MASTERVOLT
THE POWER TO BE INDEPENDENT

High Precision Battery Monitor

BattMan Pro

Owner's manual

Thank you for purchasing a Mastervolt Battery Monitor.
Please read this owner's manual for information about using the product correctly and safely.
Keep this owner's manual close to the battery monitor for future reference.

Before proceeding with this owner's manual, please make sure you have carefully read the enclosed installation and quick start guide as well!

1. BattMan Pro display and control overview
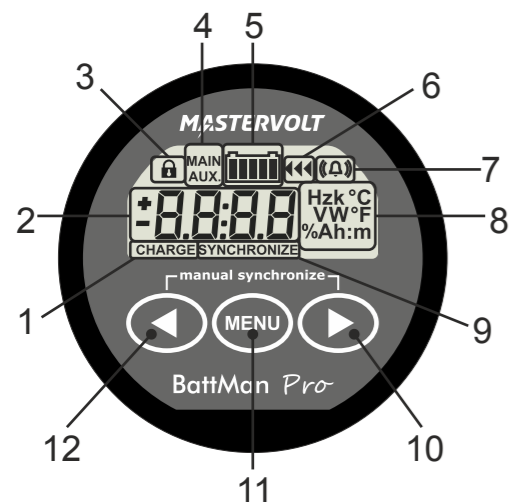
1. Charge battery indicator
2. Numeric value indicator field
3. Setup lock / Master lock indicator
4. Main battery or Auxiliary battery indicator
5. State-of-charge bar
6. Charging in progress indicator
7. Alarm activated indicator
8. Readout units
9. Synchronize indicator
10. Next value or Right key (>)
11. Menu key
12. Previous value or Left key (<)

2. Synchronisation

In order to keep your battery monitor delivering accurate status information about your battery, it is important to regularly synchronize your battery monitor with your battery. As explained in the quick start guide, a synchronisation step is also needed before you can actually use your battery monitor. During operation, the battery monitor automatically indicates when a synchronisation is required, by displaying the message SYNCHRONIZE.

A synchronisation step means nothing more than performing a complete charge cycle on your battery. A charge cycle will be considered complete when all discharged energy is restored in the battery and Auto-sync parameters F1.0, F1.1 and F1.2 (see chapter 5) are met. This typically means : when the battery charger switches to float mode. By meeting these conditions, the battery is considered full, which will be indicated by a flashing FULL message on the display. Besides this, the State-of-charge readout will be set to 100% and the Amphour readout reset to 0Ah. The FULL message will disappear when a key is pressed, or automatically, when the battery starts discharging again.

Performing synchronisations regularly is also important to keep your battery healthy and to increase it's lifetime. You will notice that if you are often performing full charge cycles yourselves, the battery monitor will most likely not display the SYNCHRONIZE message, since the battery is already kept in good sync with the battery monitor.

Besides automatic synchronisations based on meeting the Auto-Sync Functions, you can also manually synchronize the battery monitor with your battery when you are sure your battery is fully charged. This can be accomplished by pressing both < and > keys simultaneously for three seconds. After these three seconds, the flashing FULL message appears on the the display just like when it is automatically synchronized.

3. Status menu

The Status menu is a read only menu that shows the battery monitor's current status of several items. This menu can be accessed by the following sequence:
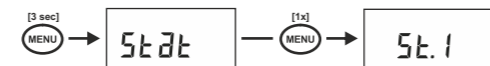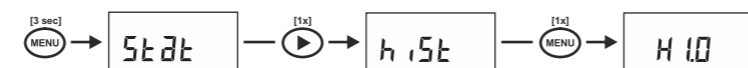

When the Status menu is entered, you can use the < and > keys to browse through the different status items. By pressing the MENU key, the selected status item can be viewed. Pressing the MENU key again, will then step back to the Status menu. From any menu position, the Normal Operating Mode can be accessed again by pressing the MENU key for 3 seconds. The following Status menu items are available :

St.1 Alarm Status. When multiple alarms are activated, use the < or > keys to browse through the currently active alarms. When no alarms are activated, this item displays "----".

St.2 Days running. The number of days the battery monitor is operating to monitor your battery. This item resets when a battery reset is executed (see Reset menu).

St.3 Days since last synchronized. The number of days the battery monitor has not been synchronized. This item resets when the battery monitor is synchronized or when a battery reset is executed (see Reset menu).

St.4 Charge Efficiency Factor (CEF). The charge efficiency factor used by the battery monitor. Depending on the value set in Function F5.6, this item displays the automatically calculated CEF or the manually set CEF.

4. History menu

The History menu is a read only menu that shows the battery monitor's History data. History data are special events that are stored in internal memory. This menu can be accessed by the following sequence :
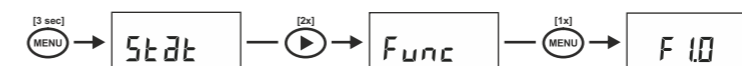

When the History menu is entered, you can use the < and > keys to browse through the different History items. By pressing the MENU key, the selected History item can be viewed. Pressing the MENU key again, will then step back to the History menu. From any menu position, the Normal Operating Mode can be accessed again by pressing the MENU key for 3 seconds. The following History menu items are available :

H1 : BATTERY HISTORY :

H1.0 Average discharge in Ah. This number will be recalculated after each synchronization.

H1.1 Average discharge in %. This number will be recalculated after each synchronization.

H1.2 Deepest discharge in Ah.

H1.3 Deepest discharge in %.

H1.4 Total Amphours removed. The total number of Amphours removed from the battery. When exceeding 10000Ah, the units are kAh and the value displayed must be multiplied by 1000.

H1.5 Total Amphours charged. The total number of Amphours charged to the battery. These Amphours are not compensated by the Charge Efficiency Factor (CEF). When exceeding 10000Ah, the units are kAh and the value displayed must be multiplied by 1000.

H1.6 Number of cycles.

H1.7 Number of synchronizations. This is the number of times the battery is fully charged meeting the Auto-sync Functions.

H1.8 Number of full discharges. The number of times the battery has been fully discharged reaching a State-of-charge of 0.0%.

H2 : ALARM HISTORY

H2.0 Number of Low Battery alarms.

H2.1 Number of Main battery low voltage alarms.

H2.2 Number of Auxiliary battery low voltage alarms.

H2.3 Number of Main battery high voltage alarms.

H2.4 Number of Auxiliary battery high voltage alarms.

5. Function setup menu

In the Function setup menu, your battery monitor can be adjusted to fit into your system. Lots of parameters, called Functions, can be set according to your needs. This menu can be accessed by the following sequence :

When the Function setup menu is entered, you can use the < and > keys to browse through the different Functions. By pressing the MENU key, the selected Function value can be viewed. The < and > keys can now be used to change this value. Pressing the MENU key again, will then step back to the Function menu. From any menu position, the Normal Operating Mode can be accessed again by pressing the MENU key for 3 seconds. This will also save any Function value changes to internal memory. When no keys are pressed for 90 seconds while operating in the Function setup menu, the battery monitor will automatically return to the Normal Operating Mode again without saving any Function value changes.The following Functions are available :

F1 : SYSTEM PROPERTIES

F1.0 Charger's float voltage (Auto-sync parameter). This value must be equal to your battery charger's float voltage. which is the last stage of the charging process. In this stage the battery is considered full.

Default : 13.2V   Range : 8.0V - 33.0V   Step size : 0.1V

F1.1 Charger's float current (Auto-sync parameter). When the charge current is below this percentage of the battery capacity (see Function F5.0), the battery will be considered as fully charged. Make sure this Function value is always greater than the minimum current at which the charger maintains the battery or stops charging.

Default : 2.0%   Range : 0.5 - 10.0%   Step size : 0.1%

F1.2 Auto-sync time (Auto-sync parameter). This is the time the Auto-sync parameters F1.0 and F1.1 must be met in order to consider the battery as fully charged.

Default : 240sec   Range : 5 - 300sec   Step size : variable

F1.3 Discharge floor. This is the reference point at which the battery needs to be recharged. When the State-of-charge percentage falls below this value the Charge battery indicator starts flashing while the time remaining readout shows *0:00* and the State-of-charge bar is empty.

Default : 50%   Range : 0 - 99%   Step size : 1%

F1.4 Battery temperature. In this Function the average battery temperature can be adjusted.

Default : +20°C   Range : -20..+50°C   Step size : 1°C

F1.5 Time remaining averaging filter. Specifies the time window of the moving averaging filter. There are three settings, where setting 0 gives the fastest Time remaining readout response and setting 2 the slowest. The best setting will depend on the type of battery load and your personal preference.

Default : 1   Range : 0 - 2   Step size : 1

F1.6 Auto-sync sensitivity. Only change this setting when F1.0, F1.1 and F1.2 are set correctly and automatic synchronization still fails. If automatic synchronization takes too long or does never occur, lower this value. When the battery monitor synchronizes too early, increase this value.

Default : 5   Range : 0 - 10   Step size : 1

F2 : LOW BATTERY ALARM SETTINGS

F2.0 Low battery alarm On (% SOC). When the State-of-charge percentage has fallen below this value, the alarm relay will be activated (depending on F2.6).

Default : 50%   Range : 0 - 99%   Step size : 1%

F2.1 Low battery alarm On (Volts). When the battery voltage has fallen below this value, the alarm relay will be activated (depending on F2.6).

Default : 10.5V   Range : 8.0 - 33.0V   Step size : 0.1V

F2.2 Low battery alarm Off (% SOC). When the State-of-charge percentage has risen above this value and the alarm relay was activated, the alarm relay will deactivate again. When "FULL" is selected, the alarm relay is deactivated when the Auto-sync parameters are met.

Default : 80%   Range : 1 - 100% / FULL   Step size : 1%

F2.3 Low battery alarm On delay time. This is the time the Low battery alarm On conditions, F2.0 and F2.1, must be met before the alarm is activated.

Default : 10sec   Range : 0 - 300sec   Step size : variable

F2.4 Minimum 'Alarm On' time. Minimum time that the alarm relay stays activated even if the State-of-charge percentage has risen above the Low battery alarm Off setpoint (F2.2). Function units are hours:minutes.

Default : 0:00   Range : 0:00 - 12:00   Step size : variable

F2.5 Maximum 'Alarm On' time. Maximum time that the alarm stays activated even if the the State-of-charge percentage is still below the Low battery alarm Off setpoint (F2.2). The value "-:--" indicates an unlimited time, and the relay will stay activated until the State-of-charge percentage has risen above the Low battery alarm Off setpoint (F2.2). Function units are hours:minutes

Default : -:- -   Range : 0:00 - 12:00 / -:- -   Step size : variable

F2.6 Enable Low battery alarm / Use contact. Select "OFF" to disable the low battery alarm. Select "[1]" to use the battery monitor's internal alarm relay.

Default : [1]   Range : OFF / [1]

F3 : LOW VOLTAGE ALARM SETTINGS

F3.0 Main battery low voltage alarm On. When the Main battery voltage falls below this value, the message "Lo" will appear on the display and the selected alarm relay will be activated (depending on F3.2).

Default : 10.5V   Range : 8.0 - 33.0V   Step size : 0.1V

F3.1 Main battery low voltage alarm Delay. This is the time the Main battery low voltage alarm On condition, F3.0, must be met before the alarm is activated.

Default : 10sec   Range : 0 - 300sec   Step size : variable

F3.2 Enable Main battery low voltage alarm / Use contact. Select "OFF" to disable the Main battery low voltage alarm. Select "[1]" to use the battery monitor's internal alarm relay.

Default : OFF   Range : OFF / [1]

F3.3 Auxiliary battery low voltage alarm On. When the Auxiliary battery voltage falls below this value, the message "Lo" will appear on the display and the selected alarm relay will be activated (depending on F3.5).

Default : 10.5V   Range : 8.0 - 33.0V   Step size : 0.1V

F3.4 Auxiliary battery low voltage alarm Delay. This is the time the Auxiliary battery low voltage alarm On condition, F3.3, must be met before the alarm is activated.

Default : 10sec   Range : 0 - 300sec   Step size : variable

F3.5 Enable Auxiliary battery low voltage alarm / Use contact. Select "OFF" to disable the Auxiliary battery low voltage alarm. Select "[1]" to use the battery monitor's internal alarm relay.

Default : OFF   Range : OFF / [1]

F4 : HIGH VOLTAGE ALARM SETTINGS

F4.0 Main battery high voltage alarm On. When the Main battery voltage rises above this value, the message "Hi" will appear on the display and the selected alarm relay will be activated (depending on F4.2).

Default : 16.0V   Range : 10.0 - 35.0V   Step size : 0.1V

F4.1 Main battery high voltage alarm Delay. This is the time the Main battery high voltage alarm On condition, F4.0, must be met before the alarm is activated.

Default : 5sec   Range : 0 - 300sec   Step size : variable

F4.2 Enable Main battery high voltage alarm / Use contact. Select "OFF" to disable the Main battery high voltage alarm. Select "[1]" to use the battery monitor's internal alarm relay.

Default : OFF   Range : OFF / [1]

F4.3 Auxiliary battery high voltage alarm On. When the Auxiliary battery voltage rises above this value, the message "Hi" will appear on the display and the selected alarm relay will be activated (depending on F4.5).

Default : 16.0V   Range : 10.0 - 35.0V   Step size : 0.1V

F4.4 Auxiliary battery high voltage alarm Delay. This is the time the Auxiliary battery high voltage alarm On condition, F4.3, must be met before the alarm is activated.

Default : 5sec   Range : 0 - 300sec   Step size : variable

F4.5 Enable Auxiliary battery high voltage alarm / Use contact. Select "OFF" to disable the Auxiliary battery high voltage alarm. Select "[1]" to use the battery monitor's internal alarm relay.

Default : OFF   Range : OFF / [1]

F5 : 'MAIN' BATTERY PROPERTIES

F5.0 Battery capacity. Your Main battery's capacity in Amphours (Ah).

Default : 200Ah   Range : 20 - 9990Ah   Step size : variable

F5.1 Nominal discharge rate (C-rating). The discharge rate (in hours) at which the battery manufacturer rates your battery's capacity.

Default : 20h   Range : 1 - 20h   Step size : 1h

F5.2 Nominal temperature. The temperature at which the battery manufacturer rates your battery's capacity.

Default : 20°C   Range : 0 - 40°C   Step size : 1°C

F5.3 Temperature coefficient. This is the percentage that your battery's capacity changes with temperature. The unit of this value is percent capacity per degree Celsius. The setting "OFF" disables temperature compensation.

Default : 0.50%cap/°C   Range : OFF / 0.01 - 1.00   Step size : 0.01%cap/°C

F5.4 Peukert's exponent. The Peukert's exponent represents the effect of reducing battery capacity at higher discharge rates. When the Peukert value of your battery is unknown, it is recommended to keep this value at 1.25. A value of 1.00 disables the Peukert compensation and could be used for Lithium based batteries.

Default : 1.25   Range : 1.00 - 1.50   Step size : 0.01

F5.5 Self-discharge rate. This is the rate at which the battery loses capacity by itself, even when it is not used. The unit of this value is percent capacity per month at the Nominal temperature (F5.2). The setting "OFF" disables self-discharge compensation and could be used for Lithium based batteries.

Default : 3.0%/month   Range : OFF / 0.1 - 25.0%/month   Step size : 0.1%/month

F5.6 Charge Efficiency Factor (CEF). CEF is the ratio between the energy removed from a battery during discharge and the energy used during charging to restore the original capacity. It is recommended to keep keep this value at "AU" (automatic calculation). The setting "100" disables charge efficiency compensation.

Default : AU   Range : 50 - 100% / AU   Step size : 1%

F6 : BATTERY MONITOR PROPERTIES

F6.0 Firmware version. Displays the firmware version of the battery monitor (read only).

Default : x.xx

F6.1 Shunt Amp Rating. This Function is linked to F6.2 and represents the Amp rating of your shunt at the given voltage indicated by F6.2. Included with your battery monitor is a 500Amp/50mV shunt, meaning that at 500A flowing through the shunt, a voltage of 50mV is generated across the small 'Kelvin' screw terminals of the shunt. This voltage will be used by the battery monitor to measure the amount of current.

Default : 500A   Range : 10 - 9000A   Step size : variable

F6.2 Shunt milliVolt Rating. This Function represents the milliVolt rating of your shunt at the given current indicated by F6.1. The battery monitor supports 50mV and 60mV shunts.

Default : 50mV   Range : 50 / 60mV

F6.3 Backlight mode. Represents the duration of backlight activation in seconds after key-press. The backlight can also be set to be always "ON" or always "OFF". Function setting "AU", activates the backlight automatically when charge / discharge current exceeds 1Amp or when a key is pressed.

Default : 30sec   Range : OFF / 5…300 / ON / AU   Step size : variable

F6.4 Alarm contact polarity. Enables selection between a normally open (NO) or normally closed (NC) contact.

Default : NO   Range : NO / NC

F6.5 Voltage prescaler. This Function is only important when an optional voltage prescaler is installed on the battery monitor. All voltage related Functions are linked to this Function F6.5. Always keep this Function set to "1-1" when no prescaler is installed!

Default : 1-1   Range : 1-1 / 1-5 / 1-10

F6.6 Temperature unit selection. Enables selection between degrees Celsius (°C) and degrees Fahrenheit (°F) in the temperature readout.

Default : °C   Range : °C / °F

F6.7 Auxiliary input mode. This Function is used to configure the VA input terminal on the rearside of the battery monitor, and can be set in two modes. In mode "0", the VA input operates in normal voltage measurement mode. In mode "1", the VA input can be used to control the backlight. In this mode, the backlight is switched ON at an input voltage higher than 2V and switched OFF again if the voltage is below 1V.

Default : 0   Range : 0 / 1

F6.8 Communication mode. This Function is used to configure the data output mode. Intended for servicing purposes only.

Default : 0   Range : 0 / 1 / 2 / 3

F6.9 Setup lock. When set to "ON", all functions (except this one) are locked and cannot be altered. The Reset menu is also locked.

Default : OFF   Range : OFF / ON

6. Reset menu

In the Reset menu, you can reset a number of items of your battery monitor This menu can be accessed by the following sequence :
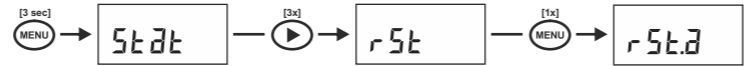
When the Reset menu is entered, you can use the < and > keys to browse through the different reset items. By pressing the MENU key, the selected reset item can be viewed. The default value for all reset items is "OFF". To actually reset the selected item, use the < and > keys to change the value from "OFF" to "ON". Pressing the MENU key again, will step back to the Reset menu. All reset items set to "ON" will only be reset once the Normal Operating Mode is accessed again by pressing the MENU key for 3 seconds. The following Reset menu items are available :

rSt.a Reset alarms. Use this reset item to reset or ignore all current alarms.

rSt.b Reset Battery status. Use this reset item to reset your current battery status (CEF, State-of-charge and battery history). You can use this reset item after you have installed a fresh battery of the same specifications as the previous one.

rSt.F Reset Functions. This reset item can be used to reset all Function values to factory default values.

rSt.c Reset zero-offset current. Use this reset item to remove small current readings on the display when no current is flowing in- or out of the battery. When performing this reset action, please be 100% sure that all DC consumers/chargers are disconnected or turned off.

7. Troubleshooting guideline

Problem	Remedy or suggestion
The monitor doesn't operate (no display)	- Check monitor- and battery side connections. - Make sure the inline fuses are installed and not blown. - Check battery voltage. Battery might be flat. Vbatt must be >8VDC. - Try to restart the monitor by removing / placing the fuses again.
Current readout gives wrong polarity (positive current instead of negative when discharging)	- Current sense leads from the shunt are reversed. Check the installation guide.
The monitor resets all the time	- Check the wiring for corrosion and / or loose contacts. - Battery might be flat or defective.
No changes can be made in the Function setup	- Check if the setup-lock is OFF (Function F6.9)
"CHARGE" or "SYNCHRONIZE" keeps on flashing	- Charge battery full (synchronize your battery with the monitor) - Check the Auto-sync parameters in Functions F1.0, F1.1 and F1.2 for possible wrong settings.

Problem	Remedy or suggestion
State-of-charge and/or time-to-go readout not accurate	- Check if all current is flowing through the shunt (the negative terminal of the battery may only contain the wire going to the battery-side of the shunt!). - Current sense leads from the shunt are reversed. - Check all Battery properties Functions (F5) - Check if battery monitor is synchronized. - Battery is exhausted and needs replacement
Display returns '- - - -' in temperature readout	- Set battery monitor temperature to ambient temperature of the battery. See F 1.4
Battery voltage readout is highly inaccurate	- Check prescaler setting in Function F6.5

9. Technical specifications

Parameter		BattMan Pro
Supply voltage range		9..35VDC
Supply current [1] :	@Vin=24VDC	7mA
	@Vin=12VDC	9mA
Input voltage range (auxiliary battery)		2..35VDC
Input voltage range (main battery)		0..35VDC
Input current range[2]		-9999..+9999A
Battery capacity range		20..9990Ah
Operating temperature range		-20..+50°C
Readout resolution :	voltage (0..35V)	± 0.01V
	current (0..200A)	± 0.1A
	current (200..9999A)	± 1A
	amphours (0..200Ah)	± 0.1Ah
	amphours (200..9990Ah)	± 1Ah
	state-of-charge (0..100%)	± 0.1%
	time-to-go (0..24hrs)	± 1minute
	time-to-go (24..240hrs)	± 1hr
	temperature (-20..50°C)[3]	± 0.5°C
Voltage measurement accuracy		± 0.3%
Current measurement accuracy		± 0.4%
Dimensions :	frontpanel	ø 64mm
	body diameter	ø 52mm
	total depth	79mm
	Weight	95grams
Shunt dimensions :	footprint	45 x 87mm
	height	17mm (base) / 35mm (M8 screws)
	weight	145 grams
Protection class		IP20 (frontpanel only IP 65)

Note: the given specifications are subject to change without notice.

[1] Measured with backlight and alarm relay turned off.
[2] Depends on selected shunt. With standard delivered 500A/50mV shunt (350A continuous), the range is limited to -600..+600A.
[3] Only available when optional temperature sensor is connected.

10. Declaration of conformity

MANUFACTURER   :   Mastervolt International BV

ADDRESS   :   Snijdersbergweg 93
                        1105 AN Amsterdam
                        The Netherlands

Declares that the following products :

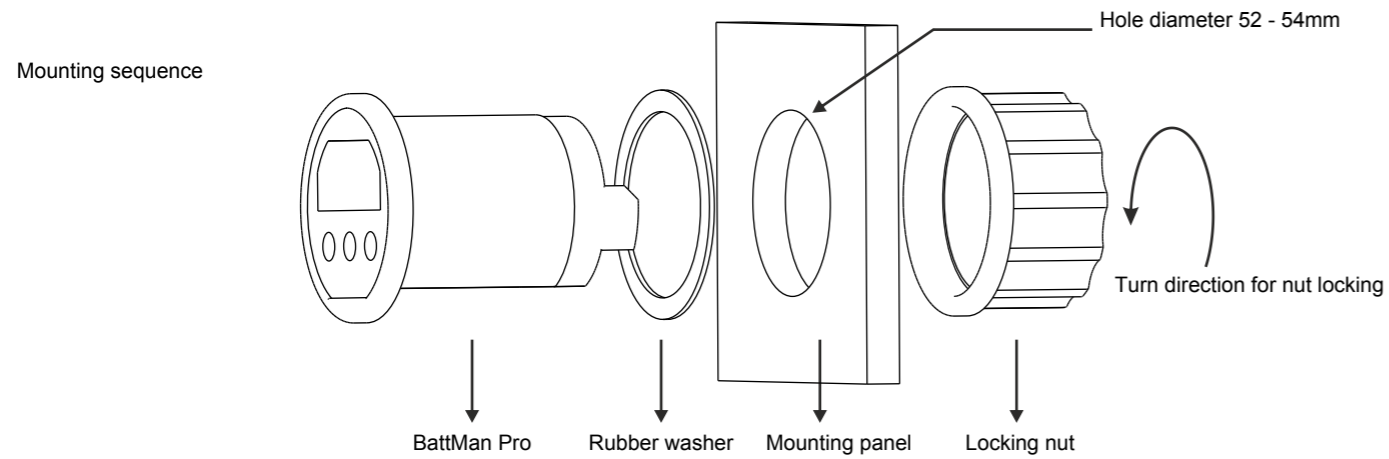PRODUCT TYPE   :   BATTERY MONITOR
MODEL   :   BattMan Pro

Conforms to the requirements of the following Directives of the European Union :
                        EMC Directive 2004/108/EC
                        RoHS Directive 2002/95/EC
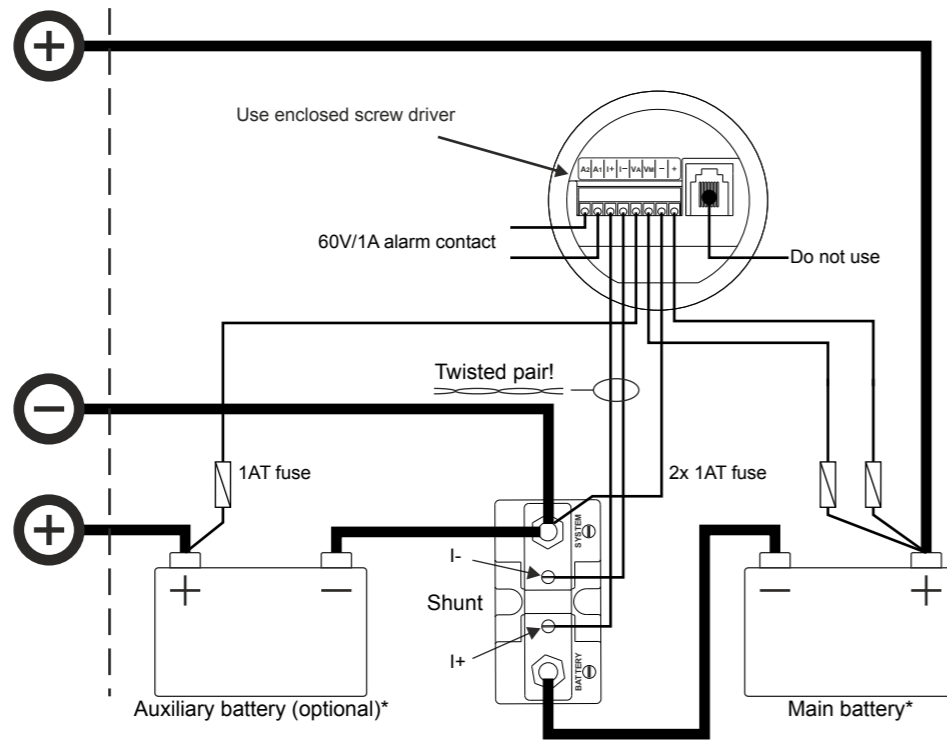
The above product is in conformity with the following harmonized standards :
            EN61000-6-3: 2001   EMC - Generic Emissions Standard
            EN61000-6-2: 2005   EMC - Generic Immunity Standard

INSTALLATION GUIDE

Please read this document very carefully to avoid battery monitor malfunction and/or fire hazards!

Mounting sequence

Hole diameter 52 - 54mm

Turn direction for nut locking

BattMan Pro   Rubber washer   Mounting panel   Locking nut

Battery positive 'MAIN' (to load e.g. charger or inverter)

Use enclosed screw driver

60V/1A alarm contact

Do not use

Battery negative (system ground)
Batterij negatief (systeem min)

Twisted pair!

1AT fuse

2x 1AT fuse

I-

Shunt

I+

*   Make sure the batteries you install are always in good health, preferably fully charged

Auxiliary battery (optional)*

Main battery*

⚡ **WARNING**
The shunt must always be installed into the <u>negative</u> line!
Installing the shunt into the positive line may damage the battery monitor!

⚡ **WARNING**
All fuses must be located as close as possible to the battery terminals. <u>Install the fuses only when all other connections are made and double checked!</u>

⚡ **WARNING**
All **thick** lines in the above connection diagram, represent the main current lines. These lines must be wired with a wire type which can handle the full battery current!
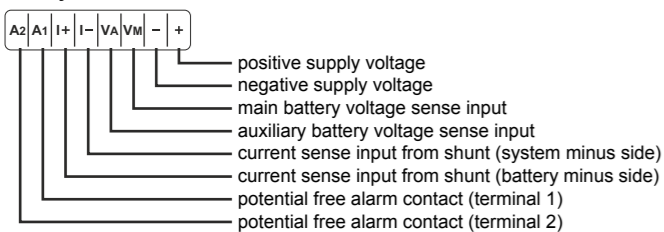
⚡ **WARNING**
All thin lines (from and to battery monitor) in the above connection diagram, must have a minimum thickness of AWG24/0.2mm². Maximum distance between battery monitor and shunt is 30 meters.

⚡ **WARNING**
To avoid large errors in current measurement, always twist the 'I+' and 'I-' shunt lines. Connect all wires to the shunt <u>exactly</u> as given in the connection diagram.
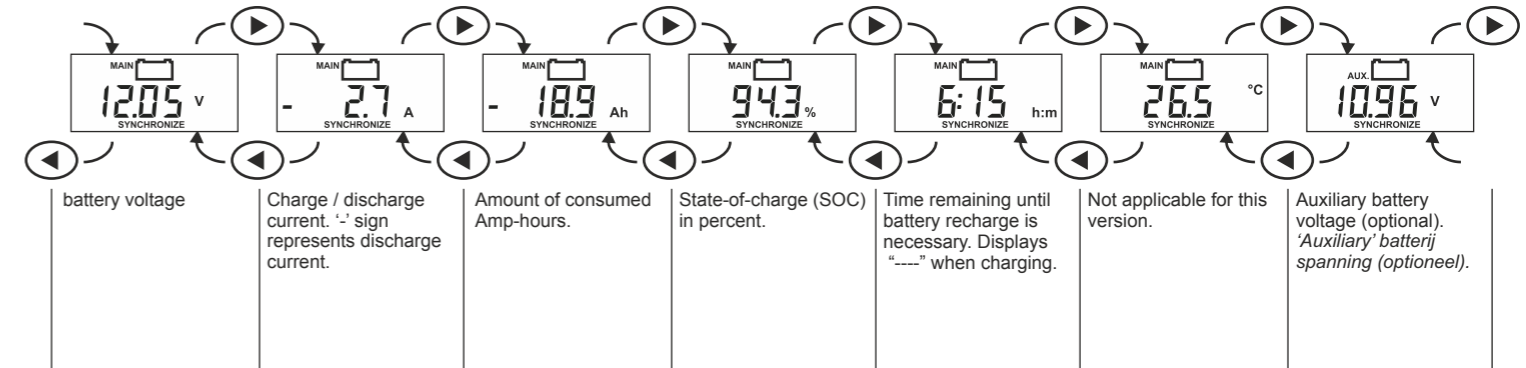
Battery monitor connection terminals :

A2 A1 I+ I- VA VM – +

positive supply voltage
negative supply voltage
main battery voltage sense input
auxiliary battery voltage sense input
current sense input from shunt (system minus side)
current sense input from shunt (battery minus side)
potential free alarm contact (terminal 1)
potential free alarm contact (terminal 2)

QUICK START GUIDE

This column decribes the absolute minimum number of required steps in order to setup your Battery Monitor.

⚠ In all enclosed documents, unless otherwise stated, all settings and readout selections are related to the MAIN battery. The MAIN battery will be described as 'battery' in all following chapters including the owner's manual.

When all fuses are installed, the battery monitor will startup with a blinking display in MAIN battery voltage readout selection. When pushing one of the three buttons, the LCD stops blinking and you can navigate through all readout selections using the < or > keys. The battery monitor now operates in the Normal Operating Mode. The standard readout selection sequence is as follows :

MAIN **12.05** V	MAIN - **2.7** A	MAIN - **18.9** Ah	MAIN **94.3** %	MAIN **6:15** h:m	MAIN **26.5** °C	AUX **10.96** V
SYNCHRONIZE	SYNCHRONIZE	SYNCHRONIZE	SYNCHRONIZE	SYNCHRONIZE	SYNCHRONIZE	SYNCHRONIZE
battery voltage	Charge / discharge current. '-' sign represents discharge current.	Amount of consumed Amp-hours.	State-of-charge (SOC) in percent.	Time remaining until battery recharge is necessary. Displays "----" when charging.	Not applicable for this version.	Auxiliary battery voltage (optional). *'Auxiliary' batterij spanning (optioneel).*

Func

To enter the FUNCTION setup menu, press the MENU key. Now, the desired Functions can be selected by pressing the < or > keys. To alter a specific Function, press MENU again when the desired Function is selected. The value of this specific Function can then be changed by pressing the < or > keys again. When the Function is changed, press MENU again to select other Functions which needs to be changed.

When all Functions are correctly set up, the MENU key must be pressed for three seconds to save all settings and to jump back to normal operating mode again. When in setup mode no key is pressed for 90 seconds, the battery monitor will return to normal operating mode again automatically, without saving any changed setting.

Supposing your setup contains a standard battery monitor and two batteries of 12V/60Ah connected in series to become a 24V/60Ah system, the following Function settings can be implemented using the above explained method :

The display also indicates *SYNCHRONIZE*. As will be further explained in the owner's manual, this message means that the battery needs to be fully charged first, in order to synchronize the battery monitor with the battery. Otherwise, the State-of-charge readout will be invalid. The more often you are fully charging your batteries, the more precise the battery monitor will indicate all parameters. This will also result in a longer lifetime of your batteries.

But before the batteries can be fully charged, you first need to adjust Functions F1.0 (Charger float voltage), F2.1 (Low battery alarm on in Volts) and F5.0 (Nominal battery capacity). Setting these Functions to the right values, will in most cases result in a correctly operating battery monitoring system. However, some specific battery chargers or advanced requirements for controlling the alarm contact, might involve adjusting additional Functions. This will be explained in the enclosed owner's manual. The factory default settings are valid for a 12V battery system with a total capacity of 200Ah.

To setup the above mentioned Functions, press the MENU key for three seconds to enter the main MENU. Press the > key twice until the following display appears :

a) Change Function F1.0 to the float charge voltage level of your 24V battery charger. This will typically be 26.4V.

b) Change Function F2.1 to the voltage level at which a low battery voltage alarm must be automatically activated. For a typical 24V system, this will be 21.0V

c) Change Function F5.0 to the nominal battery capacity value of your battery system. In this example this Function must be set to 60Ah.

When these three Functions are correctly setup, you can use the earlier explained method to save these settings and jump back to normal operating mode again. Your battery monitor is now ready to be Synchronized with your batteries, by performing a full charging cycle until the display returns the following flashing message :

MAIN **Full** %
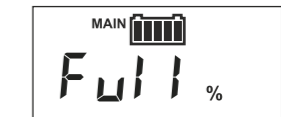
This could take several hours, depending on the State-of-charge of your batteries at the time of installation.

For further in depth explanations about the functionality of your battery monitor, please read the enclosed owner's manual.

⚡ **WAARSCHUWING**

General battery precautions :

1. Have someone within range of your voice or close enough to come to your aid when you work near a lead acid battery.

2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.

3. Wear proper, non-absorbent gloves, complete eye protection, and clothing protection. Avoid touching your eyes and wiping your forehead while working near batteries.

4. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least 15 minutes and get medical attention immediately.

5. Never smoke or allow a spark or flame near batteries.

6. Use extra caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.

7. Remove all personal metal items, like rings, bracelets, and watches when working with batteries. Batteries can produce a short circuit current high enough to weld metal to skin, causing a severe burn.

8. If you need to remove a battery, always remove the ground terminal from the battery first. Make sure all accessories are off so you don't cause an arc.

9. Never charge a frozen battery.

10. Make sure the area around the battery is well ventilated while charging. Make sure the voltage of the battery matches the output voltage of the battery charger. Study all battery manufacturer's recommendations for further specific precautions such as whether equalization is acceptable for your battery or not, and recommended rates of charge.

Check out the collection of fuel transfer systems and parts we offer.