TRAINING-SIGNAL

Two different approaches have been implemented throughout the Program to better simulate real-life sample signals, to be used by various labs. Most of the labs require participant to tap on signals generated from the Quickstart board while more complicated labs rely on training signals generated internally from Keysight Infiniivision scope.

The Quickstart Board

Keysight Infiniivision 1000X series oscilloscope comes standard with Educators Training Kit where complex signals like sinewave with glitch, sinewave with harmonic distortion and clock with infrequent glitch, to name a few, are pre-built into the memory so participants can learn what an oscilloscope does and how they can perform basic oscilloscope measurements.

The **Quickstart board** (Tekmark Proprietary Board) on the other hand, is utilizing basic electronics components like op-amp, filters, oscillator, and potentiometer to generate wave-forms commonly faced by electronics engineers during circuit design phase. For instance, the board is capable to simulate signal-integrity anomaly when high-frequency noise from 100MHz clock signal is falsely coupled to low-frequency component when both signals are sharing the same ground. This is a common-mistake frequently made by junior circuit designer and the impact can be humongous when a product is launched with bug
escapee.



Sample Circuit on the Quickstart Board

7. TRAINING DURATION

Industrial Electronic Troubleshooting and Debugging Techniques with Digital Storage Oscilloscopes

Day one:

- Oscilloscope introduction and theory of operation
- Specification overview and selection considerations
- Understanding oscilloscope accessories and processing tools
- Compensation for better measurement accuracy
- Initial setup, screen display walk-through, and instrument controls
- Troubleshooting case-studies
- Lab 1: Compensating passive 10:1 probes
- Lab 2: Default Setup and Auto-set
- Lab 3: Basic waveform capture

Day two:

- Lab 4: Triggering CH1 signal with CH2
- Lab 5: External Triggering
- Lab 6: Automatic parametric measurements
- Lab 7: Zoom Timebase to perform gated measurements
- Lab 8: Fast Fourier Transform (FFT) operation
- Lab 9: Generating signals with built-in waveform generator [-G only]
- Lab 10: How to debug infrequent event in noisy clock signal
- Lab 11: How to capture transient signal during switch bounce or circuit power-on.
- Lab 12: How to identify glitches when the signal is under-sampled?
- Lab 13: How to identify phase difference between two signals?
- Lab 14: How to trigger on non-repetitive signal, i.e. Pseudo-random Sequence Signal

Equipment & Tools Provided:

- Keysight Infiniivision 1000 X-Series Digital Storage Oscilloscope
  (2 pax to 1 scope for best learning experience)

- 2 Oscilloscope Passive Probes with each oscilloscope

- TESTED1 - Training Quickstart Board

- Training material and step-by-step tutorial lab sheets

Note: Equipment & Tools will be given to Customer upon completion of Training Program

8. CERTIFICATE / MOMENTO

Certification of Attendance will be given to each of the participants upon completion of the program. On top of the Certificate of Attendance, successful candidates who passed the exam will get another certificate endorsed by Tekmark Sdn Bhd

9. BUDGETARY PROPOSAL

Item	Quantity	Price	Total
Training Program (2 days) - 10 Pax or Less	1		
Grand Total			

10. YOUR TRAINER- EERIC, LIM (SENIOR APPLICATION CONSULTANT, TEKMARK GROUP)

Ee Ric, Lim has been in test and measurement industry for the past 7 years, with vast hands-on experience in high-speed digital data test and measurement, signal quality assurance, test automation solution development, and project management.

Ee Ric started his career in Intel Microelectronics Sdn. Bhd., a subsidiary of Intel Corporation, as a validation engineer. Being in a semiconductor company that produces CPU and motherboard, he equipped himself with vast hands-on experience in handling high-speed serial IO projects, including compliancy certification test execution, pre-silicon RTL or logic verification, signal integrity and quality assurance, analog and logic issue troubleshooting, as well as automation solution development. He has strong understanding in industrial electrical compliance certification governed by International organisation like PCI Sig, SATA Org and USBIF. He was subsequently promoted to the technical leader, leading a group of engineers in project scoping, execution planning, trouble- shooting, budget and risk assessment, and resources management.

In 2015, Ee Ric decided to join SIRIM Measurements Technology, a subsidiary of SIRIM Berhad. He is an application engineer, specialising in Keysight Technology digital products, working closely with business development manager on pre-sales and post-sales technical support for new business closure. Ee Ric subsequently continue his career in Tekmark Sdn. Bhd., one of the strongest Test and Measurement companies in the Region, as an assistant application manager. With Tekmark being the Authorised technology partner for Keysight Technologies, Ee Ric is able to contribute to the T&M industry with strong test and measurement application skillset accumulate over his career.

Throughout the entire career experience, Ee Ric has been trained with strong analytical and problem-solving skill for proper technical issue handling. He exhibited strong leadership and conflict management competencies, able to work well with counterparts from various technical and cultural background. He is trained with ISO/IEC 17025 (2005) International standard for the competence of testing and calibration laboratories and involved in several internal lab audits for calibration competency.

Ee Ric is a Master of Engineering degree holder, majoring in Electrical - Computer and Microelectronic System, from University Technology Malaysia. He speaks fluently in English, Bahasa Malaysia, Mandarin and a few Chinese dialects.

CONTACT INFORMATION

If you have questions regarding the training program or would like to contact us for more Information on how we can better cater to your needs, please do not hesitate to contact us via the following details. We are always open to suggestions as well as collaboration opportunities.

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Established since 1994, Tekmark Group provides accurate test & measurement science solutions to strategic industries. Tekmark is well equipped with an ISO certified service & calibration lab and has over 10 offices across the ASEAN Region. Tekmark is the Sole Authorised Technology Partner for Keysight Technologies in Malaysia.