

Safely Testing Circuit Breakers Using a Dual Ground Method

With the Vanguard CT-7000 S3 and CT-8000 S3



Vanguard Instruments
A DOBLE COMPANY



TEL: (909) 923-9390
FAX: (909) 923-9391

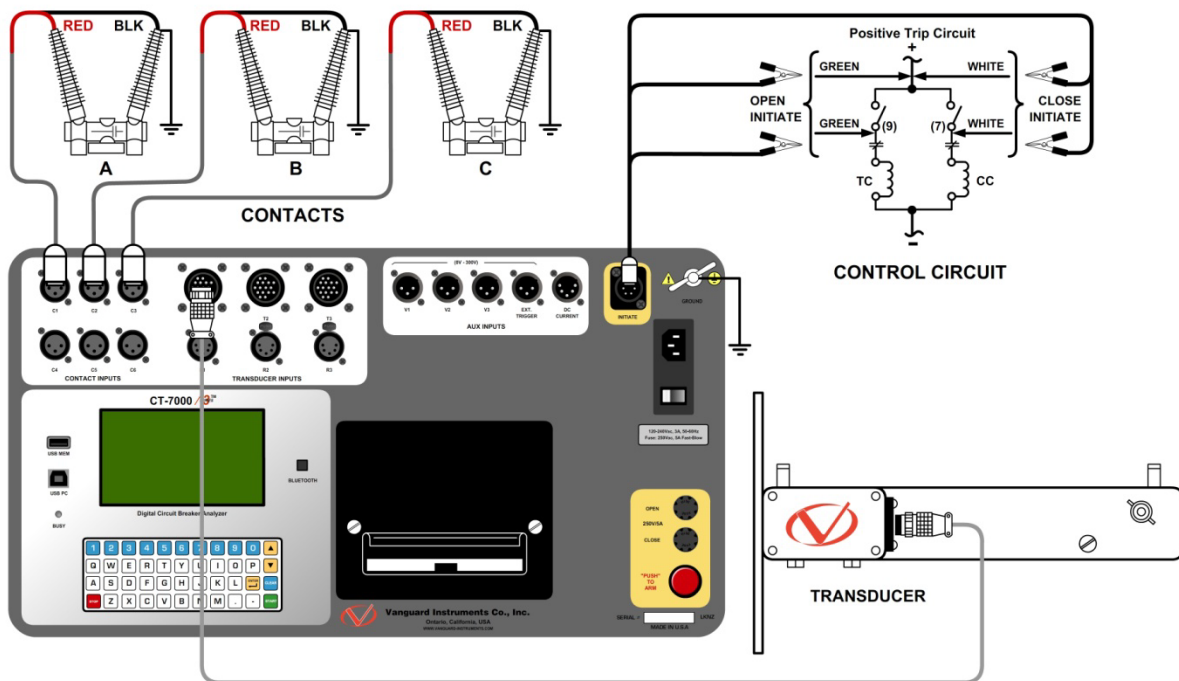
October 2024
Revision 2

Circuit Breaker Testing Methodology

Testing high voltage circuit breakers (CB) can be a hazardous task because of the risk of induced voltages from adjacent circuits. However, these risks can now be eliminated by a novel test technique that allows both sides of the breaker to remain grounded while testing.

Measuring the opening and closing times of the circuit breaker's main contact is an important criterion for determining the proper operation of the circuit breaker. Timing errors outside the manufacturer's specified limit is the single most important diagnostic indicating the need for breaker maintenance. For these reasons, all circuit breaker test sets provide facilities for measuring contact timing. The most common and conventional test method is simply to apply a DC voltage across the contacts. The voltage drop across the CB main contact is monitored during the opening and closing operations of the circuit breaker. From this data, the opening and closing time of the main contacts can be determined accurately. The measured operating time should be checked against the manufacturer's specifications as well as against previous test data. Any deviation from previous testing values should be further analyzed.

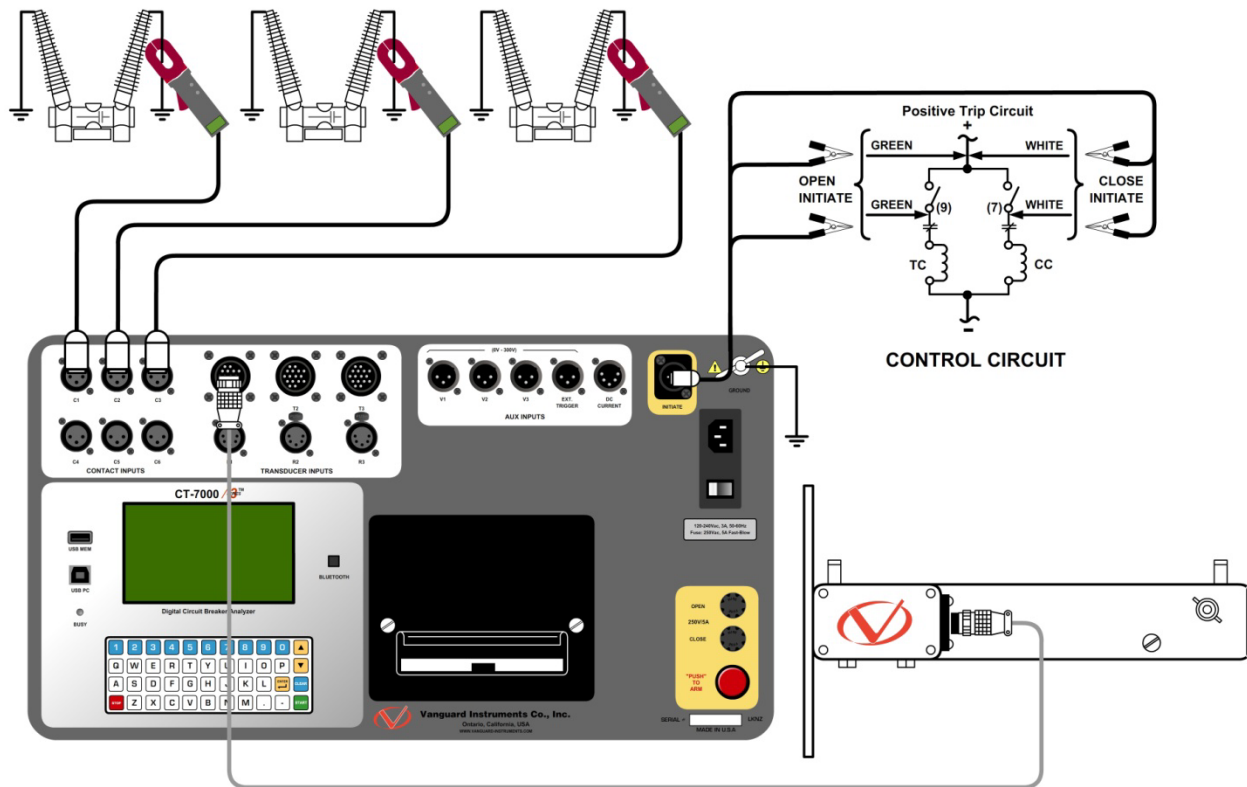
With this traditional method of testing, both sides of the CB should be grounded while test connections are being made; however, only one side of the breaker can be grounded during testing. Leaving one side of the circuit breaker ungrounded creates a major safety hazard as it may be energized by induction from nearby circuits. For this reason, the ground connection should always remain in place on the side on which there is the greatest danger of capacitive or inductively coupled voltages.



Conventional Timing Connections

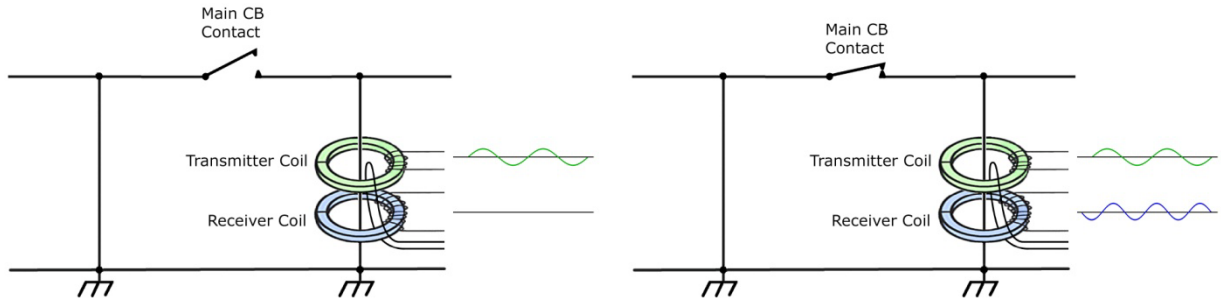
Dual Ground Testing with Vanguard Circuit Breaker Analyzers

Dual ground testing is the method designed to test a circuit breaker easily with increased personnel safety. Vanguard Instruments' state of the art CT-7000 S3 and CT-8000 S3 circuit breaker analyzers offer a Dual Ground option for testing circuit breakers in which both sides are grounded. With Vanguard's circuit breaker analyzers, users can safely perform tests with both sides grounded using the same procedures they are familiar with for performing traditional tests. This allows for efficient testing without a complicated process. For further simplicity, the same test plans that are used for traditional testing can be used for dual ground testing.



Dual Ground Timing Connections

Vanguard's dual ground testing of circuit breakers requires the user to connect the measurement probe on one side of the grounding cable in each phase. It uses a novel patent pending technique for the OPEN and CLOSE timing measurement of the main contacts. With this technique, a high frequency voltage signal is injected by the transmitter embedded in the measurement probe. If the main CB contacts are closed, this high frequency voltage signal will cause high frequency current to flow through the ground loop and closed CB main contacts. The receiver embedded in the measurement probe senses the high frequency current flow due to the injected signal by the transmitter. When the CB main contacts open, the closed ground loop is broken and the receiver of the measurement probe senses the loss of the current signal. The receiver signals are sent to the Vanguard CB analyzer and the algorithm in the unit computes the CB main contact open and close times. Field trials carried out with this dual ground testing method have produced results that compare well with traditional testing results.



The biggest advantages of dual ground testing circuit breakers are:

- Increased test personnel safety since both sides of the circuit breaker bushing are grounded during testing.
- No need to connect DC contact probes to CB bushing and remove one side ground. This results in shorter outage time.
- Same simple testing procedure as traditional testing.
- Ability to use existing test plans designed for traditional testing.
- Comparable test results with traditional test results.

CT-7000 S3 and CT-8000 S3 Features

The Vanguard CT-7000 S3 and CT-8000 S3 both offer a dual ground testing option that can test circuit breakers safely by keeping the grounding cable connected to the circuit breaker during testing. They are housed in a field-rugged enclosure and feature a QWERTY-style membrane user interface keypad and a built-in thermal printer. Each instrument can store up to 100 test plans as well as 200 test records internally. They can also be computer-controlled via the USB PC interface or an optional Bluetooth wireless PC interface.

For further information on Vanguard Instruments' offerings for circuit breaker testing, please contact our local channel partner or visit our web site at www.vanguard-instruments.com.



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Safely Testing Circuit Breakers with the CT-7000/CT-8000 S3 • Revision 2.0 • October 2, 2024 • TA