

## REAMP: High accuracy power consumption logger

### *To ease the life of IoT developers*



When you want to get the longest battery life possible, you need a high accuracy and reliable power measurement tool.

So REAMP is the best choice for your Ultra Low Power projects. REAMP functions as a highly stable and accurate power source for Device Under the Test (DUT).

It allows you to see even subtle changes in the power consumption profile of the DUT.

#### Features:

- Wide range and high accuracy Current measurements (from 10 $\mu$ A to 1A)
- Two channels for Voltage measurement
- 10 Hz to 10 kHz Sample rate
- TRIG and SYNC gates to synchronize logger with target board and vice versa
- Time-limit and infinite measurement modes
- Built-in Li-Ion battery for cases when DUT current consumption is over 500 mA
- Comprehensive power consumption analysis with PC Software
- Easy navigation both for small or extremely large measurement data sets, zooming and scrolling features
- Consumption averaging as well as real-time analysis
- Battery Life Calculator
- Ready-to-use Multi-OS software for Windows®, Linux® and macOS®

Use REAMP in your ULP DIY projects to achieve more and succeed faster

## 1. Intro

REAMP POWER CONSUMPTION LOGGER (REAMP) is designed for testing the power consumption modes of various devices powered by 1.8V to 5V DC. Furthermore, REAMP itself is a source of supply voltage for the device under test (DUT) with a wide selection range: 1.8V to 5.2V with a 50mV step.

REAMP allows you to measure instantaneous values of the consumption current and record them in a log file, mark the maximums and minimums, perform average over a specified time interval, calculate the duration of an autonomous source DUT operation, determine time intervals, and much more.

The range of current measurement is 10 $\mu$ A to 1A (100dB).

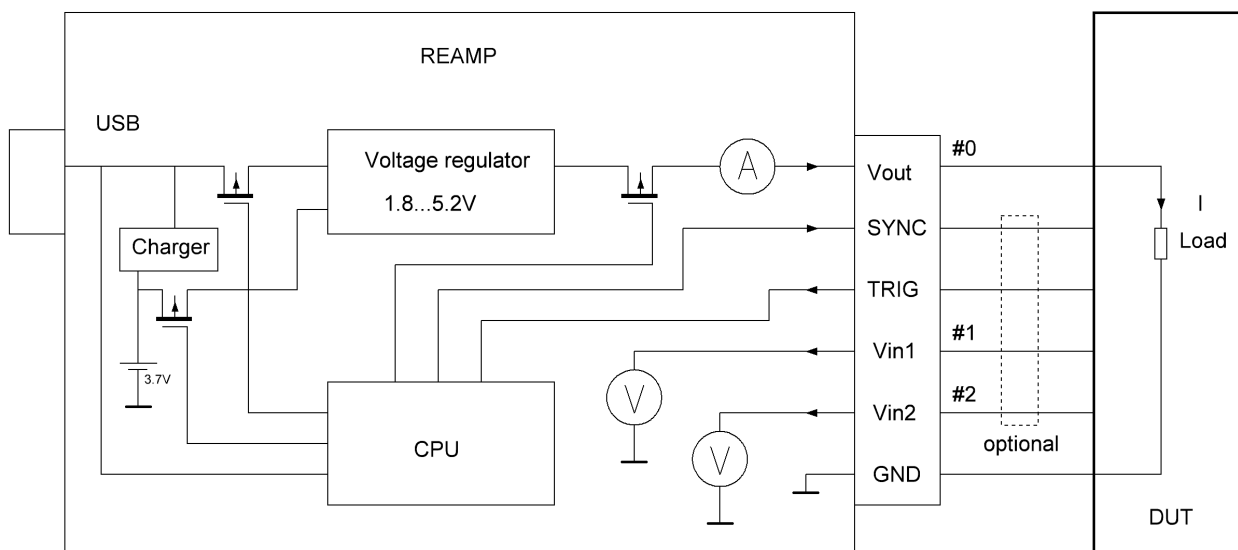
Additionally, there are two input channels for voltage measurement at the user's DUT points of interest. The range of voltage measurement is 20mV to 5V.

The sampling frequency is 10 Hz to 10 kHz.

The device will be of interest to developers of IOT, USB, and other devices where the ability to place the device under test into sleep mode with minimal power consumption is critical. The device is powered and operated when connected to a computer via USB port.

## 2. Functional diagram and connection

**Fig. 2.1. Functional and connection diagram**



- DUT—device under test
- #0—current measurement channel
- #1—1st voltage measurement channel
- #2—2nd voltage measurement channel
- SYNC—output for synchronization of the external process with the measurement triggering process
- TRIG—input from the external source to trigger the measurement

A 6-position connector on the device front panel is used to connect the DUT. The designation of the pins is shown in Fig. 2.1. Since the DUT receives power directly from the REAMP, at least two connections are required for its operation: Vout and GND.

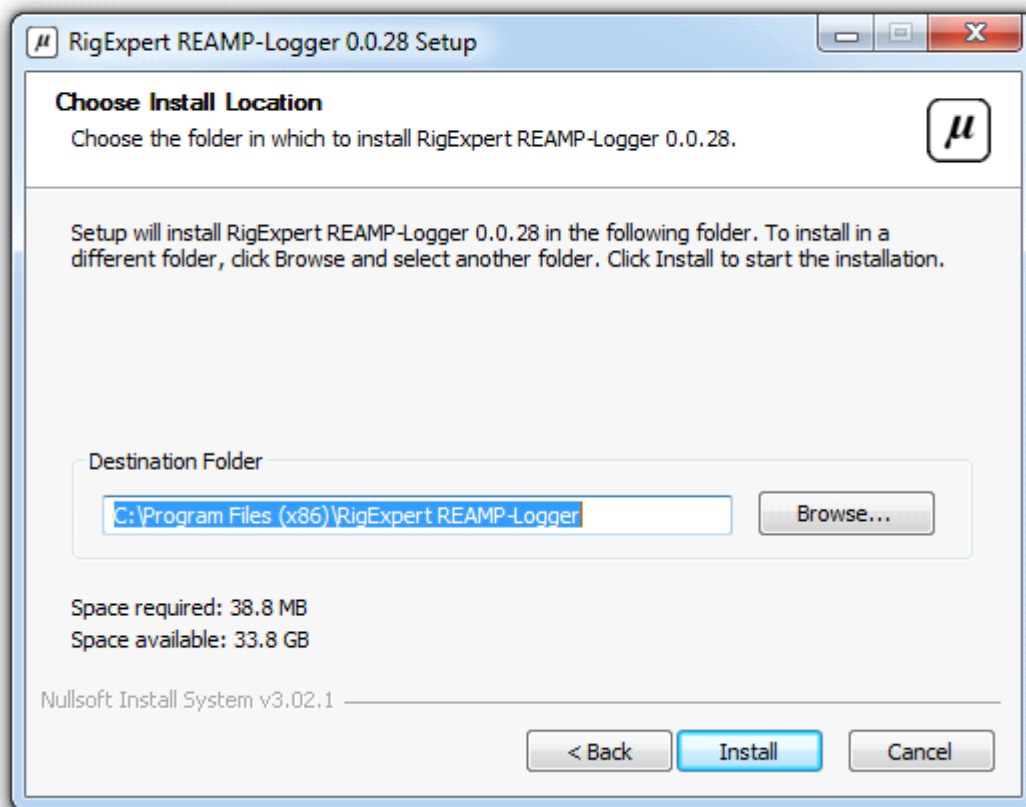
Connect to your PC with a TYPE A–TYPE B USB cable. To operate the device, use the RigExpert AMP Logger (REAMP) software running under OS Windows 7, Windows 10.

### 3. Installation

Use this link <https://rigexpert.com/products/kits/reamp/downloads/> to download and install the REAMP Logger software.

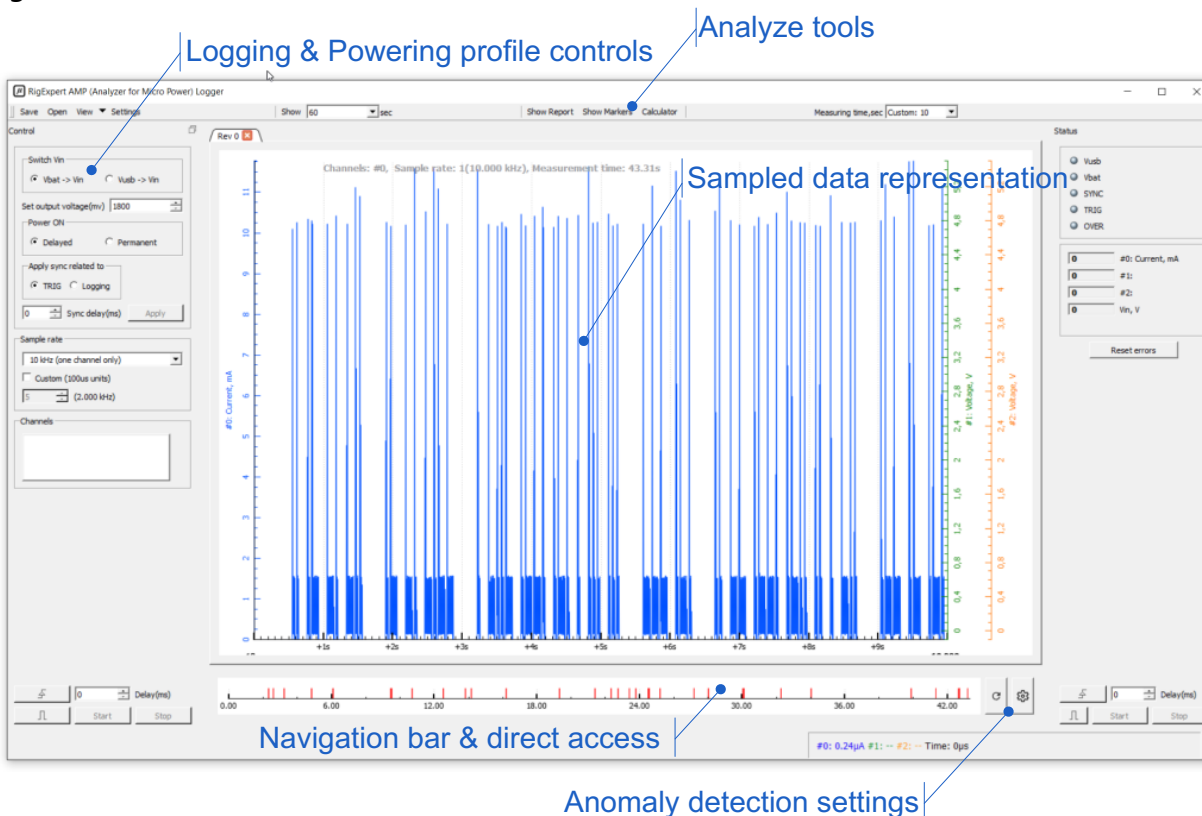
**Fig. 3.1. SW install**

 REAMP-Logger-setup-0.0.28.exe



- Please double click on REAMP setup icon, then press NEXT.
- Select the destination folder and press Install.
- Connect REAMP Logger to a USB port of your PC.
- Wait until USB HID drivers are automatically installed.
- Launch SW REAMP Logger and check the main window—see **Fig.3.2.**

Fig. 3.2. Main window



### Finding anomalies

When you work with an extremely large file of data logged, an **anomaly detector** can help you to find peaks and examine them. Just set peaks threshold to view all anomalies then click any of them on Navigate bar to access directly to appropriate segment of measurements.

### ZOOMing data

To zoom, move the cursor to mark the position of your interest on the measuring axis and rotate the mouse wheel. To return to default scale, just double click appropriate axis. You can also select a piece of data with the mouse to enlarge it.

## 4. Basic operation

- The device has two operation modes
- Stop mode.
- Logging mode—instantaneous measurements taking and their recording in a log file (hereinafter referred to as the measurement mode). In the measurement mode, configuration and control functions (except for the “STOP” button) and “Show Report” are not available.

Connect the DUT as shown in diagram **Fig. 2.1**.

To ensure normal operation of the DUT, set the required supply voltage and choose the power source.

Since a USB 2.0 port cannot provide the output of more than 500 mA of current, the REAMP has a built-in Li-ion battery.

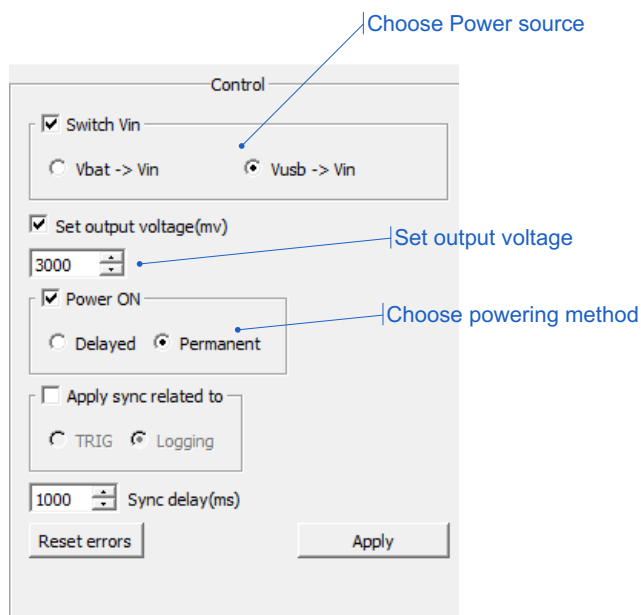
The battery is automatically recharged via a USB port. The charge algorithm: CC-CV, 250 mA current. When the battery is fully discharged (below 3 V), the power source will automatically switch to a USB.

In this case, remember that, until the battery is fully charged, a part of the USB port current will be allocated to charge the battery; therefore, only the remaining part of the total 500 mA current will be available for powering the DUT. The REAMP contains an internal overload protection circuit that limits the output current to:

- 0.5 A when powered via a USB.
- 1.5 A when powered by a battery.

### 4.1. Power control

**Fig.4.1. SYNC control.**

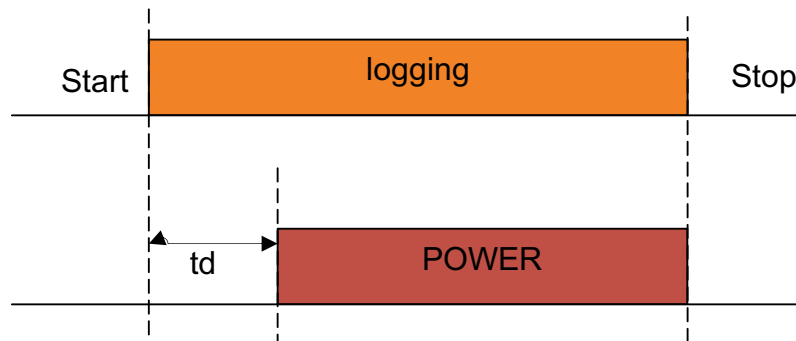


Controlled by the user in the stop mode only.

1. Choosing the power source: a USB or a battery.
2. Setting the output voltage (1800mV to 5200mV).
3. Apply a voltage to the DUT. There are two options:
  - Always on.
  - Deferred start with a delay linked to the measurement process. The delay time is 100 measurement samples but no more than 100ms—see **Fig. 4.2**.

**Press Apply button to make the new settings take effect.**

**Fig. 4.2. Delayed power supply**



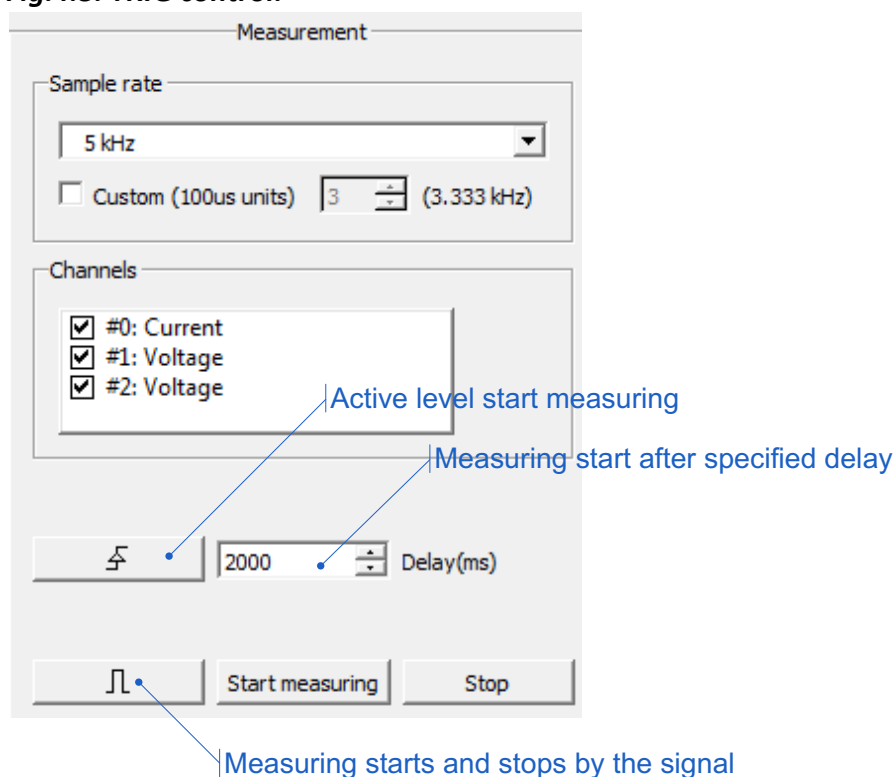
This mode can be useful when tracking abnormal peaks of power consumption when the DUT starts.

## 4.2. Triggering control and synchronization

In certain cases, when studying the DUT sleep modes, it may be necessary to trigger measurements synchronously (or with a specific delay) with a process taking place in the DUT circuit. Or vice versa, the gauge must trigger a process synchronously (or with a delay) relative to the start of measurements. For this purpose, the REAMP device has TRIG and SYNC signals.

### 4.2.1. Triggering (TRIG) control

**Fig.4.3. TRIG control.**



TRIG signal. Input.

The acceptable signal levels are:

Low (LOW):  $U < 1 \text{ V}$ .

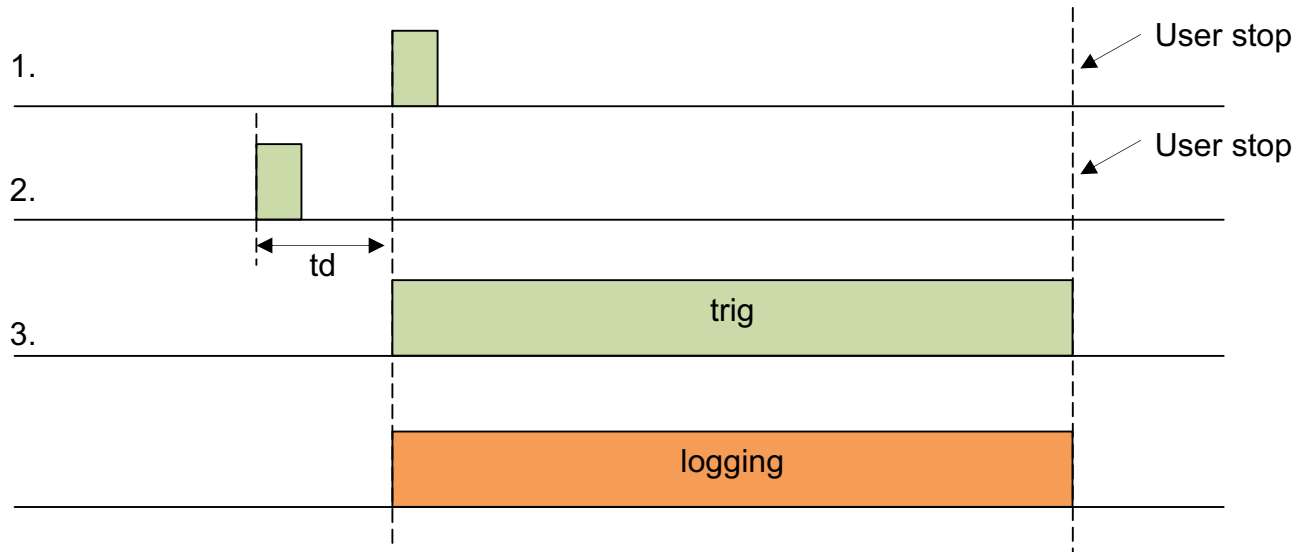
High (HIGH):  $10 \text{ V} > U > 2.5 \text{ V}$ . The active level is HIGH.

It allows an external source to trigger the measurement process. Three modes are available:

1. The active level triggers the measurement, the user stops the process arbitrarily.
2. The active level triggers the measurement after the configured delay, the user stops the process arbitrarily.
3. The measurement is triggered and stopped by a signal— see **Fig.4.4.**

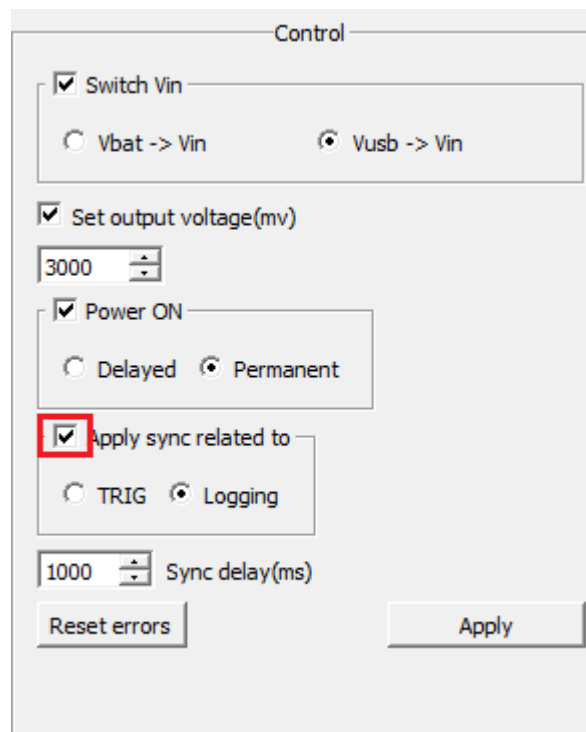
**Fig.4.4. TRIG modes**





## 4.2.2. Synchronization (SYNC) control

**Fig.4.5. SYNC control**



SYNC signal. OPEN-DRAIN output. The levels acceptable for this signal are:

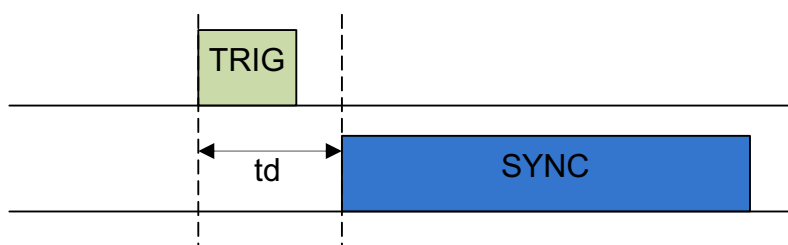
Low (LOW):  $U < 1 \text{ V}$ .

High (HIGH):  $U_{\text{up}} > U > 2.5 \text{ V}$ .

The active level is LOW. It enables synchronization of the external process with the measurement triggering process. Two modes are available:

1. Linked with the TRIG signal. Activated with a preset delay by the TRIG signal. Deactivated at the end of the measurement.
2. Linked with the measurement process. Activated with a preset delay after the start of the measurement and deactivated at the end of the measurement— see **Fig.4.6**.

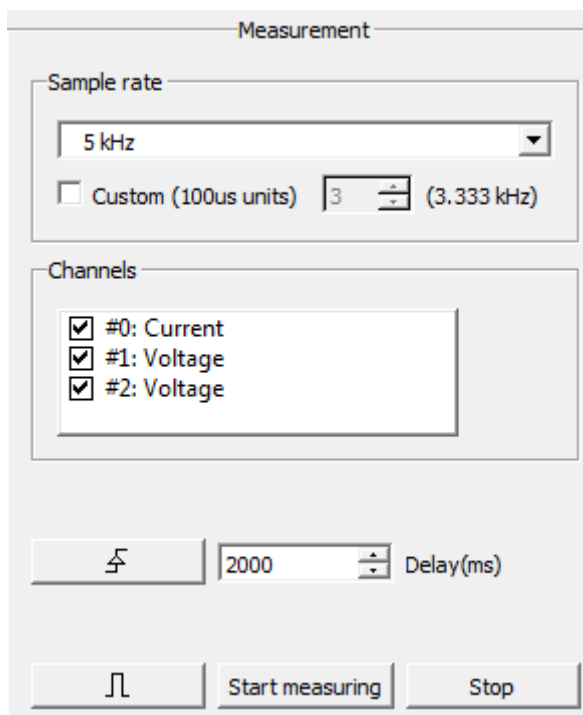
**Fig.4.6. SYNC modes**



### 4.3. Operation in the measurement mode

The measurement mode (logging) is the REAMP device operating mode which allows instantaneous sampling of the measured value, digitizing, displaying as a graph on the screen, as well as saving to a log file.

**Fig. 4.7. Measurement control**



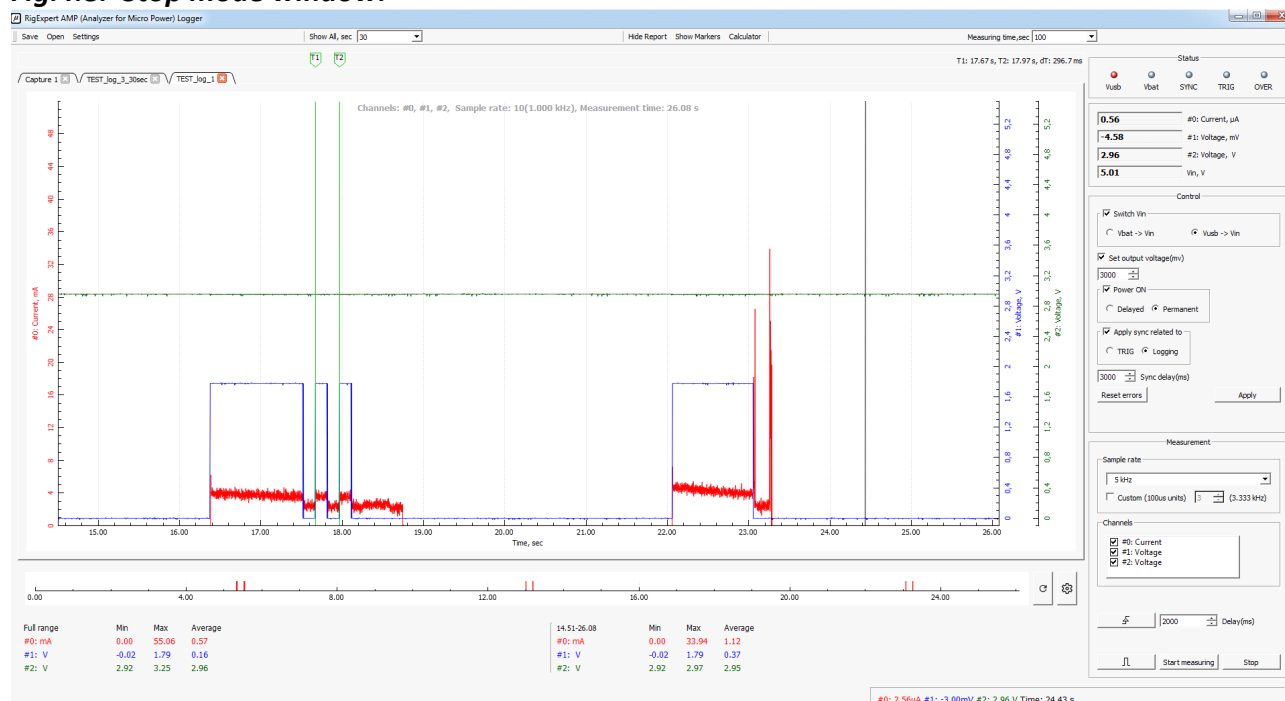
Elements of the measurement control panel — see **Fig.4.7**.

1. Setting the sampling frequency in kHz. The maximum sampling frequency of 10 kHz is available when single-channel gauge only is chosen.
2. Setting the sampling frequency in 100  $\mu$ s units.
3. Selecting a gauge channel.
4. Triggering the measurement mode. Each new measurement is performed in a new tab.
5. Quitting the measurement mode.

All settings are available only in the stop mode.

## 4.4. Operation in the stop mode

**Fig.4.8. Stop mode window.**



The screen in the stop mode is shown in **Fig.4.8, Fig.3.2**.

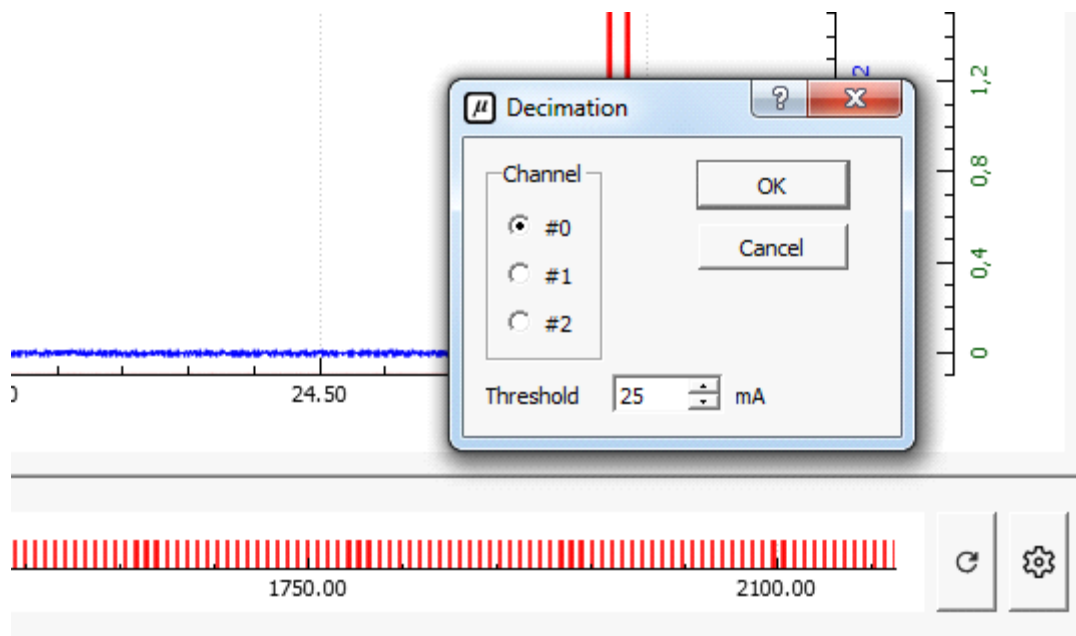
In this mode, you can change REAMP settings and measurement parameters, switch between tabs, save measurement results, operate with previously saved log files, navigate through the log.

- MTI (measuring time interval). Sets the time interval during, which measurements are taken.
- Measurer panel. This panel displays the current averaged current and voltages at the DUT control points, as well as the input voltage powering the REAMP (a USB or a battery).
- Mouse hints. Displays the values of measurable parameters at the point/location on the graph, to which the mouse pointer is moved.
- Report bar. Appears when the “Show report” button is pressed. Displays the maximums, minimums, and averages of the measurable values in the measurement period. In the left part, the result is displayed for the entire period of time specified in the “Show all” drop-down box — see the DTI (display time interval) in **Fig. 4.8**. In the right part, the result is displayed for the time interval currently visible on the screen (the DTI).
- DTI (display time interval). Sets a specific time interval that will be instantly displayed on the graph (squeezed into the main window).
- Time markers and markers hints. Allow the user to define specific time interval on the graph section of interest.

### 4.4.1. Working with data

In general, the MTI (measuring time interval) can be set in infinitely large range. In this case, the Navigation bar is provided to facilitate working with a large amount of data, — see **Fig. 3.2**. **Fig.4.9**.

**Fig.4.9. Navigation bar setup.**



In the Navigation bar settings, for each channel of the measurable parameter, you can set threshold values, the excess of which will be displayed in the Navigation bar. When you click on a section of the Navigation bar, it will be shown in the main display window.

For more detailed study of the graph section of interest, you can scale it horizontally and vertically. This can be done in two ways:

- Hold the left mouse button and select a section on the graph and then release the LMB.
- Place the mouse pointer below the horizontal axis and turn the scroll wheel to zoom horizontally.
- Similarly, place the mouse pointer on the left end of the axis (for current values) or on the right end of the axis (for voltages) to zoom vertically.

Additionally, by placing the mouse pointer below (to the left or to the right) of the desired axis and holding the LMB, you can drag the graph along the axis. To display the entire time interval of interest, use the DTI (display time interval) window and the “Show all” button—see **Fig.4.8**.

### 4.4.2. Additional tools

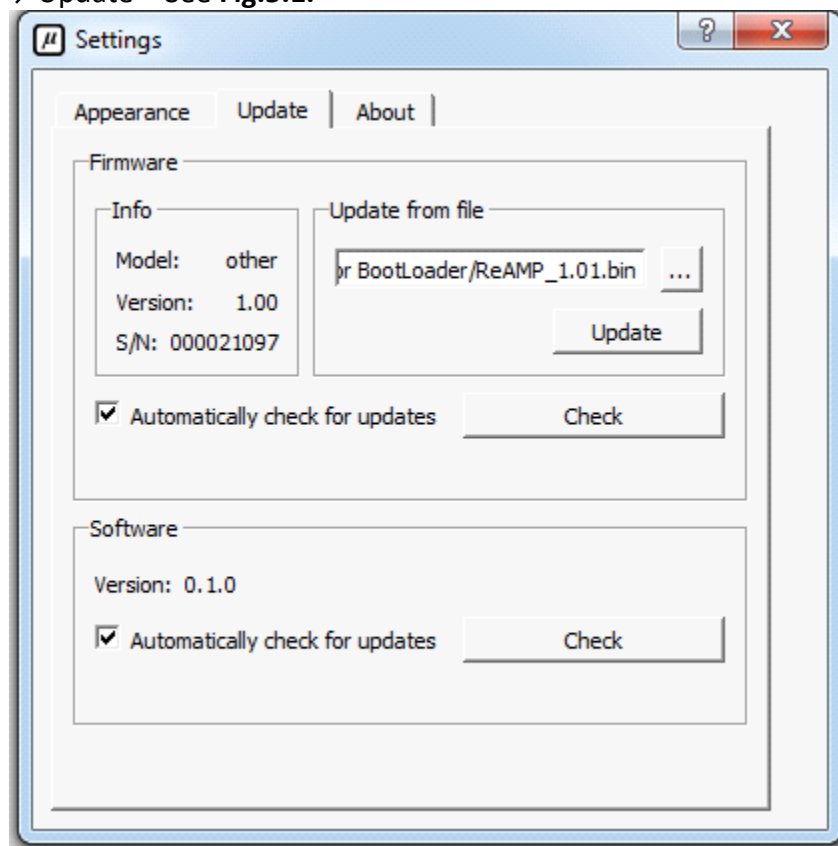
Calculator— see **Fig. 4.8.** —Tools. Based on the measurements obtained, the calculator allows you to quickly calculate the duration of the DUT operation from the power source with a given capacity.

\* The list of additional tools will be updated.

## 5. FW update

**Fig.5.1. FW update.**

Select Settings → Update - See **Fig.5.1.**



- Select file.
- Press the "Update" button.

## 5. Specification

Number of measuring channels: 3

Measuring range:

- Current – 10 $\mu$ A to 1A (1 channel)
- Voltage – 0V to 5V (2 channels)

Sample rate: 10 hZ...10 kHz (10 kHz one channel only)

Measuring results displaying:

- Instant values graph
- Average values in digital format
- Saving data to a log
- Easy navigation using horizontal and vertical zooming

Power supply:

- PC USB port
- Additional built-in Li-ion battery to be used when current consumption is over 500 mA

Interface:

- USB connection to a PC (USB 2.0, USB 3.0)
- Operation system Windows 7, Windows 8, Windows 10.
- Application software “REAMP Logger”
- 3 languages support (EN, UA, RU)

Dimensions: 67 mm x 57 mm x 27 mm

Operation temperature: 0...40 °C

Weight: 100 g.

Warranty: 2 years

REAMP Logger made in Ukraine.

**\* All specifications are subject to change without notice or obligation.**