Probewell Connect

User Guide for WT Series

Version 2.1 – April 2021

PROBEWELL
MAKING FIELD TESTING EASY

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If you have any questions about this Agreement, please contact us.

Last updated: 2019-11-06

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Limited Warranty

Your WT Series meter tester comes with a two-year hardware warranty. Probewell Lab Inc. (Probewell) warrants WT Series meter tester against defects in material and workmanship for a period of two (2) years from the date of purchase from Probewell. This warranty applies only to the original purchaser of the WT Series meter tester and is not transferable.

For additional information regarding your tester warranty, please refer to the related WT Series meter tester user guide.

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Features and specifications are subject to change without notice.

Table of contents

List of Abbreviations

Abbreviation	Complete Term	Abbreviation	Complete Term
A	Ampere	PPI	Pore per inch
Amp	Ampere	Rev	Revolution, number of revolutions
AC	Alternating current	RMS	Root mean square
AP	Access point	TA	Test ampere
ATK	Accuracy Testing Kit	THD	Total harmonic distortion
CFM	Cubic feet per minute	V	Volt
CL	Class	VA	Volt-ampere
CSV	Comma-separated values	VAC	Volt(s) of alternating current
CT	Current transformer	VARh	VARhour (Volt-ampere reactive hour)
DSP	Digital signal processor	Vdc	Voltage direct current
HL	High load (full load)	VT	Voltage transformer
Kh	Watthour constant. The number of watthours represented by one revolution of the disk. Also, called disk constant.	W	Watt(s)
Kt	Test constant. For electronic (no disk) meter, the amount of energy represented by each cal-ibrated pulse of the LED.	Wh	Watt hour
kW	Kilowatt	Wi-Fi	Wireless network protocols
Lb	Pound	WLAN	Wireless local area network
LL	Light load	WWW	World Wide Web
NIST	National Institute of Standard and Technology	µWh	Micro-watthour
PF	Power factor	µVARh	Micro-VARhour

Introduction

Probewell Connect is the official companion application for MT-1/WT3 and MT-1/WT1 wireless watt hour meter testers. It allows the user to perform various types of meter tests, review test report data and change the WT Series testers' operation parameters. The application is available free of charge for iOS, Android and Windows.

The following document outlines the scope of the application, its capabilities and how it enables complete control over the WT Series testers.

Getting the app

The Probewell Connect application is available on all major platforms as stated above and is continually updated to ensure the best user experience. To download the application, follow the instructions for your mobile device operating system:

iOS

On your iOS device, launch the App Store and search for the Probewell Connect application.

The application supports all devices running iOS 11 and above.

Android

On your Android device, launch the Google Play Store and search for the Probewell Connect application.

The application supports all devices running Android 7.0 and above*.

Windows

The application supports all PCs running Windows 10. Older versions of Windows are not actively tested by Probewell Lab.

Please note that the installer requires administrator privileges.

Install from the provided USB key

The Probewell Connect application installer is included on the USB key provided with the order of a WT Series tester. Browse to the USB drive with Windows Explorer. Launch the installer and follow the on-screen instructions.

Install from the website

The latest version of Probewell Connect for Windows is downloadable from the Probewell website at the following link:
https://probewell.com/pw-connect/

To download the application installer (.exe file), click on "**Download on Windows**". Once the download is complete, launch the installer and follow the on-screen instructions.

* Probewell Lab Inc. cannot control nor be held responsible for compatibility issues resulting from mobile phone manufacturers' non-compliance with current firmware and/or operating system standards.

Features

Operating system

The Probewell Connect application has a different feature set depending on the mobile device operating system (OS). Throughout this document, the following icons help identify which features are available for a specific operating system:

→ Windows PC

→ iOS or Android phone or tablet
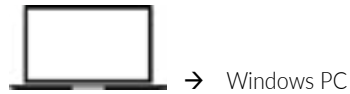
A quick rundown of the available features per operating system is given below.

	iOS/Android	Windows
GPS coordinates	Yes	No
E-mail reports	Yes	No
Barcode scanner	Yes	No
Export CSV / PDF	No	Yes
Offline mode	No	Yes
Settings Profiles (Import and Export)	No	Yes
Accuracy Test Report (Export)	No	Yes

Online/Offline mode

Some features are also only accessible when the Probewell Connect application is in online mode (connected to a WT Series tester). The icons for indicating these are:

→ Online mode

→ Offline mode

Operation

Connecting to the WT Series tester

In the order to use the WT Series tester, the user must first connect their mobile device to the socket.

iOS and Android

The connection process is done from within the Probewell Connect application itself. Follow these steps to connect to the WT Series tester:

1. Connect the WT tester to a meter base.
2. Power up the WT tester by setting the Power switch to the ON position.
3. Launch the Probewell Connect application on your mobile device.
4. Press on the "SCAN QR CODE" button. If prompted, allow the app to use the device camera.
5. Point the camera at the QR code located on the side of the WT tester unit.
6. Once connected, the unit emits a beeping sound.

If the WT Series has already been connected to the mobile device, it may also be selected from the "Choose a network" instead.

WiFi connection changes for Android 10 and above.

When running the Probewell Connect App on an Android 10 or above, a confirmation will be required to finilize the connection to the device after the meter QR code has been scanned.

Tap "SCAN QR" code, the screen below will be displayed until your mobile has established a connection.

Once the connection has been established with the Probewell tester, the device ID will be displayed.

Tap "CONNEXION" to pair the devices and start testing .
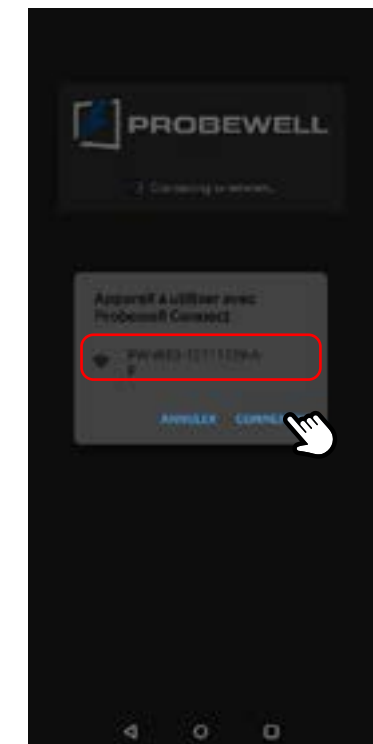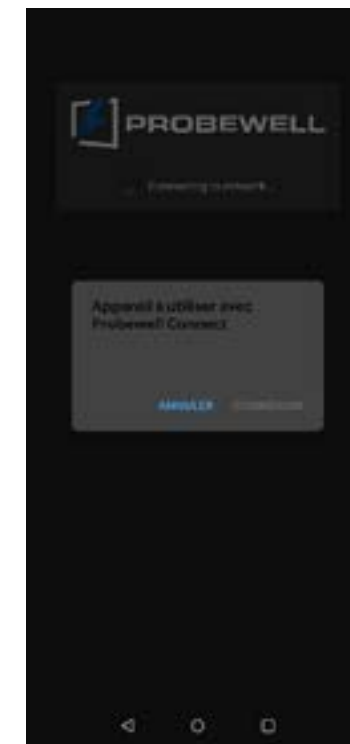
Windows

To connect to the WT Series tester with a Windows PC, follow these steps:

1. Connect the WT tester to a meter base.
2. Power up the WT tester by setting the Power switch to the ON position.
3. To connect, go to Windows Settings, Select Network & Internet
   A.   Click on Show available networks.
       Tip: Shortcut often located In the Windows Taskbar (bottom of the screen),
       click on the networking icon.
   B.   Locate the socket SSID in the list of available networks.
   C.   When connecting to a socket's network for the first time,
       input the SSID name as the security key.
       (i.e., PW-WT3-{S/N}-AP or PW-WT1-{S/N}-AP).

NOTE:
Once the connection process has been completed, the socket's SSID will appear on the network list in future sessions.

4. Once connected, the unit emits a beeping sound.
5. You can now start the Probewell Connect for Windows application.

If the WT Series has already been connected to the PC, it may also be selected directly from the known networks list.

Windows offline mode
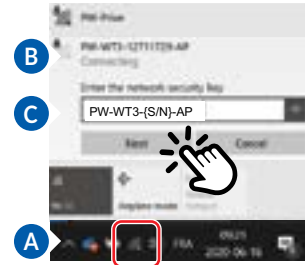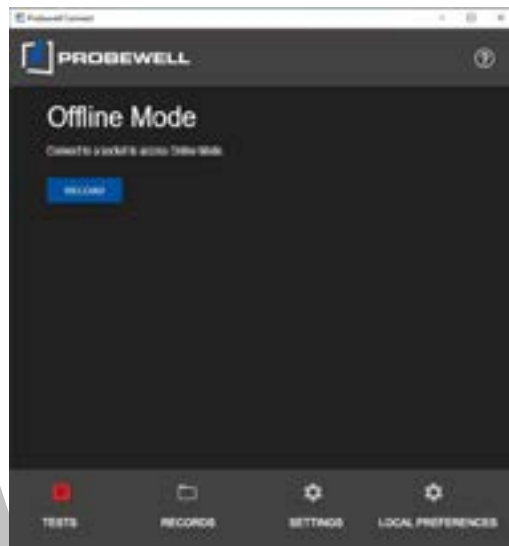
When the Windows application is started without a valid connection to a WT Series meter tester, the application starts in Offline mode. In offline mode, the user can perform some management operations (such as editing, importing and exporting settings profiles and viewing test reports from the local machine) and cannot run any meter tests.

Main View

The Main View of the application is always available to the user. It gives access to basic system information and handles basic navigation within the application.

Header

The Header is located at the top of the window. It shows the Probewell company logo and quick access buttons for basic control.
The quick access buttons are located on the right-hand side of the Header.

⑦ Information button

Clicking on this button displays all system information, including:

1. Socket information:
   • Tester model
   • DSP number
   • Optical (Metercam or Pulse pickup)
2. System information:
   • User Calibration Date
   • Factory calibration date
   • Lifetime tests

3. Meter (under test) information:
   • TA
   • Form
   • Kh
4. App:
   • Firmware version
   • Software version

Additional information includes:

   • Probewell website
   • Support contact (e-mail and phone number)

The *Disconnect* button (at the bottom) disconnects the mobile device from the unit and brings the user back to the device connection view.
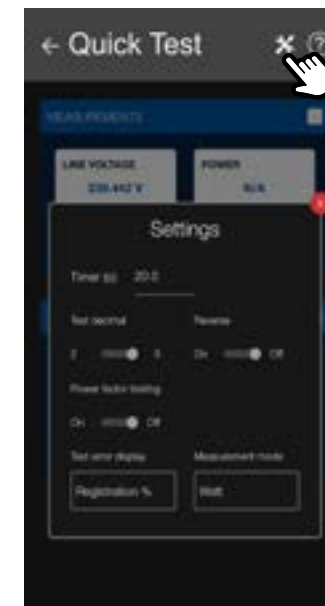
✖ Temporary Settings

This button is only available when a test mode is selected.

Clicking on the button displays temporary test settings. These settings can be changed to match the desired test parameters. Such modifications stay active until the WT Series tester is turned off.

The number and type of available parameters in this test view varies with the selected test mode.

Additionally, settings can be changed temporarily through the *Settings* tab without saving the configuration.

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again,

Footer

The Footer is located at the bottom of the window. It allows basic navigation within the application.

☐ Mobile Footer

Tests

The Test view lists all available test modes. Some test modes are only available for certain meter categories and system operation modes. A summary of available test modes and their minimal conditions is available in the Tests section of this document.

Records

The Records view lists all test reports.

Settings

The Settings view shows all available tests and device settings.

☐ Windows Footer

Tests

When the test icon is red, tests are not available because the app is in offline mode.

If the icon is green, the PC is connected to a WT Series meter tester and tests are available.

Records

The Records view lists all test reports. The reports can be stored locally or on the WT socket.

Settings

The Settings view shows all available tests and device settings. Settings profiles can be loaded from an external file and programmed onto the WT tester.

Local Preferences (Windows only)

To set the local directory for CSV reports and company information for PDF reports.

Meter Setup

The Meter Setup view lets the user set basic parameters for the meter to be tested. These parameters are used by the WT Series tester to properly energize the meter and calculate test results.

Meter Setup parameters are:

Form: the meter form (already populated with detected meter form).

TA: the meter test amps.

Kh Auto-detection: allows or disables auto-detection of the meter Kh value with the optical pickup or metercam.

Kh Auto-detection delay: time delay to start registering pulses after the meter is first energized.

☐ Barcode Scanner

On a mobile device (iOS and Android), the meter settings may be automatically imported by scanning a barcode located on the meter itself. The barcode must be in the AEP or one of the predefined formats (Read system settings barcode note on page 48) and contains information on the meter form, TA, Kh and serial number. This meter serial number is kept in memory to be automatically filled in when saving test results.

Once all meter parameters are correctly entered, press NEXT to complete the meter setup.
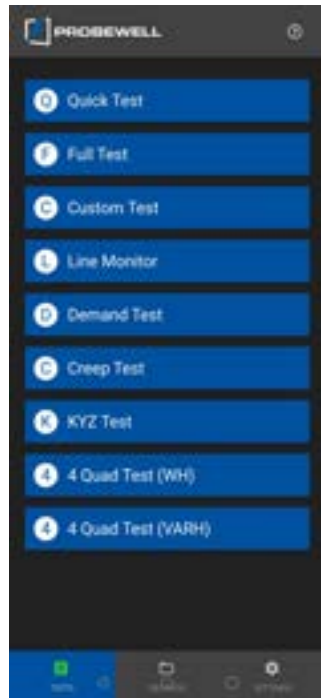
> **Note**
>
> If the meter is equipped with a communication module (AMI/AMR) that emits from the same port as the test pulse, a delay can be added before registering the first pulse by modifying the *Kh Auto-detection delay* setting. For example, use a 10 second delay for a KV2C Form 9S, TA 2.5A.

Tests

The Tests View shows a list of all available test modes for the meter. A short and full description of all test modes follows.

Note

The test modes available in the Tests View is dependent on both the type of meter (single phase or polyphase) and the System Operating Mode (which can be changed in the Settings tab).

Summary of test modes and availability

Test mode	Meter type	Pickup
Quick Test	Any	Optical/Metercam
Full Test	Polyphase	Optical/Metercam
Custom Test	Any	Optical/Metercam
Line Monitor	Any or None	Any or None
Demand Test	Any	Any or None
Creep Test	Any	Any or None
KYZ Test	Any	Any
Manual/Tracking	Mechanical	None
4 Quad Test	Solid-state	Optical

Test Description

Quick Test: The quick test is the most common type of test. It can be used to quickly assess the accuracy of a meter. The Quick Test runs a predetermined sequence of sub-tests, all in one operation, during which all phases are energized simultaneously.

Full Test: This is the most thorough type of test. It is used to fully assess the quality of a meter, as it runs a complete sequence of sub-tests. The Full Test runs an equivalent of the Quick Test followed by additional single-element tests. is the most thorough type of test. It is used to fully assess the quality of a meter, as it runs a complete sequence of sub-tests. The Full

Custom Test: Custom Test consists of choosing one of the three loads to apply to the meter: HL, PF or LL. The disk revolutions or pulses are counted automatically by the pickup. No critical timing is required to start a test. The test ends automatically.

Test runs Test: It is an equivalent of the Quick Test followed by additional single-element tests.

Line Monitor: It is used to observe the input voltage and obtain the THD measurement.

Demand Test: Is used to test meters that have a demand register. The meter must first be configured to be in kW demand test mode (check meter manual for device specific procedure).

Creep Test: Is used to check the effect of a 0 A current and nominal voltage on the energy registration of a meter.

KYZ Test: Is used to assess the ability of some solid-state meters to transmit energy use information to another piece of equipment via a physical wire interface.

Manual/Tracking: Is used to assess the quality of a mechanical meter without using external accessories. To do this, the meter is energized with a low or high load while the test operator counts the number of disk revolutions.

4 Quad: Test: is an automatic test sequence that can be used to assess the meter's ability to register energy in all four quadrants of the power vector diagram.

Quick

Prerequisites

An optical pickup or a metercam must be installed on the WT Series tester.

Description

The Quick Test is the most common type of test. It can be used to quickly assess the accuracy of a meter. The Quick Test runs a predetermined sequence of sub-tests, all in one operation, during which all phases are energized simultaneously. The sub-tests are:

a) All phases, High Load (HL)
b) All phases, Power Factor (PF)
c) All Phases, Low Load (LL)

Once the test is completed, the user may save the test data in the device memory.
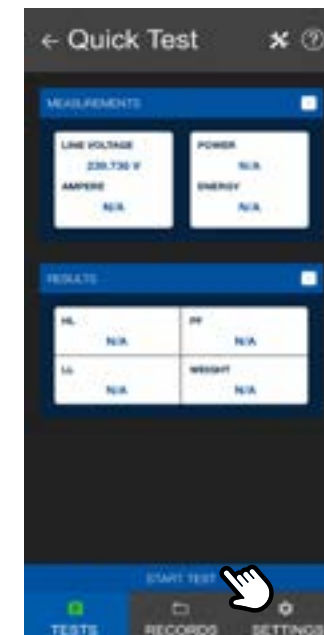
Operation
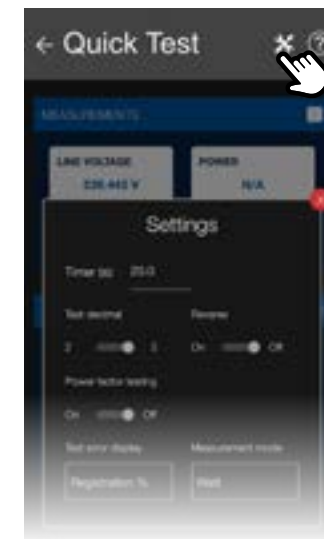
Step 1: Temporary test settings

If necessary, modify the test settings by clicking on the wrench icon in the top portion of the screen.

Test settings for the quick test are:

- **Timer**: minimum test time in seconds
- **Test decimal**: display results with 2 or 3 digits
- **Reverse**: enables or disables reverse flow testing
- **Power factor testing**: enables or disables power factor testing
- **Test error display**: test error display type
- **Measurement mode**: Watt or VAR

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again,

Step 2: Start Test

Press the **Start Test** button to initiate the test sequence. The load current increases to its HL value, the meter sends pulses and the WT Series internal electronic standard registers the energy that flows through the meter.

Step 3: Test Execution

In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the bottom of the screen, the test timer displays the remaining time for the sub-test.

A spinning wheel indicates which sub-test is currently running.

The test may be aborted at any time by pressing the **Stop Test** button.

Step 4: Test End

When all sub-tests have been completed, the test ends automatically. The load is then removed, and the test results are displayed.

The last test result, Weight, is the weighted average of the three other test results. The Weight result formula depends on the meter type and the Weight factor configuration in the settings. Please refer to the System Settings section for a complete description of the Weight result calculation.

To save the test results, click on the **Yes** button at the bottom of the screen.
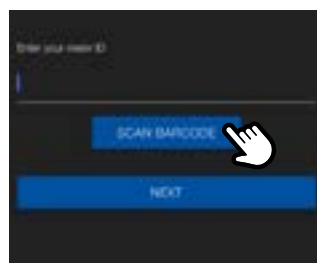
Step 5: Meter ID

Enter the meter ID (serial number). The meter serial number can be scanned on mobile devices. If the AEP code was used to import device information at the Meter Setup step, the meter serial number is already populated. The barcode scan may fail if the barcode sticker is damaged. In this case, please enter the meter ID manually.

Step 6: User Questions

Up to 8 user defined questions can be programmed in the **Settings** tab.

Answer each question and click on the **Save** button to save the test report in the device memory.

Full

Prerequisites

An optical pickup or a metercam must be installed on the WT Series tester.

Description

The Full Test is the most thorough type of test. It is used to fully assess the quality of a meter, as it runs a complete sequence of sub-tests. The Full Test runs an equivalent of the Quick Test followed by additional single-element tests. The sub-tests are:

a) All phases, High Load (HL)
b) All phases, Power Factor (PF)
c) All Phases, Low Load (LL)
d) Phase A, High Load (HL)
e) Phase A, Power Factor (PF)
f) Phase A, Low Load (LL)
g) Phase C, High Load (HL)
h) Phase C, Power Factor (PF)
i) Phase C, Low Load (LL)

If applicable phase B is done between phase A and phase C,

j) Phase B, High Load (HL)
k) Phase B, Power Factor (PF)
l) Phase B, Low Load (LL)

Once the test is completed, the user may save the test data in the device memory.

Operation

Step 1: Temporary test settings

If necessary, modify the test settings by clicking on the wrench icon in the top portion of the screen.

Test settings for the full test are:

- **Timer**: minimum test time in seconds
- **Test decimal**: display results with 2 or 3 digits
- **Reverse**: enables or disables reverse flow testing
- **Power factor testing**: enables or disables power factor testing on single element
- **Low Load Testing**: enables or disables the low load testing on single element
- **Test error display**: test error display type
- **Measurement mode**: Watt or VAR

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again,

Step 2: Start Test

Press the **Start Test** button to initiate the test sequence. The load current increases to its HL value, the meter sends pulses and the WT Series internal electronic standard registers the energy that flows through the meter.

Step 3: Test Execution

In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the bottom of the screen, the test timer displays the remaining time for the sub-test.

A spinning wheel indicates which sub-test is currently running.

At any time during the test, the user can navigate the test results for multiphase and single-element by using the left and right arrows on each side of the results table.

Use the left and right arrows to navigate and preview results fields ABC, A, B or C

The test may be aborted at any time by pressing the **Stop Test** button.

Step 4: Test End

When all sub-tests have been completed, the test ends automatically. The load is then removed, and the test results are displayed.

The last test result, Weight, is the weighted average of the three other test results according to the following formula:

$$\frac{(4HL+2LL+PF)}{7}$$

To save the test results, click on the **Yes** button at the bottom of the screen.
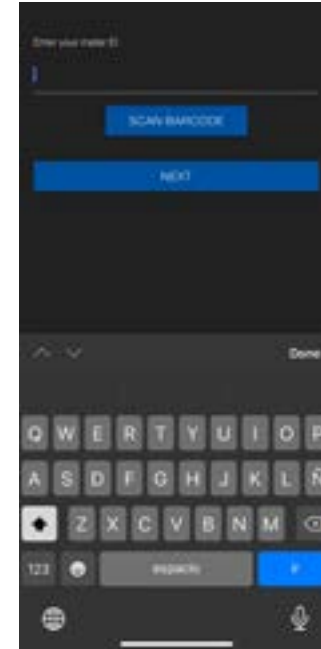
Step 5: Meter ID

Enter the meter ID (serial number). The meter serial number can be scanned on mobile devices. If the AEP code was used to import device information at the Meter Setup step, the meter serial number is already populated.

Step 6: User Questions

Up to 8 user defined questions can be programmed in the **Settings** tab.

Answer each question and click on the **Save** button to save the test report in the device memory.

NOTE

In the Reports tab, a Full Test report is split into multiple entries: one entry for the multiphase test and one entry for each single-phase test.

Custom

Prerequisites

An optical pickup or a metercam must be installed on the WT Series tester.

Description

The Custom Test is used to test a specific combination of load and active phase.

Once the test is completed, the user may save the test data in the device memory.

Operation

Step 1: Temporary test settings

If necessary, modify the test settings by clicking on the wrench icon in the top portion of the screen.

Test settings for the custom test are:

- **Timer**: minimum test time in seconds
- **Test decimal**: display results with 2 or 3 digits
- **Reverse**: enables or disables reverse flow testing
- **Test error display**: test error display type
- **Measurement mode**: Watt or VAR

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again,
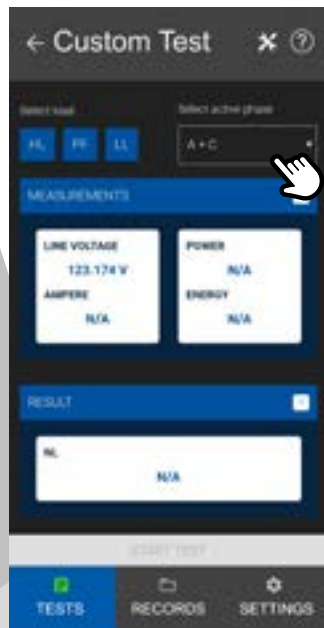
Step 2: Test Setup

Select the load and the active phase.

Active Phase:

A+B+C or A+C: multiphase test on polyphase meter

A, B or C: Single-element test on phase A, B or C

The Start Test button is only available when a load is selected.

Step 3: Start Test

Press the **Start Test** button to initiate the test sequence. The load current increases to its selected load value, the meter sends pulses and the WT Series internal electronic standard registers the energy that flows through the meter.
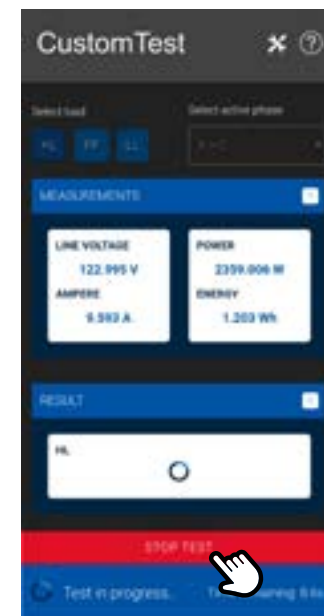
Step 4: Test Execution

In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the bottom of the screen, the test timer displays the remaining time for the test.

The test may be aborted at any time by pressing the **Stop Test** button.

Step 5: Test End

When enough test pulses have been registered, the test ends automatically. The load is then removed, and the test result is displayed.

To save the test result, click on the **Yes** button at the bottom of the screen.

Step 6: Meter ID

Enter the meter ID (serial number). The meter serial number can be scanned on mobile devices. If the AEP code was used to import device information at the Meter Setup step, the meter serial number is already populated.
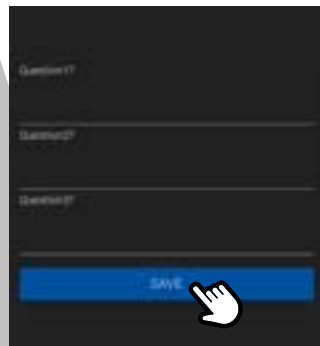
Step 7: User Questions

Up to 8 user defined questions can be programmed in the **Settings** tab.

Answer each question and click on the **Save** button to save the test report in the device memory.

Note

The Custom Test runs a specific subset of the Full Test. If a meter has already been tested with the Full Test mode, running a Custom Test is redundant.

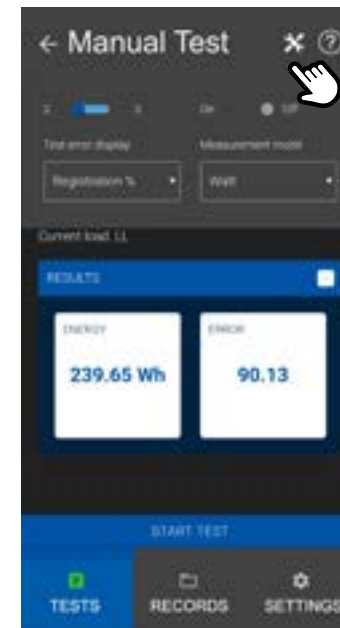## Manual/Tracking

Prerequisites

No accessories must be connected to the WT Series tester.

Description

The Manual/Tracking test is used to assess the quality of a mechanical meter without using external accessories. To do this, the meter is energized with a low or high load while the test operator counts the number of disk revolutions. Once a predefined number (default is 10) of revolutions has been completed, the operator ends the test and an error percentage result is given.

This test does not save data to the device memory.

Operation

Step 1: Temporary test settings

If necessary, modify the test settings by clicking on the wrench icon in the top portion of the screen.

Test settings for the manual/tracking test are:

- **Test decimal**: display results with 2 or 3 digits
- **Reverse**: enables or disables reverse flow testing
- **Test error display**: test error display type
- **Measurement mode**: Watt or VAR

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again,
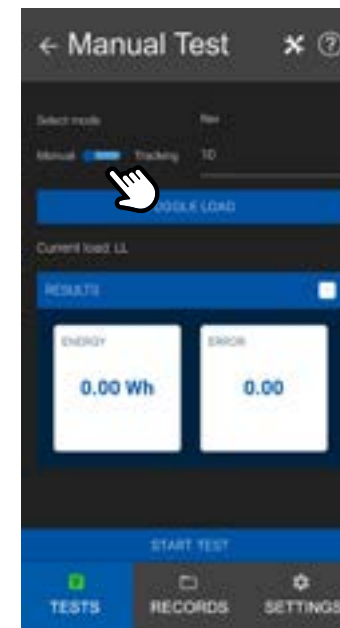
Step 2: Test Setup

Select the test mode:

- **Manual**: the meter is energized, and the disk rotates. The test operator must track the position of the disk and count its revolutions.
- **Tracking**: same as Manual, with the addition that the WT Series tester emits a single beep at each disk rotation (approximated with the reading of the internal standard) and a double beep before the last disk rotation.

Select the field "Rev" and customize the number of revolutions (the default value is 10).

The load current will be set to LL value (calculated from the selected TA at meter setup) and the disk will start to rotate slowly. The load can be switched between LL (Light Load) to HL (High Load) using the "TOGGLE LOAD" button

Step 3: Start Test

The Manual/Tracking test can be started by either pressing the **Start** button on the mobile device (app) or by shortly pressing a magnet to the left side of the WT Series. Operating the test with the magnet switch is deemed to be more accurate as it removes the latency of the mobile app.

When the black mark of the mechanical meter disk lines up with the black line on the meter nameplate, start the test with your method of choice. At this precise moment, the electronic standard of the WT Series tester begins to register the energy that goes through the meter.
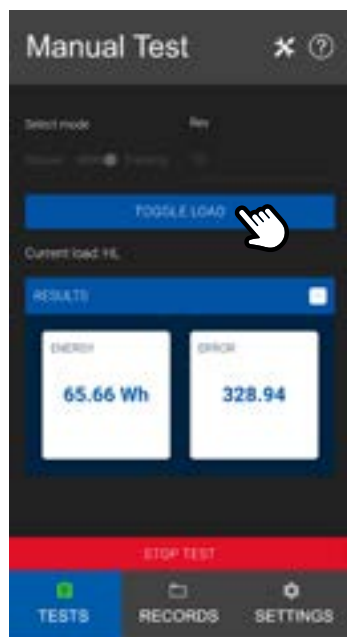

Step 4: Test Execution

At this step, the load can be changed to HL in order to speed up the test. To do this, press once on the **Toggle Load** button.

> **Note:**
>
> It is easier to start and end a test when the disk rotates slowly. To do this, press on **TOGGLE LOAD** to change from HL to LL and from LL to HL.

In manual mode, the test operator must fully track the number of disk revolutions.

In tracking mode, the WT Series tester beeps at each disk revolution. At the second to last revolution, the socket emits a double beep and will automatically switch the load to LL in order to slow down the disk for the end of the test.
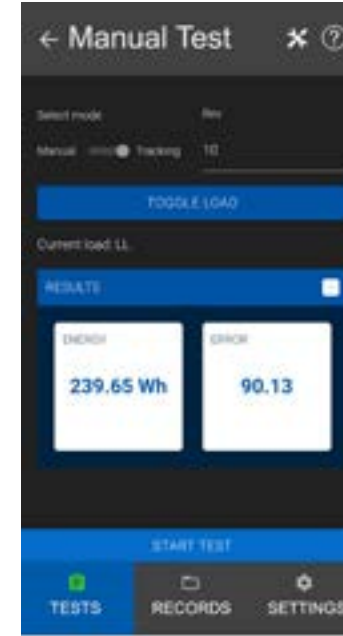
Step 5: Test End

On the last rotation, stop the test at the exact moment the disk mark lines up with the black line on the meter plate. This can be done by either pressing the **Stop button** in the app or by using the magnetic switch on the side of the WT tester.

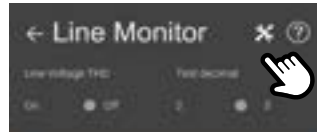The error percentage is displayed.

Line Monitor

Prerequisites

There are no prerequisites for running the Line Monitor test.

Description

The Line Monitor Test is used to observe the input voltage and obtain the THD measurement.

This test does not save data to the device memory.

Operation

Step 1: Temporary test settings

If necessary, modify the test settings by clicking on the wrench icon in the top portion of the screen.

Test settings for the line monitor test are:

- **Line Voltage THD:** enables or disables the display of the THD
- **Test Decimal**: display results with 2 or 3 digits

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again.

Step 2: Start Test

Press the **Start Test** button to initiate the test sequence. This test only monitors the line voltage and does not involve the meter.

Step 3: Test Execution

The voltage, frequency and THD (if selected) values are continuously updated. Minimum and maximum values are also displayed for each parameter.

The harmonic content (THD) considers harmonics up to the 32nd order.

To stop the test, click on the **Stop Test** button.

Demand

Prerequisites

No accessories must be connected to the WT Series testers

Description

The Demand Test is used to test meters that have a demand register. The meter must first be configured to be in kW demand test mode (check meter manual for device specific procedure). The Demand Test applies a load on the meter for a given sub interval time. When the sub interval time is reached, the energy reading of the internal standard of the WT Series tester is compared to the energy reading given by the meter.

This test does not save data to the device memory.

Operation
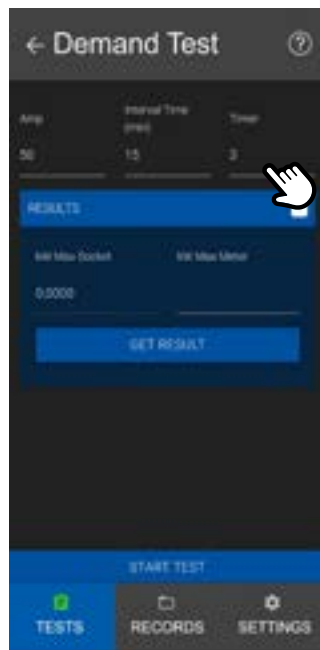

Step 1: Test Setup

The available parameters for this test are:

Amp: load to apply to the meter

Interval Time (min): the demand interval time of the meter in minutes (between 1 and 99)

Timer: duration of the demand test in minutes (must be less or equal to the demand interval of the meter under test)

Fill in the appropriate values for the meter in the input fields.
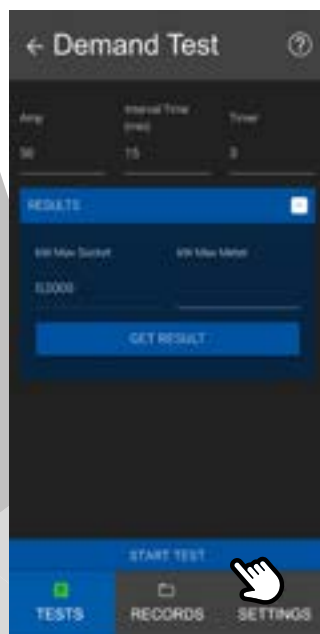
Step 2: Start Test

To initiate the test sequence, reset the demand register of the meter and press the **Start Test** button on the mobile device simultaneously.

> **Note**
>
> To know how to reset the demand register of the meter under test, please refer to the meter manufacturer's specific instructions.

Step 3: Test Execution

During the test, the WT Series tester's internal standard registers the accumulated energy and displays it on screen.

The test may be aborted at any time by pressing the **Stop Test** button.

At the bottom of the screen, the test timer displays the remaining time for the test.
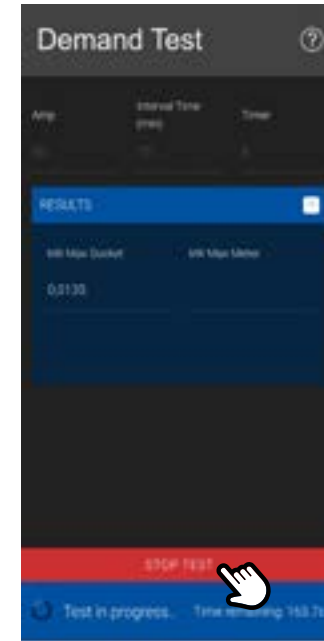
Step 4: Test End

When the test timer runs out, the test ends automatically, and the load is removed.

Type the value of the demand meter register (read on the meter display) in the *kW Max Meter* field. Press on the *Get Results* button to calculate the final test results as a percentage error.

A result higher than 100% indicates that the meter records a higher kW demand compared to the reference. Conversely, a result lower than 100% means that the meter records less kW demand compared to the reference.

> **Note**
>
> There may be a slight delay between pressing the Start button on-screen and resetting the meter demand register. This may affect the precision of the test. Please ensure that both actions are performed simultaneously.
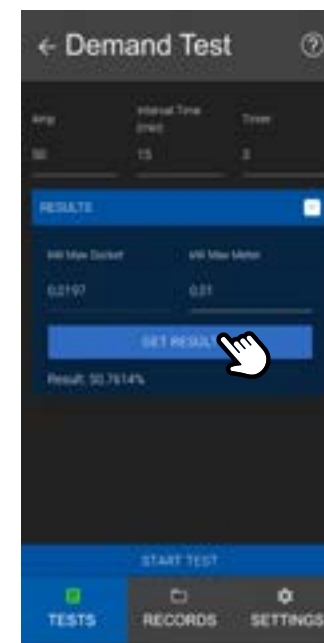
Creep

Description

The Creep Test is used to check the effect of a 0 A current and nominal voltage on the energy registration of a meter. Under a 0 A load, a mechanical meter should do no more than one disk revolution in a 10-minute time window. Under the same conditions, a solid-state meter should emit no more than 1 pulse in a 10-minute time window. If these conditions are not met, the meter is considered to creep.

This test does not save data to the device memory.

Operation

Step 1: Test Setup

Select the test time.

Available time intervals are:

- 5 minutes
- 10 minutes (standard)
- 15 minutes
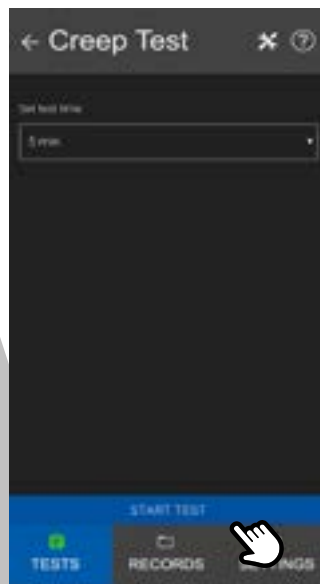
Step 2: Start Test

Press the **Start Test** button to initiate the test sequence.
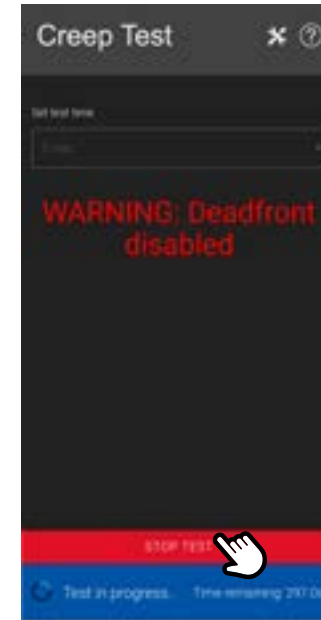
Step 3: Test Execution

⚠️ **WARNING:** The dead front safety is disabled when this test is initiated. Do not remove the meter while the test is running. Line voltage is applied on the upper front jaws. A warning message is displayed.

The test may be aborted at any time by pressing the **Stop Test** button.

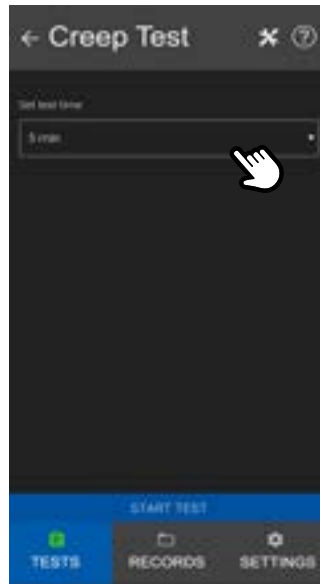At the bottom of the screen, the test timer displays the remaining time for the test.

Note
The WT Series testers use a closed-link arrangement on the meter's load terminals and cannot be opened. However, in the Creep Test, the internal current synthesizers are set to 0.00 A (no current), thus simulating an open circuit.
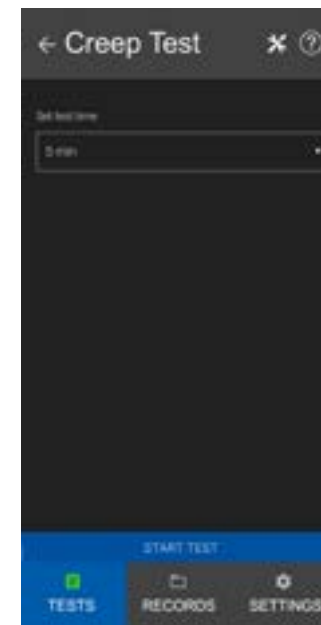
Step 4: Test End

When the test timer runs out, the test ends automatically. The dead front safety is re-enabled. If the disk has not completed a full revolution or no more than one pulse was received during this time, the meter does not creep.

KYZ

Prerequisites

An optical pickup must be connected to the WT Series testers.

Description

The KYZ Test is used to assess the ability of some solid-state meters to transmit energy use information to another piece of equipment via a physical wire interface. This test mode requires the KYZ Device accessory (model PW-0767) and an optical pickup with suction cup (model PW-9073). The KYZ device accessory transforms the electrical pulses generated by the meter into optical pulses to be picked up with the optical device. The optical pickup is connected to the IO port of the WT Series tester and transmits pulses to the device. By using the total energy registered by the internal standard of the WT Series tester and the number of registered KYZ pulses, a Watt hour/Pulse value can be obtained.

This test does not save data to the device memory.

Operation

Step 1: Temporary test settings

If necessary, modify the test settings by clicking on the wrench icon in the top portion of the screen.

Test settings for the KYZ test are:

Test decimal: display results with 2 or 3 digits

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again,

Step 2: Start Test

To initiate the test sequence, press the **Start Test** button.
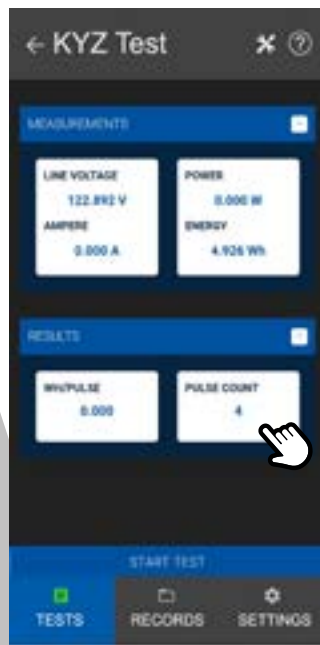
Step 3: Test Execution

During the test, the WT Series tester's internal standard registers the accumulated energy and the number of pulses obtained from the KYZ interface. The average Watthour/Pulse value and the number of pulses is displayed.

The test may be stopped at any time by pressing the **Stop Test** button.

Step 4: Test End

Once enough KYZ pulses have been registered, the user may stop the test by pressing the **Stop** button. The test will not stop by itself.

The average WH/Pulse value is displayed. Depending on how the solid-state meter is programed, this value may be different from the Kh value.

Four Quadrant Watthour (4 Quad)

Prerequisites

An optical pickup must be installed on the WT Series tester.

Description

The Four Quadrant test in Wh is an automatic test sequence that can be used to assess the meter's ability to register energy in all four quadrants of the power vector diagram. The Four Quadrant Test runs four sub-tests, first two are an equivalent of a Quick Test in Active Power amd the an Reactive Power, followed by Custom Tests for PF in remaining angles. The fours sub-tests are:

a. **Subtest 1: Watthour (Quadrant 1)**

   HL angle: 0°

   Power factor angle: 60°

   LL angle: 0°

b. **Subtest 2: Watthour (Quadrant 3)**

   HL angle: 180°

   Power factor angle: 240°

   LL angle: 180°

c. **Subtest 3: Watthour (Quadrant 2)**

   Power factor angle: 120°

d. **Subtest 4: Watthour (Quadrant 4)**

   Power factor angle: 300°

Four Quadrant VARhour (4 Quad)

Prerequisites

An optical pickup must be installed on the WT Series tester.

Description

The Four Quadrant test in VARh is an automatic test sequence that can be used to assess the meter's ability to register energy in all four quadrants of the power vector diagram. The Four Quadrant Test runs four sub-tests, first two are an equivalent of a Quick Test in Active Power amd the an Reactive Power, followed by Custom Tests for PF in remaining angles. The fours sub-tests are:

a. **Subtest 1: VARhour (Quadrant 1)**

   Power factor angle: 30°

b. **Subtest 2: VARhour (Quadrant 3)**

   Power factor angle: 210°

c. **Subtest 3: VARhour (Quadrant 2)**

   Power factor angle: 150°

d. **Subtest 4: VARhour (Quadrant 4)**

   Power factor angle: 330°

Operation
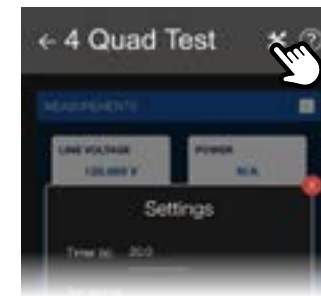
Step 1 : Temporary test settings

If necessary, modify the test settings by **clicking on the wrench icon** in the top portion of the screen.

Test settings for the four quadrant test are:

- Timer: minimum test time in seconds
- Test decimal: display results with 2 or 3 digits
- Low Load Testing: enables or disables the low load testing
- Test error display: test error display type

To return the Temporary test settings to their default values, the unit needs to be turned OFF and ON again.

Step 2: Start Test

> **NOTE:**
> if the meter has separate optical outputs for Wh and VARh, install the optical pickup on the output depending on the test you are performing.

Press the **Start Test button** to initiate the test sequence. The load current increases to its HL value, the meter sends pulses and the WT Series internal electronic standard registers the energy that flows through the meter.

Step 3: Test execution

In addition to the test results, the user can see the line voltage and current applied to the meter, the power and cumulated energy.

At the bottom of the screen, the test timer displays the remaining time for the sub-test.

A spinning wheel indicates which sub-test is currently running.

At any time during the test, the user can navigate the test results each sub-test by using the left and right arrows on each side of the results table.

The test may be aborted at any time by pressing the **Stop Test button**.

Step 4 : Test End

When all sub-tests have been completed, the test ends automatically. The load is then removed and the test results are displayed.

To save the test results, click on the Yes button at the bottom of the screen.

To save the test results, click on the **Yes** button at the bottom of the screen.

Step 5: Meter ID

Enter the meter ID (serial number). The meter serial number can be scanned on mobile devices. If the AEP code was used to import device information at the Meter Setup step, the meter serial number is already populated.
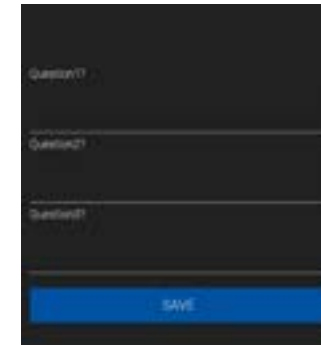
Step 6: User Questions

Up to 8 user defined questions can be programmed in the Settings tab.

Answer each question and click on the Save button to save the test report in the device memory.

NOTE
In the Reports tab, a Four Quadrant Test report will be split into multiple entries: one entry for each sub-test of the sequence (for a total of four sub-tests). An algorithm allows to generate one PDF integration the 4 sub-test into one report. although four identical will be generated. The report will merge all four sub-test and displayed from quadrant 1 to 4. In CSV format, the will be one line for each sub-test. DO NOT erase a sub-test, this action will disrupt the algorithm.

Accuracy

Description

The accuracy of MT-1/WT1 and MT-1/WT3 can be checked against a **NIST** traceable standard using the following test procedure. The accuracy is tested on 6 different current test points: 1.5, 3.0, 5.0, 15.0, 30.0 and 50.0 A at both 1 (0°) and 0.5 lag (60°) power factors in Wh. Additionally the MT-1/WT3 does VARh at 30° and 90°. The accuracy test can be done using a stabilized and isolated AC power source at either 120 or 240 volts.

Equipment Required

- A primary or secondary electronic watt hour standard traceable to NIST, with an output BNC port of *10µWh or 20µWh* per pulse. The standard must have at least 1 isolated current input port of a minimum capacity of 50 A with autoranging capability. We recommend a standard with an accuracy of 0.02% or better.
- The Probewell Accuracy Test Kit (single-phase or three-phase). The Kit includes the following items:
- An Accuracy Test Interface (PW-8967), a BNC coaxial cable and a Probewell extension cable RJ12 type connection.
- An Accuracy Test Jack.
    - o Three-phase (ATK-3) for MT-1/WT3
    - o Single-phase (ATK-4) for MT-1/WT1
- A laboratory stabilized and isolated AC power source with fundamental waveform selectable at 120V or 240V ±5%, 58~62 Hz, rated at least 150VA.
- A Windows PC, an Android device or iOS device with the latest Probewell Connect application installed.

> **NOTE**
>
> A laboratory stabilized, and isolated AC power source is preferred rather than a small isolated line transformer or autotransformer. Such small transformers could generate severe harmonics and voltage fluctuations which could cause small additional measuring errors. **Always fuse** the power leads going to the rear tabs 1 & 3 of the unit with a quick action 1A fuse. The power leads and fuses are not provided with the Accuracy Test Kit (ATK).

For further information and a complete calibration procedure for WT Series testers, please refer to the *Accuracy Test Kit User's Guide* which can be downloaded from the Probewell website at the following link: https://probewell.com/atk3-atk4/
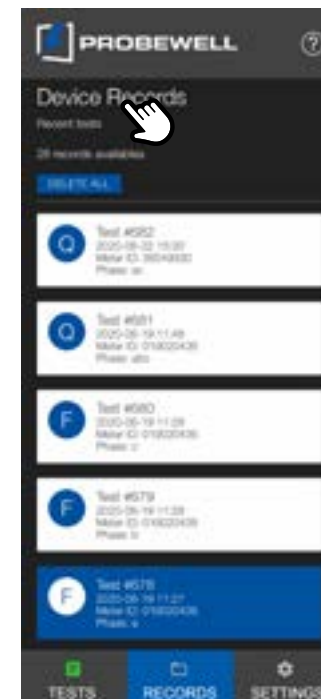
Records

The WT Series tester can hold up to 100 test records in its non-volatile memory. A test record is created when the operator opts to save the data of a test conducted with either an optical pickup or a metercam. Test modes that support data logging are:

- Quick
- Full
- Custom
- Four quadrants

A Full Test and a Four Quadrant Test take up to four test record slots. In Full Test, one one for the polyphase subtest and one for each single element subtest. In Four Quadrant, one for each subtest.

The test results can be accessed by clicking on the Records tab at the bottom of the screen.

Test List Viewer

The test list viewer lists all available test results that are currently stored on the WT Series tester. Test records are sorted by date; newer tests being the first in the list. The test record list shows the following basic information for each test result:

- Test ID: numerical identifier for the test
- Date and time
- Meter ID: meter serial number or unique identifier
- Phase: phases that were energized for the test

The operator can scroll the record list to reach older test results.

Selecting an element in the list opens the test report viewer.

The **Delete All** button deletes all test reports from the WT Series tester non-volatile memory. Please ensure that test data has been properly exported to a Windows computer before deleting all test data from the device. This procedure is defined in the Export section of this document.

The test report viewer is composed of 4 distinct sections:

• Report: full test data, including meter specifications and error percentage readings

• Questions: user defined questions and their corresponding answers filled in at the end of the test

• Sensor: information on the type of sensor (optical pickup or metercam) and the number of pulses or revolutions that were recorded at each step of the test
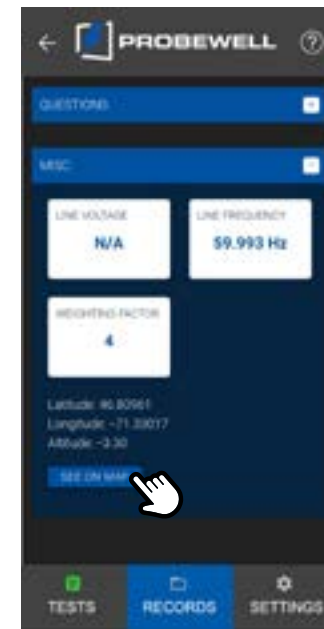
• Misc.: line quality data and GPS coordinates (when available)

If the test has associated GPS data, the **See on Map** button is available. Clicking on this button launched Google Map (if installed on device) and shows the test location on a 2D map. This functionality requires that the mobile device have internet access.

Note

When there are no more vacant test report slots on the system (i.e., when all 100 report slots are occupied), the device will display a system error when trying to save new test data. The device does NOT automatically overwrite test data. At this point, the user must transfer test reports to a computer and delete data from the tester before running additional tests.

Individual record deletion

On iOS and Android, an individual report can be deleted by swiping left on the report entry in the list and pressing on the trash can icon.

On Windows, the trash can icon is always visible for each report entry.

The application requires additional validation to complete the deletion process. Once a report has been deleted, it is completely removed from the device memory and is no longer accessible.

Please ensure that test data has been properly exported to a Windows computer before deleting any test data from the device. This procedure is defined in the Export section of this document.

E-mail

A single test report can be sent by e-mail by pressing the **Send Mail** button in the test report view. This automatically opens the default e-mail app on the mobile device and populates the subject and content of the message.

Subject

The e-mail subject has the following structure:

Meter Test #102 (Meter ID: 012345 - Socket ID: 12711729 - Date: 2020-01-10 11:12)

Content

The e-mail content is human readable text. It has the following structure:

METER

| Form: 9S | TA: 2.50 A | KH: 1.8 | Phase: ABC |

REGISTRATION

| HL: 99.98 % | PF: 100.00 % | LL: 99.98 % | Weight: 99.98 % |

ENERGY

| HL: 10.80 Wh | PF: 5.40 Wh | LL: 1.80 Wh |

AMPERE

| HL: 2.50 A | PF: 2.50 A | LL: 0.25 A |

SENSOR

Type: Optical Pickup

| Pulse-HL: 6 pulses | Pulse-PF: 3 pulses | Pulse-LL: 1 pulses |

MISC.

Line Voltage: 239.71 Vrms

Line Frequency: 59.98 Hz

Weighting factor: 4

LOCATION

| Longitude: -71.33016 | Latitude: 46.80960 | Altitude: -1.00 |

QUESTIONS

Predetermined questions setup from the settings tab. Answers will be displayed if the operator wrote them, if not they will display N/A

testq1? => answer1

If the mobile device cannot reach the internet when the e-mail is sent, the message will go to the Outbox and will automatically be sent when the mobile device is connected to the internet again (either via WiFi or cellular data).

Export

The Probewell Connect application offers two data exports formats for WT Series test reports: PDF and CSV. In both cases, test data is extracted from the WT tester's non-volatile memory and saved on a local drive on a Windows computer.

PDF

The PDF report format is a human readable, non-modifiable representation of the test data.

CSV

The CSV report format shows the test data in a row-column text file that can be viewed with a basic text editor or Microsoft Excel.

Initial setup

For information on how to do the initial configuration of the Probewell Connect app for test report generation, refer to section Local Preferences of this document.

Export all test reports to CSV
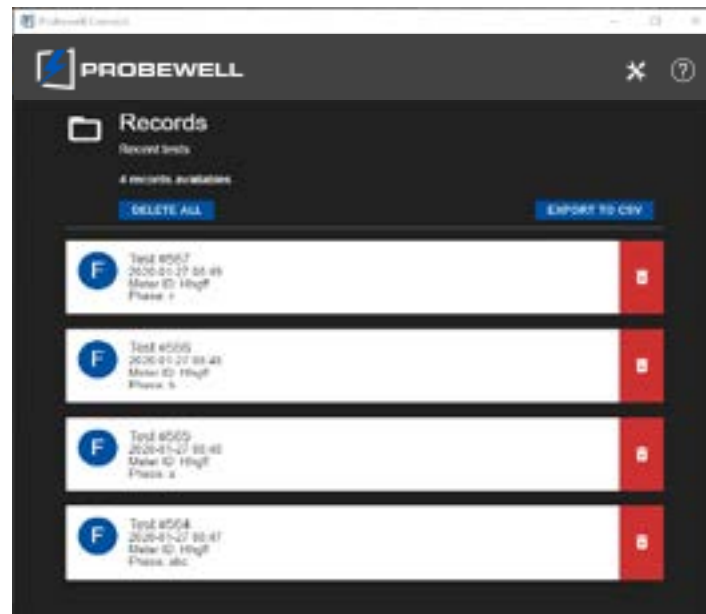
1) Power up the WT Series tester.
2) On a Windows PC, connect to the WT Series tester's wireless network. Complete procedure on how to do this is outlined in section Connecting to the WT Series tester of this document.
3) Start the Probewell Connect application.
4) Go to the Records tab.
5) Click on the Export to CSV button. All test reports present on the WT tester's memory are exported to the CSV report file path (configurable in the Local Preferences tab).

Export single test report to PDF

1) Power up the WT Series tester.
2) On a Windows PC, connect to the WT Series tester's wireless network. Complete procedure on how to do this is outlined in section Connecting to the WT Series tester of this document.
3) Start the Probewell Connect application.
4) Go to the Records tab.
5) Click on a report entry.
6) Click on the Export to PDF button.
7) A file Save As prompt is displayed. Select where to save the file on the Windows computer and click on the Save button.

Settings

☐ Mobile Footer

💻 Windows Footer

The WT Series tester's come with factory default settings that are suitable for most operations. The device settings can be easily changed to suit the operator's needs by using the Settings tab in the app. The device settings are stored in the non-volatile memory of the socket.

Custom Questions

The custom questions are used to allow user specific data logging for each test. The system allows up to 8 custom questions and each can be up to 32 characters long.

To reach the Custom Questions edit view, press on the Edit Custom Questions in the Settings tab.
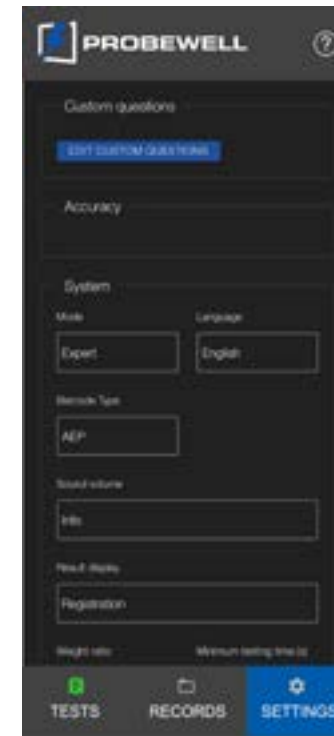
Edit the questions as needed. Up to 8 custom questions can be defined.

Press on Save to store the questions in the non-volatile memory of the socket or Delete All to reset all questions.

System Settings

System Settings are used to configure how the WT Series tester performs tests and contains various basic usability settings.

Mode
Selects the system mode. Some modes allow more configuration over the WT tester.
- **Expert Mode:** full configuration of all settings

Language
Language selection.
- **English (default)**
- **French**
- **Spanish**

Barcode type
By default the app barcore scanner is setup for AEP barcode format. You can find a break down of the pre-defined barcode setup below:

AEP: Position 1 & 2 = Meter Setup / Position 3 = Meter Manufacturer (skipped) / Position 4 to 12 = Meter ID
Custom 1: Position 1 & 2 = Meter Setup / Position 3 to 8 = Meter ID
Custom 2: Position 1- to 6 = Meter ID

*only above mentioned barcode position digits are taking into consideration for Meter setup and Meter ID

Sound volume
Affects the behavior of the internal speaker of the WT Series tester.
- **Info (default)**: informs the user of info, warning and error level alerts
- **Warning**: informs the user of warning and error level alerts
- **Error**: informs the user of error alerts only
- **Off**: turns off the internal speaker

Result display
Display type of the error percentage result.
- **Error percentage**: error on the meter readout compared to the reference. Positive values indicate a leading meter and negative values indicate a lagging meter.
- **Registration (default)**: readout of the meter as a percentage of the reference standard measurement. Values over 100% indicate a leading meter and values under 100 % indicate a lagging meter.

Weight ratio
High Load specific weight in the weighted average calculation. Default value is 4.

With WR as the weight ratio parameter, the weighted average formulas are :

Single-phase and 12S meters		Three-phase meters	
	$\frac{(WR \cdot HL + LL)}{(WR+1)}$		$\frac{(WR \cdot HL + 2 \cdot LL + PF)}{(WR+2+1)}$
With the default WR value of 4, the formula is :	$\frac{(4 \cdot HL + LL)}{5}$	With the default WR value of 4, the formula is:	$\frac{(4 \cdot HL + 2 \cdot LL + PF)}{7}$
With a WR value of 2, the formula is :	$\frac{(2 \cdot HL + LL)}{3}$	With a WR value of 4 and with the LL in Full Test option disabled, the formula is:	$\frac{(4 \cdot HL + PF)}{5}$

Minimum test time
Minimum test duration time per load type for solid-state meters. Minimum time is 10 seconds and maximum time is 120 seconds. Default is 20 seconds.

Measurement mode
- **Wh (Default)**: tests the meter in watthour
- **VARh**: tests the meter in VARh

Line Voltage THD

Enables or disables to display of the THD value in the Line Monitor test.

Reverse

Enables or disables the reverse flow testing when doing Net Metering. Disabled by default.

Low Load Testing in Full Test

Enables or disables the Low Load single element subtest in the Full Test mode.
Disabled by default.
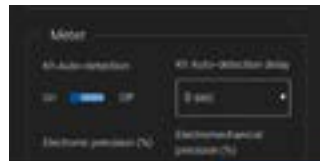
Power Factor Test Enable

Enabled by default.

For polyphase meters:

• Enables or disables PF Load in Full Test sequence.

Test Decimal

Number of test decimals used to display the error percentage result. Default value is 2.

Meter Settings

Kh Autodetection

Enables or disables the automatic detection of the meter Kh value when an Optical Pickup or Metercam is connected. Enabled by default.

Kh autodetection delay

Adds a delay (in seconds) before registering the first pulse for the Kh automatic detection. This option is useful for meters that have an AMI/AMR module that emits from the same port as the test pulse.

Available values are (in seconds):

• 0 (default)
• 1
• 2
• 5
• 10

Electronic precision (%)

Solid-state meter accuracy class (e.g. 0.2%). This value is used to evaluate the Pass/Fail status of a test when an Optical Pickup is used. When the error percentage is greater than the accuracy class of the meter, the numerical result is surrounded by square brackets [ ].*

Electromechanical precision (%)

Electromechanical meter accuracy class (e.g. 2%). This value is used to evaluate the Pass/Fail status of a test when a Metercam is used. When the error percentage is greater than the accuracy class of the meter, the numerical result is surrounded by square brackets [ ].*

*The RESULTS window, should read something like this, LL exceeding the accuracy: HL 99.95%   PF 99.97%   LL [99.97]%.

KH default table*

Default Kh value per specific meter form. This value is populated in the Meter Setup view depending on the automatically suggested meter form.

TA default table*

Default TA value per specific meter form. This value is populated in the Meter Setup view depending on the automatically suggested meter form.

Load*

Percentage of the test amperage (TA) that defines which current value to use for each subtest. By default, LL is set as 10% of TA, PF and HL are set as 100% of TA.

As an example, with a TA of 25 amperes:

• LL: 0.1*25 = 2.5 A
• PF and HL: 1*25 = 25 A

Revolution per load*

Number of revolutions registered when using the Manual/Tracking mode or any automatic test using the Metercam. Default values are:

• LL: 1 revolution
• PF: 5 revolutions
• HL: 10 revolutions

*Default values can be modified

Calibration Settings

User calibration date

User calibration factor last update

User calibration factor

Custom user calibration factor (affects all error percentage results)

Factory calibration date

WT unit calibration date at the Probewell factory

### Calibration decimal

Number of test decimals used to display the error percentage result in the accuracy test. Default value is 4.

Profiles

The Probewell Connect application supports the import and export of complete user generated settings profiles. This allows the user to transfer their custom system settings from one computer to another and to quickly set up multiple WT Series testers from the same computer. Settings can be exported/imported in both online and offline mode.
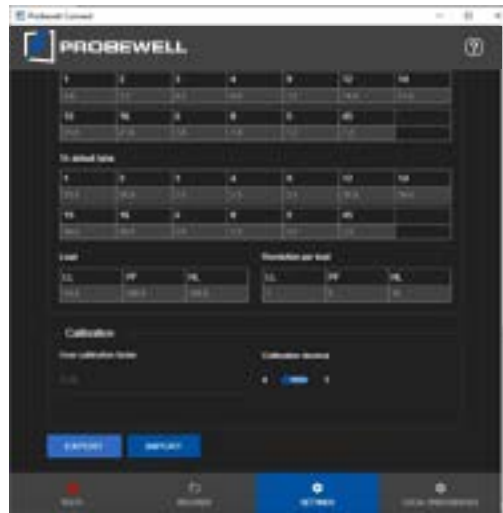
EXPORT

Exports all settings into a save file. This includes:

- Custom questions
- System settings
- Meter settings
- Calibration settings
- Local preferences

IMPORT

Imports all settings from a save file.

Other functions

SAVE

Saves the configured settings to the WT Series tester's non-volatile memory. The device immediately holds the new settings and they are also retained the next time the device is booted up.

FACTORY DEFAULT

Resets the settings of the WT Series tester to the factory default values. Previously saved configurations are erased.

RESET SOCKET

De-energizes the meter. Going to the Tests tab yields the Meter Setup view.

Local Preferences

In the Local Preferences tab, the user can configure parameters that are specific to the Windows version of the Probewell Connect application. These parameters are stored locally and are kept when the application is closed and restarted.

CSV

Local file path to save exported test data. The file format is comma-separated values (CSV).

Company Info

Company contact information. Used to generate the top-left portion of the header in PDF reports. Click on *Set Company Info* to edit.

Company Info (continued)

Set Logo

Opens a file selector prompt for the company logo.

Clear

Clears the company logo.

Company contact fields

Enter company contact information.

Click on the **Save** button to save the information into the local settings of the app.

Firmware Update

In order to benefit from all the latest features and bug fixes, Probewell Lab suggests that firmware updates on WT series testers be done periodically.

The latest firmware for WT Series testers is always available on the Probewell website at the following link: www.probewell.com/services (password protected)

Setup and material required

The required material for a firmware update for the WT series testers is:

- A proprietary USB update Cable included with the socket (if you need a replacement USB cable, contact sales@probewell.com)
- A computer running on Windows 10
- The Probewell Connect App for Windows.
- The MT-1/WT3 or MT-1/WT1 meter tester. The tester must be energized and powered on. A meter base, desktop solution or test board providing 120 or 240 V on the two upper jaws with a capacity of at least 150 VA can be used to energize the tester. Be sure to properly configure the twist tabs and form switch selector.

Note

The Windows computer does not need to be connected to the wireless network of the WT series tester to perform the firmware update.

The update process is done over a physical connection with the USB Update Cable.

Instructions

1. Download the firmware update .ucf file in a Windows 10 computer.

Click on the link https://probewell.com/services to access the secured client page containing all the firmware files.
Password: jb17549

IMPORTANT:

BE sure to download the appropriate file depending on the product are updating.

File names start with the product family
WTProd_(version).zip for the wireless meter tester
or
XT3Prod_(version).zip for the wireless site tester.

- After right clicking the appropriate firmware file, chose "Save link as..."

This will open a window prompting you to choose where to save the zip file.
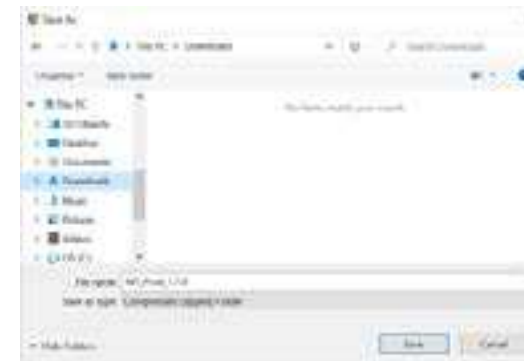
- Choose a location where you will save the file in your computer.
- Locate the file in your Windows Explorer

FILE FORMAT

The UCF file has been compressed and will appear as a zip file (.zip) on the page.

Right-click on the ZIP file related to your Probewell product to extract the .ucf file at the next step.

The UCF file type is used for the firmware update with Probewell Connect app and the file name should end with the .ucf file extension.
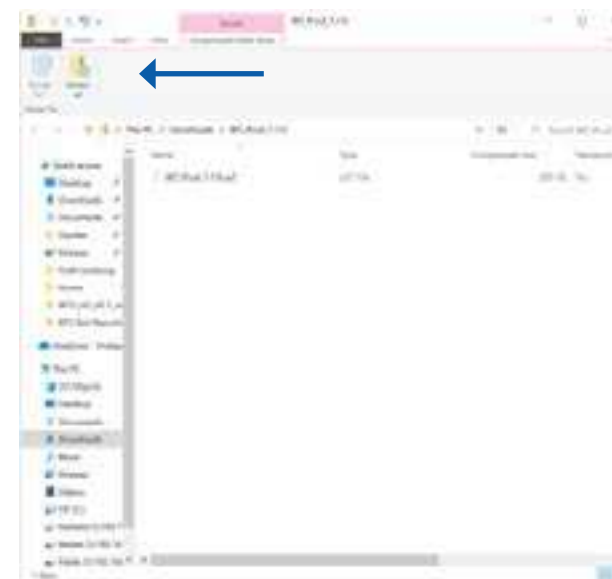
- In the top menu, click the "Extract all" icon.
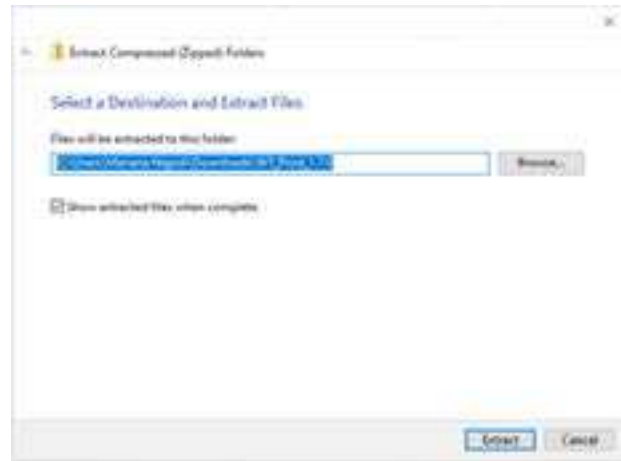
- Choose the destination location on your local computer for the firmware file and click the "Extract" button.

2. Place your Probewell tester into a socket for energization and turn your tester on

3. Locate your Probewell Update cable (usually placed inside Probewell tester carrying case). Use the Probewell Update cable and plug it into a USB port of your computer. Plug the other end (RJ connector/telephone jack) of the cable into the I/O port of your tester.

4. Launch the Probewell Connect App on your computer (if it has not been downloaded yet or to make sure you have the latest version, go to our website, at the software section and download Probewell Connect for Windows: https://probewell.com/pw-connect

Probewell
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5. Select the "Settings" tab at the bottom of your Probewell Connect application.
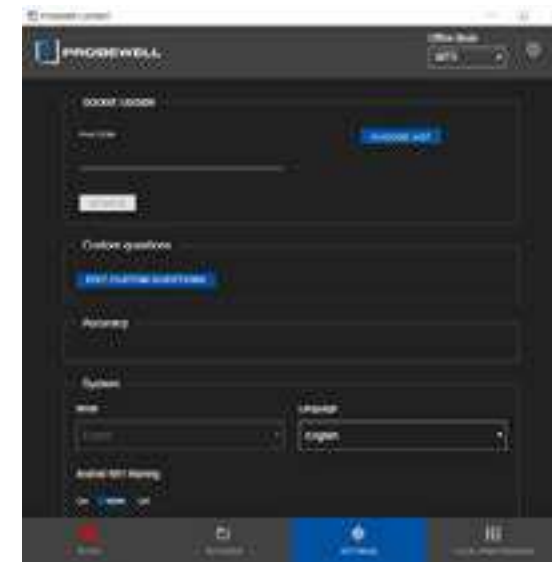
6. Use the top section "Socket Update"

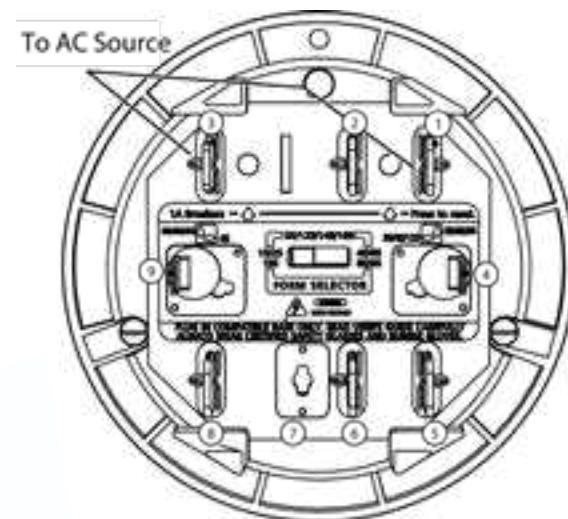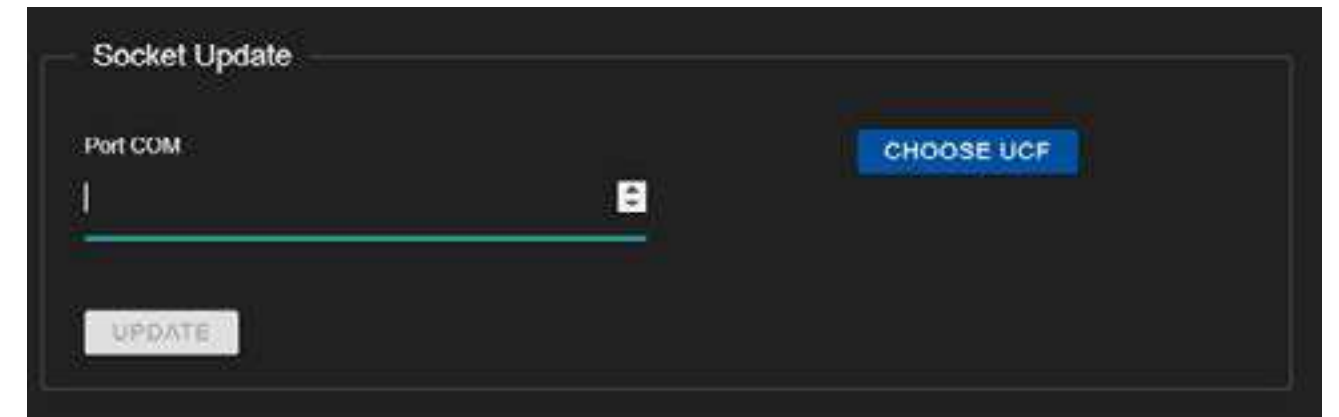7. At the top of the settings page, enter the appropriate com port in which your USB Update cable is plugged in. To find the appropriate com port number, locate your device manager by searching for "Device Manager" in the bottom left corner of your computer screen (Detailed instructions on Appendix D of this guide).

8. Click on "Choose UCF" and locate UCF file previously saved in your computer. Once located, click on select.

9. The "Update" button will have changed from light grey to blue. Click the "Update" button.

10. Follow the instructions on your Probewell application to restart your device (tester) by turning the tester off then back on after waiting 3 seconds.

11. Probewell Connect application will now start programming the new firmware into your tester. The update process will take a few minutes. Do not interrupt the process.

12. When completed, restart your device (tester) by turning the tester off then back on after waiting 3 seconds.

Setup

USB driver installation

This driver supports the Windows 10 operating system.

1. Check that your PC is connected to the internet.
2. Connect the Update Cable to a vacant USB port on your PC.
3. A notification should appear in the system tray. It should indicate that the driver software is installing.
4. Wait for the driver to download and install. This should take a few minutes at most.

If the automatic installation of the driver is not successful, please contact Probewell Support at the following e-mail address: support@probewell.com.

Specific operation modes

The WT Series tester supports operation modes that allow it to test additional functionalities of electrical meters.

Wh/VARh

The Wh/VARh measurement mode lets the WT Series tester evaluate the resistive and the reactive operation of the electrical meter separately.

The measurement mode can be modified from the test specific settings in the Quick, Full and Custom test modes. This is a temporary setting that is reset to its default value (Wh) when the WT Series tester is power cycled.

Wh

In Wh operation mode, the **LL** and **HL** load subtests are done at 0° lag (current and voltage in phase) and the **PF** load subtest is done at 60° lag.

VARh

In VARh operation mode, the **LL** and **HL** load subtests are done at 90° lag and the **PF** load subtest is done at 30° lag (current lagging on voltage).

> **Note**
>
> Before conducting a test with a solid-state meter, please validate that the meter's output pulses settings are set to match the WT Series tester measurement mode. That is, if the WT Series tester is set to test the meter in Wh mode, the meter must be programmed to pulse in increments of resistive energy. If the WT Series tester is set to test the meter in VARh mode, the meter must be programmed to pulse in increments of reactive energy. Please refer to the meter manufacturer's reference technical guide for instructions.

> **Note**
>
> There are several recognized methods to calculate the VAR measurements for solid-state meters. When the harmonic content becomes noticeable, the VAR reading may vary considerably depending on the selected calculation method. In depth analysis of VAR calculation falls beyond the scope of this guide. The WT Series testers use the vector method (using VA RMS) for VAR calculations.

Reverse Flow Testing

In its typical operation mode, the meter measures the total energy being delivered to the customer by the grid. Some residential installations are equipped with renewable energy systems. In such cases, the renewable energy system may harvest more energy than is needed by the installation. The energy surplus may be delivered back to the power grid and the electric meter must be able to measure reverse energy flow to affect billing accordingly.

On the WT Series tester, the reverse flow testing is available in Wh and VARh measurement mode, with or without the optical pickup. Reverse flow testing is not available when a Metercam is connected. The WT Series tester's internal current generator can reverse the current flow and thus test the accuracy of a solid-state meter in received flow.

To configure Reverse flow testing, enable the Reverse option in the Settings tab under the System section. The option can also be set temporarily from within the test mode view. In the test report, the Power and Energy measurements are preceded by a backward arrow to indicate reverse flow.

> **Note**
>
> Before conducting a test with a solid-state meter, please validate that the meter's output pulses settings are set to match the WT Series current flow mode. That is, if the WT Series tester is set to test the meter forward current flow, the meter must be programmed to pulse in increments of positive flow. If the WT Series tester is set to test the meter in backward current flow, the meter must be programmed to pulse in increments of negative flow. Please refer to the meter manufacturer's reference technical guide for instructions.

Appendix A

Troubleshooting

Under specific circumstances, the Probewell Connect app may display a warning or error message requiring further action from the user. A list of the most common troubleshooting topics is included below. If any problem persists, please contact Probewell Lab Inc. Technical Services.

FAULT	DESCRIPTION	• FIX
CANNOT PAIR WITH SOCKET	The application cannot connect to the WT Series tester wireless network.	• Make sure the WT Series tester is turned on. • Check if the fan inside the socket is spinning. • Scan the QR code that is located on the directly on the tester. If using a QR code printed on the included plastic card, please validate that the serial number written on the card matches the serial number of the unit.
FIRMWARE VERSION WARNING	The application gives a warning about the WT Series tester firmware version not matching the application version.	• Follow the Firmware Update section of this document to update the firmware of the WT series tester
METER BARCODE NOT READABLE	The application cannot get a proper reading on the meter barcode.	• Make sure the meter barcode is readable and not damaged.
METER BARCODE NOT RECOGNIZED	The application reads the meter barcode, but cannot recognize the structure of the barcode	• Make sure that the meter barcode matches the AEP barcode standard.

To find the exact meaning of an error code, please visit: https://probewell.com/support/

Appendix B

Parameters for Data Logging Option

The following describes all the different data fields contained in the.CSV (Comma Separated Value) report file.

1- TEST#	This test # is given to each subsequent test conducted in the field. The unit can store up to 100 tests. Once the tests have been uploaded into your PC and deleted from the remote, the test # restarts at 1.	c) YES	This will be returned when the %HL and %LL error difference is outside the acceptable error margin; a creep test has been run and the technician answers YES to the question: Does the meter creep?
2- REC#	This is a permanent record number, it cannot be modified or deleted (already stored in remote). This number is incremented at each new logged test. It starts at 1 and increment by 1 up to 99999 then restarts at 1.	d) NO	This will be returned when the %HL and %LL error difference is outside the acceptable error margin; a creep test has been run and the technician answers NO to the question: Does the meter creep?
3- DATE/TIME	Stamp date and time of the test	e) N/S	Not supported
4- REMOTE#	MT-1/WT Remote Serial Number (same as the SOCKET#)	18- 33 Q & A	8 custom questions and answers
5- SOCKET#	MT-1/WT Socket Serial Number (already stored in socket).	34- RevHL	Revolutions run during HL test
		35- RevLL	Revolutions run during LL test
6- FORM	Meter form	36- RevPF	Revolutions run during PF test
7- PHASE	Phase tested	37-Weighting factor	Weighted error ratio as defined in configuration
8- TA	Testing Amperage of meter tested	38- AmpHL	Load in amps applied during HL test
9- Kh	Kh of the meter tested	39- AmpLL	Load in amps applied during LL test
10- MODE	Mode in which test was conducted. Result can be full, quick or custom (single).	40- AmpPF	Load in amps applied during PF test
11- SENSOR	Indicates what type of sensor was used during test. Result can be *Optical Pickup* or *Metercam*.	41- WhHL	Watthours recorded during HL test
		42- WhLL	Watthours recorded during LL test
12- METER ID:	Tested meter's serial number as entered by the technician in the field.	43- WhPF	Watthours recorded during PF test
		44- VOLT	Line voltage recorded at end of all tests
13- %HL	Result of HL test in registration percentage	45- FREQ	Line Frequency recorded at end of all tests
14- %LL	Result of LL test in registration percentage	46- Latitude	GPS coordinates (latitude)
15- %WT	Weighted average in registration percentage as calculated with the configured ratio.	47- Longitude	GPS coordinates (longitude)
		48- Altitude	GPS coordinates (altitude)
16- %PF	Result of PF test in registration percentage		
17- CREEP	Status and result of creep test. There are 5 possible answers:		
a) N/A	This will be returned when the %HL and %LL error difference falls within the acceptable error margin and no creep test needs to be run.		
b) SKIP	This will be returned when the %HL and %LL error difference is outside the acceptable error margin, but the technician decided not to run a creep test.		

Appendix C

Customer Service

Warranty and repairs

If your MT-1/WT3 becomes defective while under warranty (two years after original date of purchase), Probewell Lab Inc. will repair or replace it. If the unit becomes defective after the warranty has expired, Probewell Lab. Inc. will repair it, charging the cost of labor and spare parts.

Before returning a unit for repair

Please do not return your MT-1/WT3 without first contacting customer service at 1 866-626-1126 or sending an email to info@probewell.com. You will be given detailed shipping instructions.

Technical questions

If you have any technical questions regarding the MT-1/WT3's operation, contact our technical support team at 1-866-626-1126 or send an email to support@probewell.com.

Appendix D

USB Update cable COM port

In order to upgrade the firmware of the WT Series tester, the COM port number of the USB Update cable must first be determined. The following procedure outlines the required steps:

1. On the Windows PC, open the Device Manager. This can be done by searching for it in the Windows search bar or by going through Control Panel -> Hardware and Sound -> Devices and Printers -> Device Manager.

2. Expand the Ports (COM & LPT) section. The USB Update cable is identified as USB Serial Port (COMX), where X is a number. If many similar devices are already present in the list, try disconnecting the USB Update cable to see which one is removed from the list.

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