TEGAM

Model 125
Electrical Service Voltmeter

Instruction Manual

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SPECIFICATIONS

FUNCTIONS: VAC/VDC, and continuity with automatic selection. When both AC and DC input voltages are present, VAC function is selected if peak AC voltage is greater than magnitude of DC voltage. Otherwise, VDC function is selected. Continuity function is enabled when peak (AC + DC) input voltage is 0+300 mV typical.

RANGES: 750 volts AC.

±750 volts DC.

RESOLUTION: 1 volt

ACCURACY: VAC; ±(0.2%rdg + 1 volt), 50-60 Hz
±(0.5%rdg + 1 volt), 45-1000 Hz
±(2% rdg + 5 volts), 1-10 KHz, typical
VDC; ±(0.2%rdg + 1 volt)

MAXIMUM INPUT: 750 volts continuous.

OVERVOLTAGE TEST: 1100 volts peak for <5 seconds.

INPUT RESISTANCE: 5K ohm typical.

CREST FACTOR: Up to 3:1. Less than 2% additional error with 60 Hz rectangular pulse-train with crest factor of 3:1.

NORMAL MODE REJECTION: 40 dB typical.

REJECTION OF CAPACITANCE-COUPLED INPUTS: Suppresses 1500pF of capacitive effect to less than 1 count at 120v/60Hz.
Reads <(50,000) (LineFreq) (LineVoltage) (Capacitance)
Suppression Interruption Delay (typical); 120v (not applicable), 240v/35 seconds, 480v/10 seconds, 600v/7 seconds.
Suppression Restoration: 30 seconds (typical)

CONTINUITY: Sensing current is 1 mA (typical). Display reads CON when external probe-to-probe resistance is less than 300 ohms (typical).

READING RATE: 2.5 readings/second

DISPLAY: 0.5" LCD (3.5 digits), polarity and annunciators for VAC, VDC, OL, Low Battery.

INPUT LEADS: PVC insulated, 36" long, with color-coded, probes, retracting tip-sheaths. Strain-relieved leads soldered into eyelets to permit replacement by meter-repair personnel.

ENVIRONMENTAL LIMITS FOR OPERATION: 0°F to 140°F, less than 80% R.H. up to 95°F. Reduce R.H. Limit by 1.7% per °F above 95°F.

ENVIRONMENTAL LIMITS FOR STORAGE: –30°F to 150°F, less than 90% R.H. up to 95°F. Reduce RH limit by 1.7% per °F above 95°F.

ENVIRONMENTAL/TIME LIMITS TO ACCURACY: 64° to 82°F, 80% R.H., 1 year.

TEMPERATURE COEFFICIENT: From 64°F to 82°F; included in accuracy specifications. Below 64°F and above 82°F; less than 0.05 times applicable specifications per °F.

POWER: 9 volt battery (NEDA 1604).

BATTERY LIFE: 150 hours typical, alkaline battery.

LOW-BATTERY INDICATOR: Display indicates 'BAT' when less than 10% of life remains.

AUTOMATIC TURN-OFF: Voltmeter turns off after 10 minutes (typical) of operation to conserve battery life. Turns off below 6.5v (typical) battery voltage.

SIZE, WEIGHT: 6.3" x 2.7" x 1.2", 12 oz.

CONSTRUCTION: Heavy-duty Cycolac Flame Retardant ABS Housing.

ACCESSORIES SUPPLIED: Manual, Battery.

ACCESSORIES AVAILABLE: Model 1104 Leather Case, Replacement Probe/Lead-Set, (P/N 121-404).

DESCRIPTION

TEGAM's Model 125 is a hand-held digital voltmeter designed specifically to increase productivity of electric-utilities' meter installers and linemen. It differs from conventional DMMs in many important respects.

- Model 125 is RMS-responding. It provides accurate AC measurements even when line-voltage harmonics are present.
- Model 125 automatically indicates continuity in de-energized circuits with less than 300 ohms of tip-to-tip resistance.
- Model 125 is insensitive to the effects of distributed capacitance in residential wiring. In meter installation applications it functions like an analog meter yet provides a digital display. Capacitance induced readings are typically 1 volt or less instead of the 50-90 volt readings displayed by other digital meters.

- Model 125 has an integral probe-holder to permit true two hand operation, while the permanently secured test leads prevent loose-end shocks. Sheathed probe tips also enhance safety.
- Model 125 turns off after 10 minutes of operation. This feature helps conserve battery power when a user forgets to turn off the meter.
- Model 125 provides more than a low-battery warning. When battery power is too weak to ensure accurate readings, the meter turns off automatically.
- Model 125 has automatic selection of AC or DC measurement. This precludes the potential hazard of a live circuit measuring zero due to incorrect meter-function selection by a user.

APPLICATIONS

Though not limited to electrical service applications, Model 125 is optimized to provide safe, automatic measurement capabilities for checking power-distribution systems.

Used at a residential meter-base, Model 125 will verify service voltage and load-wiring integrity. Model 125 has a low input-resistance (like solenoid-type indicators) to preclude ambiguous readings caused by distributed-capacitance. Unlike solenoid-indicators, Model 125 has thermal protection against sustained high-voltage inputs. No time limits or duty-cycles restrict the use of Model 125.

Model 125 is also suited to commercial & industrial plant applications where the increasing prevalence of non-linear loads (e.g. variable speed drives, inverters, etc.) is causing harmonic distortion of the normal sinewave service voltage. Average-responding AC voltmeters become inaccurate with non-sinusoidal inputs. Model 125 is root-mean-square responding, and maintains accurate voltage readings with harmonics present.

When connected to de-energized circuits, Model 125 automatically operates as a continuity-indicator.

In DC systems, Model 125 switches automatically to function as a DC voltmeter.

MANUAL ADDENDA

Improvements or changes to this manual will be explained on an addendum included with the instrument. All change information should be incorporated immediately into the appropriate places in the manual.

UNPACKING AND INSPECTION

Each instrument is inspected both mechanically and electrically before shipment. Upon receiving your instrument unpack all items from the shipping container and check for any obvious damage that may have occurred during transit. Report any damage to the shipping agent. Retain and use the original packing materials if reshipment is necessary.

The following items are included with every shipment.

1. Model 125 Electrical Service Voltmeter.
2. Instruction Manual.
3. 9 volt Battery (NEDA 1604)
4. Optional Accessories as requested.

SAFETY SYMBOLS AND TERMS

The symbol  on the instrument denotes that the user should refer to the operating instructions.

The **CAUTION** term used in this manual and on the instrument explains hazards that could damage the instrument.

The **WARNING** term used in this manual and on the instrument explains dangers that could result in personal injury or death.

SAFETY PRECAUTIONS

CAUTION

1. Test instrument on a known live-circuit before use.

WARNING

1. This instrument is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety

precautions required to avoid possible injury. Read over the manual carefully before operating this instrument.

2. **Exercise extreme caution when a shock hazard is present at the instrument's input. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V rms or 42.4V peak are present. A good safety practice is to expect that a hazardous voltage is present in any unknown circuit before measuring.**
3. **Inspect the test leads for possible wear, cracks or breaks before each use. If any defects are found, replace with P/N 121-404 probe/ test-lead set before using the instrument. Refer to Maintenance Information section.**
4. **For optimum safety do not touch the test leads or the instrument while power is applied to the circuit under test. Turn the power off and discharge all capacitors, before connecting or disconnecting the instrument.**
5. **Do not touch any objects which could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface, capable of withstanding the voltage being measured.**
6. **Exercise extreme safety when testing high energy power circuits (AC power lines, etc.).**
7. **Do not exceed the instrument's maximum allowable input as defined in the specification and printed on the front panel of the instrument.**

ENVIRONMENTAL CONDITIONS

Operation of the instrument should take place at an ambient temperature of 0°F to 140°F, less than 80% relative humidity up to 95°F. Reduce relative humidity limit by 1.7% per °F from 95°F to 140°F.

PREPARATION FOR USE

Each instrument is supplied with a 9 volt battery. See Battery Installation section of this manual for battery installation instructions.

FUNCTIONALITY CHECKS

1. PROBE CHECK
Slide the power-switch to the “ON” position (See Figure 1) and touch the probe-tips together. Display should indicate “CON”, i.e. continuity.

2. ZERO CHECK
Disconnect probes from each other and all external circuits. Display should stabilize to read 0 VAC or 0 VAC.

Occasional flicker between VAC and VDC or O to 1 is normal.

3. DC VOLTS
Touch the black probe to the negative terminal of a fresh 9 volt transistor battery (alkaline or carbon-zinc), and touch the red probe to the positive terminal. A reading of 9-10 VDC should be displayed. Reverse the probes. The same reading except for a minus polarity should be displayed.

4. AC VOLTS
Connect Model 125 probes to the hot and neutral terminals of a standard 120 VAC power receptacle. Under normal line conditions, a reading of 120 ±10 VAC should be displayed.

OPERATION

The automatic features of Model 125 make it easy to use. Just slide the power switch to the “ON” position (See Figure 1).

WARNING

Observe safety precautions listed in Safety Precautions section of this manual.

After turn-on, the instrument automatically selects either VDC or VAC function. VAC is selected if the peak value of an AC input voltage is greater than the magnitude of any DC voltage present. Otherwise the VDC function is enabled. VAC and VDC annunciators in the liquid crystal display indicate the selected function. Observe the maximum allowable input (750 volts continuous).

After approximately 10 minutes, Model 125 turns off automatically to conserve battery life. (This interval can be reduced to 2 minutes with an

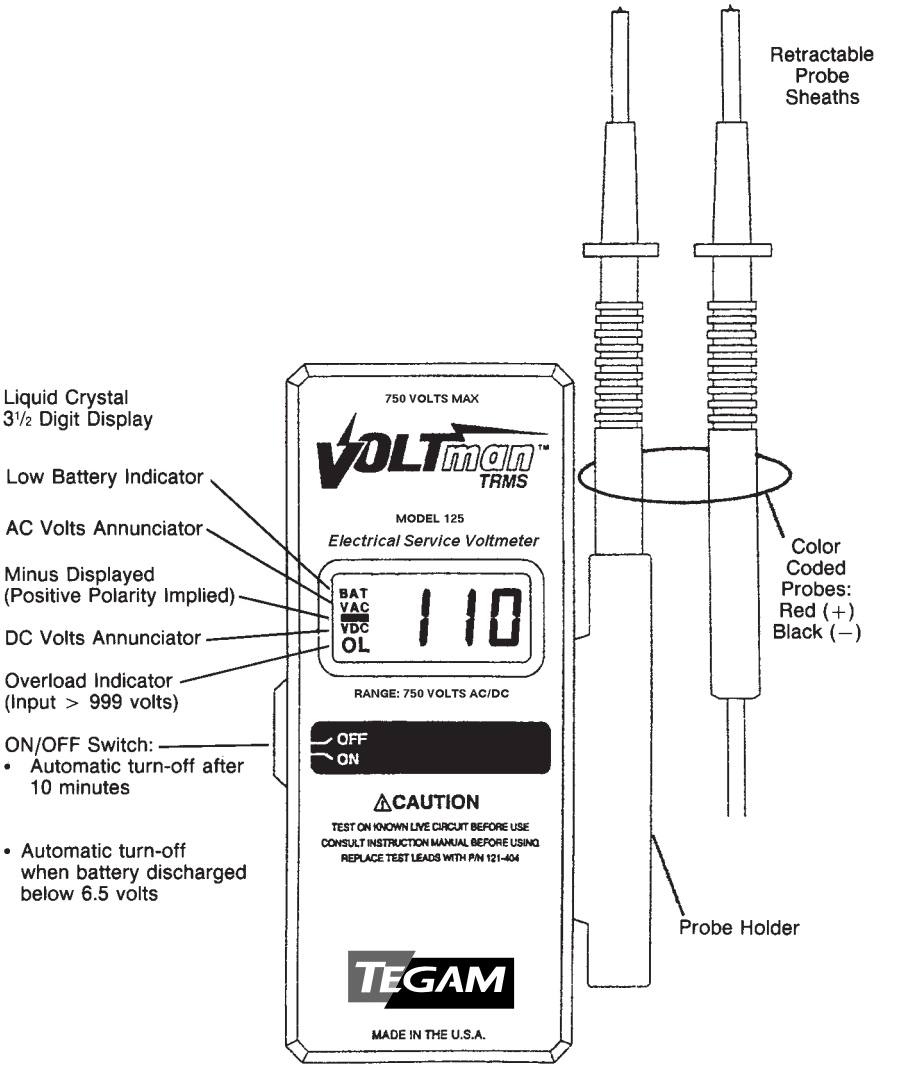

Retractable
Probe
Sheaths
Liquid Crystal
3½ Digit Display
Low Battery Indicator
AC Volts Annunciator
Minus Displayed
(Positive Polarity Implied)
DC Volts Annunciator
Overload Indicator
(Input > 999 volts)
ON/OFF Switch:
• Automatic turn-off after
10 minutes
• Automatic turn-off
when battery discharged
below 6.5 volts
750 VOLTS MAX
VOLTman™
TRMS
MODEL 125
Electrical Service Voltmeter
BAT
VAC
VDC
OL
110
RANGE: 750 VOLTS AC/DC
OFF
ON
⚠CAUTION
TEST ON KNOWN LIVE CIRCUIT BEFORE USE
CONSULT INSTRUCTION MANUAL BEFORE USING
REPLACE TEST LEADS WITH P/N 121-404
TEGAM
MADE IN THE U.S.A.
Color
Coded
Probes:
Red (+)
Black (−)
Probe Holder

Figure 1

internal modification to the voltmeter. The automatic turn-off feature can also be disabled. Refer to the Maintenance Information section for details.) To turn Model 125 on again, return the “ON/OFF” switch to the “OFF” position, then back to the “ON” position.

When battery voltage drops below 6.5 volts, the Model 125 turns off until a new battery is installed (refer to Battery Installation section).

Capacitance induced readings with up to 1500pf are suppressed automatically. After a period of continuous use, this suppression feature is thermostatically interrupted to prevent overheating. This typically occurs after 35 seconds of continuous use at 240v, 10 seconds at 480v, or 7 seconds at 600v. The feature is restored after 30 seconds of rest. No other functions are affected. This unique arrangement creates a meter that measures voltage like a DMM, blocks “ghost” voltages (capacitive effect) like a solenoid-type voltage indicator, yet is safer and more accurate than both in field use.

WARNING

Model 125 is capable of indicating voltages that exceed the maximum rated value. These voltages pose a safety hazard to the user, and can damage the meter.

Excessive input voltages will damage components within the meter. Fuses are built into the test-probes to enhance user safety under abusive overvoltage conditions. However, these fuses cannot guarantee meter protection. An instrument incurring over-voltage damage must be returned to the factory for repair.

MAINTENANCE INFORMATION

This section contains information needed to maintain your instrument. The following information is included: probe replacement procedure, reducing turn-off delay, disabling the automatic turn-off feature, performance verification, and battery installation/replacement.

WARNING

The information presented in this section is intended for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing unless you are qualified to do so.

WARNING

Probe replacement to be done by qualified personnel only.

PROBE REPLACEMENT PROCEDURE

CAUTION

Replacing Model 125 probes with anything other than a TEGAM P/N 121-404 probe set will reduce meter overload protection.

WARNING

Disconnect probes from external circuits and turn the instrument off before removing the bottom cover. Reinstall the cover before resuming use of the instrument.

Open the Model 125 case (see Battery Installation/Replacement section), and cut the strain relief tie-wraps securing the test-leads to the circuit board.

Next, remove the circuit board from the top case by unscrewing the hex spacer in the center of the board.

Use a small soldering iron (< 45 watts) to remove the test-leads from the circuit board eyelets. Pull the old probes free of the Model 125 case.

Feed the test-leads of the replacement probes through the holes in the top-case, and solder into appropriate eyelets (red probe to (+) eyelet, black probe to (–) eyelet). Install new tie-wraps, (TEGAM Part Number CC-38-4) and reassemble Model 125.

Check Model 125 operation per Performance Verification section.

REDUCING TURN-OFF DELAY

WARNING

Disconnect probes from external circuits and turn the instrument off before removing the bottom cover.Reinstall the cover before resuming use of the instrument.

Model 125 has a timer which automatically turns off the meter approximately 10 minutes after the ON/OFF switch is moved to the ON position. This feature prevents premature battery discharge when a user forgets to turn a unit off. This delay can be reduced to 2 minutes as follows:

Turn off Model 125, and remove its bottom cover and battery. Detach the circuit board from the top case.

Install a 1/4 watt, carbon-composition, 2.2 Mohm resistor (TEGAM P/N R-76-2.2M) in location R4 on the circuit board. Reassemble Model 125 and confirm that a 2 minute (approx.) timeout is in effect.

Timing can later be returned to 10 minutes by reversing this procedure.

DISABLING AUTOMATIC TURN-OFF

WARNING

Disconnect probes from external circuits and turn the instrument off before removing the bottom cover. Reinstall the cover before resuming use of the instrument.

Users have the option of disabling the automatic turnoff feature. This is done by removing resistors R7 (10M ohm composition) and R4 (if previously installed). This can be quickly performed by cutting the resistor leads.

PERFORMANCE VERIFICATION

Equipment needed:
- 750 VDC voltage source with 0.05% accuracy or better
- 750 VAC, 60 Hz voltage source with 0.05% accuracy or better
- Ohmmeter (TEGAM Model 130A or equivalent).

Turn on Model 125. Use the voltage sources and the following table to verify that readings are within specifications.

TABLE 1 VERIFICATION SUMMARY

Input	Allowable Reading
Shorted	CON
Open	0 ± 1 VAC or VDC
+750 VDC	750 ± 3 VDC
–750 VDC	–750 ± 3 VDC
750 VAC	750 ± 3 VAC

Turn off Model 125. Verify resistance between probe tips is 5000 +600 ohms.

BATTERY INSTALLATION/REPLACEMENT

WARNING

Disconnect probe from external circuits and turn the instrument of 1 before removing the bottom cover. Reinstall the cover before resuming use of the instrument.

1. Place the unit face down on a bench or other similar surface and remove the screws from the bottom cover.
2. Separate the bottom cover from the rest of the instrument by grasping the top of the case (just above the display) and carefully lifting it away from the display.
3. Remove the old battery.
4. Place the new battery in the battery compartment. Be sure to observe the proper polarity (refer to Figure 2).
5. Reinstall the bottom cover before resuming use of the instrument.

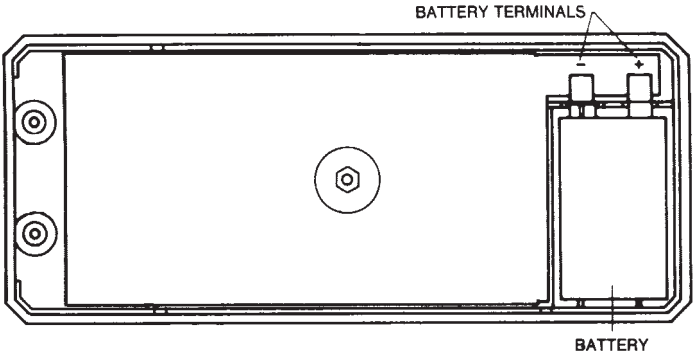


Figure 2 Battery Installation

OPTIONAL ACCESSORIES

Model 1104	Utility belt carrying case (leather).
Model 8668	Soft carrying case, antique vinyl (brown)
P/N 121-404	Replacement probe/test-lead set (1 red, 1 black).

Calibration and troubleshooting guide.

WARRANTY

TEGAM, Inc. warrants this product to be free from defects in material and workmanship for a period of three years from date of shipment. During the warranty period, we will at our option, either repair or replace any product that proves to be defective.

TEGAM, Inc. warrants the calibration of this product for a period of one year from date of shipment. During this period we will recalibrate any product that does not conform to the published accuracy specification.

To exercise this warranty, contact TEGAM, Inc., Ten TEGAM Way, Geneva, Ohio 44041/FAX (440) 466-6110/PHONE (440) 466-6100, M-F, 8 a.m.-5 p.m. ET. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made and the instrument returned, transportation prepaid.

Repaired products are warranted for the balance of the original warranty, or at least 90 days, whichever is longer.

LIMITATION OF WARRANTY

This warranty does not apply to defects resulting from unauthorized modification or misuse of any product or part. This warranty also does not apply to fuses, batteries, or damage from battery leakage.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. TEGAM, Inc. shall not be liable for any indirect, special or consequential damages.

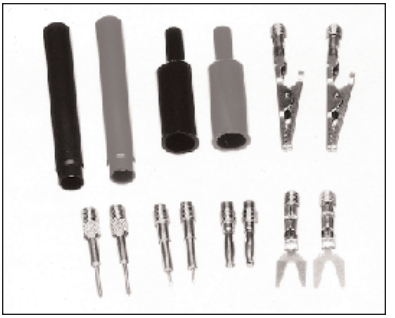
STATEMENT OF CALIBRATION

This instrument has been inspected and tested in accordance with specifications published by TEGAM, Inc.

The accuracy and calibration of this instrument are traceable to the National Institute of Standards and Technology through equipment which is calibrated at planned intervals by comparison to certified standards maintained in the Laboratories of TEGAM, Inc.

PROBE ADAPTOR KITS

12501



12502

The 12501 probe adaptor kit allows you to convert your test leads to alligator clips. The kit includes two screw-on probe adaptors and two heavy duty screw-in alligator clips with insulating rubber boots. These alligator clips open to 1/2" and fit most terminals and bus bars. The 12502 probe adaptor kit includes two screw-on probe adaptors and interchangeable screw-in accessories including two alligator clips with insulating rubber boots, two banana plugs, two needle tips, two spade lugs and two heavy duty tips. With this kit you can adapt your voltmeter to the many different situations you encounter on the job.

ORDERING INFORMATION

Model	Description
12501	Alligator Clip Adaptor
12502	Universal Adaptor

For more information call 1-800-666-1010.

NOTES

Other quality products from TEGAM:

- Single and dual-input microprocessor based digital thermocouple thermometers
- Economy series thermocouple thermometers
- Thermocouple calibrators
- Thermistor and RTD digital thermometers
- Handheld digital multimeters
- Safety and electrical service voltmeters
- Solder system test equipment
- Electrical phase sequence indicators and panel meters
- Motor rotation indicators
- Ratio and Phase Angle Primary Standards
- RF Current Probes
- A wide selection of standard TC/RTD/Thermistor probes
- Custom temperature probes our specialty
- Kits, cases, and other accessories.

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