

User Manual for Kunkin KP184 Modbus Software

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Introduction

Kunjin KP184 is a budget electronic load that back on 2020 packed a nice list of features:

- Works both at 110 and 230VAC
- DC load voltage up to 150V
- DC load current up to 40A
- DC load dissipated power up to 400W
- Measurement accuracy is 0.05% +5 counts offset for both current and voltage with 1mV / 1mA resolution
- RS232 or RS485 connectivity with Modbus protocol

Back in 2020 the manufacturer complimentary software however was hard to get, almost impossible to get it to run properly, badly translated and was not up to the task regarding the product potential.

There are many online reviews / teardowns / tweaks and suggestions about this product, those are not the point of this document.

Interflexo developed the KP184 Modbus software at first to fill an in house need for battery testing automation and then made it available to the rest of the community.

The KP184 Modbus software allows full device operating panel remote operation on the Modbus supported load test modes. This is a good thing. The device's operating panel is not very resilient, or practical and does not

tolerate heavy use or abuse. This way you can extend the useful life of your equipment for many years.

The special device test modes: 10Khz dynamic load (DYN), overcurrent protection test (OCP) modes and compare test (COP) modes are not Modbus friendly. The device's firmware has a minimum sample period of 250 ms.

The data acquisition works beautifully only limited by your disk size and file system limitations.

Burn-in tests for your new electronic device project or repair can be programmed, logged and plotted using any of the standard load modes Constant current (CC), constant voltage (CV), constant resistance (CR) and constant power (CW).

On the battery capacity CC/CW discharge and internal resistance test modes was possible to go beyond the product capabilities with extra features, improvements and automatically produce detailed test result PDF reports with curve plots.

A new test mode (SOL) was created for solar panels diagnostic with Isc/Voc characterization, I-V curve plot and MPP determination with a detailed PDF report.

A new CV load mode (CVL) was created with added software current limitation, it is operated in dynamic CC mode with a software configurable PID loop.

A new dynamic Cycle load mode (CYC) was created. It adds support for a user programmable custom variable load current profile of unlimited steps, ramps, and repetitions.

If you have any special needs in my mind about the remote use of this electronic load please drop me a line (interflexo@sapo.pt). After the work already done I have a good understanding after a quick assessment of what can be or can not be done.

System Requirements

- Kunkin KP184 or modded KP182 electronic load with its own supplied serial cable.
- x86 personal desktop computer, laptop, or notebook with 800×600 minimum resolution display, 1024×768 or more recommended.
- For processor type, system clock speed, amount of RAM, hard disk size and graphics card please observe the recommended system requirements for your particular operating system.
- A minimum of available 100Mb on disk (HDD or SSD) are required for software installation.
- USB port plus USB to serial adapter or RS232 serial port.
- Operating system Windows Vista/7/8/10 – 32 or 64 bit and Windows 11.

Software Installation Instructions

- Use one of the links below to download the executable installer to any folder with permissions. 32-bit for Win 7 and up. 64-bit for Win 8 and up.
- [Setup Installer V1.0.73.0 \(32-bit\)](#)
- [Setup Installer V1.0.73.0 \(64-bit\)](#)
- Open File Explorer.
- Navigate to the folder with the downloaded setup executable file.
- Select the setup executable file.
- Use the right mouse button to show the file context menu.
- Click the Run as administrator option.
- Follow all the prompts that appear.
- It is suggested that you follow all the defaults, but you can select an alternate directory for the installation.
- An optional application shortcut may be created on your desktop.
- Maintain your Windows system with all updates and current patches.

Note 1: Windows 10 may interrupt your kp184 Modbus install with a warning about “Microsoft-verified apps”. Kp184 Modbus is safe to install and use, so choose “install anyway”. See the Windows 10 warns me to use a “Microsoft-verified” app article for more information.

Note 2: Windows 10 in S mode does not allow the installation of kp184 Modbus or other apps from outside the Microsoft Store. You may change your system settings to allow for this and other installations you trust. See the Windows 10 S won't let me install Third-Party Apps article for more details.

Setup Installer Prompts

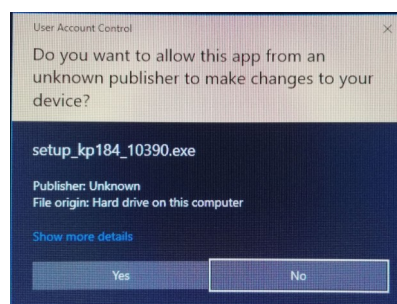
After starting the setup installer if your windows system has the Windows Defender Smartscreen enabled it will ask for confirmation, please click on the **More info** option.



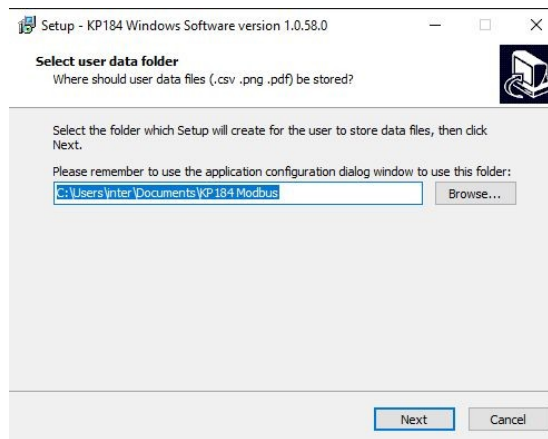
Click on the **Run anyway** button.



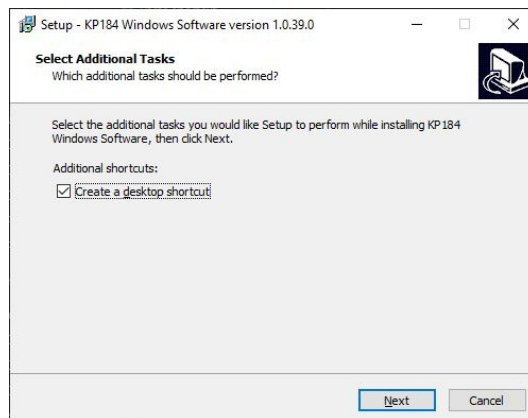
And confirm with the **Yes** button.



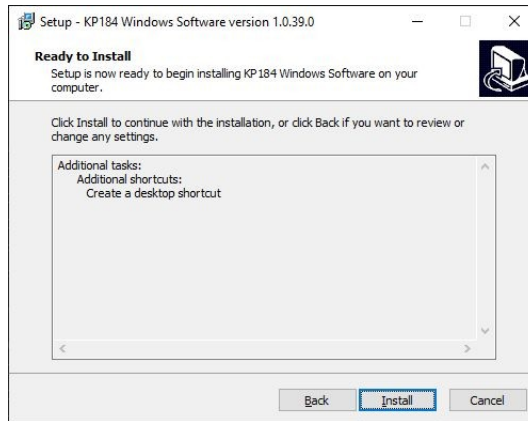
Select the folder that will be used to store user data files (“.csv”, “.png” and “.pdf”). The setup installer will create the folder if it does not exist. After the installation the user will use the application configuration dialog window to use this folder. During the installation of an updated application version the setup installer will suggest your last folder name entry. Confirm the folder name and click on the **Next** button.



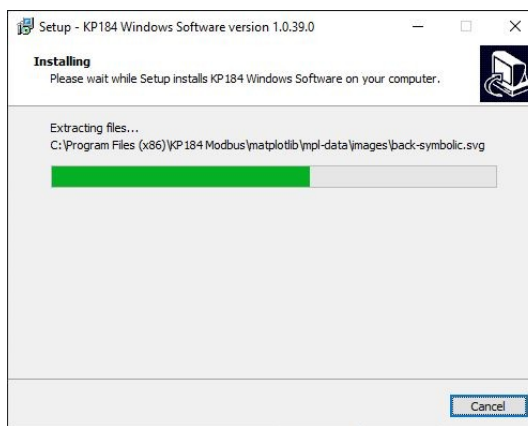
Confirm if you want to create a desktop shortcut and click on the **Next** button.



Click on the **Install** button.



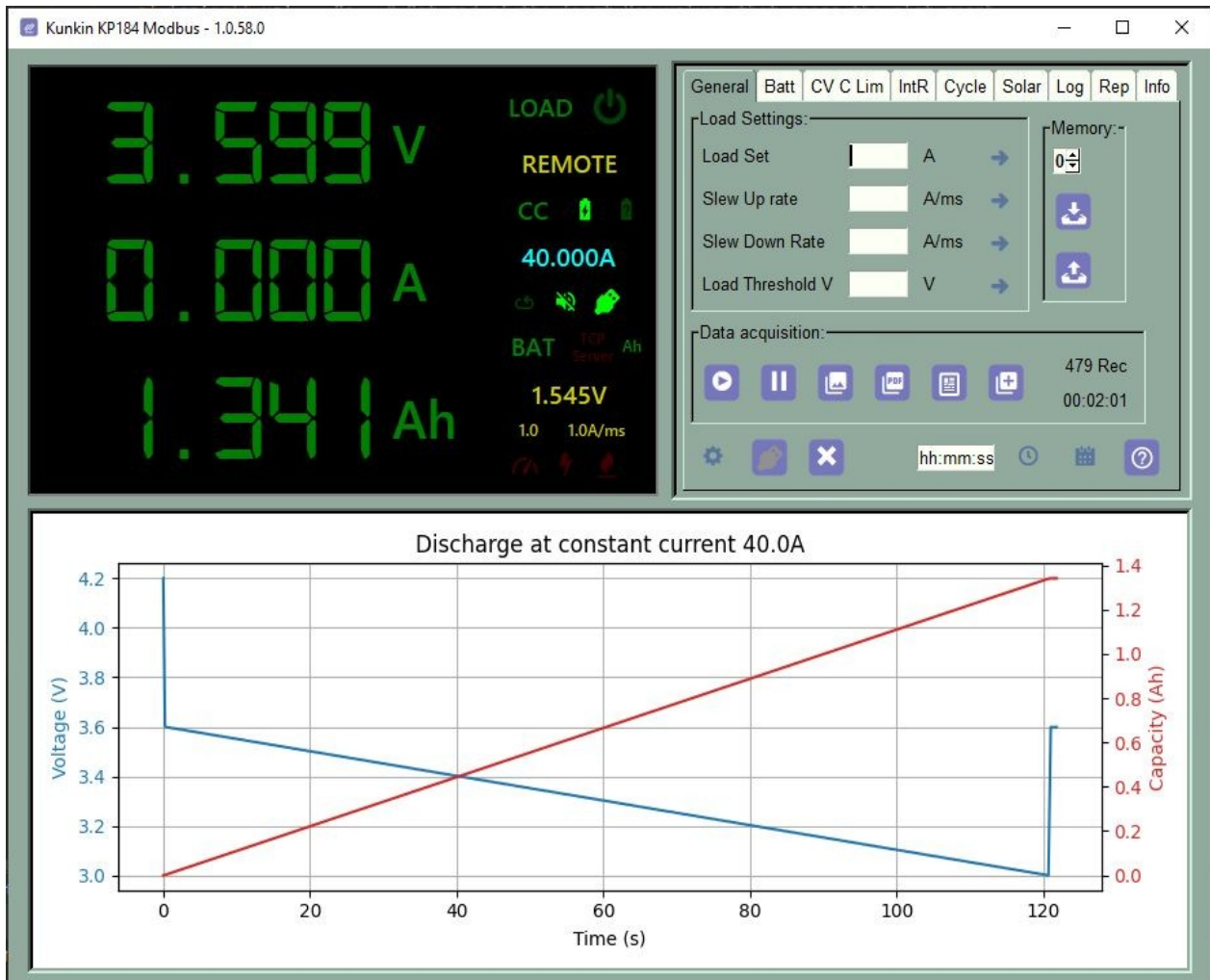
Wait for the installation process to finish.



Click on the **Finish** button to exit the setup installer.



Application Main Screen



Configuration dialog button. Disabled when connected to COM port.

Configuration Dialog Window

The screenshot shows a 'Configuration' dialog box with the following sections and settings:

- General Settings:**
 - KP184 Address (1..250):
 - Threshold voltage for Load OFF by software
 - Data capture sampling period in ms (>= 250):
 - CRC LSB First - 2020 FW and above
 - Beep on Load ON/OFF
- File Settings:**
 - May use "__DUT_BRAND__", "__DUT_MODEL__" or "__DUT_SN__" in file names
 - Captured data .CSV file name:
 - Graph .PNG file name:
 - Graph .PDF file name:
 - Battery capacity discharge / Solar panel test report .PDF file name:
- TCP Server Settings:**
 - Run TCP Server
 - Local IP Addr.:
 - Port:
- COM Settings:**
 - COM Port:
 - Baud rate:
- Registration Settings:**
 - Registration ID:
 - Registration Key:

Buttons:

The standard Kunkin KP184 operating parameters are omitted from this manual, please refer to the equipment manual for reference.

KP184 Address (1...250): Device communication address, must match the value configured on Kunkin operating panel.

Threshold voltage for Load OFF by software: The hardware threshold voltage for Load OFF on the Kunkin KP184 is implemented with some weird ramp that throttles down the current in an unstable way. This software option lowers the KP184 hardware programmed value by 500mV to get it out of the way and just cuts the load automatically when the programmed threshold value is reached.

The screen values are always refreshed 3 times per second. The **Data capture sampling period** refers to the .csv and plot graph data creation.

The captured data includes elapsed time in seconds, voltage, current, capacity (Ah) and energy (Wh). I probably should add Power in Watts.

Check the **CRC LSB First** option if you experience difficulties establishing the serial communication with KP184 later models (Firmware 2020 and up – can be checked through the Kunkin screen brief flash at startup)

File settings group: Default file names and folders for captured data, graph images and battery capacity discharge test reports.

A verification is made to check if the folder and path are valid. In error case it will default to “My Documents\KP184 Modbus\”.

All the data file names (.csv; .png; .pdf) are used as base file names, numbers are automatically added in subsequent files to avoid overwriting files.

__DUT_BRAND__ , __DUT_MODEL__ and __DUT_SN__ strings can be used on configured file names for csv data, image, PDF and report files. These substrings will be replaced on runtime with the Rep tab DUT report identification details.

TCP Server Settings group: The software can run an internal TCP Server to feed any TCP Client the device's real-time data. Configure the local IP and port for the TCP Server. The button "Get" gets the local IP information from the OS. Please refer to the TCP Server chapter for further information.

COM Settings group: Please specify the COM port and baud rate. The "Rescan" updates the COM port combo box list after inserting or removing a USB to Serial adapter.

Please use a decent USB serial adapter in the absence of a legacy COM port. A FTDI or Silabs processor chips are far better than a low cost Prolific or WCH. A Digitus DA-70156 USB 2.0 to Serial (FTDI/FT232RL) from ASSMANN Electronic GmbH costs 8,67 EUR + Shipping on Amazon. Don't need to break the bank.

The serial COM is a high latency communication. The protocol used is a Modbus RTU with CRC checks. COM Port configuration: 8,N,1 No hardware/software flow control. It will work reliably across the KP184 limits

from 2400 to 115200. Please favor the higher speeds to keep the application responsive depending on your adapter, cable and distances.

Registration Settings group: Application registration details. Please refer to the registration chapter for further information.

Returning to the main application window general tab:



Connects to the configured COM serial port



When connect the corresponding icon lights up on the black LCD panel area. When there is an adapter/cable/ baud rate problem the icon first flashes during five seconds trying to find the Kunjin KP184 then stays dimmed.



Exits the application.



Displays the application user manual PDF file.

All controls have tool tips (hints) when you carefully hover the cursor over the controls.

LCD Panel



Switches the electronic load ON/OFF. The dimmed image signals the OFF state.



Remote/Local Toggles the voltage sense mode. Local uses the power connectors and is affected by the voltage drop (proportional to the electronic load current) on the cables, connectors, etc. Remote uses the independent front BNC connector for voltage sense and is not affected by the voltage drop because it does not carry any meaningful current. You may connect the alligators directly to the battery (being tested) terminals, please respect the polarity. The assembly bellow costs about 7 Eur.



CV/CC/CW/CR Signals and Cycles through the four load modes. Constant Voltage, Constant Current, Constant Power and Constant Resistance.



Toggles battery capacity test mode ON/OFF. Mode ON unlocks Battery tab.



Toggles Internal resistance test mode ON/OFF. Mode ON unlocks In Resist tab.

0.000V/0.000A/0.000W/0.000Ω Shows the programmed load value



Toggles the Power up load state. OFF (dimmed) the electronic load is always OFF at power up. ON the electronic load remembers the last state when was power down and uses it at power up.



Toggles Kunjin KP184 key beep sound ON/OFF.

GEN/CVL/CYC/SOL Shows the Kunjin active test mode. Toggles between General (CV, CC, CW, CR), CVL (Constant Voltage Current Limited), CYC (Cycle – User Programmed Variable Current Load Profile) and SOL (Solar panel) test modes. Battery capacity test mode and Battery internal resistance test mode both have separate icons shown above.

0.000V Threshold voltage for load OFF programmed value. Please notice the tool tip (hint) to check for hardware or software handling type. When using the software type the indicator flashes red when stopping the load.

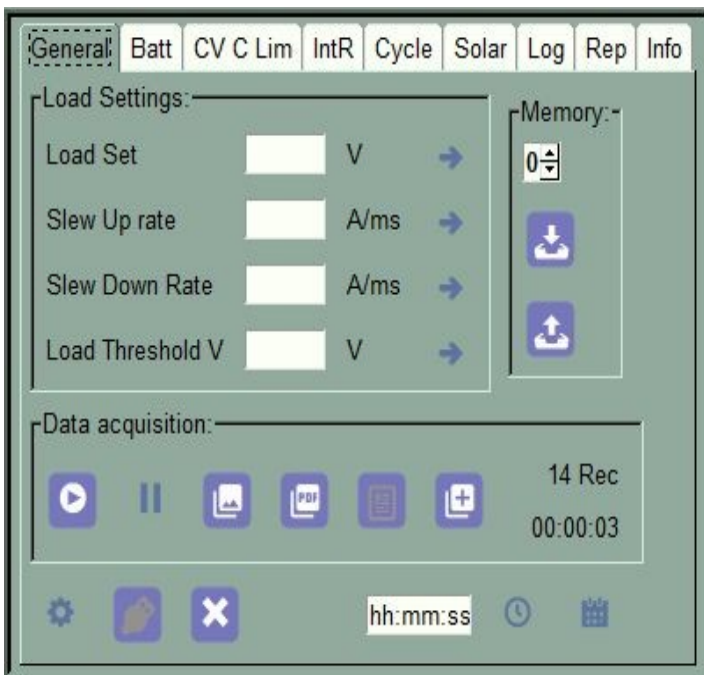
0.0 0.0 A/ms Current slew down rate and current slew up rate when switching ON/OFF.

 Overpower indicator. Power > 410W.

 Over voltage indicator. Voltage > 152V.

 Over temperature indicator.

General Settings



Load Settings

Set the:

Load Set Value: 0..150V;
0..40A; 0..400W; 0..8000Ω

Slew Up rate: 0..100A/ms


Slew Down rate: 0..100A/ms


Threshold Voltage: 0..150V

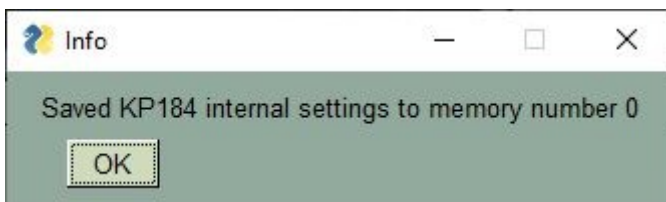
→ And use the corresponding send button. The new setting is sent to Kunkin KP184. This button can appear enabled or disabled

according to the setting entered string syntax validation and COM port communication status.

Preset Memories

 Preset memory load button. Loads settings from preset memory number (0..9) defined on the spin box and sends them to Kunin KP184.

 Preset memory save button. Saves settings from Kunin KP184 to preset memory number (0..9) defined on the spin box.



A non blocking pop up window confirms the selected operation.

Settings involved on preset memories:

key_sound

power_up_state

voltage_sense

load_mode

cv_setting

cc_setting

cr_setting

cw_setting

threshold_volt

slew_up_rate

slew_dn_rate
dynamic_mode_1
level_1_cur
level_1_tim
level_2_cur
level_2_tim
dynamic_mode_2
battery_mode
bat_end_volt
bat_go_half_cur
bat_cap_units
bat_test_over_signal

Data Acquisition



Erases previous memory data. Start collecting new data.



Pauses/Resumes collecting data.



Saves collected data on a previously configured .csv file name and folder. The file name is used as a base file name, numbers are automatically added in subsequent files to avoid overwriting files. It can be used during data acquisition to follow up during long processes. A progress window is shown during the file creation process. The system can save more than 14.000 records per hour. Adjust the data sampling period (> 250ms) on the configuration dialog window according to your needs.



Saves the plot graph on a previously configured PDF file name and folder. The file name is used as a base file name, numbers are automatically added in subsequent files to avoid overwriting files. It can be used during data acquisition. A matching “.png” image file is also added for easier document insertion. After file creation the PDF file is automatically opened on Adobe Acrobat Reader or configured web browser.

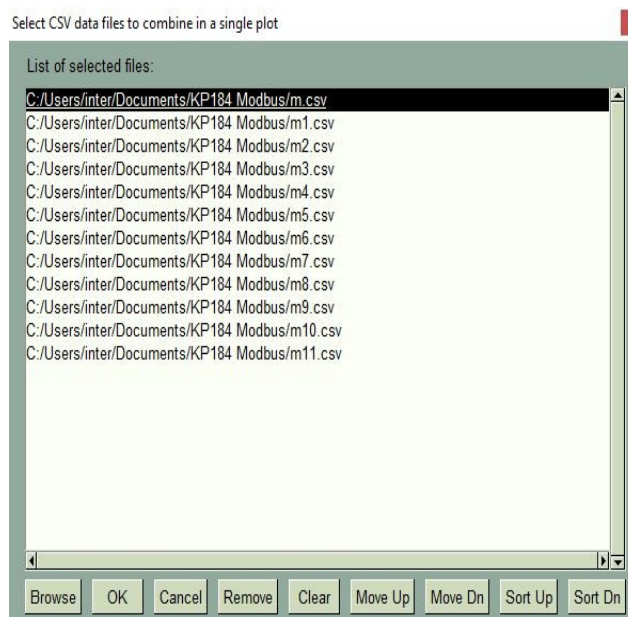


Creates a battery capacity discharge test PDF report, solar panel test PDF report or multiple battery internal resistance test PDF report according to the current selected test mode. When using battery capacity test mode this option creates a detailed report page including battery identification, capacity and internal resistance test results and test settings. Please refer to page 36 for details about this report.

Combine Multiple Plots



Allows the selection of several .CSV similar test data files to superimpose on the same plot graph.



The button “Browse” allow multiple file selection. You can select “Browse” many times to select multiple files from different folders. A verification is made to remove full path duplicates. The file name (without extension) will also name each line graph and should be unique to avoid confusion.

The selected .CSV files data must:

- Have have the same number of columns.
- Column names must be same as used by the KP184 Modbus application.
- Time column must be the elapsed time not time stamp.
- The current must be constant except for the periodic internal resistance test current short pulses.

The button “Remove” deletes the select line on the list.

The button “Clear” deletes every element of the list.

The buttons “Move Up” and “Move Dn” move the selected line on the list up or down one line.

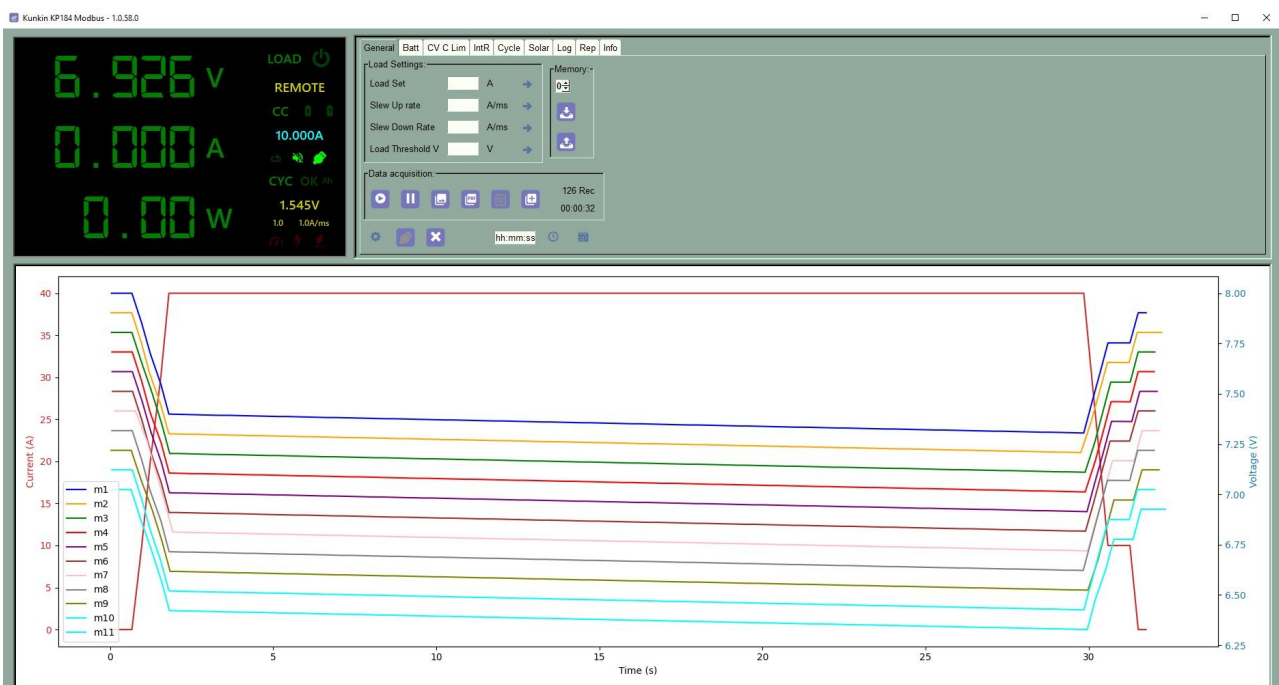
The buttons “Sort Up” and “Sort Dn” sort all the full path file names in a descending or ascending order. The order is important because it will the same on the plot graph curve legend.

Select the button “OK” to continue or the button “Cancel” to abort.

These superimposed plot graphs can be used to:

- Compare the battery cell constant current discharge test voltage curve at various C rates.
- Compare the battery cell constant current discharge test voltage curve at various temperatures.
- Compare various cells constant current discharge test voltage curve from the same battery to find “weak” cells.

The size of the plot graph affects the automatic placement of the graph legend. Resize the application window to get the best results.



The number of saved records is constantly updated as well as the elapsed time in the format hh:mm:ss.



The right mouse button clicked inside the Data Acquisition frame free top line invokes the context menu for:

- The time data type selection (Elapsed time in seconds or Time Stamp) regarding plot graph horizontal time axis and CSV data export.
- The plot graph independent (blue and red) line style selection from Solid, Dashed, Dash-Dot and Dotted styles.

The selected options are saved on the configuration defaults file on application exit.

Timer to turn Load ON/OFF



Calendar date picker for timer to turn Load ON/OFF. Adjust this setting prior to COM port connection. The settings below can be adjusted during serial communications.



Timer disabled



Timer enabled to turn Load ON at a specific date and time



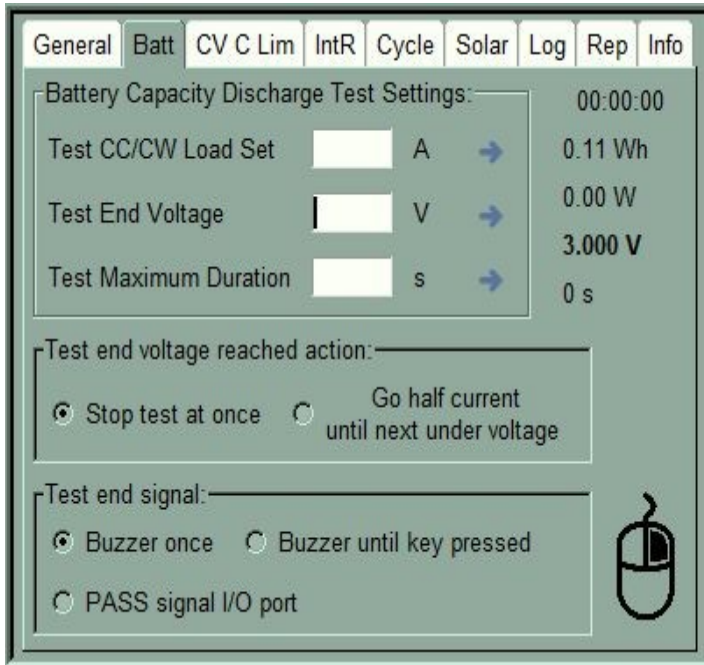
Timer enabled to turn Load OFF at a specific date and time


These last three buttons cycle through each other when the user clicks the button. The tool tips (hints) are always updated.

The input text box accepts a time in the format hh:mm:ss. Adjust this setting preferably with Timer disabled.

The input text box content is always checked for errors and in case of invalid value the current time is used and the timer is disabled.

Battery Capacity Discharge Test



 Toggles battery capacity test mode ON/OFF. Mode ON unlocks Battery tab.

The load test modes available on battery test mode are limited to CC (Constant Current) and CW (Constant Power).

Use the load mode toggles on the LCD area to set the load mode.

Test Settings

Fill the Load Set Value and End Test Voltage (LVC) and

→ use the corresponding send button. This button is enabled based on the entered setting string syntax and COM port communication status.

Test end voltage can be set as low as 0.5V for lower currents. The ability of KP184 can get as low as 0.5V depends on the test current, the device only guarantees a minimum of 1V load voltage on the entire current range (0 to 40A).

The software supervises LVC value and finishes the test even if Kunkin KP184 feels like going further.

The Max Duration input text box allows the user to specify a maximum test duration in seconds. Zero disables this feature.

To start the test use the Load Switch button:



When the test starts:

- The test stops automatically according to the programmed End Voltage and Max Duration parameters.
- The data acquisition is started and terminated automatically.
- The selected capacity units for the plot graph are based on the current choice for the LCD display Ah/Wh at the beginning of the test.

End Voltage Reached Action

Kunkin KP184 reports the memory register corresponding to this parameter when changed through the Kunkin KP184 configuration menus but does not change the internal parameter when the software sends the write memory command.

This occurrence happens on several other features. Once again the Kunkin software behaves in the exact same manner. There are no errors reported through the Modbus protocol.

This feature was implemented by software.

“Stop test at once” option ends the test when the programmed end voltage condition is reached.

“Go half current until the next under voltage” option lowers the discharge current to half the initially configured value at least 10mV prior to the test end voltage reached mark. The next time the test programmed end voltage condition is reached the test is ended. A specific log is added for this event.

In case of high voltage instability due to bad connections or other reasons the 10mV step may not be enough to avoid tripping prematurely the test end voltage condition. Please check your electric connections.

End Test Signal

The radio buttons show the parameter value and allow the user to change it.

The options are:

- Buzz once
- Buzz until a key is pressed on the Kunin KP184
- The PASS output electric signal is enabled after the test is finished

Under battery test mode:

- The plot graph displays a line for the voltage and another for the capacity.
- On the LCD area the large Power indicator shows the battery capacity (Ah). Clicking on it resets the capacity value to 0.0Ah.

- On the LCD area the **Ah/Wh** indicator allows the user to switch between Ah/Wh when clicked. The alternate units and Power are always displayed the battery tab.

Battery tab right click menu

Using the mouse right click button on the “Bat” tab opens the following context menu:



The menu current selected options are the dimmed ones.

The capacity (Ah) plot curve may be suppressed on the battery capacity discharge test plot graph, voltage curve plot graph display only. You can use these options during setup or capacity test any number of times, the plot

graph is recreated with the user latest choice. After test completion it is not possible to change the test plot graph any more.

The user can optionally ask for periodic battery internal resistance test calculation during the capacity discharge test. A user selectable number of data points will be evenly acquired from the start to the test end voltages. The data points include the battery internal resistance in Ohms and the capacity (Ah) at it was calculated. At the end of the test the %SOC is calculated for each data point.

The parameters to perform the battery internal resistance test are extracted from the “IntR” tab. Before defining the battery capacity discharge test parameters, please enter Battery Internal Resistance test mode, and verify the “IntR” tab parameters.

The number of periodic internal resistance tests performed during the battery capacity discharge test can be selected from the list [4, 6, 8, 10, 12] on the same context menu.

The test plot horizontal time axis and CSV export data may use the test elapsed time or timestamps selectable by the same context menu.

The results appear on the PDF report and on the “Log” tab.

These settings are stored on the application configuration defaults .ini file.

Enabling or disabling the automatic internal resistance test can't be done after the battery capacity test is started, please do it during the setup operations.

Enabling or disabling the automatic internal resistance test causes the current plot graph and paused acquired data to be deleted.

There are interlocks in place to avoid changing the “test end voltage” and the “set current” parameters during the battery capacity discharge test if the periodic internal resistance tests are enabled. If the periodic internal resistance tests are not selected these parameters can be adjusted during the battery capacity discharge test.

“Cycle” and “IntRes” tabs are accessible on Battery test mode when “Cycle current profile” or “Periodic Internal Resistance Test” options are enabled.

“Cycle Current Profile” option enables the use of a custom programmed periodic current profile defined on “Cycle” tab instead of the standard constant current or constant power load types.

Please refer to page 46 for details about building a custom programmed periodic current profile.

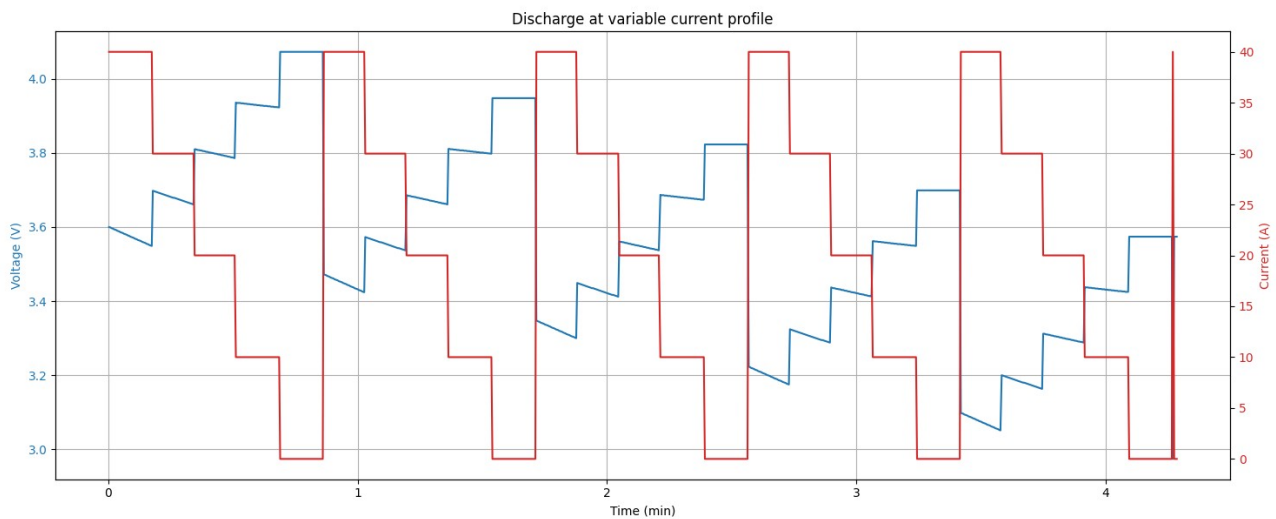
Selecting “Cycle Current Profile” option:

- Automatically disables the Periodic Internal Resistance Test during the battery capacity discharge test.
- Automatically disables the capacity curve plot, the variable current profile will be plotted as second curve.

- “Continuous cycle” infinite cycle will be automatically selected. The custom programmed current profile will be repeated until the battery capacity discharge test end condition is met.

Cycle Current Profile example:

```
// <- This indicates the line is a comment
// Current Step format: Amps Seconds
// Current Ramp format: Amps1 Amps2 Seconds
// 0 Amps for OFF period. All floats
40 10
30 10
20 10
10 10
0 10
```



The options for changing the line styles of the red and blue plot graph lines are self explanatory.

The optional 1,5s delay on the battery capacity test low voltage cut-off detection avoids the unwanted test abort condition on quick voltage dips.

Battery Capacity Discharge / Solar Panel Test Report

The report creation is a silent operation. However a line is added to the application log when the report is created.

DUT Report Identification Details

The screenshot shows a software window with several tabs: General, Batt, CV C Lim, IntR, Cycle, Solar, Log, Rep, and Info. The 'Rep' tab is selected. The main area of the window contains the following text and input fields:

Device under test (DUT) ID data for the battery capacity discharge test and solar panel PDF test result reports:

Brand name:

Model name:

Id or SN#:

Comment:

The battery or solar panel identification details that will be used on the test reports can be filled on the Rep tab.

These are simple text fields, you can type anything you want or leave them blank.

Please refer to page 20 regarding this report's generation button placement

(General settings tab / Data acquisition frame / Last button on the right).

The battery capacity test PDF report is created if:

- Test mode Battery capacity test is enabled.
- Load is OFF.
- Data recording is OFF.
- Discharge test capacity value in Ah is not null.
- Discharge test elapsed time is not null.

- The test result graph PNG file was successfully created.

The battery capacity discharge test may have ended automatically when the end test voltage was reached, time limit was reached or test was user terminated or temporary suspended by a load OFF command.

The solar panel test PDF report is created if:

- Test mode Solar panel test is enabled.
- Load is OFF.
- Data recording is OFF.
- Maximum power MPP value is not null.
- The test result graph PNG file was successfully created.

The multiple battery internal resistance test PDF report is created if:

- Test mode Internal Resistance test is enabled.
- Load is OFF.
- At least one battery internal resistance test was completed.
- There is no current test in progress.

The report is saved on a previously configured PDF file name and folder. The file name is used as a base file name, numbers are automatically added in subsequent files to avoid overwriting files. After file creation the PDF file is automatically opened on Adobe Acrobat Reader or configured web browser.

Please read the chapter referring to the Info tab. There you will find information regarding the way to optimize the report vertical page space and size of the plot graph.

On the next pages you can find several examples of test report pages:

Battery Capacity Discharge Test Report

Test Equipment: Kunkin KP184

Date: 04/10/2022

DUT Brand: No Brand

DUT Model: Hybrid 25Ah 5C

DUT ID/#SN: 843643858793

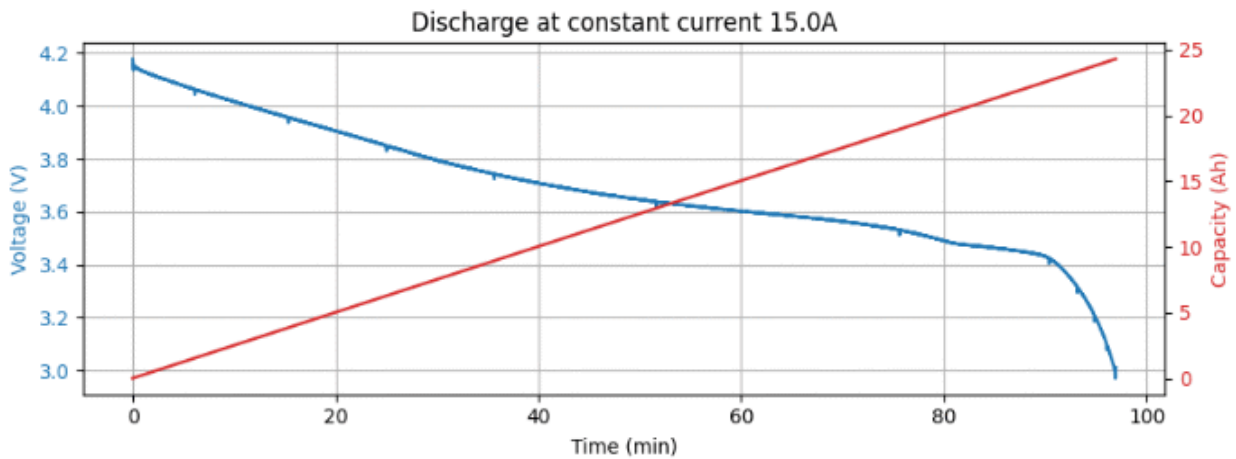
Periodic Internal Resistance Test

Load Set: 15.000 A

Pulse 1: 0.8 s 15.0 A

Test End Voltage: 3.000 V

Pulse 2: 0.8 s 30.0 A

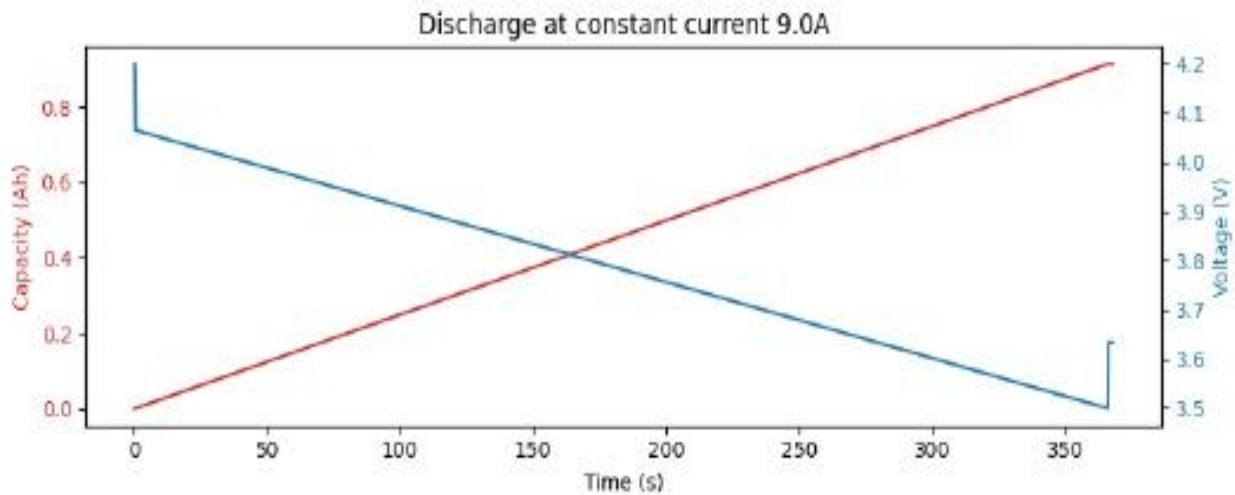


Test Results:

	SOC:	Internal Resistance:
Battery Energy: 89.62 Wh	99.9 %	1.4 mOhm
Battery Capacity: 24.272 Ah	93.7 %	1.3 mOhm
Discharge Time: 01:36:55	84.1 %	1.3 mOhm
Discharge Current: 15.000 A	74.2 %	1.3 mOhm
Start Voltage: 4.178 V	63.2 %	1.3 mOhm
End Voltage: 2.990 V	46.7 %	1.3 mOhm
	22.0 %	1.3 mOhm
	6.8 %	1.4 mOhm
	3.9 %	1.5 mOhm
	2.1 %	1.5 mOhm
	0.9 %	1.6 mOhm
	0.0 %	1.7 mOhm

Battery Capacity Discharge Test Report

Test Equipment: Kunkin KP184
Date: 18/11/2021
DUT Brand: Qwic
DUT Model: Trend 4
DUT ID/#SN: #1234567890#
Load Set: 9.00 A
Test End Voltage: 3.5 V

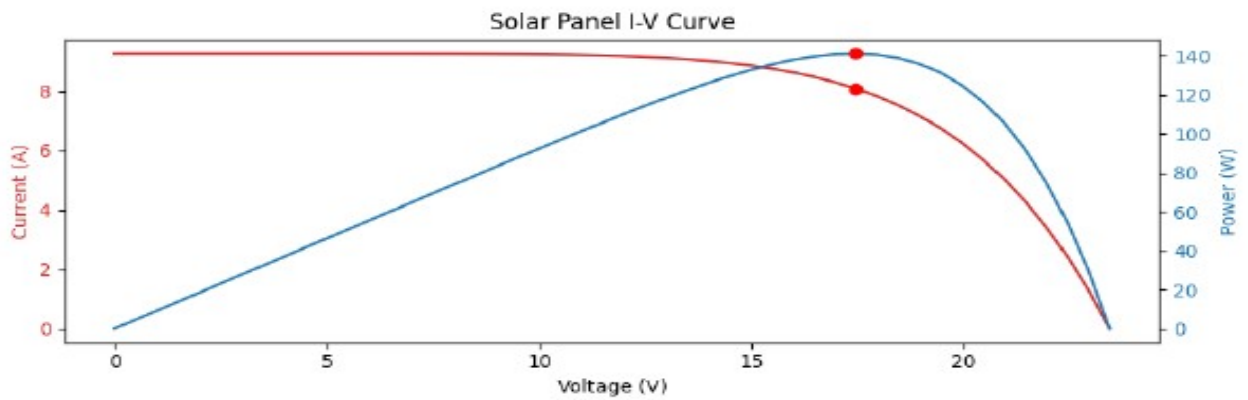


Test Results:

Battery Energy: 3.46 Wh
Battery Capacity: 0.91 Ah
Discharge Time: 00:06:07
Discharge Current: 9.00 A
Start Voltage: 4.2 V
End Voltage: 3.5 V

Solar Panel I-V Test Curve Report

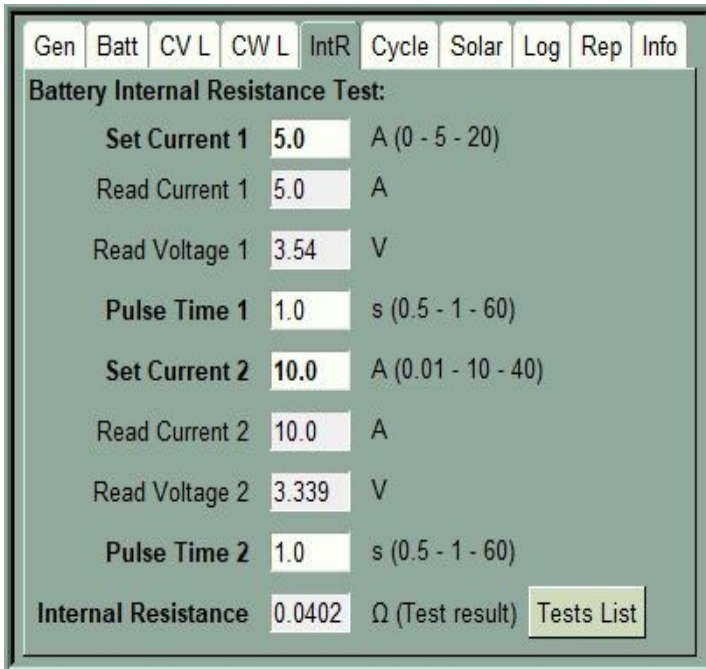
Test Equipment: Kunkin KP184
Date: 18/11/2021
DUT Brand: Qwic
DUT Model: Trend 4
DUT ID/#SN: #1234567890#



Test Results:

Open circuit voltage Voc: 23.441 V
Short circuit current Isc: 9.258 A
Maximum power MPP: 141.09 W
Maximum power point voltage Vmp: 17.455 V
Maximum power point current Imp: 8.083 A

Battery Internal Resistance Test



In the black LCD panel area:

Toggles Internal resistance test mode ON/OFF. Mode ON unlocks In Resist tab.

Fill the “Set Current 1” and “Set Current 2” step pulse values. Use large and differentiated paired values like 1A and 2A or 5A and 10A

depending on the specification of the equipment you are testing. Use remote voltage sense to rule out cable and connectors voltage drops and calculate meaningful results.

The current step pulse times are configurable. These tests can meet IEC 62620 standards for Li-ion batteries and IEC 61951-2 standards for Ni-MH batteries.

As a standard DCIR test please allow 1 second duration for Kunkin KP184 voltage settling.

DCIR is a function of the battery state of charge (SOC). Ideally SOC should not change during the test.

If you know what you are doing you can customize longer pulse times to meet your needs.

The first step may be configured to 0A to measure the battery internal resistance from an open circuit voltage (OCV) state.

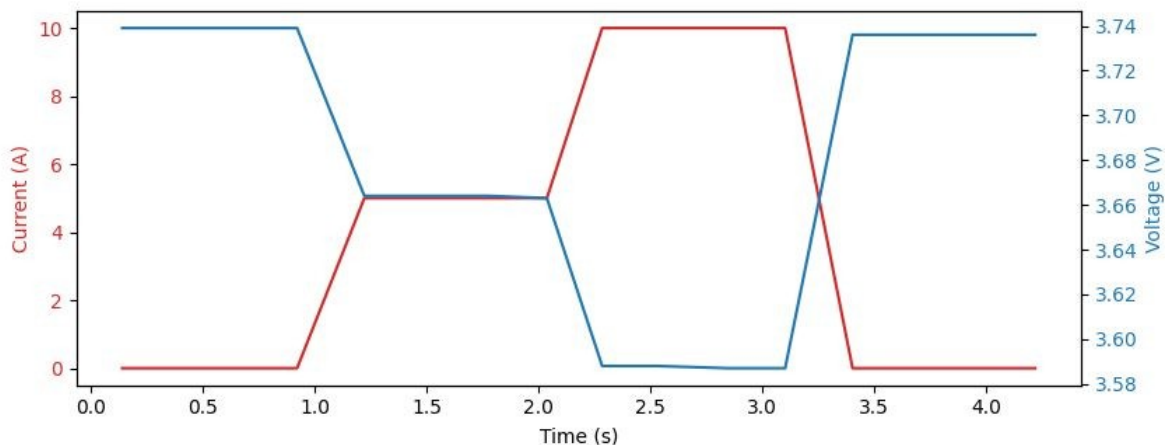
The result in ohms (Ω) is displayed on the bottom under “Internal resistance”.

To start the test use the Load Switch button:



The test stops automatically.

Before pressing the Load Switch icon you may switch to the "General" tab and start data acquisition to log the process to gain access to plot graph and optional saving of .csv data. Do remember to manually pause collecting data on the same tab after the process is finished.



This mode is implemented in software. It is impossible to change the Kunin KP184 parameters by serial port regarding this test. Once again the Kunin software behaves in the exact same manner.

The “Tests List” button opens a new window and allows the user to edit the multiple battery internal resistance tests list. This is used to characterize a group of different cells regarding the OCV and the DC internal resistance.

Brand	Model	SN#	OCV (V)	IRes (Ω)	Step 1 (A)	Step 2 (A)
Samsung	INR18650-15M	19966990	3.74	0.0402	5.0	10.0
Samsung	INR18650-15M	19966991	3.738	0.0404	5.0	10.0
Samsung	INR18650-15M	19966992	3.736	0.0404	5.0	10.0
Samsung	INR18650-15M	19966993	3.734	0.0402	5.0	10.0
Samsung	INR18650-15M	19966994	3.732	0.0402	5.0	10.0
Samsung	INR18650-15M	19966995	3.73	0.0402	5.0	10.0
Samsung	INR18650-15M	19966996	3.727	0.0404	5.0	10.0
Samsung	INR18650-15M	19966997	3.725	0.0404	5.0	10.0
Samsung	INR18650-15M	19966998	3.723	0.0402	5.0	10.0
Samsung	INR18650-15M	19966999	3.721	0.0402	5.0	10.0

Brand: Model: SN#:

For each individual battery internal resistance test performed there is a corresponding line on the grid.

The grid shows 7 columns corresponding to the DUT (Device Under Test) information (Brand, Model and SN#), OCV (Open Circuit Voltage) at the beginning of the test, DC Internal Resistance Test Result and the two step current values used for each test.

The “Edit” button edits the three DUT information fields of the selected test.

The “Delete” button removes the selected test line permanently from the grid.

The “Move Up” button moves the selected test line up one line.

The “Move Down” button moves the selected test line down one line.

The “Clear” button erases all tests permanently from the list. Exiting the Internal Resistance Test mode also clears the tests list information.

The “OK” button dismisses the window.

The multiple internal resistance tests list can be printed as a PDF report using the “Save .PDF report” button on the General tab. The PDF report handles multiple pages and provides column headings at the beginning of each page.

Internal Resistance Test List Report

Test Equipment: Kunkin KP184

Date: 14/02/2024

Brand	Model	Serial #	OCV (V)	Int Res (mΩ)	Step 1 (A)	Step 2 (A)
Samsung	INR18650-15M	19966990	3.740	40.2	5.0	10.0
Samsung	INR18650-15M	19966991	3.738	40.4	5.0	10.0
Samsung	INR18650-15M	19966992	3.736	40.4	5.0	10.0
Samsung	INR18650-15M	19966993	3.734	40.2	5.0	10.0
Samsung	INR18650-15M	19966994	3.732	40.2	5.0	10.0
Samsung	INR18650-15M	19966995	3.730	40.2	5.0	10.0
Samsung	INR18650-15M	19966996	3.727	40.4	5.0	10.0
Samsung	INR18650-15M	19966997	3.725	40.4	5.0	10.0
Samsung	INR18650-15M	19966998	3.723	40.2	5.0	10.0
Samsung	INR18650-15M	19966999	3.721	40.2	5.0	10.0

Choosing current pulses for IR test

KP184 has a voltage accuracy of +/-0.05% +5mV. The table below shows the impact of this accuracy on the calculated IR error. The lower the cell IR (Internal Resistance) is the higher the current pulses should be.

Examples are provided for:

5 Cell IR reference values (1.5, 15, 30, 90 and 150 mOhm)

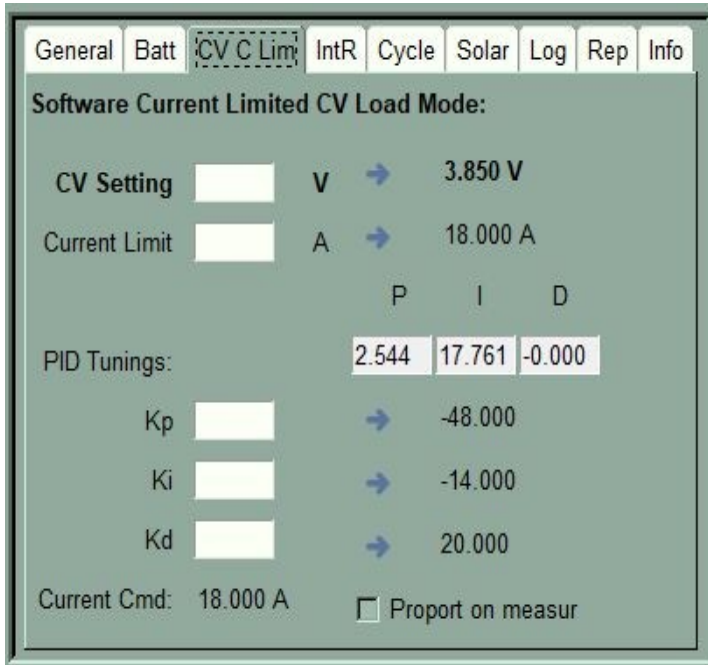
4 Test current pulse levels (0.05 - 0.1, 0.5 - 1, 5 - 10, 15 - 30 A)

IR Test Pulse Current Selection

Cell IR (Ohm)	Pulse 1 (A)	Pulse 2 (A)	Read V1 (V)	Read V2 (V)	Calc IR (Ohm)	IR Max Error (Ohm)
3.7 0.007 KP184 Voltage accuracy						
0.0015	0.05	0.1	3.700	3.700	0	0.1370
0.0015	0.5	1	3.699	3.699	0	0.0137
0.0015	5	10	3.693	3.685	0.0016	0.0014
0.0015	15	30	3.678	3.655	0.0015	0.0005
0.015	0.05	0.1	3.699	3.699	0	0.1370
0.015	0.5	1	3.693	3.685	0.016	0.0137
0.015	5	10	3.625	3.550	0.015	0.0014
0.015	15	30	3.475	3.250	0.015	0.0005
0.03	0.05	0.1	3.699	3.697	0.04	0.1370
0.03	0.5	1	3.685	3.670	0.03	0.0137
0.03	5	10	3.550	3.400	0.03	0.0014
0.03	15	30	3.250	2.800	0.03	0.0005
0.09	0.05	0.1	3.696	3.691	0.1	0.1370
0.09	0.5	1	3.655	3.610	0.09	0.0137
0.09	5	10	3.250	2.800	0.09	0.0014
0.09	15	30	2.350	1.000	0.09	0.0005
0.15	0.05	0.1	3.693	3.685	0.16	0.1370
0.15	0.5	1	3.625	3.550	0.15	0.0137
0.15	5	10	2.950	2.200	0.15	0.0014
0.15	15	30	1.450	-0.800	0.15	0.0005

Please read the datasheet of the cell being tested and set the test higher current pulse near the cell pulse current limit for best results.

CV Current Limited Load Mode



This is a software current limited CV (constant voltage) load mode.

Kunkin KP184 is hardware configured to CC (constant current) and a software configurable PID loop holds the user configured CV setting by automatically adjusting the CC load.

Please understand that with an update period of 250ms this process is only viable for fairly stable circuits.

GEN/CVL/... Toggle the test mode indicator to access CVL test. It unlocks In CVL tab.

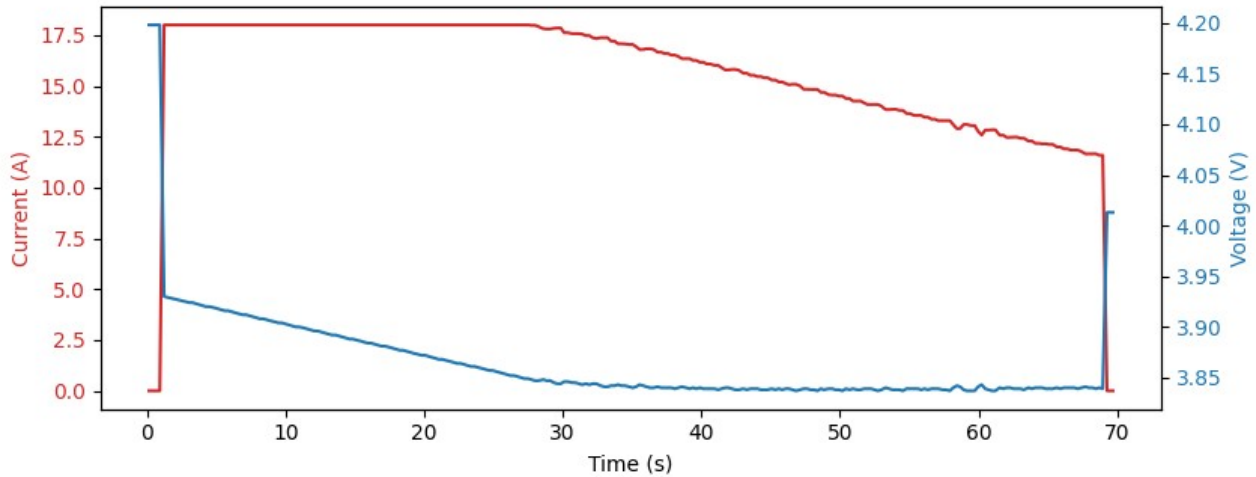
Fill the CV Setting voltage and the current limit.

Kp, Ki, Kd adjusts the PID gains on the fly to keep the process stable.

Proportional on Measurement: To eliminate overshoot in certain types of systems, the application can calculate the proportional term directly on the measurement instead of the error.



To start/stop the test use the Load Switch button:



Load Settings:

CV Setting: 3.85V
 Current Limit: 18A

Kp: -48
 Ki: -14
 Kd: 20

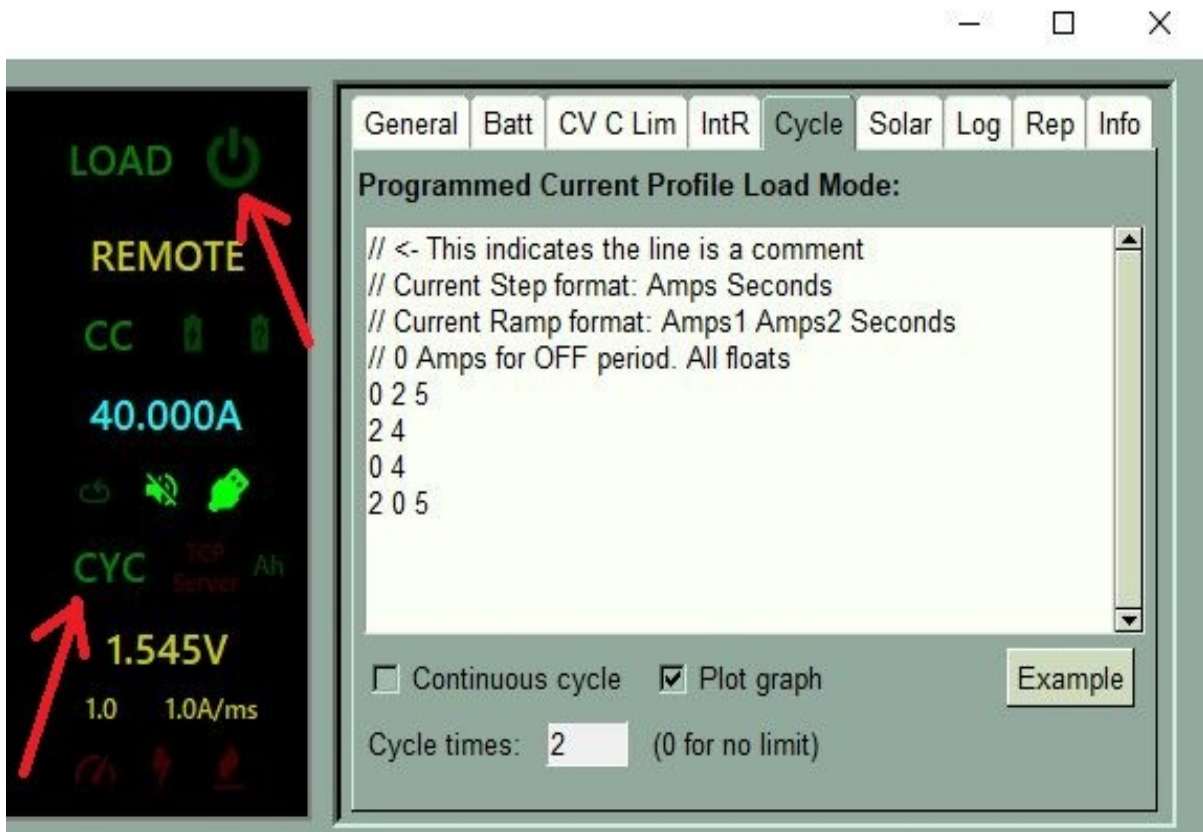
Proportional on Measurement: No

CW Current Limited Load Mode

This is a software current limited CW (constant power) load mode.

Kunkin KP184 is hardware configured to CC (constant current) and a software configurable PID loop holds the user configured CW setting by automatically adjusting the CC load. The software structure is similar to the previous CVL (Constant voltage current limited) load mode. Please refer to the previous chapter for details.

Programmed Current Profile Load Mode



The dynamic Cycle mode allows the user to program a custom variable load current profile of unlimited steps, ramps and repetitions.

Toggle the test mode indicator to access the special test modes **GEN / CVL / CYC/SOL**. CYC unlocks the Cycle Tab

The format is simple and can be edited on the multi-line text box.

Any empty lines are ignored. All lines beginning with '/' are treated as a comment.

A step current is programmed with a current value in Amperes and a pulse time in seconds. Both integer or floats can be used separated by spaces.

A null current of 0 Amperes indicates an OFF time.

A current ramp is programmed with two current values in Amperes and a duration time in seconds. Both integer or floats can be used separated by spaces.

The programmed profile can be repeated any number of times and stops automatically or indefinitely and must be stopped with Load Switch button. Use the checkbox to enable the cycle repetitions and the edit box to enter the number of repetitions, use 0 for no limit.

The load commands are sent in real time through the serial interface. Use 115200 baud to reduce the lag as much as possible. The minimum programmable time step is 0.1s

The log tab records all relevant load changes.

To start/stop the test use the Load Switch button:



The “Example” button adds comments and a short programming example to the multi-line text box.

The “Plot Graph” check box provides an easy way to turn the data acquisition On and Off automatically during the programmed profile current.

In the Cycle tab you can write lines as in a text programming language.

For example:

0 5 5

5 2

0 2

5 2

5 0 5

Will result in the following load programmed profile:

Ramp from 0A to 5A in 5 seconds

Hold 5A during 2 second

Turn Load OFF (0A) during 2 second

Turn Load ON (5A) during 2 second

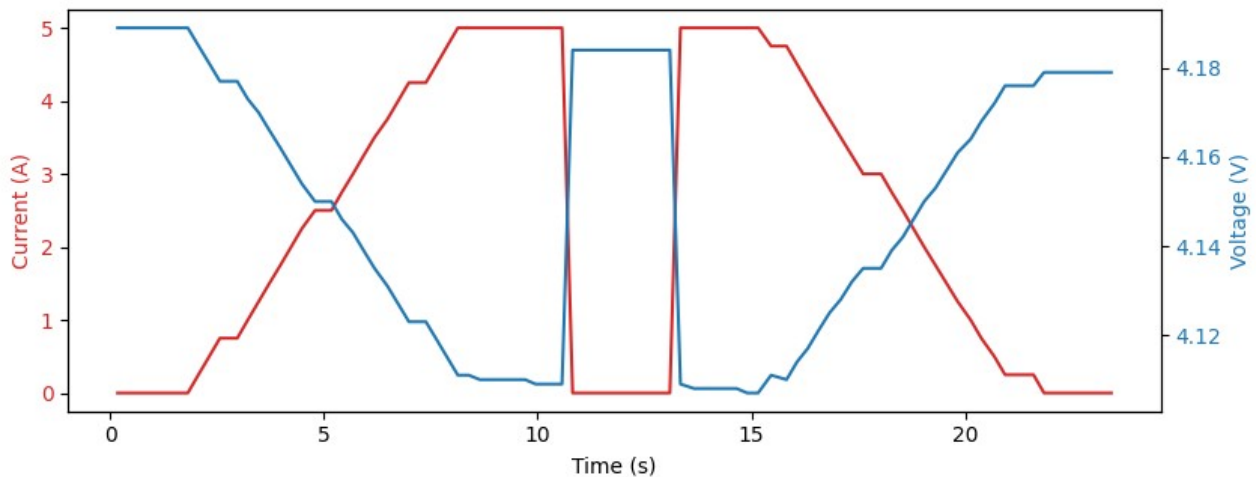
Ramp from 5A to 0A in 5

seconds.

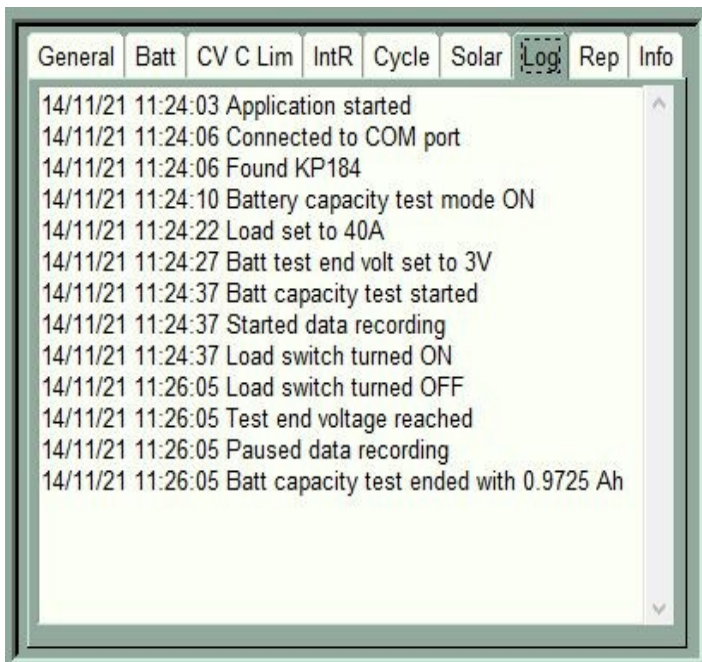
You can repeat the programmed profile any number of times or just indefinitely.

After writing the profile instructions just press the Load Switch icon.

Before pressing the Load Switch icon you switch to the "Log" tab to just watch the log lines in real time and inspect how Kunkin KP184 is being commanded.



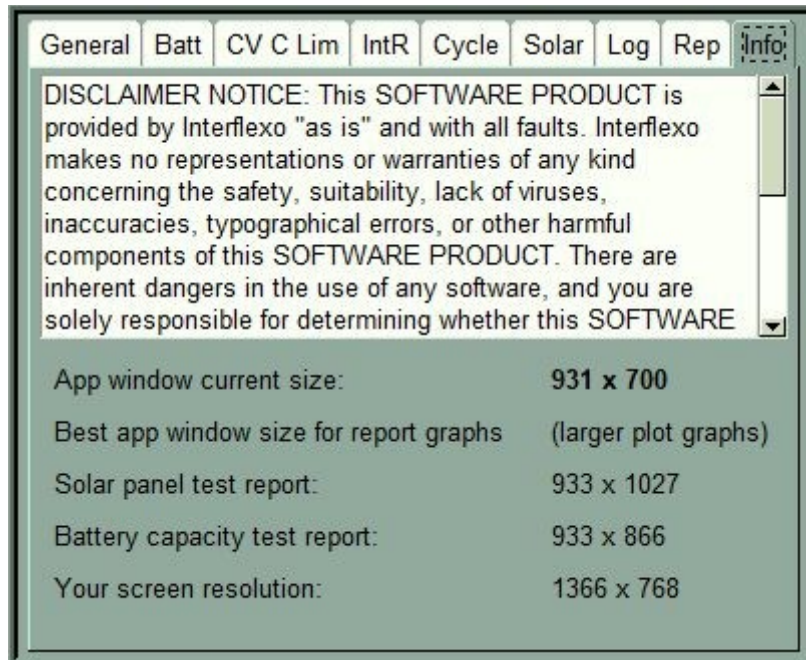
Event Log



The log tab allows the user to keep a track record of the current session activities, events and results. Events as over temperature, over power and over current are also logged as well as its recoveries.

Right click on the text widget and select **“Copy to clipboard”** to export the complete log in text format or **“Clear Log”** to erase all current session log data.

Info Tab



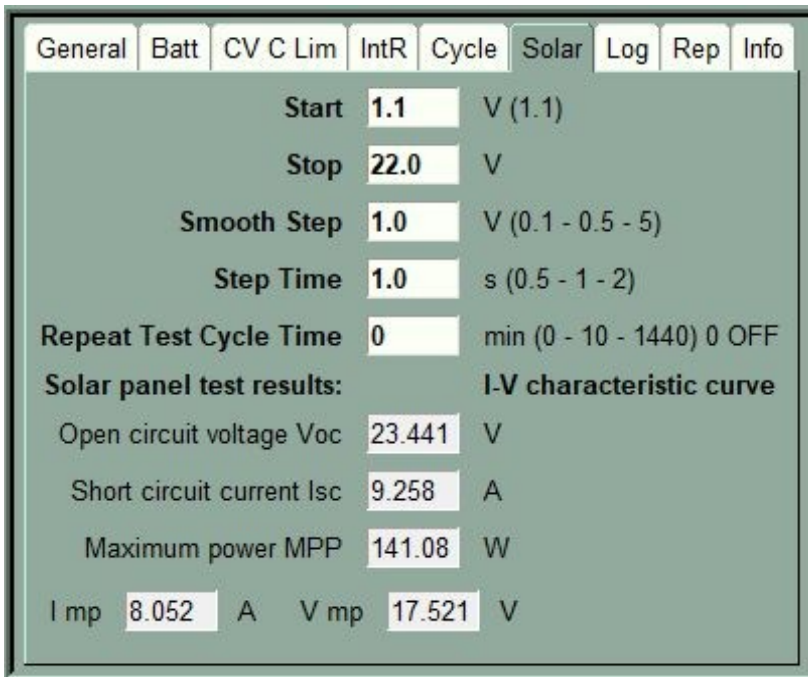
The info tab contains a software disclaimer notice.

The information regarding the screen resolution and the application window size in pixels can be used to fine tune the plot graph aspect ratio for PDF report vertical space optimization. The application window is dynamically resizable via cursor dragging. The user can follow the application window size during the window corner or edge drag operation. Set the window width to the minimum value and set the window height close to the report type recommended height. The application remembers the last used window size and location on the desktop screen.

Solar Panel Test Mode

The Solar Panel Test Mode allows the user to perform a configurable CV sweep load to test all the solar panel operating points (I-V curve plot) for diagnostic or manufacturer specifications confirmation.

Toggle the test mode indicator on the black LCD panel to access the special test modes **GEN / CVL / CYC/SOL**. SOL unlocks the Solar Tab



Enter the **Start** test voltage. Usually 1.1V to allow for the panel short circuit current measurement. KP184 minimum load voltage is about 1V.

Enter the **Stop** test voltage. Usually some tenths on Volt above

the panel open circuit voltage.

Enter the incremental voltage **step** and the **step time** in seconds. The software will automatically interpolate smoothly through the desired steps. On the right inside curved braces the user can find the upper and lower limits values where applied and a reasonable value in the middle.

Repeat Test Cycle Time if greater than zero repeats the solar panel test within the configured minutes from 1 to a maximum of 1440 minutes (24 hours). The collected data .csv file and PDF report of each test are automatically saved.

To start/stop the test use the Load Switch button:



The data acquisition to log (plot graph and optional saving .csv data) the process will be started automatically for you. The system will stop collecting data when the process is finished.

The software will record the measured:

- Voc – Open circuit voltage
- Isc – Short circuit current
- MPP – Maximum power point
- Vmp – Voltage on the maximum power point MPP
- Imp – Current on the maximum power point MPP

Please use the Rep tab (page 32) to fill in the details about solar panel DUT identification (brand, model and #SN) to use on the test report.

You may now access the General tab / Data acquisition frame to:



Save the collected data on a .csv file.



Save the current plot graph on a PDF/PNG file.



Create the detailed solar panel test PDF report.

Please refer to page 38 for an example on the solar panel test report.

User selected value annotations on the plot graph

The user can use the left mouse click on the plot graph area during the test and after the test completion to select a point. This point will define an x value to get the y curve values and the final position to the arrow of text annotation.

Left mouse click deletes the last annotation and creates a new one on the selected point. Useful to iterate the best position for an annotation.

Shift + Left mouse click adds a new annotation on the selected point inside the plot graph area. Does not need to be selected on top of the curves. There is no limit for the number of annotation that can be created this way.

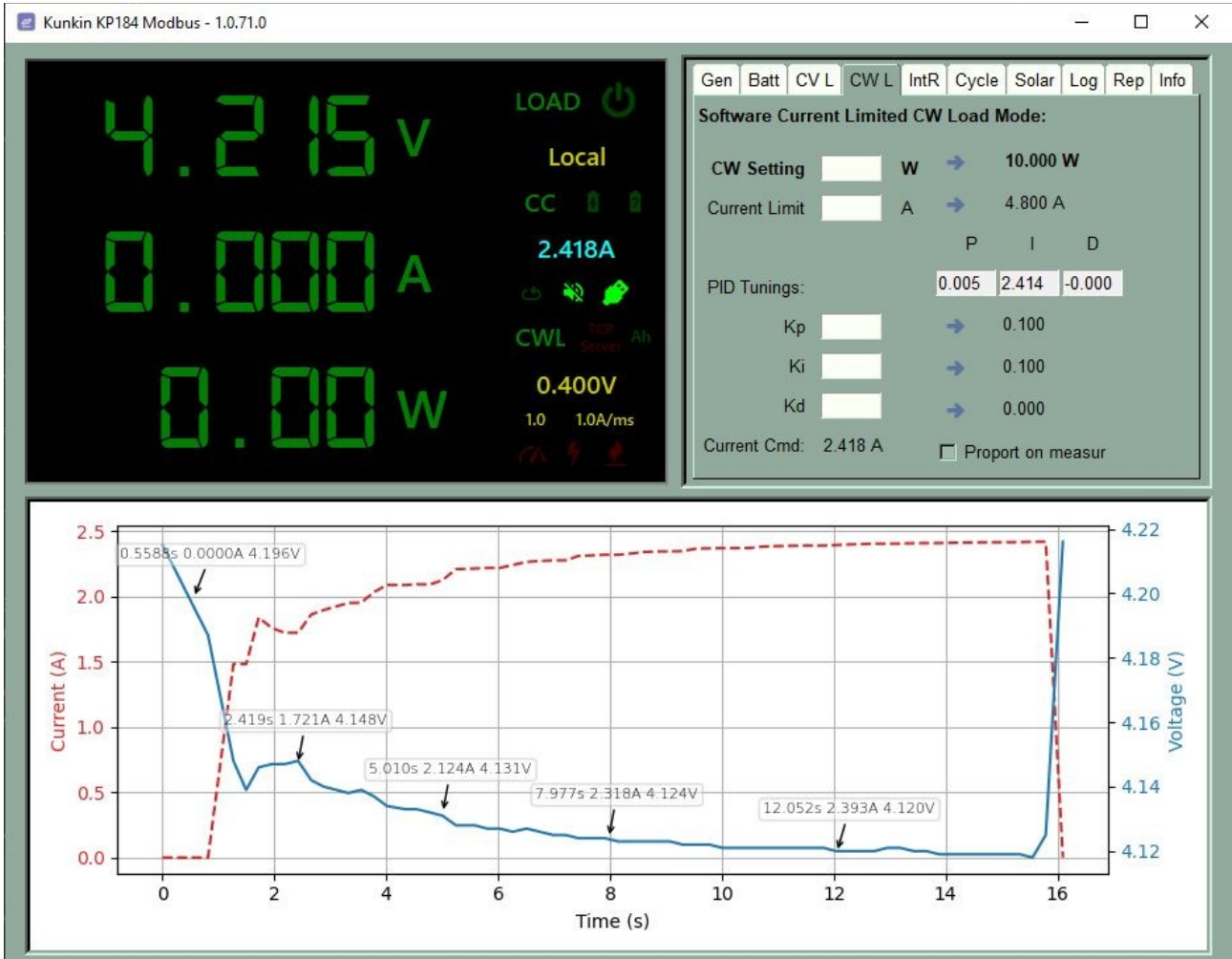
Backspace + Left mouse click anywhere inside the plot graph area deletes the last annotation created. Works like an undo. Any number of annotations can be deleted sequentially this way. The user can't select a random annotation to delete.

Right mouse click anywhere inside the plot graph area deletes all the annotations created in a single operation.

The annotations are automatically deleted when a new plot graph is started at the beginning of a test.

When the plot graph x scale changes from seconds to minutes (at the 3-minute mark) and from minutes to hours (at the 2-hour mark) during a test the annotations are erased. New ones can be created after the event.

The annotations will become integral of the plot graph and will be displayed on the PDF, images, and test reports plot graph.



Test Examples:

18650 NCM Lithium Cell Capacity Test

Assuming the software is already configured and communicating with Kunkin KP184 or else please refer to page 5 regarding the software and hardware configuration.



Use the “Toggle Connect/disconnect serial port” button on the General settings tab to open the configured serial connection.



The “Serial Connection Status” icon on the black LCD panel should light up meaning you have a serial connection with Kunkin KP184.



Use the black LCD panel “Toggle Battery Capacity Test Mode ON/FF” icon to enter the battery capacity test mode. The icon should light up and the battery capacity test settings tab should open automatically. If you are changing from one test mode to another you may have to click on the Battery tab to open it.

On the battery capacity test mode you may choose to set the test load mode as constant current **CC** or constant power **CW**. Please check the corresponding selected indicator on the black LCD panel. Click on the same “Toggle Load Mode” indicator to toggle the selected load mode.

The currently programmed load value can be found on the black LCD panel cyan value Ex. 5.000A.

→ If you want to change this value on the Test Settings frame please enter the new load value and press the right arrow set button.

The programmed test end voltage can be found at the right outside the Test Settings frame. Hover the cursor through the controls and use the tool tips to double check.

→ If you want to change this value on the Test Settings frame please enter the new test end voltage and press the right arrow set button. A value of 2.8V can be used for this battery chemistry.

You can leave the maximum test duration disabled at 0s.

In the “End Voltage Reached” frame select the “Stop Test at Once” option.



Please make sure the “Hardware threshold voltage for load limit” is below the programmed test end voltage so it does not interfere with this test. You can change this setting on the General tab / Load Settings frame / Load

Threshold setting.



Use the black LCD panel “Toggle Load ON” button to start the test. You can interrupt the test at any moment using the same button.

You will hear a tone and the battery capacity discharge test will begin. The data acquisition will be started automatically for you.



Clicking the Ah/Wh small indicator toggles the battery capacity value large indicator units between Ah and Wh.



Clicking the battery capacity value large indicator resets its value. This can only be done with the load off to avoid inadvertently resetting it during the test.

The test will end automatically with a tone when the test end voltage value is reached or the maximum test duration is achieved. The data acquisition will also be automatically stopped.

|| You may press the General tab / Data acquisition frame / Pause/Resume button at this point to continue the data acquisition process and register the cell's voltage recovery for as long as you want. You may stop it again with the same button.



Saves the collected data on a .csv file.



Saves the current plot graph on a PDF/PNG file.



Creates the detailed battery capacity discharge test PDF report.

TCP Server

The application can configure and run an internal TCP Server to feed any TCP client the device real-time data. The TCP Client may mix and process the data with more sensors data and do whatever is supposed to do.

Typical TCP Client operation

1. Open the connection to the TCP Server
2. Send the "KP184:?" data request message
3. Wait for the server answer (average <9ms over WiFi)
4. Get the 22 bytes binary data
5. Close the connection
6. Unpack and process data
7. Wait 1 or several seconds
8. Repeat

TCP IP Server 22 Bytes Message Format

Parameter	Values	Size	
Load State	0,1	1-bit	1 Byte
Load Mode	0,1,2,3	2-bit	
Test Mode	0,..,9	4-bit	
RemVSense	0,1	1-bit	
OverTemp	0,1	1-bit	1 Byte
OverVolt	0,1	1-bit	
OverPower	0,1	1-bit	
Reserved		bits 3..7	
Voltage	0..150000 mV	4 Bytes	
Current	0..40000 mA	4 Bytes	
Power	0..400000 mW	4 Bytes	

Capacity	0..4294967295 mAh	4 Bytes	
Energy	0..4294967295 mWh	4 Bytes	

TCP Client python code example:

```

import asyncio
import sys
import time

def decode_data(dat: bytes) -> None:
    load_modes_str = ['CV', 'CC', 'CR', 'CW']
    test_modes_str = ['GEN', 'BAT', 'RES', 'CVL', 'CWL', 'DYN', 'COP', 'OCT', 'CYC', 'SOL']
    if len(dat) == 22:
        flags_0 = dat[0]
        load_on = flags_0 & 1
        print('load_on', load_on, end=" ")
        load_mode = flags_0 >> 1 & 3
        print('load_mode', load_modes_str[load_mode], end=" ")
        test_mode = flags_0 >> 3 & 15
        print('test_mode', test_modes_str[test_mode], end=" ")
        rem_volt_sense = flags_0 >> 7 & 1
        print('rem_volt_sense', rem_volt_sense, end=" ")
        flags_1 = dat[1]
        over_temp = flags_1 & 1
        print('over_temp', over_temp, end=" ")
        over_volt = flags_1 >> 1 & 1
        print('over_volt', over_volt, end=" ")
        over_power = flags_1 >> 2 & 1
        print('over_power', over_power, end=" ")
        voltage = int.from_bytes(dat[2:6], byteorder='big', signed=False) / 1000.0
        print(voltage, 'V', end=" ")
        current = int.from_bytes(dat[6:10], byteorder='big', signed=False) / 1000.0
        print(current, 'A', end=" ")
        watts = int.from_bytes(dat[10:14], byteorder='big', signed=False) / 1000.0
        print(watts, 'W', end=" ")
        ah = int.from_bytes(dat[14:18], byteorder='big', signed=False) / 1000.0
        print(ah, 'Ah', end=" ")
        wh = int.from_bytes(dat[18:], byteorder='big', signed=False) / 1000.0
        print(wh, 'Wh')
    else:
        print('Incorrect data size ', dat, ' ', len(dat))

async def tcp_client(host: str, port: int) -> None:
    while True:
        reader, writer = await asyncio.open_connection(host, port)
        writer.write("KP184:?".encode())
        try:
            data = await reader.read(22)
        except ConnectionResetError:
            print('Connection reset error')
            sys.exit(-1)
        writer.close()
        decode_data(data)
        time.sleep(1)

asyncio.run(tcp_client("192.168.1.97", 10000))

```

Packet Sender test example:

The screenshot shows the Packet Sender application window. At the top, the title bar reads "Packet Sender - IPs: 172.31.144.1, 192.168.112.1, 192.168.0.1, 192.168.1.91, 192.168.56.1, fe80::4750:4694:f86db1ee%ethernet_32777, 2001:818:e6afa300:a29...". The main interface includes a menu bar (File, Tools, Multicast, Panels, Help) and a configuration section with fields for Name, ASCII (set to KP184:?), HEX (4b 50 31 38 34 3a 3f), Address (192.168.1.97), Port (10000), Resend Delay (1), and Method (TCP). Below this is a search bar for saved packets and a table with columns: Senc, Name, Resenc, To Address, To Port, Method, ASCII. A log section at the bottom shows a table of traffic with columns: Time, From IP, From Port, To Address, To Port, Method, Error, ASCII, and Hex. The log entries show a sequence of outgoing and incoming packets, all using TCP on port 10000. At the bottom of the window, there are status indicators for "Send: (Resend)", "Resending", "UDP:65395", "TCP:61267", "SSL:61268", and "IPv4 Mode".



The application black LCD panel contains a TCP Server running status indicator.

Unlocking the unlimited data acquisition time

This unregistered product exhibits watermarks and works in trial mode where the data capture is limited to 15 minutes, at a time, all other features remain functional. If you find out that this software product is useful to you, please register sending your registration ID from the configuration dialog to interflexo@sapo.pt along with \$30 USD by PayPal. Interflexo will then email you back the unlocking registration KEY.

This will help to support the software maintenance and the development of new features.

Please use one of the following secure PayPal links for payment:

[PayPal Link](#)

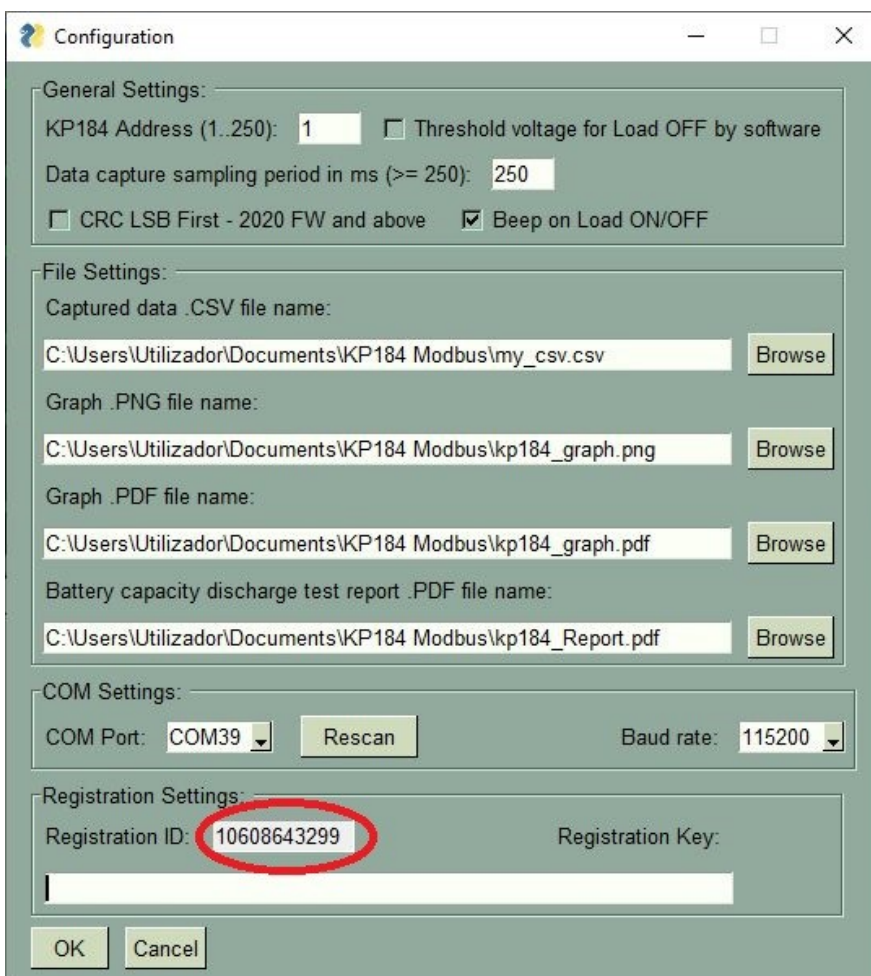
or

[PayPal.Me](#)

If you don't have a PayPal account or you don't want to use it, just select the provided link option "Pay with a Bank Account or Credit Card".

Detailed registration instructions:

1. Please start the KP184 Modbus application.
2. From the application main screen press the Configuration Settings button, this action will open the configuration dialog window.
3. From the bottom of the settings window copy/paste the Registration ID code from your system and send it by email to interflexo@sapo.pt
4. Interflexo will then email you back your personal Registration Key. Please copy/paste it to the input field below.
5. Please close the configuration dialog with the OK button.



If you have any questions don't hesitate to drop a line to interflexo@sapo.pt

Antivirus Programs

This application is programmed in Python. Python code is often distributed as source code, but sometimes it is more convenient to use another format: such as a compiled (.exe) file. A module called pyinstaller is typically used to compile and package the source code.

Code compiled with pyinstaller is often incorrectly classified as malware, virus or Trojan by antivirus programs.

This is what is known in the virus industry as a “false positive”. The code does not do anything malicious, but because it was compiled in a way that looks like other code which might do malicious things antivirus judges it to be a virus. Things get worse when antivirus systems use somewhat blind machine AI learning algorithms.

Even with code signature developers go to great lengths to keep their code whitelisted having to individually contact antivirus providers submitting and backing up the false positive claims. Every KP184 Modbus software release is checked against a 70+ antivirus panel including the industry heavy weights Kaspersky, Norton, Panda, Bitdefender, McAfee, Avira, Avast, Symantec and Microsoft Defender before being made available to download.

Please rest assured that we take pride in the quality of our service and product, and rare instances like this occur due to the complexity of file structures.

If you have further concerns, please do send us a mail and we will immediately assist you.

Change Log

V1.0.1.0 – 28 May 2020

- First release.

V1.0.2.0 – 2 June 2020

- Capacity (Ah)/Energy (Wh) calculations error fix.
- Minor bug fixes.
- New software CVL mode with current limiting capability. Operates Kunkin in CC mode and a PID configurable control loop holds the configured CV setting by permanently adjusting the CC load.

V1.0.3.0 – 13 June 2020

- Plot graphs are now placed on the same directory as the configured .csv file.
- A matching “.png” plot graph image file is also added to the same output directory for easier document insertion.
- Dimmed icons bumped 78% in brightness.
- Several minor cosmetic issues fixed.
- Several support modules were updated in the Python ecosystem.

V1.0.4.0 – 20 June 2020

- Fixed an issue with the battery capacity test maximum duration.
- A new log tab allows the user to keep a track record of the current session activities and results. Events like over temperature, over power and over current are also logged as well as its recoveries. Right click on the text widget and select “Copy to clipboard” to export the complete log in text format.

V1.0.5.0 – 24 November 2020

- Fixed some data logging hiccups during application main window drag.
- Fixed graph y-label slightly clipped.
- Several support modules were updated in the Python ecosystem.

V1.0.6.0 – 15 January 2021

- Added some thread locks around logged data handling.
- Several support modules were updated in the Python ecosystem.

V1.0.7.0 – 21 January 2021

- Added automatic PDF report creation from the battery discharge capacity test results.
- Smoother data files (.csv; .png; .pdf) bulk writes during data acquisition.
- Several support modules were updated in the Python ecosystem.

V1.0.8.0 – 25 January 2021

- Added a software implemented end voltage condition test: go half current until next under-voltage during battery capacity discharge test.
- Added Windows Setup Installer.
- Documentation, fonts and Microsoft Visual C++ 2015 Redistributable (x86) are automatically installed if required.

V1.0.9.0 – 25 January 2021

- Added the new information to the automatic PDF report creation for the end voltage condition test: go half current until next under-voltage during battery capacity discharge test.

V1.0.10.0 – 25 January 2021

- .ini configuration file now is placed on folder "KP184 Modbus" inside "User\AppData\Roaming" folder. During setup installation upgrades this file is not overwritten to preserve your configuration.
- Data files (.csv, .png, .pdf, pdf reports, etc. are now created on a folder "KP184 Modbus" inside "My Documents" folder. You can select other folders, the configured folder for .csv files is used.

V1.0.12.0 – 27 January 2021

- .csv data files; .png plot graph files; .pdf plot graph files and .pdf test report files now all have independent configurable file names and folders and reset to folder "KP184 Modbus" inside "My Documents" in case of error.
- There is a new button specific for the battery capacity discharge test report creation.
- PDF User Manual now is installed on the folder named "KP184 Modbus" inside "My Documents".

V1.0.13.0 – 9 February 2021

- Replaced several functions from external lib modules that will be deprecated in the future.

V1.0.14.0 – 17 February 2021

- Fixed an issue related to configuration dialog file browse select controls startup folder.

V1.0.15.0 – 2 March 2021

- Also accepts Modded KP182 (U23 > ADUM1201 + 2 RX/TX resistors + USB/Serial Converter).

V1.0.16.0 – 3 March 2021

- Added a new configuration setting for CRC LSB First – New 2020 FW and above.

V1.0.17.0 – 12 March 2021

- Current and power manual entry values limits (20A 200W) are checked for the KP182 MOD model, they are half the KP184 model (40A 400W).
- A new dynamic CYC test mode allows the user to program a custom variable current load profile of unlimited steps, ramps and repetitions.

V1.0.18.0 – 13 March 2021

- Made some corrections to the new CYC test mode current ramp profiles.
- Added a new "Clear Log" to the Log context menu to help better inspect the new CYC test mode results.

V1.0.19.0 – 31 March 2021

- Battery capacity LCD display always shows 5 significant digits, 3 decimal places until 99,999Ah and 2 decimal places above that value.
- You can run as many instances of the application as you want and configure each one for a different serial port. Only the first application instance will save it's default configuration on disk.

V1.0.20.0 – 1 April 2021

- Fixed the Version 1.0.19.0 startup problem

V1.0.21.0 – 3 April 2021

- LCD Panel uses a new 7 segment display mono-spaced font
- Pros: String does not shift around when '1' char is used
- Cons: Decimal separator takes as much space as an '8'

V1.0.22.0 – 23 April 2021

- Enhanced battery DCIR test. The first step may be configured to 0A to measure the battery internal resistance from an open circuit voltage (OCV) state. The step pulse time is configurable to meet specific user needs.

V1.0.23.0 – 27 April 2021

- Enhanced battery DCIR test. Both pulse step times are now configurable. These tests can now meet IEC 62620 standards for Li-ion batteries and IEC 61951-2 standards for Ni-MH batteries.
- Application load time was cut to one third.

V1.0.24.0 – 29 April 2021

- Back to one exe file distribution. Unpacked folder distribution causes problems accessing the .ini file.
- When a new configuration key was added to an older .ini file, example "inres_pulse_time2" from version 22 to 23 the error message "Can't access the .ini" was not adequate, there is a new popup message stating that one or more configuration keys were added.

V1.0.25.0 – 6 June 2021

- An optional Beep on load ON/OFF was added to the configuration page. Beeps are annoying but on remote operation it is nice to receive a notification when battery discharge is over.

V1.0.26.0 – 5 July 2021

- Several Python modules were updated.

V1.0.27.0 – 28 October 2021

- Overcomes a KP184 internal firmware issue that periodically (each 7.53h) resets the Wh value during very long battery discharge tests. The screen shows the internal Kunkin Wh value but the saved .csv file shows the correct calculated value by the software.
- Several Python modules were updated.

V1.0.28.0 – 2 November 2021

- On the non static cycle (CYC) load mode the user load profile definition text for line comment char was changed from '#' to '//'. The .ini read file parsing code was deleting multiple line comments.
- Several GUI tool-tips were corrected.

V1.0.29.0 – 14 November 2021

- New solar panel test mode (SOL) added. A user defined CV sweep mode records de solar panel characteristic I-V curve and MPP data for device diagnostic or manufacturer specification confirmation.
- The data acquisition report button now handle both types of reports (battery capacity discharge test and solar panel test) according to the last test mode.
- Correction on the non static cycle (CYC) load mode startup.
- Some settings were not available on the configuration dialog window.

V1.0.30.0 – 19 November 2021

- Both types of reports (battery capacity discharge test and solar panel test) now share the same PDF generation engine and have a consistent layout.
- Correction on the non static cycle (CYC) load mode. Now when the load profile programming code is empty the load does not turn on and an appropriate message is displayed.

- On the solar panel test mode (SOL) plot graph curves the MPP point is now highlighted in red.
- On the data acquisition save .csv or .png plot graph files a file explorer window is opened with the selected file.

V1.0.31.0 – 5 December 2021

- Some python modules were updated.
- Resolved some issues with the tests PDF reports.

V1.0.32.0 – 10 December 2021

- When having trouble to connect both CRC LSB First flag states are tested for the new Kunjin 2020 Firmware and above.
- Resolved some issues with the modded KP182 identification on the PDF reports.

V1.0.33.0 – 28 December 2021

- Some python modules were updated.

V1.0.34.0 – 30 December 2021

- Application now checks for updates at startup.

V1.0.35.0 – 4 January 2022

- Application load time was cut in half.
- Software updates are automatically downloaded and installed upon user confirmation.

V1.0.36.0 – 20 June 2022

- Cyclic solar panel test option added.
- Some python modules were updated.

V1.0.37.0 – 27 June 2022

- Cycle mode continuous operation not restarting correction.
- Corrected PDF plot graph export missing module.

V1.0.38.0 – 2 August 2022

- `__DUT_BRAND__`, `__DUT_MODEL__` and `__DUT_SN__` strings can be used on configured file names for csv data, image, PDF and report files. These substrings will be replaced on runtime with the Rep tab DUT Report Identification Details.
- Record time is paused during paused data recording.

V1.0.39.0 – 6 September 2022

- Application is now a resizable grab anywhere window.
- The application last window size and screen position are saved.
- The screen plot graph aspect ratio is also used on the PDF reports. Info on the Report tab helps the user to get optimized and larger plot graphs on the PDF reports.

V1.0.40.0 – 22 September 2022

- Plot graph x axis now shows hours, minutes or seconds units depending on test duration.
- PDF Report button was not enabled after very long battery capacity discharge test completion.

V1.0.41.0 – 23 September 2022

- Plot graph grid lines added for x and left y axis.
- Capacity plot graph may be suppressed with right click context menu options on "Bat" tab on setup or during test itself, voltage curve plot graph display only. This setting is stored on the configuration defaults .ini file.
- Ah / Wh data now has 6 decimal places. Now small current battery capacity discharge plot graphs look better.
- Application exit confirmation dialog added.

V1.0.42.0 – 25 September 2022

- On low amperage battery capacity tests eliminated the race condition between Kunkin and software end voltage reached.
- On battery capacity test the cable disconnect condition is handled and logged.
- Long .csv data file creation can now be interrupted.

V1.0.43.0 – 28 September 2022

- During battery capacity test the data acquisition pause button will also stop the load current. Ex: for fixing some cable issue. Hitting the pause button again will make the test resume (plot graph + load current). The open circuit voltage spike will appear on the plot graph.

V1.0.44.0 – 29 September 2022

- 10 different measurements of the battery internal resistance at regular SOC intervals can optionally be acquired during the battery capacity discharge test. Two new enable/disable options were added to the right click context menu options on the "Bat" tab. The results appear on the PDF report and on the "Log" tab. This setting is stored on the configuration defaults .ini file.

V1.0.45.0 – 29 September 2022

- Corrected PDF report SOC table value calculations on battery internal resistance data regarding capacity discharge test.

V1.0.46.0 – 29 September 2022

- Corrected battery capacity test end voltage to eliminate the influence of the optional battery internal resistance measurement current pulses.

V1.0.47.0 – 30 September 2022

- Correction to the battery capacity discharge test PDF reports related to the internal resistance measurements.

V1.0.48.0 – 1 October 2022

- Added user comments to the battery capacity test and solar panel test PDF reports.
- Added a selection choice of [4, 6, 8, 10, 12] periodic internal resistance tests on the battery capacity discharge test to the “Bat” tab context menu. The selection was added to configuration .ini file.
- Added pulse setup data to the battery capacity report when periodic internal resistance tests are performed.
- Adjusted default and check values of solar panel test start voltage parameter. KP184 minimum load voltage is about 1V.

V1.0.49.0 – 3 October 2022

- Added KP184 internal bat_end_volt parameter automatic manipulation to allow periodic internal resistance test higher current pulses than the current discharge set value on the battery capacity test. Fast pulses won't trip a premature test end voltage condition.

V1.0.50.0 – 3 October 2022

- Added interlocks to avoid changing the “test end voltage” and the “set current” parameters during the battery capacity discharge test if the periodic internal resistance tests are enabled. If the periodic internal resistance tests are not selected these parameters can be adjusted during the battery capacity discharge test.
- Added an image to the “Bat” tab to remember the user about the mouse right click menu feature.

V1.0.51.0 – 6 March 2023

- Solved the update download failure issue on non standard “Downloads” system folder name.
- Improved serial error handling and logging on communication protocols.
- Added serial response timeout to the KP184 Modbus protocol
- Added capacity discharge test termination reason to the PDF report.
Reasons: LVC, user abort, eload abort, current interruption or max_time reached.
- Some python modules were updated.

V1.0.52.0 – 23 March 2023

- Corrected issue with solar panel test that was blocking data acquisition.

V1.0.53.0 – 31 March 2023

- Some python modules were updated.

V1.0.54.0 – 13 April 2023

- Downgraded python numpy module version to allow application startup on Windows 7 - 32 bits systems.

V1.0.55.0 – 4 October 2023

- Solved issue with right mouse button battery test tab context menu update.
- Added two new options to the battery test context menu: Elapsed Time and Time Stamp for the test results plot horizontal time axis and csv data export. Also on Data Acquisition Frame new context menu.
- Several python modules were updated.

V1.0.56.0 – 10 October 2023

- Solved issue with update setup installer download.

V1.0.57.0 – 16 October 2023

- Added TCP Server to export real-time device data to custom third party applications.

V1.0.58.0 – 10 November 2023

- Added button to combine (superimpose) multiple .CSV test file data on the same plot graph.
- Added “Plot graph” check box to the CYC mode (programmed current profile) test. When checked the data acquisition starts and stop automatically.
- KP184 reports an erroneous residual current at Load OFF when the set current is below 35 mA. CYC mode was adjusted to avoid this inconvenience.
- During data acquisition startup an early data gather before Load On was added to ensure test startup conditions recording.
- Added help button to open the application user manual.
- The application user manual PDF file is now stored on the application folder.
- The Setup Installer offers now the option to create the user specified data folder (storing .csv , .png and .pdf files). The user must later access the application configuration dialog window to use this folder.

V1.0.59.0 – 12 November 2023

- Compiled new bootloader.

V1.0.60.0 – 13 November 2023

- Battery capacity test end voltage can be set as low as 0.5V for lower currents. The ability of KP184 can get as low as 0.5V depends on the

test current, the device only guarantees a minimum of 1V load voltage on the entire current range (0 to 40A).

V1.0.61.0 – 13 November 2023

- Timer for Load ON/OFF was turning the Load ON or OFF but was not starting or stopping the data acquisition on BAT/SOL/CYC/CVL test setups. Now a standard UI toggle Load ON/OFF is emulated.

V1.0.62.0 – 12 December 2023

- Corrected an issue that could display an erroneous set test current on the battery capacity discharge test report.

V1.0.63.0 – 08 February 2024

- New option on Battery capacity discharge test right mouse button context menu to enable the use of a programmed periodic current profile defined on the Cycle tab instead of a simple constant current or constant power load types.
- “Cycle” and “IntRes” tabs are now accessible on Battery test mode when “Cycle current profile” or “Periodic Internal Resistance Test” options are enabled.

V1.0.64.0 – 14 February 2024

- New multiple battery internal resistance test PDF report included. The PDF report handles multiple pages and provides column headings at the beginning of each page.
- New multiple battery internal resistance test list editor window for removing unwanted tests, clear the test list, change the order of the tests inside the list and edit the DUT information (Brand, Model and SN#) of each test.

V1.0.65.0 – 16 February 2024

- New automatic baudrate detection scan on serial connection. If a serial connection fails the following baudrates are automatically scanned: 2400, 4800, 9600, 19200, 38400, 57600, 115200. Each baudrate value is tried with both “CRC LSB First” flag states. Serial connection details information log was improved and new popup messages were added for serial connection and disconnection.

V1.0.66.0 – 6 March 2024

- During the battery capacity discharge test with periodic internal resistance tests enabled, the last test (near test end voltage) sometimes races against Kunkin KP184 internal test end voltage. This will be enhanced in the future releases.
- Corrected hang on application exit during automatic baudrate detection scan on serial connection.

- Plot graph horizontal time scale automatically adjusted to hours, minutes or seconds on the combined multiple .CSV test file data plot option.
- New options were added to the battery capacity discharge test and data acquisition right mouse button context menus to select from four different line styles for the independent red and blue plot graph curves.

V1.0.67.0 – 20 May 2024

- New options on battery capacity discharge test tab right mouse button context menu for an optional low voltage cut-off 1,5s detection delay. This avoids battery capacity test premature ending on quick voltage dips.

V1.0.68.0 – 22 May 2024

- Some events handling were blocked during right mouse button context menu display. Corrected.
- CVL test mode startup manual load ON event triggers automatic data acquisition.

V1.0.69.0 – 28 May 2024

- New software CWL mode with current limiting capability. Operates Kunkin in CC (constant current) mode and a PID configurable control loop holds the configured CW (constant power) setting by permanently adjusting the CC load.

1.0.70.0 – 31 May 2024

- Compiled new bootloader.
- Suppressed disconnect message on application exit when not connected.

1.0.71.0 – 3 July 2024

- Added user selected value annotations on the test plot graphs.
- Corrected an issue related to the current timezone access.
- Added a new 64-bit version. 32-bit/64-bit versions need Win 7 and up.

1.0.72.0 – 14 July 2024

- V1.0.71.0 32-bit failed to run on Win 7. Fixed.

1.0.73.0 – 5 August 2024

- Application popup windows were showing up on the wrong monitor on multiple monitor configurations. Center of the application window is now used for the popup windows location.
- On the battery capacity discharge test report when using constant power load mode the units on the “Load Set:” and “Discharge Current/Power:” fields were wrong.

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