Knowledge Is Power℠

The World Leader in Diagnostic Test Instruments and Knowledge Services for Electric Power

TDR9000

Circuit Breaker Test System

The TDR9000 Circuit Breaker Test System provides efficient, accurate measurements of circuit breaker dynamic timing and motion. Field proven for over 25 years, more than 2,300 Doble circuit breaker diagnostic instruments are being used in the field today.

TDR9000

Introduction

The TDR9000 Circuit Breaker Test System provides efficient, accurate measurements of circuit breaker dynamic timing and motion.

Field proven for over 25 years, more than 2,300 Doble circuit breaker diagnostic instruments have been sold.

Identification

Breaker Performance Report
TDR9000 Version: RE 4.01

Manufacturer :A.B.C. Electric
Model Number: 1234-GW-10000
Serial Number: 1-38Y1740
Instr Book # : 33-123-C3
Mechanism # :
Mech Instr # :
Special ID : 02472
:
Test Type : TRIP

Location : Webster Circuit
Circuit : 45678
Operator : You

Operation Counter : 696
:
Test Plan Name :

Test was performed on 03/30/2004 at 13:09:10.

Motion Channels 1-3 Transfer Function
1.000 in Travel at the contacts is 1.000 in Travel at the transducer.

Command Parameters	Trip Pulse	4.00 cy	Close Pulse	95.50 cy
	Delay 1	0.50 cy	(Standing)	
Command Currents	Trip Current	16.55 A pk	Close Current	0.72 A pk

Test Tabulation

OCB Contact Timing
Reclose Operation

Reclose Dead Time Within a Phase

Specifications	Test Results	Compare
Maximum 16.50 cy Minimum	Phase A 16.92 cy Phase B 16.81 Phase C 16.72	Fail Fail Fail

Reclose Dead Time Within the Breaker

Specification	Test Results	Compare
	Breaker 16.72 cy	Fail

Main Contact Opening Time Measured From Test Initiation

Specifications	Test Results	Travel	Velocity	Compare
Maximum 1.90 cy Minimum 0.00	CONTACT1 1.51 cy CONTACT2 1.60 CONTACT3 1.68	0.48 in 0.68 0.84	8.84 ft/s 9.50 11.40	Pass Pass Pass

Delta Main Contact Opening Time Within the Breaker

Specifications	Test results	Compare
Maximum 0.30 cy	Breaker 0.17 cy	Pass

Main Contact Reclosing Time Measured From Test Initiation

Specifications	Test Results	Travel	Velocity	Compare
Maximum 20.00 cy Minimum 16.00	CONTACT1 18.43 cy CONTACT2 18.41 CONTACT3 18.40	0.52 in 0.50 0.47	7.40 ft/s 7.30 7.08	Pass Pass Pass

Delta Main Contact Reclosing Time Within the Breaker

Specifications	Test results	Compare
Maximum 0.30 cy	Breaker 0.03 cy	Pass

Specifications	Test results	Compare
Average Velocity in Open zone 1		
Maximum 16.00 ft/s Minimum 14.00 Zone 1 1.000 in to 5.000 in	VEL 1. 14.84 ft/s	Pass

Benefits

- **Accurate measurement of grading capacitors capacitance values, and insertion resistor resistance values –** built-in, precision measurements for grading capacitors and insertion resistors testing eliminates the need for separate measuring instruments. No other product on the market can match the TDR9000 in this capability.
- **Immune to Interference –** accuracy of test results is unaffected by severe conditions of electrostatic and electromagnetic interference, present in harsh substation environments.
- **Modular Design –** customize the system to match present testing requirements; field upgrade the system as required, to protect the capital investment.
- **High Accuracy Motion Recording –** a patented digital rotary and linear transducer provides early diagnosis of mechanical problems, auxiliary switch and main contact timing errors.
- **Rugged and Reliable –** the TDR9000 is a single box solution, providing the accuracy of a laboratory instrument with durability for field use.
- **Self-Diagnostics –** self-diagnostics on demand ensures accurate and valid test results.
- **User-friendly PC interface –** an intuitive control panel on your PC provides quick, efficient and simple testing of circuit breakers.
- **Comprehensive Testing –** accurately measures all essential parameters of a circuit breaker in a single test for accurate diagnostics of the circuit breaker operation.

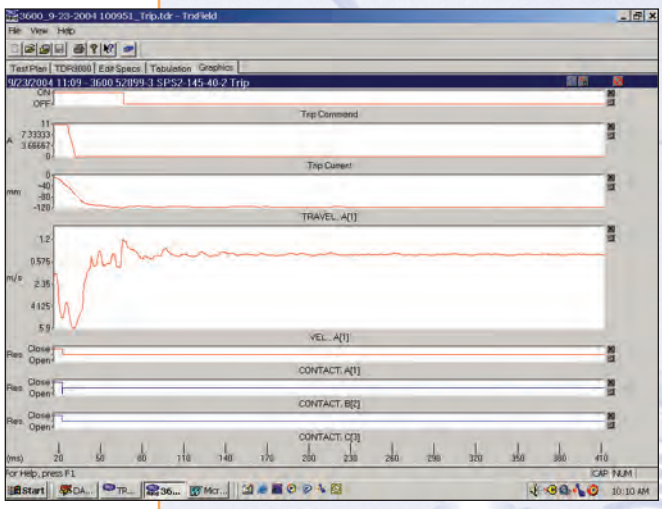
Description

The TDR9000 is a state-of-the art Circuit Breaker Test System engineered to test all types of circuit breakers. The modular construction of the TDR9000 allows testing of simple circuit breakers, to very complex circuit breakers, using a single, field-portable and rugged instrument. The modular design allows users to acquire a Circuit Breaker Test System matched to today's specific testing applications and permits easy upgrades in the field to expand the capabilities to test different or more complex apparatus. The modular design results in complete usage of its capital investment and simultaneously provides an upgrade path to test future circuit breaker designs.

Packaged in a compact, portable and sturdy case, the TDR9000 is the singlebox solution for Circuit Breaker Testing in the field.

The TDR9000 provides testing of up to eight breaks per phase, for a total of 24 main contacts simultaneously. The EHV The

EHV Contact Timing Module measures the opening and closing times of both the main contacts and the insertion resistor contacts with 100 µs second resolution. During a separate test, it measures the capacitance of grading capacitors. This substantially reduces the required number of channels required for circuit breaker testing. The high-speed data acquisition circuitry, coupled with interference suppression specifically designed for electro magnetic interference substation environments, provide accurate test results and records contact bounce time as low as 60 µs.



Reclose Operation Test Results

During a Trip/Close test, the TDR9000's Motion Module simultaneously records the output from up to six digital rotary/linear transducers. The digital rotary/linear transducer provides high accuracy measurements of ± 0.1%. This patented field-proven device provides precise details of the operating mechanism's performance for damping, total travel, over travel, rebound, average velocities and instantaneous velocity. It also supplies details about contact wipe and contact bounce. Digital transducers overcome errors associated with analog transducers, such as slide wire transducers, where wire slippage or distortion can contribute significant errors to the measurements.

The TDR9000 System Panel with Trip and Close Command and Trip and Close Command Current Recording as well as general purpose event recording modules for measuring urrents/voltage and breaker/relay auxiliary contacts. A graphic recording of the trip and close coil current provides useful insight into the electrical and mechanical condition of the trip and close mechanisms.

TRX™ Software

The Windows based TRX software controls the TDR9000 and stores test results and test plans. TRX Software uses an industry standard SQL compliant client server database architecture.

For ease of analysis, TRX displays test data and test results in tabular or graphical form. Time-related information such as travel, velocity, contact transition, trip and/or close coil currents, analog and auxiliary contact channels are displayed graphically. TRX Software organizes Circuit Breaker Test Plans and test types by user-defined regions, locations, substations, manufacturers, models and serial numbers along with the historical results. Both the reliability of the system and productivity of test personnel is improved.

TRXField, an independent component of TRX Software, quickly allows Test Plan creation, switching device Testing and Test Result analysis. The operator can specify expected results. The software compares the actual test results with the user defined expected test results to make a pass or fail determination.

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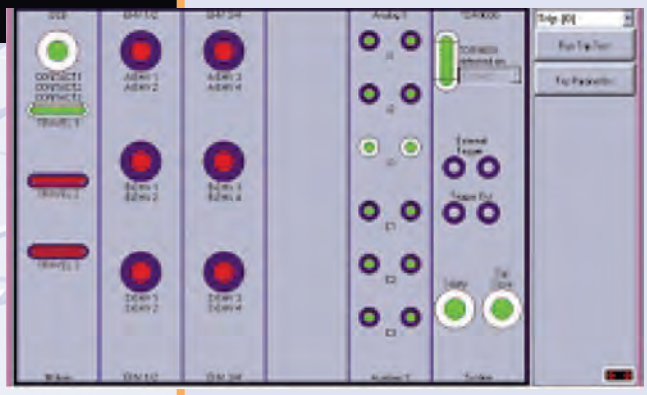
TDR9000 Control Panel

Efficient operational Circuit Breaker verification is accomplished with the TDR9000 Control Panel. This user-friendly PC interface allows an operator to configure the TDR9000 for testing via a simple point and click mouse operation. The TDR9000 Control Panel's intuitive controls allow circuit breaker testing without the need for an elaborate test plan. Test results such as contact timing and instantaneous velocity and displacement, can be displayed graphically for instant analysis, while an optional 8.5 inch thermal printer, provided with the TDR9000, prints out the test results for a paper record. A test created in the TDR9000 Control Panel can be saved for future use on the PC.



Operations

TDR control circuit breaker trip and close commands allow the user to perform these operations:

Trip (O)
Close (C)
Reclose (O-C)
Tripfree (O-C)
O-C-O
First Trip (O)
First Close (C)
Slow Close (C)
Continuity
Capacitance
Self Diagnostics

Identify your selection in a test plan by using the control panel.

Doble is certified ISO 9001:2000

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