

T+ and T+ PRO

Electrical Tester

Calibration Information

Introduction

This document provides the following information for the T+ and T+ PRO Electrical Testers (hereafter referred to as the “Tester” or UUT):

- Safety information
- Symbols
- Contacting Fluke
- Specifications
- Maintenance
- Performance tests
- Parts and accessories list
- Product Warranty Statement

For complete operating instructions, refer to the *T+ and T+ PRO Instruction Sheet*.

Safety Information

Warning

To avoid possible electric shock or personal injury, follow these guidelines:

- Use the Tester only as specified in this document, otherwise the protection provided by the Tester may be impaired.
- The Tester is to be used only by qualified personnel.
- Do not use the Tester if it is damaged. Inspect the case before use. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before using the Tester.
- Do not use the Tester if it operates abnormally. Protection provided by the Tester may be impaired. When in doubt, have the Tester serviced.

P/N 2823862

July 2007

© 2007 Fluke Corporation, All rights reserved. Printed in USA.
All product names are trademarks of their respective companies.

- Do not operate the Tester around explosive gas, vapor, or dust.
- Do not apply more than the rated voltage, as marked on the Tester, between terminals or between any terminal and earth ground.
- When measuring hazardous voltage, verify the Tester's operation by measuring a known voltage.
- Only the test probes and batteries are serviceable. When servicing, use only specified replacement parts.
- To determine the LEDs and beeper are working correctly, short the test leads together. The beeper sounds (if enabled) and all LEDs and display segments (T+ PRO) switch on briefly indicating correct operation.
- Comply with local and national safety requirements when working in hazardous locations.
- Use proper protective equipment, as required by local or national authorities when working in hazardous areas.
- Use caution when working above 30 V ac rms, 42 V peak, or 60 V dc. Such voltages pose a shock hazard.
- When using probes, keep fingers away from the probe tips.
- Connect the common test lead before connecting the live test lead. When disconnecting the test leads, disconnect the live test lead first.
- Do not operate the Tester with the battery door or portions of the cover removed or loosened.
- When the batteries are depleted, self test will not function.
- When the beeper is disabled, it will not sound until the beeper is reactivated.
- For voltages above 240 V, you must only connect to a voltage source for a MAXIMUM of 30 seconds and then disconnect for a MINIMUM of 300 seconds.
- Perform a self test before any measurements are taken for voltage, continuity, resistance, or rotary field. See "Self Test."
- Exercise caution when performing measurements on PLC inputs. When measuring relay control voltages on PLCs, be aware that this may open or close the relay/switch.

⚠ Caution

Although the Tester may be used with depleted batteries, replace depleted batteries immediately to avoid Tester damage from battery acid leakage.

Symbols

Table 1 describes the symbols that appear on the Tester or in this document.

Table 1. Symbols

Symbol	Explanation	Symbol	Explanation
	Important information		Hazardous Voltage
	Double insulated		Conforms to European Union Directives
	Earth ground		Continuity beeper
	Canadian Standards Association		Underwriters Laboratories Certification
	Do not dispose of this product as unsorted municipal waste. Visit Fluke's Web site for recycling information.		Conforms to relevant Australian standards
CAT III	CAT III equipment is designed to protect against transients in equipment in fixed-equipment installations, such as distribution panels, feeders and short branch circuits, and lighting systems in large buildings.	CAT IV	CAT IV equipment is designed to protect against transients from the primary supply level, such as an electricity meter or an overhead or underground utility service.

Contacting Fluke

To order parts, or for warranty service, contact Fluke as follows:

USA: 1-888-99-FLUKE (1-888-993-5853)

Canada: 1-800-36-FLUKE (1-800-363-5853)

Europe: +31 402-675-200

Japan: +81-3-3434-0181

Singapore: +65-738-5655

Anywhere in the world: +1-425-446-5500

Or, visit Fluke's Web site at www.fluke.com. To register your product, go to register.fluke.com.

Specifications

Temperature Performance

Operating –10 °C to 55 °C (14 °F to 131 °F)

Storage –30 °C to 60 °C (–22 °F to 140 °F)

Relative Humidity

90 % 0 °C to 30 °C (32 °F to 86 °F)

75 % 30 °C to 40 °C (86 °F to 104 °F)

45 % 40 °C to 50 °C (104 °F to 122 °F)

Altitude

Operating 2,000 m

Storage 10,000 m

Battery Type/Life AAA (2); 40 hours

Shock, Vibration Sinusoidal vibration per MIL-PRF-28800F for a Class 2 instrument

Safety ANSI/ISA S82.02.01, CSA C22.2-1010.1, IEC 61010-1 to 1000 V CAT III/600 V CAT IV

AC Bandwidth 45 Hz to 66 Hz

Earth Ground	MAXIMUM working voltage 1000 V ac or dc MAXIMUM measurable voltage 600 V ac or dc This will be displayed on the LED and LCD (T+ PRO)
Duty Cycle	Indefinitely for voltages up to 240 V. For voltages between 240 V to 600 V, the duty cycle is 30 s on / 300 s off. For voltages above 240 V, the Tester must connect to a voltage source only for a MAXIMUM of 30 s and then disconnect for a MINIMUM of 300 s.
Voltage Hazard LED	LEDs turn on @ voltages > 30 V ac/dc $\pm$ 35 %
LEDs	LEDs turn on @ between 70 % and 100 % of the indicated voltage on the LED, except for the 12 V LED that turns on @ between 50 % and 100 %.
Accuracy	
AC voltage	$\pm$ (3 % rdg + 2 digits)
DC voltage	$\pm$ (2 % rdg + 2 digits)
Resistance	$\pm$ (5 % rdg + 3 digits)
LCD Resolution	0.1 V for voltages < 50 V, 1 V for voltages $\geq$ 50 V, 0.01 k Ω at resistance measurement
GFCI Test Current	100 V to 150 V @ 6 mA to 9 mA ac 150 V to 240 V < 12 mA
Standard Input Test Current	< 5 mA
Size (HxWxL)	1.3 x 2.15 x 7.6 in.
Weight	9.9 oz

Maintenance

Basic maintenance for the Tester includes cleaning, checking the battery charge, and replacing depleted batteries.

Cleaning the Tester

Warning

To avoid electrical shock or damage to the Tester, never allow water inside the case. To avoid damaging the Tester case, never use solvents on the Tester.

If the Tester requires cleaning, wipe it down with a cloth that is lightly dampened with water or a mild detergent. Do not use aromatic hydrocarbons, chlorinated solvents, or methanol-based fluids when wiping down the tester. These cleaning agents will damage the Tester case.

Testing the Batteries

Perform a self test, described later in this document, to determine the charge state of the batteries on the Tester. The self test will not work with depleted batteries. On T+ PRO Testers, the low battery icon () on the LCD indicates that the batteries need to be replaced.

Replacing the Batteries

Warning

To avoid possible electric shock or personal injury:

- **Disconnect test leads from any electrical source before opening the battery compartment.**
- **Do not operate the Tester with the battery door or portions of the cover removed or loosened.**

To replace the batteries, do the following:

1. Remove the battery door by using a flat blade screwdriver to turn the battery door fastener one-quarter turn counterclockwise.

2. Observing proper polarity, replace the batteries with two new AAA alkaline batteries.
3. Replace the battery door and secure it by turning the battery door fastener one-quarter turn clockwise.

Calibration Adjustment

The T+ and T+ Pro have no field calibration. If the UUT fails any performance test, contact Fluke Service for repair. See “*Contacting Fluke.*”

Performance Tests

⚠⚠ Warning

To avoid possible electric shock, do not perform the performance test procedures unless the Tester is fully assembled and you are qualified to do so.

The following performance tests verify the complete operation of the Tester and check the accuracy of each Tester function against its specifications. The recommended calibration interval is 12 months. In the performance tests, the Tester is referred to as the unit under test (UUT). If the UUT fails any performance test, contact Fluke Service for repair. See “*Contacting Fluke.*”

Required Equipment

Table 2 lists equipment that is required to complete the performance tests:

Table 2. Equipment Requirements

Equipment	Minimum Required Characteristics	Recommended Model
Calibrator	ac / dc voltage range: 10 V to 600 V Accuracy: $\pm 5\%$ Frequency 50/60 Hz Resistance range: 100 Ω to 9 k Ω Accuracy: $\pm 1.25\%$)	Fluke 5520A High Performance Multi-Product Calibrator or 5500A Multi-Product Calibrator
3-phase power supply	120 V, 3-phase output	Elgar 5250A or equivalent
Digital multimeter	ac current range: 0 to 20 mA ± 7	Fluke 189 Digital Multimeter

Self Test

⚠⚠ Warning

To avoid possible electric shock or personal injury:

- **Perform a self test before any measurements are taken for voltage, continuity, resistance, or rotary field.**
- **When the batteries are depleted, self test will not function. Replace the batteries.**

⚠ Caution

Although the Tester may be used with depleted batteries, replace depleted batteries immediately to avoid Tester damage from battery acid leakage.

To perform the self test, short the two probes. The self test lights all LEDs, and all LCD segments (T+ PRO). The beeper sounds (unless disabled) and the Tester switches to continuity mode. To

complete the self test, measure a known voltage before use. If the Tester fails self test, it must not be used and requires service. See “Contacting Fluke.”

Testing the LCD Display (T+ PRO)

Use the following procedure to test the LCD display:

Note

The Tester must remain inactive for approximately 30 seconds before performing the following test. This will force a processor reset that will display all LCD segments for approximately 1 second at power up.

1. Observe the LCD and short the test probes together. All LCD segments shown in Figure 1 should light.



Figure 1. LCD Display

Testing the LEDs

Use the following procedure to test the LEDs:

Note

The Tester must remain inactive for approximately 30 seconds before performing the following test. This will force a processor reset that will display all LCD segments for approximately 1 second at power up.

1. Short the test probes together.
2. Observe that all LEDs light (voltage range, hazard, volts ac and dc, and continuity).

Testing the Backlight (T+ PRO)

Use the following procedure to test the backlight:

1. Insert the test probes into a voltage source of > 10 V ac or dc.
2. Observe that the backlight lights.

Testing the Audible Signal

Use the following procedure to test the audible signal:

1. Short the UUT test probes together. The beeper should sound.
2. If inactivated, press and hold  until you hear three beeps.

Testing the Flashlight

Use the following procedure to test the flashlight:

1. Press the UUT headlight button.
2. Observe that the flashlight turns on for approximately five seconds.

Accuracy Tests

Perform the accuracy and verification tests in Table 3.

Table 3. T+ and T+ PRO Accuracy Tests

Step	Function	Range	Input Value	UUT Response (LED)	LCD Display (T+ PRO) Measurement Limits
1	Pos Off	12 V	+20 V	12 V LED On	---
2	Neg Off	12 V	-20 V	12 V LED On	---
3	Pos On	24 V	+40 V	+ LED On 12 V, 24 V LED On Hazard On	---
4	Neg On	24 V	-40 V	- LED On 12 V, 24 V LED On Hazard On	---
5	Digital Display Voltage Measurement	dc V 0 – 50 V	+10.5 V	12 V LED On	10.1 to 10.9
6			-10.5 V	12 V LED On	-10.1 to -10.9
7			+48 V	+ LED On 12 – 48 V LED On Hazard On Beeper & Vibration On	46.8 to 49.2
8			-48 V	- LED On 12 – 48 V LED On Hazard On Beeper & Vibration On	-46.8 to -49.2
9		dc V 0 – 600 V	+55 V	+ LED On 12 – 48 V LED On Hazard On Beeper & Vibration On	52 to 58
10			-55 V	- LED On 12 – 48 V LED On Hazard On Beeper & Vibration On	-52 to -58
11			+590 V	+ LED On 12 – 600 V LED On Hazard On Beeper & Vibration On	576 to 604
12			-590 V	- LED On 12 – 600 V LED On Hazard On Beeper & Vibration On	-576 to -604
13		ac V 0 – 600 V	55 V, 60 Hz	ac LED On 12 – 48 V LED On Hazard On Beeper & Vibration On	51 to 59

Table 3. T+ and T+ PRO Accuracy Tests (cont.)

Step	Function	Range	Input Value	UUT Response (LED)	LCD Display (T+ PRO) Measurement Limits
14	Voltage LEDs	24 V	24 V	24 V LED On	---
15		120 V	120 V	120 V LED On	---
16		208 V	208 V	208 V LED On	---
17		240 V	240 V	240 V LED On	---
18		277 V	277 V	277 V LED On	---
19		347 V (Canada)	347 V	347 V LED On	---
20		480 V	480 V	480 V LED On	---
21	Continuity	0 – 20 k Ω	Short	Continuity LED On	Continuity Sign
22	Resistance	0.00 – 9.99 k Ω	Short	None	0.00 to 0.03
23			100 Ω	None	0.06 to 0.14
24			9 Ω	None	8.52 to 9.48

Load Current Test

To test the load current, set up the UUT with equipment as shown in Figure 2 and complete the following procedure:

1. Set the DMM to the mA dc function.
2. Apply 600 V dc from the Source. The DMM reading should be < 5 mA.
3. Apply –600 V dc from the Source. The DMM reading should be < 5 mA.

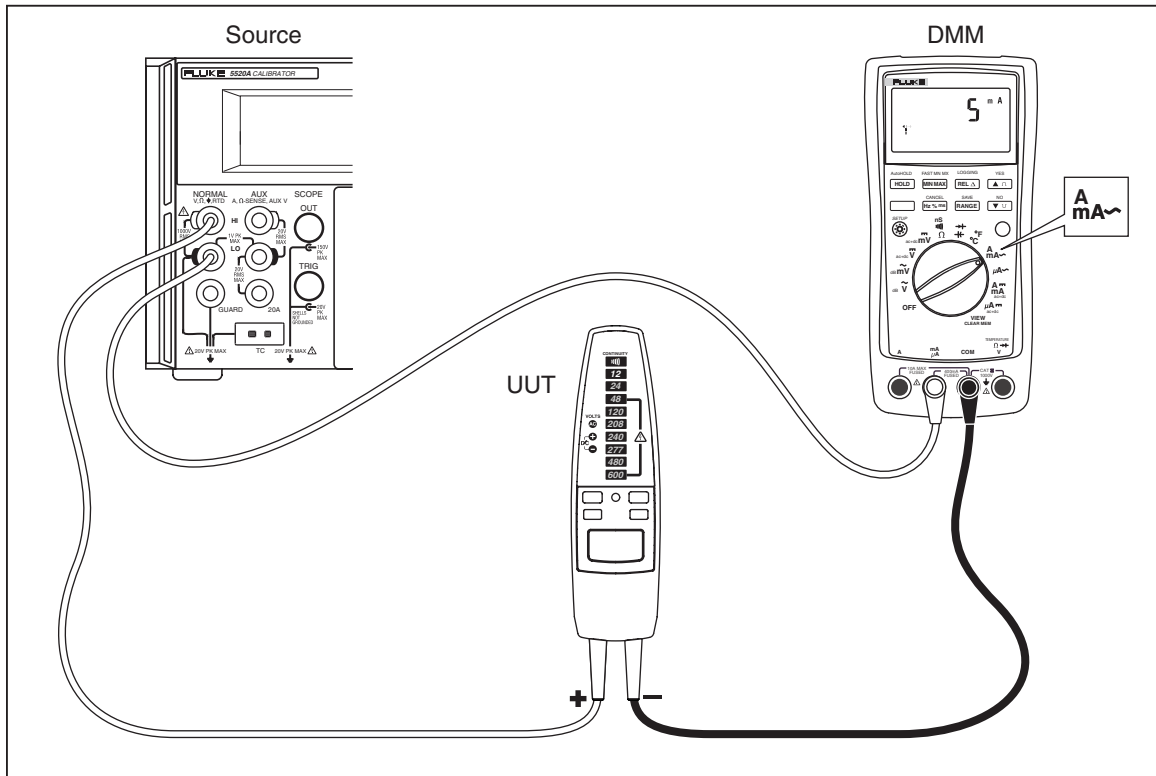


Figure 2. Load Current/GFCI Current Test

eqc90.eps

GFCI Trip Test

To test the GFCI Trip current accuracy, set up the UUT and equipment as shown in Figure 2, and complete the following procedure:

Note

When you press the GFCI pushbutton, the resulting test will last for up to seven seconds.

1. Set the DMM to the mA ac function.
2. Apply 100 V, 60 Hz from the Source. The DMM reading should light the 12 – 48 V LEDs and Hazard symbol.
3. Press the UUT GFCI pushbutton for one second. The UUT DC + and DC – LEDs should alternately switch on and off while the beeper sounds. The DMM reading should be between 6 and 9 mA ac during the test.

Rotary Field Test (T+ PRO)

To test the rotary field direction indicator, complete the following procedure:

1. Connect the UUT to a 60 Hz, three-phase source of > 120 V, with the UUT red lead to A-phase and the UUT COM lead to B-phase. The UUT's rotary field direction indicator arrow should point to the right.
2. Move the UUT COM lead to C-phase. The rotary field direction indicator arrow should point to the left.

Parts and Accessories List

Table 4 lists the replacement parts and accessories that are available from Fluke for the T+ and T+ PRO.

Table 4. Replacement Parts and Accessories

Description	Fluke Part Number
Calibration Information	2823862
Battery Access Door	2558967
Test Lead Set	2559535
TP2 Replaceable Test Probe (black)	2637501
TP2 Replaceable Test Probe (red)	2637512

Limited Warranty and Limitation of Liability

Each Fluke product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is two years and begins on the date of shipment. Parts, product repairs, and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke authorized reseller, and does not apply to fuses, disposable batteries, or to any product which, in Fluke's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. Fluke warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke does not warrant that software will be error free or operate without interruption.

Fluke authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke. Warranty support is available only if product is purchased through a Fluke authorized sales outlet or Buyer has paid the applicable international price. Fluke reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including overvoltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Fluke Corporation
P.O. Box 9090
Everett, WA 98206-9090
U.S.A.

Fluke Europe B.V.
P.O. Box 1186
5602 BD Eindhoven
The Netherlands