

TILT II & QUICK-CHECK®

TRANSFORMER & CAPACITOR TESTERS

and ACCESSORIES

Operating & Instruction Manual



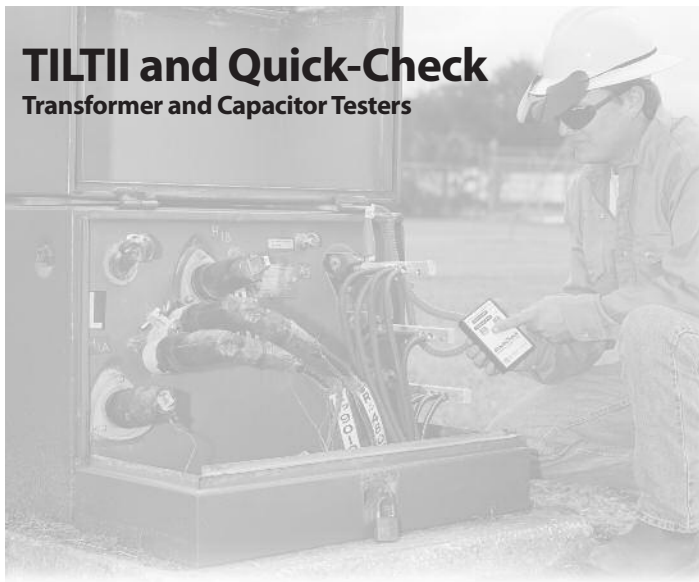
HDETM

HD ELECTRIC COMPANY

1475 LAKESIDE DRIVE • WAUKEGAN, ILLINOIS 60085 U.S.A.
PHONE 847.473.4980 • FAX 847.473.4981 • website: www.HDElectricCompany.com

TILT II and Quick-Check

Transformer and Capacitor Testers



SAFETY

WARNING: The TILT II and Quick-Check should be used only on equipment known to be deenergized and/or discharged.

CAUTION: Using the TILT II and Quick-Check on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing.

The Quick-Check will not leave a significant charge on a capacitor.

INTRODUCTION

The TILT II and Quick-Check are versatile tools for quick and easy checks of transformers and the connections made to them. The Quick-Check also tests power capacitors and capacitor banks. The transformer connections can include bundled secondaries or a cable run from the transformer to the meter.

In the field, the testers are used to test the primary and secondary sides of new or reworked, single or three phase transformer installations. The Quick-Check also tests capacitor banks for short or open circuits prior to energizing.

In the shop the testers are used for quick screening of incoming and outgoing transformers (including their internal fuses and breakers). The Quick-Check also tests capacitors for both shorts or opens. Both testers test 1Ø and 3Ø transformers including PT's and other instrument transformers, and the Quick-Check tests power capacitors in almost any size.

HOW IT WORKS

The TILT II and Quick-Check are used in the field for testing connected transformers, their connected primary and secondary leads and the Quick-Check for power capacitors, individually or in banks, for both shorts or opens. Unlike a simple ohmmeter, the TILT II and Quick-Check use a high frequency, low voltage signal to measure transformer winding inductance (and power capacitor capacitance) and they can differentiate true shorts from other low resistance windings or connected equipment such as meters.

NOTE: The TILT II and Quick-Check will not detect a partially shorted transformer coil or an improper transformer ratio. They will not detect a capacitor with a partial short or open.

TESTING THE TILT II AND QUICK-CHECK

Before using the TILT II or Quick-Check to test a transformer or capacitor, test the instrument itself using the built in TEST terminals on the right side of the unit. With the test leads disconnected from any equipment and from each other, press the TEST button. The OPEN light should flash. If it does not, replace the battery. Next, short the test leads together and press the TEST button. The SHORT light should flash. Now touch the right test lead to the right side test terminal labeled TRANSFORMER and press the TEST button. The TRANSFORMER O.K. light should flash and the beeper should be heard.

For the Quick-Check, touch the right test lead to the right side test terminal labeled CAPACITOR and press the TEST button. The CAPACITOR O.K. light should flash and the beeper should be heard.

USING THE TILT II & QUICK-CHECK

For single phase transformers, use these figures as guidelines to get started.

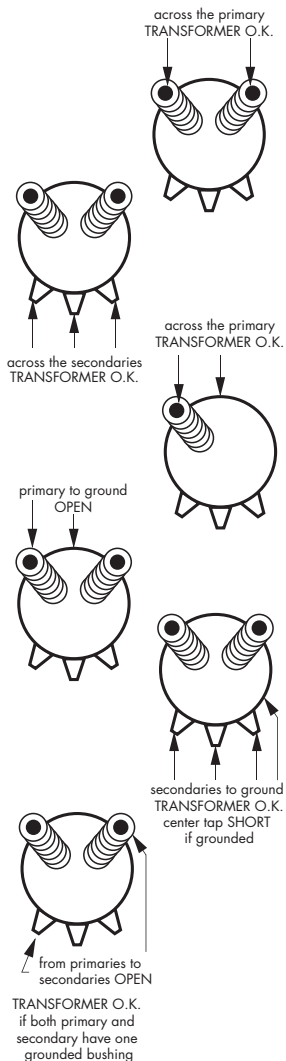
For 3Ø transformers, the TILT II and Quick-Check test leads are connected from each phase to neutral and across each pair of phases. When all connections are proper and the transformer itself is good, the TILT II and Quick-Check will beep and show TRANSFORMER O.K. The OPEN indication designates a bad connection or an open transformer winding. A SHORT indication designates a short from phase to neutral or phase to phase in the transformer or the connections to it.

NOTE: Disconnect primaries or remove primary fuses before testing secondaries.

For the Quick-Check and power capacitors, tests across the two bushings should show CAPACITOR O.K. On a single bushing capacitor tests from bushing to ground will also show CAPACITOR O.K. On a two bushing capacitor, tests from bushing to ground should show OPEN.

As a quick test in the shop, the TILT II and Quick-Check can be used to screen transformers by checking both primary and secondary windings and connections. Test for SHORTs on both primary and secondary windings and from primary to secondary. Test for OPENs on both primary and secondary windings to check for open windings or open breakers and fuses. Tests for power capacitors with the Quick-Check are performed across each bushing and from bushing(s) to ground.

Test Connections for TILT II and Quick-Check



These instruments are intended for quick and simple testing of transformers or capacitors and the connections made to them. Do not energize visibly damaged equipment such as a transformer leaking oil or a bulged capacitor even if the TILT II or Quick-Check gives an O.K. reading.

The TILT II and Quick-Check are powered by an internal 9V alkaline battery. It is easily and quickly replaced by removing the battery cover on the back of the unit.

WARNING: The TILT II and Quick-Check should be used only on equipment known to be deenergized and/or discharged.

CAUTION: Using the TILT II and Quick-Check on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing.

The Quick-Check will not leave a significant charge on a capacitor.

NOTE: For user safety there is a non-replaceable 600V internal fuse inside the instrument. If the instrument is connected to an energized transformer, the fuse will blow. The instrument must then be returned to the factory for repair.

SPECIFICATIONS

SHORT: $\leq 10\Omega$, varies with battery voltage

OPEN: $\geq 10\Omega$, varies with battery voltage

TRANSFORMER O.K.: minimum inductance $800\mu\text{H}$

CAPACITOR O.K.: (Quick-Check only)

minimum capacitance $0.5\mu\text{f}$

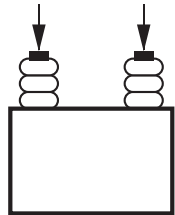
maximum capacitance $300\mu\text{f}$

TESTING 3Ø TRANSFORMERS

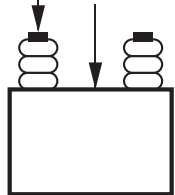
The TILT II and Quick-Check should be used only on equipment known to be deenergized. Using the TILT II or Quick-Check on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing.

Test Connections for
Quick-Check Only

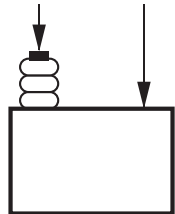
across two bushings
CAPACITOR O.K.



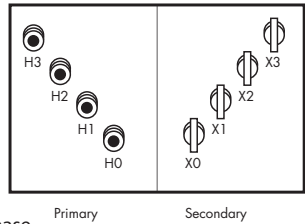
one bushing to ground
OPEN



one bushing
CAPACITOR O.K.

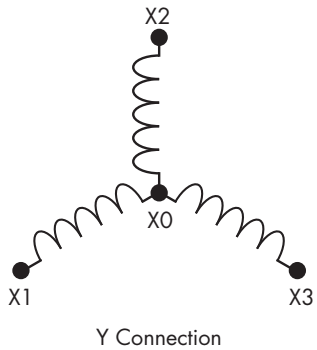


For 3Ø transformers, the TILT II or Quick-Check test leads are connected from each phase to neutral and across each pair of phases. When all connections are proper and the transformer itself is good, the TILT II or Quick-Check will beep and show O.K. The OPEN indication designates a bad connection or an open transformer winding. A SHORT indication designates a short from phase to neutral or phase to phase in the transformer or the connections to it.



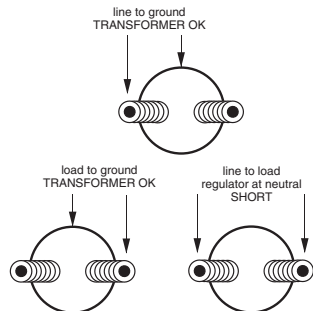
For Y (wye) connections, test the primary and secondary sides of the transformer as follows:

- | | |
|---------|---|
| X1 - X2 | Transformer O.K. |
| X2 - X3 | Transformer O.K. |
| X1 - X3 | Transformer O.K. |
| X1 - X0 | Transformer O.K. |
| X2 - X0 | Transformer O.K. |
| X3 - X0 | Transformer O.K. |
| H1 - H2 | Transformer O.K. |
| H2 - H3 | Transformer O.K. |
| H1 - H3 | Transformer O.K. |
| H1 - H0 | Transformer O.K. |
| H2 - H0 | Transformer O.K. |
| H3 - H0 | Transformer O.K. |
| H1 - X1 | } Transformer O.K. if both H0 and X0 are grounded, otherwise OPEN |
| H2 - X2 | |
| H3 - X3 | |
| H0 - X0 | SHORT, if both sides are grounded, otherwise OPEN |



TESTING DISTRIBUTION VOLTAGE REGULATORS

For typical distribution voltage regulators, test using these figures as guidelines. Both the line and load bushings tested to ground should indicate the reading shown in the figures. With the regulator in the neutral position, the line and load are internally connected with the resulting test indicating SHORT.



For Δ (delta) connections, test the primary and secondary sides the same as the Y (wye) except omit the connections to X0 and H0.

The TILT II and Quick-Check will not detect a partially shorted transformer coil or an improper transformer ratio. It is intended for quick and simple testing of transformers and the connections made to them.

TESTING DISTRIBUTION TRANSFORMERS FROM METER SOCKETS

An overhead or underground distribution transformer can sometimes be more conveniently tested from a meter socket served by that transformer.

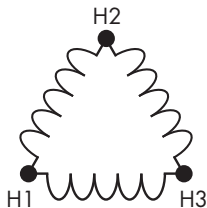
The TILT II and Quick-Check should be used only on equipment known to be deenergized. Test both the load and source sides of the meter socket for the presence of voltage before using the TILT II or Quick-Check.

Using the TILT II or Quick-Check on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing. The Quick-Check will test the secondary side of a transformer connected to the meter socket. Connect the TILT II or Quick-Check across the two source side receptacles and from each receptacle to ground and test.

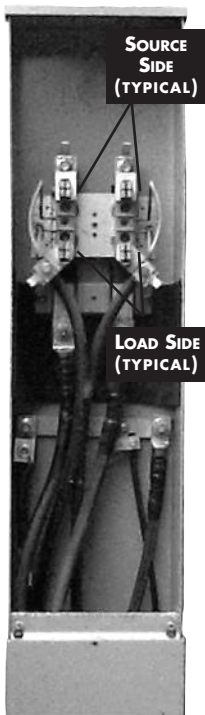
NOTE: This procedure will not work if other loads are connected to the same transformer.

The wiring on the load side of the meter socket going into the main breaker can also be tested for shorts or crossed phases. Connect the TILT II or Quick-Check across the two load side receptacles and from each receptacle to ground. The absence of shorts or crossed phases will be indicated by an OPEN reading. If the main breaker is not open, connected loads within the building may cause a SHORT or TRANSFORMER O.K. indication.

The meter socket connections shown are typical. Local standards may specify different connections.



Delta Connection



LIMITED WARRANTY AND LIMITATION OF LIABILITY

This warranty applies to all products sold by HD Electric Company (the "Products"); provided, however, that the term Products does not include any third party products purchased through HD Electric Company, for which no warranties are made (the "Third Party Products"). Third Party Products may be subject to a separate manufacturer's warranty; [should you have any question regarding whether a separate warranty applies, please contact HD Electric Company].

NOTICE: READ THIS LIMITATION OF WARRANTY AND LIABILITY BEFORE BUYING OR USING THE PRODUCTS CONTAINED HEREIN.

It is impossible to eliminate all risks associated with the use of the Products. Risks of serious injury or death, including risks associated with electrocution, arcing and thermal burns, are inherent in work in and around energized electrical systems. Such risks arise from the wide variety of electrical systems and equipment to which Products may be applied, the manner of use or application, weather and environmental conditions or other unknown factors, all of which are beyond the control of HD Electric Company.

HD Electric Company does not agree to be an insurer of these risks.

WHEN YOU BUY OR USE THESE PRODUCTS, YOU AGREE TO ACCEPT THESE RISKS.

HD Electric Company warrants to the original purchaser that the Products (excluding any third party products purchased through HD Electric Company, for which no warranties are made) will be free from defects in material and workmanship, under normal use and regular service, and preventative maintenance for a period of one (1) year from the date of shipment (the "Warranty Period"). Should any failure to conform with this warranty be found during the Warranty Period, you must notify HD Electric Company of your claim within thirty (30) days of discovery, and within the Warranty Period. Your failure to give notice of claims of breach of warranty within the Warranty Period shall be deemed an absolute and unconditional waiver of claims for such defects. HD Electric Company will have no responsibility to honor claims received after the date the applicable Warranty Period expires.

Upon notice of your claim, HD Electric Company will provide a return authorization number, and further instructions on how to return the product for service. You must follow HD Electric Company's instruction. You are responsible for all Product removal, handling, re-installation, and shipping (both to and from HD Electric Company). Products returned for repair, as well as repaired or replacement Products shall be sent postage / freight prepaid. After receipt of a product which HD Electric Company determines is defective, HD Electric will, at its option, either (1) repair (or authorize the repair of) the Product or (2) replace the Product, subject to the following: The Products are made using parts sourced from a variety of manufacturers. Due to the rapidly changing technology environment, parts may become obsolete / unavailable over time (end of life). In the event that a Product cannot be repaired or replaced due to unavailability of parts, HD Electric Company will use commercially reasonable efforts to obtain substitute parts or conduct work around design, but cannot guarantee its ability to do so.

Items not found defective will be returned at your expense, or failing receipt of instruction from you on return of such items within five (5) business days of our notice to you that the product is not defective, HD Electric may dispose of the product at its discretion and with no liability to you. HD Electric Company's determination of defects is final. Products repaired or replaced during the Warranty Period shall be covered by the foregoing warranties for the remainder of the original Warranty Period or ninety (90) days from the date of delivery of the repaired or replaced Products, whichever is longer.

LIMITATIONS:

This warranty is void in the event of misuse, alteration, faulty installation, or misapplication of the product. This warranty does not cover failure of product or components due to any ACT OF NATURE; lightning, floods, hurricanes, tornadoes or any other such catastrophic events.

HD Electric Company does not warrant any third party products or associated hardware or their performance or suitability for use and application. Such items are provided "as-is".

All repairs must be authorized by HD Electric Company. Unauthorized repairs will not be reimbursed under any circumstances.

HD Electric Company is not required to make replacement or loaner equipment available while Products are being repaired or replaced, or to compensate you for any in/out labor charges or expenses associated with removal, handling or re-installation of the Products.

TO THE MAXIMUM EXTENT PERMITTED BY LAW, THIS WARRANTY AND THE REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, REMEDIES AND CONDITIONS, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. HD ELECTRIC EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY AND NON-INFRINGEMENT.

IN NO EVENT SHALL HD ELECTRIC COMPANY BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM THE USE OR HANDLING OF THESE PRODUCTS. THIS SHALL INCLUDE BUT, NOT LIMITED TO, LOST PROFITS OR REVENUE, LOSS OF USE OF THE PRODUCTS, COST OF SUBSTITUTE PRODUCTS, FACILITIES OR SERVICES, OR DOWNTIME.

IN NO EVENT SHALL HD ELECTRIC COMPANY HAVE ANY LIABILITY FOR ANY THIRD PARTY PRODUCTS OR ASSOCIATED HARDWARE, OR CUSTOMER-OWNED SYSTEMS, EQUIPMENT OR SOFTWARE.

HD Electric Company must have prompt notice of any claim so that an immediate product inspection and investigation can be made. Buyer and all users shall promptly notify HD Electric Company of any claims, whether based on contract, negligence, strict liability, or other tort or otherwise be barred from any remedy.

HD Electric Company is committed to ongoing review and improvement of its product lines, and thus reserves the right to modify product design and specifications without notice.

HD Electric Company products are available through HD sales representatives worldwide.

Printed in U.S.A. © HD Electric Company 2011 • Bulletin No. TILT/QC IM-100a

Quick-Check Patent No. 6130530