

# TILT II & QUICK-CHECK®

## TRANSFORMER & CAPACITOR TESTERS

### Operating & Instruction Manual



**HDE** HD ELECTRIC COMPANY  
A Textron Company

**T**Equipment  
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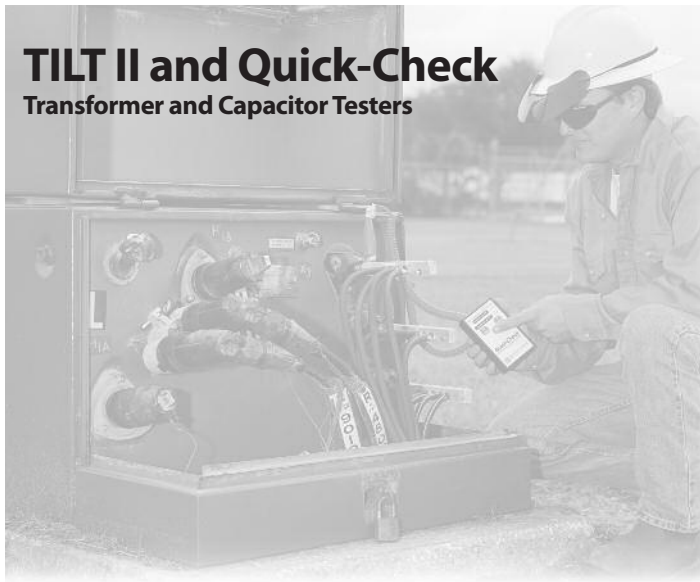
# TILT II & QUICK-CHECK

## TRANSFORMER & CAPACITOR TESTERS

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# TILT II and Quick-Check

## Transformer and Capacitor Testers



### IMPORTANT SAFETY INFORMATION

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

**CAUTION:** Use 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 Transformer and Capacitor Tester will not leave a significant charge on a capacitor.

**OPERATIONAL IMPAIRMENT:** If the Testers are used in a manner not described in this instruction manual, the protection and effective operation of this equipment may be impaired.

## INTRODUCTION

The TILT II and Quick-Check Transformer and Capacitor Testers are versatile tools for quick and easy checks of transformers and the connections made to them. The Quick-Check Transformer and Capacitor Tester 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 Transformer and Capacitor Tester 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 Transformer and Capacitor Tester 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 Transformer and Capacitor Tester tests power capacitors in almost any size.

## HOW THEY WORK

The Testers are used in the field for testing connected transformers, their connected primary and secondary leads and the Quick-Check Transformer and Capacitor Tester for power capacitors, individually or in banks, for both shorts or opens. Unlike a simple ohmmeter, the Testers 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 Transformer and Capacitor Testers 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.

## PRE-USE INSPECTION

Before using the Testers 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 Transformer and Capacitor Tester, 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.

## TESTING SINGLE PHASE TRANSFORMERS

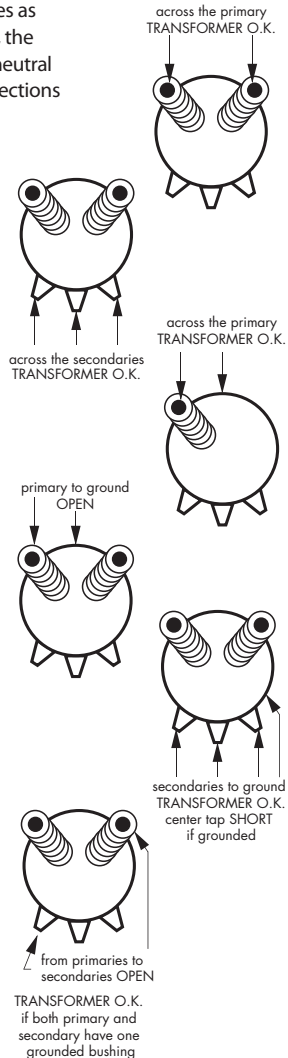
For single phase transformers, use these figures as guidelines to get started. For 3Ø transformers, the test leads are connected from each phase to neutral and across each pair of phases. When all connections are proper and the transformer itself is good, the Tester will beep and show TRANSFORMER O.K. 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 Transformer and Capacitor Tester 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 Testers 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 Transformer and Capacitor Testers are performed across each bushing and from bushing(s) to ground.

## Test Connections



## TESTING CAPACITORS

**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 Testers give an O.K. reading.**

The Testers are powered by an internal 9V lithium or alkaline battery. It is easily and quickly replaced by removing the battery cover on the back of the unit.

**WARNING:** The Testers should be used only on equipment known to be deenergized and/or discharged.

**CAUTION:** Using the Testers 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 Transformer and Capacitor Tester will not leave a significant charge on a capacitor.**

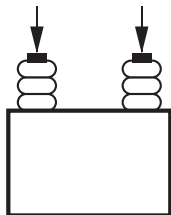
**NOTE:** For user safety there is a non-replaceable 600V internal fuse inside the instrument. If the instrument is connected to an energized transformer, the fuse will blow. The instrument must then be returned to the factory for repair.

## TESTING THREE PHASE TRANSFORMERS

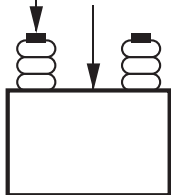
The TILT II and Quick-Check Transformer and Capacitor Testers should be used only on equipment known to be deenergized. Using the Testers on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing.

Test Connections for  
Quick-Check  
Transformer and  
Capacitor Testers  
Only

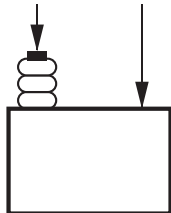
across two bushings  
CAPACITOR O.K.



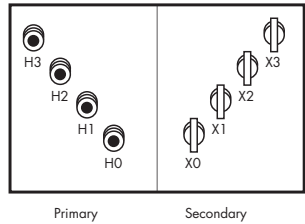
one bushing to ground  
OPEN



one bushing  
CAPACITOR O.K.

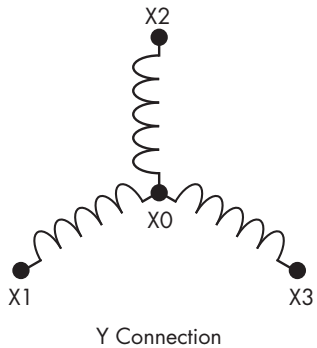


For  $3\phi$  transformers, the test leads are connected from each phase to neutral and across each pair of phases. When all connections are proper and the transformer itself is good, the Tester will beep and show O.K. The OPEN indication designates a bad connection or an open transformer winding. A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



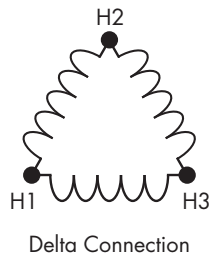
For Y (wye) connections, test the primary and secondary sides of the transformer as follows:

- |         |                                                                       |
|---------|-----------------------------------------------------------------------|
| 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<br>and X0 are grounded,<br>otherwise OPEN |
| H2 - X2 |                                                                       |
| H3 - X3 |                                                                       |
| H0 - X0 | SHORT, if both sides are grounded, otherwise OPEN                     |



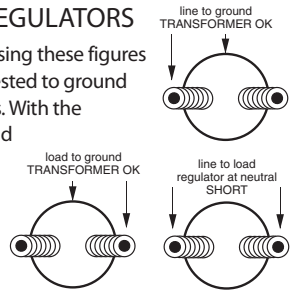
For  $\Delta$  (delta) connections, test the primary and secondary sides the same as the Y (wye) except omit the connections to X0 and H0.

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



## 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.



## 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.

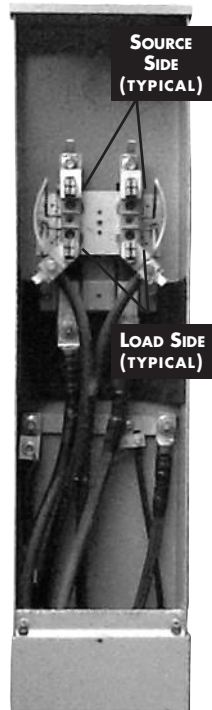
Transformer and Capacitor Testers should be used only on equipment known to be deenergized. Test both the load and source sides of the meter socket for the presence of voltage before using the Tester.

Using the Tester 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 Transformer and Capacitor Tester will test the secondary side of a transformer connected to the meter socket. Connect the Tester 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 Tester 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.





## CARE AND MAINTENANCE

**STORAGE** - It is recommended for protection of the TILT II and Quick-Check Transformer and Capacitor Tester that it is stored in the carrying case.

**CLEANING INSTRUCTIONS** - To clean, wipe with a damp cloth with water. Do not use harsh chemicals or solvents.

**DAMAGE** - If you suspect any mechanical or electrical damage, do not use and arrange for repair by returning to the factory.

**CALIBRATION & TESTING** - Regular calibration is not required. There is no calibration adjustment.

## REPAIRS

All repairs are performed at HD Electric Company. If any damage is found please contact HD Electric Company at 847-473-4980 to arrange for service.

**WARNING: Use Only on Equipment Known to be Deenergized and/or Discharged**  
Test this tool before each use. Touch the right test lead to each of the two test terminals in turn, push the TEST button and verify proper operation of the corresponding lights. Test for OPEN by leaving the leads open. Test for short by shorting the leads. The beeper will sound when a green OK lights is on.  
Connect the test leads to the device under test. Push the test button and observe the lights. An OK indication verifies no direct shorts or opens. OPEN indicates an open connection or high resistance leakage path. SHORT indicates a very low resistance.

Using this tool on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing. Refer to instructions. Check the battery if unit fails to operate. Replace with 9V alkaline or lithium types. Contains a 600V fuse which is not replaceable. Return to factory for service. Maximum output voltage 6VDC.

**DANGER:** Failure to follow these directions or the instructions may expose the user to high voltage, severe injury or death.  
HD Electric Company, Waukegan IL USA [www.HDElectricCompany.com](http://www.HDElectricCompany.com)  
US Patent 6,130,530 4/16



TL-MAN-N, TL-MAN-M, QC-MAN-N, QC-MAN-M

## TECHNICAL SPECIFICATIONS

### MODELS

TL-MAN-N, TL-MAN-M, QC-MAN-N, QC-MAN-M

### DIMENSIONS

3.6 in. W x 5.7 in. L x 1.2 in. H (9.1 cm x 14.5 cm x 3.0 cm)

### WEIGHT

TL-MAN-N / QC-MAN-N - 1lb., 1oz. (0.47 kg)

TL-MAN-M / QC-MAN-M with magnet - 1lb., 2 oz. (0.51 kg)

### BATTERY

9V alkaline ANSI 1604A, IEC 6LR61 or 9V lithium ANSI-1604LC

OUTPUT VOLTAGE: 6VDC maximum pulsed at 50Hz nominal

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

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

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

CAPACITOR O.K.: (Quick-Check Transformer and Capacitor Tester only)

minimum capacitance 0.5 $\mu$ f

maximum capacitance 300 $\mu$ f

AUDIO OUTPUT: 85db at 30cm

### ENVIRONMENTAL CONDITIONS

CONDITIONS: Indoor and outdoor use

ALTITUDE: Up to 6,566 ft. (2000M)

OPERATING TEMPERATURE: -20°F to +140°F (-29°C to +60°C)

HUMIDITY: 95% to +60°C (non-condensing)

POLLUTION DEGREE: PD2

OVERVOLTAGE CATEGORY: II Non-contact

ENCLOSURE MATERIAL: ABS UL 94-HB

PRINTED CIRCUIT BOARDS: FR-4 UL 94-V0

### BATTERY REPLACEMENT INSTRUCTIONS

To replace the battery, open the compartment on the bottom of the housing. Remove and dispose of the old battery, replacing it with a fresh, new 9-volt lithium or alkaline battery.

### MANUFACTURING LOCATION

HD Electric Company • Waukegan, IL. 60085, USA



Call Us 1.877.571.7901

## 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, and shall have no liability for any claims arising from such 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 (ten (10) years for HDE Capacitor Controls) 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.

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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.

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