Electronic Design Service (EDS)

Engineering Solutions for Avionics and Electrical Systems

WELT-010

Wireless Electrical Tester & Analyzer

Bluetooth-Enabled Electrical Diagnostics Tool

Electrical Diagnostics | Wiring Analysis | Mobile Monitoring

key Features

- Voltage drop testing
- Wiring impedance analysis
- AC current measurement
- AFCI / GFCI diagnostics
- Bluetooth connectivity
- Digital reporting

User Guide
Model: WELT-010
Version 4.0
2026

Electronic Design Service
www.eldesignservice.com

Revision History

The Table below displays the revision history for the chapters in this User Guide

Date	Version	Change Made
September 7, 2022	1.0	Original release
March 11, 2026	4.0	Description update

Contact Us

For the most up-to-date information about the Electronic Design Service products, go to the Electronic Design Service website at www.eldesignservice.com.

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Contents

Quick Start Guide

Follow these steps to begin using the WELT-010 Wireless Electrical Tester / Analyzer.

1. Install Batteries

1. Remove the silicone protective cover.
2. Open the battery compartment.
3. Install **two AA batteries (1.5 V each)**.
4. Close the battery cover and reinstall the silicone cover.

Refer to Figure 10 and Figure 11 for battery installation details.

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2. Install the Mobile Application

Install the **WELT-010 iOS application** from the Apple App Store.

Search for **"WELT-010"** in the App Store.

Allow the following permissions when prompted:

• Bluetooth access
• Device pairing

These permissions are required for communication between the WELT-010 device and the mobile application.

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3. Power On the Device

Press and hold the **Power button for approximately 2 seconds**.

The LED indicator will confirm device operation.

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4. Start the Application

Open the **WELT-010 application** on the iPhone or iPad.

The application will automatically search for available devices.

When the WELT-010 is detected, the application will establish a Bluetooth connection.

5. Verify Connection

The device is ready for operation when the application shows:

Ready for Operation

Refer to Figure 12

6. Start Testing

Select the desired measurement or test mode:

- Voltage measurement / Current measurement / Power measurement
- Voltage drop test 5A, 10A, 15A or 20A
- Socket wiring verification
- GFCI test
- AFCI test

Measurement results appear on the mobile application screen in real time.

About WELT-010 Wireless Electrical Tester / Analyzer

The **WELT-010 Wireless Electrical Tester / Analyzer** is a professional diagnostic instrument designed to inspect electrical wiring installations and evaluate compliance with electrical safety requirements (see Figure 1 for iPhone operation screen example).

The device analyzes key parameters of electrical systems including:

- AC voltage
- AC current
- voltage drop under controlled load conditions
- wiring impedance
- socket wiring configuration
- circuit protection performance.

Voltage drop and wiring impedance are calculated using the measured load current during controlled load tests (see Figure 2). These measurements allow the WELT-010 to detect wiring problems such as:

- poor electrical connections
- degraded splices
- undersized conductors
- excessive branch circuit resistance.

The WELT-010 also performs several electrical safety tests including:

- socket wiring verification
- GFCI test
- AFCI series test
- 30 mA ground leakage test
- AC voltage measurement
- AC current measurement using an external current sensor
- power calculation based on measured voltage and current.

All measured parameters directly influence the **safety, reliability, and performance of electrical installations**.

The WELT-010 uses an **iPhone or iPad as the command and display interface**, providing flexible and intuitive user experience.

Bluetooth connectivity enables:

- remote monitoring
- real-time data display
- safer testing from a distance

- convenient data logging.

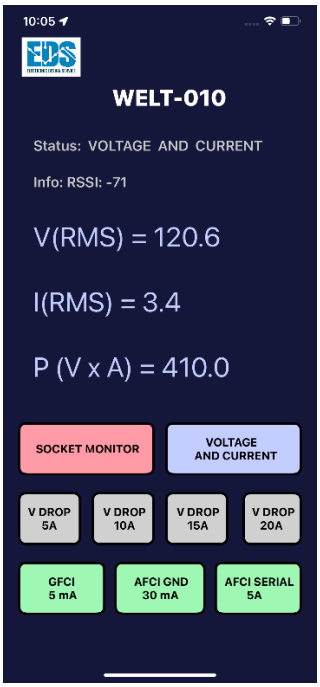

Figure 1 Normal Operation Screen Example*

* Latest GUI background color version

Main Functions

The WELT-010 provides the following diagnostic and testing capabilities:

1. Measurement of AC voltages:
2. Measurement of external AC RMS current using an external current sensor
3. Power calculation based on measured voltage and current
4. Electrical socket wiring verification (incorrect wiring detection) by measuring AC voltages:
    - Line to Neutral
    - Line to Ground
    - Neutral to Ground
5. Voltage drop testing under controlled loads:
    - 5 A
    - 10 A
    - 15 A
    - 20 A

    Real load current is measured during testing to ensure accurate analysis without tripping circuit breakers or blowing fuses.

6. Wiring impedance calculation based on measured voltage drop and load current
7. GFCI protection verification test
8. AFCI series arc-fault test
9. 30 mA ground leakage test

Engineering Explanation

Electrical Wiring Impedance Analysis

One of the key diagnostic capabilities of the WELT-010 is the ability to evaluate the **effective impedance of electrical wiring circuits**.

The device performs controlled load tests and measures:

- voltage before load application
- voltage during load conditions
- actual load current.

Using these measurements, the WELT-010 calculates the effective impedance of the wiring circuit (see Figure 2 for principal).

High wiring impedance may indicate:

- poor electrical connections
- degraded splices
- damaged conductors
- undersized wiring.

This diagnostic capability allows electricians and inspectors to identify wiring problems that may not be detected during standard voltage measurements without load.

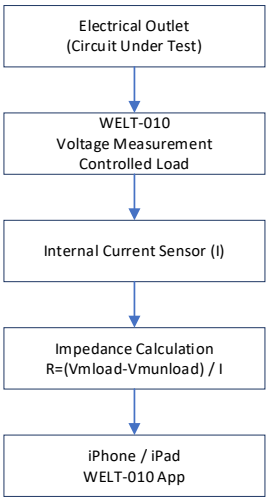

Figure 2 Wiring impedance measurement principle

The WELT-010 applies a controlled load and measures voltage drop and current to calculate circuit wiring impedance.

Specifications

Operating Temperature: 32°F – 110°F (0° – 45°C)

Operating Humidity: 0 – 95%, non-condensing

Voltage Measuring Accuracy: ±1 VRMS

External AC Current Measuring Accuracy: ±1 ARMS (using external current sensor)

External Current Sensor: SCT-013-30 (0 to 30A measurement range, 0 to 1V output)

Voltage Drop Measuring Accuracy: ± 0.2

Voltage Drop Load: 22 Ohms (for 5A test), 11 Ohms (for 10A test), 7.3 Ohms (for 15A test), 5.5 Ohms (for 20A test),

Voltage Drop Tests Current Measuring Accuracy: ± 0.3 A

GFCI Test Current: 7.6 mA

AFCI Test Current for 30 mA ground test: 40 mA

AFCI Series Test Current: 6A

AFCI devices proved by test: Siemens QA115AFCP and HOM115CAFI Issue No: DP3640

Battery: 2 x 2AA (1.5V)

Internal Alarm: 91dB

Bluetooth: 2.4-GHz RF Transceiver Compatible with Bluetooth low energy (BLE) 4.2 Specification

Antenna: Integrated Antenna

FCC Compliance: FCC CFR47, Part 15 and ARIB STD-T-66

WELT-010 Application SW: iOS 14.5 or newer version devices

Inside Box

1. WELT-010 device
2. Test Power Cord
3. Current Sensor (optional)
4. 2 x AA size Battery (not included)

Applications and Test Connections

Typical Applications

The WELT-010 is designed for use by:

- electricians performing installation verification
- electrical inspectors evaluating wiring quality
- maintenance technicians diagnosing electrical systems
- engineers analyzing circuit performance.

Typical applications include (see Figure 3, Figure 4 and Figure 5 for typical setups):

- diagnosing wiring faults and poor connections
- verifying electrical installation quality
- identifying excessive voltage drop in branch circuits
- testing GFCI and AFCI protection devices
- measuring electrical load current
- monitoring electrical parameters remotely during testing.

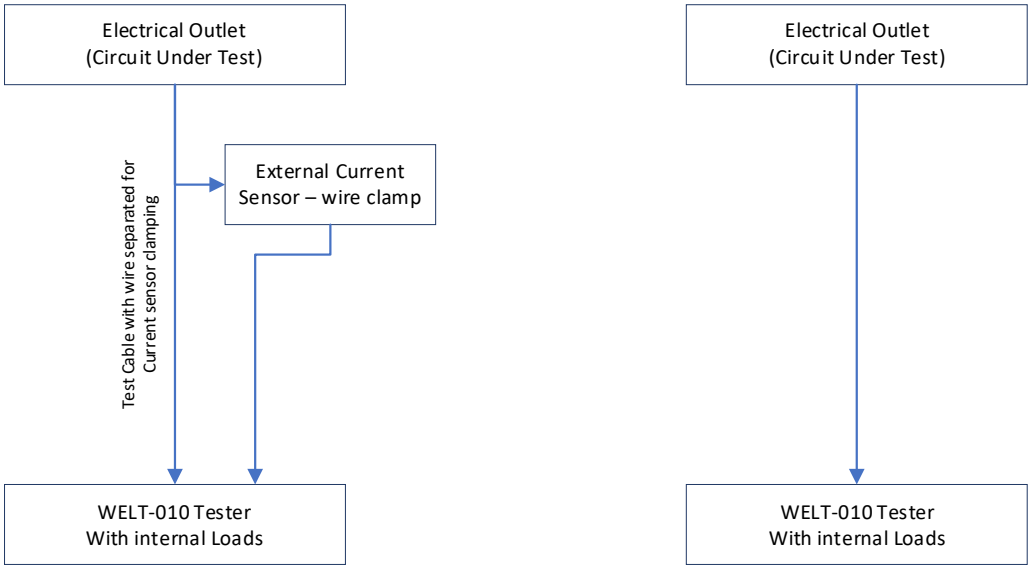

Figure 3 Typical diagnostic setup for voltage drop and current measurements.

Figure 4 Voltage, Voltage Drop Measurements, Socket Monitor, GFCI and AFCI Tests

Note: Voltage and Voltage Drop measurements, Socket Monitor, GFCI and AFCI Tests can be performed with Current sensor disconnected.

Current and Power Measurement

The WELT-010 can measure **AC current and calculated electrical power** (VA) using an external current sensor.

The current sensor clamps around the conductor under test and provides a measurement signal to the WELT-010 device.

The measured current together with the measured voltage allows the application to calculate electrical power consumption.

This capability allows users to monitor electrical load conditions and analyze circuit performance during operation.

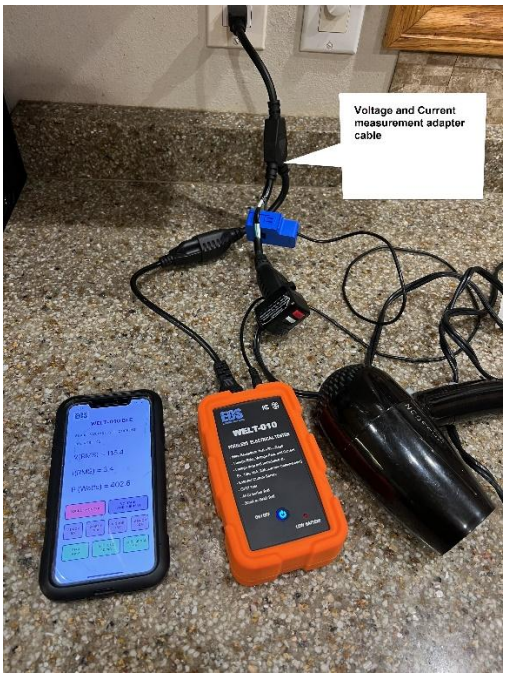

Figure 5 Voltage, Current and Power Measurement

The voltage and current measurement adapter cable is not part of package. It can be built by electricians. There is example of adapter cable (see Figure 6).

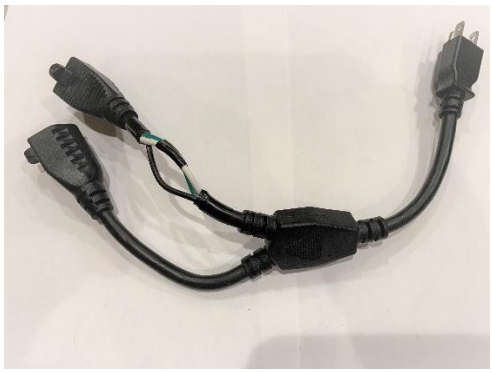

Figure 6 Adapter Cable Example

Socket Monitoring Hint

In some cases, it may be difficult to distinguish between **Neutral and Ground wiring reversal** during socket monitoring.

When this condition occurs, the WELT-010 may indicate a possible Neutral-to-Ground reversal.

This situation can occur especially in **new houses or installations where no electrical loads are connected to the inspected circuit**.

To avoid this ambiguity during inspection:

1. Visually check wiring connections at the inspected outlet and along the branch circuit.
2. If wiring appears correct, connect a small load to the outlet (for example a lamp).
3. Repeat the socket monitoring test.

The presence of a small load helps the WELT-010 accurately determine Neutral and Ground connections (see Figure 7).

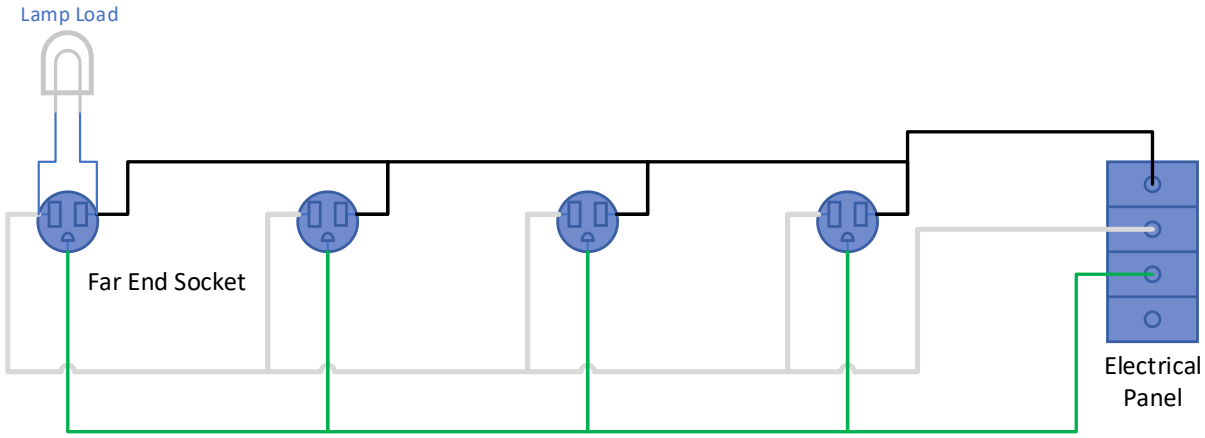

Figure 7 Socket Monitoring Hint

Safety Information

The WELT-010 is designed for diagnostic testing of standard residential and commercial electrical installations.

Always follow applicable electrical safety procedures when performing measurements.

Before starting any test:

- verify that the tested circuit is suitable for the selected test mode
- ensure that the test cord and adapters are properly connected
- avoid contact with energized conductors
- follow local electrical safety regulations.

Remote Monitoring Capability

The WELT-010 supports **remote monitoring of electrical parameters through Bluetooth connectivity**.

The device communicates with an iPhone or iPad running the WELT-010 application, allowing the user to observe measurement results while operating switches or connecting loads at different locations within the installation (see Figure 8).

This capability improves both **testing convenience and safety**, especially when diagnostic procedures require actions at different points within the electrical system.

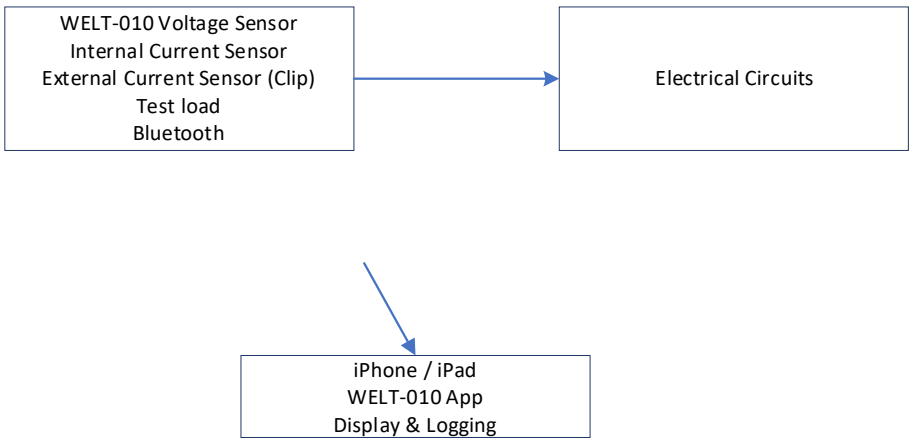

Figure 8 WELT-010 system architecture

The tester communicates with the iOS mobile application via Bluetooth to display and log measurement data. The Figure 9 depicted workflow diagram.

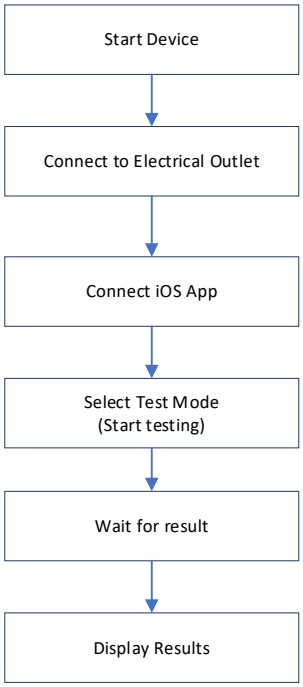

Figure 9 Test Workflow Diagram

Operation

WELT-010 Batteries Installation and Serial Number Location

The WELT-010 is shipped with uninstalled 2 x AA Batteries.

Serial Number is located on back side label (see Figure 11).

The 2 x AA batteries shall be installed before start of operation:

1. Remove silicon cover (see Figure 10)
2. Open battery cover and install batteries (see Figure 11)
3. Close battery cover and install silicone cover.

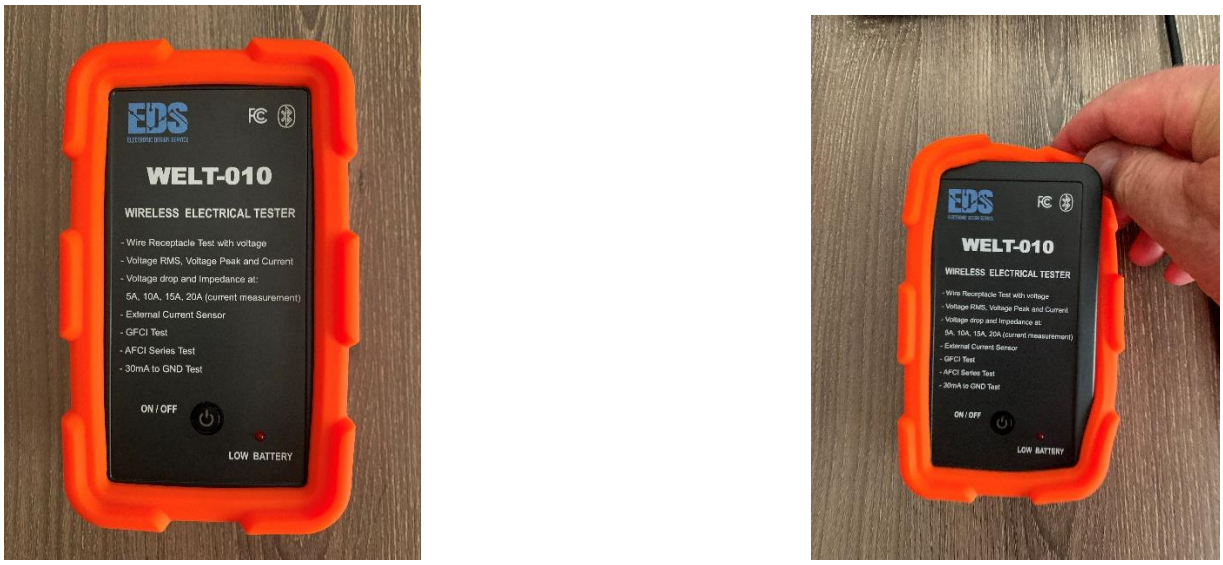

Figure 10 Silicon Cover

Figure 11 Battery Installation and Serial Number Location

WELT-010 Front Panel

There is only one control element at front. It is power ON/OFF button and LOW BATTERY LED indicator (see Figure 12).

Figure 12 SPM-010 Front Panel and iPhone Application example

WELT-010 iOS Application Installation and Operation

Installation

Install WELT-010 Application on iPhone or iPAD from Apple store (search for WELT). The following notifications will appear:

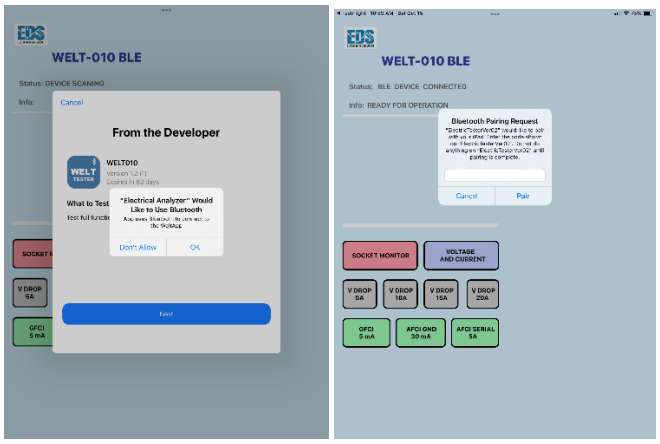

Figure 13 Startup screenshots

Perform the following actions:

- Allow to use Bluetooth (see Figure 13)
- Allow Pairing with WELT-010 (see Figure 13)

Application - Start Operation:

iOS Application Screenshot

The Figure 14 shows iPhone / iPad screenshot with application fields explanation.

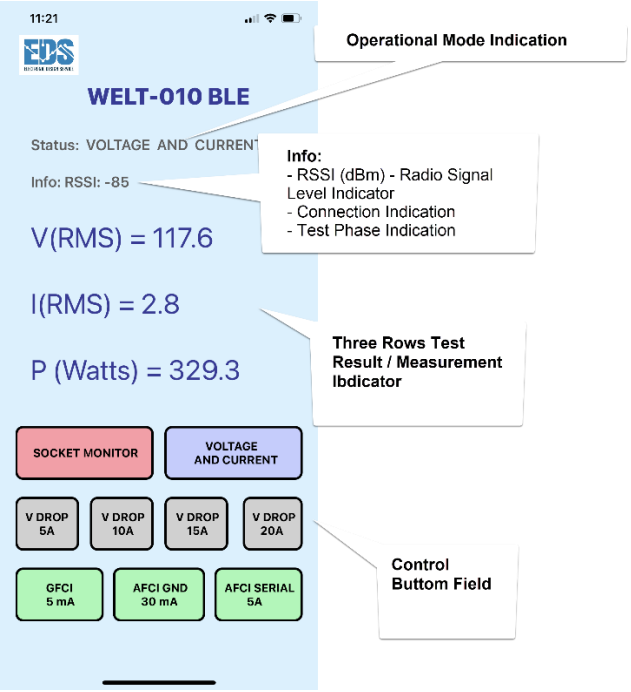

Figure 14 iPhone / iPad Application Screenshot

Application receives data steadily from device if RSSI is more than -91dBm. The location of device shall guarantee that RSSI more than -91dBm for continuous operation. But it is no problem if your smartphone (or iPAD) loses communication with device due to out of receiving zone, it will be automatically reconnected when smartphone (or iPAD) is coming inside of zone where RSSI more than -91dBm.

Start and Operation Conditions

There are no restrictions to whether WELT-010 unit or the iOS application need to be started first. Push and hold for 2 seconds power button on WELT device. The button LED is indicated of device operation.

Start WELT-010 application on iOS smartphone or iOS tablet.

There are the following operation conditions:

Start operation *(see Figure 15):*

a) Scanning device
b) Ready for Operation

Figure 15 Start Operation Screenshots

Voltage, Current and Power Measurements *(see Figure 16):*

a) Start Test

b) Continuous Test Results (Voltage RMS, Current RMS and Power (VA)

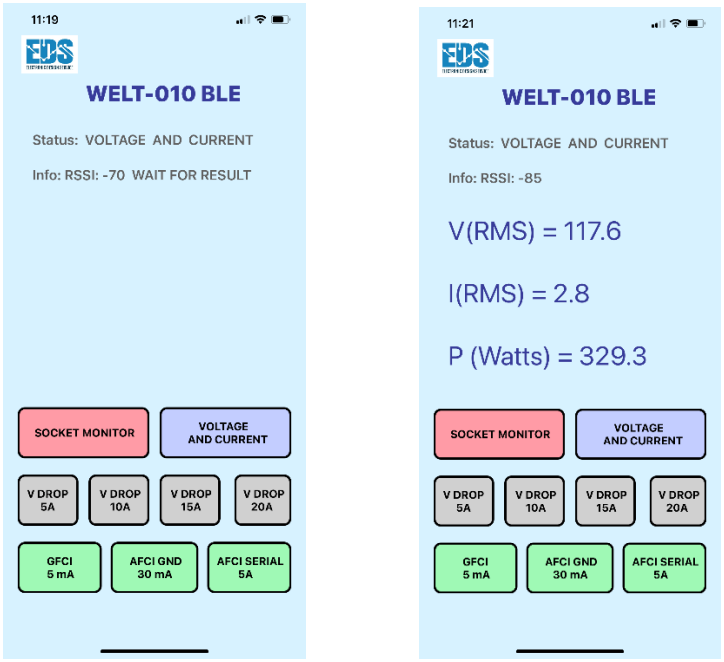

Figure 16 Voltage and Current Measurement Screenshots

Socket Monitor Test operation (see Figure 17):

a) Start Testing
b) Phase voltage Measurement Results
c) Peak Voltage Measurement Results for accuracy defining Neutral and Ground connections
d) Test Results.

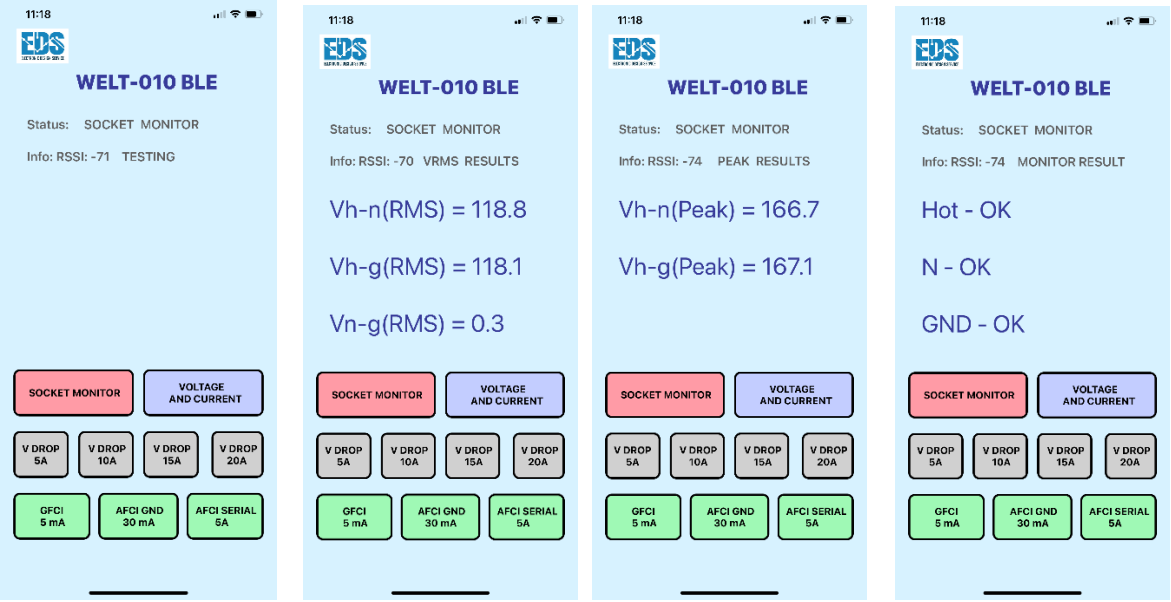

Figure 17 Socket Monitor Test Screenshots

Recommendation about how to solve the GND and Neutral connection ambiguity:

Voltage Drop and Impedance Test Operation (see Figure 18)

a) Start Test
b) Test results.

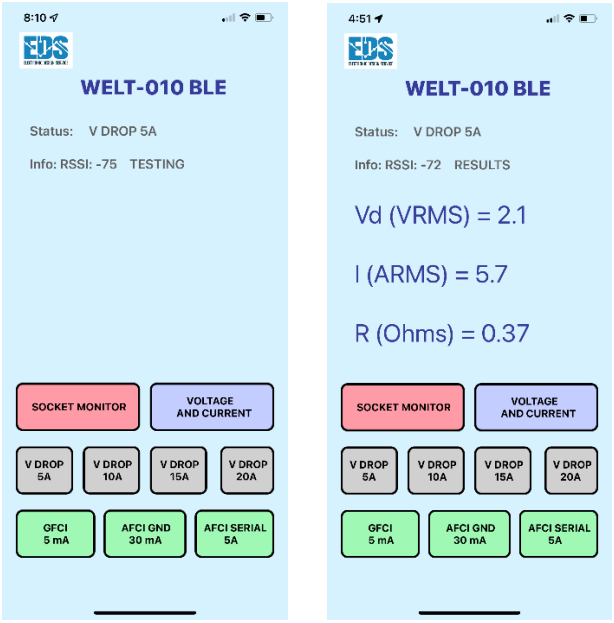

Figure 18 Voltage Drop Test Example screenshot

Note: There is time restriction to use voltage drop test in the range of 1.5 minutes after first application. iOS SW disables Voltage Drop test buttons for this period. This period is necessary for load resistors to cool down.

GFCI 5mA, AFCI 30mA and AFCI Tests Operation (see Figure 19, Figure 20 and):

a) Start test.
b) Voltage indication before load application
c) Voltage indication after load application and test result

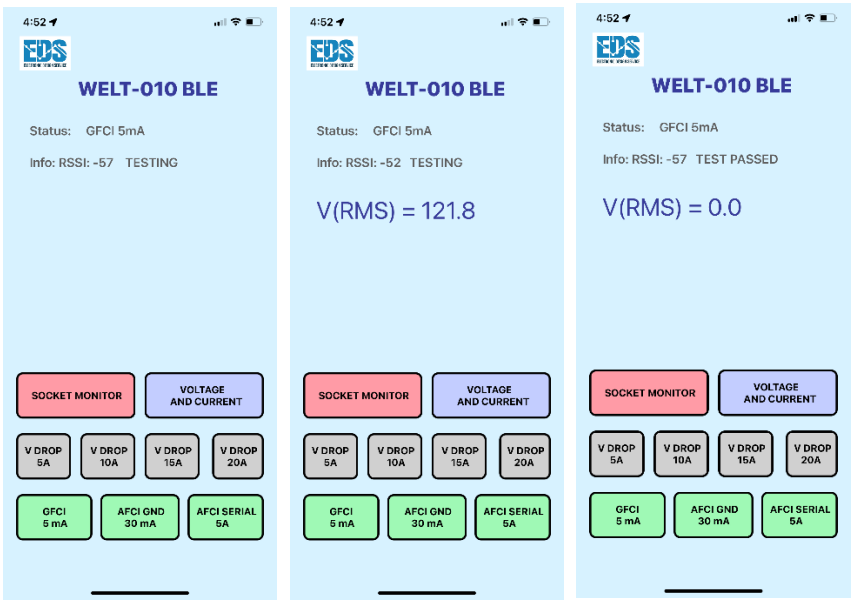

Figure 19 GFCI Test screenshots

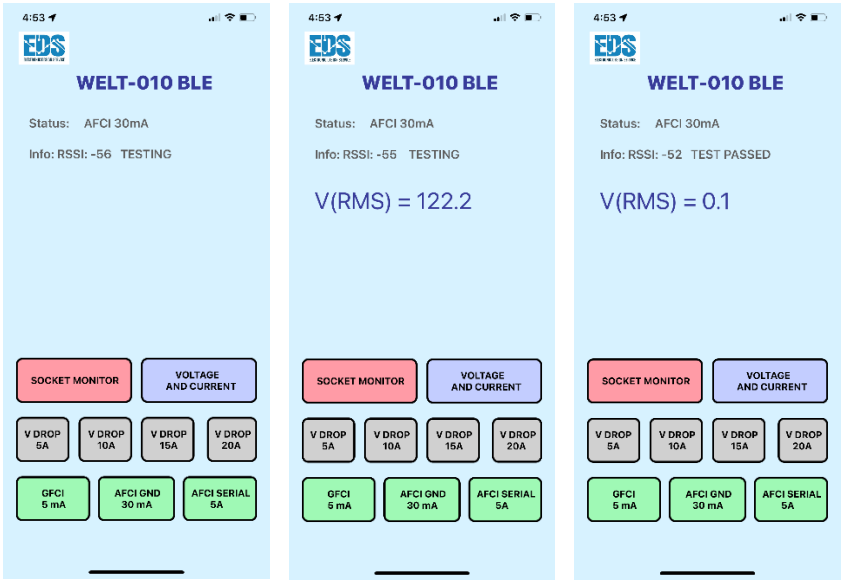

Figure 20 AFCI 30mA Test screenshots

AFCI Series Tests Operation (see Figure 21):

a) Start test.
b) Voltage indication before load application
c) Voltage indication after load application and test result

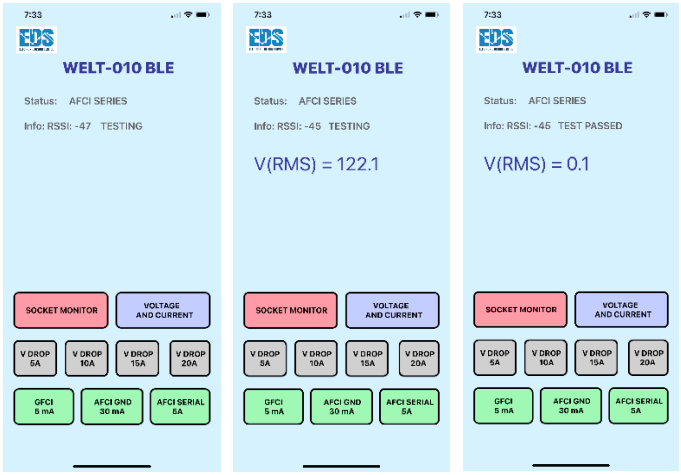

Figure 21 AFCI Test screenshots

Note: There is time restriction to use AFCI Series test in the range of 2 minutes after first application. iOS SW disables the AFCI Series test button for this period. This period is necessary for load resistors to cool down.

Warranty

When used and maintained in normal use and in accordance with the Installation and Operating Instructions, your WELT-010 product is warranted against original defects in material and workmanship for a full one year from date of purchase (the “Warranty Period”). During the warranty period, WELT-010 will be repaired or replaced at no cost to you, to correct such defects in products found upon examination by EDS to be defective in materials or workmanship.

This warranty does not cover use of the product in improper installation and/or improper maintenance of the product, damage due to misuse, owner’s acts or omissions, use outside the country in which the product was initially purchased. This warranty does not cover pick up, delivery, transportation or house calls. However, if you mail your product to EDS for warranty service, cost of shipping will be paid one way. This warranty does not cover products purchased from a party that is not an authorized retailer, dealer, or distributor of EDS products.

Maintenance

The WELT-010 requires minimal maintenance.

Users should periodically:

• check the condition of the test power cord
• verify proper operation of the current sensor
• replace batteries when the low battery indicator appears.

The device should be serviced only by **Electronic Design Service authorized personnel**.

Example Diagnostic Scenarios

The WELT-010 allows electricians and inspectors to diagnose electrical installation problems that are difficult to detect using conventional voltage testers.

Example 1 – Detecting High Resistance Connections

A circuit may show normal voltage when measured without load, but equipment connected to the circuit may operate improperly.

Using the **Voltage Drop Test**, the WELT-010 measures unload condition voltage, applies a controlled load and measures load condition voltage, true load current then calculates the voltage drop.

A large voltage drop may indicate:

• poor connections
• degraded splices
• undersized wiring.

Example 2 – Verifying Electrical Socket Wiring

Incorrect wiring of electrical sockets can create unsafe conditions.

The **Socket Monitor Test** verifies wiring configuration by measuring voltages between electrical lines and detects:

• reversed line and neutral
• missing ground
• incorrect wiring configuration.

Refer to Figure 17.

Example 3 – Testing GFCI Protection

Ground Fault Circuit Interrupters should be tested periodically.

The WELT-010 generates a controlled leakage current to verify proper operation of the GFCI device.

Refer to Figure 19.

Example 4 – AFCI Protection Test

Arc Fault Circuit Interrupters protect electrical systems from arc-fault conditions.

The WELT-010 generates a controlled test signal (current pattern is close to real arc) to verify AFCI protection operation.

Refer to Figure 22.

Troubleshooting

Connectivity and Common Issues

Bluetooth cannot stay connected:

a) Device may be out of communication range.

b) Move the iOS device closer to the WELT-010 until the RSSI value is greater than −90 dBm.

Bluetooth cannot connect:

a) Assuming the iOS device is withing range of the WELT-010. Use “Forget This Device” function in iOS device Setting > Bluetooth>SumpPumpMonitorV010> Forget This Device and turn off and turn on power of WELT-010 device.

Voltage Drop Test does not work:

a) There is time restriction (1.5 minutes) for using applications after first time.
b) Internal fuse may be blown. **Device requires service.**

AFCI Test does not work:

a) There is time restriction (2 minutes) for using application after first time.
b) Internal fuse may be blown. **Device requires service.**

Device does not perform any function:

a) Internal fuse may be blown. **Device requires service.**

Fault Indications

Low Voltage Indicator

Test could not start due to low input voltage (see Figure 22).

Possible reasons:

- Electrical socket is disconnected
- Broken input cable
- Blown Internal Fuse (**device needs service**)

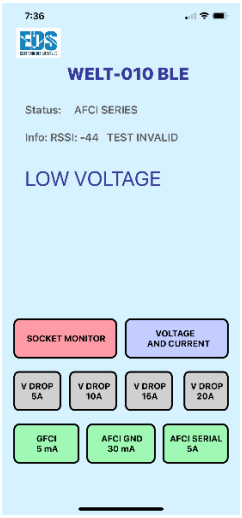

Figure 22 Test could not start due to low input voltage (AFCI example)

Low Current Indicator during 5A Voltage Drop Test

Voltage Drop Test defines low current condition (see Figure 23).

Possible reasons:

- Broken internal fuse (**device needs service**). It is possible that other tests such as 15A and 20A tests can operate with 5A and 10A test modes instead of real 15A and 20A load.

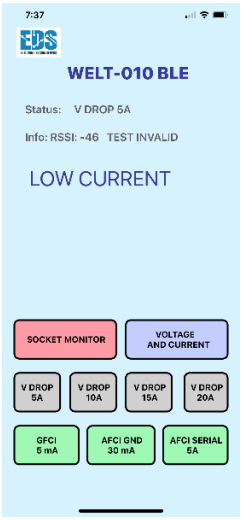

Figure 23 Low Current Indicator

Support

Send us an email to: support@eldesignservice.com or submit a request through our webpage: https://eldesignservice.com/contacts/

