

High-Voltage Circuit Breaker Testing

Overview:

This interactive, 2-day training course combines theoretical background with practical experience to provide maintenance personnel the necessary training to test circuit breakers with Doble TDR900/9000/9100 and T-Doble software. Students will be divided into groups of 3 or 4 students per group with laptops. The training will consist of several short lectures followed by hands-on exercises using the test equipment and T-Doble software. Participants should be familiar with basic electric circuit theory and basic operating principles of high-voltage circuit breakers. Doble encourages participants to bring their unique real-world problems for discussion.

Learning Outcomes:

Upon completion of this course, the participant will be able to:

- Familiarity with Doble TDR900/9000/9100 circuit breaker test instruments, understanding its features and capabilities and ability to operate and use it for testing circuit breakers.
- Ability to create test plans and successfully test circuit breakers.

Course Audience:

Circuit breaker specialists and technicians working in maintenance or service field in which knowledge of electrical circuit breaker testing methods and evaluation is required part of job responsibility.

Duration:

Two Days

Class Size:

8 - 15 Attendees



COURSE OUTLINE

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The course program contains the following training outline:

Day 1:

- **Introduction to High-Voltage Circuit Breakers** – Basic circuit breakers theory is presented. Different breakers design are explained in reference to their requirements for testing.
- **Safety During Testing** – An overview of Doble recommended safety practices will be discussed.
- **Timing and Motion Measurement** – Review testing methodology and test set-up. Importance of circuit breaker functionality and use of transducers is explained with examples.
- **Test Plan Preparation**
- **Interactive Case Studies** – Each day, field test results related to the material presented will be provided for seminar participants to discuss and analyze in small groups. Groups will be asked to identify the issues in their cases, recommend next actions to be taken, and present their findings and conclusions. Case discussion, problem solving techniques and solutions will be presented. This will be a practical exercise with real situations and decision-making which all field personnel encounter.

Day 2:

- **Circuit Breaker Field Testing** – Hands-on testing to provide students opportunity to see all stages of circuit breaker testing, from test plan preparation, circuit breaker and test instrument preparation, connection between instrument and breaker and positioning of transducers. Preliminary test results analysis and validation included.
- **Test Results Analysis** – Different test methods and test results analysis is explained.
Below list can be expanded depending on type of breakers in service.
 - o Use of instant velocity for shock absorber analyze
 - o First trip
 - o Use of universal rotary to linear adapter
 - o Insertion resistors timing
- **Workshop on Student Examples** – Student data will be reviewed in class room style with discussion by participants. Time is provided to review the presentations and discuss in more detail any questions.



Presenter(s):

Jozef Levi, Principal Application Engineer, Doble Engineering Company

Division of Responsibilities:

If the course is hosted at a customer location, to ensure smooth training course delivery, Doble requests the following division of responsibilities:

Doble will provide:

- Confirmed training dates upon receipt of a purchase order.
- Technical agenda for 2 day program.
- One experienced instructor including their travel/living expenses.
- Training manual (soft copy) to each participant.
- Training certificate for each participant.
- If applicable, all required measurement test equipment and tools for class and site training.
- All personnel safety equipment for Doble's instructor.

Customer will provide:

- Confirmed training schedule at least 60 days in advance.
- Training coordinator through whom all contractor requests will be coordinated.
- Training facility, AV equipment, whiteboard and pens.
- Tables to accommodate 3 students – laptops and TDR900/9000/9100 with transducers|
- Each participant should have a laptop computer with Windows 2000 or later.
- Printing hard copy training material as required.
- If applicable, site access for any areas of the program outlined above for practical on-site training. Responsible for all safety issues before, during, and after the field demonstration.