

Manual of the remote for the BMS of the company Kart Masters

Remote control model 360-011 - September 2017

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1 Remote control for BMS

1.1 Batteries of the remote

The remote controller is powered by two 8.4V batteries or Lithium 9.0V. The remote has an internal charger: just connect power + 12V or + 15V on the remote and the battery recharges.

Do not turn off the remote control to recharge the batteries as this is the microprocessor of the remote control that manages the final charge.

In case of non-use, it is advisable to disconnect the batteries from the remote control.

1.2 The global controls on the remote

The remote control has a numeric key of 0 to 9 and six function keys (A) to (F).

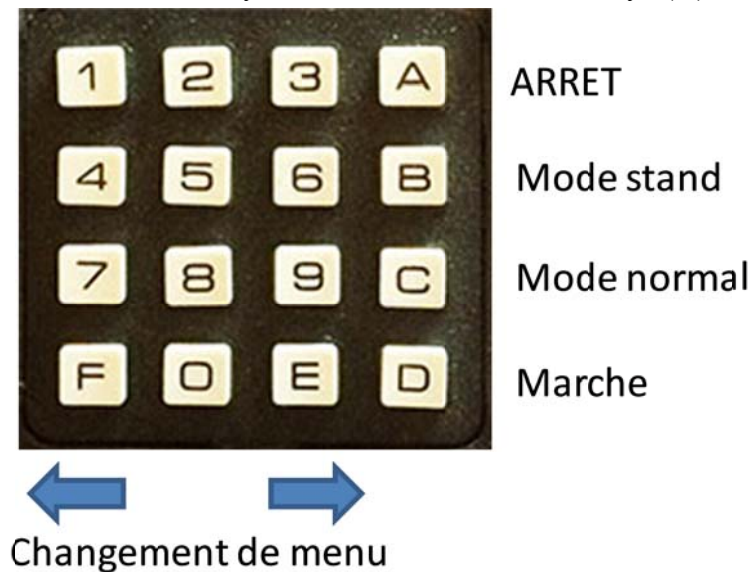


Fig. 1. The keypad of the remote.

The basic controls on the remote are:

- F: left arrow for menu navigation, diminishing numbers;
- E: right arrow to navigate menus, increasing numbers;
- A: To stop ALL the karts;
- D: to restart ALL the karts;
- B: to activate the standby mode (low acceleration);
- C: to activate the normal mode (out of STAND mode).

1.3 The menus with BMS number

Some menus use the BMS number to query the status of the corresponding kart.

If the menu offers only a simple display of values, BMS number can be changed using the number buttons (1) to (9).

If the menu includes changing a parameter while the BMS number can't be changed on this menu and the digital keys (1) to (9) are used to modify the parameter value. The key (9) is often used to validate and send the new parameter value to the BMS on the kart.

1.4 In case of default on the BMS

Defects managed by BMS are:

- A loss of communication between the cards of the BMS in the case of BMS having more than 8 analog inputs: the “DEFAULT” variable is then 5.
- A cell or battery has a lower voltage than the limit set in the BMS: the “DEFAULT” variable is then 7 "Cell Under Voltage";
- A cell or battery has a higher voltage than the limit set in the BMS: then the “DEFAULT” variable is 8 "Cell Over Voltage".
- One of the temperature sensors measure a temperature higher than the limit set in the BMS: the “DEFAULT” variable is then 11 "Over Temperature".

In case of a fault and if the "Key Switch + BAT cut" is supplied, the brake lights flash at a frequency of about 1 Hz.

The tilting of the BMS internal relay is audible.

An LED indicates red BMS internal relay operation.

2 The menus on the remote

A first menu (menu 0) indicates the version number of the electronic card ("hardware" "REMOTE5" or "REMOTE6") and the software version number ("software" Ver.32.C or more).

This menu shows the hours in the format "hours from 00h to 23h: minutes: seconds."

The voltages of two batteries are shown in mV. In the case of hardware REMOTE5, only the battery 1 voltage is used for the two displays.

A bar graph 16 levels indicates the charge state of the remote control.

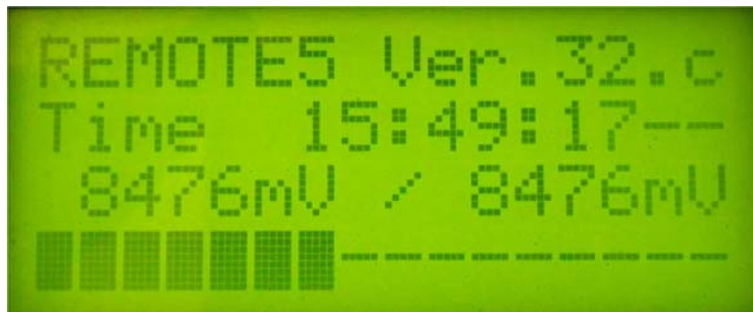


Fig. 2. Menu 0: version time and storage conditions.

2.1 Menu 1: karts states

This menu shows the keys to use to change the karts operating modes, as well as the current state of the modes stored in the remote control.

The (A) sends the order to stop ALL karts: mode = STOP.

The (D) sends the order to restart ALL karts: mode = RUN.

The (B) sends the order to activate the "reduced acceleration" mode: mode = STAND.

The (C) sends the order to restart ALL karts: mode = NORMAL.

It enters this menu 1 as soon as it is pressed one of the buttons (A), (B), (C) or (D) and regardless of the menu in which it was previously.

The 4th line of the display shows the time and the average value of the voltages of two batteries in mV OR a brief indication there was a fault on the previous selected BMS.



Fig. 3. Menu 1: karts states.

2.2 Menu 2: the minimum and maximum pressures

Menu 2 lists the minimum and maximum voltages among the set of cells or batteries connected in series.

It indicates in addition the number of the cell or the affected battery.

If a battery is composed of several cells (12V Lithium case of "ICE CART"), the cell number corresponds to the battery cells whose number is also displayed.

BMS number can be changed using the number buttons (1) to (9).



Fig. 4. Menu 2: the minimum and maximum voltages.

2.3 Menu 3: the minimum and maximum temperatures

The menu 3 shows the minimum and maximum temperatures measured from the group of temperature sensors (thermistors 10 k ohms) installed.

BMS number can be changed using the number buttons (1) to (9).

If the values "+123.4°C" and "-123.4°C" is displayed, then communication with the BMS is not operational.

A value of "+ 12.3°C" corresponds to a by default "neutral" value sent by the BMS.

The 4th line of the display shows the time and the average value of the voltages of two batteries mV OR a brief indication there was a fault on the previous selected BMS.

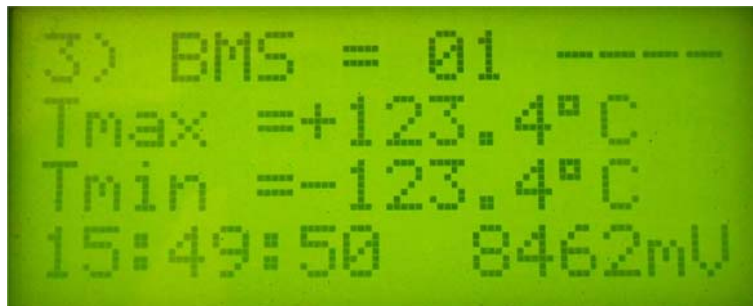


Fig. 5. Menu 3: the minimum and maximum temperatures.

2.4 Menu 4: the voltage and average current to the battery

The 4th menu shows the average voltage in volts and the average current in amps of the kart power battery. When the current is positive, the battery discharges. When the current is negative, the battery is charging

BMS number can be changed using the number buttons (1) to (9).

The 4th line of the display shows the time and the average value of the voltages of two batteries mV OR a brief indication there was a fault on the previous selected BMS.

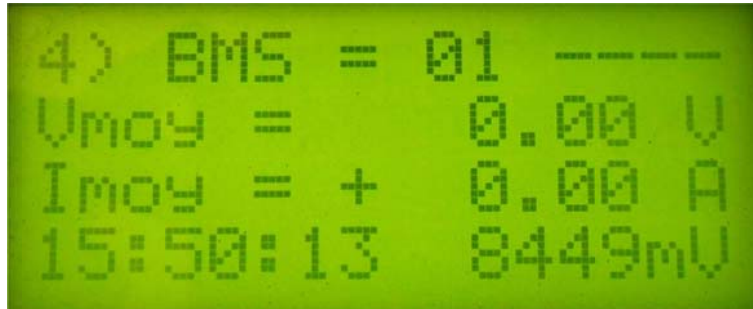


Fig. 6. Menu 4: the voltage and average current of the battery.

2.5 Menu 5: changing the mode of a kart

The menu 5 is used to configure the operating mode of a kart in particular:

- The key (1) switches to "NO" the "STOP" mode, so the kart is allowed to run.
- The key (2) switches to "YES" the "STOP" mode, so the kart is not allowed to run.
- The key (4) switches to "NO" the "STAND" mode, so the kart is allowed to run in "NORMAL" mode.
- The key (5) switches to "ON" the "STAND" mode, so the kart run into "STAND" mode (low acceleration).
- The key (7) switches to "NO" the "ADULT" mode, so the kart is in "CHILD" mode.
- The key (8) switches to "YES" the "ADULT" mode, so the kart is in "ADULT" mode.

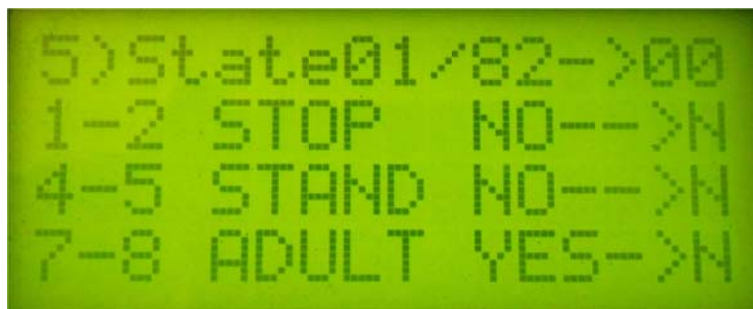


Fig. 7. Menu 5: changing the mode of a kart.

2.6 Menu 6: State of the BMS 1/2

The menu 6 indicates the state of the inputs and outputs of the BMS. The variable M indicates the state of the inputs and outputs of the BMS on an 8-bit byte, displayed in hexadecimal.

BMS number can be changed using the number buttons (1) to (9).

- The R1 variable corresponds to the relay # 1 of the brake light. If R1 is "ON", the brake light is on if the "Key Switch + BAT" is powered on. If R1 is "OFF", the brake light is off.
- The R2 variable corresponds to the relay # 2 for controlling the charger. If R2 is "ON", the charger is allowed to operate (closed circuit). If R2 is "OFF", the charger is not allowed to operate (open circuit).
- The T1 variable corresponds to the logic input "ON/OFF" with a temperature sensor: This input is not used.
- T2 variable corresponds to the logic input "ON/OFF" with a temperature sensor: This input is not used.
- The variable V1 corresponds to the logic input "ON/OFF" a voltage sensor of the charger in the case of the cabinet unit charger for the "ICE KART" Lithium batteries.
- Variable V2 corresponds to the logic input "ON/OFF" a voltage sensor of the charger in the case of the cabinet unit charger for the "ICE KART" Lithium batteries.



Fig. 8. Menu 6: the state of the BMS inputs and outputs 1/2.

2.7 Menu 7: the state of the inputs / outputs of BMS 2/2

The menu 7 indicates the state of inputs and outputs of the BMS. The variable M indicates the state of the inputs and outputs of the BMS on an 8-bit byte, displayed in hexadecimal.

BMS number can be changed using the number buttons (1) to (9).

- The variable "LED" corresponds to the logic input "ON/OFF" of the external LED power controller sensor. When the light is on, the variable "LED" is "ON". When the light is off, the variable "LED" is "OFF".
- The variable "SLOW" is the logical output "ON/OFF" for reducing the operating range of the accelerator ("STAND" mode). When the "SLOW" variable is "ON", the acceleration of the kart is reduced. When the "SLOW" variable is "OFF", the acceleration of the kart is normal.
- The T1 variable corresponds to the logic input "ON/OFF" of a temperature sensor. This input is not used.
- The T2 variable corresponds to the logic input "ON/OFF" of a temperature sensor. This input is not used.
- The variable "SC1" corresponds to a logic output of BMS connected at the input "Speed Cutback 1" of the power converter ("CHILD mode"). When the variable "SC1" is "ON", the "CHILD" mode is active. When the variable "SC1" is "OFF", the "ADULT" mode is active.
- The variable "SC2" corresponds to a logic output of BMS connected at the input "Speed Cutback 2" of the power converter ("BRAKE mode"). When the variable "SC2" is "ON", the "brake" mode is activated and the brake light is on. When the variable "SC2" is "OFF", the "brake" mode is not activated.

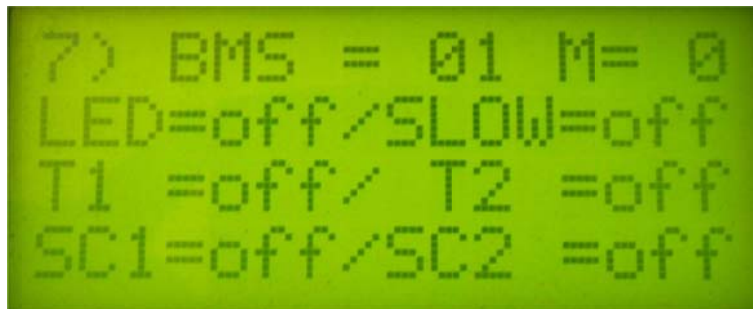


Fig. 9. Menu 7: the state of the BMS inputs and outputs 2/2.

2.8 Menu 8: the charging time

Menu 8 indicates the charging time of the kart power battery in minute (from 0 to 255 min) and second. If the charging time exceeds "255min59s", it back to 0.

The measurement of charging time is triggered and resets itself to "000min00s" when the load current (negative for the battery) is, in absolute value, greater than the limit set in the BMS by the variable "I limit" (see menu 12).

The measurement of charging time stops when the current drops below the limit.

BMS number can be changed using the number buttons (1) to (9).

The 4th line of the display shows the time and the average value of the voltages of two batteries mV OR a brief indication there was a fault on the previous selected BMS.



Fig. 10. Menu 8: the charging time.

2.9 Menu 9: the time setting

The menu 9 allows setting the time on the remote. It also allows the transmission of this adjustment to the BMS in the case of giant 7-segment display.

- the key (1) allows to increase the hours;
- the key (4) allows to reduces the hours;
- the key (2) allows to increases the minutes;
- the key (5) allows to reduce the minutes;
- the key (3) allows to increases the second;
- the key (6) allows to reduces the second;
- the keys (7) and (8) are not used;
- the keys (9) allows the transmission of the setting to the BMS.



Fig. 11. Menu 9: the time setting.

2.10 Menu 10: the version of the BMS software

The menu 10 allows reading of the version number of the BMS software and the value of the fault detected by the BMS.

BMS number can be changed using the number buttons (1) to (9).

The number of the defect is displayed on the

The fault number "D" is displayed on the right of the 2nd line. A brief indication of the fault is displayed on the 4th line.

The "Text" field displays the 8-character version number ("[89VM6b--]" for example).

The 4th line of the display shows the time and the average value of the voltages of two batteries mV OR a brief indication if there was a fault on the selected BMS.

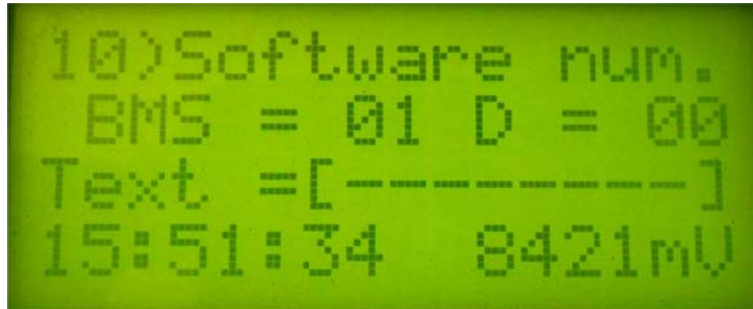


Fig. 12. Menu 10: BMS version of the software.

2.11 Menu 11: changing the BMS number

WARNING: menu 11 allows changing the BMS number. The BMS number often corresponds with the kart number. If you forget the BMS number, use the menu 10 and try ALL the numbers from 1 to 99 until you get an answer from the BMS.

The variable "New BMS" shows the new number.

- the key (1) increases the dozens of new number;
- the key (4) to reduce the dozens of new number;
- the key (2) increases the units of the new number;
- the key (5) reduces the units of the new number;
- the keys (3), (6), (7) and (8) are not used;
- the key (9) allows the transmission of the new number to the BMS.

After confirming with the key (9), the remote control is switched to the menu 2 to see if the BMS number change is correct. Otherwise, you must repeat the number change procedure.

The 4th line of the display shows the average value of the voltages of two batteries of the remote mV.

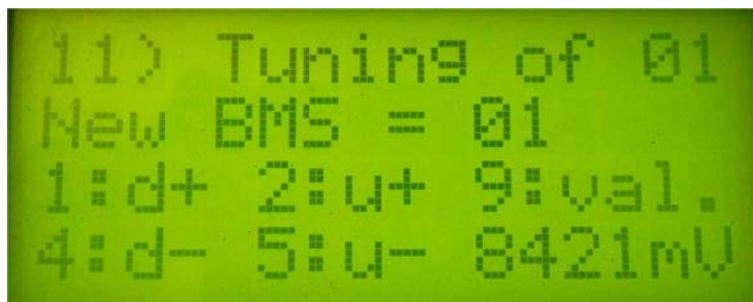


Fig. 13. Menu 11: Change of BMS number.

2.12 Menu 12: the battery charge threshold current

The menu 12 makes it possible to change the charging current of the battery power threshold used for measuring the charging time (see menu 8).

The value of the threshold current recorded in the BMS is displayed left on the 2nd line. In case of bad communication, "0.0A" value is displayed.

The new modified value of the threshold current is displayed right on the 2nd line.

- the key (1) increases the tens of the new value of the current;
- the key (4) reduces the tens of the new value of the current;
- the key (2) increases the units of the new value of the current;
- the key (5) reduces the units of the new value of the current;
- the key (3) increases the tenths of the new value of the current;
- the key (6) reduces the tenths of the new value of the current;
- the keys (7) and (8) are not used;
- the key (9) allows the transmission of the new value of the threshold current to the BMS.

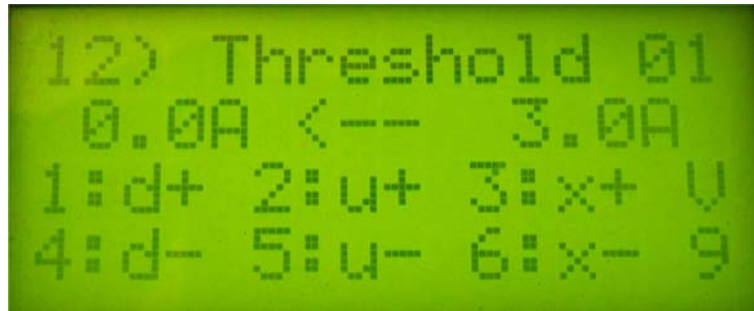


Fig. 14. Menu 12: the battery charge threshold current.

2.13 Menu 13: the maximum voltage per cell

The menu 13 allows setting the maximum voltage of cells or batteries from 2.00V to 20.00V. Depending on the BMS used, this maximum voltage is limited internally by the BMS to a smaller range, appropriate to the cells or batteries monitored (e.g. between 12.0V and 16.5V for a lead acid battery).

The maximum voltage value recorded in the BMS is displayed left on the 2nd line. In case of bad communication, "0.00V" value is displayed.

The new modified value of the maximum voltage is displayed right on the 2nd line.

- the key (1) increases the units of the new value of the maximum voltage;
- the key (4) reduces the units of the new value of the maximum voltage;
- the key (2) increases the tenths of the new value of the maximum voltage;
- the key (5) reduces the tenths of the new value of the maximum voltage;
- the key (3) increases the hundredths of the new value of the maximum voltage;
- the key (6) reduces the hundredths of the new value of the maximum voltage;
- the keys (7) and (8) are not used;
- the key (9) allows the transmission of the new value of the maximum voltage to the BMS.

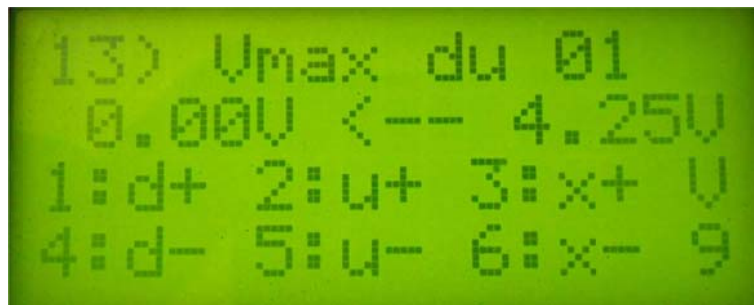


Fig. 15. Menu 13: the maximum voltage per cell.

2.14 Menu 14: the minimum voltage per cell

The menu 14 allows adjustment of the minimum voltage of the cells or batteries from 2.00V to 20.00V. Depending on the BMS used, this minimum voltage is limited internally by the BMS to a smaller range, appropriate to the cells or batteries monitored (e.g., between 8.5V and 12.0V for a lead acid battery).

The minimum voltage value recorded in the BMS is displayed left on the 2nd line. In case of bad communication, "0.00V" value is displayed.

The new modified value of the minimum voltage is displayed right on the 2nd line.

- the key (1) increases the units of the new minimum voltage value;
- the key (4) reduces the units of the new minimum voltage value;
- the key (2) increases the tenths of the new minimum voltage value;
- the key (5) reduces the tenths of the new minimum voltage value;
- the key (3) increases the hundredths of the new minimum voltage value;
- the key (6) reduces the hundredths of the new minimum voltage value;
- the keys (7) and (8) are not used;
- the key (9) allows the transmission of the new value of the minimum voltage to the BMS.



Fig. 16. Menu 14: the minimum voltage per cell.

2.15 Menu 15: maximum temperature

The menu 15 allows adjustment of the maximum temperature threshold BMS between 10°C and 90°C.

The value of the maximum temperature threshold stored in the BMS is displayed to the left on the 2nd line. In case of bad communication, the value "0°C" is displayed.

The new modified value of the temperature threshold is displayed right on the 2nd line.

- the keys (1) and (2) increase the new value of the temperature threshold;
- the keys (4) and (5) decrease the new value of the temperature threshold;
- the key (3) increases directly the value of the temperature threshold stored in the BMS;
- the key (6) decreases directly the threshold temperature stored in the BMS;
- the keys (7) and (8) are not used;
- the key (9) allows the transmission of the new value of the maximum temperature threshold to the BMS.

The 4th line of the display shows the time and the average value of the voltages of two batteries mV OR a brief indication if there was a fault on the selected BMS.



Fig. 17. Menu 15: the maximum temperature.

2.16 Menu 16: adjusting the brightness of the display

The menu 16 allows adjustment of the brightness of the giant LED display. The brightness depends on the variable “PWM” (Pulse Width Modulation) that ranges from 0 (maximum brightness) to 254 (minimum brightness).

The new modified brightness value is displayed right on the 2nd line.

- the key (1) increases the hundreds of the new value of brightness;
- the key (4) reduces the hundreds of the new value of brightness;
- the key (2) increases the tens of the new value of brightness;
- the key (5) reduces the tens of the new value of brightness;
- the key (3) increases the units of the new value of the brightness;
- the key (6) reduces the units of the new value of the brightness;
- the keys (7) and (8) are not used;
- the key (9) allows the transmission of the new value of brightness to the BMS of the display.

The 4th line of the display shows the average value of the voltages of two batteries of the remote mV.

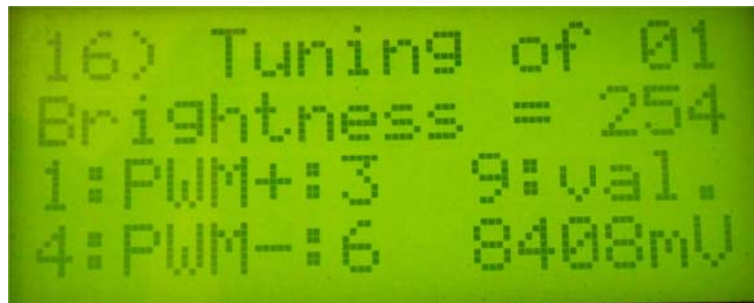


Fig. 18. Menu 16: adjusting the brightness of the display.

2.17 Menu 17: setting the display timer

The menu 17 allows setting the timer of the giant LED display.

This timer start counting down to zero until receipt of a new value.

The adjustment range is 00min00s to 99min59s.

The new modified value of the timer is displayed right on the 2nd line:

- the key (1) increases the tens of minutes of the new value of the timer;
- the key (4) reduces the dozens of minutes from the new value of the timer;
- the key (2) increases the units of minutes of the new value of the timer;
- the key (5) reduces the units of minutes from the new value of the timer;
- the key (3) increases the second of the new value of the timer;
- the key (6) reduces the second of the new value of the timer;
- the keys (7) and (8) are not used;
- the key (9) allows the transmission of the new timer value to the BMS of the display.

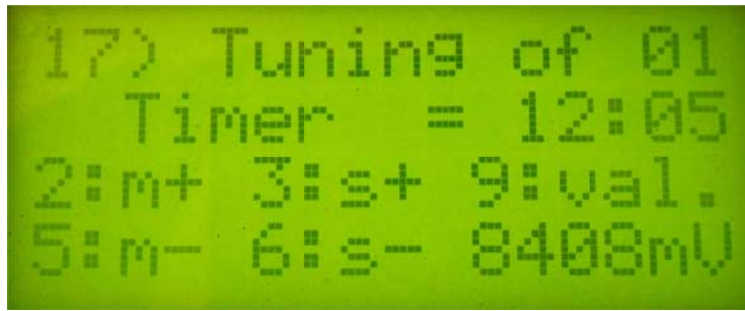


Fig. 19. Menu 17: setting the timer display.

2.18 Menu 18: charger status of the remote control.

The menu 18 indicates the state of the internal charger for the 2 accumulators 8.4V or 9.9V of the remote control. This menu is automatically activated when the + 12V power block (case of 8.4V lithium batteries) or + 15V power block (case of 9.9V lithium accumulators) is connected to the remote control.

The voltage "Vout" indicates the output voltage of the internal charger. This voltage is slightly higher than the battery voltage when the charger works. It is worth a few mV when the charger is stopped.

The charging timeout is triggered when the battery voltage exceeds 8350mV for 8.4V Lithium accumulators and 9850mV for 9.9V Lithium accumulators.

The internal charger stops if the voltage exceeds 8.4V or 9.9V based on accumulators, or timeout.

The 4th line of the display shows the time and the average value of the voltages of two batteries mV OR a brief indication if there was a fault on the selected BMS.



Fig. 20. Menu 18: charger status of the remote control.

2.19 Menu 19: the choice of language

The menu 19 is used to select the language for the remote. The key (1) decreases the variable "Options". The key (2) increases the variable "Options". This allows choosing between 3 languages:

- French (FR) "Options" = (0);
- English (UK) "Options" = (1);
- Spanish (ES) "Options" = (2).

This menu 19 also lets you choose the activation period, in seconds, of the LCD backlight between 0s and 255s. If the value is 0s, the backlight of the LCD screen is constantly turned off: the batteries discharge slower and the battery life is longer. The higher the value, the lower the range of the remote control.

The 4th line of the display shows the time and the average value of the voltages of two batteries mV OR a brief indication if there was a fault on the selected BMS.

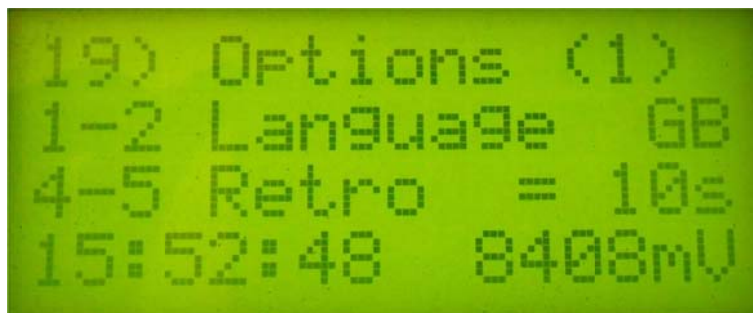


Fig. 21. Menu 19: the choice of language.

2.20 Menu 20: the keyboard test

The menu 20 is a keyboard test menu of the remote. It sends the key number to the BMS. This menu is used to change the display mode on the giant LED display.

The variable "Var1" represents ASCII character code received by the remote control.

The variable "Var2" represents ASCII character code sent by the remote control.

The 4th line of the display shows the time and the average value of the voltages of two batteries in mV.



Fig. 22. Menu 20: the keyboard test.

3 Appendix: cell and battery voltage range

3.1 Voltages for 3.7V Lithium EPS cell

Table 1. Minimum, nominal and maximum voltages of the Lithium EPS cells.

	1 cell	4 cells	8 cells	16 cells	24 cells
Minimum voltage	2.75 V	11.00 V	22.00 V	44.00 V	66.00 V
Minimum voltage	3.00 V	12.00 V	24.00 V	48.00 V	72.00 V
Nominal voltage	3.70V	14.80 V	29.60 V	59.20 V	88.80 V
Maximum voltage	4.20 V	16.80 V	33.60 V	67.20 V	100,80 V
Maximum voltage	4.30V	17.20 V	34.40 V	68.80 V	103,20 V

3.2 Voltages for 3.2V Lithium CALB cell

Table 2. Minimum, nominal and maximum voltages of the Lithium CALB cells.

	1 cell	4 cells	8 cells	16 cells	24 cells
Minimum voltage	2.00 V	8.00 V	16.00 V	32.00 V	48.00 V
Minimum voltage	2.50 V	10.00 V	20.00 V	40.00 V	60.00 V
Nominal voltage	3.20 V	12.80 V	25.60 V	51.20 V	76.80 V
Maximum voltage	3.65 V	14.60 V	29.20 V	58.40 V	87.60 V
Maximum voltage	3.80 V	15.20 V	30.40 V	60.80 V	91.20 V

3.3 Voltages for 12V OPTIMA YELLOW Lead batteries

Table 3. Minimum, nominal and maximum voltages of 12V OPTIMA lead batteries.

	1 battery	2 batteries	3 batteries	4 batteries	6 batteries
Minimum voltage	9.0 V	18.0 V	27.0 V	36.0 V	54.0 V
Minimum voltage	10.0 V	20.0 V	30.0 V	40.0 V	60.0 V
Nominal voltage	13.2V	26.4 V	39.6 V	52.8 V	79.2 V
Maximum voltage	15.0 V	30.0 V	45.0 V	60.0 V	90.0 V
Maximum voltage	16.0 V	32.0 V	48.0 V	64.0 V	96.0 V

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