

Thank you for purchasing a TBS Electronics 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.

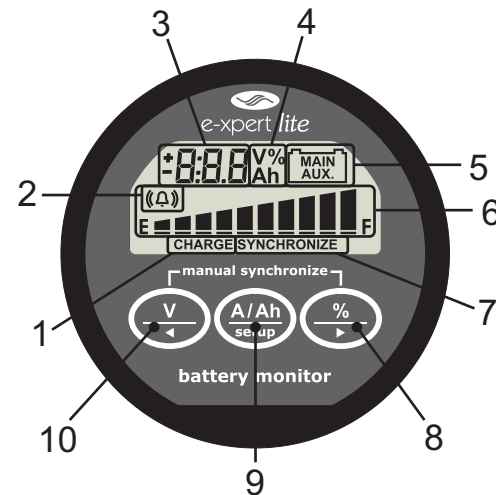
TBS ELECTRONICS BV

De Factorij 46, 1689AL, Zwaag, The Netherlands

<http://www.tbs-electronics.com>

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

1. E-xpert lite display and control overview



1. Charge battery indicator
2. Alarm activated indicator
3. Numeric value indicator field
4. Readout units
5. Main battery or Auxiliary battery indicator
6. State-of-charge bar
7. Synchronize indicator
8. Select State-of-charge readout, or next value (>)
9. Select current (A) or Amp-hour (Ah) readout, or enter / leave Setup menu
10. Select voltage readout (Main or Auxiliary), or previous value (<)

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 both Auto-sync parameters F02 and F03 are met during at least 4 minutes. 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 its 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. Setup menu

Using the Setup menu, your battery monitor can be adjusted to fit into your system. A number of parameters, called Functions, can be set according to your needs. This menu can be accessed by the following sequence :



When the Setup menu is entered, you can use the < and > keys to browse through the different Functions. By pressing the SETUP key, the selected Function value can be viewed. The < and > keys can now be used to change this value. Pressing the SETUP key again, will then step back to the Setup menu. From any menu position, the Normal Operating Mode can be accessed again by pressing the SETUP 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 Setup menu, the battery monitor will automatically return to the Normal Operating Mode again without saving any Function value changes.

The factory settings are based on a 12V battery system with a capacity of 200Ah. For 12V systems, generally only Function F01 has to be checked for correct operation of your battery monitor. When your battery capacity is other than 200Ah, Function F01 has to be changed to a value that is equal to your battery capacity. All other Functions can be left unchanged if you are uncertain about adjusting these values yourselves.

When your battery system is 24V, besides checking battery capacity Function F01 for the correct value, you should also change the values of F02 and F05. Default 24V system values for F02 and F05 are respectively 26.4V and 21.0V.

The following Functions are available :

F01	Battery capacity. Your Main battery's capacity in Amphours (Ah).	Default : 200Ah	Range : 20 - 999Ah	Step size : 1Ah
F02	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
F03	Charger's float current (Auto-sync parameter). When the charge current is below this percentage of the battery capacity (see Function F01), 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%
F04	Low battery alarm On (% SOC). When the <u>State-of-charge</u> percentage has fallen below this value, the alarm relay will be activated, the Charge battery indicator starts flashing and the State-of-charge bar is empty.	Default : 50%	Range : 0 - 99%	Step size : 1%
F05	Low battery alarm On (Volts). When the <u>battery voltage</u> has fallen below this value, the alarm relay will be activated.	Default : 10.5V	Range : 8.0 - 33.0V	Step size : 0.1V
F06	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%
F07	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.	Default : 1.25	Range : 1.00 - 1.50	Step size : 0.01

F08 Shunt Amp Rating. This Function represents the Amp rating of your shunt at 50mV. 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 - 900A Step size : variable

F09 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

F10 Alarm contact polarity. Enables selection between a normally open (NO) or normally closed (NC) contact.

Default : NO Range : NO / NC

F11 Reserved

Default : x Range : x

F12 Firmware version. Displays the firmware version of the battery monitor (read only).

Default : x.xx

The last two Functions are so-called Reset Functions. By pressing the SETUP key the selected Reset Function can be viewed. The default value for all Reset Functions is "OFF". To actually reset the selected Function, use the < and > keys to change the value from "OFF" to "ON". Pressing the SETUP key again, will step back to the Setup menu. All reset items set to "ON" will only be reset once the Normal Operating Mode is accessed again by pressing the SETUP key for 3 seconds. The following Reset Functions are available :

r.b Reset Battery status. Use this reset item to reset your current battery status, for example after you have installed a fresh battery of the same specifications as the previous one.

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

4. Warranty conditions

TBS Electronics (TBS) warrants this product to be free from defects in workmanship or materials for 24 months from the date of purchase. During this period TBS will repair the defective product free of charge. TBS is not responsible for any costs of the transport of this product.

This warranty is void if the product has suffered any physical damage or alteration, either internally or externally, and does not cover damage arising from improper use¹⁾ or from use in an unsuitable environment.

This warranty will not apply where the product has been misused, neglected, improperly installed or repaired by anyone other than TBS. TBS is not responsible for any loss, damage or costs arising from improper use, use in an unsuitable environment or improper installing, setup and malfunctioning of the product.

Since TBS cannot control the use and installation (according to local regulations) of their products, the customer is always responsible for the actual use of these products. TBS products are not designed for use as critical components in life support devices or systems, that can potentially harm humans and/or the environment. The customer is always responsible when implementing TBS products in these kind of applications. TBS does not accept any responsibility for any violation of patents or other rights of third parties, resulting from the use of the TBS product. TBS keeps the right to change product specifications without previous notice.

¹⁾ Examples of improper use are :

- too high input voltage applied
- wrong shunt connection
- applying battery voltage to shunt input
- mechanically stressed enclosure or internals due to harsh handling and/or incorrect packaging
- contact with any liquids or oxidation caused by condensation

5. Technical specifications

Parameter	e-xpert lite
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⁾	-999..+999A
Battery capacity range	20..999Ah
Operating temperature range	-20..+50°C
Readout resolution :	voltage (0..35V) : ± 0.1V current (0..100A) : ± 0.1A current (100..999A) : ± 1A amphours (0..99Ah) : ± 0.1Ah amphours (100..999Ah) : ± 1Ah

state-of-charge (0..100%)	± 0.1%
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)
Accessories	- e-xpert professional connection kits lengths : 5m, 10m, 15m, 20m, 30m - e-xpert quick connection kits lengths : 10m

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.

6. Declaration of conformity



MANUFACTURER : TBS Electronics BV
ADDRESS : De Factorij 46
1689 AL Zwaag
The Netherlands

Declares that the following products :

PRODUCT TYPE : BATTERY MONITOR
MODEL : e-xpert lite

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



tbs electronics

High Precision Battery Monitor

e-xpert lite



Gebruiksaanwijzing

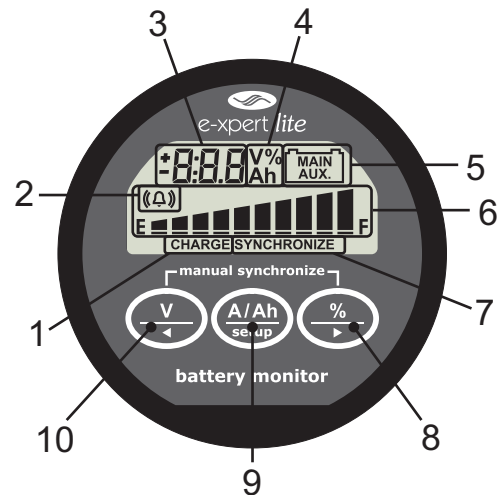
Wij danken u voor de aankoop van deze TBS Electronics Batterij Monitor. Leest u alstublieft deze gebruiksaanwijzing zorgvuldig door voor een correcte en veilige werking van dit produkt. Om de gebruiksaanwijzing snel te kunnen raadplegen, is het raadzaam deze in de buurt van de batterij monitor te houden.

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Voordat u deze gebruiksaanwijzing verder leest, is het belangrijk dat u tevens de installatie voorschriften heeft doorgenomen!

1. E-xpert lite display en bedieningsoverzicht



- 1. Batterij laden indicator
2. Alarm geactiveerd indicator
3. Indicatieveld voor numerieke waarden
4. Uitlees eenheden
5. "Main" batterij of "Auxiliary" batterij indicator
6. Laadtoestand (State-of-charge) indicator
7. Synchronisatie indicator
8. Selecteer Laadtoestand uitlezing, of volgende waarde (>)
9. Selecteer stroom (A) of Ampere-uren (Ah) uitlezing, of activeer / verlaat Setup menu
10. Selecteer voltage (V) uitlezing (Main of Auxiliary), of vorige waarde (>)

2. Synchronisatie

Om uw batterij monitor een accurate batterij (akku) status te laten tonen, is het belangrijk om regelmatig de batterij monitor te synchroniseren met uw batterij. Zoals reeds uitgelegd in de beknopte handleiding, is een synchronisatie stap ook noodzakelijk voordat u de batterij monitor doelmatig kunt gebruiken.

Een synchronisatie stap betekent niets meer dan het uitvoeren van een complete laadcyclus op uw batterij. Een laadcyclus wordt als compleet beschouwd, wanneer aan beide "Auto-sync parameters" F02 en F03 zijn voldaan gedurende minimaal 4 minuten.

Het periodiek uitvoeren van synchronisaties is ook belangrijk voor de levensduur van uw batterij. U zult merken dat wanneer u zelf regelmatig volledige laadcycli uitvoert op uw batterij, de batterij monitor vrijwel nooit het "SYNCHRONIZE" bericht zal tonen omdat de batterij reeds goed synchroon loopt met uw batterij monitor.

Naast automatische synchronisaties gebaseerd op het voldoen aan de Auto-Sync Functies, kunt u de batterij monitor ook manueel synchroniseren als u zeker weet dat uw batterij reeds volledig opgeladen is. Dit kan worden bereikt door de < en > toetsen tegelijkertijd voor drie seconden in te drukken.

3. Setup menu

In het Setup menu, kan de batterij monitor perfect worden afgestemd op uw batterij systeem. Een aantal parameters, Functies genaamd, kunnen naar eigen inzicht worden ingesteld. Dit menu kan bereikt worden via de volgende toets combinatie :



Wanneer het Setup menu bereikt is, kunt u de < en > toetsen gebruiken om door de diverse Functies te bladeren. Door op de SETUP toets te drukken, kan de waarde van de op dat moment geselecteerde Functie bekeken worden. De < en > toetsen kunnen nu gebruikt worden om deze waarde te wijzigen.

De fabrieksinstellingen zijn gebaseerd op een 12V batterij systeem met een capaciteit van 200Ah. Voor 12V systemen zal in het algemeen alleen Functie F01 gecontroleerd moeten worden voor een correcte werking van de batterij monitor.

Wanneer u een 24V batterij systeem heeft, moeten naast het controleren van Batterij capaciteits Functie F01, tevens de waarden van Functies F02 en F05 gewijzigd worden.

De volgende Functies zijn beschikbaar :

Table with 4 columns: Functie, Beschrijving, Standaard, Bereik, Stapgrootte. Rows include F01 (Batterij capaciteit), F02 (Lader 'float' spanning), F03 (Lader 'float' stroom), F04 (Low battery alarm Aan (% SOC)), F05 (Low battery alarm Aan (Volts)), F06 (Low battery alarm Uit (% SOC)).

Table with 4 columns: Functie, Beschrijving, Standaard, Bereik, Stapgrootte. Rows include F07 (Peukert's exponent), F08 (Shunt Ampere rating), F09 (Backlight modus), F10 (Alarm kontakt polariteit), F11 (Gereserveerd), F12 (Firmware versie).

De laatste twee Functies zijn zogenaamde Reset Functies. Door op de SETUP toets te drukken, kan de op dat moment geselecteerde Reset Functie bekeken worden. Gedurende deze periode neemt TBS de kosten van eventuele reparatie voor haar rekening.

Table with 2 columns: Functie, Beschrijving. Rows include r.b (Reset Batterij status) and r.F (Reset Functies).

4. Garantie condities

TBS Electronics (TBS) garandeert dit produkt vrij van defecten veroorzaakt in de assemblage of door de gebruikte materialen, tot 24 maanden na de aankoopdatum.

Deze garantie vervalt wanneer dit produkt fysiek beschadigd is, zowel extern als intern en dekt geen kosten veroorzaakt door onjuist gebruik of gebruik in een ongeschikte omgeving.

Deze garantie is niet geldig wanneer dit produkt is misbruikt, verwaarloosd, onjuist geïnstalleerd of gerepareerd door iemand anders dan door TBS is aangewezen.

Omdat TBS geen controle kan uitvoeren op het gebruik en de installatie (volgens lokaal geldende voorschriften) van dit produkt, is de eindgebruiker ten alle tijden aansprakelijk voor het gebruik hiervan. Dit TBS produkt is niet geschikt voor toepassing als kritische component in (medische-) apparatuur of systemen die een potentieel gevaar kunnen vormen voor mens, natuur en milieu.

- 1) Enkele voorbeelden van onjuist gebruik zijn :
- het aanbieden van een te hoge ingangsspanning
- verkeerde aansluiting van de shunt
- het aanbieden van de accu spanning op de shunt ingang
- mechanisch te zwaar belaste behuizing en/of interne onderdelen, vanwege misbruik of incorrecte verpakking
- contact met vloeistoffen of oxidatie door condensatie

5. Technische specificaties

Table with 2 columns: Parameter, e-xpert lite. Rows include Voedingsspanningsbereik, Voedingstroom, Ingangsspanningsbereik, Ingangsspanningsbereik, Ingangsstroom bereik, Batterij capaciteit bereik, Werkingstemperatuur bereik, Uitlezingsresolutie, Nauwkeurigheid spanningsmeting, Nauwkeurigheid stroommeting, Afmetingen, Shunt afmetingen, Beschermingsklasse, Accessoires.

N.B.: Bovenstaande gegevens kunnen zonder aankondiging van de fabrikant wijzigen.
1) Gemeten met uitgeschakelde backlight en alarm relais.
2) Afhankelijk van geselecteerde shunt. Met standaard meegeleverde 500A/50mV shunt (350A continu), is de range gelimiteerd tot -600..+600A.

6. Conformiteitsverklaring



Table with 2 columns: FABRIKANT, ADRES. Values: TBS Electronics BV, De Factorij 46, 1689 AL, Zwaag, The Netherlands

Verklaart dat het volgende product :

Table with 2 columns: PRODUKT TYPE, MODEL. Values: BATTERIJ MONITOR, e-xpert lite

conform de eisen is van de volgende richtlijnen van de Europese Unie :
EMC Directive 2004/108/EC
RoHS Directive 2002/95/EC

Het bovenstaande produkt is conform de volgende geharmoniseerde normen :
EN61000-6-3: 2001 EMC - Generic Emissions Standard
EN61000-6-2: 2005 EMC - Generic Immunity Standard