

# WHAT YOU NEED TO KNOW

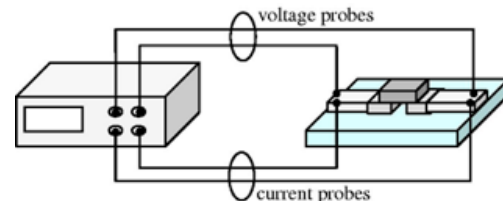
A PowerHawke Informational Series  
**De-Energized Maintenance Services**

## De-Energized Testing & Labeling

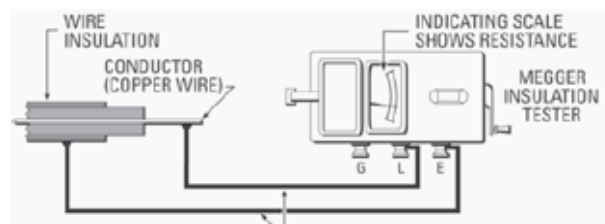
De-energized maintenance uncovers problems that energized maintenance can miss. Don't let today's brewing problem become tomorrow's lengthy shutdown. Schedule de-energized maintenance for a weekend or off-shift to ensure your installation stays up and running.

### DEFINITIONS OF TYPICAL TESTS

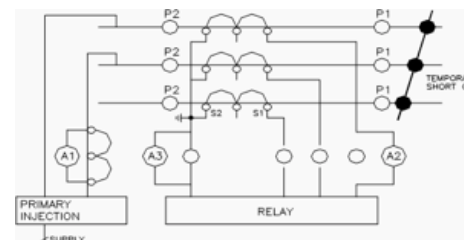
A **Contact Resistance Test**, commonly known as a **Ductor Test**, measures resistance in micro-ohms between connections. This test helps find problems from corrosion or erosion of contact surfaces, failing construction of the contact assembly (loose connections), absent or contaminated lubricant in the contact assembly and improperly adjusted contacts.



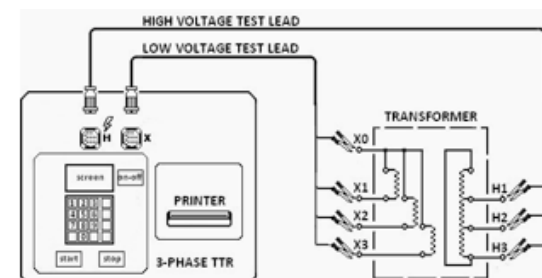
An **Insulation Integrity Test**, commonly known as a **Megger Test**, measures the insulation reliability in mega-ohms of dry-type transformers and circuit breakers—that is, insulation of the moldings, inter-phase barriers and arc chutes. Comparing values from one test to the next can produce trends that identify insulation deterioration and help predict future circuit breaker and transformer failures.



A **PIT** or **Primary Injection Test** evaluates the ability of an electro-mechanical trip device or solid state trip system to open its associated circuit breaker. Current is injected through the circuit breaker at values that could be expected while the breaker is in service. The results of the test are then compared to the manufacturer's curves to ensure that the overcurrent device is operating properly within the trip curve's values.



A **TTR** or **Transformer Turns Ratio Test** detects shorts between turns of a given transformer coil, which would indicate insulation failure between the turns. A TTR test may uncover the need for an internal inspection or removal from service.



# De-Energized Testing & Labeling

## DE-ENERGIZED MAINTENANCE LABELS

NFPA 70B, Recommended Practice for Electrical Equipment Maintenance, was revised in 2013 to specify the use of color-coded labels that show at a glance the maintenance status of every piece of equipment.

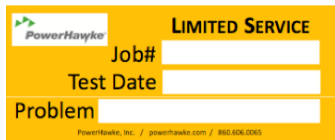
### NFPA 70B 11.27.1

“After a piece of electrical equipment or device is tested and/or calibrated, a color-coded decal should be attached on the exterior enclosure to that particular equipment. The decal should include the following: (1) date of test or calibration, (2) person or outside company who performed the testing or calibration, (3) color coding indicating the service classification as described in 11.27.3.”



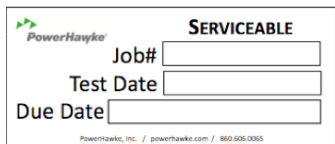
#### Nonserviceable

- Device has a problem detrimental to its proper electrical or mechanical operation such as no trip on one or more phases or high contact resistance readings
- Device should not be in service



#### Limited service

- Device has a minor problem such as slightly lower than acceptable insulation resistance readings or chipped arc chute
- Does not impact equipment serviceability but should be fixed as soon as possible



#### Serviceable

- Device is electrically and mechanically sound and suitable for service
- May have some minor defects such as slight corrosion or incorrect circuit ID

### Caution!

When you approach a piece of electrical equipment, do not assume that a white label ensures it is safe. You must still take all the necessary precautions you would for equipment without a label. Even a perfectly functioning piece of equipment can develop problems at any time.

## DE-ENERGIZED MAINTENANCE SCHEDULES

How often you test is as important as how well you test. Of course, the ideal testing frequency depends on many factors, including the age of the equipment, the manufacturer’s recommendations, the environment, the duty cycle, the load conditions and how critical a particular piece of equipment is. But NFPA 70B recommends testing frequencies that can help simplify your decisions about when to test.

### Recommended Electrical Equipment Maintenance

from NFPA 70B2013 Table L.1

Item or Equipment	Task or Function	Interval
Air circuit breakers, low voltage	visual inspection/cleaning/adjustment	annually
	electrical tests	3 years
Fuses, 1000 volts or less	visual inspection	3 years
	clip contact pressure check	3 years
	cleaning contact surfaces	3 years
Busway, 600 volts or less	infrared scanning	annually
	visual inspection	annually
Molded case circuit breakers	electrical tests	2 years
	visual inspection/cleaning	3 years
	mechanical test	2 years
Motor control equipment	electrical tests	3-5 years
	infrared scanning	annually
	visual inspection/cleaning	annually
Stationary batteries and chargers	checking connections for tightness/proper torque	2 years
	electrical tests	2 years
Switchgear assemblies	visual inspection/cleaning	monthly
	infrared scanning	annually
Transformers, dry type	visual inspection	6 months
	electrical insulation tests	2 years
	visual inspection/cleaning/testing	2 years
Transformers, liquid filled	liquid/dissolved gas analysis	annually
	insulation test	3-5 years
	turns-ratio test	3-5 years
Uninterruptible power supply systems	infrared scanning	annually
	visual inspection	quarterly
	routine maintenance	6 months
	system tests	2 years

This is a selected subset of equipment around which we most frequently build maintenance programs for our customers. The full table can be found in Annex L of NFPA 70B 2013.

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