MK75 Instruction Manual

Manual Version 103 Firmware version 136 at time of writing.

Welcome

The Mkove MK75 Battery Monitor is a precision instrument which will allow you to monitor the state of any low or medium voltage Lithium or Lead Acid battery system.

With reliable information you will be able to accurately assess your energy systems performance and take care of your battery system.

The battery monitor will show you;

• The state of charge of your battery system.

• Accurate measurements of the current flowing into and out of the system as well as the battery voltage.

• Historical data about the utilisation and performance of the system.

This battery monitor uses a number of techniques to provide accurate information about your system.

Notes on Safety

• Please read all instructions before using this battery monitor.

• The battery monitor is designed for indoor use only. Do not expose to sources of heat, water or any other liquid. Avoid undue exposure to corrosive or salty environments.

• Do not open or disassemble the product.

• Ensure that all wiring connections are solid and secure. Do not use in systems where there is loose wiring or wiring malfunctions such as exposed, corroded or burnt wiring.

• Lead acid and Lithium battery systems are sources of high energy electric current. Take every precaution to ensure that the battery terminals are not connected together, such as via tools used during installation, personal jewellery or by incorrect connections. If in doubt use a professional installer to install the system.

• Clean only with a soft dry cloth. Do not use solvents, abrasive cleaners or water.

Package Contents

Your Mkove MK75 Battery Monitor package includes the following contents.

- One MK75 Battery Monitor.

- Two Mounting Clips for panel mounting the unit.

- A 150 Amp 50 milliVolt shunt or a 500 Amp 75 milliVolt shunt.

Variations

There are two versions of the MK75, the MK75 and the MK75HV.

They are both the same as each other with the exception that the MK75HV can connect to a much higher input voltage. The specifications of each are outlined in the Specifications section at the end of this manual.

The MK75HV will show "Mkove MK75HV" at the top of the main screen when running and the MK75 will show "Mkove MK75".

Throughout this manual the two devices will be referred to generally as the MK75 and the same information applies to both of them.
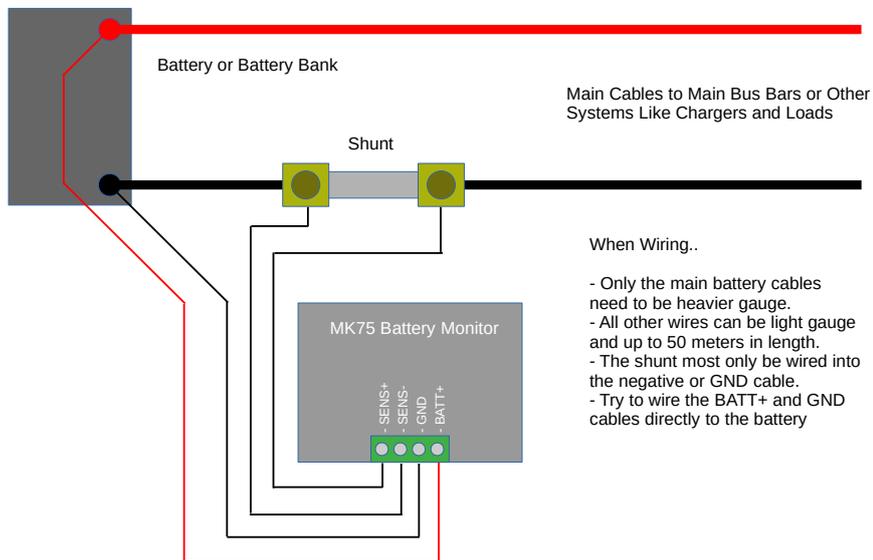
Important Notes on Installation

Please note that these notes have changed recently. Due to the chip shortage we have changed the main current sensing chip to a more accurate one but also one that requires connection to the batteries negative cable only. Earlier versions could be installed in either the negative or positive cable.

There is a wiring diagram on the following page.

- The shunt should only be installed into the main negative main battery cable. The shunt carries all of the current flowing into or out of the battery. It is important that all connections and cables are appropriately sized for the loads expected.

- To install the shunt cut the negative battery cable and then install suitable lugs to attach the cable to the larger connectors on the shunt.

- The Sense+ and Sense- terminals on the battery monitor are sensitive electronic connections. They can tolerate only the very small voltages (milliVolts) which are produced by the shunt for current reading. Connection to the positive cable or another high voltage source will overload these terminals and damage the unit..

- For the battery monitor to work as designed it must be able to measure all current flowing into or out of the battery. It is important that any loads or charge sources are connected to the shunt and not directly to the battery so that the shunt can measure all of the current flowing into or out of the system. The battery monitor should be the only electrical device connected directly to the battery, otherwise the readings will be inaccurate.

- The battery monitor is aware of and includes calculations of it's own current use. This allows the battery monitor to show a zero reading when there are no other currents flowing into or out of the system even though the battery monitor itself requires a small amount of power to operate.

- Aside from the heavy duty cables required to connect the shunt into the batteries main supply cables, all other wires to and from the battery monitor carry only very small currents and can be as small or as large as required.

- If the battery monitor is not installed correctly the data that it shows will be inaccurate or unusable, or the battery monitor could be damaged.

Battery Monitor Wiring Diagram

Battery or Battery Bank

Main Cables to Main Bus Bars or Other
Systems Like Chargers and Loads

Shunt

MK75 Battery Monitor

- SENS+
- SENS-
- GND
- BATT+

When Wiring..

- Only the main battery cables
need to be heavier gauge.
- All other wires can be light gauge
and up to 50 meters in length.
- The shunt most only be wired into
the negative or GND cable.
- Try to wire the BATT+ and GND
cables directly to the battery

Installing the Battery Monitor

Disconnect the battery or battery bank from the system before installing the battery monitor.

Install the shunt into the battery system. The shunt should only be installed into the negative battery cable. This is normally done by cutting the main battery cable and then connecting each of the cut ends with cable lugs to the larger screw connectors on the shunt.

On the Battery Monitor there are four connections which have to be made. All of these connections can be made with thin wire, if desired, as none of these connections carry any significant current.

The overall length of the connections between the battery or battery bank to the battery monitor can be quite long. It has been tested with lengths up to 50 meters on all wires without any loss of accuracy in the system, and without interference causing innaccuracy.

The four connections and the way to wire them is as follows;

- BATT+ This should be connected to the positive terminal of the battery or battery bank. Ideally this will be connected directly to the main terminal of the battery as this will cause the least voltage drop when large currents are flowing into or out of the battery, and provide the most accurate readings. If this is not possible choose a connection point which has a sturdy connection as close as possible to the battery.

- GND This should be connected to the ground or negative terminal of the battery or battery bank. Like the BATT+ connection this should if possible be connected directly to the batteries main terminal or to a sturdy connection point nearby.

- SENS- This should be connected to the more negative of the two small screw terminals on the shunt. The more negative end of the shunt is the end which is connected to the negative battery terminal. If the SENS- and SENS+ plus wires are connected in reverse the system will read current into or out of the battery in the incorrect direction.

- SENS+ This should be connected to the more positive of the two small screw terminals on the shunt. If the SENS- and SENS+ plus wires are connected in reverse the system will read current into or out of the battery in the incorrect direction.

If everything is correct reconnect the main battery or battery bank and ensure that the system is operating correctly.

Panel Mounting of the Battery Monitor

The MK75 is designed for panel mounting. Included with the package are two clips which allow for easy installation and removal of the battery monitor. These slide into the rear of the battery monitor on either side and a series of ratchet points allow for making a firm connection against the back of the panel. The design of the clips will support up to a 7mm panel thickness.

The size of the square hole which needs to be made in the panel is at least 79mm x 56mm. These dimensions can be up to 6mm larger in either direction due to the flange around the battery monitor.

If the battery monitor needs to be secured to a panel thicker than 7mm the easiest solution is normally to make a small thinner panel for attaching the battery monitor to and attach this panel to the front of the thicker panel.

Initial Use of the Device

When the unit is first supplied with power it will take second or two to boot before it displays anything on the screen.

Battery Settings

For the battery monitor to work correctly with your battery it is important to specify the correct battery specifications including battery type, battery capacity and the number of battery calls or voltage.

The battery capacity is usually the sticker capacity or manufacturers specification of the battery. It is important to set the battery capacity correctly and not confuse this with the CCA (Cold Cranking Amps) or any other specification.

To set the battery settings;

- Press Menu then choose Settings then Battery Settings.

The number of cells can either be set specifically or set to auto where the battery monitor will try to set the correct cell count based on voltage. The auto cell count is set either when the battery monitor starts or when the battery settings are changed. As the possible cell voltages in some cases overlap it is possible that the automatic cell setting will be incorrect if the battery is in a low state of charge.

Initial State of Charge

When first powered on the battery monitor will set an estimated state of charge based on the batteries voltage. This however will only be close to accurate if the battery has been in a resting state for some time.

The state of charge will be more accurate after the battery monitor has seen the battery go to a full charge and indicates "FULL" on it's display.

Zero Amps

Your system should show 0.00 amps when there is nothing connected to it. If required the amps can be zeroed by choosing Settings then Zero Amps.

Network Connection and Over the Air Updates

Wifi Connection Types

The battery monitor can connect via wifi. It can either act as an Access Point (where you can connect to it using a device), or it can act as a Wifi Station (where the battery monitor connects to an existing network).

When connected to the battery monitor when it is an access point, the wider internet is not available and so it will not be able to update it's firmware via an Over The Air update, however you can still visit the battery monitors web site which will give data about the battery and state of charge.

When the battery monitor is connected to an existing network as a wifi station, generally there there will be wider internet available. You can still view the battery monitors web site and see battery information, and the battery monitor will be able to update it's firmware via and Over The Air update.

Viewing Battery Data from the Battery Monitors Web Site

When the battery monitor is connected either in Access Point or Wifi Station modes the battery monitors internal web site will be available. In either case the battery monitor will show it's network address (IP address) on it's screen in either of these modes. Typing this address into a web browser will show the batteries internal web site and display various battery information.

Please note that we also have another feature called Remote Data which allows you to view your battery monitors data from anywhere in the world which is outlined in the next section of this manual.

Over The Air Updates

The battery monitor can download firmware updates from the internet which can include newer and improved features for the battery monitor.

Performing an Over The Air update on a new battery monitor is a two step process. You first have to connect to the battery monitor and tell it the address, known as SSID and password of a wifi network that it can connect to. When this is set the battery monitor will restart and attempt to connect to the specified network. Wait until the device has fully restarted, it may take longer to restart as it will connect to the network during the restart.

To check that it connected, go to Settings, Network and it should say it is in Station Mode, and show what access point it is connected to and the IP address the network assigned to the monitor

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If it is able to connect, and the network has wider internet access then it will be able to perform an Over The Air update. If it is unable to connect then it will go back into access point mode and can be connected to once again.

The steps for performing an Over The Air update are as follows..

- Go to Settings and choose Network, which is on page 2 of the three Settings pages.

- In Network press either the left or right arrow keys to turn the network on. It will indicate which mode it is in, normally Access Point mode if the network settings have not already been set. In Access Point mode it will display the SSID and password required to connect to the battery monitor. It will also display it's network address.

- On a device, such as a computer, tablet or phone, go the the wifi settings and connect to the battery monitor via wifi.

- On the same device open a web browser and go to the address shown on the battery monitors screen, usually 192.168.4.1. This will show the web site from the battery monitor.

- On the web site there is a button called Wifi Settings, select this and enter the network address (SSID) and password for a nearby wifi network with internet acesss.

- The battery monitor will restart and connect to the wifi network.

- If the battery monitor was able to connect to the wifi network, go to Settings and choose Ota Update. The battery monitor will look for the update server and will either say "Unable to connect to update server" if the server could not be found, "There is no newer version of the firmware" if the version of the firmware that you have is already the latest version or "A newer version is available" if there is a newer version. If there is a newer version available press the OK/Menu button to upgrade to it. Note that it can take some time for the new firmware to download and presently there is no indication that it is upgrading, but eventually the monitor will restart.

- Note that you can always check the version of the firmware that you have installed by going to the menu and choosing About. We will also publish the current version of the firmware on our web site at www.mkove.com

WiFi Modes

Note that when the MK75 boots in Station mode it will try to connect to the Access Point that it has been set to connect to. It will try to connect six times and there may be some delay as it does this. If it is unable to connect to the Access Point then it will no longer try to connect to this Access Point and set itself into Access Point mode.

This behaviour is as designed so that if you are trying to set the MK75 up in Station mode and it fails to connect it will revert to Access Point mode so that you can try again.

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Things are different however when the MK75 is left running. Once it has connected to an AP in Station mode it will continually try to stay connected to this AP while ever it is powered up. If the MK75 is taken out of range of the network or if the network goes down then the MK75 will continually try to reconnect to it every minute.

This is also as designed so that the MK75 can be removed from a network area and return to it and stay connected.

Remote Data

Remote data is a new feature first released in January 2023 and is only available in firmware versions 121 or higher.

Remote data allows you to share your battery monitors data in a way that makes it accessible from anywhere in the world.

To use remote data you must have you battery monitor connected to the internet in Station Mode (so that it can access the wider internet) and turn on the Remote Data option in the settings.

Details about how to use the system and access to the remote data for your battery monitor can be found by visiting the page at: mk75.codecity.net.au

Other Settings

Some other settings are explained here.

Shunt Calibrate

The Shunt Calibrate options in the settings allows you to use the battery monitor with a different shunt. For example a 500 Amp 75 Millivolt allows for the masurement of larger currents.

The value to use for shunt calibrate is based on a formula where Shunt Calibrate = Millivolt rating of the shunt divided by the Amps rating of the shunt times 1000.

For example for a 500 Amp 75 Millivolt shunt the calculation is 75 / 500 X 1000 = 150.

Specifications for the MK75 and MK75HV

Electrical

Maximum Input Voltage: MK75 - 40 volts DC, MK75HV – 90 volts.

Maximum Voltage between the Sens+ and Sens- inputs (maximum shunt rated voltage): +/- 120 milliVolts.

Power consumption for the MK75: 39mA with the screen off. Then between 40 to 105mA total with the screen on depending on screen brightness. With wifi turned on approximately 18mA additional when in station mode and 50mA additional when in Access Point mode. Wifi power consumption will vary with network conditions.

The MK75HV will always consume less power than the MK75 as it uses a switching power supply which is more efficient.

Thermal

Note that the regular version of the MK75 (not the HV version) can overheat if used at high voltages and with certain options switched on. If using the regular version of the MK75 at 24 volts or above try to avoid using Wifi in Access Point mode and also turn the screen brightness down to prevent overheating.

If it overheats the unit MK75 will reset continually, and more rapidly depending on how much it has overheated, until the overheating conditions are removed.

Physical

Overall dimensions 88mm wide x 65mm high x 37mm deep.

Minimum cut out size for panel mounting 78.5mm x 55.5mm.

Warranty and Software Services

Limited Warranty

Mkove Electronics provides a 1 year Limited Warranty covering defects in materials and workmanship under normal use. This warranty applies to the hardware components of the product and does not cover software, except as outlined below.

Warranty Coverage

Hardware: The warranty covers manufacturing details and failures of the hardware components.

Firmware and Software: We guarantee the functionality of the firmware and software included at the time of purchase.

Warranty Exclusions

The warranty does not cover:

- Normal wear and tear.
- Damage caused by misuse, abuse, accidents, unauthorised modifications, or improper installation.
- Software bugs or compatibility issues arising from using unsupported or outdated firmware versions.
- The ability to always be able to update to the latest firmware versions which may not be compatible with older hardware.
- An inability to upgrade from an old version of the firmware to a much newer version if incremental upgrades have not been made.

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Software Services

Mkove provides generally free software services like Remote Data Access and Over The Air updates. We do not guarantee that these services will always be available or always working.