User Manual for Kunkin KP184 Modbus Software

Interflexo – Sistemas de Automação e Controlo Unipessoal, Lda.

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Introduction

Kunkin 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 1024 × 768 minimum resolution display.
- 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 (FTDI/FT232RL Chipset recommended) or RS232 serial port.
- Operating system Windows Vista/7/8/10 – 32 or 64 bit and Windows 11.

Software Installation Instructions

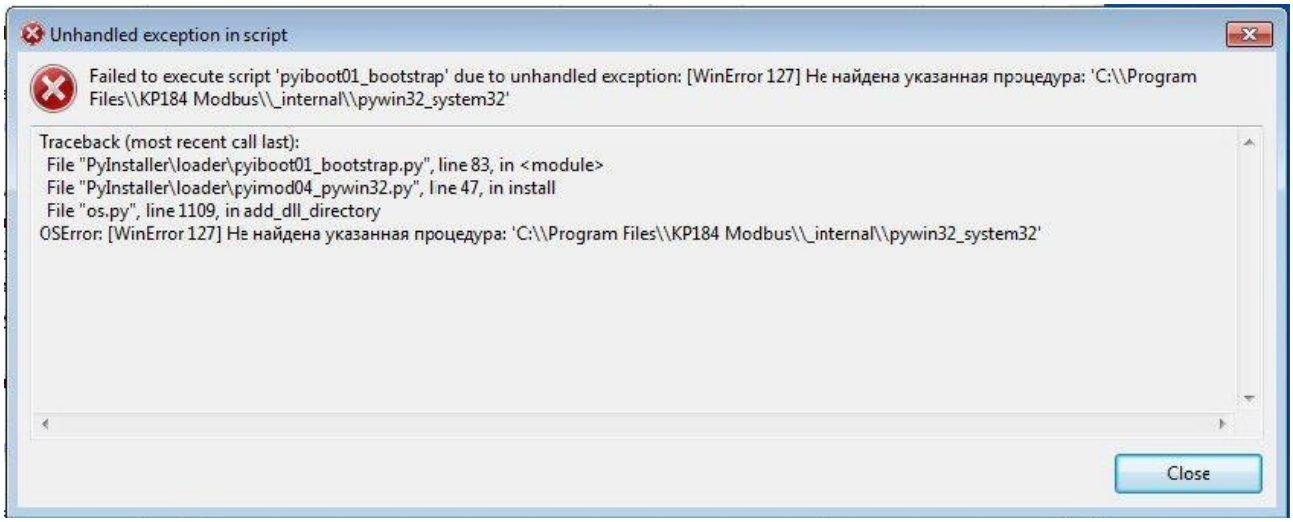
- Use one of the links below to download the executable installer to any folder with permissions. 32-bit for Win 7 and up. 64-bit for Win 8 and up.
- Setup Installer V1.0.97.0 (32-bit)
- Setup Installer V1.0.97.0 (64-bit)
- Open File Explorer.
- Navigate to the folder with the downloaded setup executable 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.

Note 3: Please check if your Windows system is up to date with all the Microsoft recommended updates installed.

Example: Windows 7 SP1 still needs +100 extra system updates installed or you may get an error like this when trying to run the application:

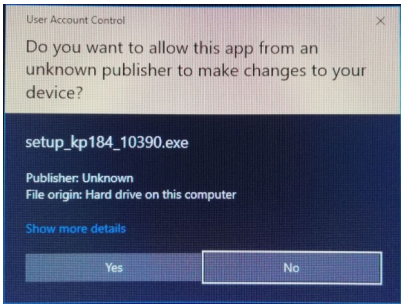


Setup Installer Prompts

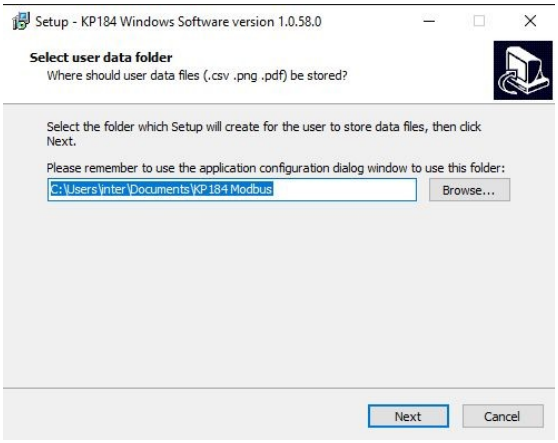
After starting the setup installer if your windows system has the Windows Defender Smartscreen enabled it will ask for confirmation, please click on the **More info** option.

Click on the **Run anyway** button.

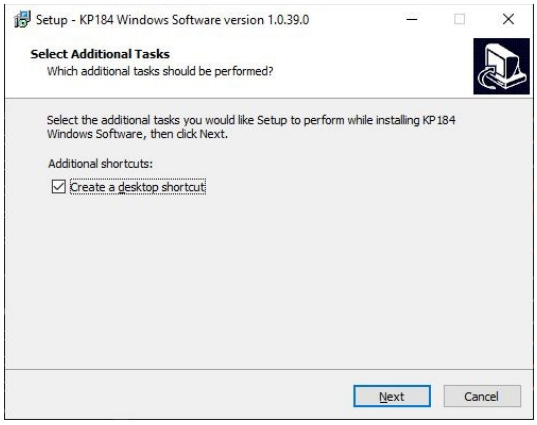
And confirm with the **Yes** button.



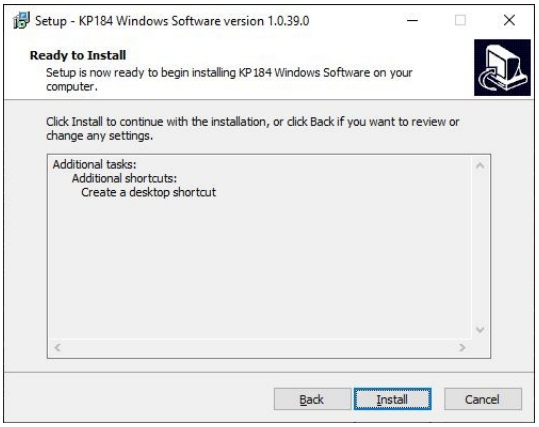
Select the folder that will be used to store user data files (“.csv”, “.png” and “.pdf”). The setup installer will create the folder if it does not exist. After the installation the user will use the application configuration dialog window to use this folder. During the installation of an updated application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



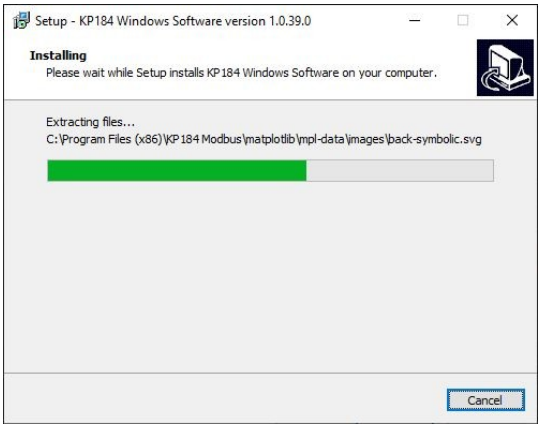
Confirm if you want to create a desktop shortcut and click on the **Next** button.



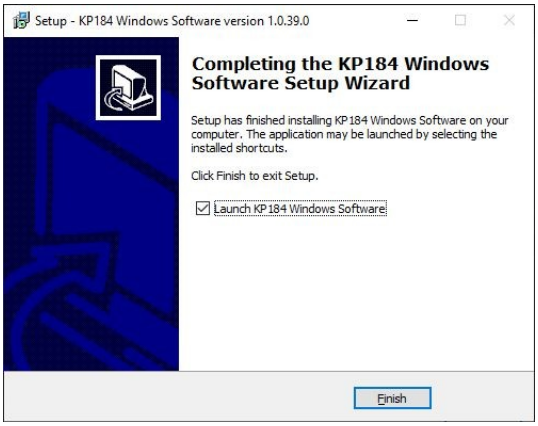
Click on the **Install** button.



Wait for the installation process to finish.



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



Linux Installation

Please download to your $HOME folder the kp184_install.sh bash script file that manages the application installation for you.

The installation was tested on Ubuntu 20.04.6 LTS (Focal Fossa) but should work on 22.04 (Jammy JellyFish) or 24.04 (Noble Numbat).

You don’t need sudo privileges to run the installer bash script or the application. There will be no files installed outside the user home folder.

Installation bash script help:

Synopsis:

```
./kp184_install.sh
./kp184_install.sh [Option] [--output "install folder"]
./kp184_install.sh [--input "archive filename"] [--output "install folder"]
./kp184_install.sh [-i "archive filename"] [-o "install folder"]
```

Description:

Bash script file to install the KP184 electronic load data acquisition and control Modbus application software on Ubuntu.

The bash script handles new installations as well as upgrades preserving the user application configuration.The application calls this bash script whenever needs to upgrade.

A .desktop file is added to the folder /home/username/.local/share/applications to add the application icon to the desktop application menu.

The archive (tar.gz) file is deleted at the end of the installation.

Options:

-h | --help
Displays this help

-V | --version
Displays the installation bash script file version.

-u | --uninstall
Uninstalls the application from your system, leaving all the application user data files (images, pdf reports and csv data files).

-y | --yes
The script does not stop to ask for y/n to proceed.

-i | --input "archive path and filename"
Specifies path and filename for the installation archive

(Ex: /home/username/Downloads/setup_kp184_10970_64-bit.tar.gz)

-o | --output "installation folder name" (Ex: kp184)
Specifies a name for the application installation folder

Examples:

./kp184_install.sh
Searches https://www.interflexo.com//kp184// for the latest 64-bit Linux release
and downloads the archive installation (tar.gz) file to /home/username/Downloads
then installs the application on folder /home/username/.local/kp184
This is the simpler method for installation.

./kp184_install.sh -i ~/Downloads/setup_kp184_10970_64-bit.tar.gz
Uses the provided archive file and installs the application on
folder /home/username/.local/kp184

./kp184_install.sh -o kp184_modbus
Searches https://www.interflexo.com//kp184// for the latest 64-bit Linux release
and downloads the archive installation (tar.gz) file to /home/username/Downloads
then installs the application on folder /home/username/.local/kp184_modbus

./kp184_install.sh -u
Performs the application uninstallation. It first looks for the /home/username/.local/kp184 installation folder. If it's not found then a recursive search is made inside the /home/username/.local folder.

./kp184_install.sh -u -o "kp184 modbus"
Performs the application uninstallation. It first looks for the /home/username/.local/kp184 modbus installation folder. If it's not found then a recursive search is made inside the /home/username/.local folder. Folder names with spaces should be enclosed in double quotes.

Application installation screen output example:

```
$ ./kp184_install.sh

******************************************************
* KP184 Modbus software installation / uninstallation *
******************************************************

No source archive supplied. Checking latest version...

--2025-09-07 16:48:47--  https://interflexo.com/kp184/kp184_latest.txt
Resolving interflexo.com (interflexo.com)...
Connecting to interflexo.com (interflexo.com)|... connected.
HTTP request sent, awaiting response... 200 OK
Length: 21 [text/plain]
Saving to: '/home/manuel/Downloads/kp184_last_.log'

/home/manuel/Downloads/kp18 100%[=========================================>]      21  --.-
KB/s    in 0s

2025-09-07 16:48:47 (867 KB/s) - '/home/manuel/Downloads/kp184_last_.log' saved [21/21]

Archive url: https://interflexo.com/kp184/setup_kp184_10970_64-bit.tar.gz
Source archive: /home/manuel/Downloads/setup_kp184_10970_64-bit.tar.gz
```

Starting download...

--2025-09-07 16:48:47-- https://interflexo.com/kp184/setup_kp184_10970_64-bit.tar.gz
Resolving interflexo.com (interflexo.com)...
Connecting to interflexo.com (interflexo.com)|... connected.
HTTP request sent, awaiting response... 200 OK
Length: 107849286 (103M) [application/x-gzip]
Saving to: '/home/manuel/Downloads/setup_kp184_10970_64-bit.tar.gz'

setup_kp184_10970_64-bit.ta 100%[===>] 102,85M 5,08MB/s in 21s

2025-09-07 16:49:09 (4,83 MB/s) - '/home/manuel/Downloads/setup_kp184_10970_64-bit.tar.gz' saved [107849286/107849286]

Download successful.
Specified installation folder: /home/manuel/.local/kp184
Do you want to proceed with the installation? (Y/n) y
Proceeding...
Checking if /home/manuel/.local/kp184 installation forder already exists...
Previous installation folder not found. New installation.
Creating folders...
Unpacking installer archive...
Unpacking successful.
Editing application shortcut file...
Copying application shortcut to desktop menu
Installing Fonts...
Removing installation archive file: /home/manuel/Downloads/setup_kp184_10970_64-bit.tar.gz
Please logout to activate the application desktop menu shortcut if it doesn't show.

To enable access to serial ports without sudo:
sudo usermod -aG dialout $USER
Reboot the computer for the changes to take effect.

Application uninstallation screen output example:

$ ./kp184_install.sh -u

****
* KP184 Modbus software installation / uninstallation *
****

Specified installation folder: /home/manuel/.local/kp184
Do you want to proceed with the uninstallation? (Y/n) y
Proceeding with uninstall...
Removing files...
The KP184 Modbus application is uninstalled.

Installation folder structure:

The main installation folder default name is 'kp184' and will be located inside the $HOME/.local/ folder. The user may choose a different folder name using the install option '-o'.

Example: $ ./kp184_install.sh -o kp184_modbus

Inside the installation folder there are four different folders:

Fonts: Contains the PDF true type fonts .ttf files.

ScrFnts: Contains some application screen fonts.

Sounds: Contains some application .ogg sound files.

_internal: Contains application internal binary files.

An application user data folder is created inside the folder $HOME/Documents named ‘KP184 Modbus’. This folder will store user personal image .png files, test report .pdf files and test data .csv files. This folder is not deleted on application uninstallation to prevent loss of user data.

The installer also create a .desktop file located on the folder $HOME/.local/share/applications to create an application launch shortcut on the GNOME desktop menu.

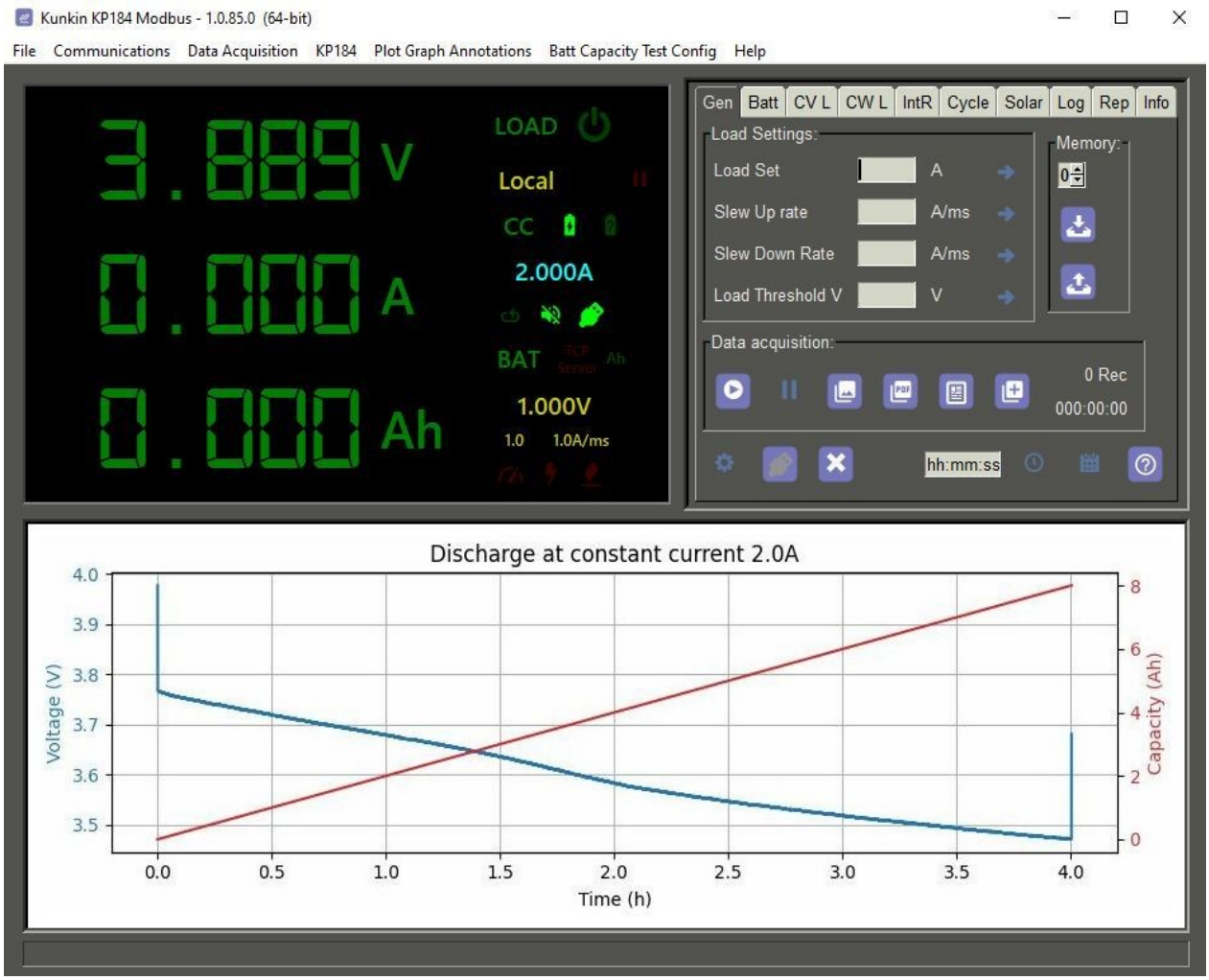
On Linux the serial ports from an USB to Serial Adapter are called something like: **/dev/ttyUSB0**

To allow the application to use the serial ports without sudo privileges you must enter the following command:

sudo usermod -aG dialout $USER

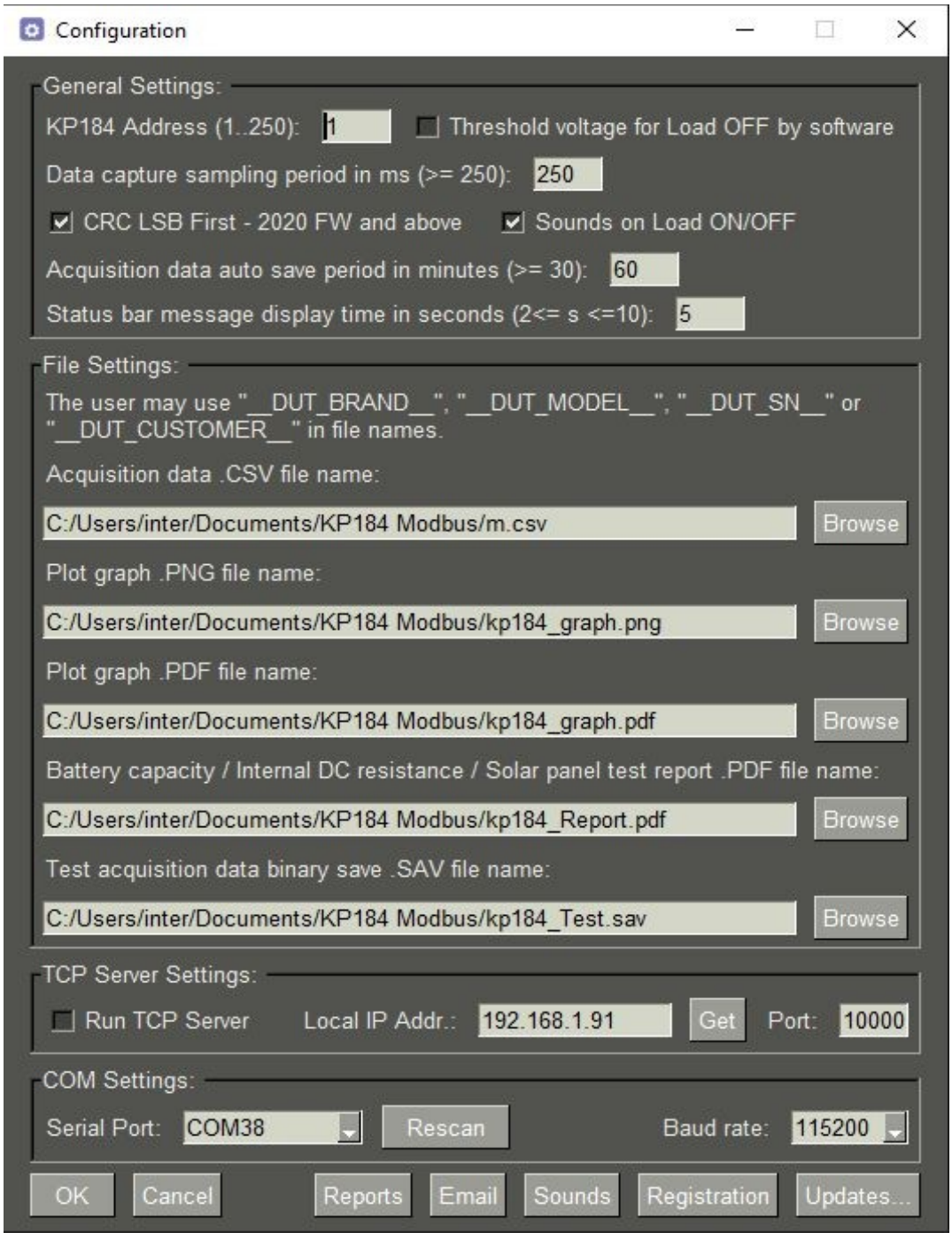
Reboot the computer for the changes to take effect.

Application Main Screen



Configuration dialog button. Disabled when connected to COM port.

Configuration Dialog Window



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).

The **status bar line message display time** is configurable between 2 and 10 seconds. Use a longer display time during training to allow the user enough time to read the long messages and reduce it when you are proficient with the software usage.

File settings group: Default file names and folders for captured data csv format export, plot graph images, battery capacity discharge test reports, multiple battery internal DC resistance test reports, solar panel test reports

and test acquisition data binary saves. The file path can use both slash ‘/’ and backslash ‘\’ symbol separators.

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__ , __DUT_SN__ and __DUT_CUSTOMER__ 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 de COM port combo box list after inserting or removing an 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 13 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.

Dialog box keyboard shortcuts:

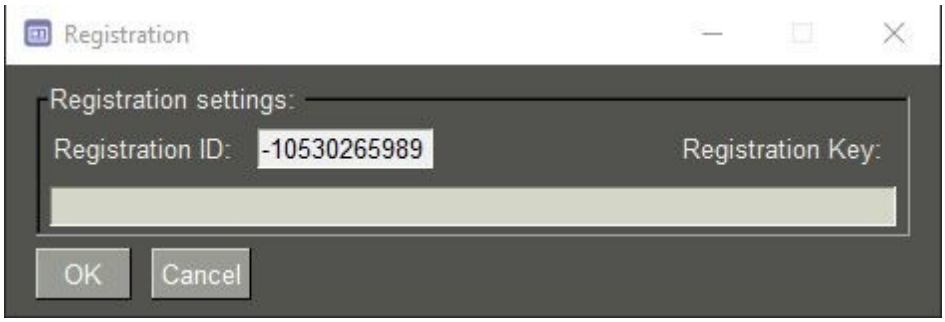
The **Tab** key advances the focus to the next control. When it reaches the end it rolls back to the first control again.

The **Space** key activates buttons, radio buttons, check boxes and combo boxes when the control has the focus.

The **Enter** key advances the focus to the next data edit control. On main application window tabs, when the edit control has a **Set** button associated (send that setting data to KP184 unit) the **Enter** key triggers the **Set** associated button.

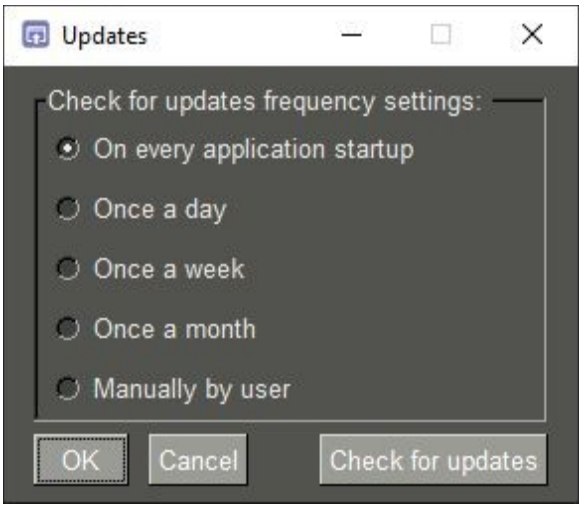
Registration:

Registration settings button opens a child dialog box with the application registration details. Please refer to the registration chapter for further information.



Updates:

Updates settings button opens a child dialog box to configure the automatic check for updates procedure frequency at application startup. **Check for updates** button proceeds to an immediate manual user check for a new application version.



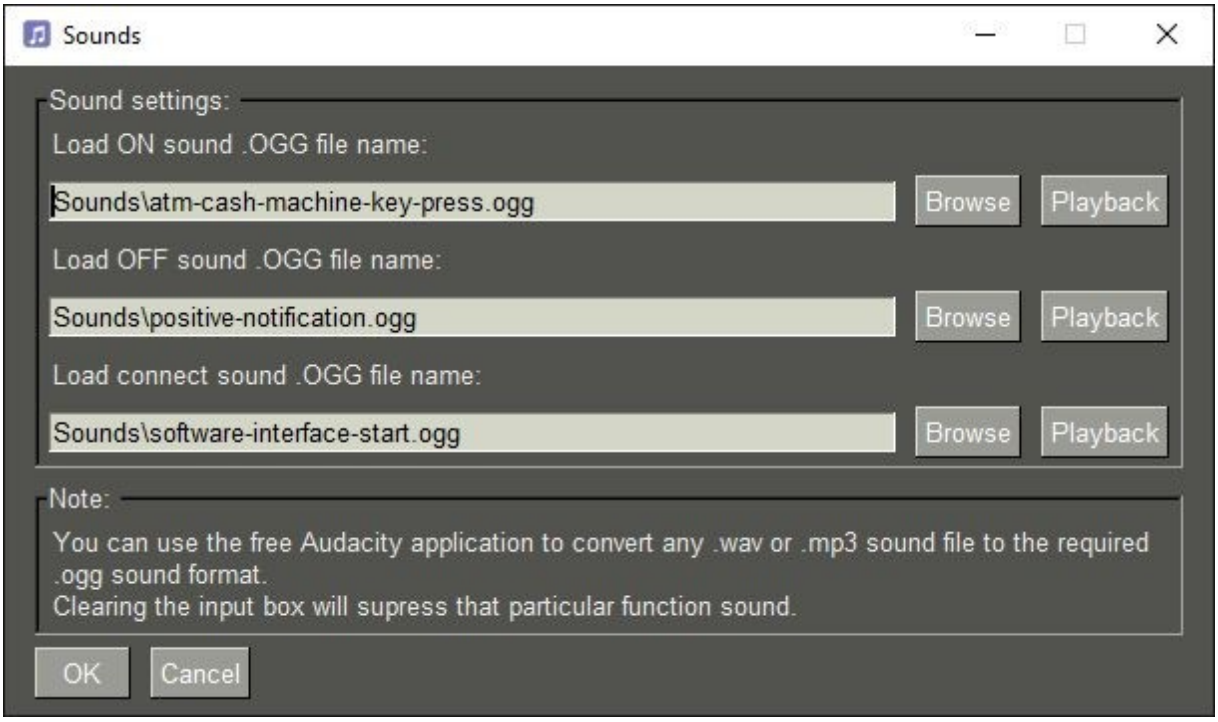
Sounds:

Sounds settings button opens a child dialog box to configure the user sound notifications for the load On/Off/Found events. The **Browse** button opens an Open file dialog window to select an .ogg sound file to be associated with the corresponding event. The **Payback** button plays the selected sound sample.

The Sounds folder inside the application folder contains the sample .ogg sound files, you can add your own sound .ogg files.

Clearing the input box field will suppress that particular sound event.

The free Audacity application can be used to convert any user .wav or .mp3 sound file to the .ogg sound format.



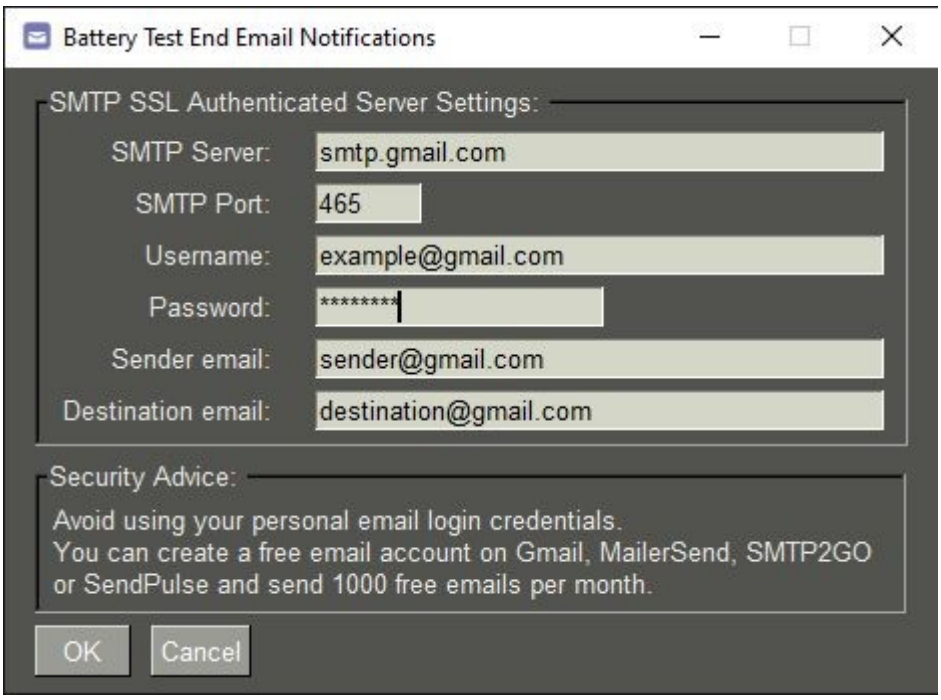
Email:

Email settings button opens a child dialog box to configure the SMTP SSL authenticated email server access settings so the Modbus application can send user notification emails.

The application can optionally send an email at the end of a long battery capacity discharge test to notify the user that the test is terminated. The email message contains the test summary result in Ah units.

Avoid using your personal email login settings that you should not share with anyone for security reasons.

You can create a free email account on Gmail, MailerSend, SMTP2GO or SendPulse and send 1000 free email per month. This should be more than enough for this purpose.

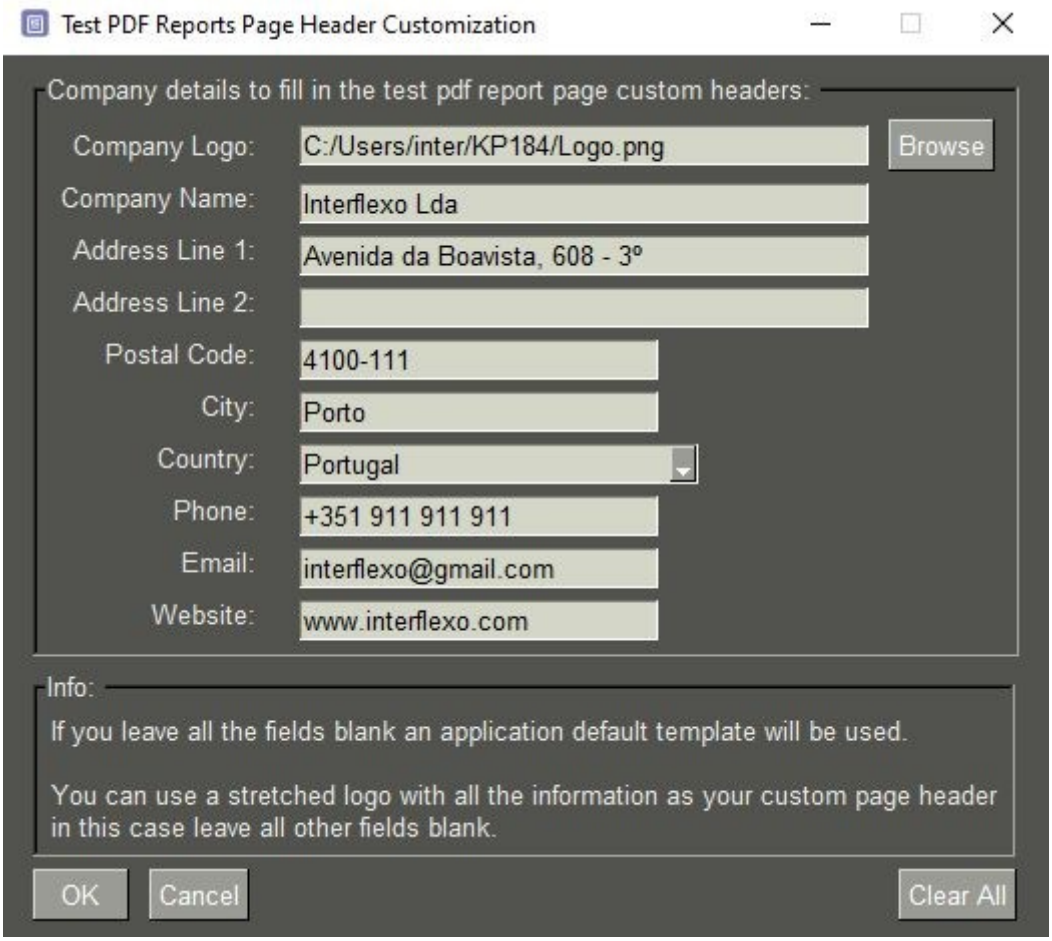


Reports:

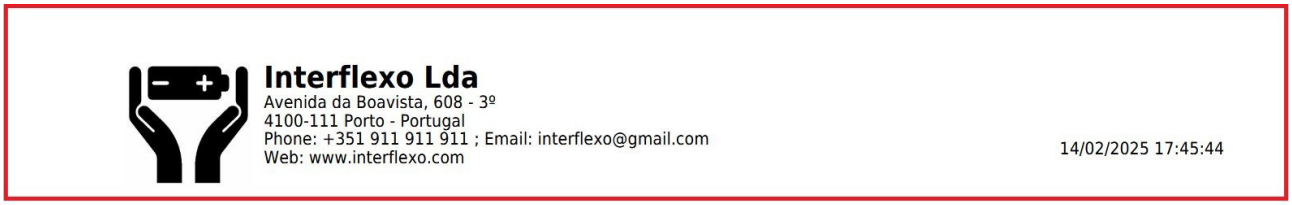
Reports settings button opens a child dialog box to configure the business custom PDF page headers.

If you leave all fields blank an application default template will be used.

You can use a stretched with all the information as your custom page header, in this case leave all other fields blank.



PDF page custom header example:



Solar Panel I-V Test Curve Report

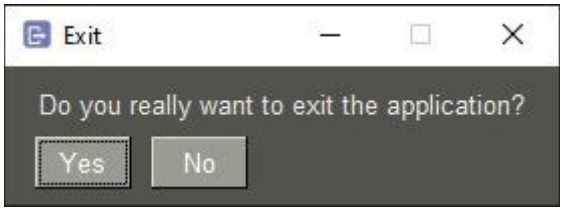
Test Equipment:	Kunkin KP184
Date:	14/02/2025
DUT Brand:	Samsung
DUT Model:	INR18650-15M
DUT ID/#SN:	19966999

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 Kunkin KP184 then stays dimmed.

Exits the application. An exit confirmation dialog window is presented.



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.

 Data acquisition operation paused status indication.

 Data acquisition operation recording status indication.

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 Kunkin KP184 key beep sound ON/OFF.

GEN/CVL/CWL/CYC/SOL Shows the Kunkin active test mode. Toggles between General (CV, CC, CW, CR), CVL (Constant Voltage Current Limited), CWL (Constant Power 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 (**BAT/RES**) both have separate selectable indicator icons as shown above.

Ah/Wh Battery capacity discharge test Capacity / Energy selected units for LCD main display.

TCP Server Application internal TCP Server ON/OFF status indicator.

1.000V 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.

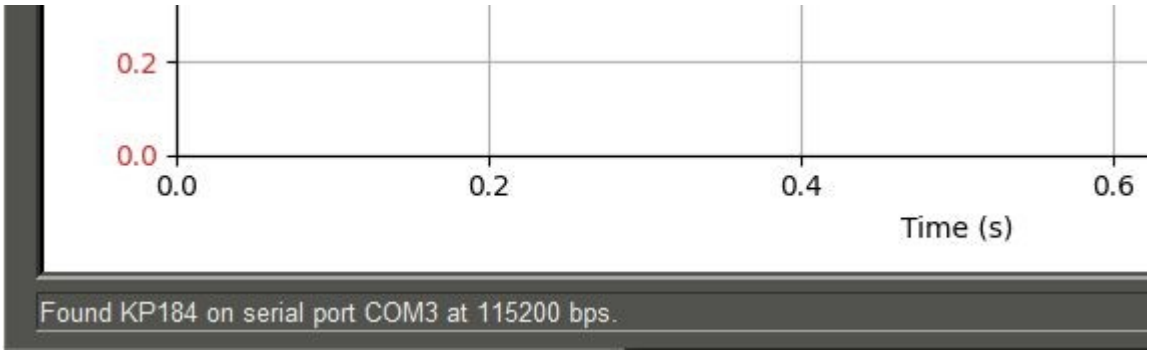
200.0 200.0 A/ms Current slew up and slew down rate when switching the load ON/OFF.

 Overpower indicator. Power > 410W.

 Over voltage indicator. Voltage > 152V.

 Over temperature indicator.

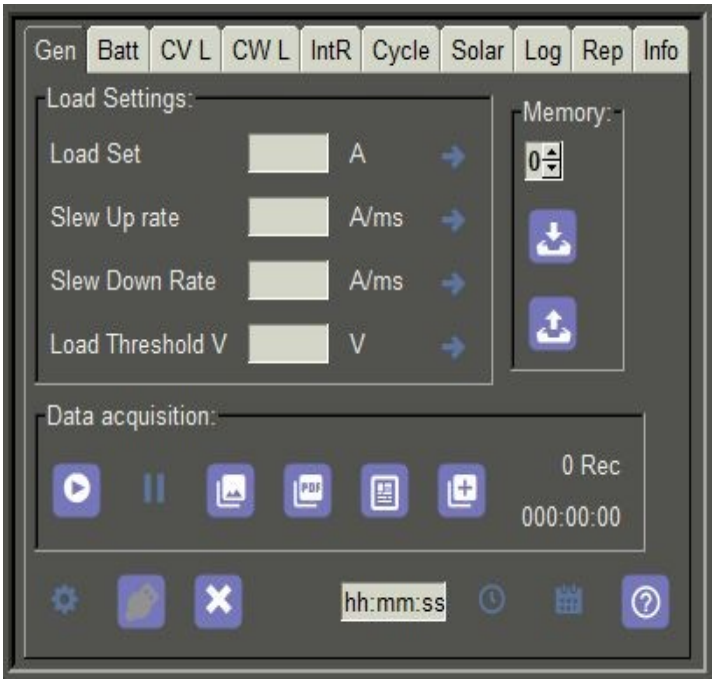
Status Bar



The application uses a bottom status bar line that provides the user with important feedback information about the KP184 device operation and the software user interface.

The status bar line message display time is user configurable between 2 and 10 seconds on the configuration dialog window.

General Settings



Load Settings

Set the:

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

Slew Up rate: 0..400A/ms
Slew Down rate: 0..400A/ms

The slew rates control to slope of the load current rise and fall. Early models had a 200A/ms upper limit.

Threshold Voltage: 0..150V

KP184 automatically throttles the current so the load don't go below this voltage. Unless you have a specific reason keep this setting below your working test voltages.

→ 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. The Return key on numeric entry field has the same effect as pressing this send button.

Preset Memories

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

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

A status bar message 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.

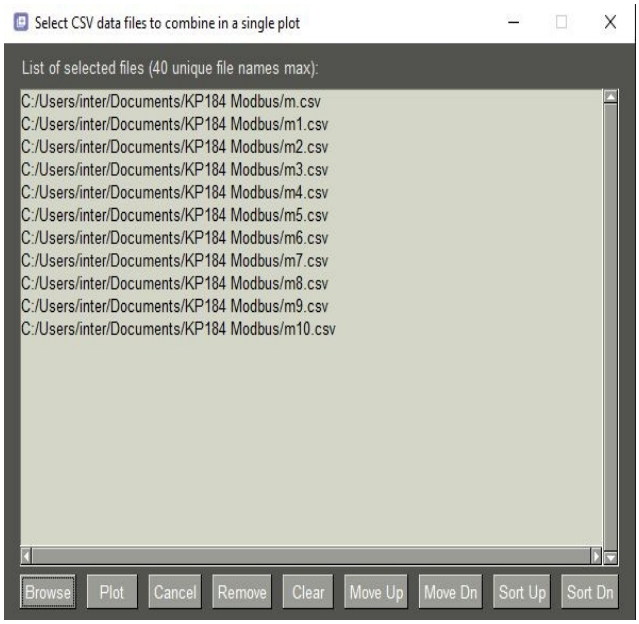
Saves the plot graph on a previously configured PDF file name and folder. The file name is used as a base file name, numbers are automatically added in subsequent files to avoid overwriting files. It can be used during data acquisition. A matching “.png” image file is also added for easier document insertion. 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 50 for details about this report.

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

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 elapsed times and not time stamps.
- 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.

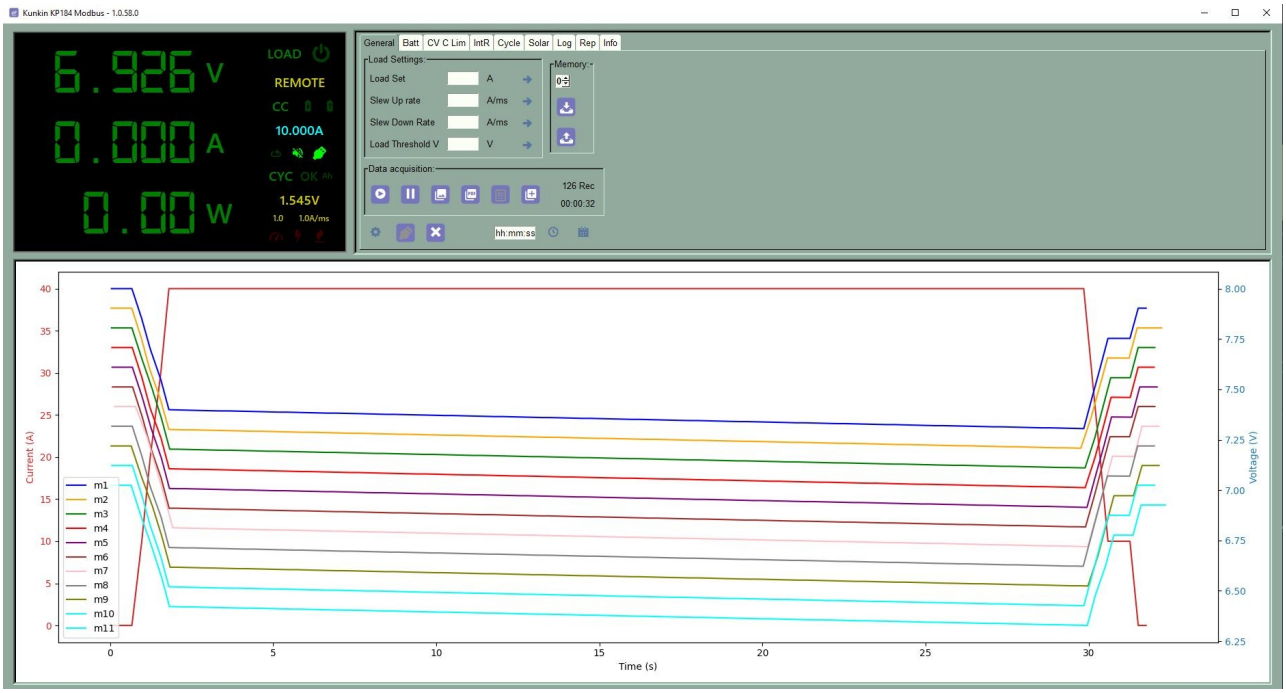
The buttons “Sort Up” and “Sort Dn” sort all the full path file names in a descending or ascending order. The order is important because it will the same on the plot graph curve legend.

Select the button “Plot” to continue to plot graph update or the button “Cancel” to abort.

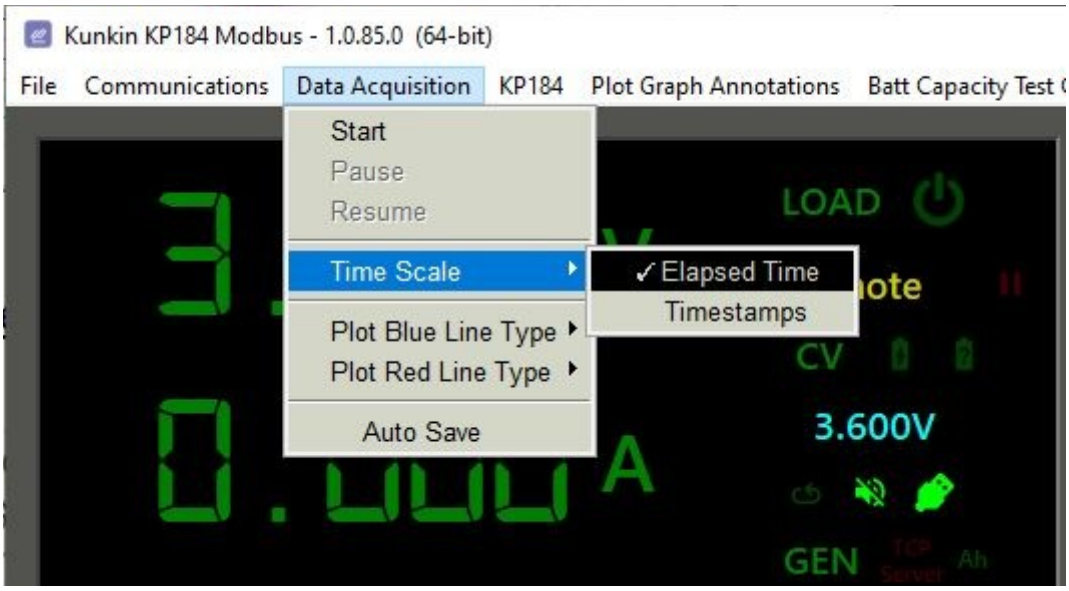
These superimposed plot graphs can be used to:

- 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.



Data Acquisition Menu



The Data Acquisition menu provides options to:

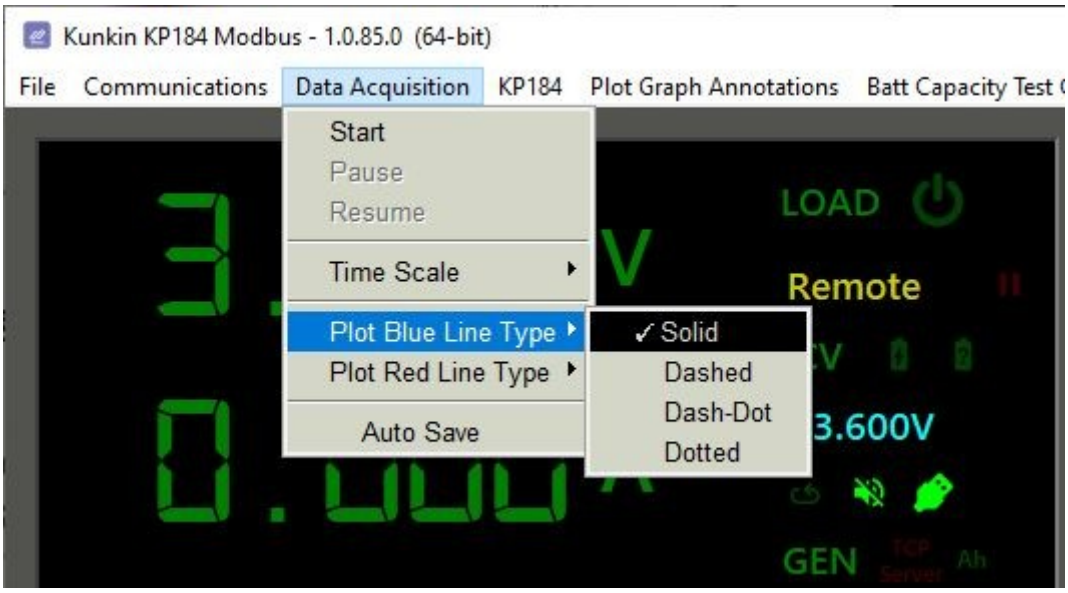
- Start / Pause / Resume data acquisition. Duplicates data acquisition frame related icon functions. On battery capacity test mode, solar panel test mode and cycle mode with plot option the manual data acquisition controls are disabled because they are automatically operated during the test progress. This eliminates some possible odd user manual operations.

- Change the time data type selection (Elapsed time in seconds or Time Stamp) regarding plot graph horizontal time axis and CSV data export.

- Change the plot graph (blue and red) curve line style independent selection from Solid, Dashed, Dash-Dot and Dotted styles. The user can change these settings during test execution and after test execution. The plot graph is updated accordingly.

- Turn ON/OFF the acquisition data Auto Save feature.

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

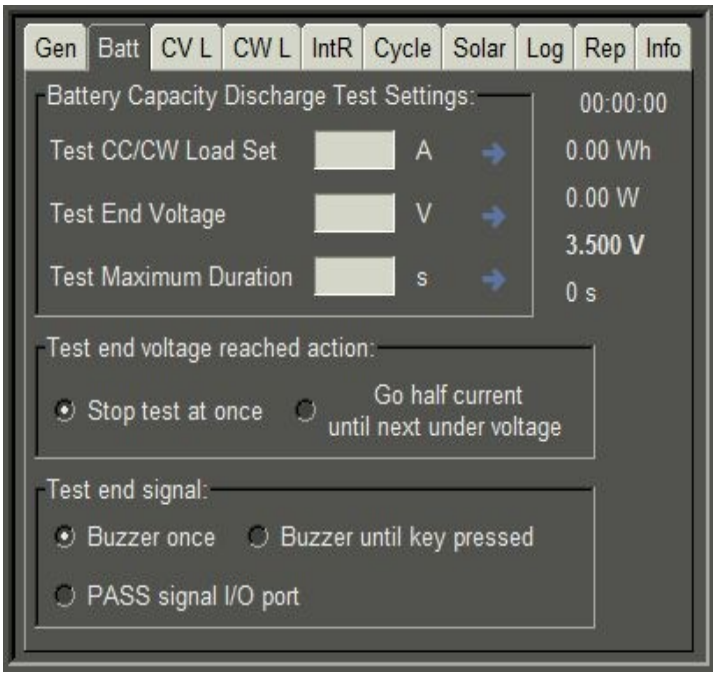
 Timer enabled to turn Load ON at a specific date and time

 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: 

After 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 (until V1.0.80.0).
- The plot graph type used on the battery capacity test PDF report will correspond to the setting at test end time (after V1.0.81.0).

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

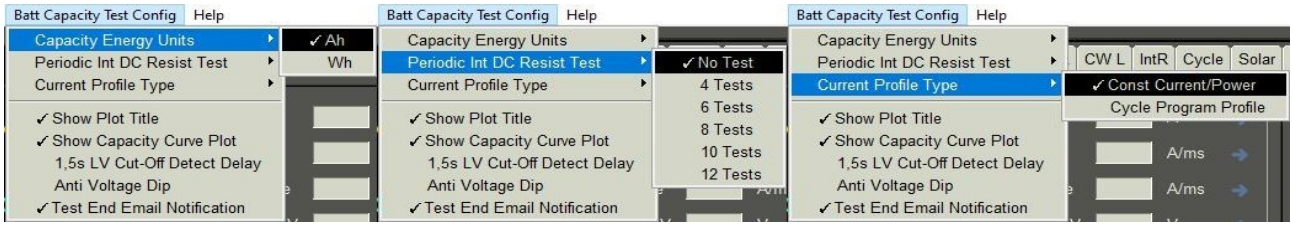
The radio buttons show the parameter value and allow the user to change it. The options are:

- Buzz once
- Buzz until a key is pressed on the Kunkin 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 Capacity Test Config Menu



The capacity / energy (Ah/Wh) plot curve may be suppressed on the battery capacity discharge test plot graph for voltage curve plot graph display only. You can use these options during setup, during capacity test and after test termination any number of times. The plot graph for the test final PDF report is recreated using the user latest choice.

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 61 for details about building a custom programmed periodic current profile.

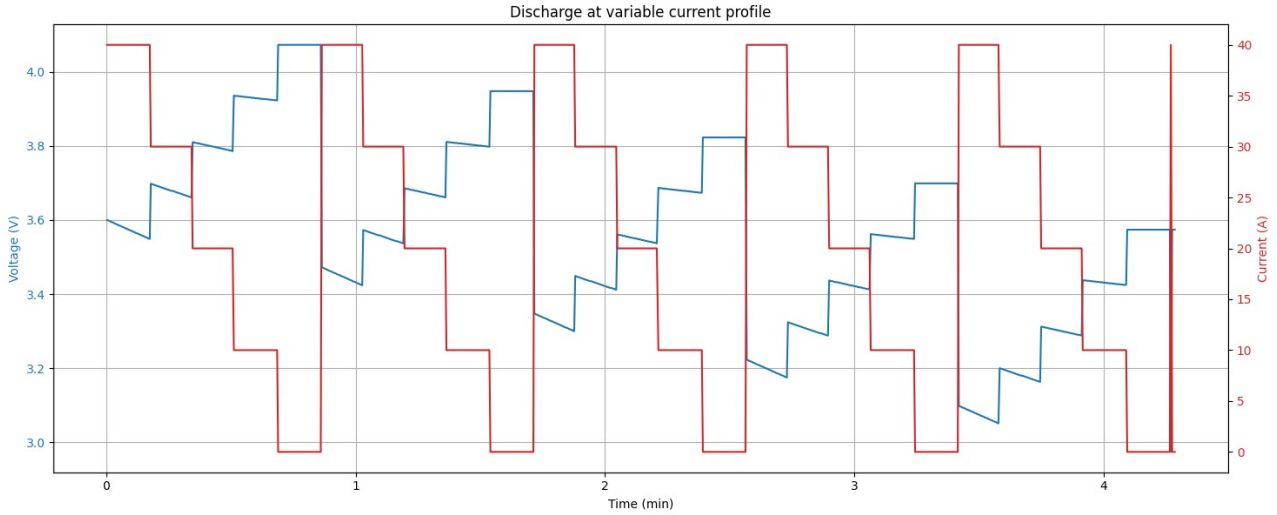
Selecting “Cycle Current Profile” option:

- 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. This setting works only for the software.

The KP184 unit may always cut the test short (turning the load OFF) if the voltage dips below the programmed test end voltage setting.

It is a good idea to use solid bolted connections on soldered ring connectors at both ends of the test power cables.

Avoid alligator clips of any kind at both test power cable ends (battery and KP184 binding posts).

Also avoid the usage of 4mm banana plugs at the KP184 binding posts. The 4mm banana jack hole on KP184 is a bit loose and do not provide the required good electric connection.

Bad electric connections will result in short voltage dips and voltage spikes caused by inductive flyback currents. This will mess up your data, test plot graph and cause a premature test ending leading to wasted time.

The optional **anti voltage dip strategy** measures and identifies fast voltage dips and tries to avoid a premature test end. If the electronic load turns the load OFF the software tries to restart the load ON.

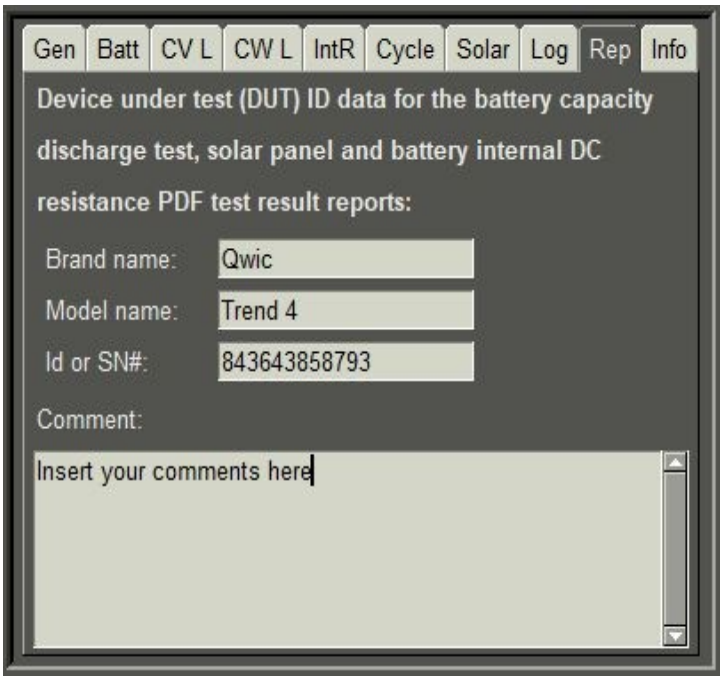
The voltage dips are identified when the voltage drops below the programmed test end voltage with a slope below -70°. There is a maximum of 3 consecutive attempts to restart the electronic load, there is no limit for the non consecutive load restart attempts. This option can be enabled and disabled during the test progress.

The **Test End Mail Notification** option toggles the ability to send a user email notification when a long battery capacity discharge test finishes.

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 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 32 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.

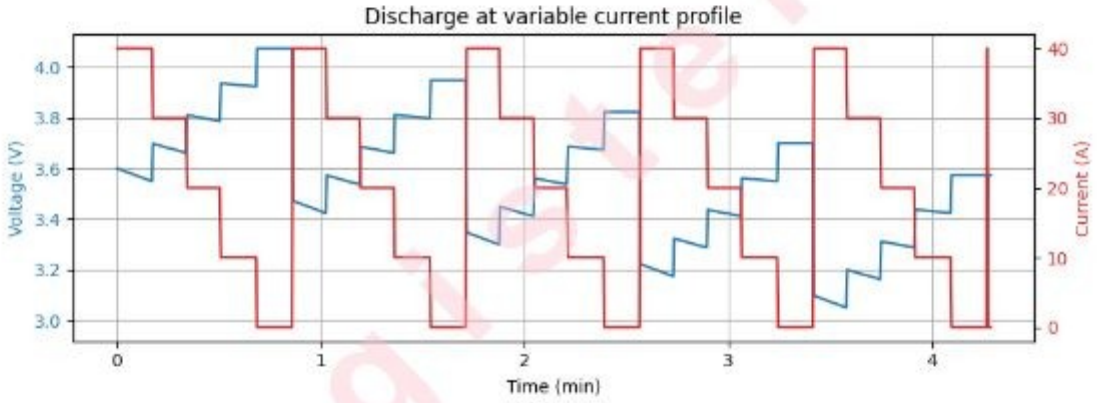
The report is saved on a previously configured PDF file name and folder. The file name is used as a base file name, numbers are automatically added in subsequent files to avoid overwriting files. After file creation the PDF file is automatically opened on Adobe Acrobat Reader or configured web browser.

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:	08/02/2024
DUT Brand:	Samsung
DUT Model:	INR18650-15M
DUT ID/#SN:	19966991
Load Set:	Variable current profile
Test End Voltage:	3.000 V



Test Results:

Battery Energy:	4.81 Wh
Battery Capacity:	1.399 Ah
Discharge Time:	00:04:17
Discharge Current:	Variable current profile
Start Voltage:	4.200 V
End Voltage:	2.974 V
Test termination:	Test end voltage reached

Battery Capacity Discharge Test Report - 04/10/2022 10:12:48

Battery Capacity Discharge Test Report

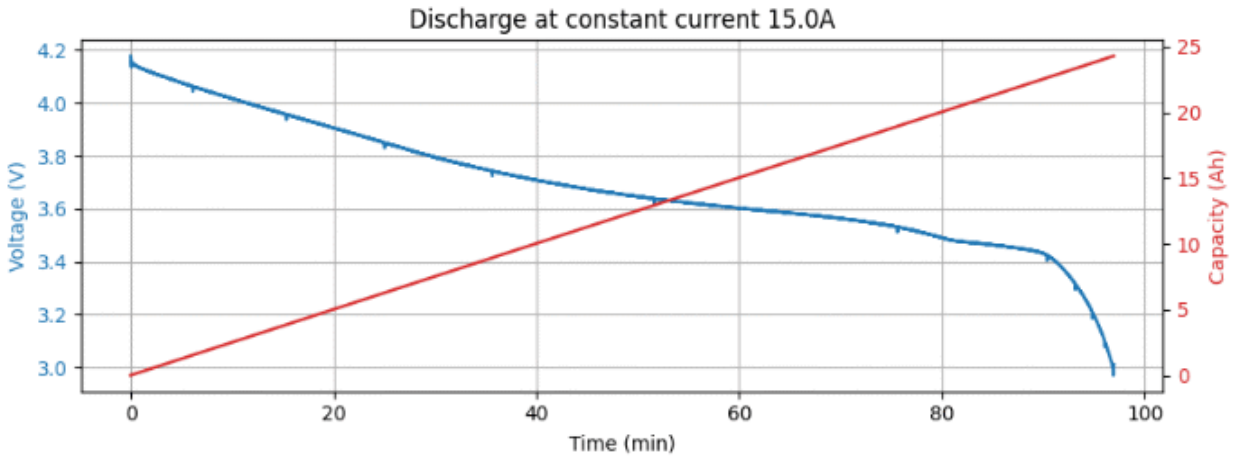
Test Equipment:	Kunkin KP184
Date:	04/10/2022
DUT Brand:	No Brand
DUT Model:	Hybrid 25Ah 5C
DUT ID/#SN:	843643858793

Periodic Internal Resistance Test

Load Set:	15.000 A
Test End Voltage:	3.000 V

Pulse 1: 0.8 s 15.0 A

Pulse 2: 0.8 s 30.0 A



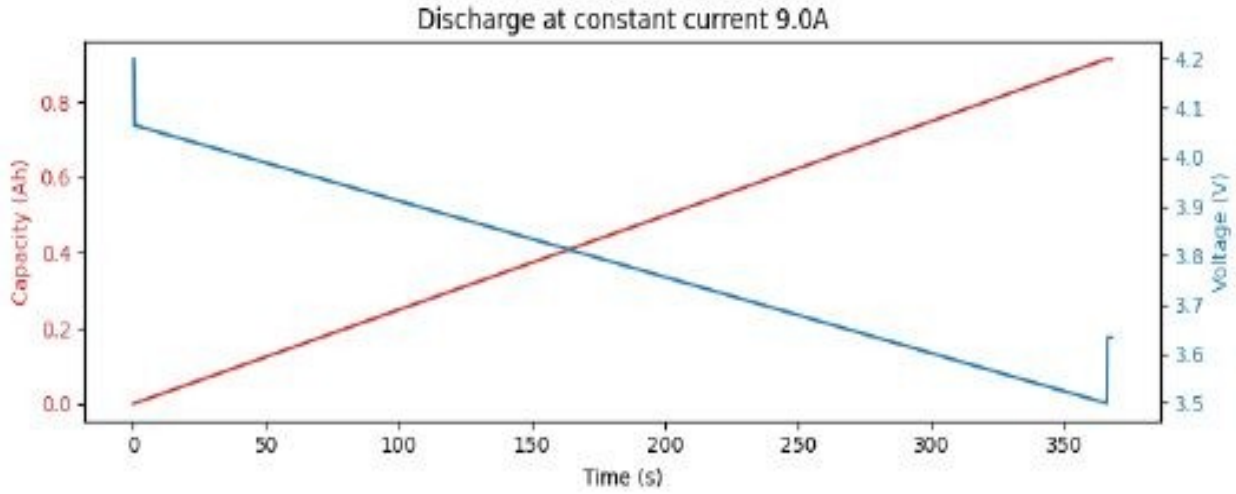
Test Results:

Battery Energy:	89.62 Wh
Battery Capacity:	24.272 Ah
Discharge Time:	01:36:55
Discharge Current:	15.000 A
Start Voltage:	4.178 V
End Voltage:	2.990 V

SOC:	Internal Resistance:
99.9 %	1.4 mOhm
93.7 %	1.3 mOhm
84.1 %	1.3 mOhm
74.2 %	1.3 mOhm
63.2 %	1.3 mOhm
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

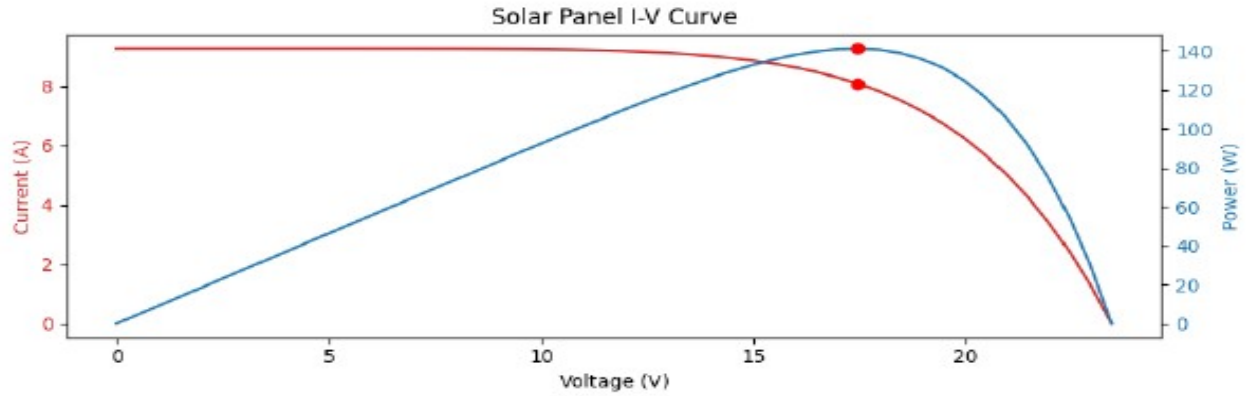


Test Results:

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

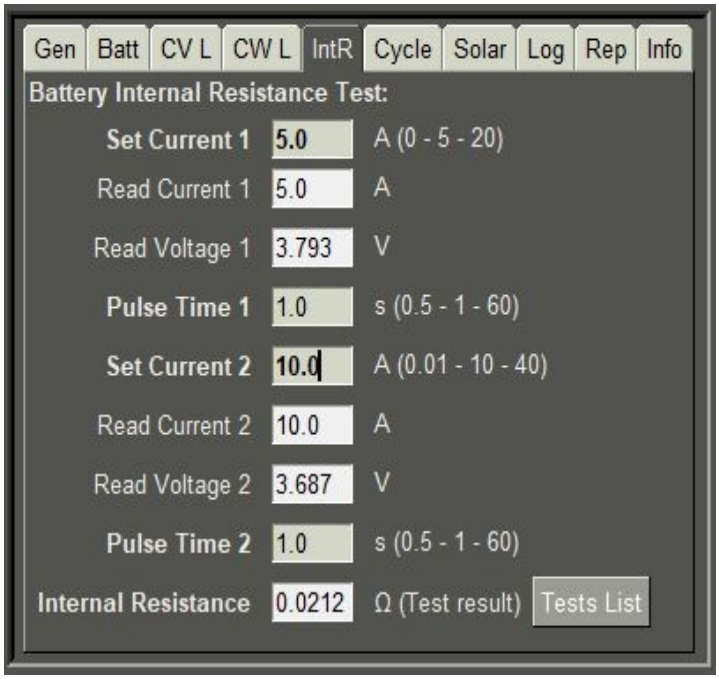
Test Equipment:	Kunkin KP184
Date:	18/11/2021
DUT Brand:	Qwic
DUT Model:	Trend 4
DUT ID/#SN:	#1234567890#



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.

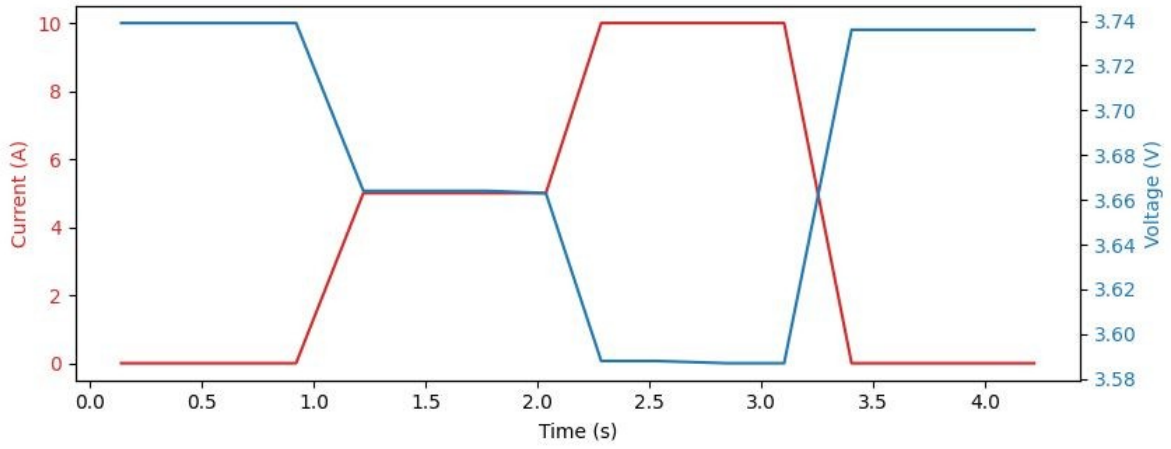
The first step may be configured to 0A to measure the battery internal resistance from an open circuit voltage (OCV) state.

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

To start the test use the Load Switch button: 

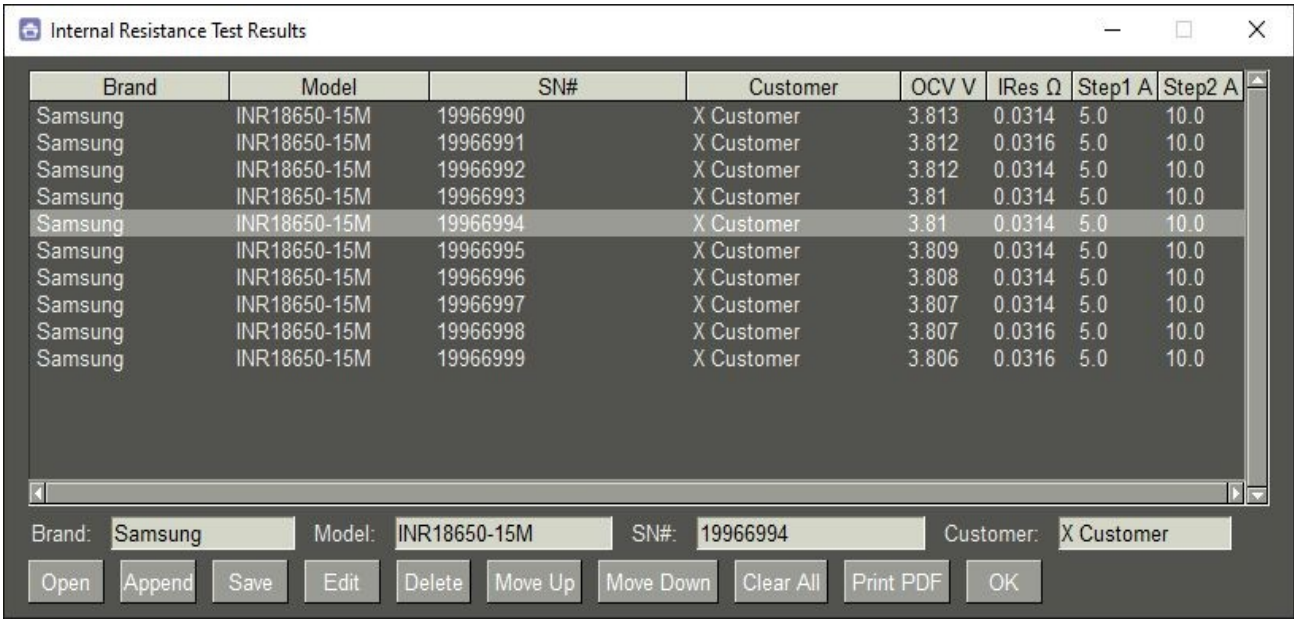
The test stops automatically.

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 Kunkin KP184 parameters by serial port regarding this test. Once again the Kunkin 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.



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, SN# and Customer), 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 “**Open**” button presents the open file dialog and allows the user to select an “.ires” binary file to load the grid with a saved set of internal resistance tests, the previous grid content is erased.

The “**Append**” button presents the open file dialog and allows the user to select an “.ires” binary file to load the grid with a saved set of internal resistance tests, the loaded information is added to the previous grid content.

The “**Save**” button presents the save file dialog and allows the user to select an “.ires” binary file name to save the grid current internal resistance tests list.

The “**Edit**” button saves the current edits on the four 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 All**” button erases all tests permanently from the list. Exiting the Internal Resistance Test mode also clears the tests list information.

The “**Print PDF**” button saves the test list summary to a PDF report. The PDF page internal resistance tests order are the same as they appear on the grid and are grouped by customer.

The “**OK**” button dismisses the window.

The multiple internal resistance test list can also 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.

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Avenida da Boavista, 608 - 3º
4100-111 Porto - Portugal
Phone: +351 911 911 911 ; Email: interflexo@sapo.pt
Web: www.interflexo.com

17/02/2025 17:49:44

Internal Resistance Test List Report

Test Equipment: Kunkin KP184

Date: 17/02/2025

Customer: X Customer

Brand	Model	Serial #	OCV V	IntRes mΩ	Step1 A	Step2 A
Samsung	INR18650-15M	19966990	3.813	31.4	5.0	10.0
Samsung	INR18650-15M	19966991	3.812	31.6	5.0	10.0
Samsung	INR18650-15M	19966992	3.812	31.4	5.0	10.0
Samsung	INR18650-15M	19966993	3.810	31.4	5.0	10.0
Samsung	INR18650-15M	19966994	3.810	31.4	5.0	10.0
Samsung	INR18650-15M	19966995	3.809	31.4	5.0	10.0
Samsung	INR18650-15M	19966996	3.808	31.4	5.0	10.0
Samsung	INR18650-15M	19966997	3.807	31.4	5.0	10.0
Samsung	INR18650-15M	19966998	3.807	31.6	5.0	10.0
Samsung	INR18650-15M	19966999	3.806	31.6	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)

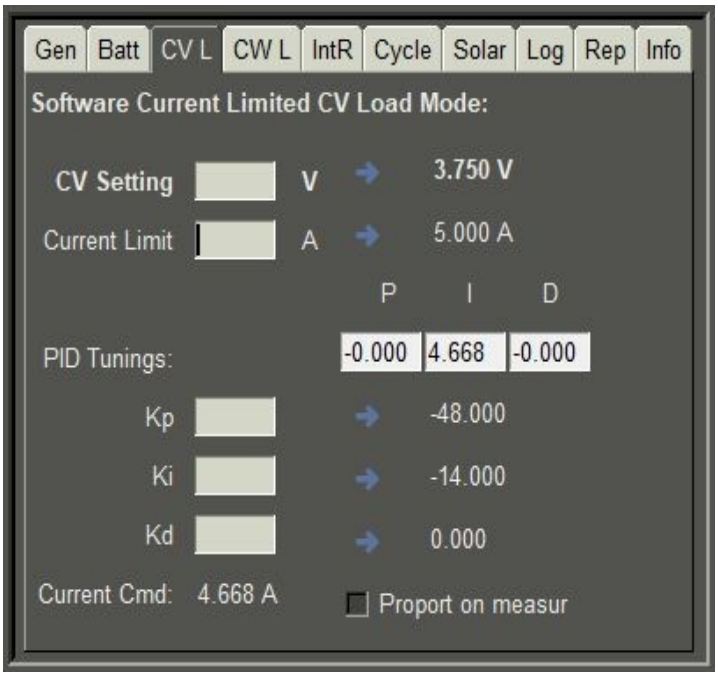
IR Test Pulse Current Selection Table

Cell Voltage 3.7 0.007 KP184 Voltage accuracy

Cell IR (Ohm)	Pulse 1 (A)	Pulse 2 (A)	Read V1 (V)	Read V2 (V)	Calc IR (Ohm)	IR Max Error (Ohm)
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.

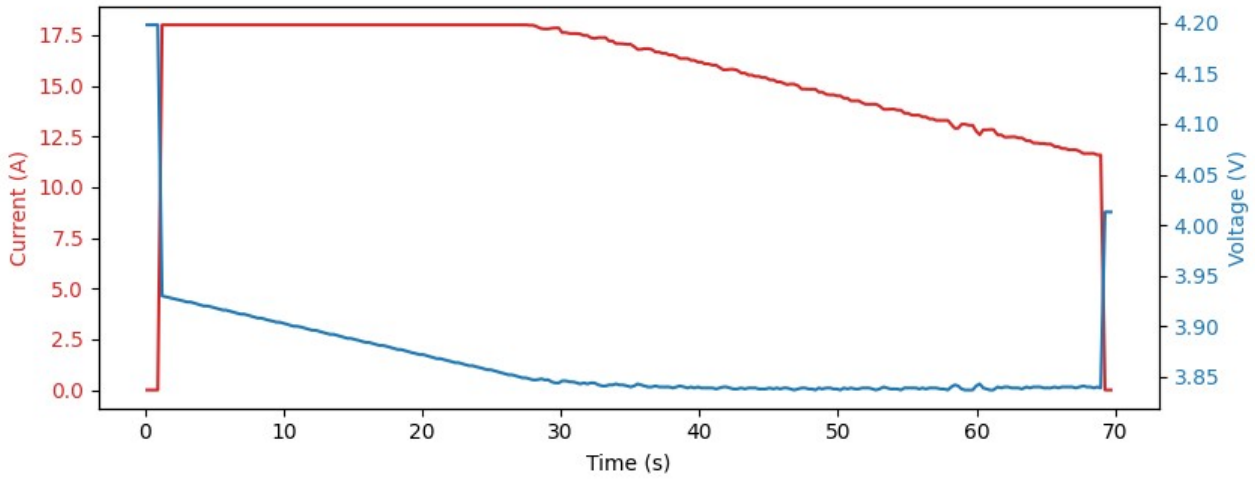
GEN/CVL/... Toggle the test mode indicator to access CVL test. It unlocks In CVL tab.

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

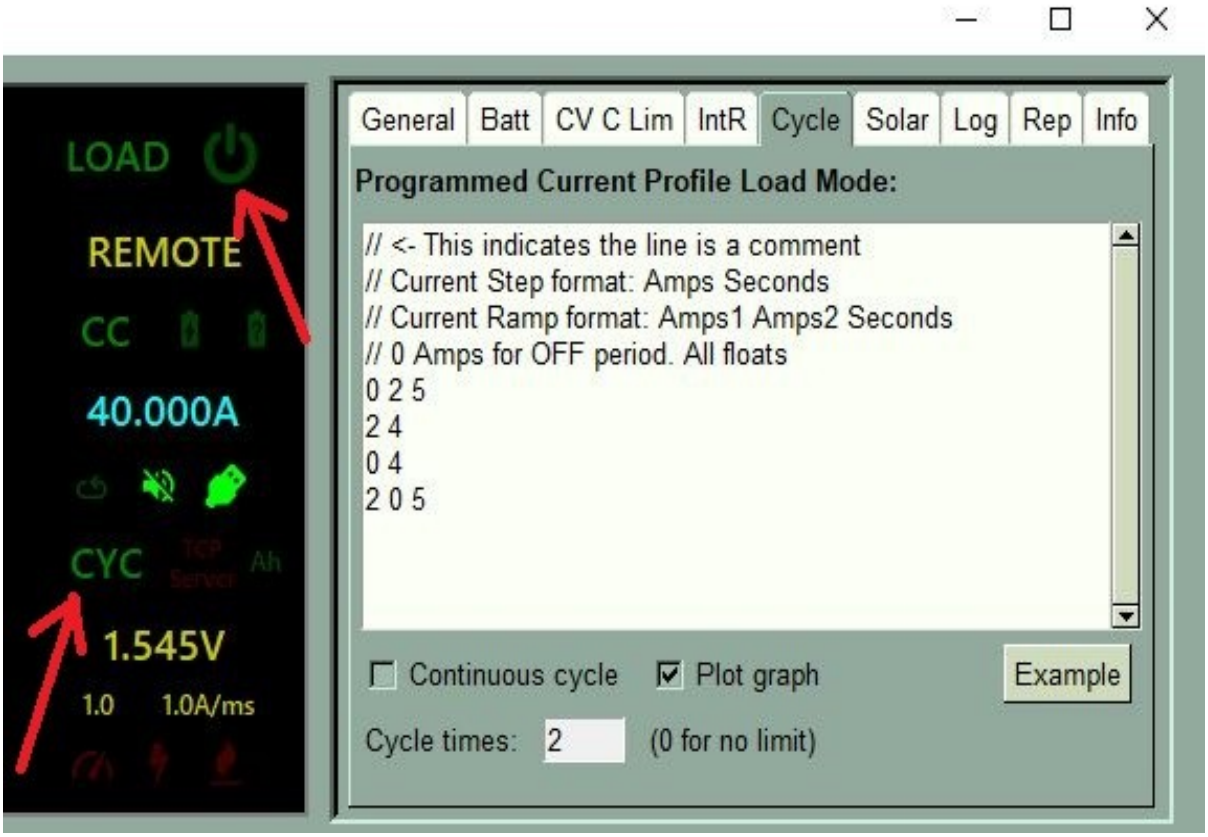
Proportional on Measurement: No

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 / CWL / 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

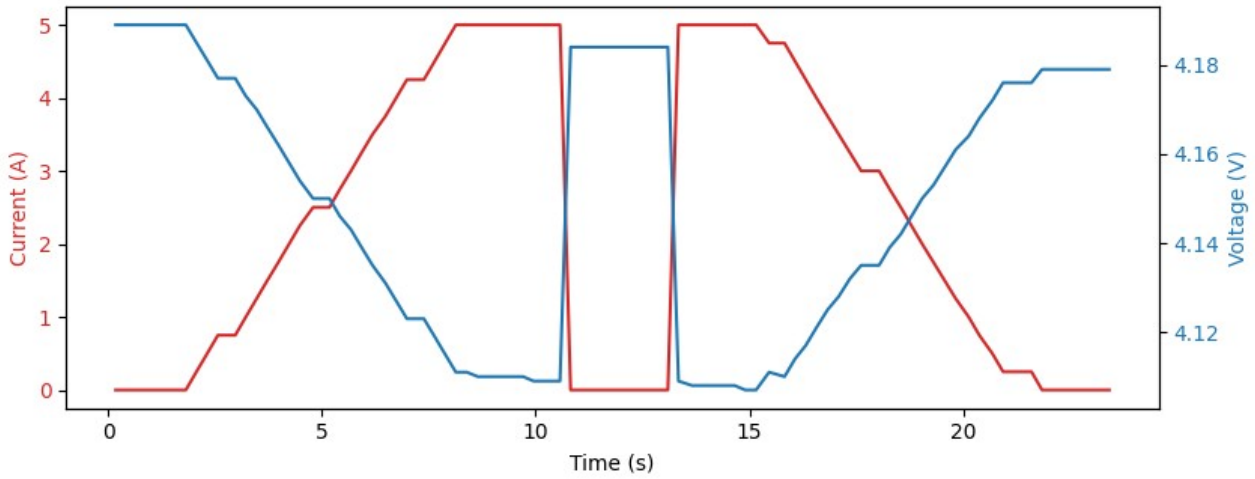
Ramp from 5A to 0A in 5

seconds.

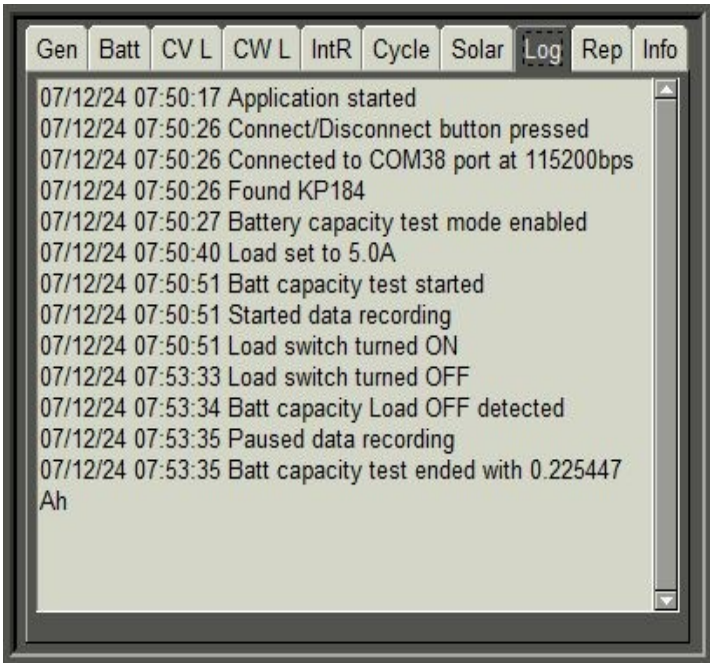
You can repeat the programmed profile any number of times or just indefinitely.

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 an inspect how Kunkin KP184 is being commanded.



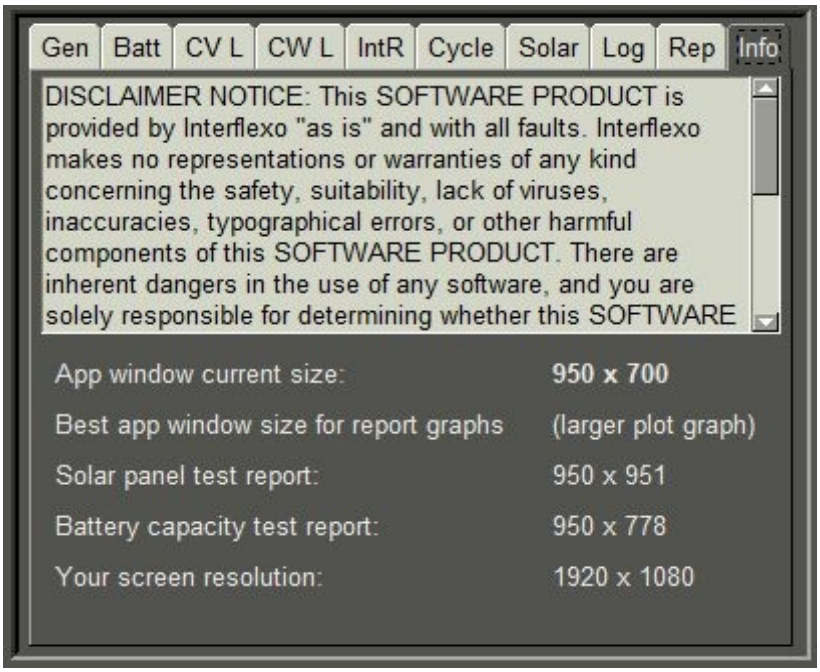
Event Log



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



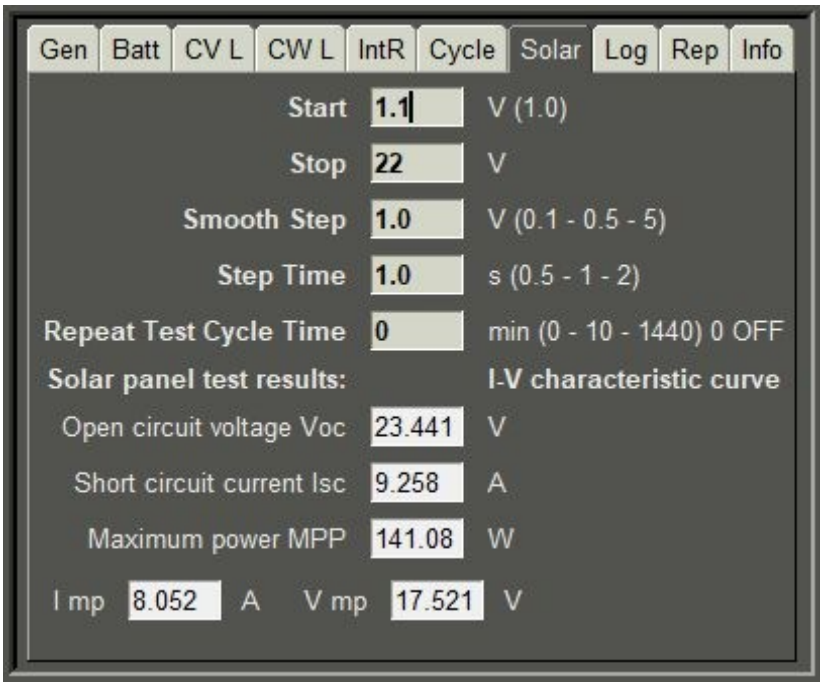
The info tab contains a software disclaimer notice.

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 / CWL / 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 of 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 currently
- 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 46) 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:

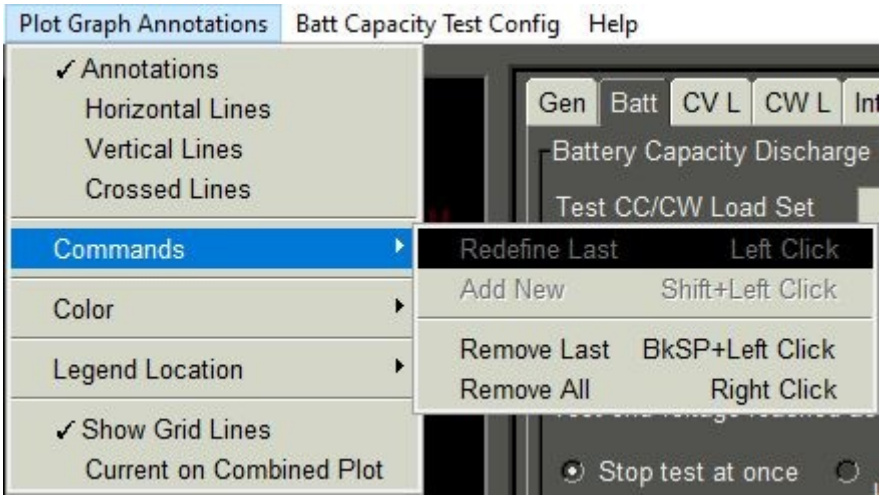
 Save the collected data on a .csv file.

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

 Create the detailed solar panel test PDF report.

Please refer to page 52 for an example on the solar panel test report.

User selected annotations on the plot graph



The user can select the annotations type from coordinate value annotations, horizontal lines, vertical lines and crossed lines (horizontal + vertical lines).

The annotations are created on a user selected point on the plot graph area.

The user can use the left mouse click on the plot graph area during the test execution and after the test termination to select a point anywhere inside the axis. This point will define an x value to get the y curve values and the final position to the arrow of text annotation or line(s) creation.

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.

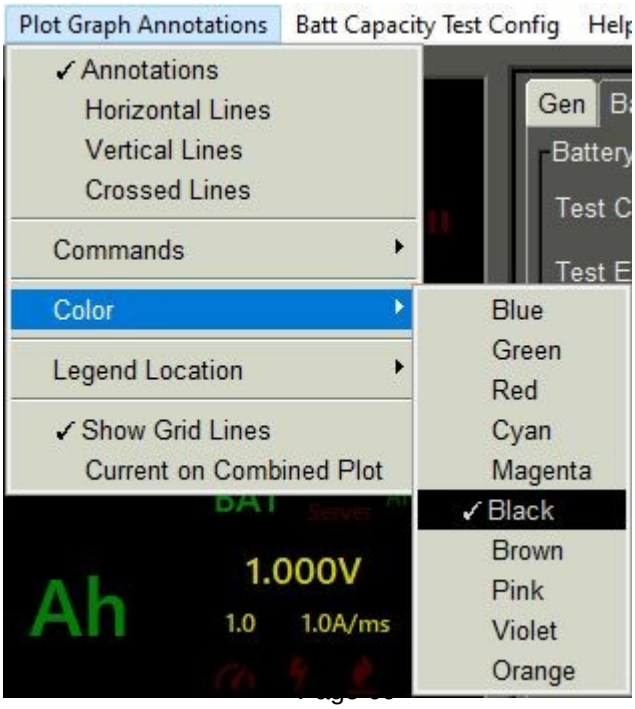
Shift + Left mouse click adds a new annotation on the selected point inside the plot graph area. Does not need to be selected on top of the curves. There is no limit for the number of annotation that can be created this way.

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.

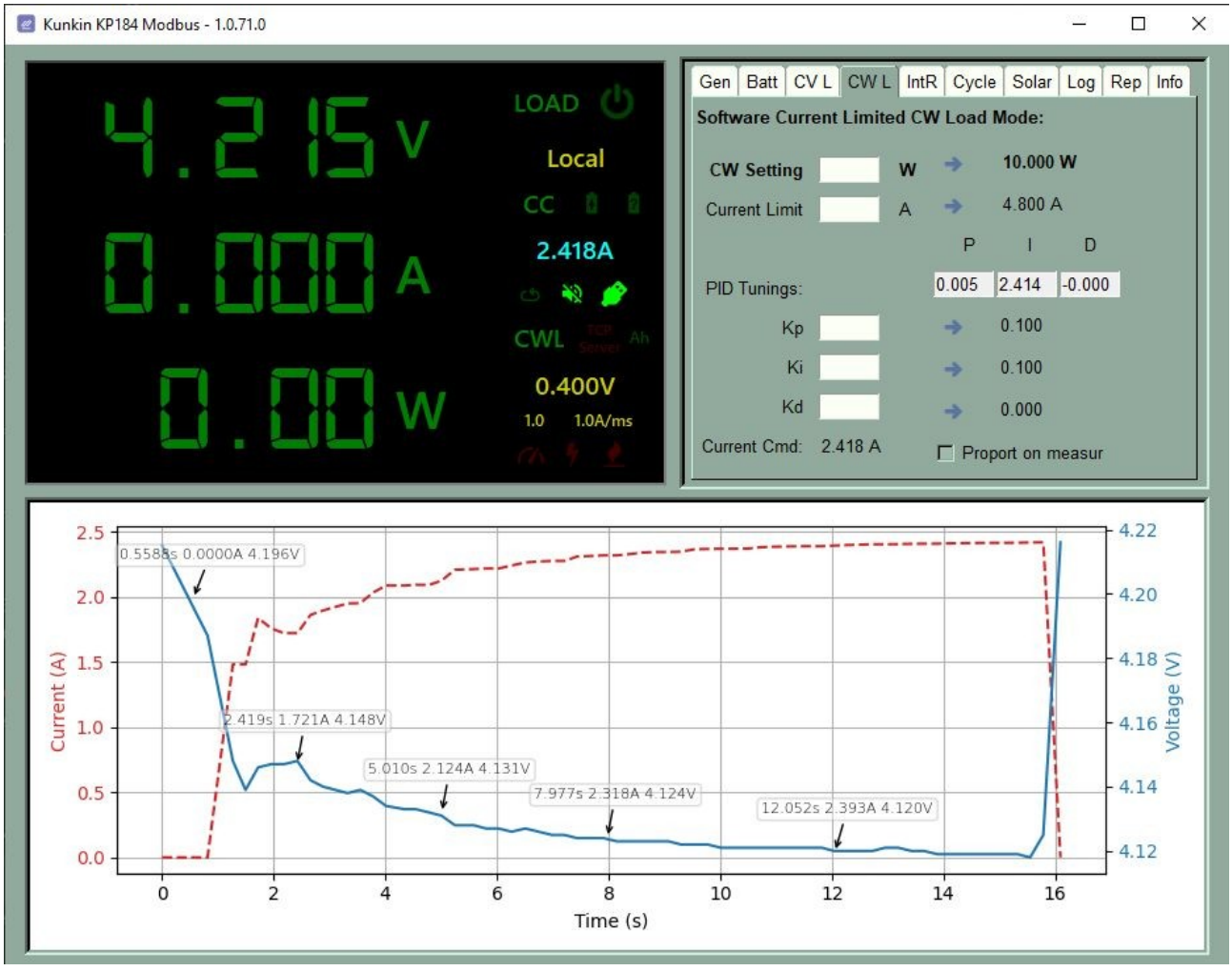
The annotations are automatically deleted when a new plot graph is started at the beginning of a test.

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.

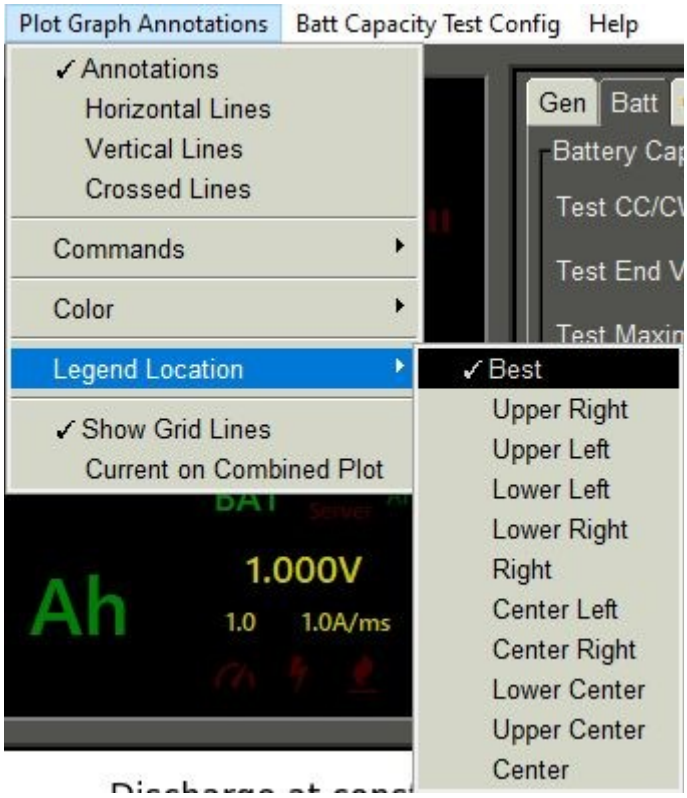


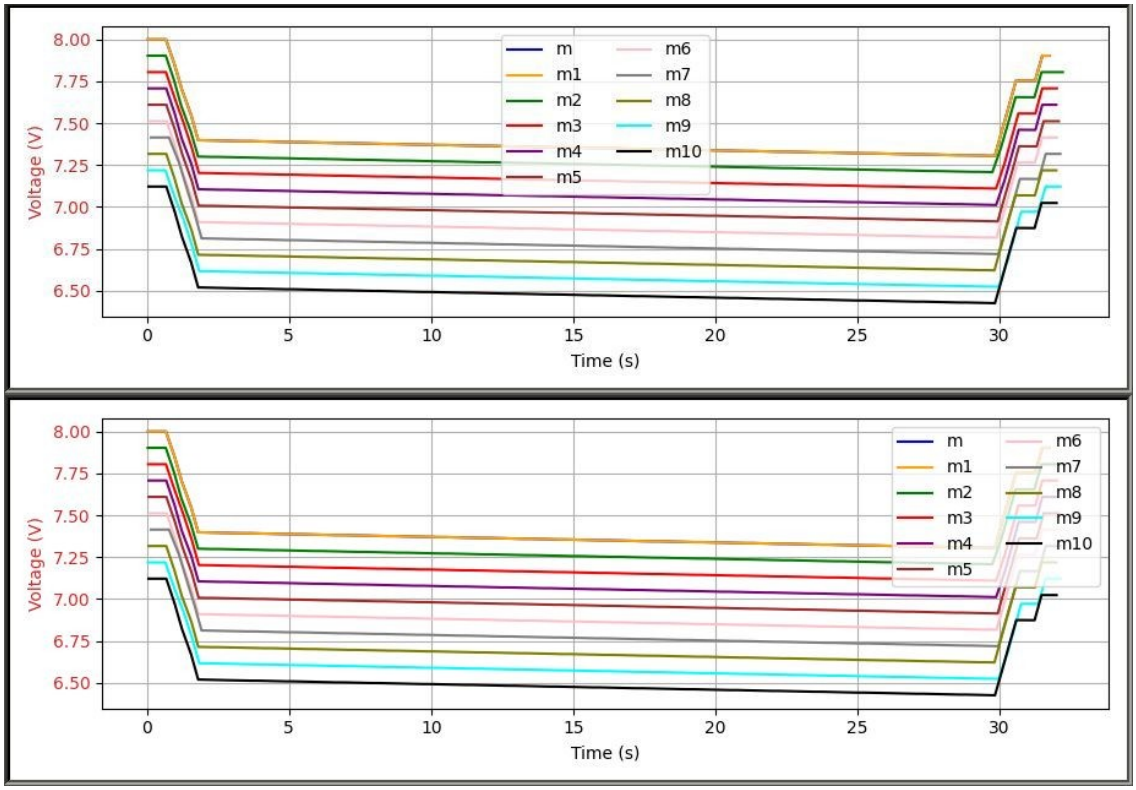
The user can previously choose the color for each plot graph annotation. After creation the annotation color can not be changed. The user can delete the last annotations change the current color and recreate the annotations.

The user can control if the **grid lines** are shown on the current plot graph. The plot graph is redrawn according to the user choice.

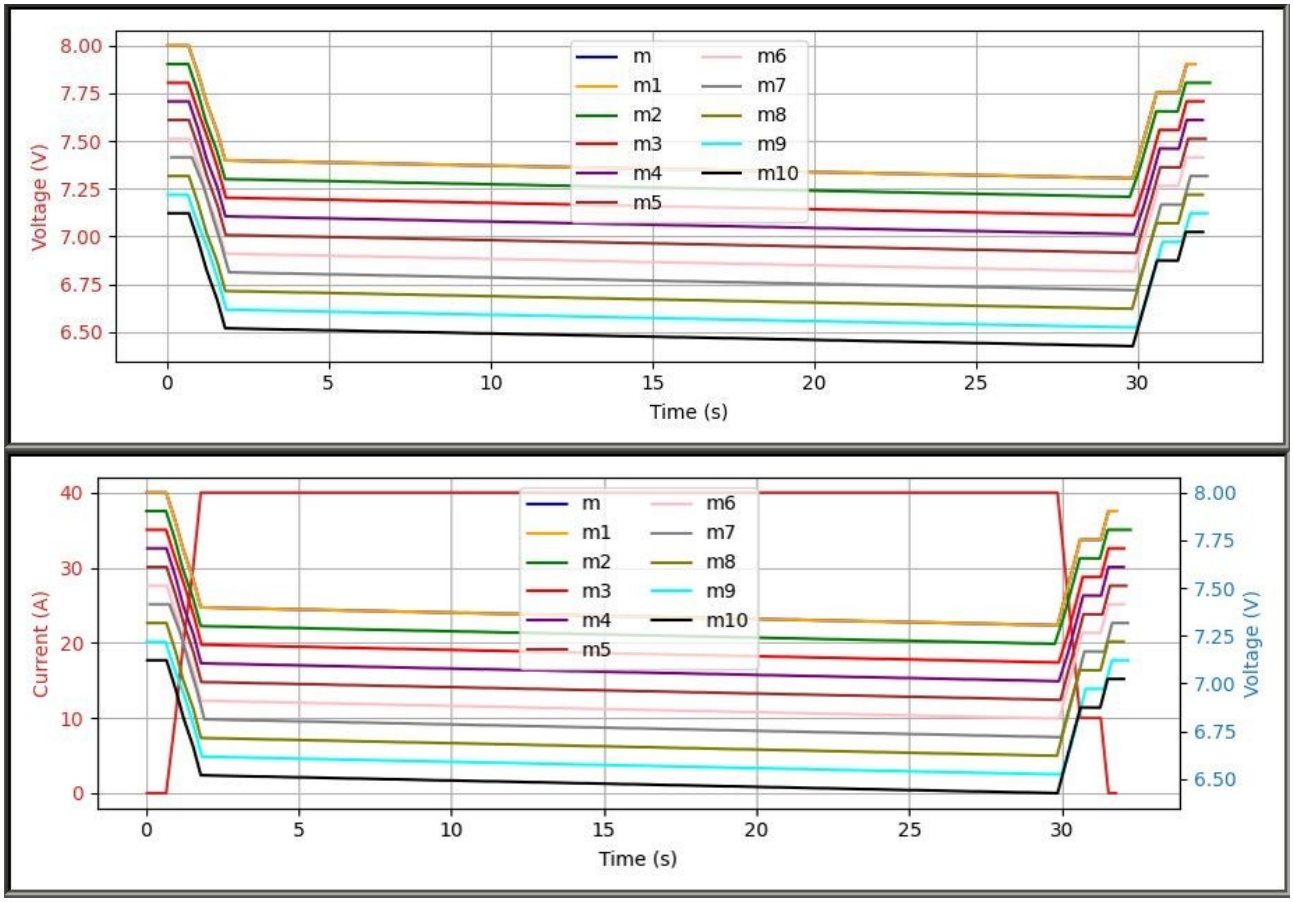


The **Legend Location** menu allows to user to select the best placement for the legend on the combined CSVs multiple curves plot graph.


Plot Graph Annotations
Batt Capacity Test Config
Help
✓ Annotations
Horizontal Lines
Vertical Lines
Crossed Lines
Commands
Color
Legend Location
✓ Show Grid Lines
Current on Combined Plot
✓ Best
Upper Right
Upper Left
Lower Left
Lower Right
Right
Center Left
Center Right
Lower Center
Upper Center
Center
Gen
Batt
Ah
1.000V
1.0
1.0A/ms


Voltage (V)
Time (s)
m
m1
m2
m3
m4
m5
m6
m7
m8
m9
m10

The **Current on Combined Plot** option allows to user to select the current curve plot display option on the combined CSVs multiple curves 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 6 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.

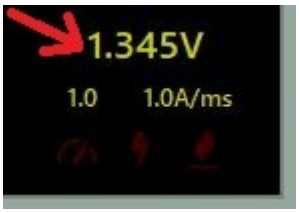
➔ If you want to change this value on the Test Settings frame please enter the new load value and press the right arrow set button.

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:

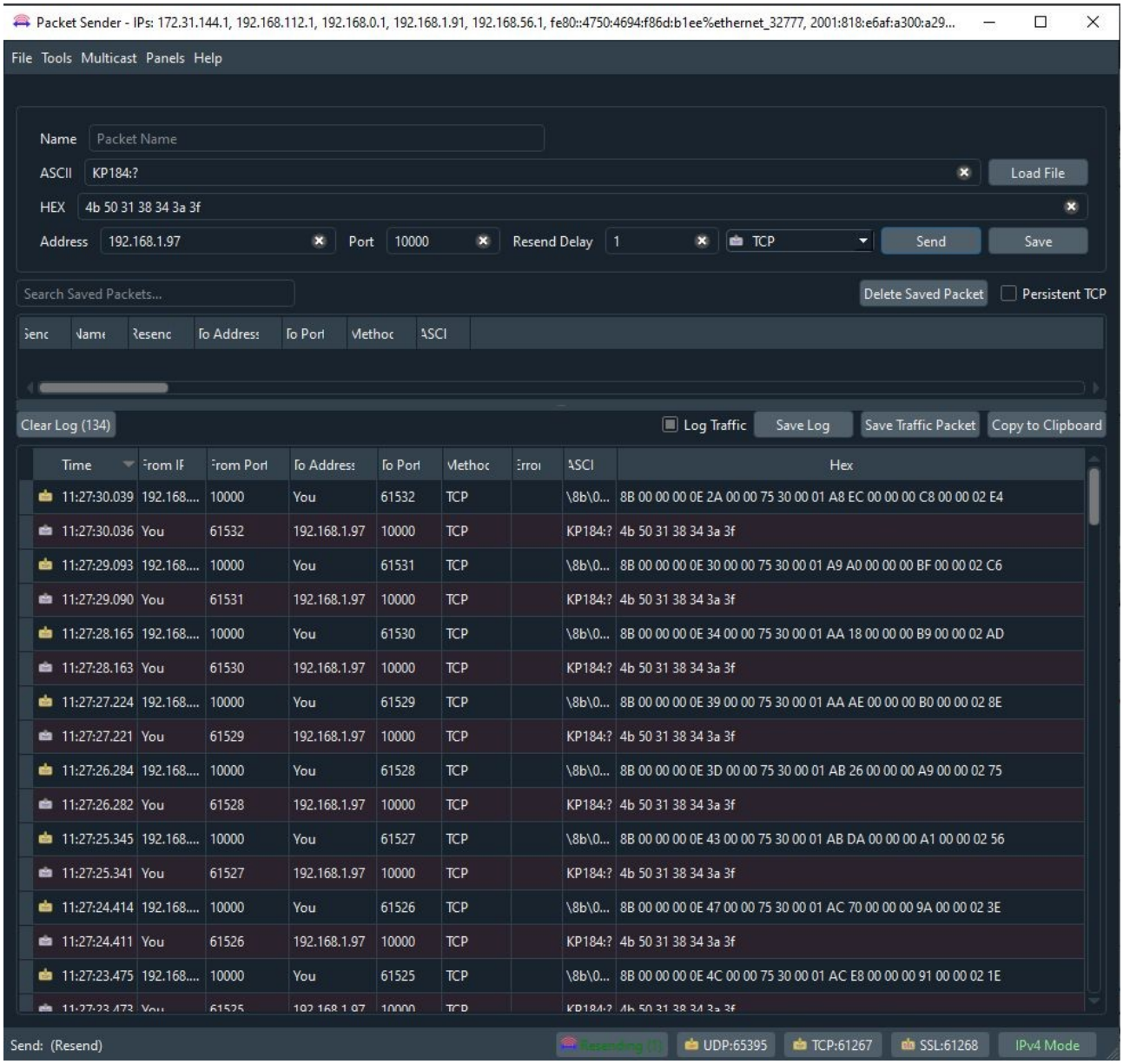
```
import asyncio
import sys
import time

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 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

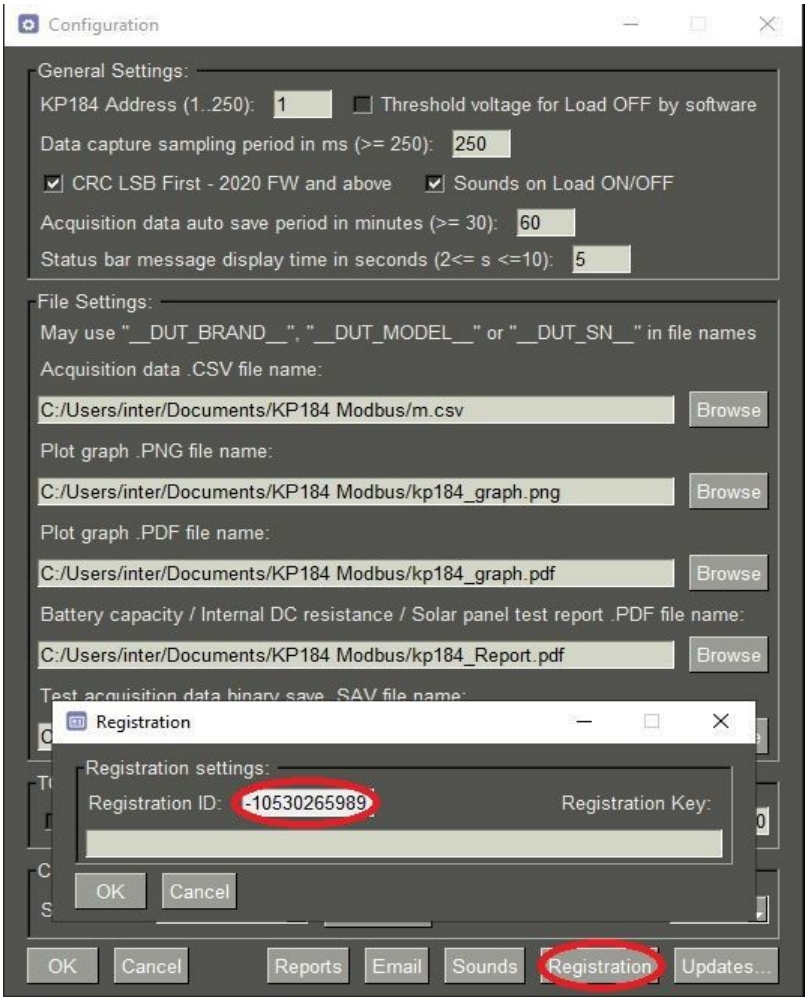
or

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 select the Registration button and 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 buttons.



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.

Troubleshooting the Serial Connection

The KP184 back panel RS-232 DB-9 male connector

A standard DTE RS-232 DB-9 male connector pinout:
2 RXD
3 TXD
5 GND

A standard DCE RS-232 DB-9 female connector pinout:
2 TXD
3 RXD
5 GND

KP184 RS-232 DB-9 male connector pinout is:
2 TXD
3 RXD
5 GND

KP184 RS-232 DB-9 male connector pins 2 and 3 are swapped from the normal DTE standard.

What Serial Cables to use?

When the user connects the DB-9 female - female straight through white cable that comes with the device (KP184):

KP184 DB-9 (male port) + DB-9 F-F straight cable = standard DB-9 DCE (female port):
2 TXD ----------> 2 TXD
3 RXD ----------> 3 RXD
5 GND ----------> 5 GND

You really end up with a standard DB-9 DCE (female port). That's why Kunkin supplied you this cable.

If your USB to Serial RS232 adapter has a male DB-9 port you should be good to go.

On the other hand if your USB to Serial RS232 adapter has a female DB-9 port you need to cross pins 2 to 3 and 3 to 2.

You can do this with those short DB-9 Male-Male adapters (they cross pins 2 and 3, image below) and add it at the end of the supplied straight DB-9 Female-Female cable.

Or else replace the DB-9 Female-Female straight through supplied cable with a DB-9 Female-Male crossed cable:

(DB-9 F-M crossed cable diagram)
2 ----------> 3
3 ----------> 2
5 ----------> 5

That's why you can't connect a USB to Serial RS232 adapter with a female DB-9 port directly to KP184 RS232 DB-9 male port:

This will not work:
KP184 (Male) USB to Serial Adapter (DCE - Female)
2 TXD ----------> 2 TXD
3 RXD ----------> 3 RXD
5 GND ----------> 5 GND

This will work:
KP184 (M) USB to Serial Adapter (DCE - Female)
2 TXD ----------> 3 RXD
3 RXD ----------> 2 TXD
5 GND ----------> 5 GND

Most PCs today don’t have external serial ports anymore. You must use an external USB to RS-232 Serial Adapter.

Buy USB to Serial adapters from reputable and well documented sources. KP184 is a bit picky on the serial adapters. Avoid very low cost Prolific (Ex: PL2303) and WCH (Ex: CH340) chipset based USB to Serial Adapters. Go for a FTDI/FT232RL chipset based adapter, it won't break the bank and save you countless headaches and lost hours. A Digitus USB 2.0 serial adapter DA-70156 FTDI chipset is a good choice.

Serial Adapter Loopback Test

If you don’t have a successful serial connection you should perform a serial loopback test to validate the USB serial adapter hardware, cable and operating system drivers.

Please shunt pins 2 and 3 on your DB9 serial straight cable connector on the KP184 side (leave KP184 DB-9 serial port disconnected for now) and connect your adapter + cable to your PC USB host port.

Install some free terminal software (Ex: CoolTerm) on Windows 10/11 (Hyperterminal is no longer part of Windows).

If you have trouble finding the COM port associated to your USB to serial adapter please go to Windows > Windows System > Control Panel > Device Manager > Ports (COM & LPT)

Run the program, configure the connection to 9600,N81 no flow control, turn off echo, connect, press some test keys and check if you receive the characters back to the screen.

This will prove to you that your USB, adapter, drivers and serial cable are at least working.

Once this works you should try again the connection with Kunkin KP184.

KP184 Response Test

If the user can’t still establish a communication with the KP184 unit let’s investigate deeper why the unit is not responding as expected.

Start with a baudrate of 9600bps. When everything works you can test up to 115200 to lower the communications latency.

Please check the KP184 internal configuration through device panel operation. KP184 user manual page 7 explains menu screen panel navigation. Check the following three communications parameters:

ADDR: **1**

BAUD: **9600**

ONLI: **OFF LINE**

The user should also check at this time the KP184 device internal firmware version.

After power on the KP184 electronic load display a brief 1 second message with a content like this:

On this particular example the message identifies the **KP184** unit, displays the internal firmware version **2128** and the configured communications address **001**.

Regarding the firmware version the relevant information is if the installed firmware version is prior to 2020 or later than (including) 2020. On this example the firmware 2128 is later than 2020. This will be important further down the page.

Once again CoolTerm will be used. Check the previous section for the download link and configuration.

1. Please make sure you have Kunkin KP184 configured for communication address 1 on the operating panel and record the configured baudrate (9600 nothing faster when diagnosing) to match with CoolTerm software configuration.

2. Connect Kunkin and your serial adapter with the supplied serial cable or particular cable combination for your hardware.

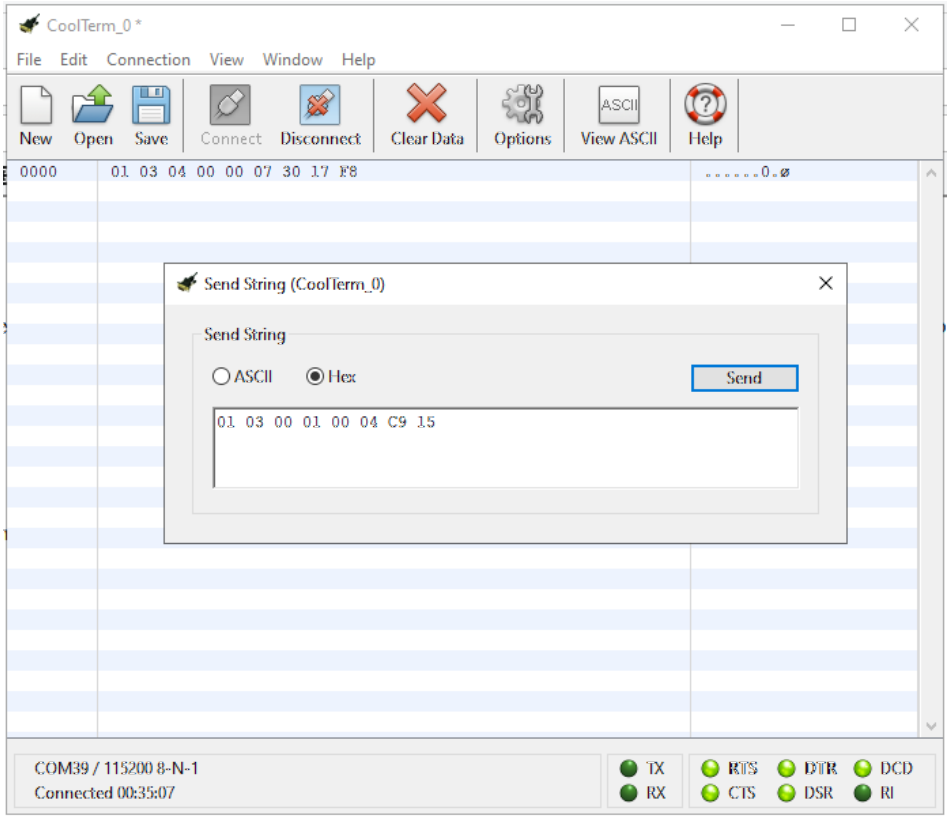
3. Start CoolTerm and configure it for the Kunkin baudrate 8-N-1 and use your serial adapter COM port.

4. Select Connection \ Connect option to connect to the COM Port.

5. Select Connection \ Send String option to send an Hex ModBus command to Kunkin.

6. Select the Hex option. You will provide each byte in Hex format. Enter the Modbus command: **01 03 00 01 00 04 15 C9** and press the **Send** button.
You can use a space between each pair of digit for easier byte identification. This Modbus command asks for 4 bytes from the Kunkin register memory address 0x001 that holds the device ID.

If your Kunkin KP184 has a few years and it's firmware prior to 2020 the last 2 bytes (CRC) are inverted. Use Modbus command:
01 03 00 01 00 04 C9 15



Kunkin's answer is **01 03 04 00 00 07 30 F8 17** on **2020** firmware or later. Answer is **01 03 04 00 00 07 30 17 F8** on the old firmware.

0x0730 is **1840** in decimal and identifies a Kunkin KP184.

If the unit is responding correctly it's time to have another go with the KP184 Modbus software.

If the Modbus software is not able to connect with the saved configuration settings it will automatically retry with all possible combination values for the possible baudrates (2400, 4800, 9600, 19200, 38400, 57600, 115200) and the firmware types (inverted CRC bytes, non-inverted) in a total of 14 different communication attempts. If a matching combination is found further attempts are canceled and the successful settings are saved.

The KP184 unit also has a TX/RX LED on the back near the DB-9 RS-232 serial port to help diagnose the communication issues.

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 Kunkin 2020 Fimware 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.

1.0.74.0 – 1 October 2024

- Changes on User Abort detection code for test end reason.
- Correction on battery capacity discharge test using a user defined variable current profile plot graph y-axis (profile current) was not showing the reference values.

1.0.75.0 – 2 October 2024

- Improved RS232 and USB disconnection detection, handling and related events logging.
- Improved electronic load OFF detection during battery capacity discharge test. This event was sometimes being incorrectly detected right after the test start without giving time to the electronic load to turn ON and report.

1.0.76.0 – 4 October 2024

- Implemented 1s timeouts, recovery handling and logging when waiting for Modbus messages responses from KP184. The connection is closed when several consecutive timeouts never get a valid response. One can disconnect the RS232 connector for some brief seconds watch the warnings on the Log Tab and connect again without aborting the data acquisition process.
- Numeric fields with the right arrow button to send the parameter to KP184 now accept a Return key that has the same effect as pressing the send parameter button.

1.0.77.0 – 7 October 2024

- Slew Up and Down rates limits increased from 200A/ms to 400A/ms.
- IntR, Solar, and Rep Tabs data entry fields now accept a Return key that moves the cursor to the next entry field.

1.0.78.0 – 8 October 2024

- Slew Up and Down rates limits were set to 399.9A/ms that is the firmware limit with Modbus, device panel operation allows 400A/ms.
- The software is thought for remote operation only. However the handling of entering or exiting battery test mode from the device panel operation during various software states was required to avoid havoc with software operation.
- During battery capacity test if the KP184 operating panel exits the battery test mode (KP184 also turns the load OFF) the test is canceled and a log message is created.
- During normal data acquisition if the KP184 operating panel enters the battery test mode (KP184 also turns the load OFF) the data acquisition session is canceled and a log message is created.
- If the software is on the several software test modes (Bat IRes, CYC, CVL, CWL and Solar), the KP184 operating panel entering the battery test mode is blocked. KP184 also turns the load OFF.
- If the software test modes are operating with the load there is no way to avoid the panel induced load OFF and unpredictable results may occur.
- Also fiddling with KP184 operating panel load ON/OFF commands during automatic software test modes operation can also cause unpredictable results.

1.0.79.0 – 14 October 2024

- Registration info was transferred to a child dialog box inside the main configuration dialog box.
- The application startup check for a new version procedure frequency is now configurable to “On every application startup”, “Once a day”, “Once a week”, “Once a month” or “Manually by user”. Accessible from a child dialog box inside the main configuration dialog box
- Now the data acquisition recording state has a status display icon on the black LCD area.
- The cyclic variable current profile test now maintains the load “on” state even when the load current is configured to zero amps.
- Several Python support modules were updated.

1.0.80.0 – 16 October 2024

- A KP184 internal firmware issue periodically (each7.53h) resets the Wh energy value during very long battery discharge tests. This was corrected on the .csv file output by the Modbus software on version 1.0.27.0 (28 Oct 2021) but not on the test final PDF report. The screen info and report now always shows the correct calculated value by the software and not the internal Kunkin Wh value.
- A tweak was made to try to plot the values before the load on event.

1.0.81.0 – 23 October 2024

- 3 decimal places are now used used on low Wh energy value LCD display.
- Less 20% execution time on plot graph display 2s periodical update.
- The user can now switch between capacity (Ah) and energy (Wh) plot graph display during the battery capacity discharge test. Use the “Toggle battery capacity display units Ah/Wh” icon on the black LCD display area for swapping the plot graph type. The plot graph type used on the PDF test report will correspond to the setting at test end time.
- Battery capacity discharge test detects when the user is manually tweaking the load current during the test, calculates the weighted average current and prints it on the PDF test report.
- Saving the acquisition data do .csv file code was optimized and is now 100x faster. Got rid of the progress bar popup window.
- Data acquisition memory management was improved.
- A status bar was added to the application bottom user interface (UI). As a result several popup ok windows were replaced by status bar messages. Less eye strain,

flashing, overlaps and confusion. UI becomes more clear and concise. More user friendly to the newcomers.

- Column widths adjusted on the battery internal resistance test list PDF report giving more room for Brand, Model and SN# columns and a new “Print to PDF” button was added inside the managing dialog box. This new button saves the user from the hassle of exiting the dialog box, going to the GEN tab and pressing the generic PDF report button.

1.0.82.0 – 11 November 2024

- A top line main menu was added. It gives more structure to the UI (user interface) and makes it easier for the user to manage all the software options. All previous UI functionality was maintained in order to do not disrupt the workflow.
- Limited the DUT (device under test) informations string length to avoid formatting problems on the multiple battery internal DC resistance PDF report columns.
- Added queued status bar messages to avoid missing information display.
- Added disk File Open/Save options to the memory recorded acquisition data. Data can be saved in a binary format and later retrieved to produce new .csv exports or test PDF reports with corrected DUT information data or different plot graphics options.
- A new programmable auto save option was created to save test acquisition data to disk at regular time intervals (Ex: 60 min).
- Battery capacity test and data acquisition context menus option selection visualization method were modified from dimmed to left check mark to match the application main menu graphics.

1.0.83.0 – 14 November 2024

- New dark theme.
- Corrected a support module compatibility issue with Windows 7 64-bit.

1.0.84.0 – 22 November 2024

- New optional anti voltage dip strategy on battery capacity test. Tries to not interrupt the discharge test and restart electronic load when required where bad electric connections are at play. Used in an attempt to save a very long discharge test. Always check your electric connections before starting any test.

1.0.85.0 – 13 December 2024

- New “Plot Graph Annotations” sub menu. Added horizontal, vertical and crossed reference lines to the existing coordinate annotations.
- New option added to select the color for annotations creation.
- New option added to control the plot graph grid lines display.
- New option added to control the plot graph title display.
- New option added to control the transparent legend placement (9 options) on combined CSVs plot graphs.
- New option added to control the current curve plot display on combined CSVs plot graphs.
- Data acquisition and battery capacity test right mouse button context menus were dropped because the options are now all available on the main menu structure.

1.0.86.0 – 19 December 2024

- On battery capacity test mode, solar panel test mode and cycle mode with plot option the manual data acquisition controls are disabled because they are automatically operated during the test progress. This eliminates some possible odd user manual operations.
- When battery capacity/energy units (Ah/Wh) or plot curve line styles are changed the plot graph is updated even after the battery capacity test termination. A new battery capacity test report can be created using the new plot graph.
- When special test mode (GEN/BAT/RES/CVL/CWL/CYC/SOL) changes the plot graph is updated with a new axis initialization.
- The time the status bar line messages remain displayed is now user configurable between 2 and 10 seconds.

1.0.87.0 – 20 January 2025

- Added configurable sounds for Load On/Off/Found user notifications.
- Added a configurable SMTP SSL authenticated mail server access for user email notifications after a battery long capacity discharge test termination.
- Added a startup splash screen during application loading time.

1.0.88.0 – 26 January 2025

- Updated the internal PDF file creation module. It's now faster and uses the v1.5 file specification version.
- In case the system motherboard has no sound card available the programmed load On/Off/Found sounds are now reverted to simple PC motherboard speaker beeps.
- The deprecated OneLineProgressMeter control was replaced.
- The application code was made compatible with Linux. The first Linux release is around the corner, some aspects of the installation are being finished.

1.0.89.0 – 30 January 2025

- Corrected some last version self inflicted bugs when opening PDF report files (an error was being thrown).
- Replaced some deprecated function parameters on PDF test reports code (battery capacity, internal resistance and solar panel).
- First release for Linux – Ubuntu.

1.0.90.0 – 17 February 2025

- Added icons for the configuration, reports, emails, sounds, registration and updates dialog windows.
- Added DUT (device under test) customer field on the test PDF reports.
- Added Open, Save and Append buttons to the battery internal resistance tests list dialog.
- On the battery internal resistance tests list PDF report the tests are now grouped by customer.
- Added page header corporate customization on test PDF reports.
- Added a serial connection troubleshoot section to the user manual.

1.0.91.0 – 24 February 2025

- Corrected an issue when saving KP184 registers to a file.

1.0.92.0 – 28 March 2025

- Corrected a cosmetic issue on the main window Report tab.
- Several Python support modules were updated.

1.0.93.0 – 14 April 2025

- Added a new menu option to send the battery capacity discharge test PDF report file attached to the test end email notification.

1.0.94.0 – 15 April 2025

- Corrected a bug regarding __DUT_CUSTOMER__ string not being replaced on the file names during runtime by the Report tab DUT customer field.

1.0.95.0 – 26 May 2025

- Several Python support modules were updated.
- Eliminated a recent delay on the application startup time.

1.0.96.0 – 2 June 2025

- Handled the exotic case of the Windows system reported Downloads folder location does not exist with proper error messages and logs.

1.0.97.0 – 7 September 2025

- Handled an exotic case exception during the startup check for the latest software version.

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