ARR-M Series
Product Manual

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Revision History

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BATTERY CHARGER USER'S MANUAL

Table of content

INSTALLATION

1. INTRODUCTION

This user manual contains important technical instructions to be followed by qualified personnel responsible for the installation, start-up, maintenance operations and knowledgeable on batteries and safety requirements/precautions involved. We recommend this manual to be read attentively to ensure safe and reliable operation of this equipment.
Should you require any assistance, please call our service department.

2. IMPORTANT SAFETY INSTRUCTIONS

Keep these instructions in a safe place: this manual contains important safety and operating instructions
AC and **DC** currents are present in this system **even** with indicators and breakers are in "**OFF**" position.
Before performing any maintenance on this system, make sure that the **battery** and the **AC** power are disconnected.

- Only experienced and qualified personnel must perform maintenance.
- Electrostatic sensitive components are used in this equipment. Proper ESD (electrostatic discharge) procedures must be followed to prevent any severe damage to electronic components**.**
- Working in the vicinity of Lead Acid or Nickel Cadmium batteries is dangerous: **batteries generate explosive gases** during normal operation. Therefore, **never smoke** or allow an **open spark** or **flame** in the vicinity of the battery or engine.
- To reduce risk of battery explosion, follow these instructions and those on the battery.
- Never charge a **frozen** battery.
- Do not expose charger/rectifier to rain or snow unless it has the appropriate NEMA/IP rating.
- Do not install or operate chargers if they have been dropped or damaged.
- Refer to your local/national electrical code for installation

3. STORAGE / MAINTENANCE DURING STORAGE

If the charger/rectifier has to be stored before commissioning, it should be stored in a dry place, in the ambient temperature within –40°F to 185°F (-40°C to 85°C), not exposed to direct sunlight, on the same pallet, protected against moisture, dust, dirt and damage. Do not use the charger/rectifier as a stocking shelf.
Remember that storing the charger/rectifier for a long period (**5 years or more**) can deteriorate performance of the filter capacitors and can cause also contact oxidation for relays, breakers, contactors… Filter capacitors shall be replaced after storing the charger/rectifier 5 years or more.
Please contact the manufacturer for capacitor specifications and installation.

Warning

For batteries and other accessories (UPS…), please refer to the specific manufacturer indications for battery periodical recharge and powering up procedure after storage.

4. PLACEMENT AND INSTALLATION

FOR INSTALLATION, PLEASE REFER TO NATIONAL AND/OR LOCAL ELECTRICAL CODES.
Chargers/rectifiers are very heavy. To prevent personal injury or equipment damage, use appropriate lifting devices and execute extreme care while handling the equipment.

The following instructions are very important to satisfactory operation. Changing the settings voids the warranty.

Warning

Battery application and maintenance:
Your battery is a crucial back up for your critical application. Special care and appropriate safety and maintenance procedures must be implemented.
Please refer to the battery manufacturer instructions and the applicable battery installation, maintenance, testing and replacement standards for stationary application in order to optimize the life of the battery as well as to determine when the battery should be replaced.
VRLA case (Lead Acid battery incorrectly called "maintenance free"): As this battery is sealed not allowing visual inspection or water addition, dry out and thermal runaway inside the battery can happen resulting to an unpredictable failure occurrence. Great care in installation, maintenance, testing and replacement is required to insure availability of backup power.
The manufacturer instruction, your local standards and the following standards can be your guide to help to apply proper procedures: (other standards may apply).

IEEE484: IEEE Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications.
IEEE450: IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary applications.
IEEE1188: IEEE Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications.
IEEE1106: IEEE Recommended Practice for Installation, Maintenance, Testing and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications.

5. VENTILATION AND COOLING

The rectifier/charger is rated to better perform within 18°F (–10°C) and 122°F (+50°C) temperature range.
To calculate the required air displacement (exchange) volume, please use the following equation:

$$V = BTU \ \frac{e^{0.125\ H\ \frac{Tk}{T0}}}{T_r - T_k}$$

V = air flow: [cubic meter/hour]
BTU: Total dissipated heat
$\mathbf{T_r}$: Maximum allowed room temperature [°K] {i.e. 50°C = 323°K]
$\mathbf{T_k}$= Temperature of input cooling air
$\mathbf{T_o}$= 273 °K
H = Altitude [km]

WARNING!

Avoid placing the system in **direct sunlight**
The **adequate ventilation** and safe access require that the following clearances are respected:

- 3 in. (10 cm) on the sides and top;
- 3 feet (1 meter) in front of the unit;
- DO NOT INSTALL OVER COMBUSTIBLE SURFACES;

Should seismic conditions require a more secure installation the unit can be **bolted to the floor**. Four (4) holes are provided for this purpose.

6. ELECTRICAL CONNECTIONS AND WIRING

Before connecting the battery charger ensure that:

- The battery is disconnected (if applicable)
- The circuit breakers are OFF
- The relays, fuses and circuit boards are installed
- The unit is wired in accordance with the instructions (refer to the wiring connections and electrical diagram)

The appropriate cable sizes are very important. The **nameplate** provides the essential information regarding the input and output voltages and currents.

Use a branch feeder (circuit breaker or fused disconnect switch), sized to the maximum input current.
Refer to your Local or **National Electrical Code** for LOCKOUT, WIRE GAUGE and GROUNDING instructions.
The ampacity of the power cables must be sized to the maximal correspondent current.
Correct voltage and polarity are of critical importance. Check all connections for tightness and polarity. Connect battery (if applicable to the output terminals observing its polarity.

7. POWERING UP

After the installation of all wires is completed and has been double checked, the unit may be powered up as follow:

- Before connecting a load to a charger, compare the critical characteristics of the load against those of the charger (i.e. **measure** ripple, line-neutral voltage, positive-neutral voltage).
- Keep a log of the values entered for V_{FLOAT} and $V_{EQUALIZE}$ values entered, alarm messages, alarm and SCR blinking LEDs, etc.
- All input and output breakers must be in **"OFF"** position
- Apply power to the equipment from a source
- Turn on AC breaker (if supplied) (**"ON"** position)
- Wait 30 seconds
- Turn on DC breaker (if supplied) (**"ON**" position)
- Green LED must light up
- Wait 5 seconds until the LCD display will show the system's output voltage and status
- The system soft starts by rising the output current and the voltage

If an adjustment or calibration of the unit is necessary, refer to the **field programming** section for more information.

8. SYSTEM POWERING OFF PROCEDURE

- Open the DC breaker (if supplied) (OFF position);
- Open the source panel's AC breaker (if supplied) (OFF position);
- Open the AC breaker feeding the powering the battery charger from external distribution panel;
- If work inside a unit has to be performed, wait 5 minutes to let the filter capacitors to discharge or use bleeding resistors of the correct rating to discharge the capacitors;

After following all previous steps, the battery charger can be considered de-energized.

THEORY OF OPERATION

1. THEORY OF OPERATION

The battery charger provides a fully regulated and Isolated DC output from the main AC input. The LCD show continuously the battery charger status: DC Voltage, DC current, alarms ….

1.1 LCD DISPLAY AND KEYPAD

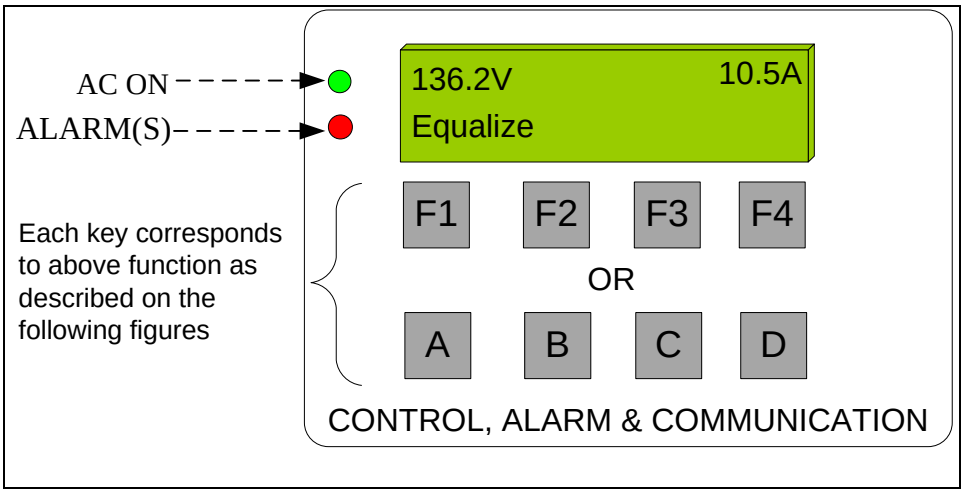


Figure 1 : Battery charger home screen.

The LCD display and keypad provide very flexible and user friendly interface. The standard display is a high visibility backlit two-line LCD display. Four (4) long life membrane switches are used as the keypad buttons.

1.2 GETTING FAMILIAR WITH BATTERY CHARGER LCD INTERFACE

All adjustable values and readings are displayed on the first line. Ex.: alarm activation status, voltage and current readings…

On the second line, soft keys are used: each keyboard button's function is displayed. The assignment of a button to a function can change as needed by different menus or at different levels of access. The Red LED will blink when any alarm occurs. A corresponding alarm message will also be displayed on the second line. If more than one message is to be displayed then the messages will scroll sequentially.

All settings can be saved individually. The lit green LED indicates that the AC is on. The LCD back lighting will turn off after 5 min of inactivity, if the power save function is selected. It will turn back on whenever a button is pressed or any alarm occurs. The accuracy of all readings is 0.5% +/- 1digit.

2. ACCESSING MENU VIA KEYPAD

All gray buttons in all figures inside this manual mean that this button is pressed and activated. When more than one button is gray, this means that we have a choice to press any button on keypad.

WARNING!

All values indicated in the following figures are given as examples. These values don't apply necessarily to your system. For more information about the real values and options set for your application, please refer to the test report at the end of this manual.

On power-up the following readings appears on the screen:

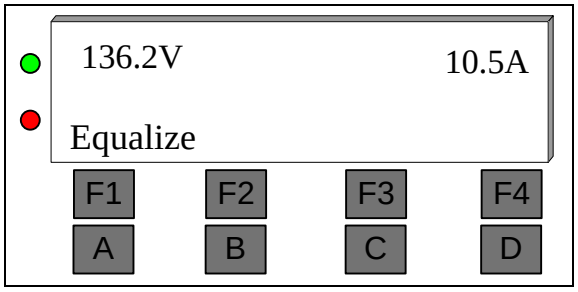


Figure 2 : Home screen example after turning ON the battery charger.

From that point, if you press any button once from **F1** to **F4** (or A to D with other keypad), you reach the menu screen:

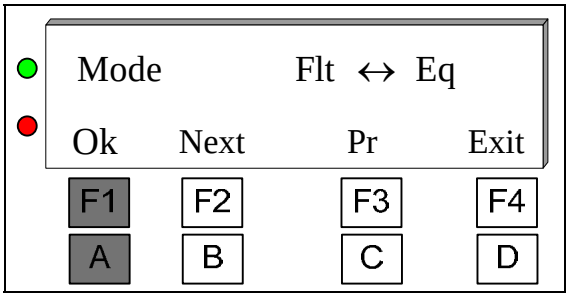


Figure 3 : LCD Display after pressing any button.

From this menu, buttons F2 and F3 (B and C with other keypad) allow us to navigate all other menus and sub-menus, adjustments and enable or disable functions. A detailed description of all menus and sub-menus will be provided in the following paragraph.

Important!

All adjustments of your battery charger are made in our service department. Some sub-menus are password protected. Only authorized personal will be able to access these sub-menus.

3. CHARGING MODES

3.1 "AC OUT" MODE

In the case of a power outage, if the AC breaker is open or if the control board fuse has blown, an AC fail alarm will be generated, warning you that one of the cases has occurred. In this mode, the rectifier waits for the AC input to be reconnected to the charger or the control board.

Note: In this mode, the load will be powered by the battery only.

Figure 4 : AC OUT Mode Display.

3.2 "Float" MODE

The Float mode is the default charging mode. It can be run via:

- Keypad (manually);
- Preset delay (periodically);
- External signal (optional);
- ModBus RS232 / RS485, or ModBus TCP/IP communication (optional);
- DNP3 RS232 / RS485 communication (optional);

The image below shows the LCD display when the charger is in "Float" mode.

Figure 5 : Float Mode Display.

3.3 "Float Current Limit 1" MODE

The maximum Float current is preset at the factory. The image below shows the LCD display when the charger is in "Float Current Limit" mode.

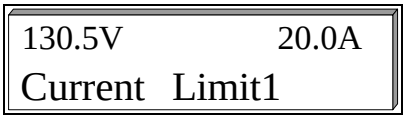


Figure 6 : Float Current Limit Mode Display.

3.4 "Equalize" MODE

Some batteries need to be periodically Equalized. Basically, Equalization refers to a controlled charging at a higher voltage than Float level. Equalize Mode can be run:

- Via Keypad (manually);

- Via a preset delay (periodically);
- Via external signal (optional);
- Via ModBus RS232 / RS485, or ModBus TCP/IP communication (optional);
- Via DNP3 RS232 / RS485 communication (optional);
- If DC Output voltage is within a preset value (Low Volt Equalize: optional);
- If battery capacity is within a preset value (optional);
- After an AC Failure during a preset delay (optional);
- If the battery charger is within a current limit during a preset delay (optional);

The image below shows the LCD display when the charger is in "Equalize" mode.

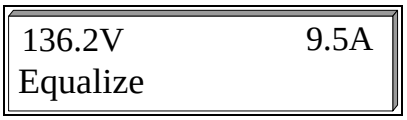


Figure 7 : Equalize Mode Display.

3.5 "Equalize Current Limit 2" MODE

The maximum Equalize current is preset at the factory. The image below shows the LCD display when the charger is in "Equalize Current Limit" mode.

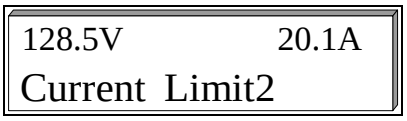


Figure 8 : Equalize Current Limit Mode Display.

4. MANUAL ACTIVATION OF EQUALIZE OR FLOAT MODE

When ordered, the charger can be configured for the manual "Equalize" mode. Please refer to your order and the battery manufacturer to confirm the Equalize requirement. If "Equalize" function does not appear on the LCD, then this automatic function has been disabled at the factory. Contact the agent or the manufacturer for more information. Switching the charger from "Float" to "Equalize" mode can be done manually through the menu. Other equalizing options are also included below. The equalizing time is adjustable between 1 hour and 8191 hours.

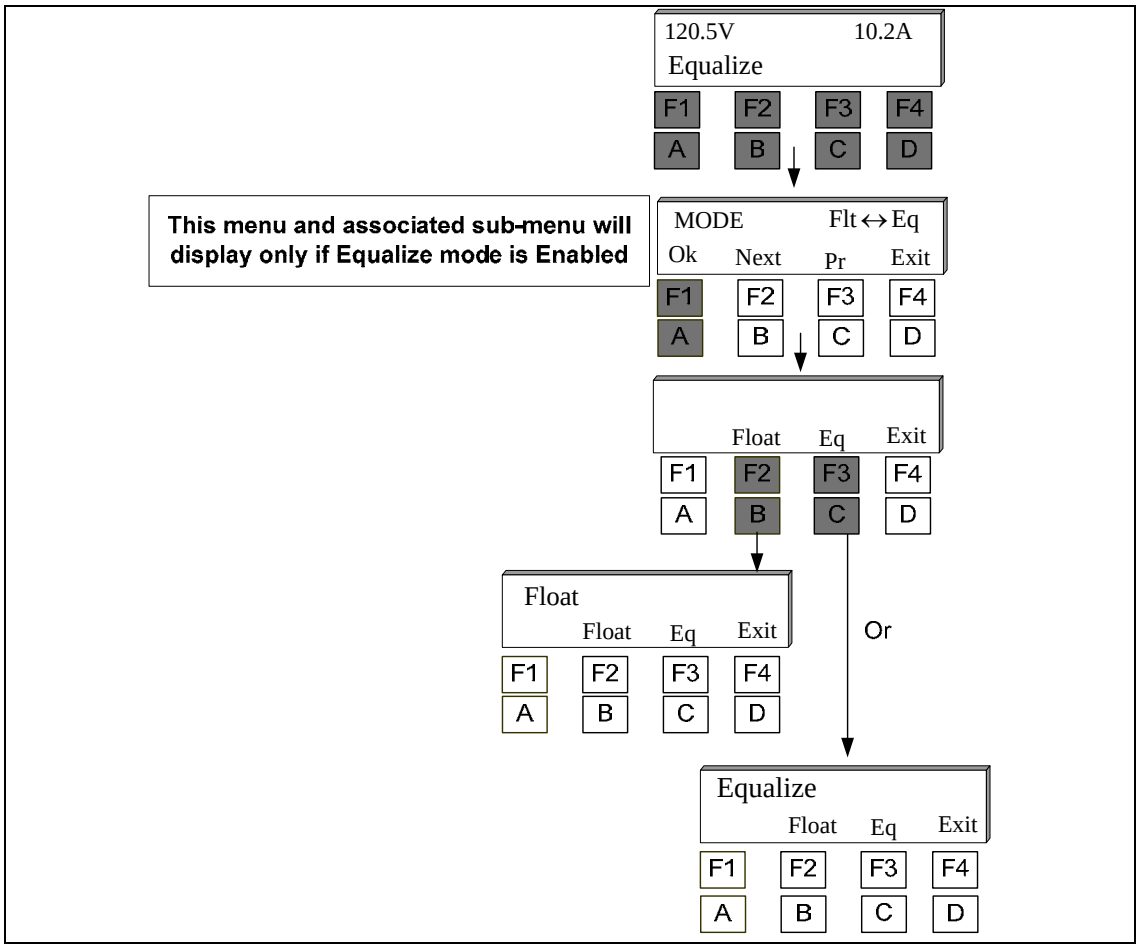


Figure 9 : Enabling Manually Float or Equalize Mode.

5. AC INPUT VOLTAGE(S) AND CURRENT(S) (OPTIONAL)

If this option is ordered, the AC Input Voltage and Current are displayed on the LCD.

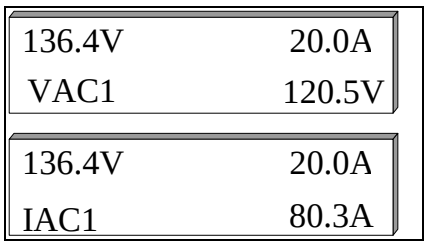


Figure 10 : AC Input Voltage and Current Readings.

In case of 3 phase units, the phase voltage and current readings will be scrolling on the LCD as follow: VAC1, VAC2, VAC3, IAC1, IAC2 and IAC3.

6. BATTERY CURRENT (OPTIONAL)

The current flowing IN or OUT of the battery will be displayed on LCD if this option is enabled. Negative (-) sign will be displayed in case of battery discharging.

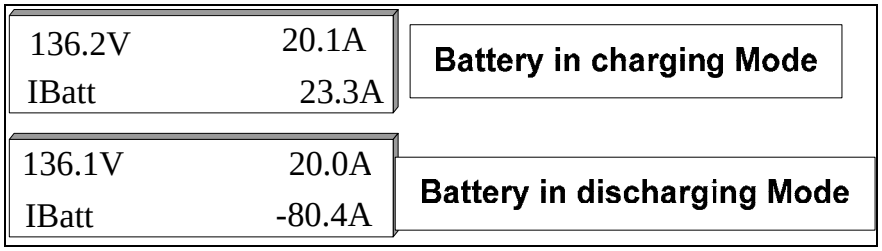


Figure 11 : Battery Current Display.

7. MENU AND CONFIGURATION PARAMETERS

The battery charger is controlled by a 32-bit Microcontroller installed on the control board. All parameters are saved into a EEPROM. The settings are configured into two categories:

1. Charger active parameters such as the alarm settings, O/P voltage and current, etc.
2. Charger active configuration: Temperature compensation, load sharing (if ordered). The calibration settings are reserved for factory use only.

The battery charger allows users to adjust and visualize the following parameters:

- DC Output voltage and current;
- Equalize operation mode;
- Float operation mode;
- Charger current limit mode;
- Battery voltage remote sensing;
- Alarm adjustments;
- Temperature compensation;
- Load sharing;
- 250 events monitoring (date and time stamp are optional);
- Reset alarms and relays;
- Measures :
    - AC Frequency.
    - Rectifier voltage.
    - Voltage between positive output and chassis.
    - Voltage between negative output and chassis.
    - Remaining time for Equalize.
    - Elapsed time for Equalize.
    - Charger temperature.
    - Battery temperature (optional).
    - Battery Voltage discharge test (optional).
    - Battery current discharge test (optional).
    - Battery discharge time (optional).
- Relay test.
- LCD contrast adjustment.

- Battery Test (optional).
- Formation test (optional).
- Language selection.
- DNP3 and Modbus Communication (optional).

    - Battery charger parameter adjustment and visualization.
    - Pre-programmable 4 messages, to be displayed on LCD (Refer to ModBus manual).

- Four external command via a four normally open contact (optional):

    - Display of the four pre-programmable messages (Refer to ModBus manual).
    - Switching to Equalize mode.
    - Switching to Float mode.
    - Reset relays.
    - Run or Stop the battery charger.

7.1 The Menu

The menu is divided into three levels: Level-0 for Readings, Level-1 for Adjustments and Level-2 for Advanced Settings.

LEVEL-0 (Readings): This level is directly accessible by the user with no password need. In this level, the user can perform basic operation of the charger such as:

- Run or stop any other operating function as Battery Test;
- Read different data such as the Battery Temperature (optional);
- Read different events: AC frequency or others;

LEVEL-1 (Adjustments): This level is protected by a password and reserved for charging parameters adjustments such as float voltage, current, alarms, etc. A user can disable / enable this password in Level 2.

LEVEL-2 (Advanced settings): This level is reserved for the Factory calibration purpose and protected by a password. This level is to adjust, calibrate, enable or disable different charger functions.

7.2 Level-0(Readings)

The following figure shows all steps to access Level-0:

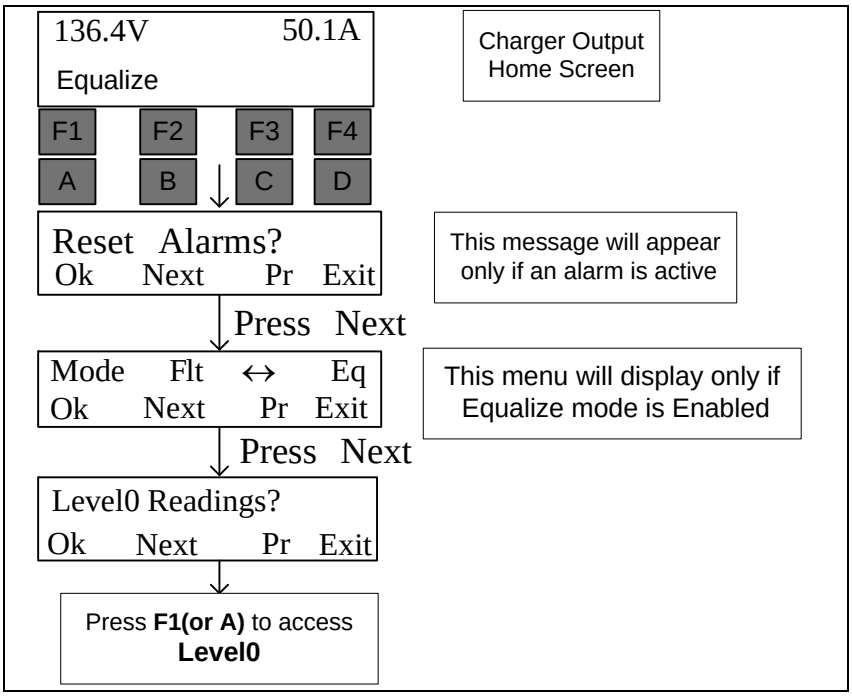


Figure 12 : Procedure to access Level-0.

7.2.1 Events format and Reset procedure

The latest 250 events are saved in the memory. Please refer to Table-1 for the event index. Please note that if dated events are required, then a special circuit with a backup battery has to be ordered at the time of placing your purchase order. Table-1 provide a list of events with associated number

Events	Associated Number
Float mode	1
Equalize mode	2
Current limit mode	3
Formation	4
reserved	5
Battery continuity test running	6
Battery test OK	7
Battery test fault	8
Test problem	9
Battery is under test	10
Battery high voltage	11
Battery low voltage	12
High voltage shutdown	13
Low voltage disconnect	14
Battery High temperature	15
Battery Low temperature	16
Charger high temperature	17
Charger low temperature	18
Positive ground fault	19
Negative ground fault	20
AC fail	21
Rectifier fail	22
Rectifier high voltage	23
Rectifier low voltage	24
AC low voltage	25
AC high voltage	26
High ripple	27
Charger Low current	28
Charger High current	29
Battery Low current	30
Battery High current	31
Battery High capacity	32
Battery Low capacity	33
Faulty communication between PCOM & PC23	34
Faulty communication between PM & PC23	35
Temperature probe alarm	36
Frequency fail	37
Battery discharge alarm	38
Cell defect	39
Battery continuity test fails	40

Table-1

Please, note that some of the above mentioned items can be excluded in your charger depending on your charger configuration.

The following figure shows the procedure to visualize Events:

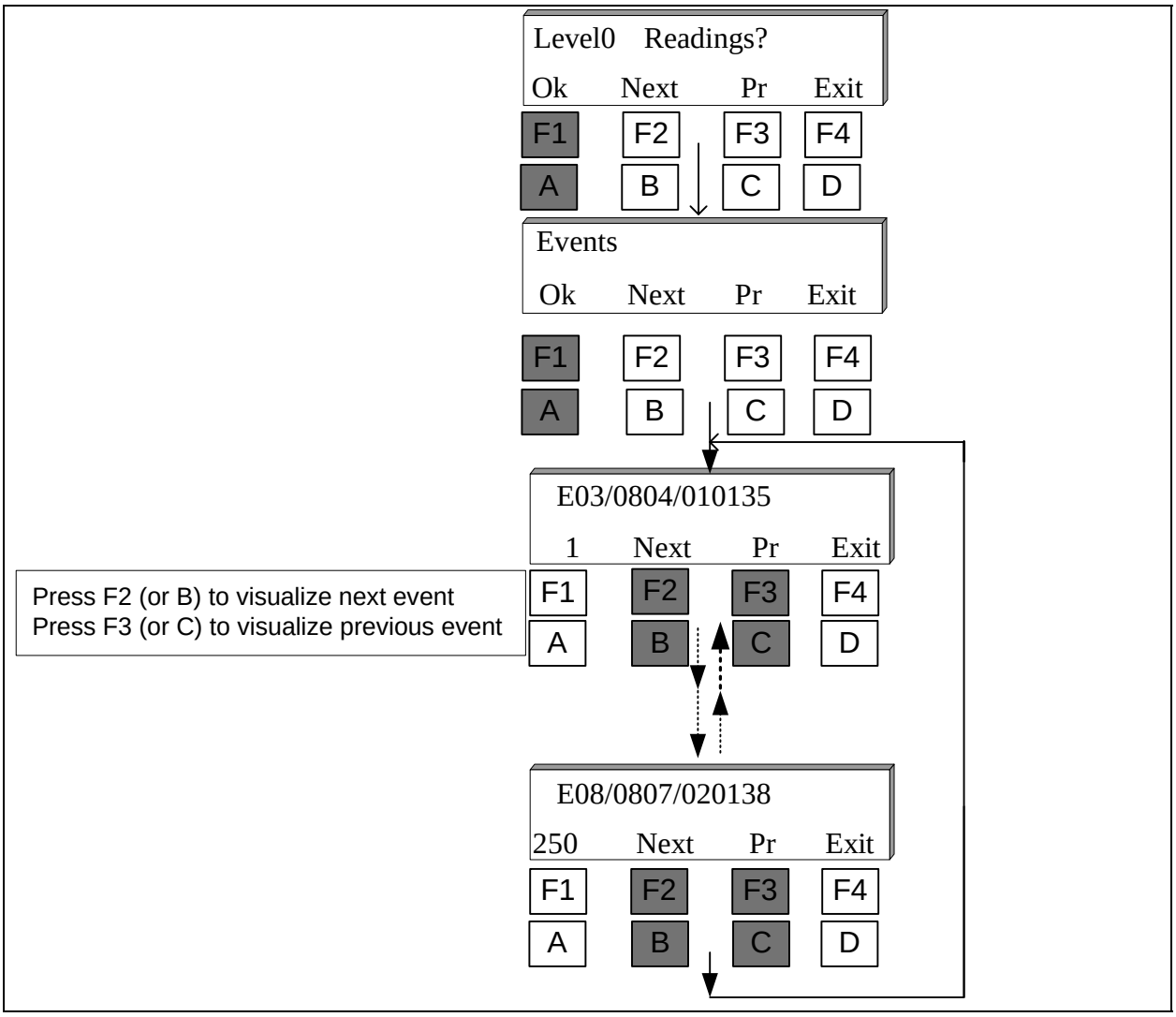


Figure 13 : Procedure to visualize Events.

- **Event Format:**

Event format is described as follow:

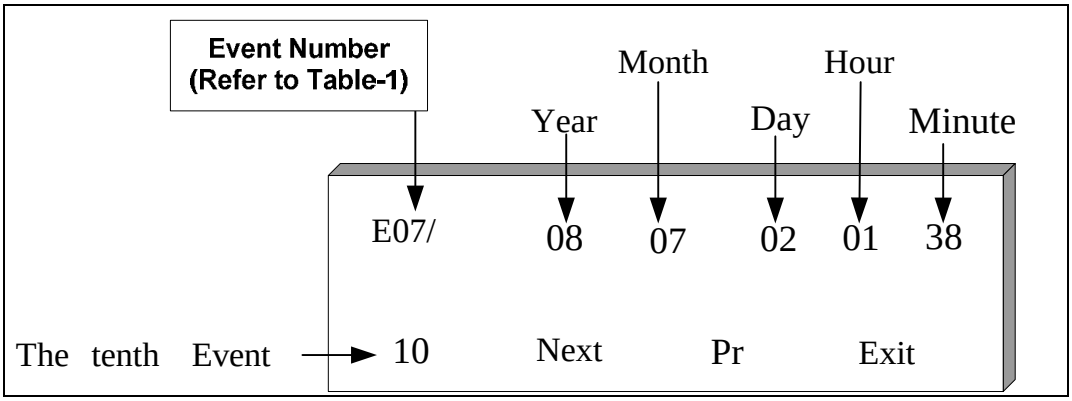


Figure 14 : Event Format description.

- **Reset Events :**

The following figure shows the procedure to Reset Events:

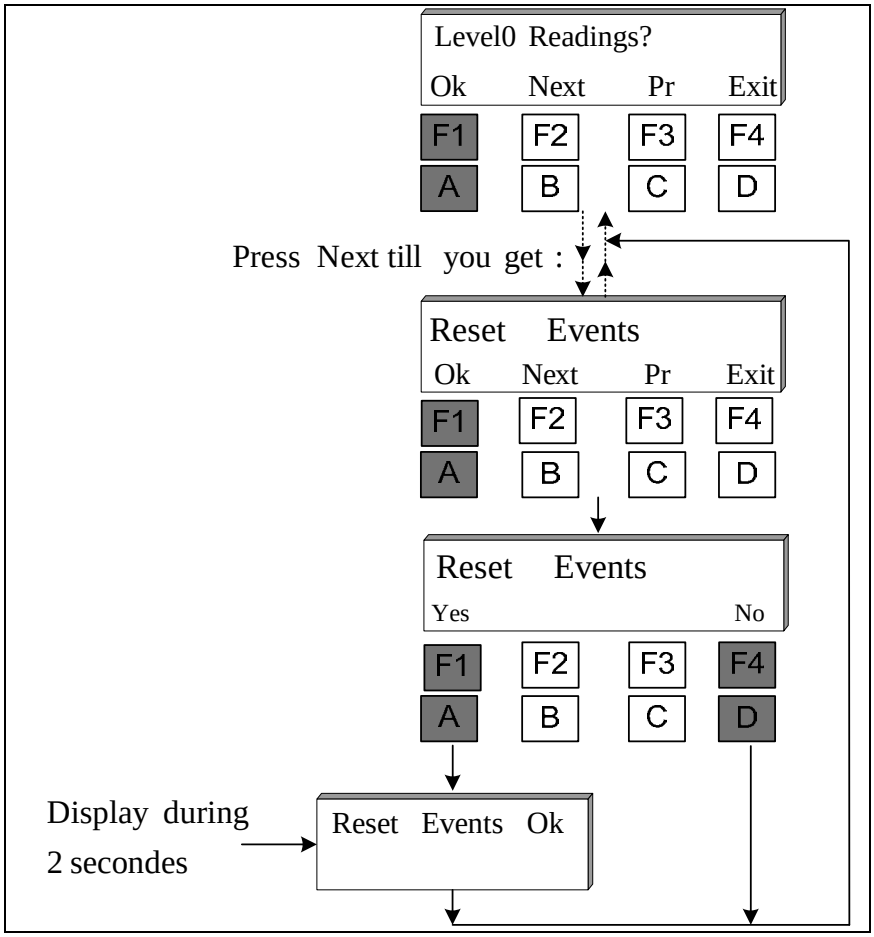


Figure 15 : Procedure to Reset Events.

7.2.2 Readings

By default, the readings are the battery DC voltage and the rectifier output current. The LCD can also show the following additional readings:

- Line Frequency.
- Rectifier output voltage.
- Voltage between positive and chassis.
- Voltage between negative and chassis.
- Remaining time for Equalize.
- Elapsed time for Equalize.
- Temperature inside charger.
- Battery temperature (optional).
- Voltage test during battery test (optional).
- Current test during battery test (optional).
- Time during battery test (optional).

The next figure describes the procedure to access all readings that can be displayed on LCD:

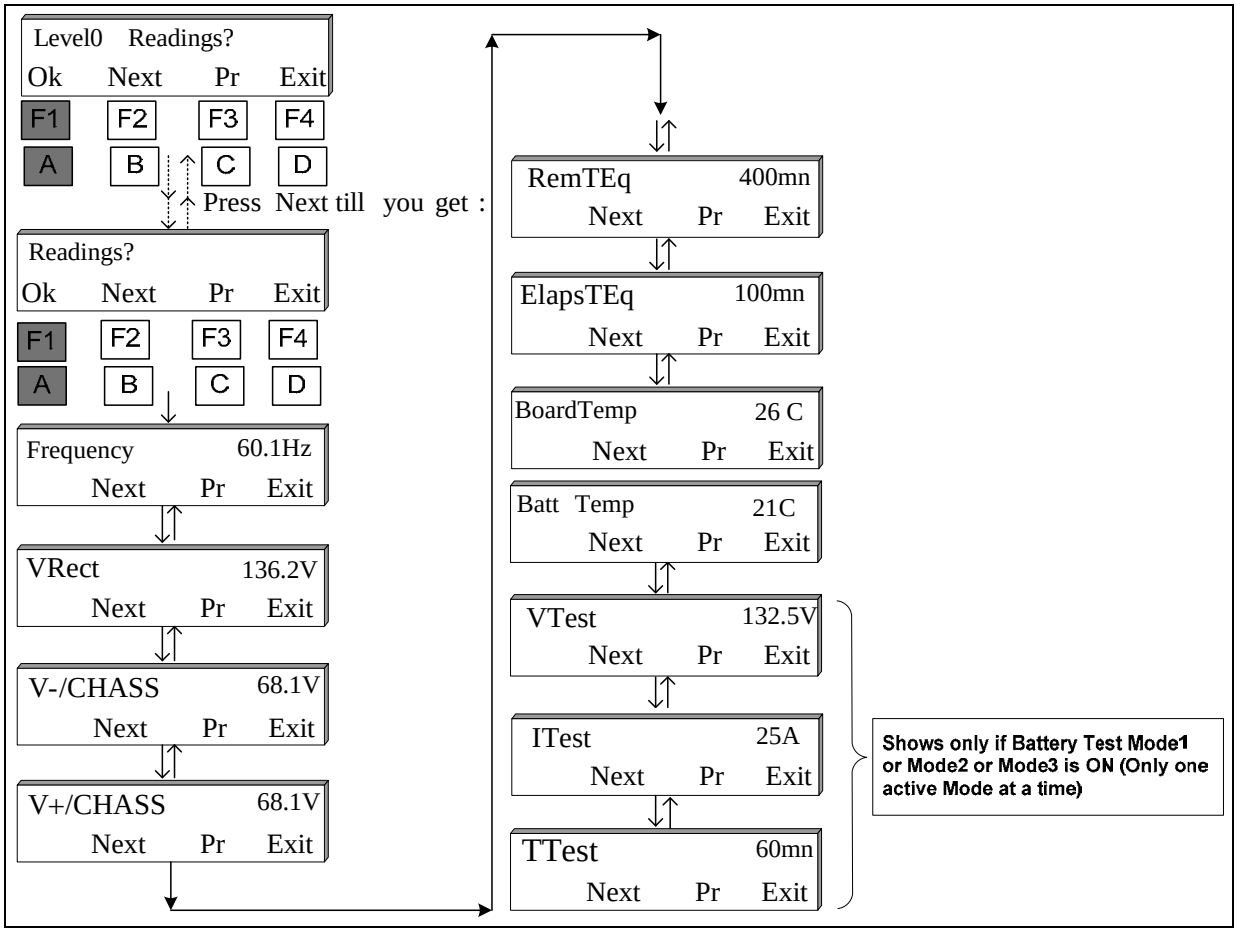


Figure 16 : Procedure to access Readings menu.

- **Acronyms :**

Refer to acronym list used for the battery charger at the end of this manual.

7.2.3 Relay test

During relay test, all relays will be energized (or de-energized if you select the fail safe operation option) for 5 seconds; after which the relays will return to their initial status.

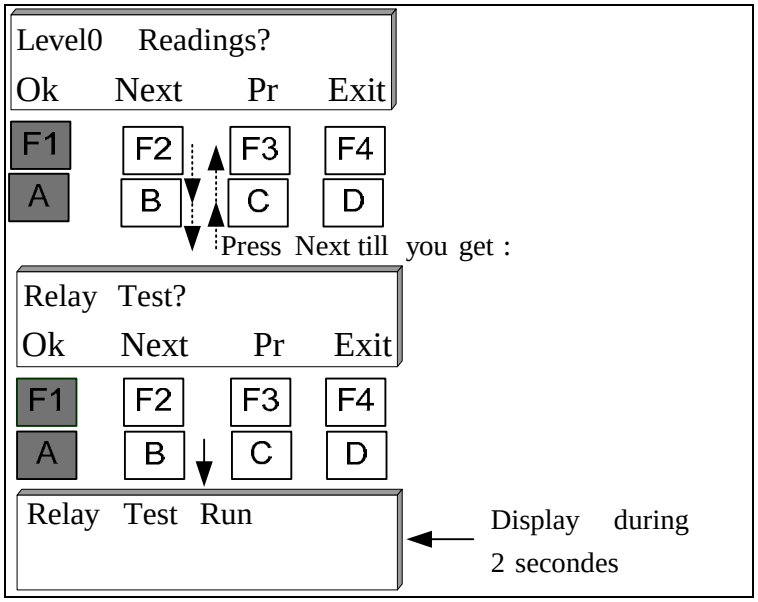


Figure 17 : Procedure to run Relay Test.

7.2.4 LED Test

During LED test, all LEDs will be lit for 5 seconds; after which the LEDs will return to their initial status.

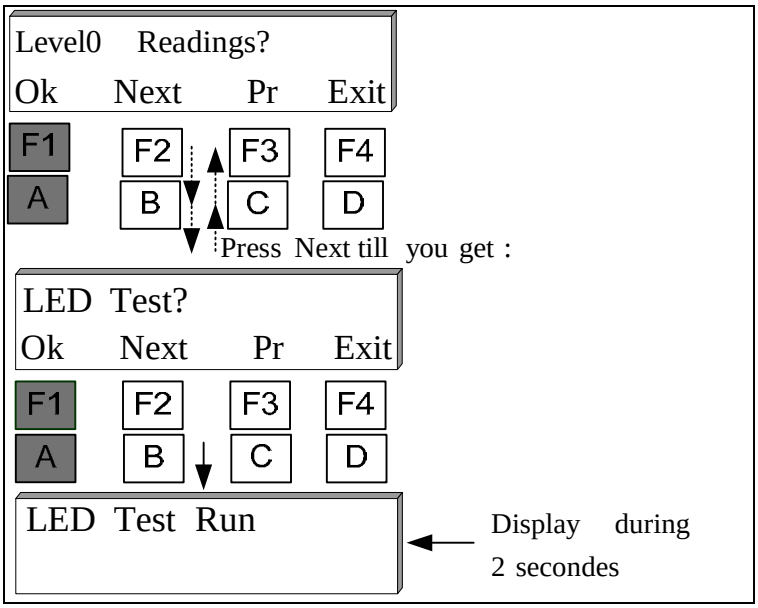


Figure 18 : Procedure to run LED Test.

7.2.5 LCD Power Save

If the LCD power save function is selected, the LCD back lighting will turn off after 5 min of inactivity. It will turn back on whenever a button is pressed or any alarm occurs.

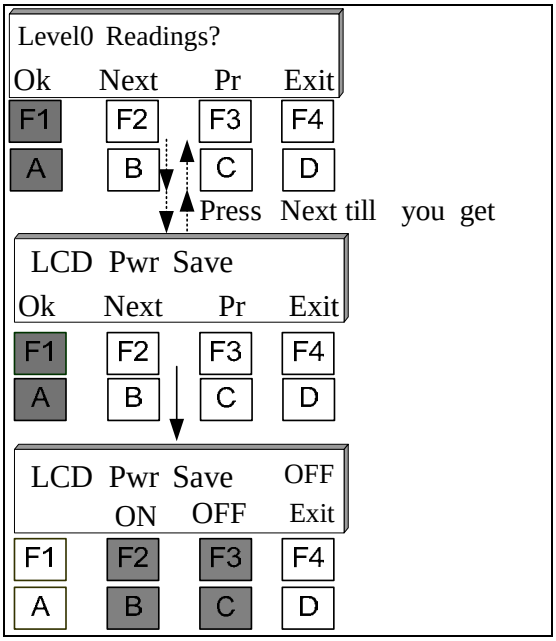


Figure 19 : Procedure to enable or disable LCD Power Save function.

7.2.6 LCD Contrast

The contrast LCD is adjusted as follows:

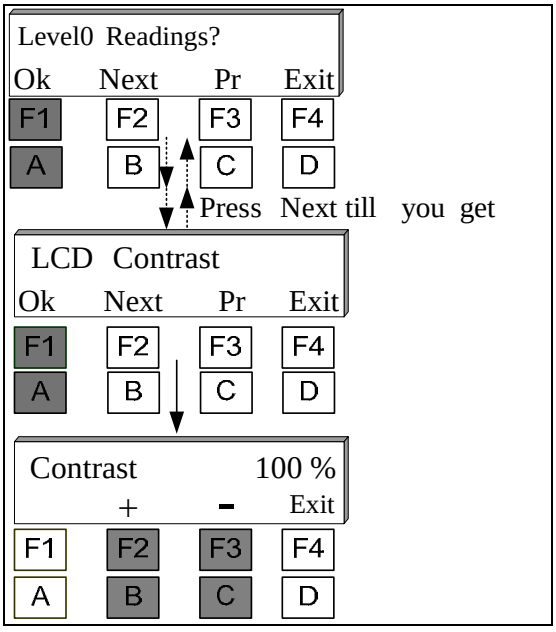


Figure 20 : Procedure to adjust LCD Contrast.

7.2.7 Run / Stop Battery Capacity Test (optional)

The image below shows how to run or stop manually the battery-capacity-test.

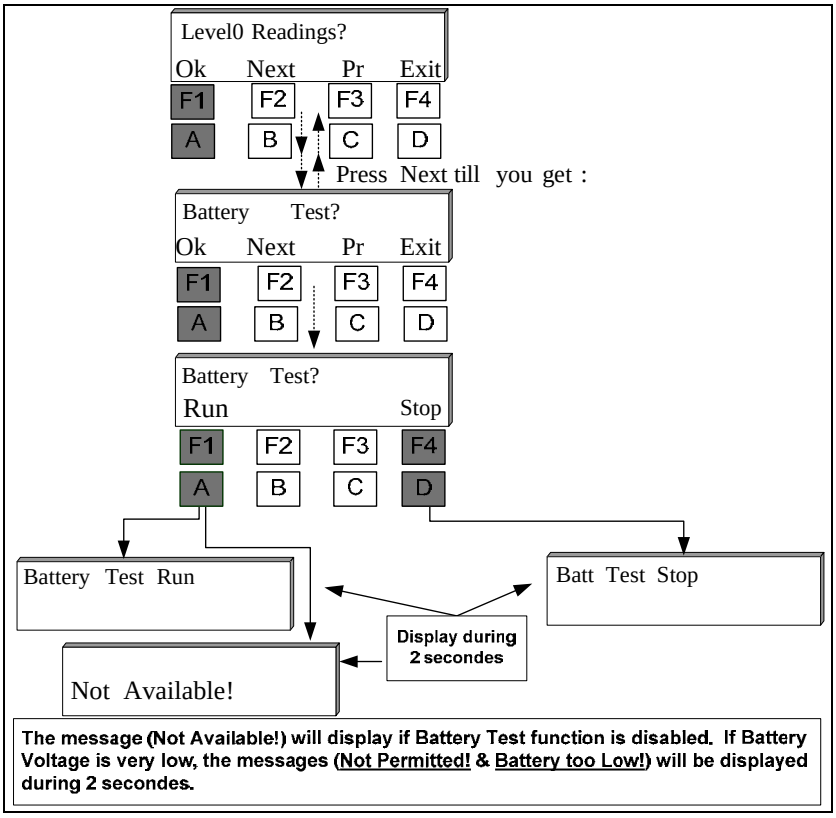


Figure 21 : Procedure to Run or Stop Battery Capacity Test.

7.2.8 Ampere-Hour meter Synchronization (optional)

The image below shows how to synchronize the ampere-hour meter. Adjustment is needed only under certain conditions:

1. When the battery voltage is between 0.98% and 1.02% of Vcharge value;
2. When The current flowing in the battery (charging current) is less than Icharge for a time exceeding Tcharge";

For more details see Appendix "Ampere-Hour meter (included when this option is purchased).

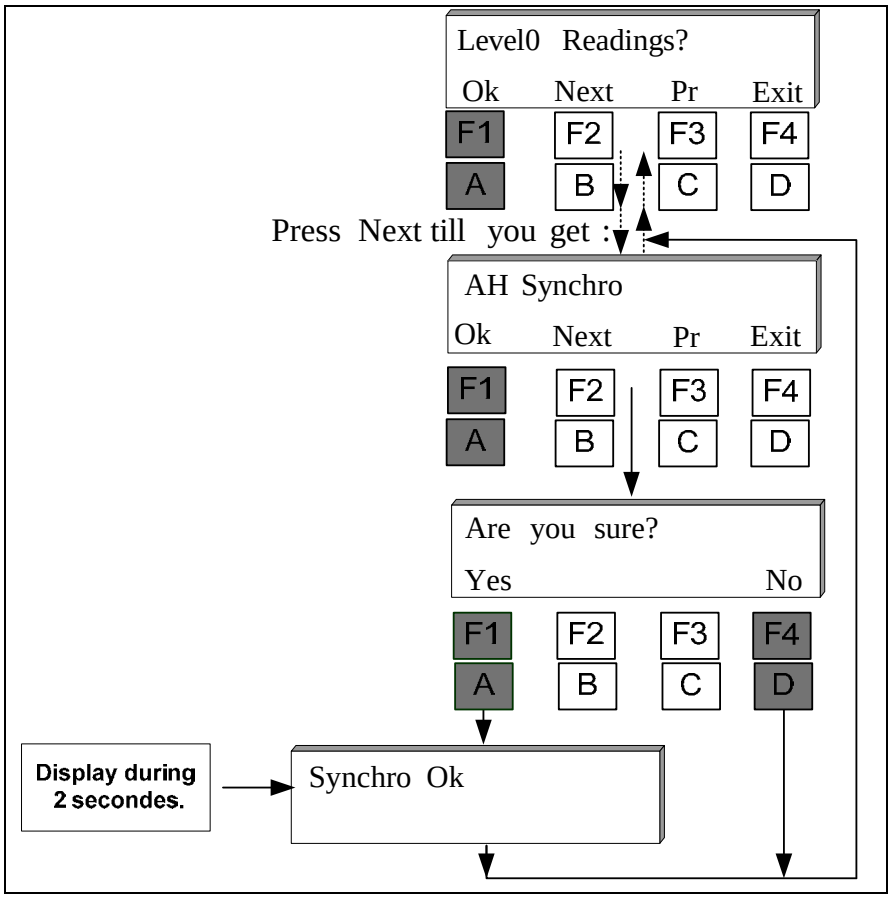


Figure 22 : Procedure to synchronize Ampere-Hour meter.

7.2.9 Run / Stop Formation Mode (optional)

The formation mode is to be exclusively used to prime a battery as per its manufacturer instructions. In this mode, the charger forms the battery at the preset voltage and during the preset time, after which the charger will go back into the float mode.
The image below shows how to run or stop formation mode.

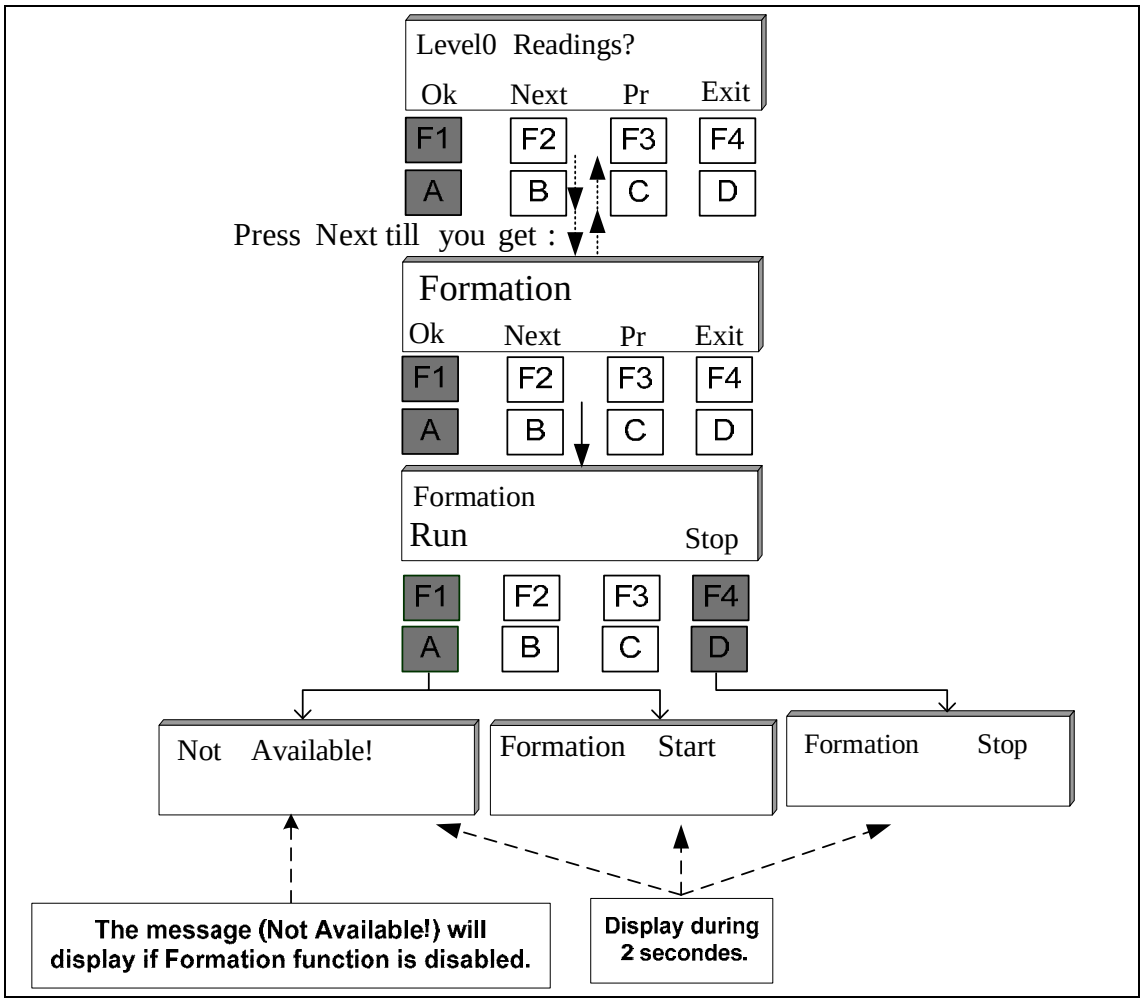


Figure 23 : Procedure to Run or Stop Formation Mode.

Once Formation mode started, the LCD will show one of messages below, depending on Battery formation status

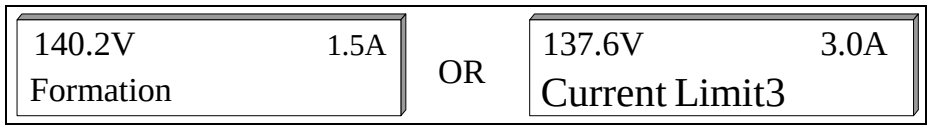


Figure 24 : Battery Formation mode display.

7.2.10 Language

Available languages with battery charger are English and French. The following figure shows the procedure to switch between the two languages:

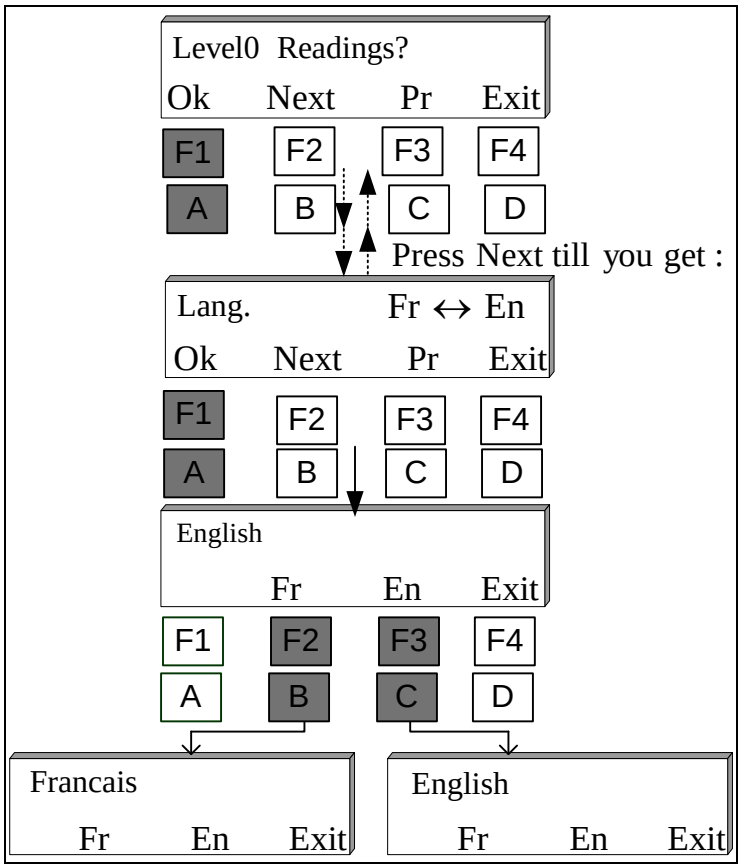


Figure 25 : Procedure to switch between languages.

7.3 Level-1 (Adjust)

Level-1 is protected by a password. It's reserved for charging parameters adjustments such as Float and Equalize voltages, current, alarms….

Warning!

Level-1 is password protected. Only authorized and qualified personal will be able to access this Level. The user can disable this password in the Level-2 of the menu.

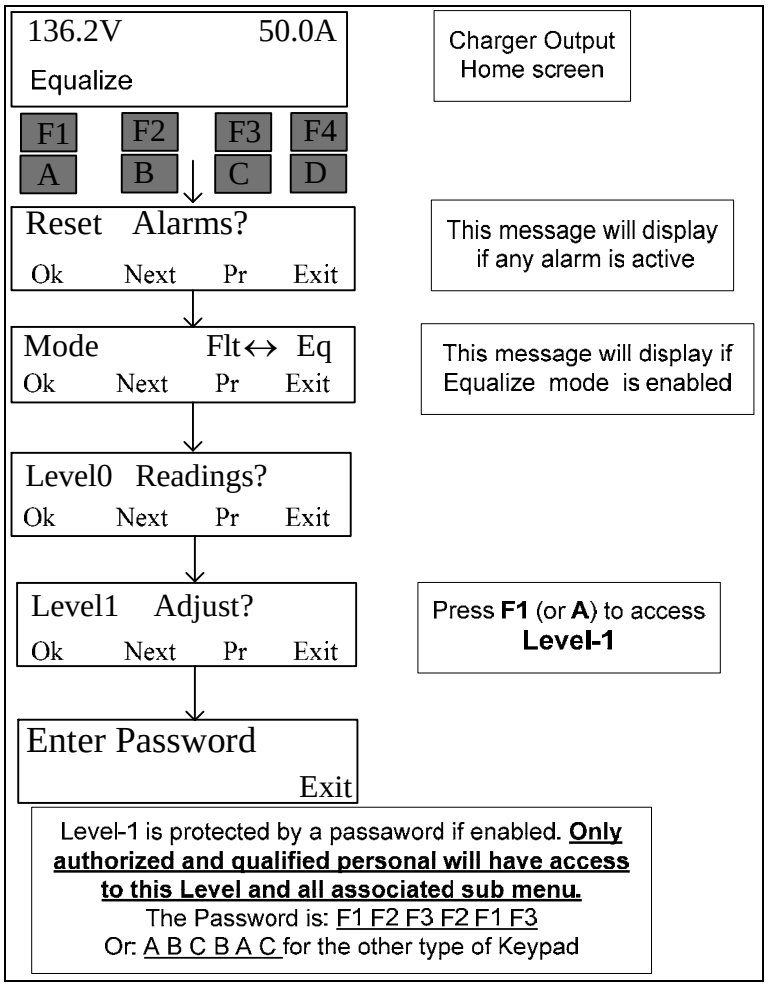


Figure 26 : Procedure to access Level - 1.

If a parameter is modified, the LCD will display the following screen to confirm changes. If the modification is not saved or canceled, the battery charger will keep the old value.

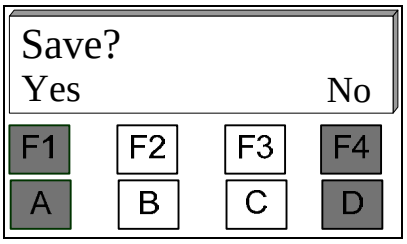


Figure 27 : Display after modifying a parameter.

7.3.1 Control

a. Setting Voltage and Current for Float Mode

The Float Voltage and Current are adjusted as follows:

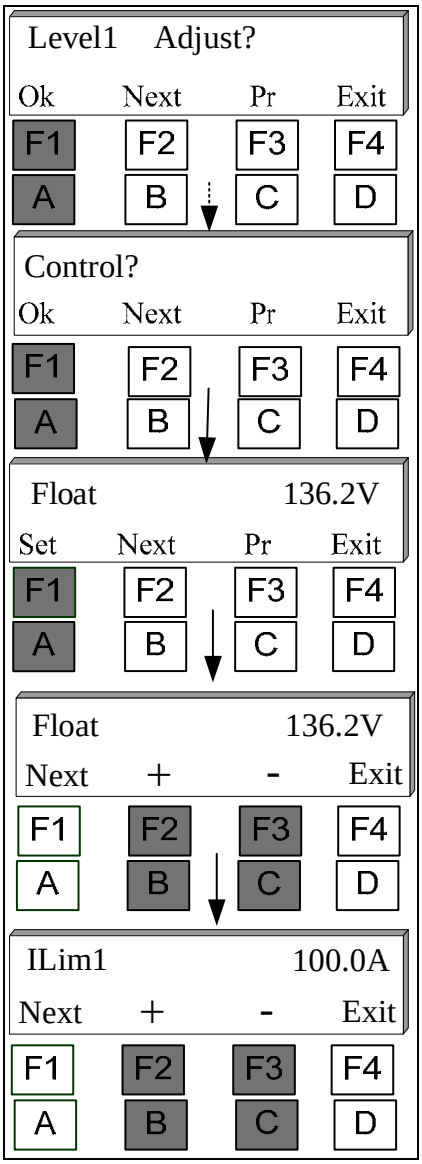


Figure 28 : Procedure to adjust Float Voltage and Float Current.

b. Setting voltage and current for Equalize Mode

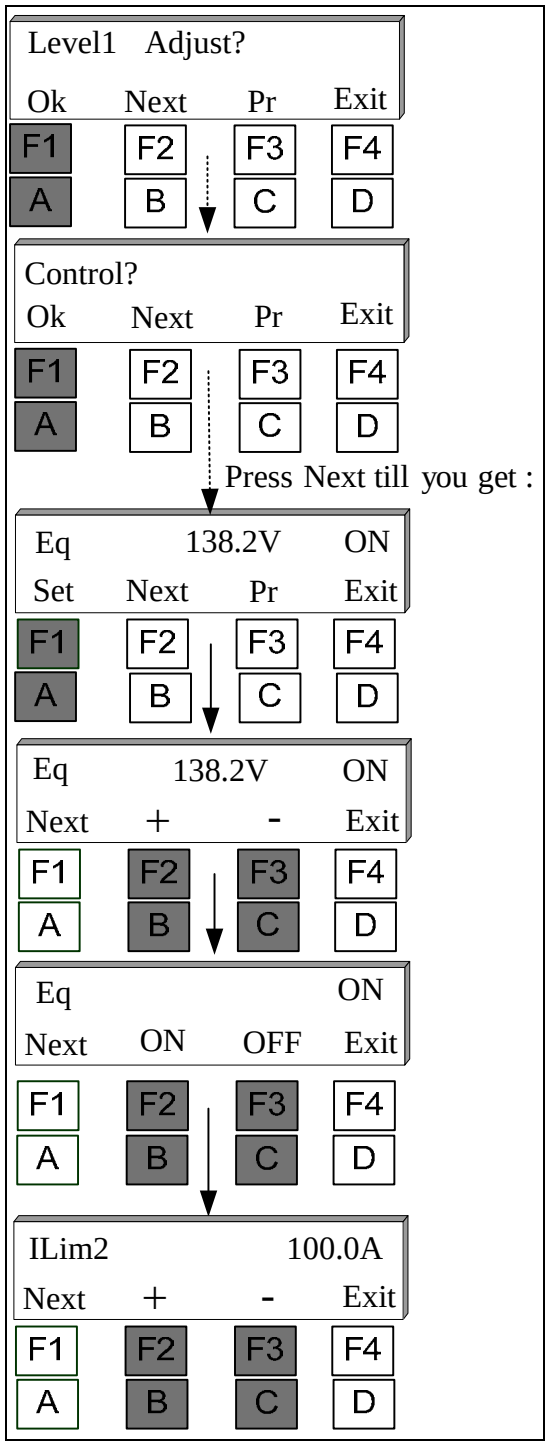


Figure 29 : Procedure to adjust Equalize Voltage and Equalize Current.

c. *Equalization Start parameter Adjustments (optional)*

In this sub menu, we can enable, disable and adjust different mode of starting Equalize.

i. Manual Equalize (optional)

If ordered, the charger can be configured for the manual "Equalize" mode. Please refer to your order and the battery manufacturer to confirm the equalize requirement. We can enable or disable and adjust manual Equalize as follows:

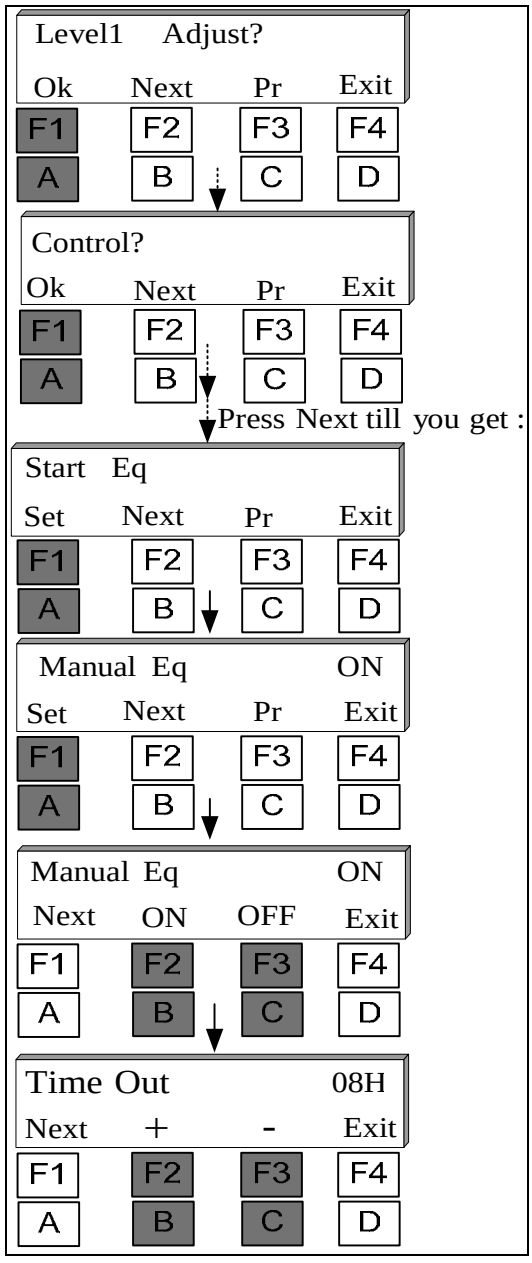


Figure 30 : Procedure to enable or disable and adjust Manual Equalize.

Time Out: Equalize mode time duration.

ii. Periodical Equalize (optional)

If Periodical Equalize is enabled then the charger will go into "Equalize" mode every preset period. The period is adjustable between 1 day and 8191 days. The duration is adjustable between 1 and 8191 hours. We can enable or disable and adjust periodical Equalize as follows:

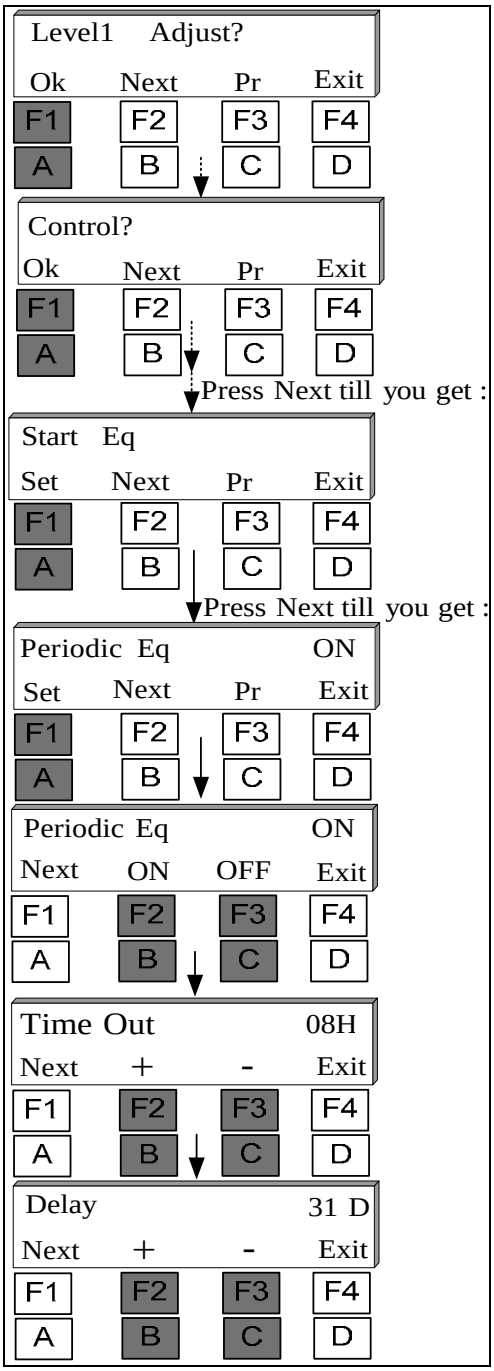


Figure 31 : Procedure to enable or disable and adjust Periodical Equalize.

Delay : (31D = 31 Days) After this Delay, the battery charger will return automatically to Equalize mode for a duration "Time Out "of 8H.

iii. Low Voltage Equalize (optional)

If the Low Voltage Equalize is enabled, then the charger will go into "Equalize" mode whenever the DC output voltage drops under a preset voltage. The duration is adjustable between 1 and 8191 hours. We can enable or disable and adjust low volt Equalize as follows:

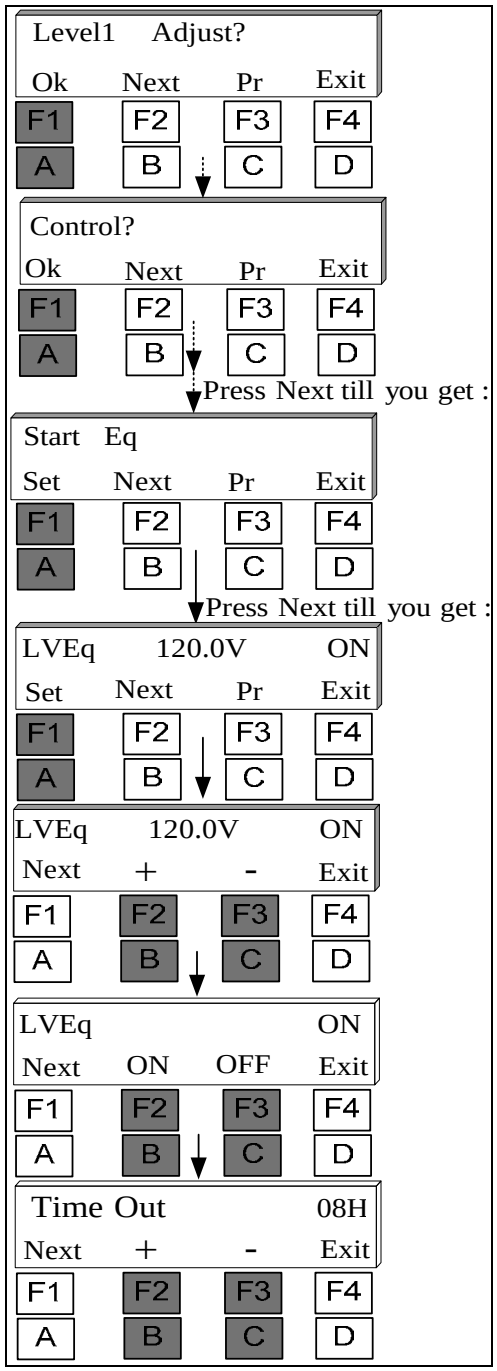


Figure 32 : Procedure to enable or disable and adjust Low Volt Equalize.

iv. Low Capacity Equalize (optional)

If the Low Capacity Equalize is enabled, then the charger will go into "Equalize" mode whenever the capacity battery decreases under a preset capacity. The duration is adjustable between 1 and 8191 hours. We can enable or disable and adjust low capacity Equalize as follows:

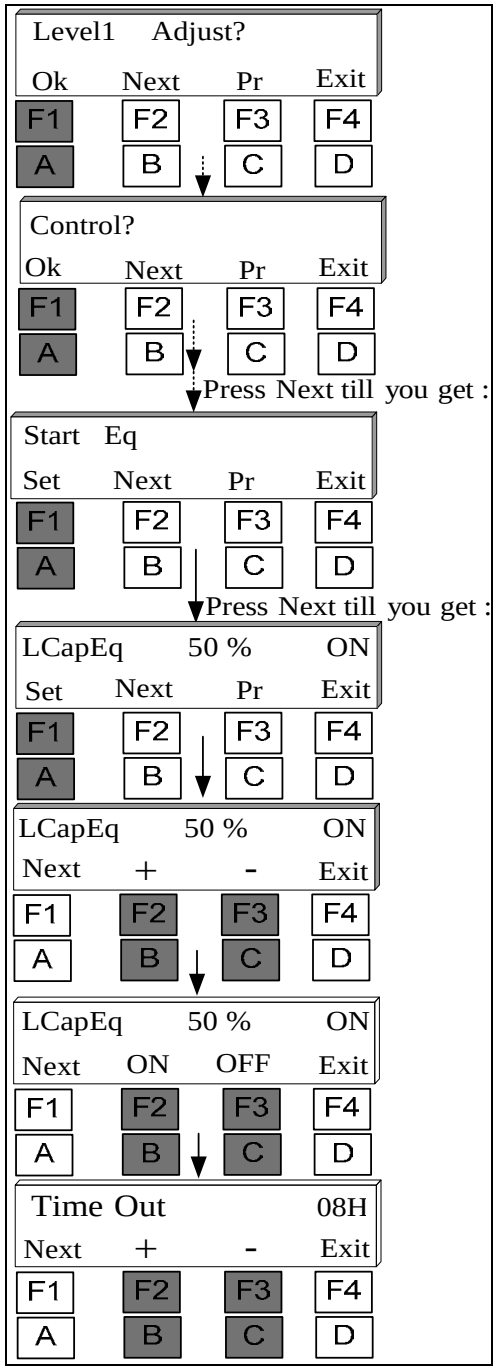


Figure 33 : Procedure to enable or disable and adjust Low Capacity Equalize.

v. Charger Equalize Start (optional)

If the charger Equalize Start is enabled, then the charger will go into "Equalize" mode when it starts (first time power up). The duration is adjustable between 1 and 8191 hours. We can enable or disable and adjust charger Equalize Start as follows:

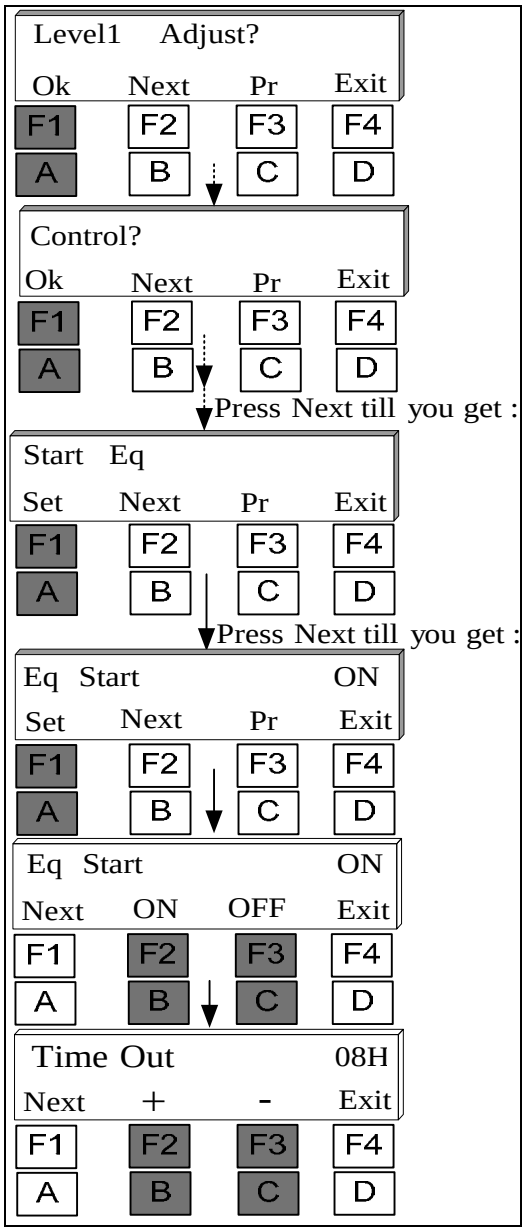


Figure 34 : Procedure to enable or disable and adjust Charger Equalize Start.

vi. AC Fail Equalize (optional)

If enabled, then the charger will go into "Equalize" mode after an AC mains failure. Equalize cycle will be during a period of time between 1 and 8191 hours. We can enable or disable and adjust AC fail Equalize as follows:

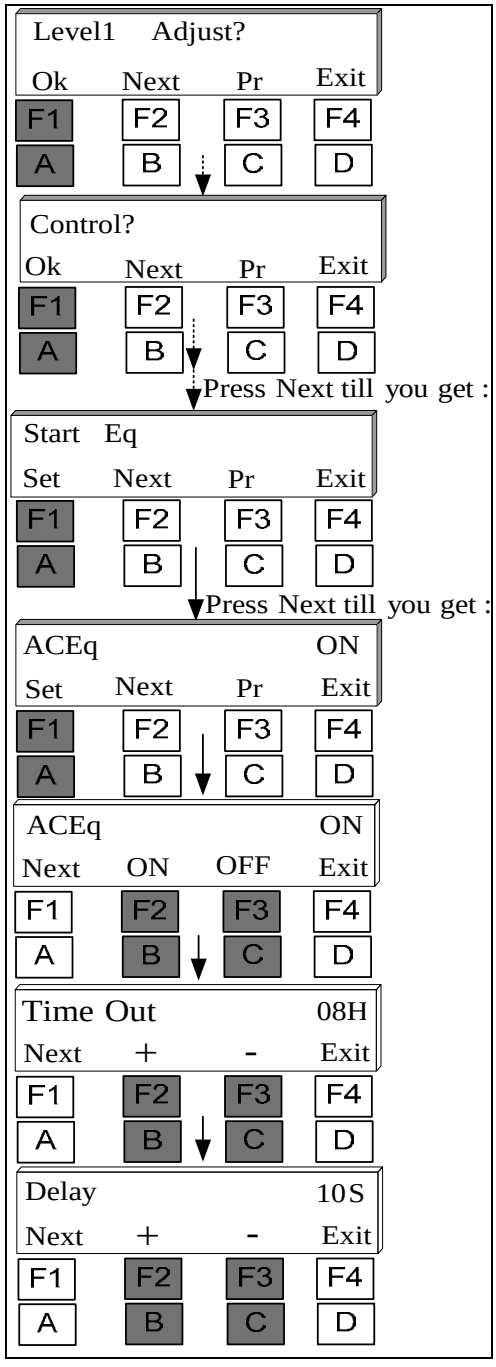


Figure 35 : Procedure to enable or disable and adjust AC Fail Equalize.

Delay =10 seconds: in this example, this delay represent the AC failure duration. If the failure persists more than 10 seconds, the battery charger will switch automatically to Equalize mode for 8 hours (Time Out) when AC input will be re-established.

vii. Refresh Equalize (optional)

If Refresh Equalize is enabled, then the charger will go into "Equalize" mode for a preset time between 1 and 8191minutes every period between 1 and 8191 hours. Example: The charger will equalize the battery during 5min every 24 hours.

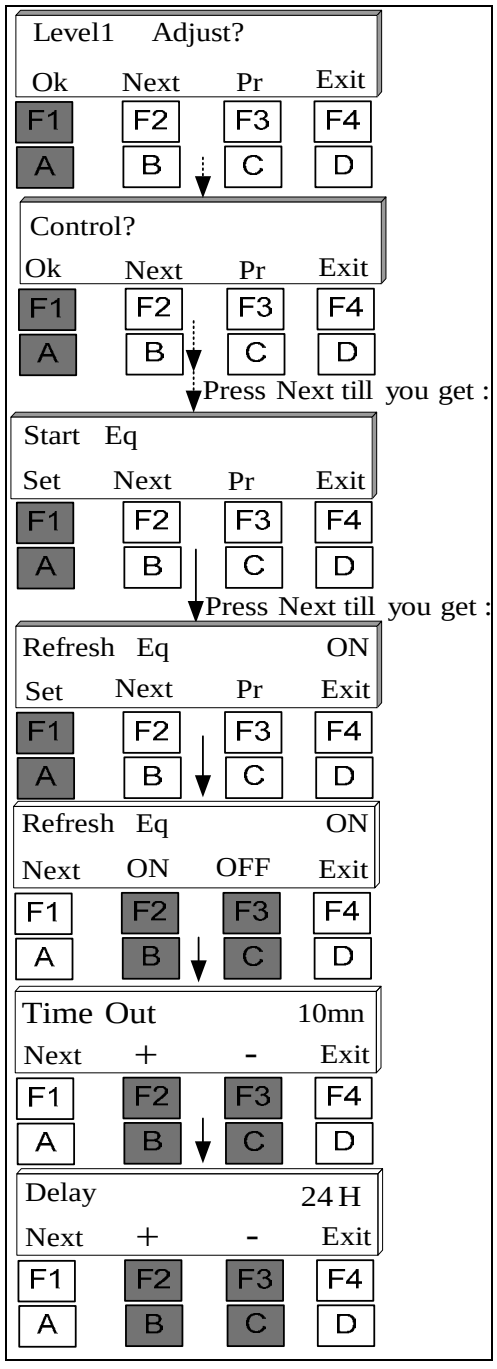


Figure 36 : Procedure to enable or disable and adjust Refresh Equalize.

viii. Remote Equalize (optional)

If Remote Equalize is enabled, the charger will go into "Equalize" mode during a preset time between 1 and 8191 hours, if command is initiated by users via web page, or whenever an external normally open contact closes momentarily or permanently. For more details, refer to Appendix-5. We can enable or disable remote Equalize via the external normally open contact as shown on the procedure below:

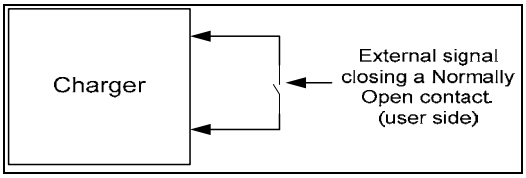


Figure 37 : External signal to Start Equalize remotely.

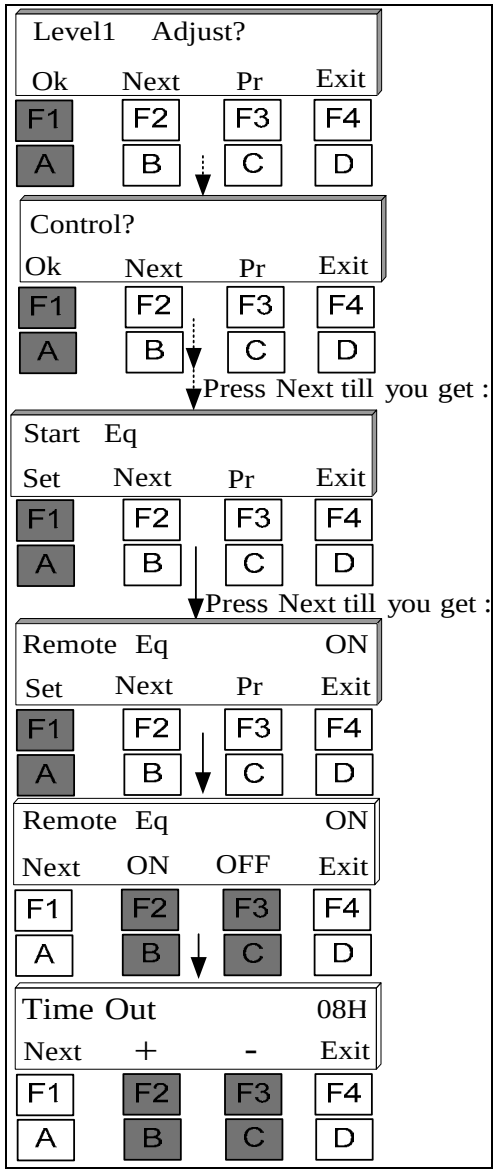


Figure 38 : Procedure to enable or disable and adjust Remote Equalize.

ix. Current Limit Equalize (optional)

If Current Limit Equalize is enabled, the charger will go into "Equalize" mode during a preset time between 1 and 8191 hours, whenever the rectifier goes into the current limit for a period of time between 1 and 8191 seconds. We can enable or disable current limit Equalize as shown on the procedure below:

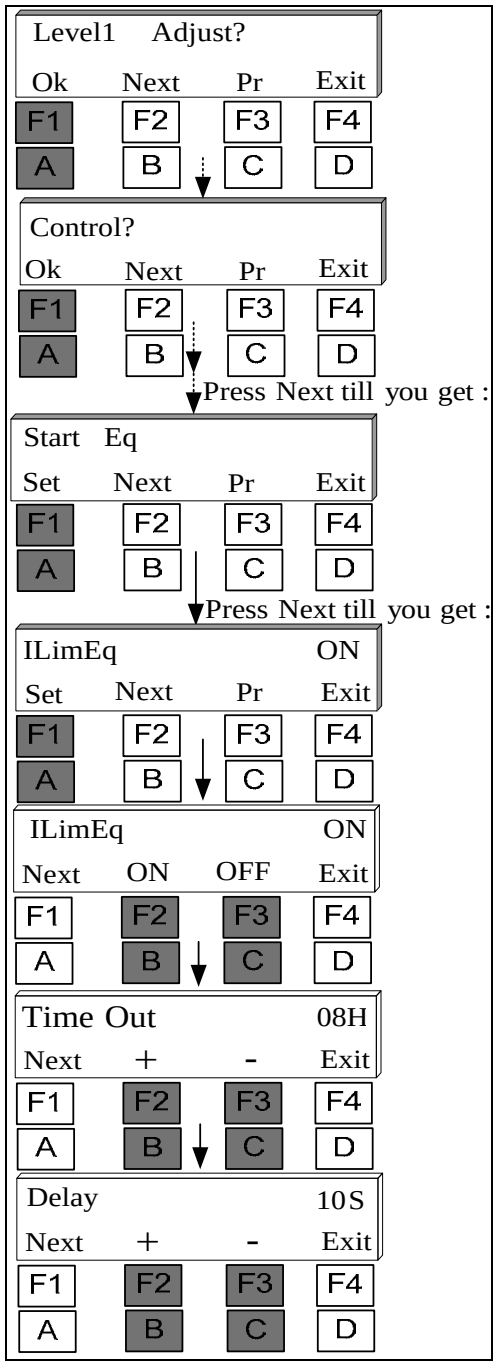


Figure 39 : Procedure to enable or disable and adjust Current Limit Equalize.

d. Equalize Termination (optional)

We can stop Equalize mode manually as described on Part-2 / Paragraph-4. However, Equalize mode can be stopped also automatically as described on the following paragraph.

i. Stopping Equalize after a preset delay: Security Time

To ensure a security while the battery charger is operating in Equalize mode and in order to protect batteries, a preprogrammed time security can be set. The Equalize mode will stop automatically after this preset time security. Whatever is the Equalize starting option, it will end after this security delay.

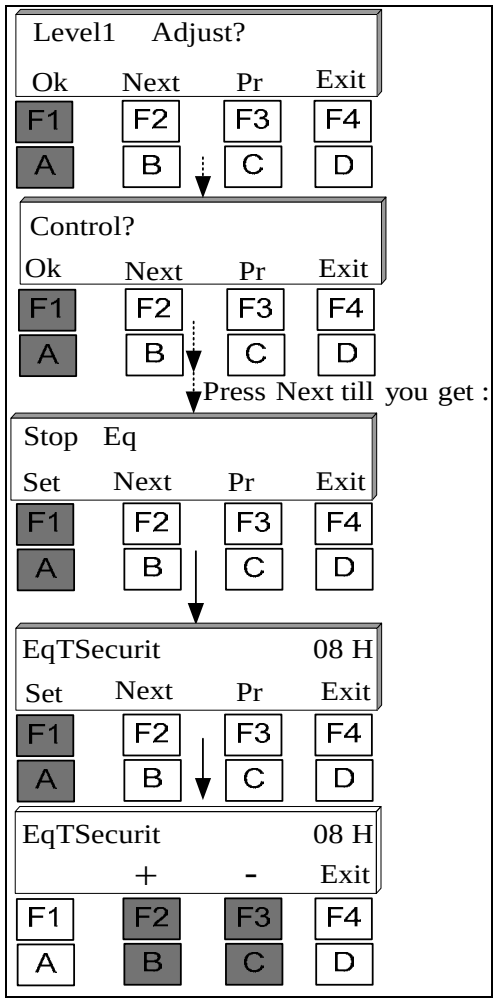


Figure 40 : Procedure to set security delay to stop Equalize mode.

ii. Voltage Post-Charge Mode (optional)

When the Voltage Post-Charge mode is selected, the charger will revert back from Equalize into the Float mode when the load voltage reaches the Equalize one during a preset time between 1 and 8191 minutes. We can enable or disable Voltage Post-Charge as shown on the procedure below:

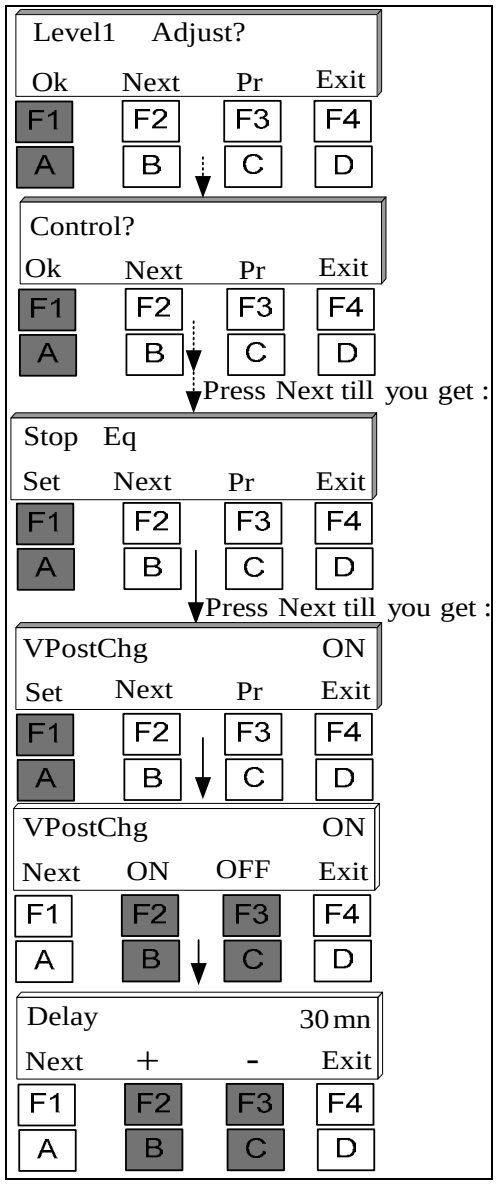


Figure 41 : Procedure to set Voltage Post-Charge parameters to Stop Equalize mode.

iii. Current Post-Charge Mode (optional)

If this option is enabled, the battery charger will revert back from Equalize to Float mode when Load current reaches a preset value between 5% and 95% of Equalize current limit value, during a preset time between 1 and 8191 minutes. We can enable or disable Current Post-Charge as shown on the procedure below:

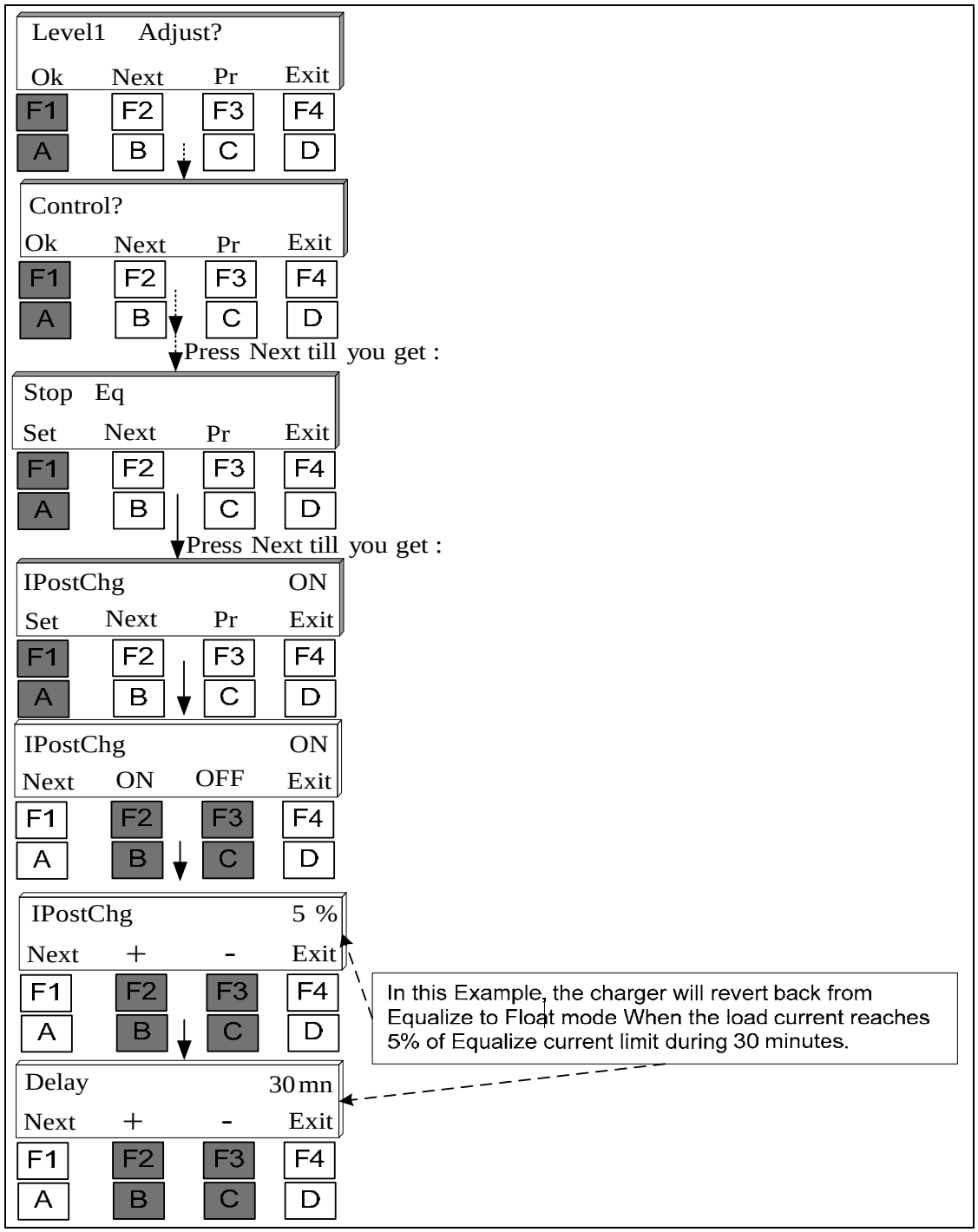


Figure 42 : Procedure to set Current Post-Charge parameters to Stop Equalize mode.

iv. Temperature Post-Charge Mode (optional)

When the Temperature Post-Charge is selected, the charger will revert back from Equalize into the Float mode when the battery temperature reaches its preset value, during a preset time between 1 and 8191 minutes. We can enable or disable Temperature Post-Charge as shown on the procedure below:

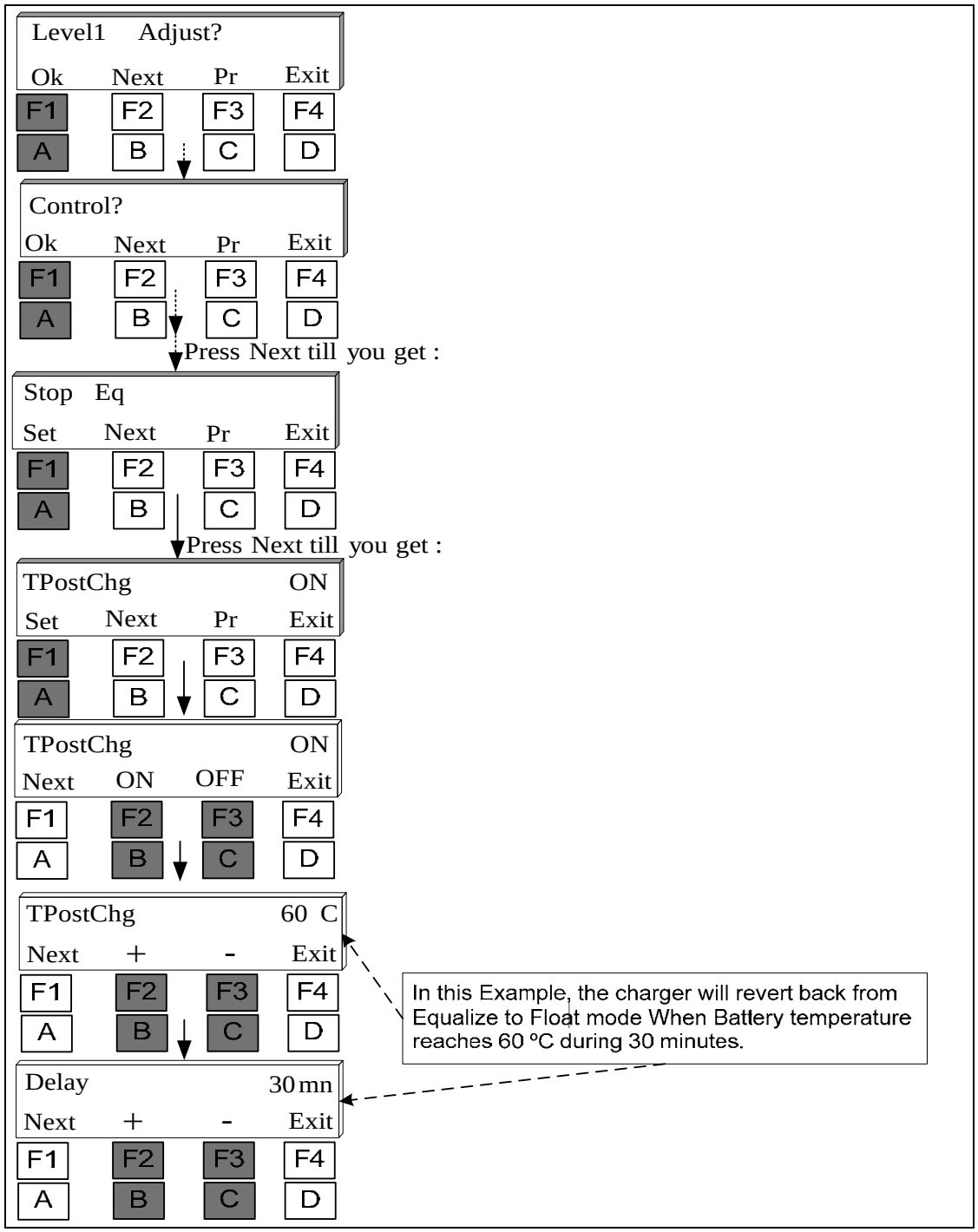


Figure 43 : Procedure to set Temperature Post-Charge parameters to Stop Equalize mode.

v. Capacity Post-Charge Mode (optional)

When the Capacity Post-Charge is selected, the charger will revert back from Equalize into the Float mode when the battery Capacity reaches its preset value, during a preset time between 1 and 8191 minutes. We can enable or disable Capacity Post-Charge as shown on the procedure below:

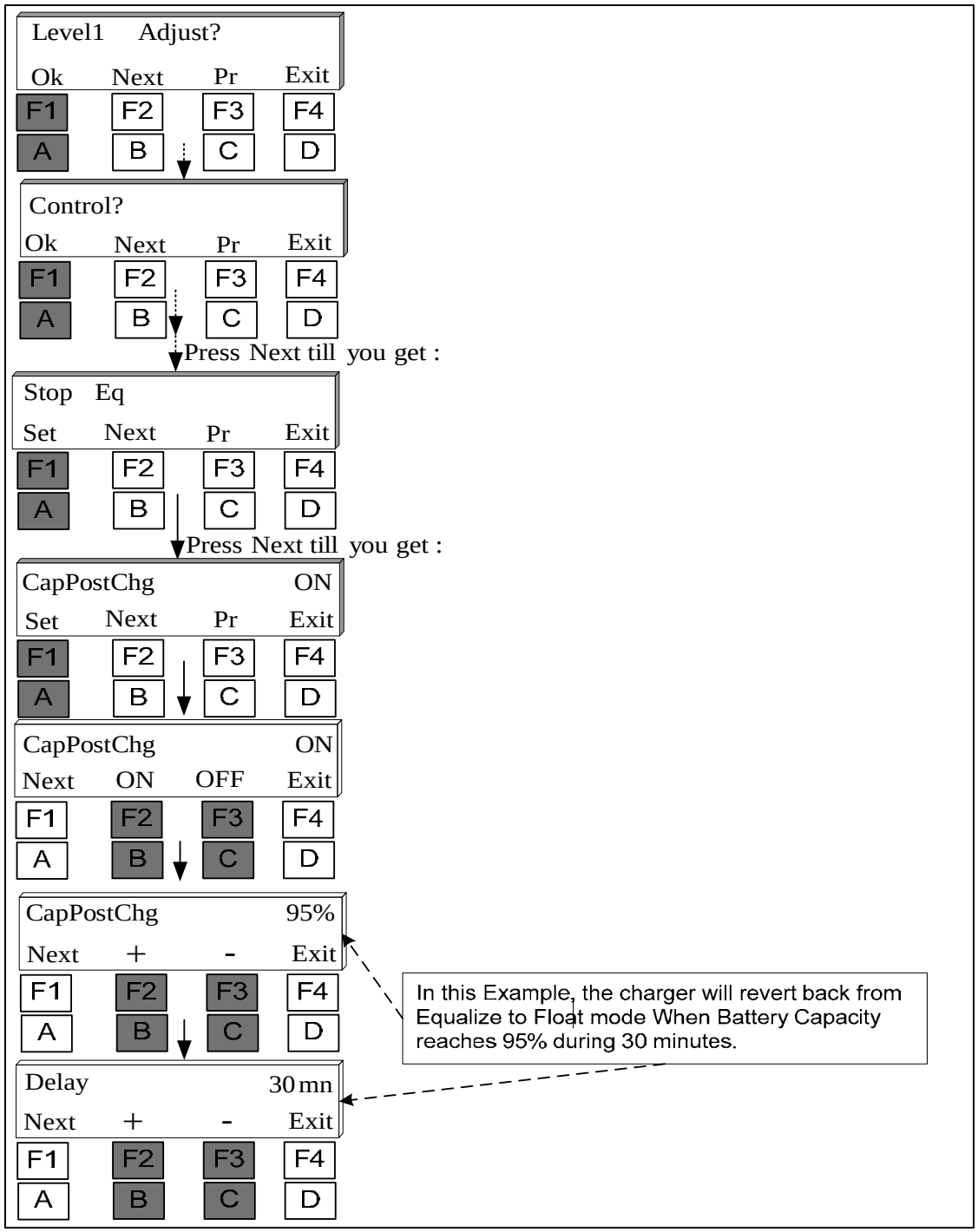


Figure 44 : Procedure to set Capacity Post-Charge parameters to Stop Equalize mode.

e. Formation Mode parameter adjustments (optional)

We can enable or disable and adjust Formation Mode parameters as follows:

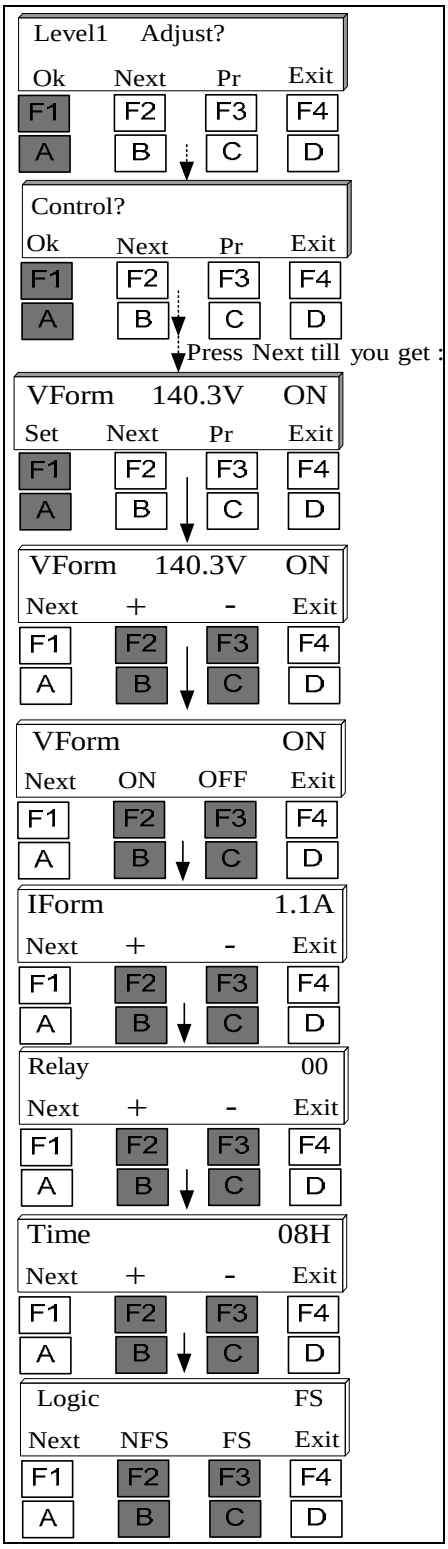


Figure 45 : Procedure to adjust Formation Mode parameters.

f. Load Sharing (optional)

Two or more chargers may be used in parallel to share the same load and recharge the same battery. This parallel configuration is meant to improve site reliability and ease the routine service during shutdowns and preventive maintenance. So should one charger fail or being disconnected, the other charger will take over. Ideally, chargers and connected charging circuits, including cabling, must be symmetrical in order to keep the same voltage drop. The chargers are usually sized to supply the load while recharging the battery when only one charger is available. Consult with the design engineer for the sizing rational.
In order to compensate for the different component, wiring and sensing characteristics, forced load sharing is introduced to force 2 identical chargers to share the load as equal as possible. The dynamic "negative slope load sharing" is designed to force 2 chargers to share the common load without having any common control circuit, thus preventing "Single Point Failure": **NO COMMON CONTROL WIRING IS REQUIRED AND NO MASTER (PRIMARY) CHARGER SET UP IS REQUIRED.**

Instructions and requirements:

- Insure that redundant chargers are fed by equivalent AC input voltages;
- Proper AC and DC protection coordination must be done by others, especially for the chargers contribution in case of input or output short circuit event.
- Load sharing between 2 similar chargers with similar control boards and software version and filter circuit, is approximately 10% when chargers are operated between 10% and their current limit.
- In order to compensate for the non-symmetrical cabling which may induce non-symmetrical voltage drops, chargers Float and Equalize voltages must be site fine-tuned to read the same current (50% of total load current) whenever it is possible. Ideally, the chargers must be running at more than 10% to 20% of their nominal output current. Example: 100mV to 200mV fine-tune on a 125VDC system would be sufficient.
- Equal load sharing on more than 2 chargers is not tested.
- Power cables for chargers, load and battery interconnections are provided by others.

If temperature compensation option applies to both battery chargers with load sharing option, observe all safety precautions and follow sensor installation instructions as described in (***Page 43, § g)***.

Sensors shall be placed together in one spot to avoid temperature gradient. Cable length for both sensors shall be equal.

We can enable or disable Load Sharing option as shown on the procedure below:

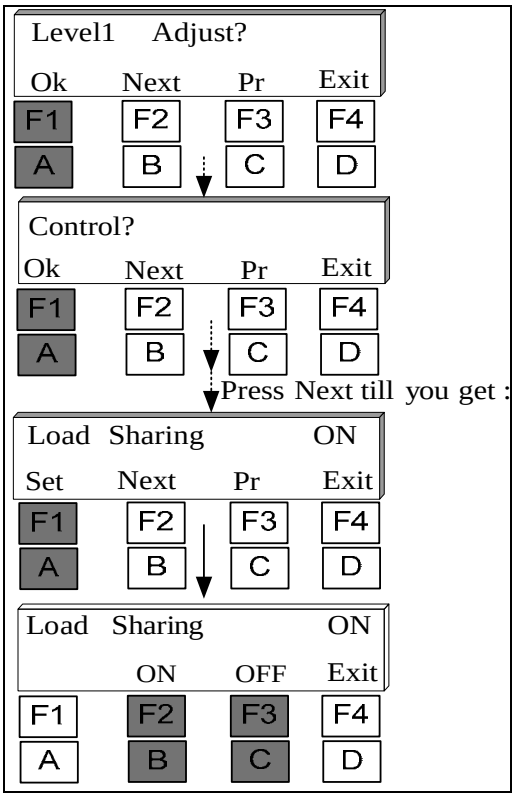


Figure 46 : Procedure to enable or disable Load Sharing Mode.

g. Voltage Temperature Compensation (optional)

g-1. Sensor Installation

When the voltage temperature compensation option is ordered with the charger, temperature sensor is wired to the charger's control card and the twisted wires are coiled and tied inside the enclosure.

WARNING
BEFORE starting to work on the installation:
Check and apply the applicable electrical codes for the installation;
Ensure that AC & DC power sources are disconnected, and breakers are open and possibly locked;
DO NOT touch battery posts or any conducting parts

To install the voltage temperature compensation sensor:

1. Open the enclosure; undo the tie holding the wires in place.
2. Route the wires to the battery string, preferably separately from the AC and DC power cables/wires to prevent the readings to be affected by the radiated noise. Cable length is 25 feet (8m).
3. Determine the battery cell/ block that will have the highest operating temperature. **Hint**: Usually it is the cell/block in the middle of the very top row.
4. Mount the sensor on the chosen battery cell/block on a clean, dry surface, as close as possible to the positive post.
5. If mounting of the sensor on the battery is not possible, place it on the battery rack, as close as possible to the chosen battery cell/block.
6. **DO NOT** mount the compensation sensor on insulation material such as wood or Styrofoam.
7. Follow the start up procedure in your battery charger manual.
8. Verify, and if needed, re-adjust the battery voltage temperature correction factor in the menu of your battery charger as per your battery manufacturer instructions.

g-2. Temperature compensation menu and examples (This option is disable in equalization mode)

When enabled, this function adjusts the float voltage to compensate the temperature effect on the battery charging. The reference temperature is 20°C / 72°F.
The compensation value is adjusted in: **mV/ºC/cell**. We can enable or disable and adjust Voltage Temperature compensation as shown on the procedure below:

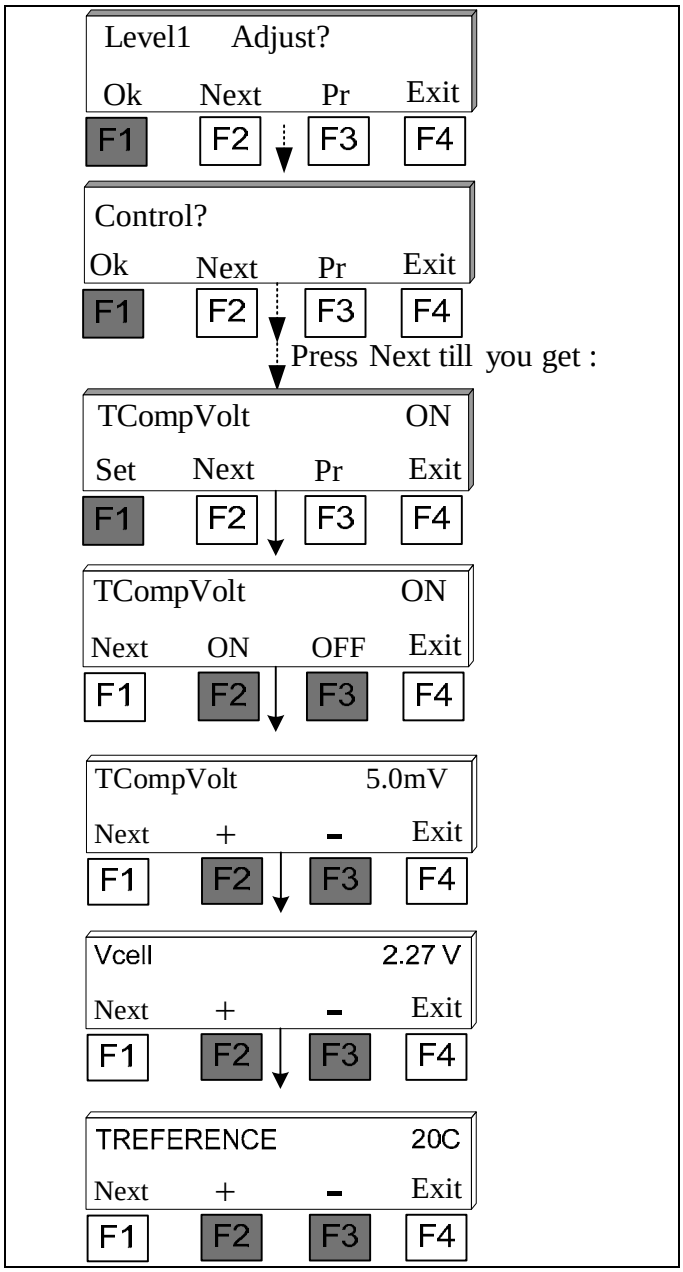


Figure 47 : Procedure to enable or disable and adjust Temperature Compensation parameters.

Example-1:

- Reference Temperature = 20 ºC
- Nominal voltage per/cell=2.27V
- Compensation Value : 5mV/ºC/cell
- Battery Temperature = 30 ºC
- DC Output Voltage = 132V

Compensation at DC Output: $(20-30)^0 C \times \frac{5}{2.27 \times 1000} \times 132 = -2.9074 V$

DC Output After Compensation = $(132 - 2.9074) = 129.093 V$

Example-2:

- Reference Temperature = 20 ºC
- Nominal voltage per/cell=2.27V
- Compensation Value : 5mV/ºC/cell
- Battery Temperature = 10 ºC
- DC Output Voltage = 132V

Compensation at DC Output: $(20-10)^0 C \times \frac{5}{2.27 \times 1000} \times 132 = +2.907\,V$

DC Output After Compensation = $(132+2.907) = 134.907\text{V}$

7.3.2 Alarms

The battery charger offers the possibility to detect and display many alarms, which can be assigned to a specific relay (up to 24 relay). The list below shows all alarms that can be set and adjusted separately:

- Battery High Voltage;
- Battery Low Voltage;
- Positive Ground Fault;
- Negative Ground Fault;
- AC Fail;
- Rectifier Fail;
- Rectifier High Voltage *;
- High Voltage Shutdown *;
- Rectifier Low Voltage *;
- End of Discharge *;
- Internal high Temperature *;
- Internal Low Temperature *;
- External High Temperature & Shutdown **;
- External Low Temperature **;
- AC High Voltage **;
- AC Low Voltage **;
- High Ripple *;
- Rectifier Low Current *;
- Rectifier High Current *;
- Battery Low Current **;
- Battery High Current **;
- Battery High Capacity **;
- Battery Low Capacity **;
- Equalize Alarm *;
- PCOM Communication Alarm **;
- PM Communication Alarm **;
- Frequency Fail *;
- Unbalanced Battery or Cell Defect **;
- Temperature Probe Alarm **;
- Battery Discharge Alarm **;
- Common and Audible Alarm **;

There can be up to 24 optional relays associated with different alarms. Each alarm has the following parameters to be set:

- Alarm — Enabled/Disabled
- Threshold — Enter value
- Time delay — 1-8191 sec.
- Relay — 1 to 24
- Alarm Display — Latched or unlatched
- Relay operation — Latched or unlatched
- Failsafe operation — ON or OFF (fail-safe (FS) is when relay coils are de-energized when associated alarms occur)
- Common Alarm — ON or OFF (When common relay for all alarms is ordered)

Should any alarm occur, a message will be displayed and the Red LED will blink.

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

a. Reset Alarms: Audible and Alarm Messages

Audible alarm and all alarm messages displayed on LCD can be reset as shown on figure below:

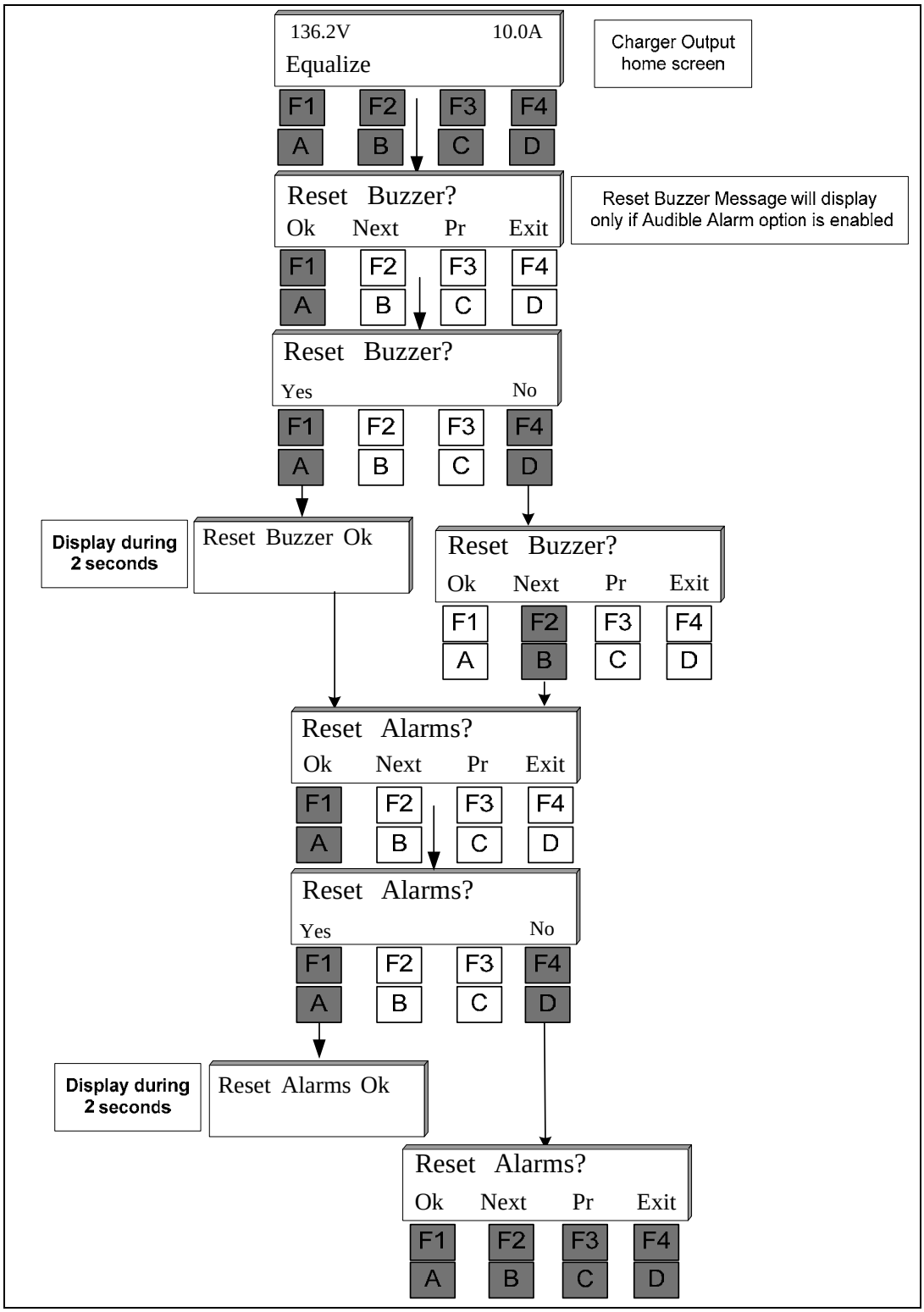


Figure 48 : Reset Audible and Message Alarms Procedure.

b. Alarm adjustments and configuration

With a few exceptions, most alarms in the battery charger have the same setup method. This paragraph will cover the common configuration for all available alarms. In order to simplify alarm configuration figures, this section will be represented by a rectangular box indicating: ***Common Alarm configuration***. The following figure shows in details all steps to follow for alarm adjustments and settings:

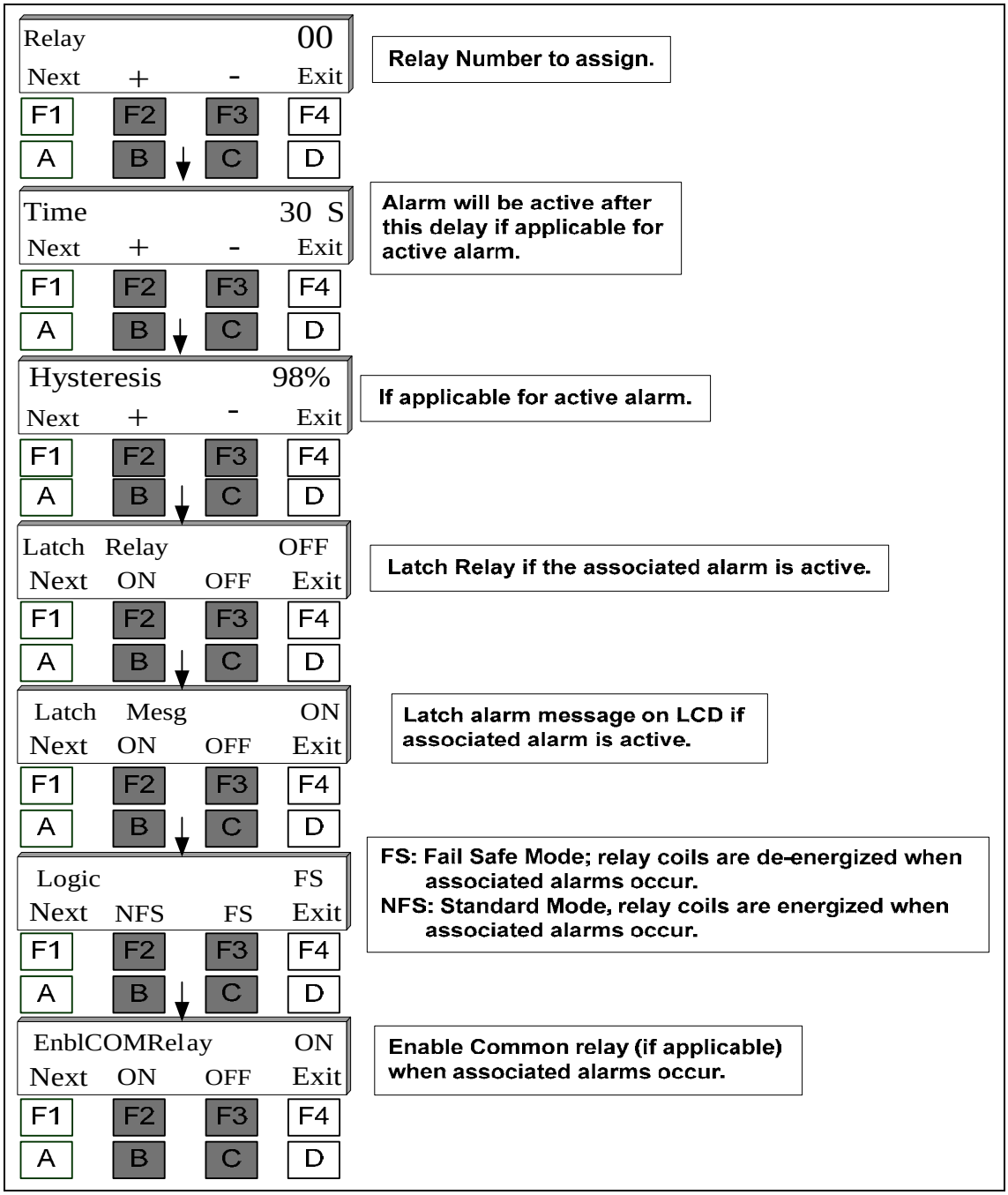


Figure 49 : Common Alarm Configuration.

i. Battery High Voltage Alarm

Battery High Voltage alarm is activated if the battery voltage exceeds a preset value during a preset time. The following figure shows in details all steps to follow to adjust Battery High Voltage Alarm, while next figures will be simplified.

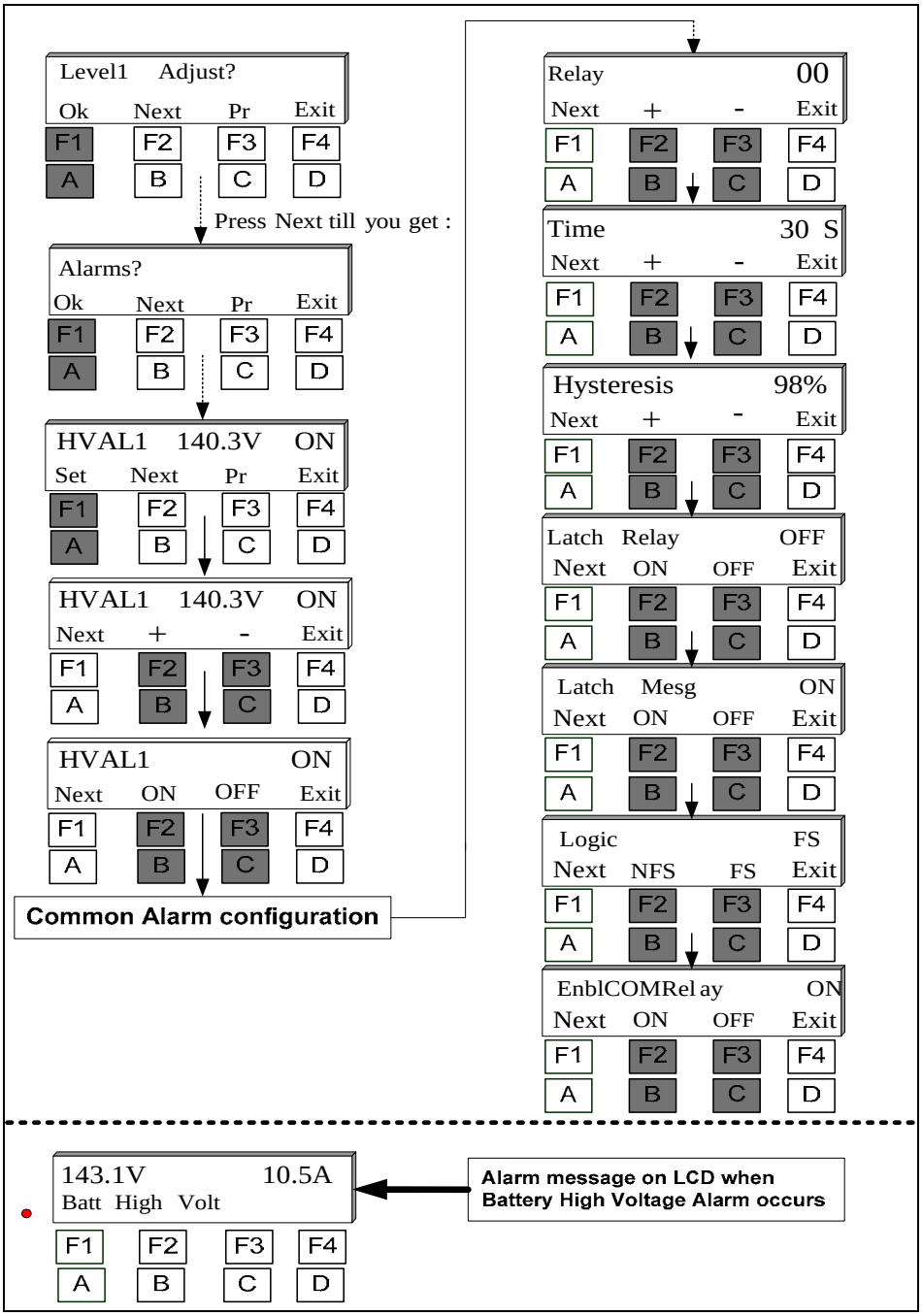


Figure 50 : Battery High Volt Alarm adjustments procedure.

ii. Battery Low Voltage Alarm

The Battery Low Voltage alarm is activated if the battery voltage decreases below a preset value during a preset time. We can enable or disable and adjust Battery Low Voltage alarm as shown on the procedure below:

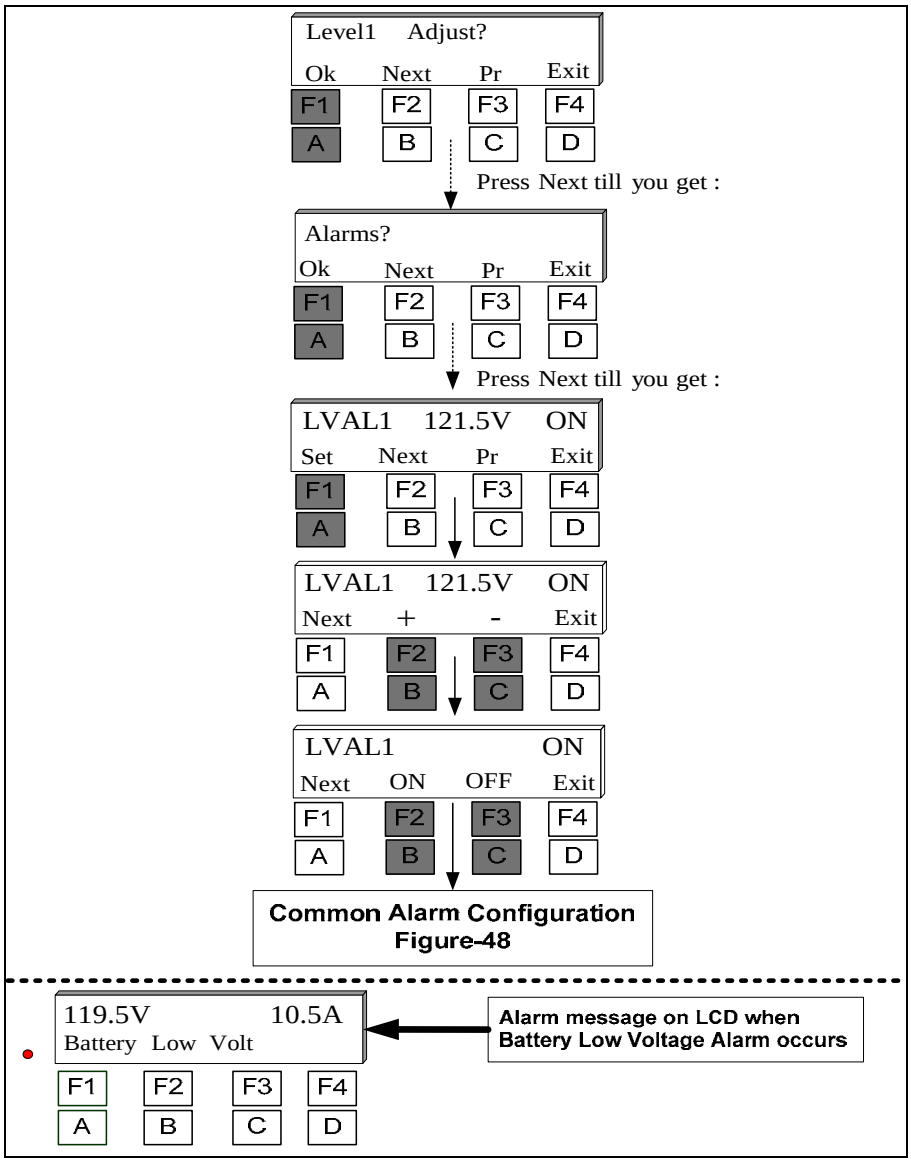


Figure 51 : Battery Low Volt Alarm adjustments procedure.

iii. Positive Ground Fault Alarm

If resistance between positive to chassis decreases below a preset value during a preset time, this alarm will be activated. Leakage resistance is given by the following formula:

$$R_{Leak} = \frac{1}{2\ I_{Leak}}$$

Example: $I_{Leak} = 5mA,\ R_{leak} = 100\,\Omega / V$

We can enable or disable and adjust Positive Ground Fault alarm as shown on the procedure below:

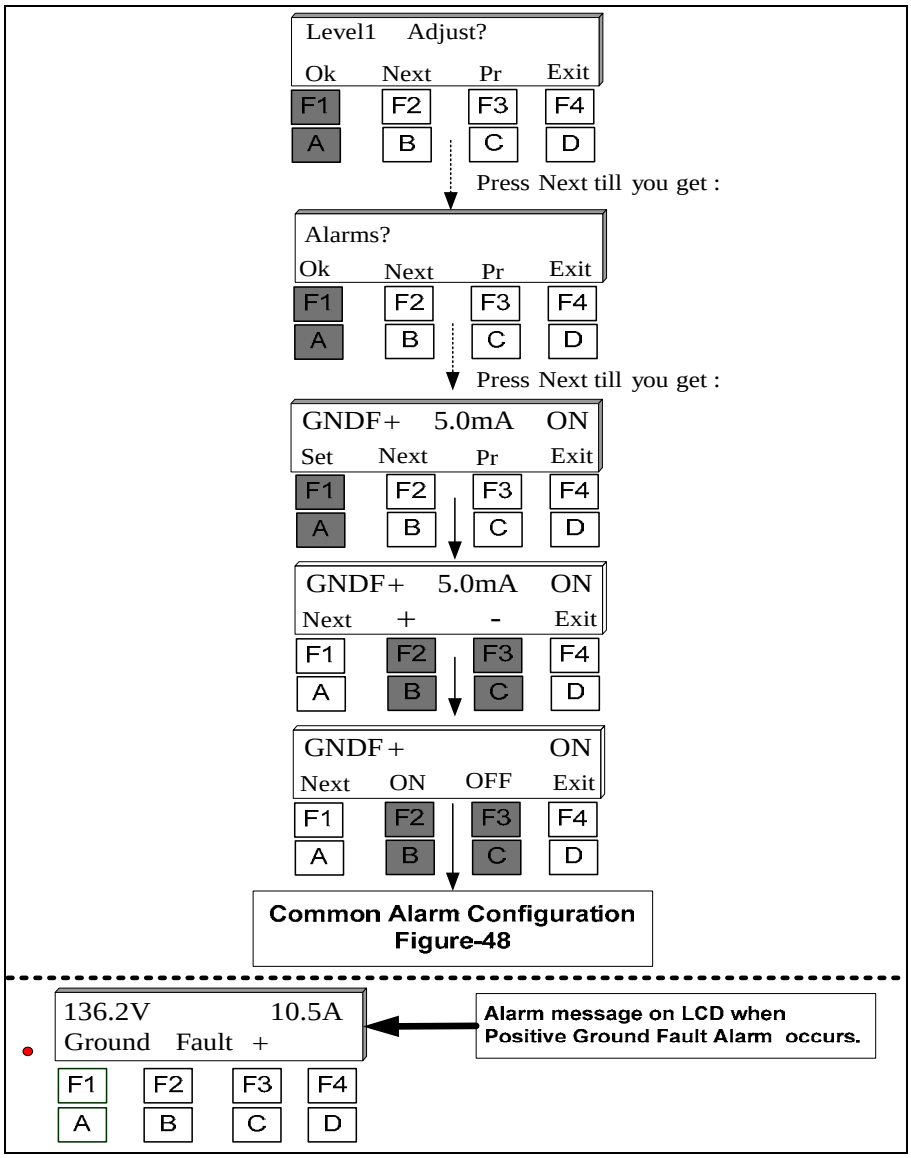


Figure 52 : Positive Ground Fault Alarm adjustments procedure.

iv. Negative Ground Fault Alarm

If resistance between negative to chassis decreases below a preset value during a preset time, this alarm will be activated. Leakage resistance is given by the following formula:

$$R_{Leak} = \frac{1}{2\ I_{Leak}}$$

Example: $I_{Leak} = 5mA,\ R_{leak} = 100\,\Omega / V$

We can enable or disable and adjust Negative Ground Fault alarm as shown on the procedure below:

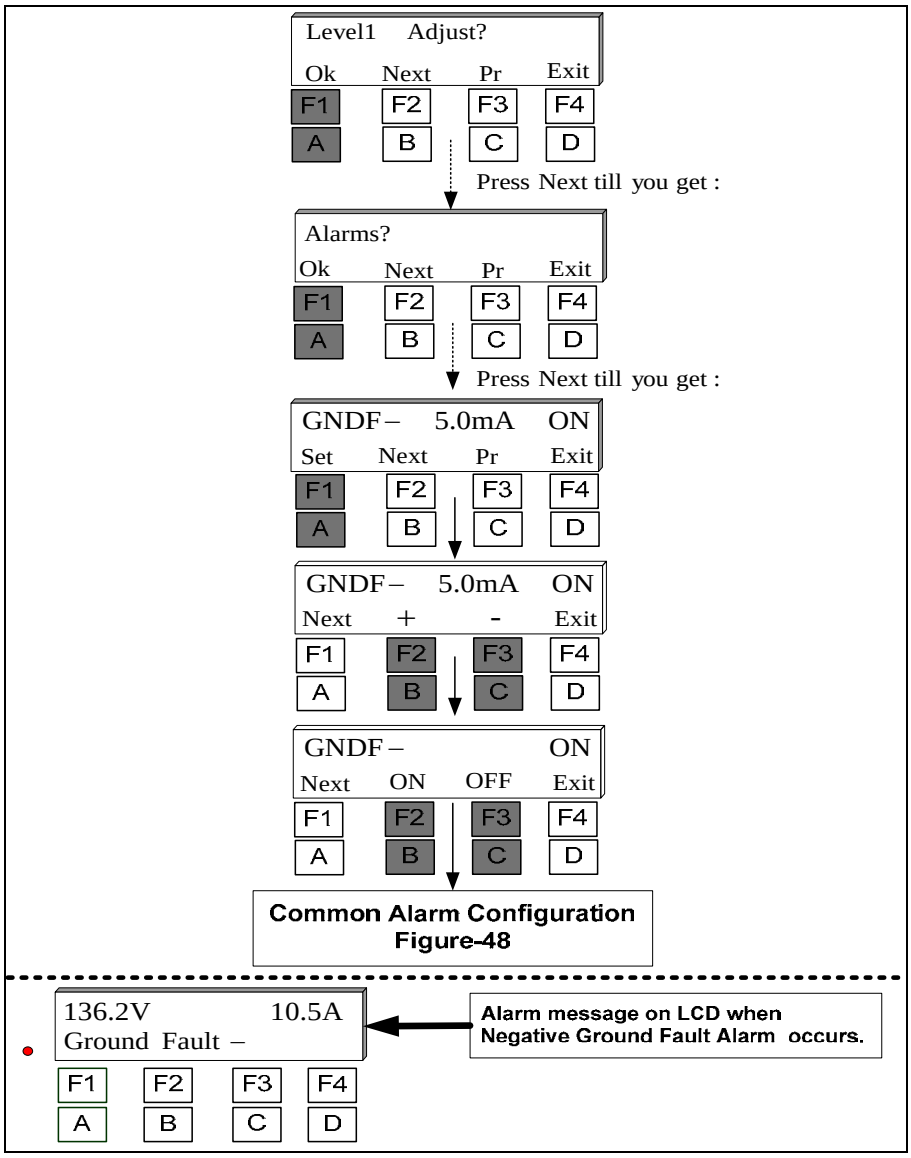


Figure 53 : Negative Ground Fault Alarm adjustments procedure.

v. AC Fail Alarm

AC Fail alarm is activated if main AC Input fails for longer than 100ms during the preset time. We can enable or disable and adjust AC Fail alarm as shown on the procedure below:

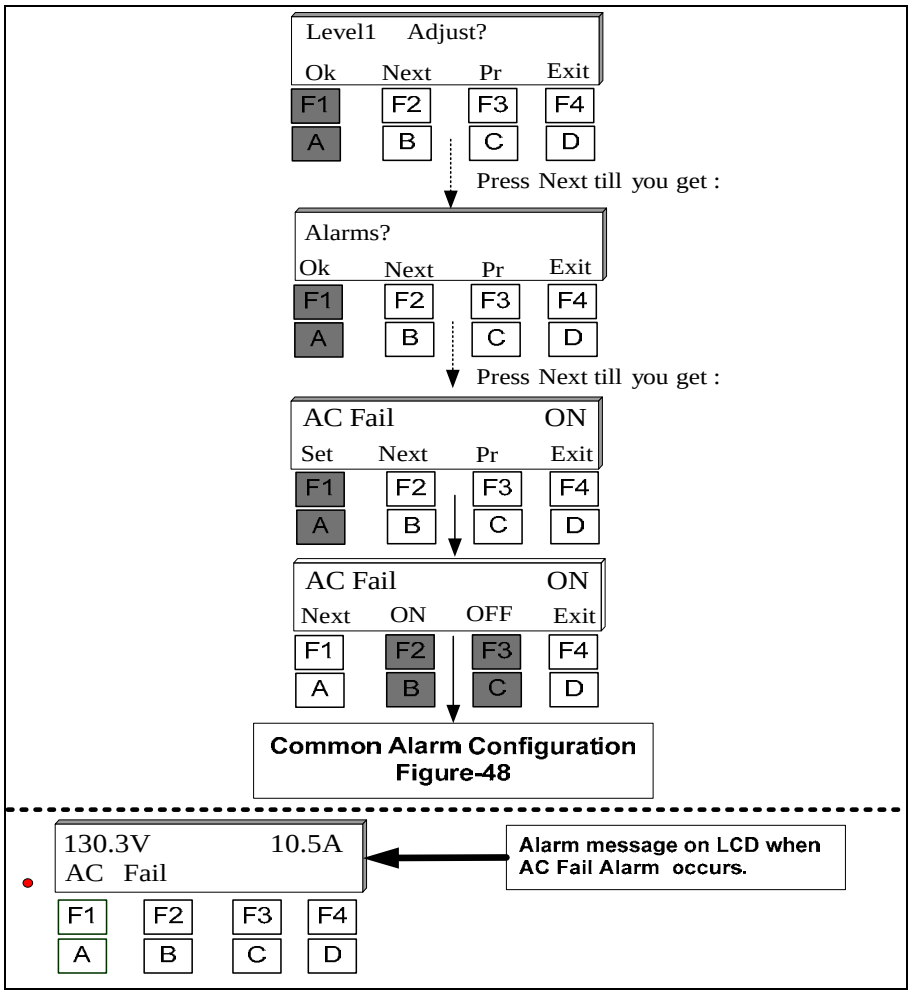


Figure 54 : AC Fail Alarm adjustments procedure.

vi. Rectifier Fail Alarm

Rectifier Fail Alarm is activated if the DC output voltage is decreasing to reach certain preset percentage of Float voltage and the output current is very low and reaching certain percentage of current limit value, during a preset time. We can enable or disable and adjust Rectifier Fail alarm as shown on the procedure below:

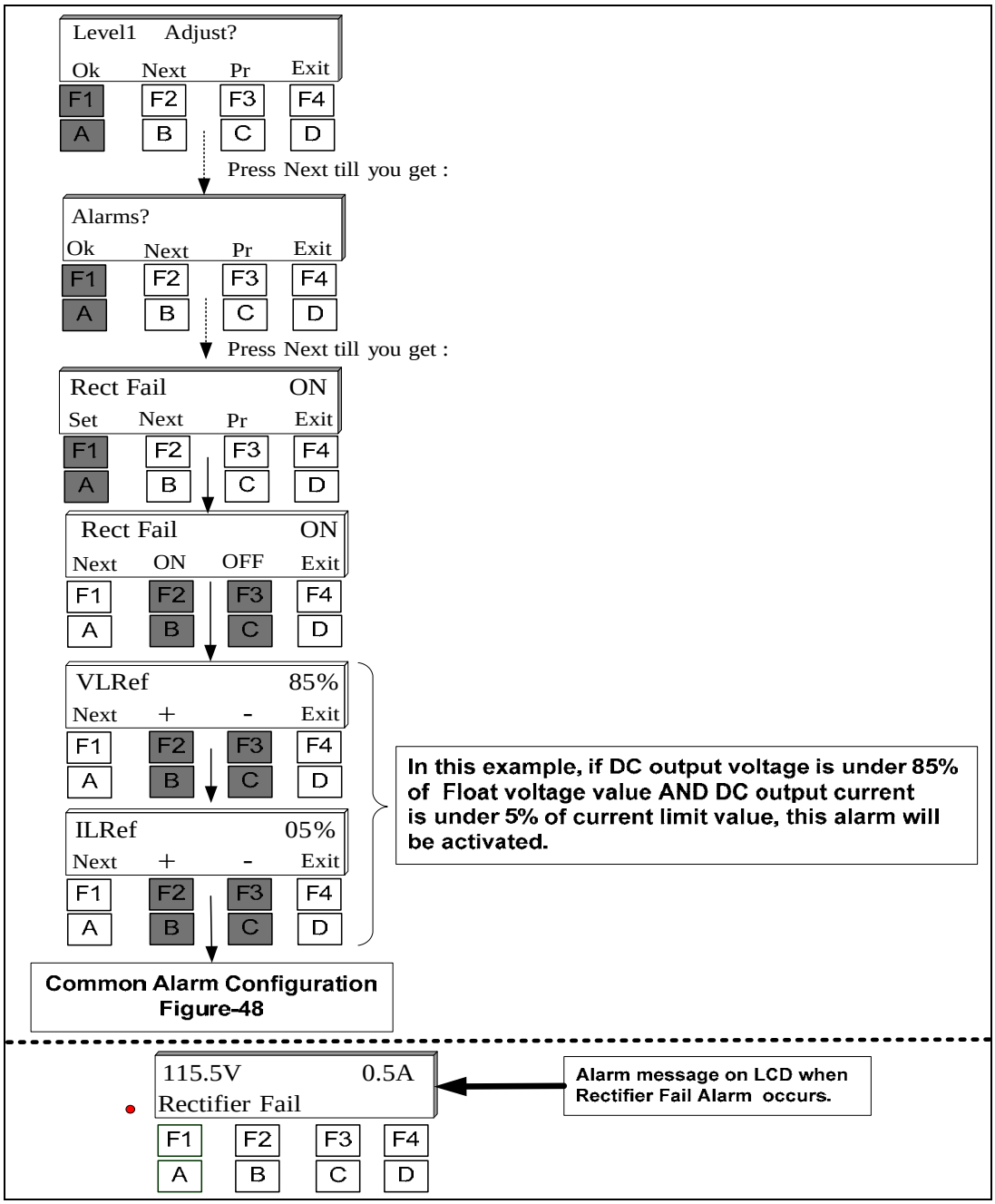


Figure 55 : Rectifier Fail Alarm adjustments procedure.

vii. Rectifier High Voltage Alarm *

Rectifier High Voltage alarm is activated if the charger output voltage exceeds a preset value during a preset time. We can enable or disable and adjust Rectifier High Voltage Alarm as shown on the procedure below:

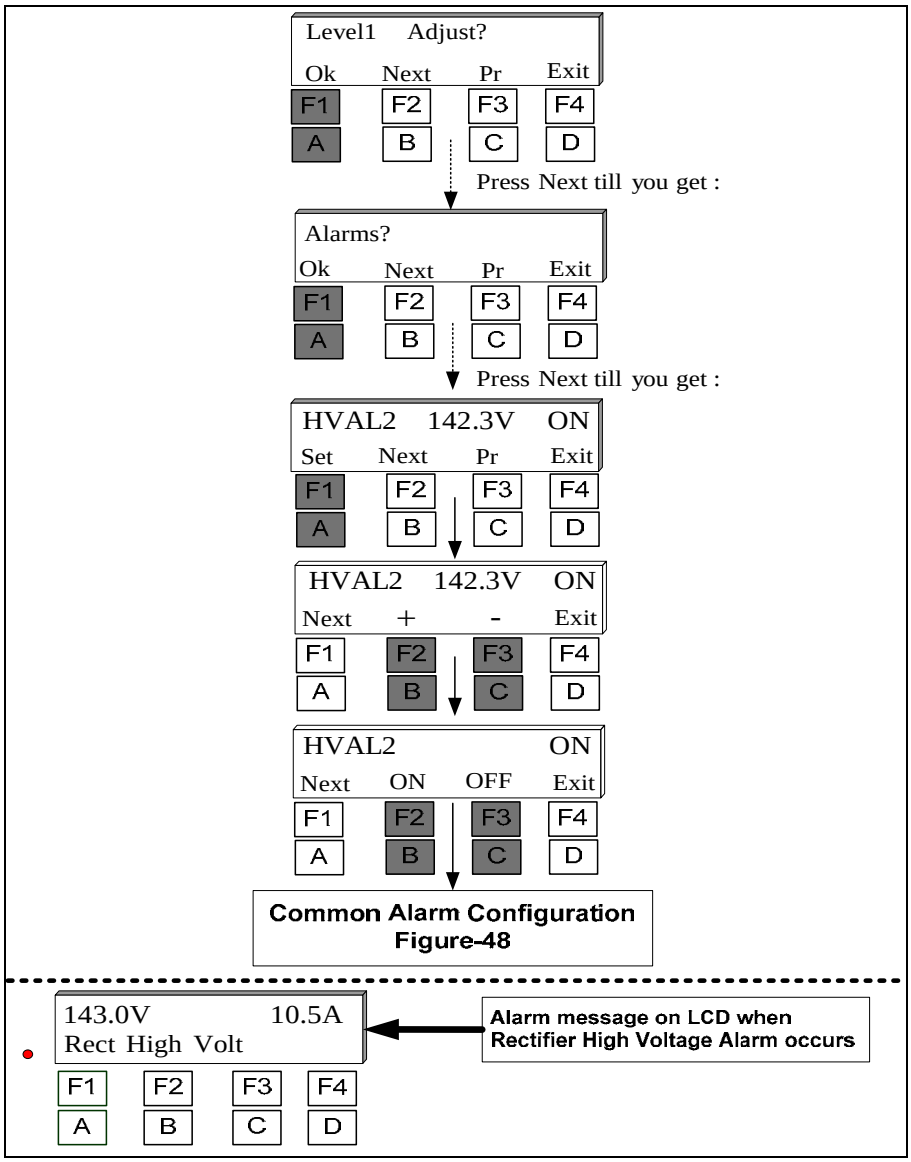


Figure 56 : Rectifier High Voltage Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

viii. High Voltage Shutdown Alarm *

High Voltage Shutdown alarm is activated if the rectifier voltage exceeds a preset value during a preset time. This alarm turns the Rectifier OFF. We can enable or disable and adjust High Voltage Shutdown Alarm as shown on the procedure below:

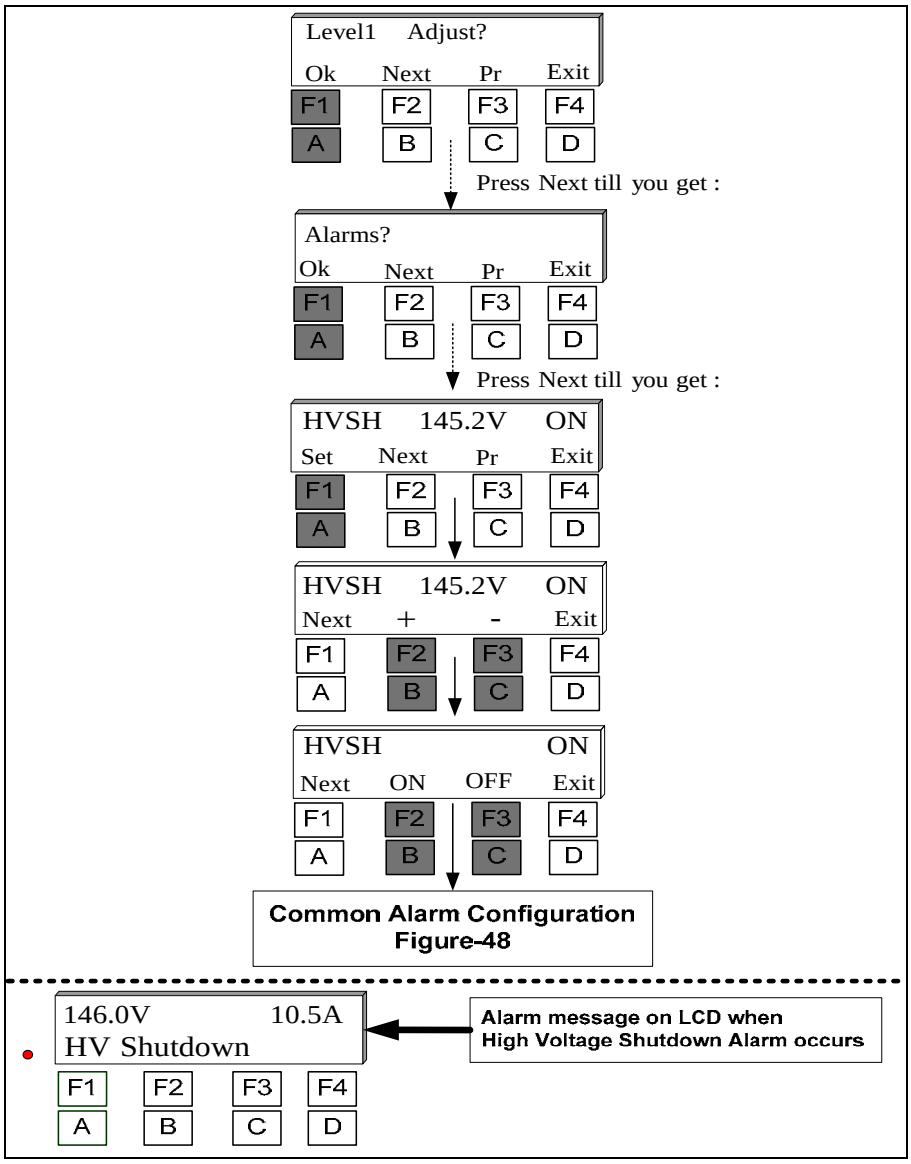


Figure 57 : High Voltage Shutdown Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
** *: Optional*

ix. Rectifier Low Voltage Alarm *

Rectifier Low Voltage alarm is activated if the rectifier voltage decreases below a preset value during a preset time. We can enable or disable and adjust Rectifier Low Voltage Alarm as shown on the procedure below:

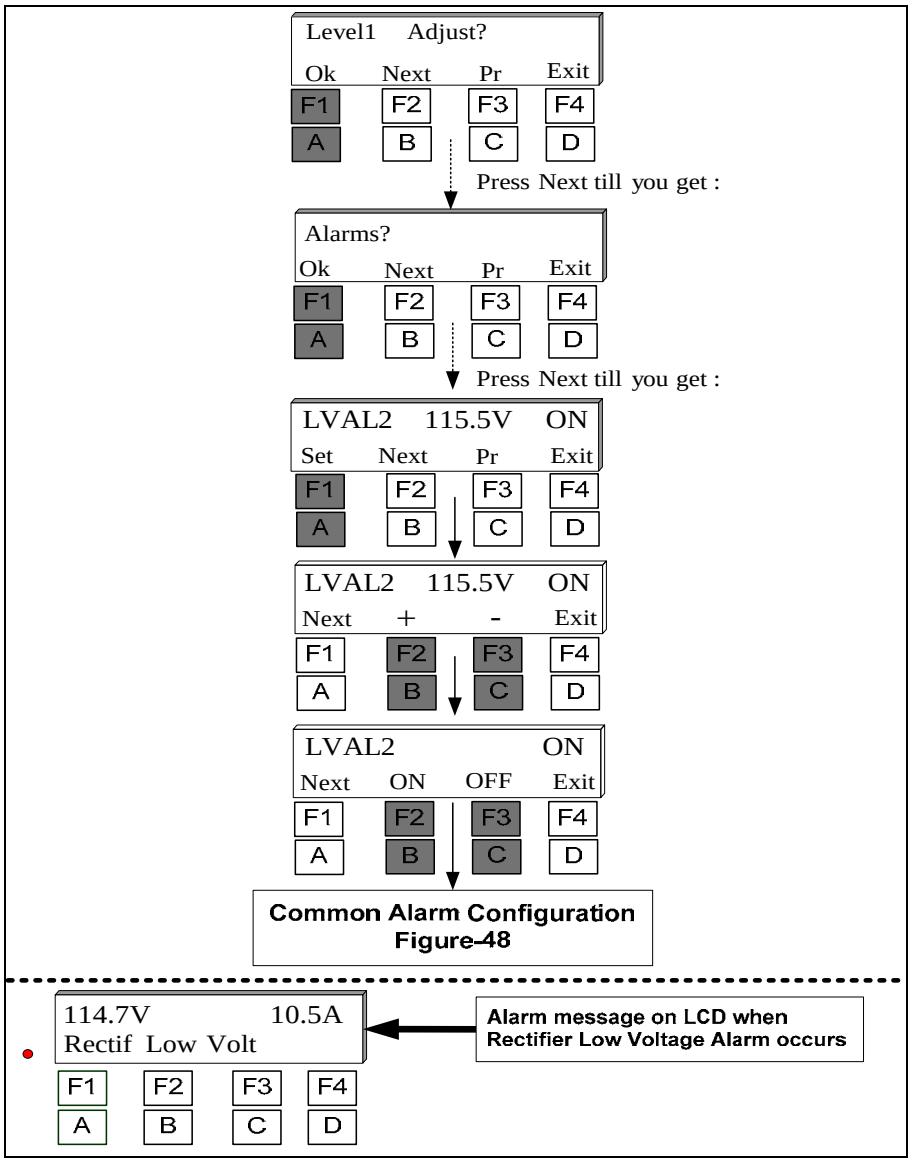


Figure 58 : Rectifier Low Voltage Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

x. End of Discharge Alarm (2nd Low Volt Level)*

End of Discharge Alarm is activated if the battery voltage decreases below a preset value during a preset time. It can be used as a critical alarm to prevent excessive battery discharge. We can enable or disable and adjust Low Voltage Disconnect Alarm as shown on the procedure below:

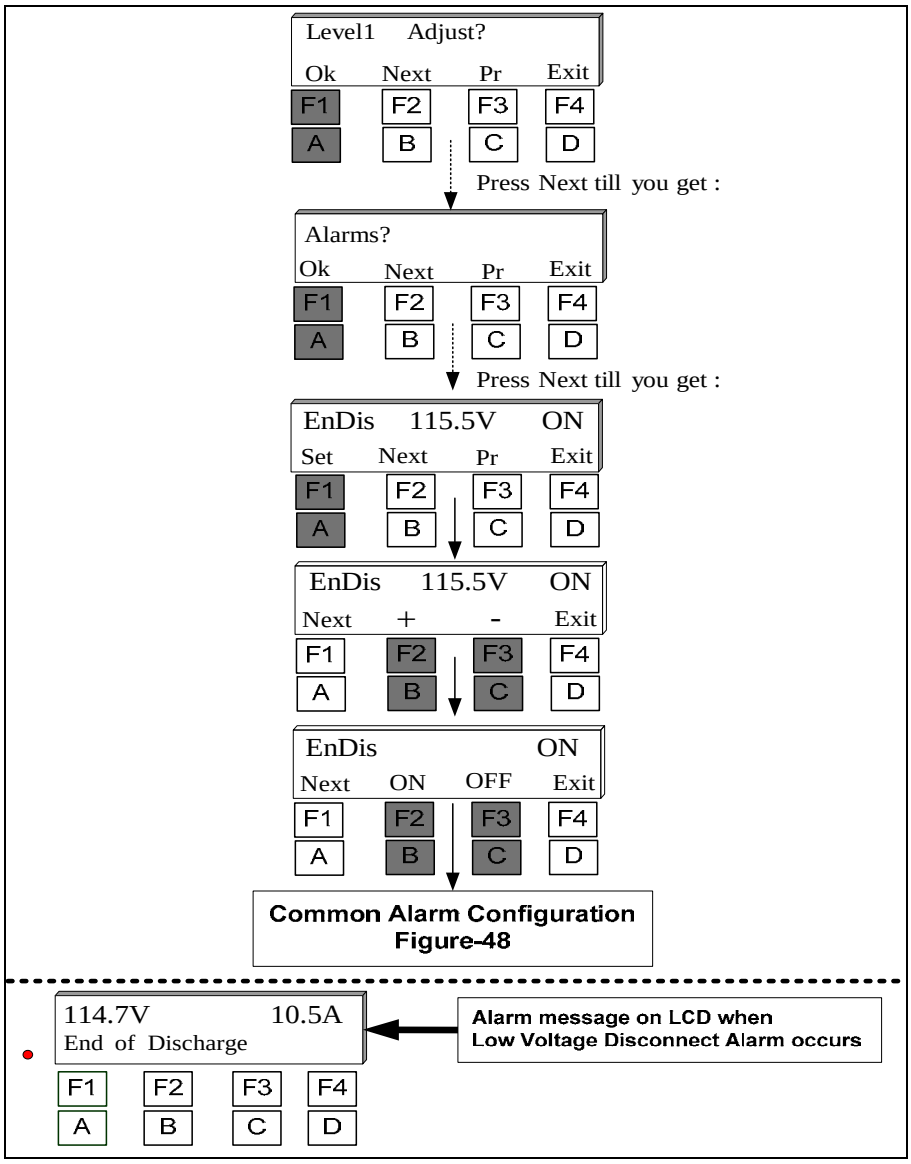


Figure 59 : End of Discharge Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xi. Charger High Temperature Alarm *

Charger High Temperature alarm is activated when the inside temperature exceeds a preset value during a preset time. We can enable or disable and adjust Charger High Temperature Alarm as shown on the procedure below:

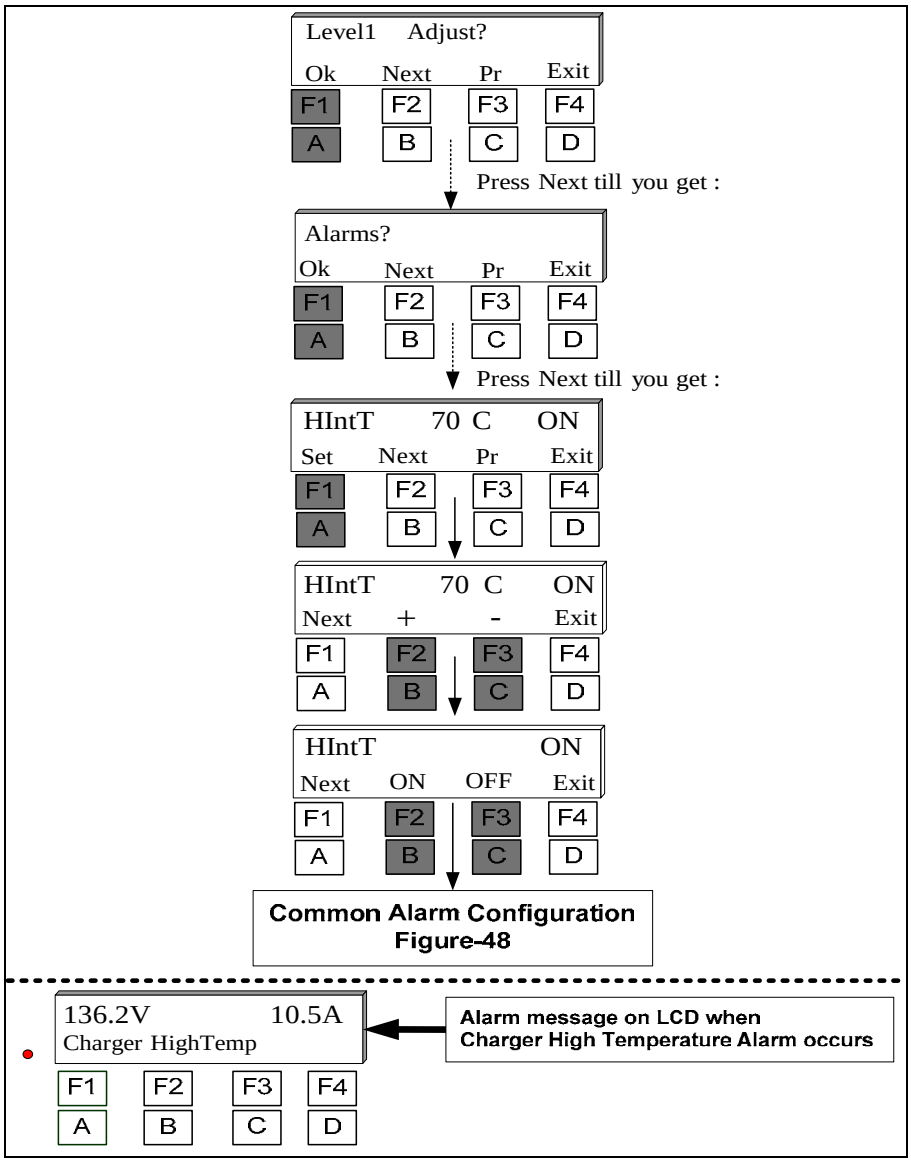


Figure 60 : Charger High Temperature Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xii. Charger Low Temperature Alarm *

Charger Low Temperature alarm is activated when the inside temperature decreases below a preset value during a preset time. We can enable or disable and adjust Charger Low Temperature Alarm as shown on the procedure below:

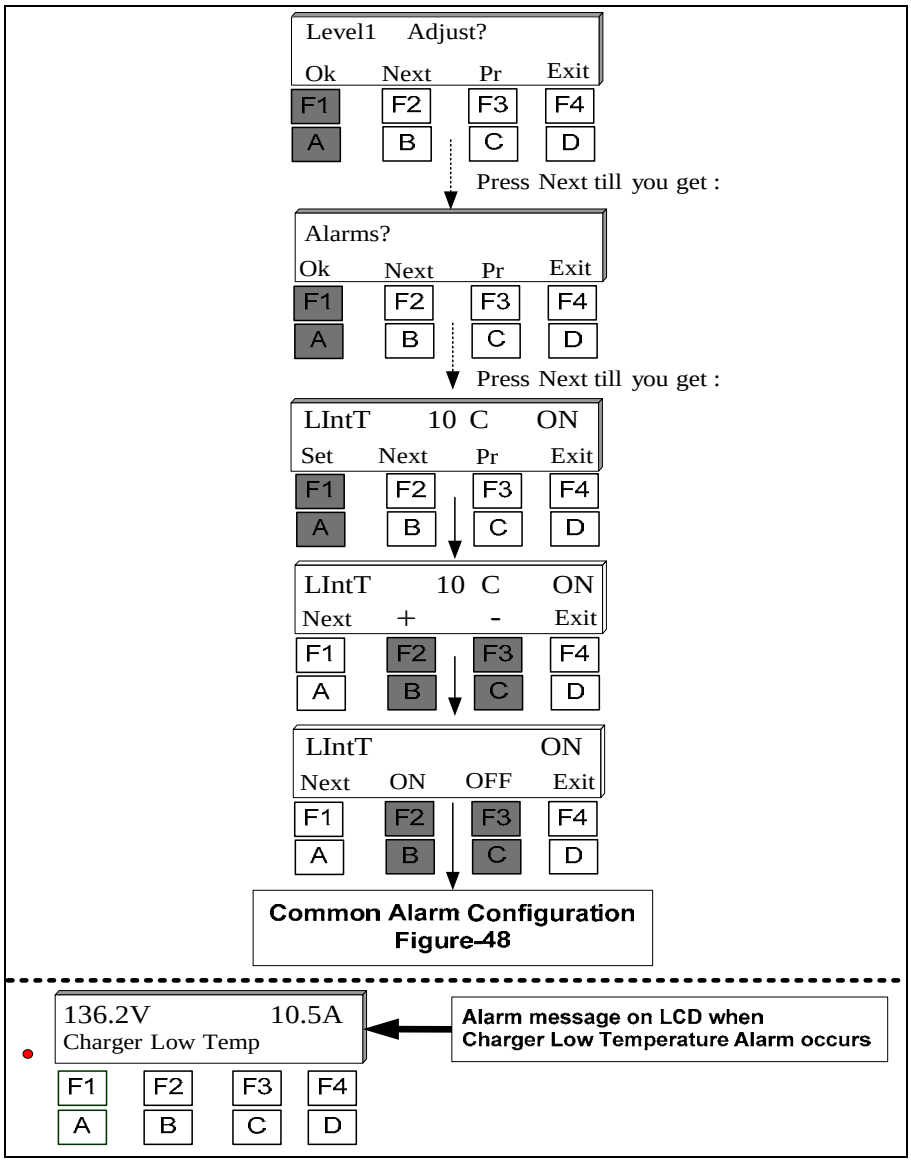


Figure 61 : Charger Low Temperature Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xiii. Battery High Temperature Alarm **

Battery High Temperature alarm is activated if the battery temperature exceeds the preset value during a preset time. We can also force the battery charger to be shut down automatically if the battery temperature reaches the High temperature preset value, by turning ON Shut Down parameter. If Shut Down parameter is turned OFF, the battery high temperature will be generated and the battery charger will still provide DC output. We can enable or disable and adjust Battery High Temperature alarm as shown on the procedure below:

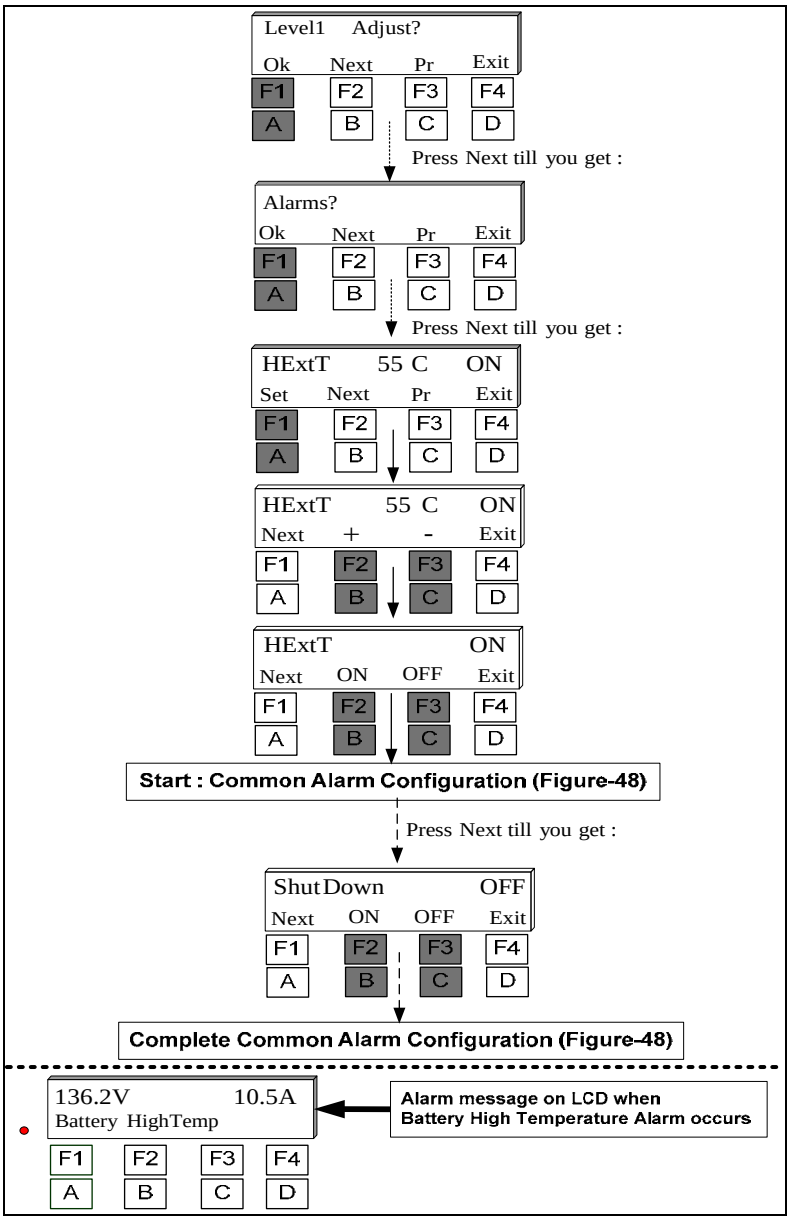


Figure 62 : Battery High Temperature Alarm adjustments procedure.

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xiv. Battery Low Temperature Alarm **

Battery Low Temperature alarm is activated if the battery temperature decreases below the preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

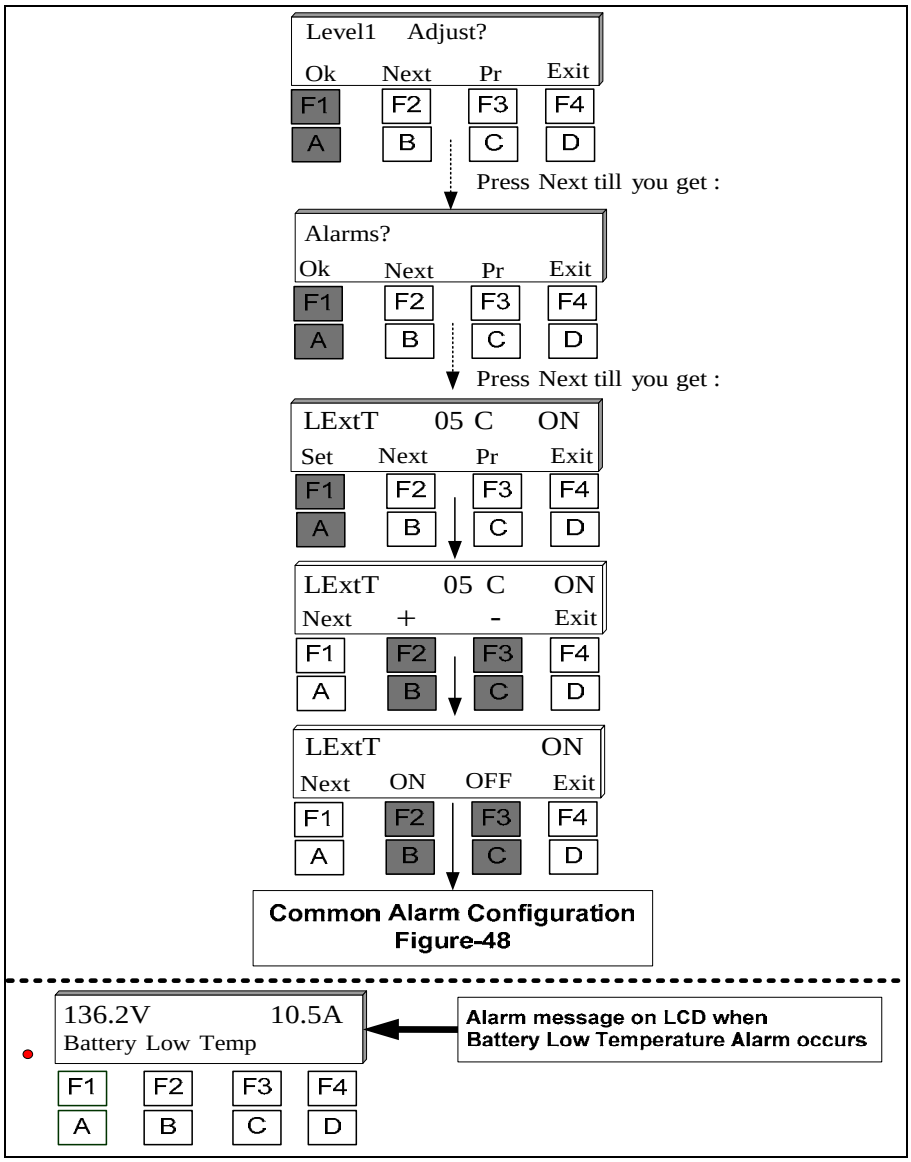


Figure 63 : Battery Low Temperature Alarm adjustments procedure.

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xv. AC High Voltage Alarm **

AC High Voltage alarm is activated if the AC voltage exceeds the preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

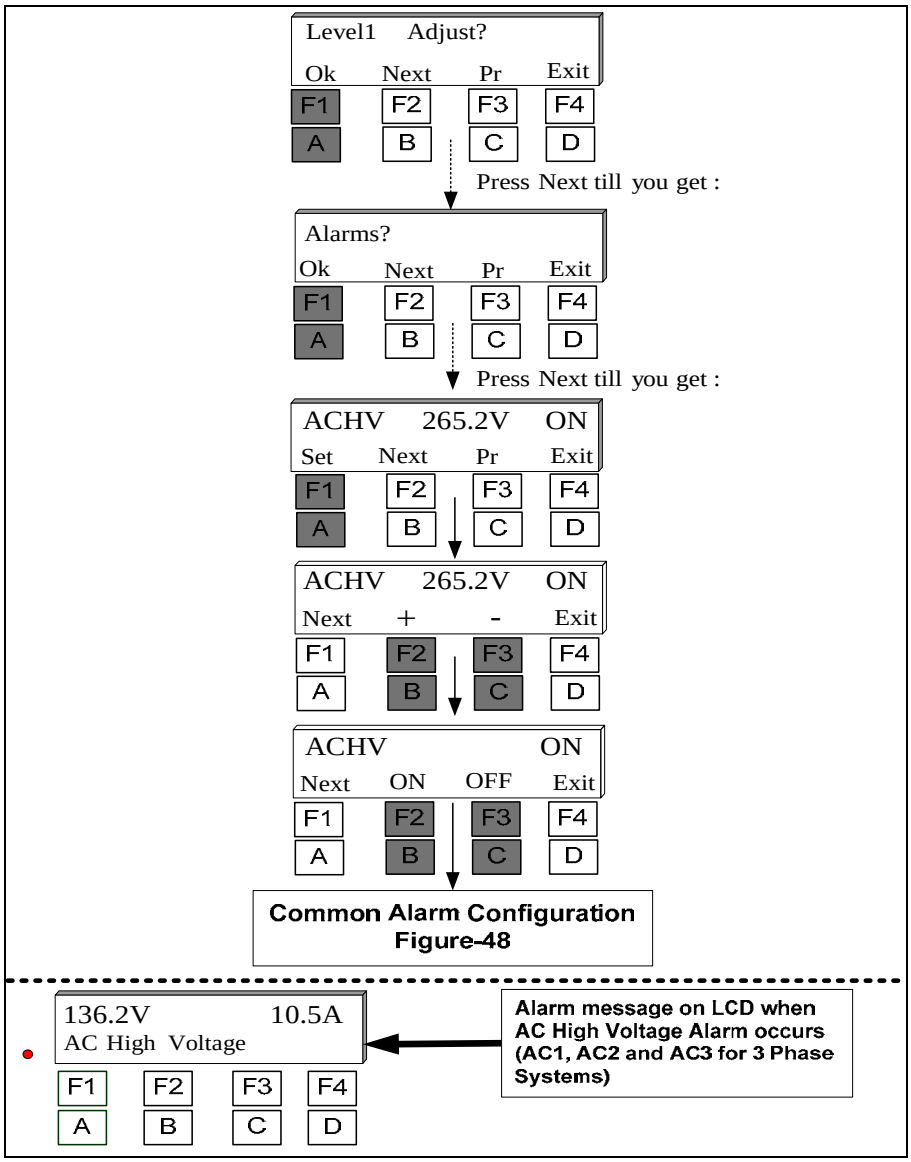


Figure 64 : AC High Voltage Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xvi. AC Low Voltage Alarm **

AC Low Voltage alarm is activated if the AC voltage decreases below the preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

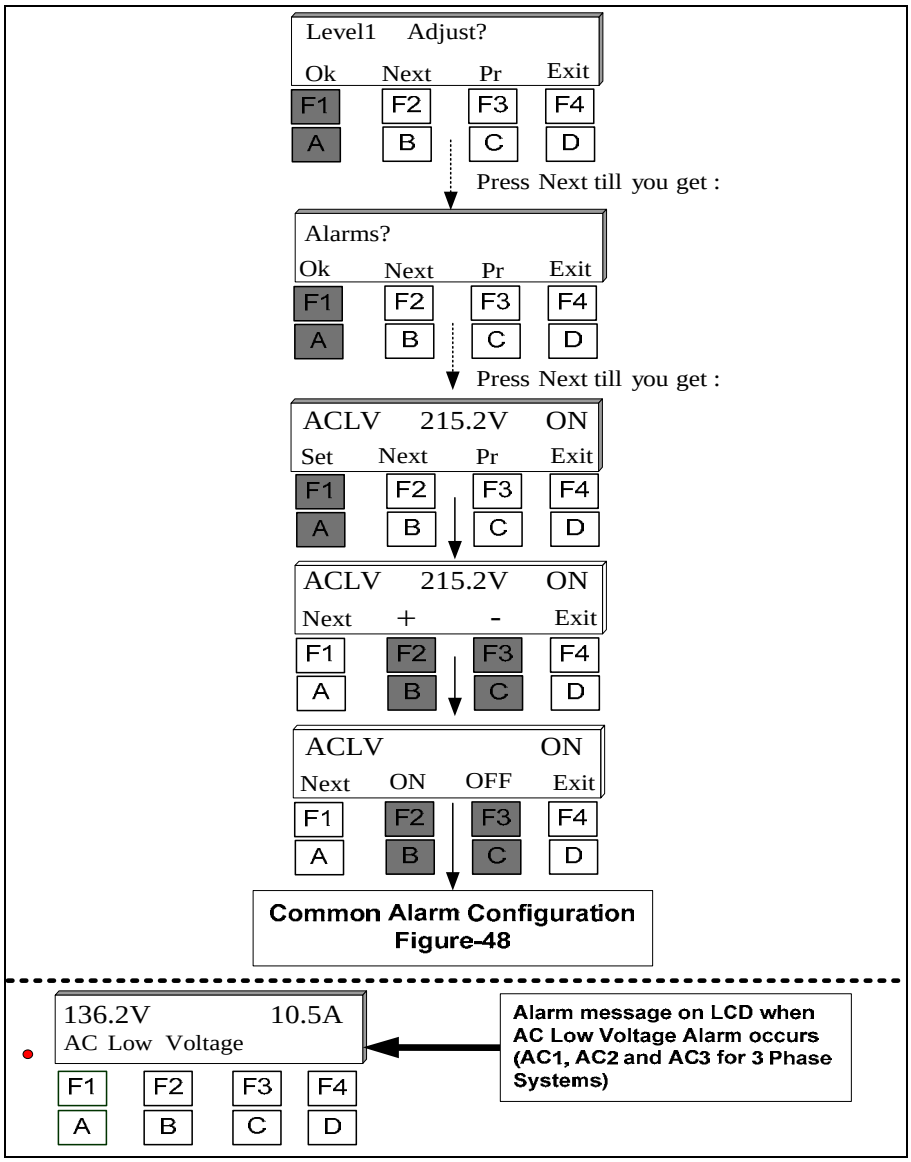


Figure 65 : AC Low Voltage Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xvii. High Ripple Alarm *

High Ripple alarm is activated if the DC voltage ripple exceeds the preset value during a preset time. It can be set between 1% and 15% of nominal DC voltage. We can enable or disable and adjust this alarm as shown on the procedure below:

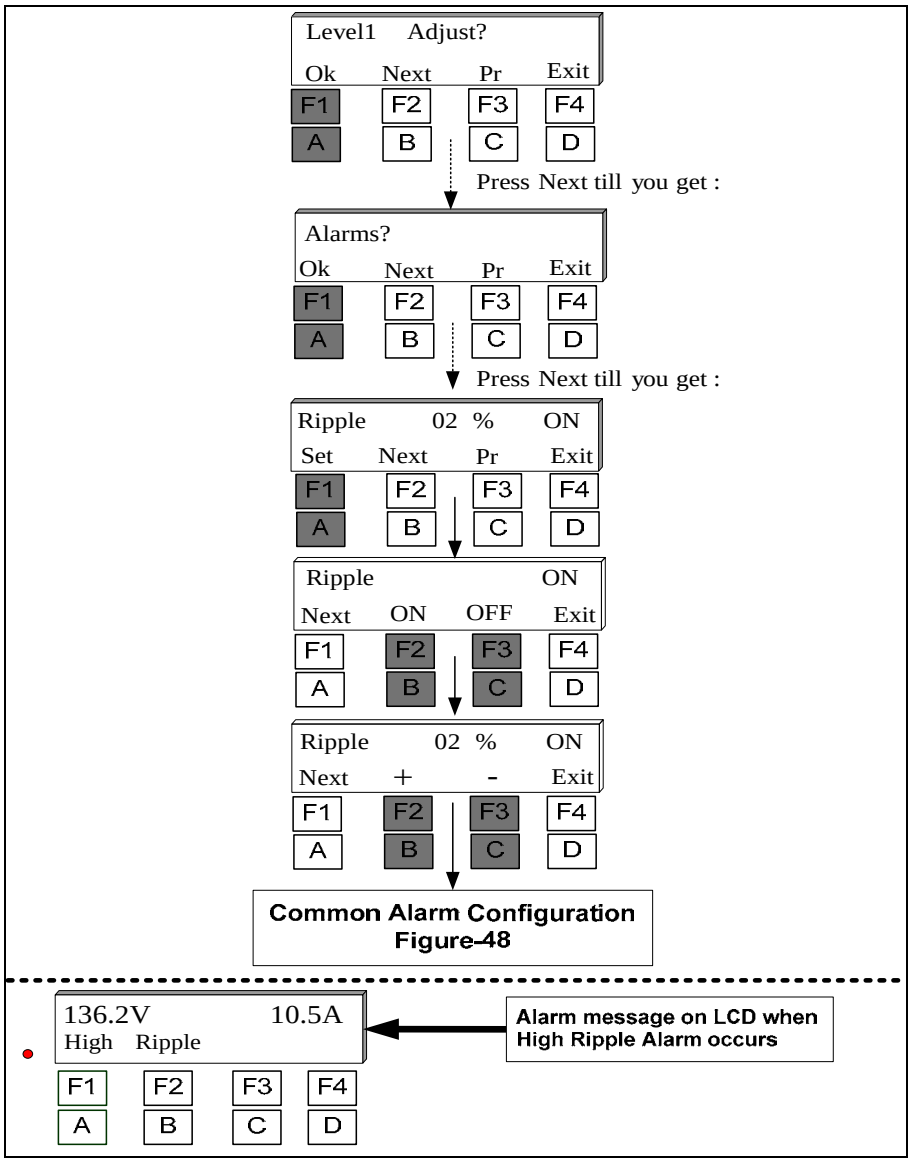


Figure 66 : High Ripple Alarm adjustments procedure.

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xviii. Rectifier Low Current Alarm *

Rectifier Low Current alarm is activated if rectifier output current decreases below the preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

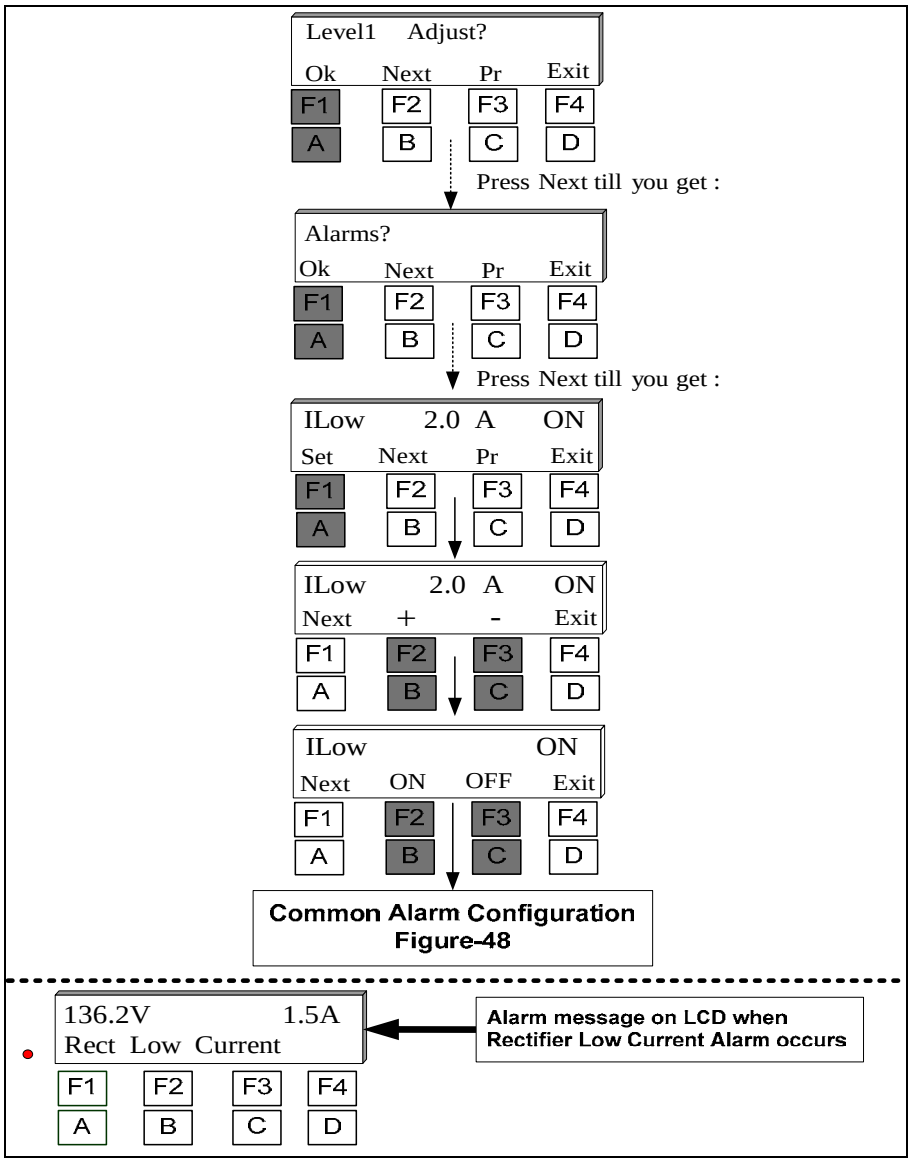


Figure 67 : Rectifier Low Current Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xix. Rectifier High Current Alarm *

Rectifier High Current alarm is activated if rectifier output current exceeds the preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

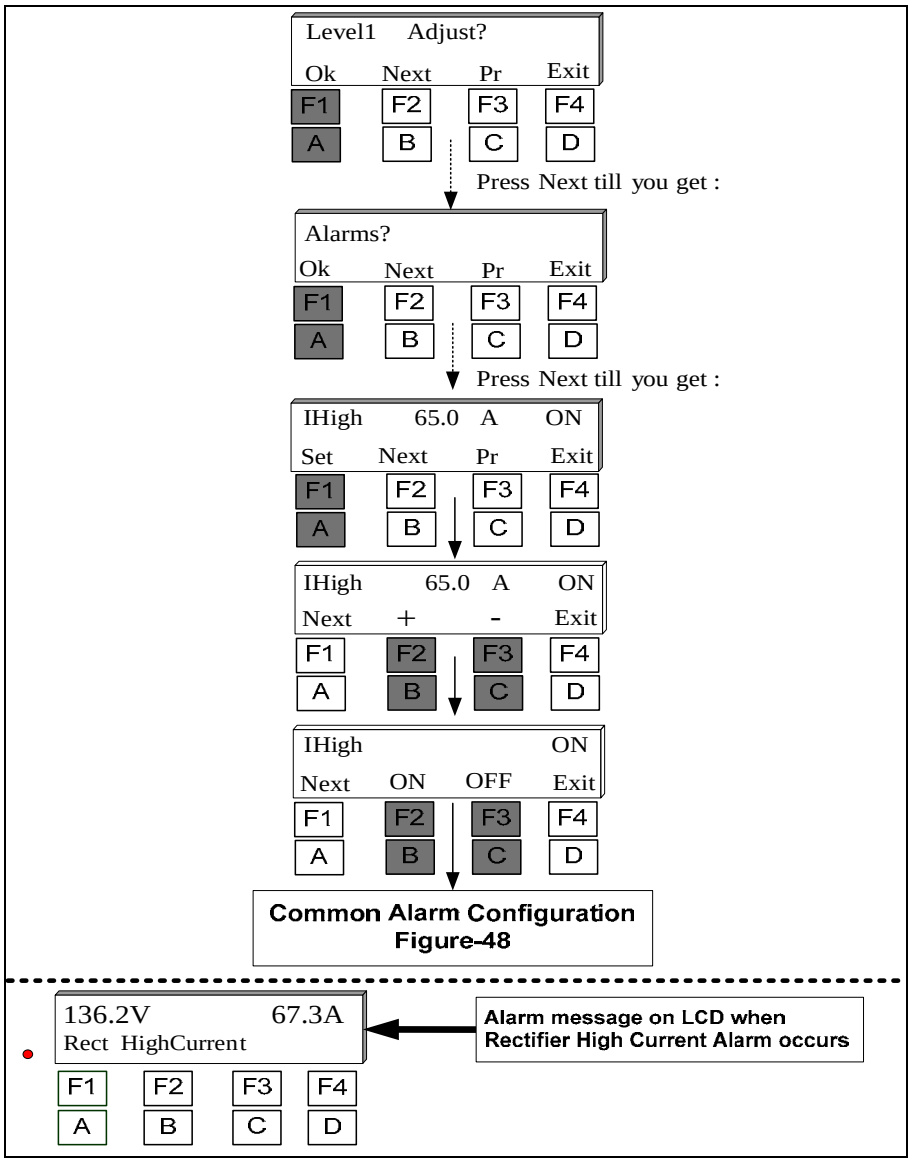


Figure 68 : Rectifier High Current Alarm adjustments procedure.

* : *Included, enabled upon customer request only. Can also be field activated*
** : *Optional*

xx. Battery Low Current Alarm **

Battery Low Current alarm is activated if the current provided from battery to load decreases below the preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

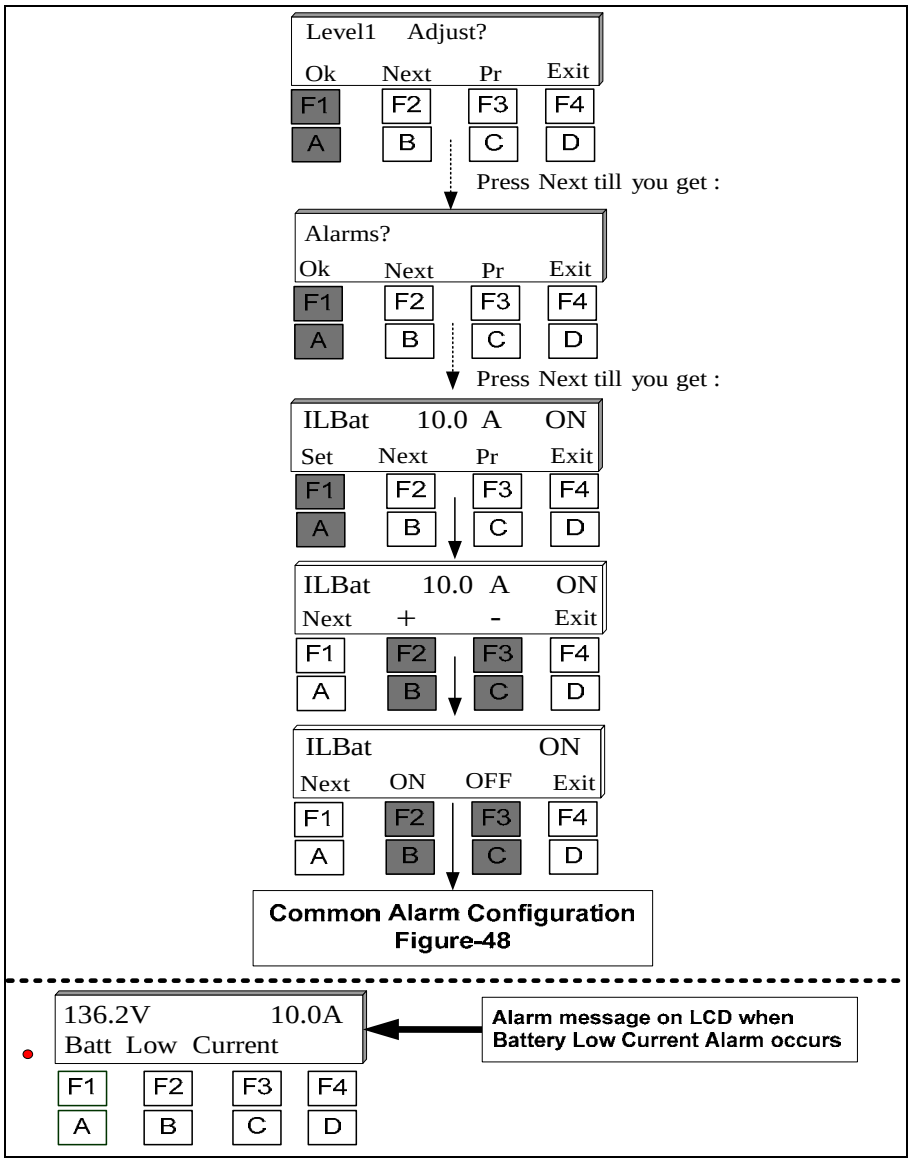


Figure 69 : Battery Low Current Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
** *: Optional*

xxi. Battery High Current Alarm **

Battery High Current alarm is activated if the current provided from battery to load exceeds the preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

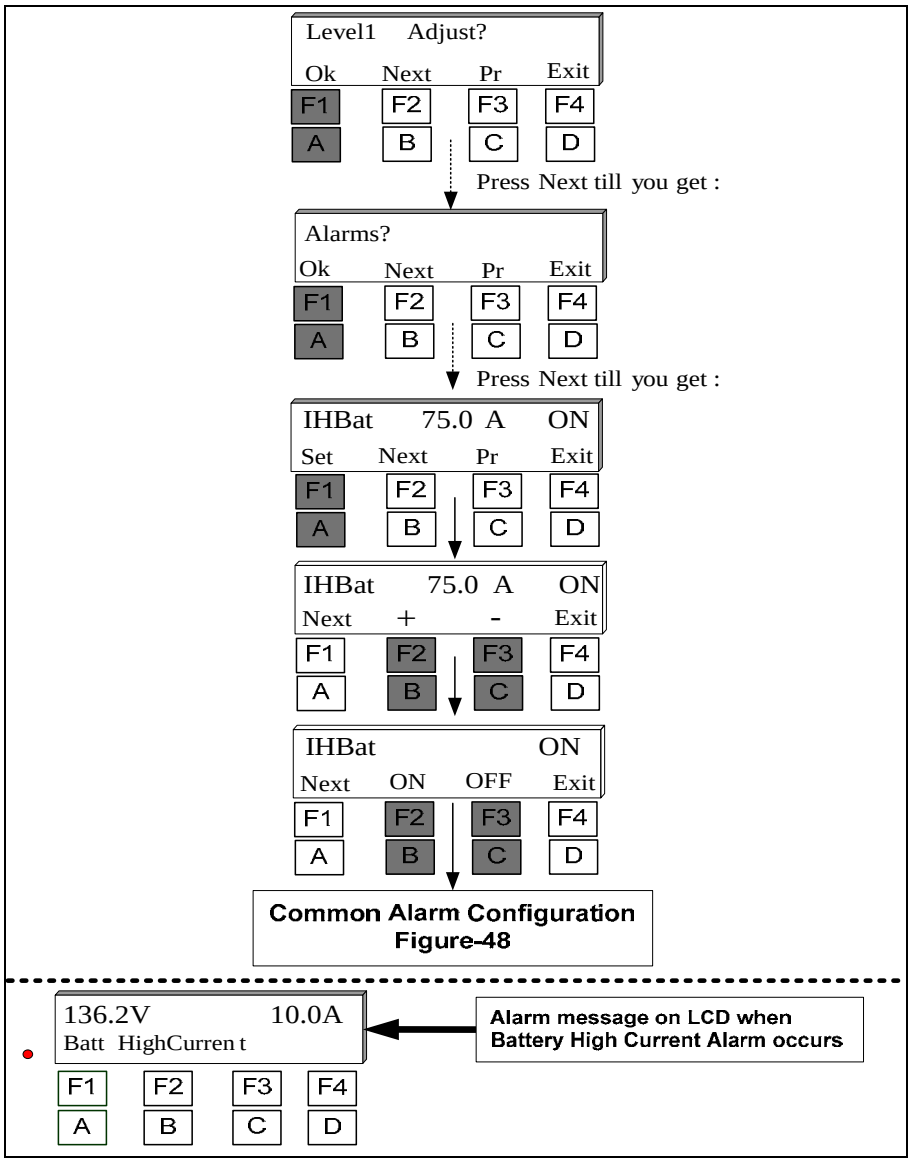


Figure 70 : Battery High Current Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xxii. Battery High Capacity Alarm **

Battery High Capacity alarm is activated if the battery capacity exceeds a preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

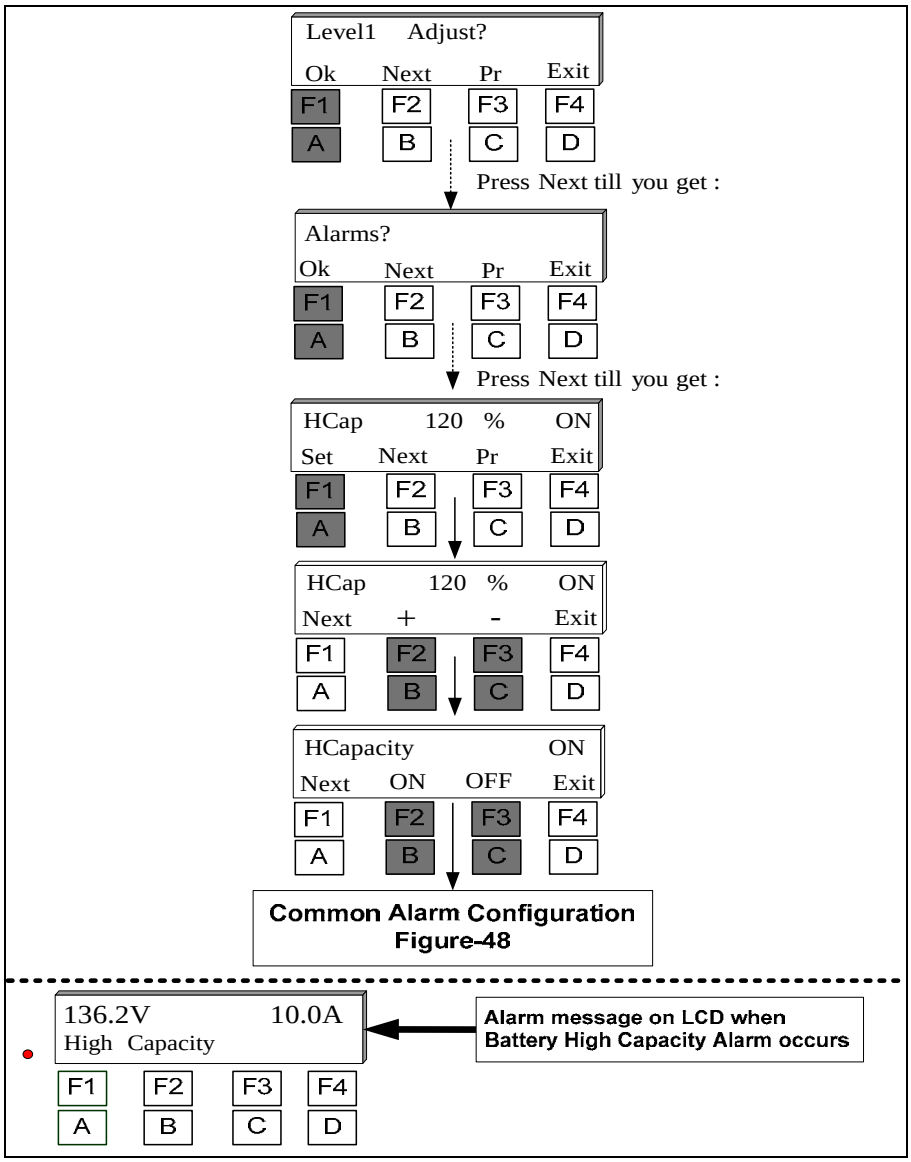


Figure 71 : Battery High Capacity Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xxiii. Battery Low Capacity Alarm **

Battery Low Capacity alarm is activated if the battery capacity decreases below a preset value during a preset time. We can enable or disable and adjust this alarm as shown on the procedure below:

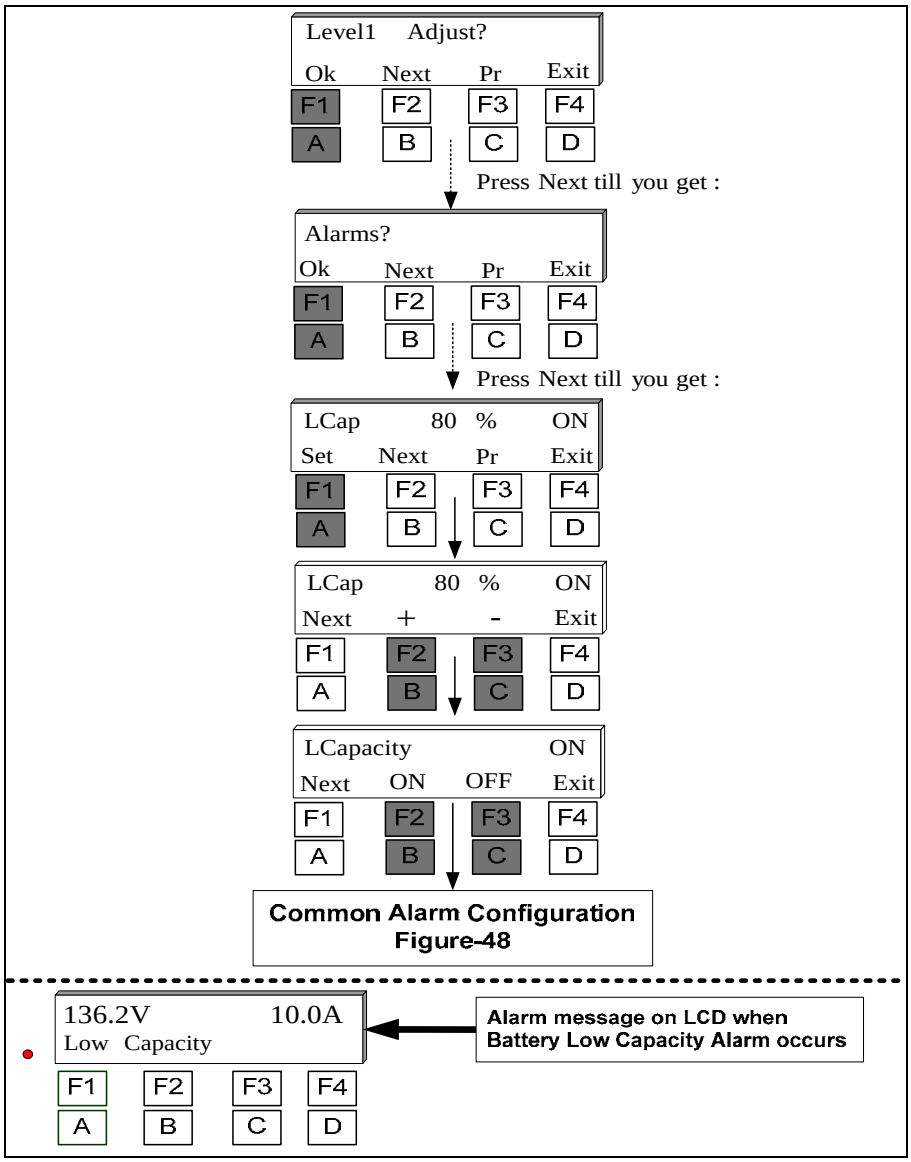


Figure 72 : Battery Low Capacity Alarm adjustments procedure.

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xxiv. Equalize Alarm *

Equalize alarm is activated when the charger goes in "Equalize" mode. We can enable or disable and adjust this alarm as shown on the procedure below:

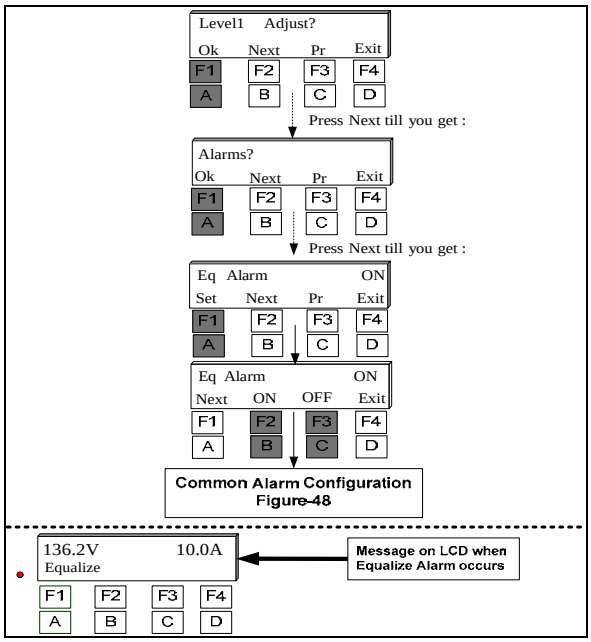


Figure 73 : Equalize Alarm adjustments procedure.

xxv. PCOM Alarm **

PCOM alarm is activated when the communication between control board and communication board (PCOM) fails. We can enable or disable and adjust this alarm as shown on the procedure below:

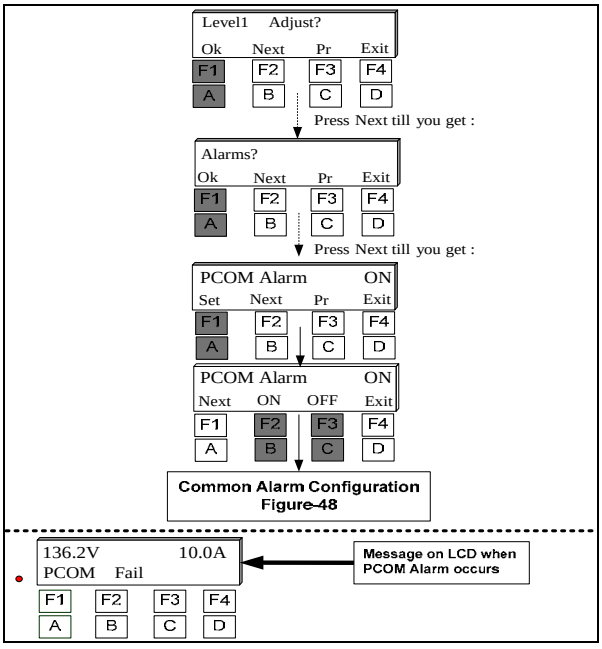


Figure 74 : PCOM Alarm adjustments procedure.

xxvi. PM Alarm **

PM alarm is activated when the communication between control board and measuring board (PM) fails. We can enable or disable and adjust this alarm as shown on the procedure below:

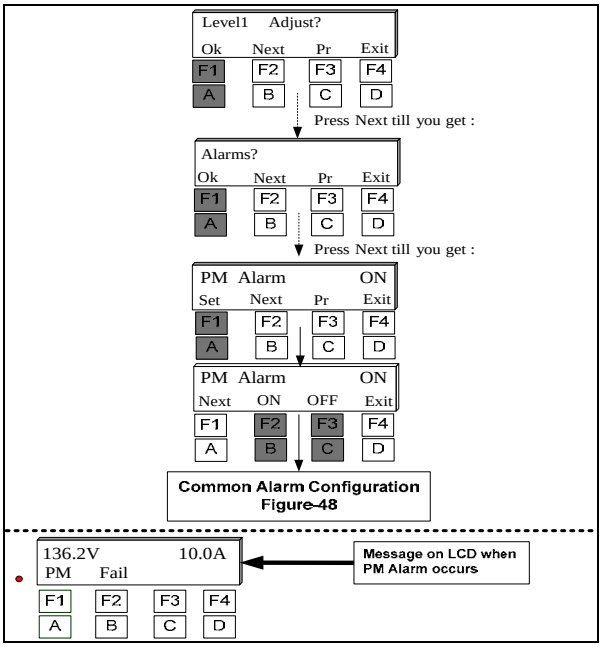


Figure 75 : PM Alarm adjustments procedure.

xxvii. Frequency Alarm *

If the frequency is out of the range, then this alarm is activated. This alarm is available when PM board (AC measurement) is ordered. We can enable or disable and adjust this alarm as shown on the procedure below:

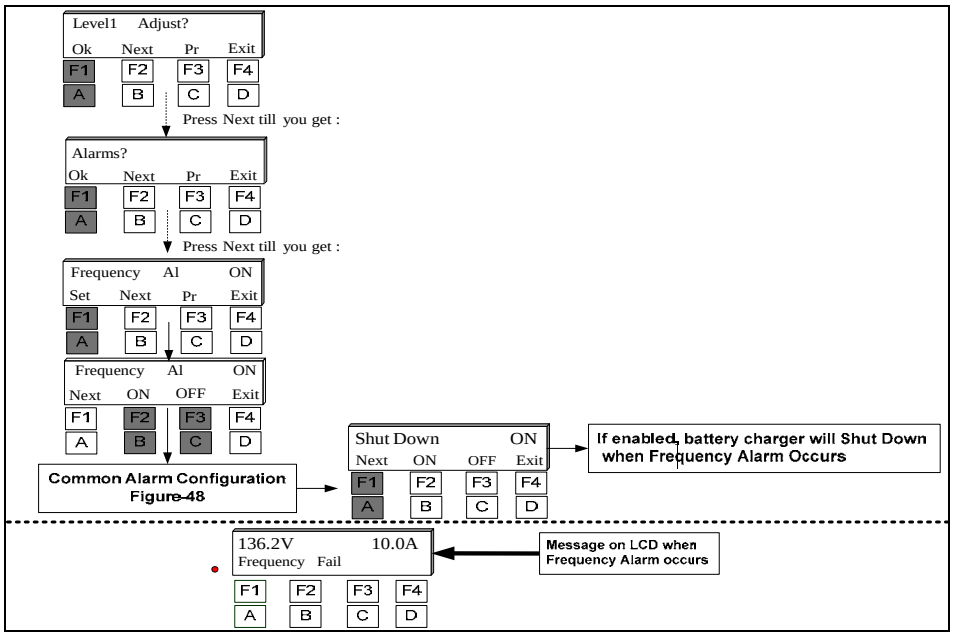


Figure 76 : Frequency Alarm adjustments procedure.

xxviii. Unbalanced Battery Alarm **

Unbalanced Battery alarm is activated if one or more battery cells are defective. VCell is the voltage unbalancing (Error) allowed for one cell/ block before this alarm will be active. If the maximum allowable voltage exceeds the preset value for VCell, during a preset time, than this alarm will be activated. We can enable or disable and adjust this alarm as shown on the procedure below:

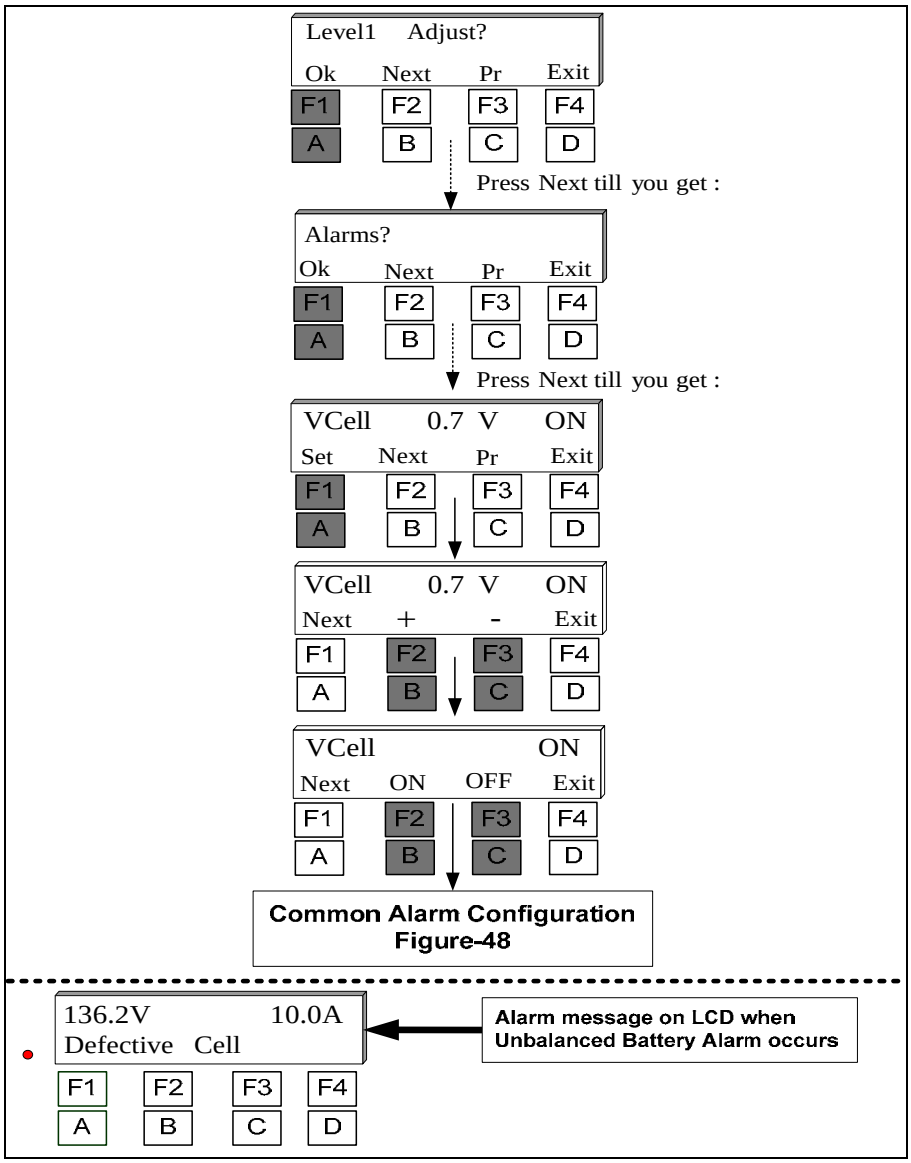


Figure 77 : Unbalanced Battery Alarm adjustments procedure.

* *: Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xxix. Temperature Probe Alarm **

This alarm is activated if a short circuit occurs in the temperature probe, provided (optional) with the battery charger. If the circuit inside the probe is open, the temperature considered by the system will be 20ºC. We can enable or disable and adjust this alarm as shown on the procedure below:

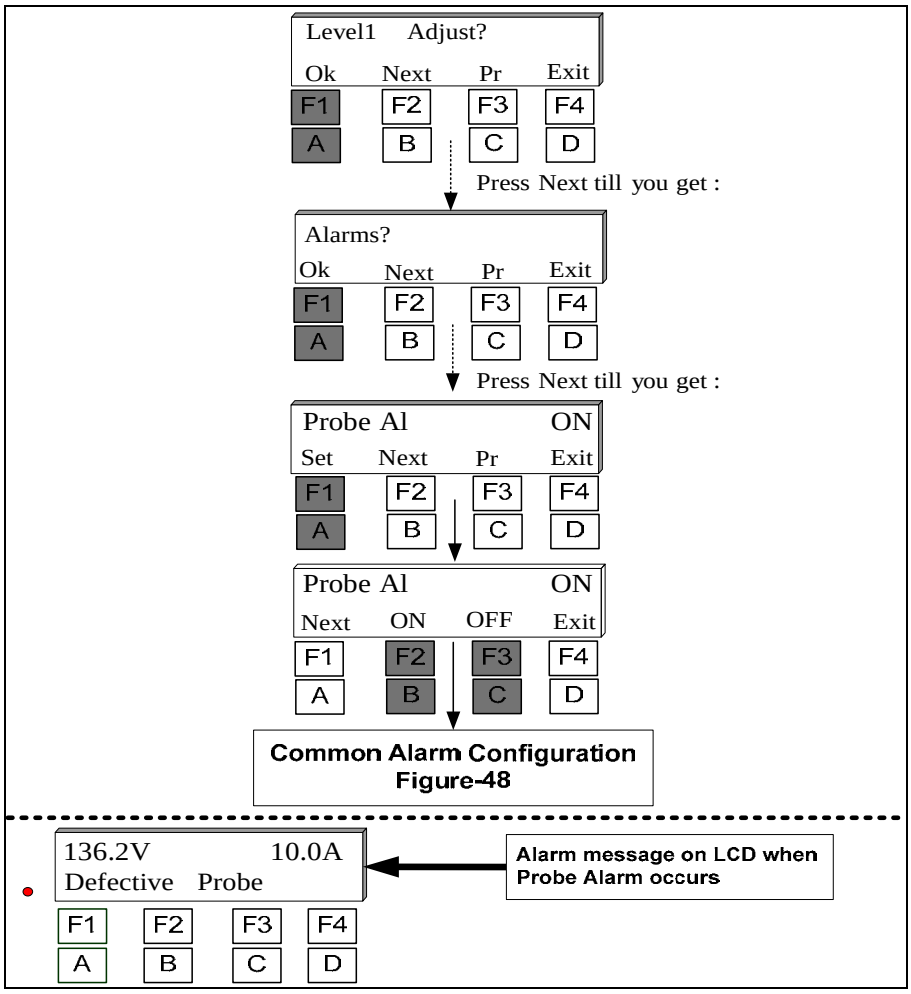


Figure 78 : Procedure to Enable or disable Probe Alarm.

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xxx. Battery Discharge Alarm **

This alarm is activated when the battery start to provide current to the load. In this case, the value of battery current shown on LCD display (if enabled) will be negative. We can enable or disable and adjust this alarm as shown on the procedure below:

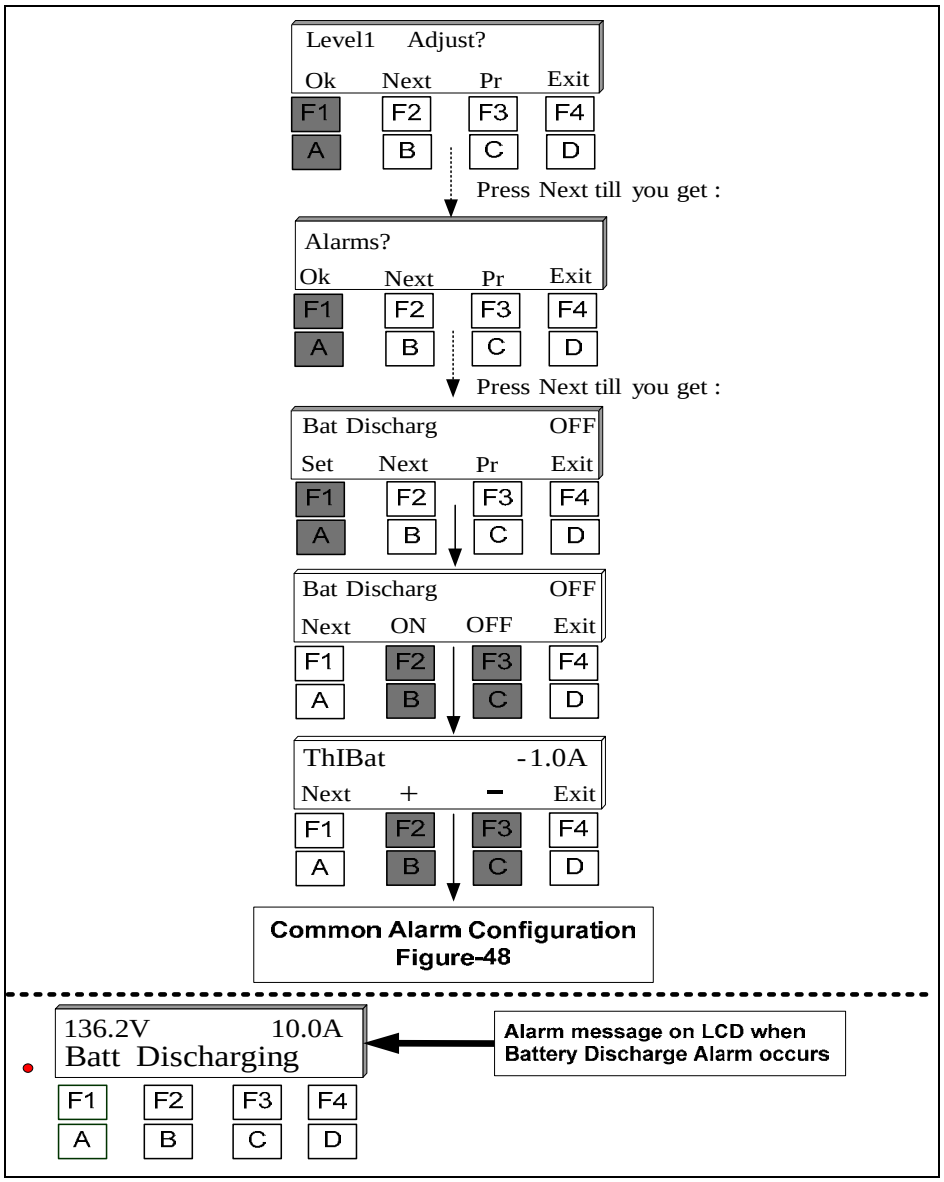


Figure 79 : Battery Discharge Alarm adjustments procedure.

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

xxxi. Common Relay and Audible Alarm configuration **

Common Relay (if applicable) will be activated when any alarm, that is configured to enable the common relay occur. We can set common relay parameters as shown on the procedure below:

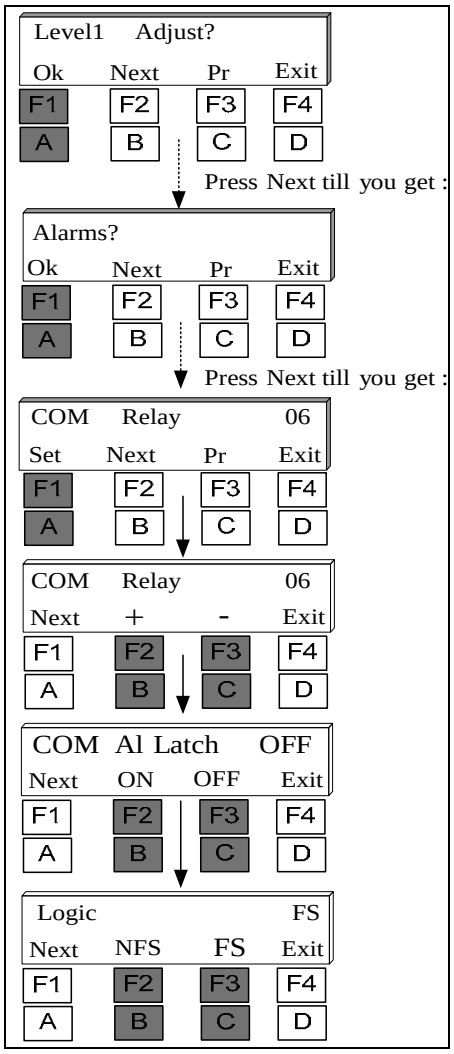


Figure 80 : Common Relay Configuration

Audible Alarm (if applicable) will be active when any alarm occurs. We can enable or disable audible alarm as shown on the procedure below:

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

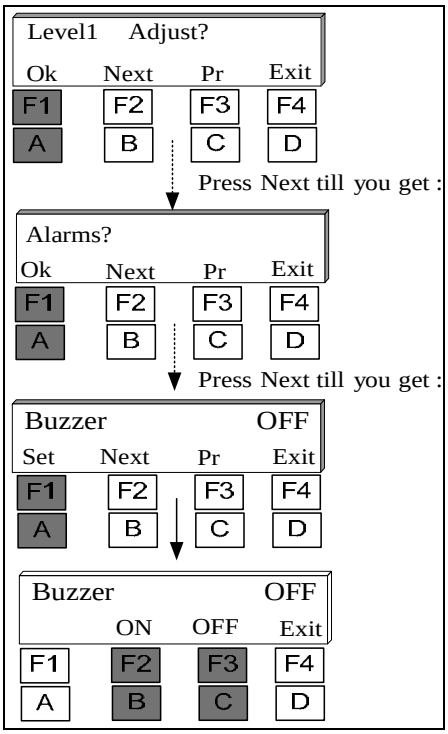


Figure 81 : Procedure to enable or disable Audible Alarm

7.3.3 System Clock **

The latest 250 events are saved in the memory. If dated events are required, then a special circuit with a backup battery has to be requested at the time of placing your order. We can access system clock settings as shown on the procedure below:

** : Included, enabled upon customer request only. Can also be field activated*
*** : Optional*

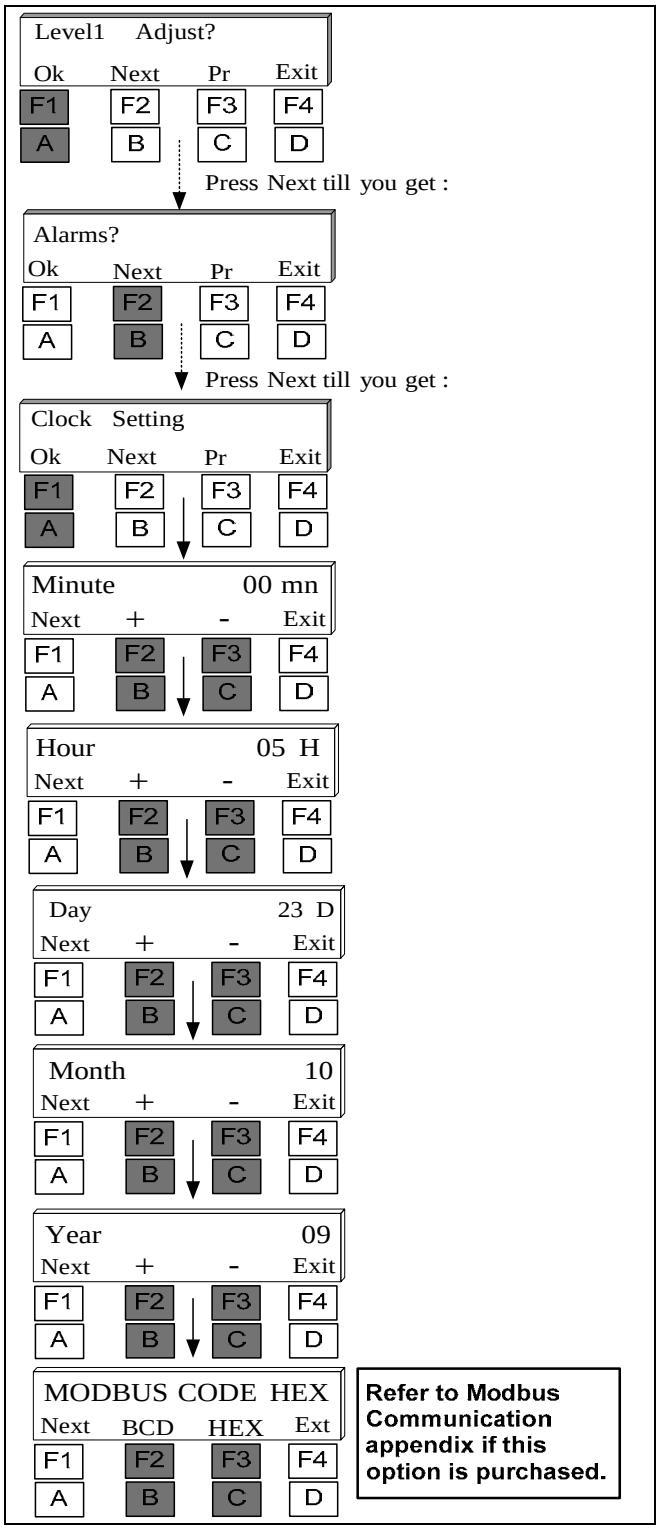


Figure 82 : Procedure to adjust System Clock

8. CURRENT TEMPERATURE COMPENSATION « OUTPUT CURRENT DERATING » (OPTIONAL)

Current temperature compensation function can be enabled or disabled in Level 2. When enabled, in order to protect all power components, the rectifier output current will be de-rated by a preset % (ex. 1%/°C/A) if the inside temperature exceeds a preset value (ex. 40°C).

Example-1:

Current Limit = 150A
Preset Temperature = 40 ºC
Compensation percentage = 1%//ºC/A
Actual internal Temperature = 60 ºC

New Current Limit value = $150 - \left(\frac{(60-40)\times 150}{100} \right) = 120A$

Compensation current in case of loss an AC Phase (optional):

This compensation is also enabled or disabled in Level-2. When enabled, in order to protect all power components, the rectifier output current will be de-rated by a preset % (ex. 34%) in case of loss of a phase.

Exemple-2:

Current Limit = 150A
Compensation percentage = 34%

If one phase is lost, the new current limit value will be set automatically at:

New Current Limit value = $150 - \left(\frac{34\times 150}{100} \right) = 99A$

9. REMOTE SENSING

Remote sensing function regulates the DC output voltage at the battery terminals instead of battery charger DC output terminals. It compensate for voltage drop in the DC wiring between the battery charger and the battery. The LCD display shows constantly the actual voltage at the battery terminals.

For remote sensing wiring, follow instructions on electrical schematic.

DANGER!

There are LIVE TERMINALS and components inside the battery charger even after turning OFF AC and DC breakers.

10. TROUBLESHOOTING

Should any problem occur with your charger/rectifier, please, read the following.

Warning!

Insure that qualified electricians perform all electrical work or properly trained persons, under direct supervision of a qualified electrician, service this equipment. The battery and AC supply must be disconnected before replacing any component. After disconnecting AC supply and batteries, wait 10 minutes to allow internal capacity to be completely discharged.

Observe all safety precautions!

Fault	Possible root cause	Recommendation
No DC Output	**1.** Open AC Breaker;	- Verify that AC breaker is closed ("ON"). Check for AC voltage on both sides of the breaker;
	2. AC Input failure;	- Verify that the AC supply is of correct voltage and frequency;
	3. DC fuse blown;	- Verify the DC output fuse;
	4. Open blocking diode;	- Check blocking diode (if provided);
	5. Open or loose connection;	- Check all wiring from Input to Output for open or loose connections (Refer to schematic);
	6. Control board failure;	- Replace control board;
	7. SCR module failure;	- Verify SCR modules and replace if needed;
	8. High Volt Shutdown alarm;	- In case of High Voltage Shutdown Alarm: Turn OFF the AC and DC breakers for 5 minutes then restart;
DC fuse blows or DC breaker trips	**1.** Freewheeling diode failure;	- Check the freewheeling diode for short circuit;
	2. Control board failure;	- Replace control board;
	3. SCR module failure;	- Verify SCR modules and replace if needed;
	4. Battery connections reversed;	- Verify polarity of battery connections;
	5. DC filter failure;	- Check for shorted DC filter Capacitor;
AC breaker trips	**1.** Short circuit;	- Check for shorts from Input to Output connections (Refer to schematic);
	2. SCR, Diode or control board failure;	- Replace defective component;
Low voltage alarm	- Charger overload;	- Check if the charger is in the current limit mode. Check the load for problems;
	- AC Input failure;	- Verify that the AC supply is of correct voltage and frequency;
	- Float, equalize and/or low voltage alarm adjustments affected;	- Refer to the adjustment procedures to reset;
High ripple voltage	**1.** AC line is too high;	- Read Input voltage and rectify the problem. Verify that the AC supply is of correct voltage and frequency;
	2. Defective filter capacitor;	- Disconnect the capacitor(s) to observe any change in the output voltage ripple. Replace capacitor(s) if needed;
	3. SCR, Diode or control board failure;	- Replace defective component;

Fault	Possible root cause	Recommendation
High Output Current	**1.** Float and (or) Equalize Current limits improperly set; **2.** Shunt signal problem; **3.** Affected calibration;	- Refer to the adjustment procedures to reset; - Check shunt signal connection to control board (Refer to schematic); - Check with an external ammeter and compare reading with current value on the display;
Low Output Current	**1.** Float and (or) Equalize Current limits improperly set; **2.** Affected calibration; **3.** Loose connection;	- Refer to the adjustment procedures to reset; - Check with an external ammeter and compare reading with current value on the display; - Check power wiring for loose connection (Refer to schematic);
Abnormal noise	**1.** SCR firing circuit problem; **2.** Unbalanced current at the AC Input / Output of power transformer; **3.** SCR module failure; **4.** Control board failure;	- Check if all LEDs on control board are ON: One LED blinking, 2 solid for 1Phase system and 6 solid for 3Phase system; - Check if current is balanced at the Input and the Output of Power Transformer - Verify SCR modules and replace if needed; - Replace control board;

If the problem persists, contact our service department.

11. REGULAR PREVENTIVE MAINTENANCE

Regular maintenance is required to ensure reliable operation of your system.

	Action	Frequency
B	Measure and record voltage across each battery cell and across the entire battery	monthly
B	Verify and record the level of electrolyte in each battery cell. If necessary top off with distilled water.	monthly
B	Verify and record the specific gravity of each battery cell	monthly
C	Verify the operation of all indicators	monthly
B, C	***VERY CAREFULLY*** (especially if you are dealing with the conductive substances) remove the accumulated dust around the ventilation openings, charger interior, surfaces of circuit boards & electrical connectors/terminals.	As needed, depending on the environmental conditions of the site, but **minimum once a year**
B, C	Visually verify the condition of all components	yearly
B, C	Verify all bolted connections. If necessary, use a torque wrench to retighten to manufacturers specifications	yearly
B	Clean and grease all battery connections	As needed, depending on the environmental conditions of the site, but **minimum once a year**
B	Wash the battery cells using distilled water only	As needed, depending on the environmental conditions of the site, but **minimum once a year**

B = battery C = charger

For systems supplied with lead acid batteries, a partial discharge of the battery is recommended on an annual basis, to verify the battery and charger performances. For systems supplied with nickel-cadmium batteries a complete discharge and decommissioning charge is recommended on a bi-annual basis.

FIGURE LIST

ACRONYM LIST

- ***Flt*** : Float Mode;
- ***Eq*** : Equalize Mode;
- ***Next*** : Access to Next menu and sub-menu;
- ***Pr*** : Access to Previous menu and sub-menu;
- ***Ok*** : Confirm access to active menu;
- ***Exit*** : Exit active menu;
- ***AC*** : Alternating Voltage / Current;
- ***DC*** : Continuous Voltage / Current;
- ***IBatt*** : Battery Current;
- ***VRect*** : Rectifier Voltage;
- ***V-/CHASS*** : Voltage between Negative output and chassis;
- ***V+/CHASS*** : Voltage between Positive output and chassis;
- ***RemTEq*** : Remaining Time for Equalize;
- ***ElapsTEq*** : Elapsed Time for Equalize;
- ***BoardTemp*** : Control Board Temperature (Internal Temperature);
- ***Batt Temp*** : Battery Temperature;
- ***VTest*** : Battery end Voltage reference (Battery Test Mode);
- ***ITest*** : Battery discharging Current reference (Battery Test Mode);
- ***TTtest*** : Battery discharge Time reference (Battery Test Mode);
- ***ILim1*** : Current Limit for Float Mode;
- ***ILim2*** : Current Limit for Equalize Mode;
- ***Periodic*** : For Periodical Equalization;
- ***LVEq*** : Low Volt Equalize;
- ***LCapEq*** : Low Capacity Equalize
- ***ACEq*** : AC Failure Equalize;
- ***ILimEq*** : Current Limit Equalize;
- ***EqTSecurit*** : Equalize Time Security;
- ***VPostChg*** : Equalize termination with Voltage Post-Charge option;
- ***IPostChg*** : : Equalize termination with Current Post-Charge option;
- ***TPostChg*** : : Equalize termination with Temperature Post-Charge option;
- ***VForm*** : Voltage for Battery Formation Mode;
- ***IForm*** : Current for Battery Formation Mode;
- ***TCompVolt*** : Voltage Temperature Compensation;
- ***FS*** : Fail Safe Mode; Relay coils are de-energized when associated alarms occur;
- ***NFS*** : Standard Mode; Relay coils are energized when associated alarms occur;
- ***EnblCOMRelay*** : Enable Common Relay (if applicable);
- ***HVAL1*** : Battery High Voltage Alarm level;
- ***LVAL1*** : Battery Low Voltage Alarm level;
- ***GNDF+*** : Positive Ground Fault level;
- ***GNDF-*** : Negative Ground Fault level
- ***Rect. Fail*** : Rectifier Failure Alarm level;
- ***HVAL2*** : Rectifier High Voltage Alarm level;
- ***HVSH*** : High Voltage Shutdown Alarm level;
- ***LVAL2*** : Rectifier Low Voltage Alarm level;
- ***EnDis*** : End of Discharge;
- ***HIntT*** : Charger High Temperature Alarm level;
- ***LIntT*** : Charger Low Temperature Alarm level;
- ***HExtT*** : Battery High Temperature Alarm level;
- ***LExtT*** : Battery Low Temperature Alarm level;
- ***ACHV*** : AC High Voltage Alarm level;
- ***ACLV*** : AC High Voltage Alarm level;

- ***ILow*** : Rectifier Low Current Alarm level;
- ***IHigh***: Rectifier High Current Alarm level;
- ***ILBat*** : Battery Low Voltage alarm level;
- ***IHBat*** : Battery High Current Alarm level;
- ***HCap*** : Battery High Capacity Alarm level;
- ***LCap*** : Battery Low Capacity Alarm level;
- ***PCOM*** : Communication Board;
- ***PM*** : Measurements board;
- ***Frequency Al*** : Frequency Alarm;
- ***VCell*** : Maximum Voltage unbalancing Error allowed;
- ***Probe Al***: Probe Alarm;
- ***COM Relay*** : Common Relay;

LCD MESSAGES LIST

- **Soft Start** : Battery Charger progressive Start;
- **Float** : Battery charger in Float mode;
- **Equalize**: Battery charger in Equalize mode;
- **Formation** : Battery charger in Formation mode;
- **Current Limit1** : Battery charger in Float Current Limit mode;
- **Current Limit2** : Battery charger in Equalize Current Limit mode;
- **Current Limit3** : Battery charger in Formation Current Limit mode;
- **AC OUT** : Message in case of AC failure;
- **VAC1**, (**VAC2** & **VAC3** for 3 Phase system) : AC Voltage readings;
- **IAC1**, (**IAC2** & **IAC3** for 3 Phase system) : AC Current readings;
- **IBatt** : Battery Current;
- **Battery Test Run** : The charger is in Battery Test Mode;
- **Batt Test Stop** : Battery Test Stopped;
- **Formation Start** : The charger is in Battery Formation Mode;
- **Formation Sop** : Formation mode stopped;
- **Not Available!** : Active function not applicable for your system;
- **Not Permitted!** : Test interrupted because test conditions are not verified;
- **Are You Sure?** : Confirm active operation;
- **Synchro Ok** : Synchronization succeeds ;
- **Save?** : Confirm value modification;
- **Reset (…) Ok** : Reset operation for active function (…) succeeds;
- **Batt High Volt** : Battery High Voltage alarm;
- **Batt Low Volt** : Battery Low Voltage alarm;
- **Ground Fault +** : Positive Ground Fault alarm;
- **Ground Fault -** : Negative Ground Fault alarm;
- **AC Fail** : AC Failure alarm;
- **Rectifier Fail** : Rectifier Failure alarm;
- **Rect High Volt** : Rectifier High Voltage alarm;
- **HV Shutdown** : High Voltage Shutdown alarm;
- **Rectif Low Volt** : Rectifier Low Volt alarm;
- **Charger HighTemp** : Charger High Temperature alarm;
- **Charger Low Temp** : Charger Low Temperature alarm;
- **Battery HighTemp** : Battery High Temperature alarm;
- **Battery Low Temp** : Battery Low Temperature alarm;
- **AC High Voltage** : AC High Voltage alarm;
- **AC Low Voltage** : AC Low Voltage alarm;
- **High Ripple** : High Ripple alarm at the DC output;
- **Rect Low Current** : Rectifier Low Current alarm;
- **Rect HighCurrent** : Rectifier High Current alarm;
- **Batt Low Current** : Battery Low Current alarm;
- **Batt HighCurrent** : Battery High Current alarm;
- **High Capacity** : Battery High Capacity alarm;
- **Low Capacity** : Battery Low Capacity alarm;
- **PCOM Fail** : Communication alarm problem between PCOM (communication board) and control board;
- **PM Fail** : Communication alarm problem between PM (Measurements board) and control board;
- **Frequency Fail** : Frequency Failure alarm;
- **Defective Cell** : Defective cell for unbalanced battery alarm;
- **Defective Probe**: Defective temperature probe (probe shorted);
- **Batt Discharging**: Battery is Discharging (Battery is providing current to the load);

ELECTRICAL / ELECTRONIC PRODUCTS WARRANTY

The Manufacturer Warrants to the original user that its rectifying equipment, load banks, DC-DC converters, chargers and UPS systems are free from defects in factory workmanship and materials, such warranty being conditional upon the product having been installed, commissioned, operated and maintained by qualified personnel and according to manufacturer instructions.

Our liability is limited to repairing or replacing without charge at its factory any product or component which at user's expense has been returned to our plant or authorized service center within 1 year from date of commissioning or 18 months from shipment, whichever occurs first. The manufacturer repair or replacement of any defective product shall constitute fulfillment of his obligations.

This warranty applies to manufacturer products which are shown by the purchaser to have been originally defective and shall not apply to products which must be repaired or replaced due to normal wear, misuse, negligence, wreckage, accident, any Act Of God or to products which have been repaired or altered outside of seller's factory or one of its authorized service centers unless authorized solely by the manufacturer.

The manufacturer shall not be liable for loss, damage, or expense, consequential or otherwise from the use of its products or from any other cause.

This warranty supersedes and is given in place of all other warranties expressed or implied or conditions whether statutory or otherwise as to quality and fitness for any purpose for which the products are supplied. No person, agent or dealer is authorized to give any warranty on behalf of manufacturer or to assume for seller any other liability in connection with any of its products unless made in writing and signed by an officer of the manufacturer.

APPENDIXES

- Appendix-1 : Level-2 (Advanced Level);
- Appendix-2 : Battery Capacity Test;
- Appendix-3 : Communication;
- Appendix-4 : Ampere-Hour meter;
- Appendix-5 : Digital Inputs;
- Appendix-6 : Web Page;
- Appendix-7 : Signal Transducer;
- Bill Of Material;
- Electrical Schematic;
- Mechanical Drawings;
- Test Report;

Important!

- ***Appendix-1 is included only for qualified expert users or authorized manufacturer trained service personnel or distributors / sellers.***

- ***Other Appendixes listed above, but not limited to, are included if the respective options have been purchased.***

Communication

User Manual
Appendix 3

27/01/2015

Table of contents

1. CONFIGURATION

The Primax PCOM Communication Card operates in the following modes:

a. Slave Modbus RS-232/485
b. Slave Modbus TCP/IP
c. Slave DNP3 (available only in the R232/485).

The RS-232/485 operates with 8 bits, 1 start and 1 stop bit. The speed of the transmission is configured on the **PCOM** board, and selected by switch SW2 (see table 2). The available speeds are 1200, 2400, 4800, 9600 (default), 19200, 38400 and 56000 baud. The address of the PCOM card is on board configurable by switch SW3 (see table 3, and table 8). The default address is “1“for Modbus and “10” for DNP3. The protocol of communication Modbus RS232/485, Modbus TCP/IP or DNP3 is selected by switch SW1 (see table 1).

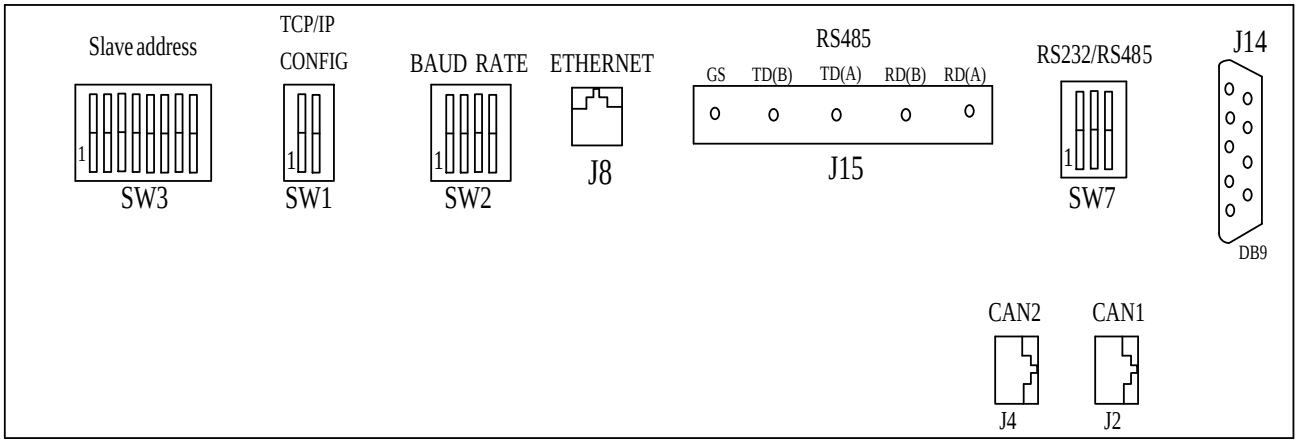


Figure 1. PRIMAX communication card PCOM. Layout

1.1 COMMUNICATION PROTOCOL

The switch SW1 allows for choosing a communication protocol: Modbus RTU, Modbus TCP/IP or DNP3.

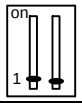
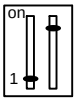
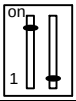
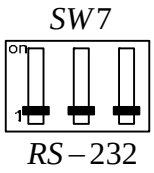
Position of SW1	Chosen protocol
	MODBUS RS232/485
	MODBUS TCP/IP
	DNP3 RS232/485

Table 1: Communication protocol

1.2 RS-232 CONNECTION

The RS-232 standard allows only a single point-to-point connection. The cable needed for the RS-232 communication is a standard one with DB9 male and female connectors. The DB9 male is connected at the **PCOM** side and the DB9 female is connected at the customer DTE**.** The cable can be 15.2m (50 ft) long maximum. To connect to the RS232 via (DB9), the switch SW7 must be set to (off/off/off) as shown below.



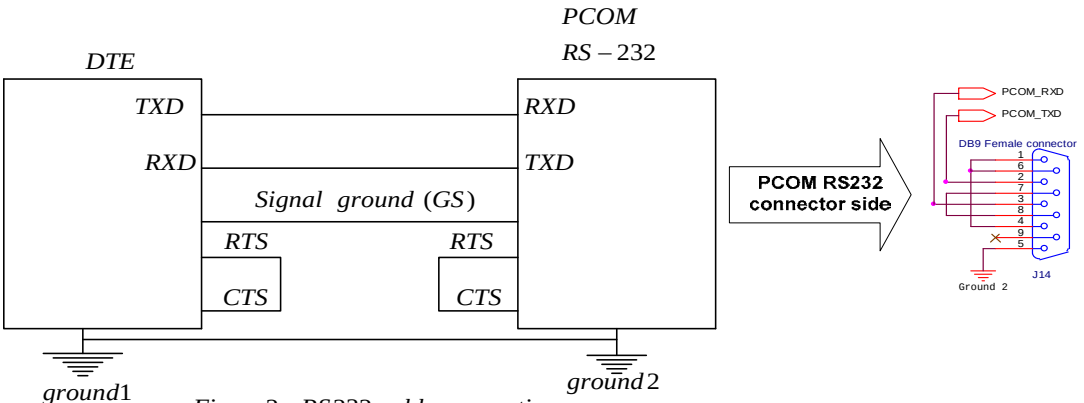


Figure 2: RS232 cable connection

1.3 RS-485 CONNECTION

To connect to the RS485 port, the switch SW7, must be set to (on/on/on) as shown below

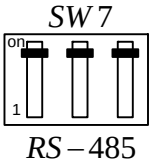


Figure 3, provides the wiring connection to the RS485.

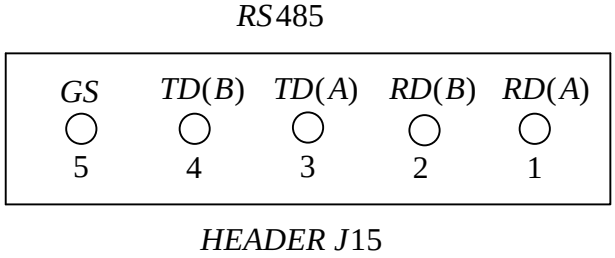


Figure3: Connector RS485

5: GS
4: TD (B)
3: TD (A)
2: RD (B)
1: RD (A)

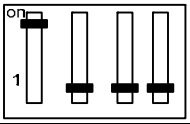
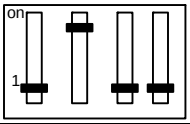
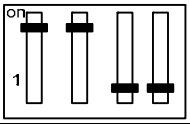
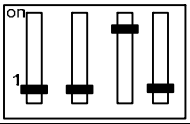
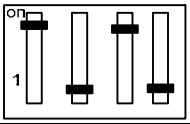
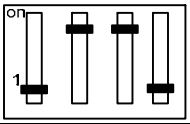
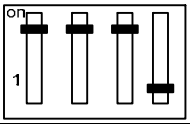
Position of SW2	Communication speed (baud)
	300
	1200
	2400
	9600
	19200
	38400
	56000

Table 2 speed of communication according to the position of the switch

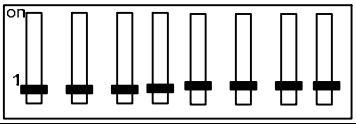
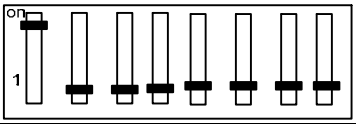
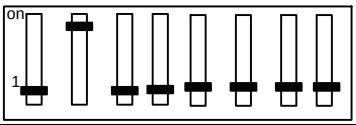
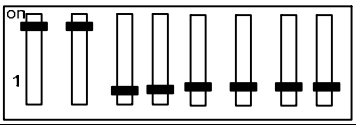
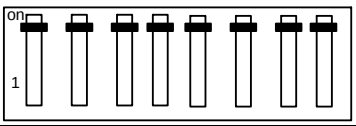
Position of SW3	Slave address
	0
	1
	2
	3
.	.
.	.
	256

Table3: address of communication according to the position of the SW3 switch

1.4 ETHERNET TCP/IP CONNECTION

1.4.1 Network precautions: before you start

The Primax **PCOM** board, provided in your kit is designed to connect to a network over Ethernet. As with any system, however, some precautions are in order before you connect. Whenever new hardware or software is added to a network, it is always advisable to create a separate test network that is isolated from your LAN. This allows testing the new system in a controlled environment and minimizes the possibilities of network interference from the new equipment. The major sources of potential interference include:

- **Addressing.** Each device on the network must have a unique address. If Dynamic Host Configuration Protocol (DHCP) is in use, The Primax **PCOM** board will automatically acquire a valid IP address. If DHCP is not used, or a fixed address is required, adding the board to the network without assigning an address may create network conflicts.
- **Traffic levels.** While the on-board Ethernet controller will filter out unwanted messages, a highly loaded network with many broadcast messages may place a sizable burden on the **PCOM** board.
- **Data Security.** Although it is unlikely that the addition of a single device will compromise the integrity or privacy of sensitive information, it is always a good idea to perform extensive testing with new equipment before adding it to a secure network.
- **Experimentation.** Even as a simple microcontroller-based device, the PCOM is capable of generating a high volume of network traffic which may severely disrupt normal network operations.

1.4.2 Using PCOM board with a local host system

The **PCOM** can communicate directly with a properly configured desktop system, known here as a *local host system*. In this configuration, the host system can communicate and configure the board through its network connection; it can also configure the board through the serial port. When configured this way, the setup is referred to as a *test system*.
The **PCOM** can also communicate to a network and a local host system separately. In this setup, the board participates on the network through its Ethernet connection. At the same time, it is connected to the local host system through the serial port, from which it can be directly configured.
To function as a local host, the system must meet the following basic requirements:

- Any computer system capable of network communication.
- Standard Ethernet card or integrated adapter, capable of supporting 100 Mbps operation, with RJ45 connector.
- One available standard serial port with a matching COM port available through the operating system.
- Any operating system with TCP/IP Stack software.
- Any terminal emulation package, such as HyperTerminal for Microsoft® Windows® operating system (optional for configuring the PCOM board's IP Address).

1.4.3 Connecting the PCOM board

There are two basic network configurations for the **PCOM** board: direct connection to a network and connection to a local host system through a crossover cable. If DHCP is not enabled on the network, the board will need to be configured before a direct network connection can be used. If you are connecting the **PCOM** board to a DHCP-enabled network, follow the steps in **Section "Connecting to a Network"**.
If you are using the board for the first time on a network using fixed IP addresses, follow the steps in **Section "Connecting directly to a Host System".** Once the IP address is configured the first time, you will be able to connect the board directly to the network as described in **Section "Connecting to a Network" w**ithout using a local host. If you are connecting the board to a local host in a test system configuration, you will also follow the steps in **Section connecting directly to a Host System.** If DHCP is enabled on the local host, the board will configure itself. Otherwise, you will need to configure both the host and board IP addresses according to the directions in **Section "Configuring the PCOM Board".**

1.4.4 Connecting to a Network

This configuration is the basic method of networking the **PCOM** board. This assumes there is a stable Ethernet network using TCP/IP for communications and that at least one DHCP server is present on the network. To set up the board for direct networking (Figure 4), connect the straight-through Ethernet cable to the board at Ethernet connector "ETHERNET", then to the Ethernet network. This can be at a network port or an available port on a network device (such as a switch or router).

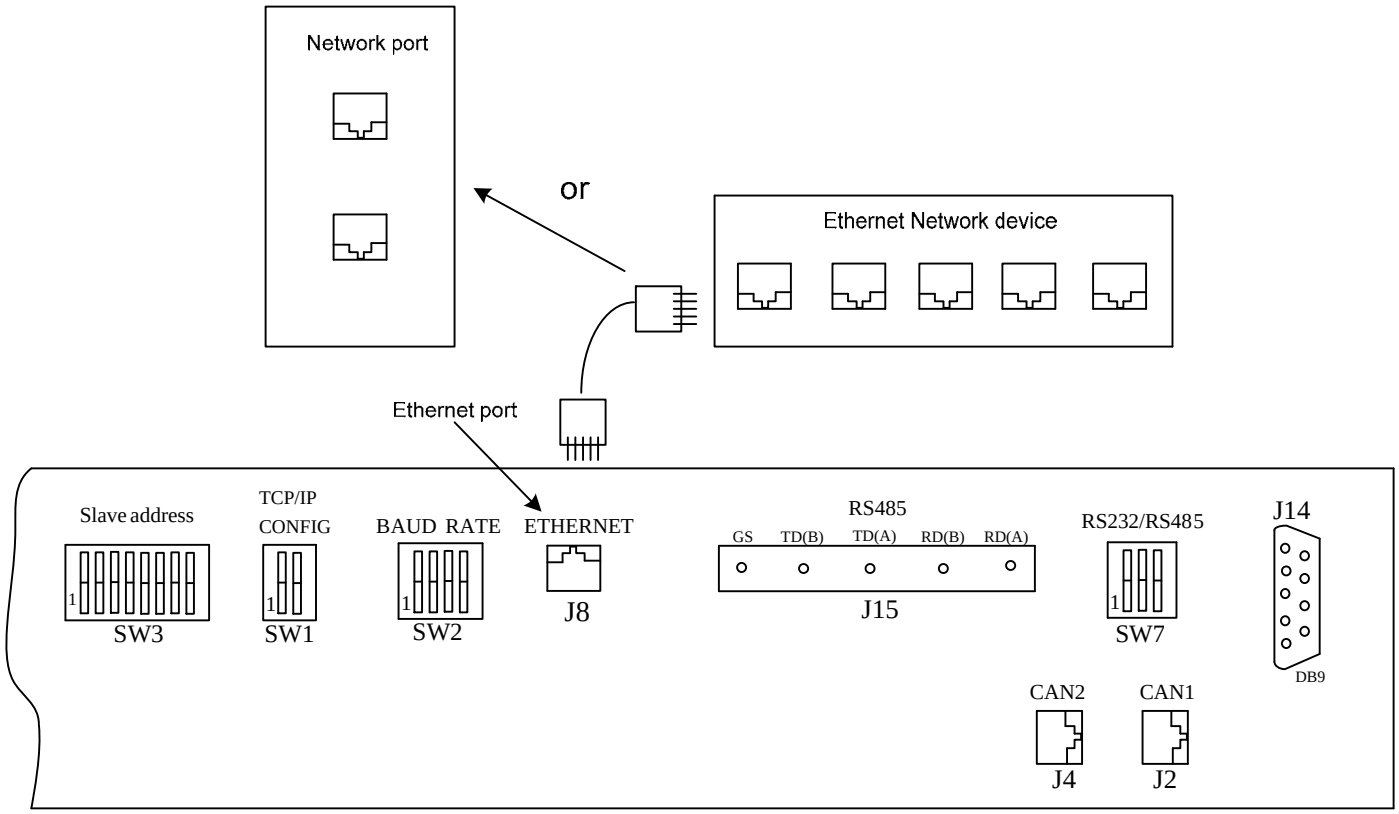


Figure 4. CONNECTING THE PCOM BOARD TO A NETWORK

1.4.5 Connecting Directly to a Host System

This option is used under the following situation:

- Operation on an isolated network is desired or;
- Connection to a deployed network is not possible.

To set up the board for connection to a local host (Figure 5):

1. Connect a serial cable to the board (optional for configuring the PCOM board's IP Address), then to the available serial port on your computer.
2. Depending on the network connection to be used do one of the following: **For connections through an Ethernet switch:** Connect a standard Ethernet cable to the board, then to a port on the Ethernet device (Option A in Figure 5). The computer should already be connected to the switch by a straight-through cable. **For direct connections to a host system:** Connect the Ethernet crossover cable to the board, then to the computer (Option B in Figure 5).

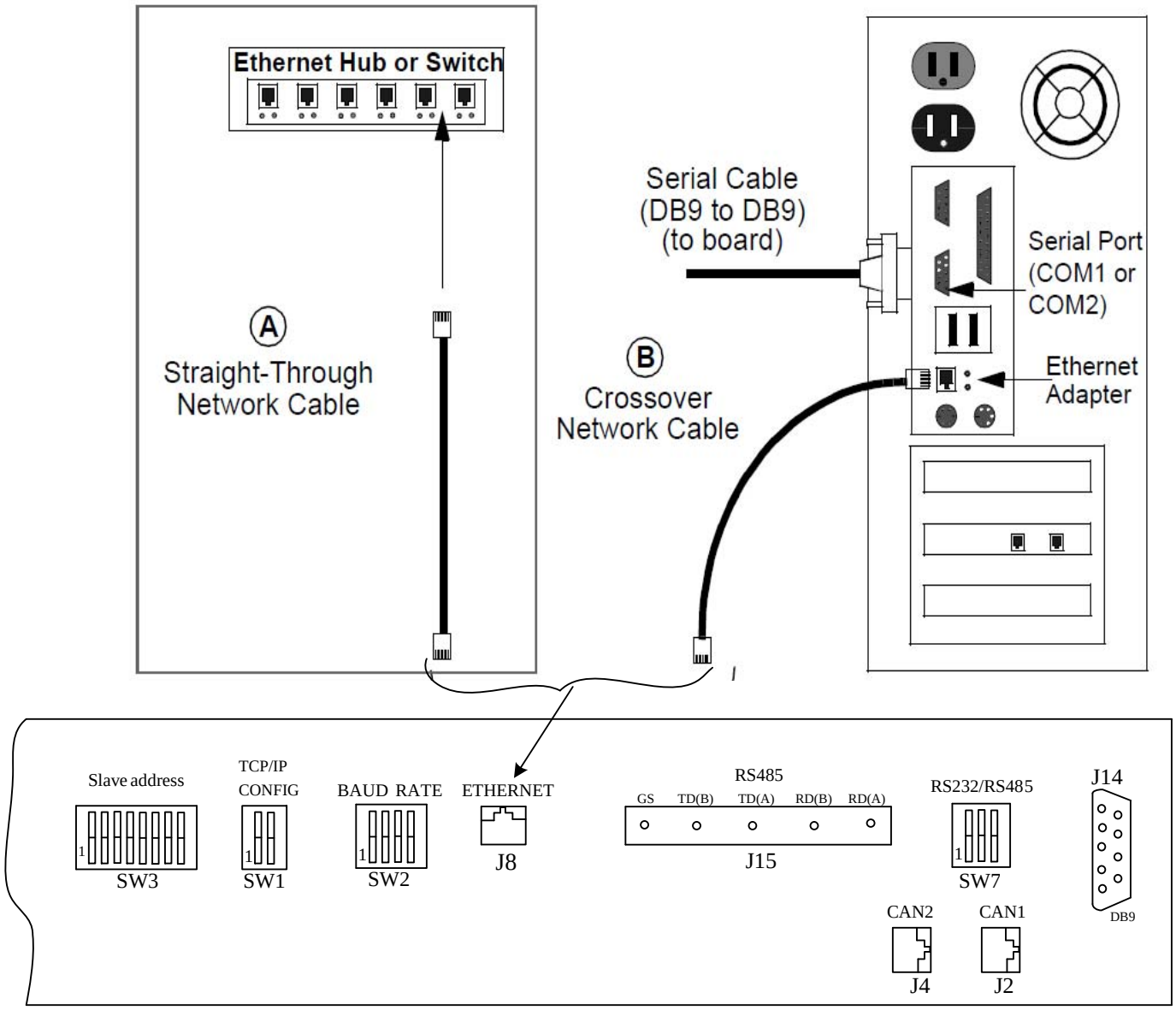


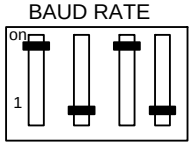
Figure 5. CONNECTING THE PCOM BOARD TO A NETWORK

1.4.6 Configuring the PCOM board

Once the **PCOM** board is properly connected, it needs to be configured to operate on the network or with the host system that it is connected to. As already mentioned, the board is factory-configured for DHCP operation; it should automatically acquire an IP address on DHCP-enabled networks and be available for immediate use. If your **PCOM** board is connected to a network without DHCP support, you will need to assign an IP address to the board. Follow the directions in **Section "Configuring the PCOM board's IP Address".**

1.4.6.1 Configuring the PCOM board IP Address

By default, the **PCOM** board uses serial configuration to assign a permanent IP address to the board. The IP configuration is written to the board's EEPROM using a direct serial connection between the board and a host system.
To configure the **PCOM** board through the serial port:
1. From the Start menu, select *Programs* > *Accessories*> *Communications* > *HyperTerminal.*
2. At the initial "Connection description" dialog box, enter a name for the connection. You may call the terminal session any name that you can easily remember. Click **OK**.
3. At the "Connect To" dialog box that follows, choose the appropriate COM port from the drop-down menu. Click **OK**.
4. At the "COM Properties" dialog box that follows, select the following settings:
Bits per second: 19200
Data bits: 8
Parity: none
Stop bits: 1
Flow Control: none
Click **OK**. The Terminal window opens with a flashing cursor. The message, "Connected", appears in the status bar at the bottom of the Terminal window, along with an elapsed time display.
5. From the menu bar, select *Files*>*Properties*, then the **Settings** tab on the "Properties Dialog". Click on the **ASCII Setup** button and check the **Echo typed characters locally** check box in the following dialog box. Click on **OK** to exit the dialog, and then **OK** to exit the "Properties Dialog".
6. In the **PCOM** board configure the switch "BAUD RATE" (Figure 6) and restart **PCOM** board.



SW2
Figure 6

The terminal responds with the serial configuration menu: Figure 7 (values shown below are given as example).

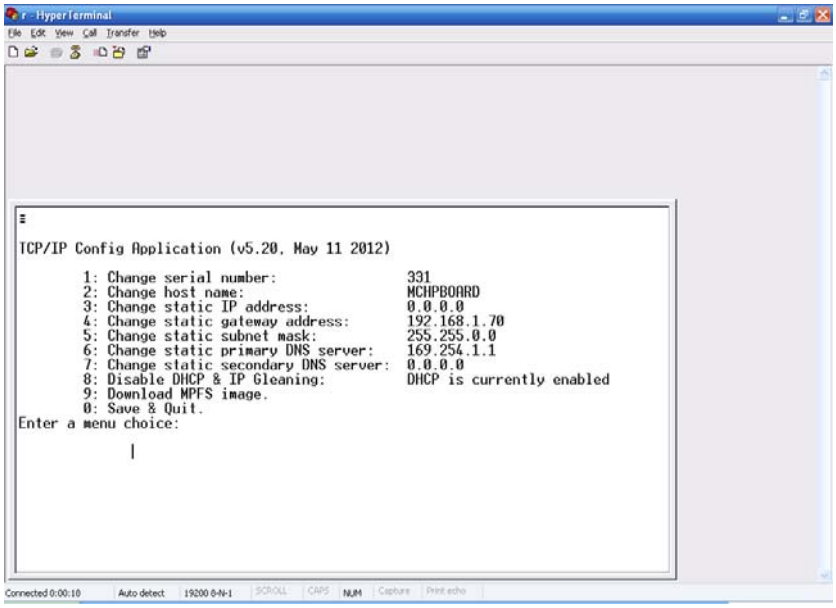


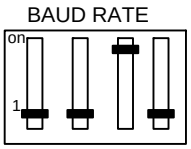
Figure 7

7. Select option “3” at the prompt, enter the board’s new IP address based on the configuration you are using:
If the board is connected to the local host system through a crossover cable: Use your host system’s IP address, incremented by one, in the final position. For example, if the host system’s IP address is “169.225.150.10” enters **“**169.225.150.11”.
If the board is connected to a fixed address network: Use the IP address assigned by your system administrator. Press <ENTER>.

8. Select option “8” to disable DHCP. This menu will configure the board to use the manually assigned IP address. If DHCP is disabled, text for option “8” will change to: “**8: Enable DHCP & IP Gleaning: DHCP is Currently disabled**” To re-enable DHCP, select option “8”.

9. Select option “0” to save changes and quit.

10. In the **PCOM** board reconfigure the switch “BAUD RATE” as shown on (Figure 8), and restart **PCOM** board.



SW2
Figure 8

11. Close the terminal session. For your convenience, you may save the terminal session when prompted. You are now ready to communicate with the board.

1.4.6.2 Display IP address

The IP address assigned by the server to **PCOM** card is displayed on the LCD display charger (Figure 9).

Display example:

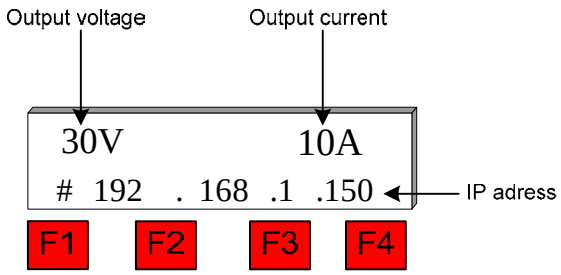


Figure 9

2. MODBUS RTU

2.1 RAM MEMORY MAP

The following map shows the structure RAM of the **PCOM** card. (**R)** mean «**readable** » and (**W**) mean « **writable** ».
The function available is: Holding register (03), input register (04), write register (06), and preset multiple register (16).

Variable	Unit	Address (hex)	Address (dec)	Byte	State	Note
Output voltage	V	01	1	2	R	note(1)
Output current	A	02	2	2	R	note(1)
Battery current	A	03	3	2	R	note(2)
AC volt phase 1	V	04	4	2	R	note(1)
AC volt phase 2	V	05	5	2	R	note(1)
AC volt phase 3	V	06	6	2	R	note(1)
AC current phase 1	A	07	7	2	R	note(1)
AC current phase 2	A	08	8	2	R	note(1)
AC current phase 3	A	09	9	2	R	note(1)
Battery temperature	°C	0AH	10	1	R	note(3)
Control board & inside temperature	°C	0AL	10	1	R	note(3)
AC frequency	Hz	0B	11	2	R	note(1)
Nominal output voltage	V	0C	12	2	R	note(1)
Nominal output current (Shunt1)	A	0D	13	2	R	note(1)
Float voltage	V	0E	14	2	R/W	note(1)
Equalize voltage	V	0F	15	2	R/W	note(1)
Float Current limit	A	10	16	2	R/W	note(1)
Equalize Current limit	A	11	17	2	R/W	note(1)
Formation voltage	V	12	18	2	R/W	note(1)
Formation current	A	13	19	2	R/W	note(1)
Formation relay		14H	20	1	R/W	note(3)
Formation remaining time	H	14L	20	1	R/W	note(3)
Formation time	H	15H	21	1	R/W	note(3)
Charger state		15L	21	1	R	note(8)
Charger configuration		16	22	2	R/W	note(7)
Equalize mode start		17	23	2	R/W	note(9)
Equalize remaining time out	mn	18	24	2	R	note(4)
Equalize elapsed time out	mn	19	25	2	R	note(4)
Manual equalize time out	H	1AH	26	1	R/W	note(3)
Periodical equalize time	H	1AL	26	1	R/W	note(3)
Periodical equalize period (delay)	H	1BH	27	1	R/W	note(3)
DC Low volts equalize time out	H	1BL	27	1	R/W	note(3)
DC Low volts equalize level	V	1C	28	2	R/W	note(1)
AC fail equalize time out	H	1DH	29	1	R/W	note(3)
AC fail equalize delay	S	1DL	29	1	R/W	note(3)
Refresh equalize time out	mn	1EH	30	1	R/W	note(3)
Refresh equalize period (delay)	H	1EL	30	1	R/W	note(3)
Remote equalize time out	H	1F H	31	1	R/W	note(3)
Current limit equalize time out	H	1FL	31	1	R/W	note(3)
Current limit equalize delay	S	20H	32	1	R/W	note(3)
Equalize termination (On/Off)		20L	32	1	R/W	note(10)
Post Charge Voltage delay	mn	21	33	2	R/W	note(4)

Post charge current delay	mn	22	34	2	R/W	note(4)
Post charge current Percentage	%	23H	35	1	R/W	note(3)
Equalize safety time (Eq T security)	H	23L	35	1	R/W	note(3)
DC output voltage temperature compensation	%	24	36	2	R/W	note(6)
DC output current temperature compensation (TCompAmp)	%	25H	37	1	R/W	note(3)
Current temperature threshold (Tref)	°C	25L	37	1	R/W	note(3)
Charger mode enabling		26	38	2	W	note(21)
password		27	39	2	W	note(4)
Alarms status		28	40	2	R	note(11)
Alarm status		29	41	2	R	note(12)
Alarms authorization (ON/OFF)		2A	42	2	R/W	note(13)
Alarm authorization (ON/OFF)		2B	43	2	R/W	note(14)
Alarms Relays latch authorization		2C	44	2	R/W	note(15)
Alarms Relays latch authorization		2D	45	2	R/W	note(16)
Alarm messages latch authorization		2E	46	2	R/W	note(17)
Alarm messages latch authorization		2F	47	2	R/W	note(18)
Alarm failsafe		30	48	2	R/W	note(19)
Alarms failsafe		31	49	2	R/W	note(20)
Rectifier high volts alarm level	V	32	50	2	R/W	note(1)
Battery high volts alarm level	V	33	51	2	R/W	note(1)
Rectifier low volts level	V	34	52	2	R/W	note(1)
Battery low volts level	V	35	53	2	R/W	note(1)
High volts shutdown level	V	36	54	2	R/W	note(1)
End of Discharge level	V	37	55	2	R/W	note(1)
Negative Ground fault alarm level	mA	38	56	2	R/W	note(1)
Positive ground fault level	mA	39	57	2	R/W	note(1)
Control board & inside high temperature level	°C	3A	58	2	R/W	note(4)
Battery high temperature level	°C	3B	59	2	R/W	note(4)
Battery low temperature level	°C	3C	60	2	R/W	note(4)
AC high volts alarm level	V	3D	61	2	R/W	note(1)
AC low volts alarm level	V	3E	62	2	R/W	note(1)
High DC current alarm level	A	3F	63	2	R/W	note(1)
Low DC current alarm level	A	40	64	2	R/W	note(1)
High ripple alarm level	V	41	65	2	R/W	note(1)
Cell failure alarm level	V	42	66	2	R/W	note(1)
Delay to initiate Rectifier high volts alarm (time)	S	43H	67	1	R/W	note(3)
Delay to initiate Battery high volts alarm (time)	S	43L	67	1	R/W	note(3)
Delay to initiate Rectifier low volts alarm (time)	S	44H	68	1	R/W	note(3)
Delay to initiate Battery low volts alarm (time)	S	44L	68	1	R/W	note(3)
Delay to initiate High volts shutdown alarm (time)	S	45H	69	1	R/W	note(3)
Delay to initiate End of Discharge alarm (time)	S	45L	69	1	R/W	note(3)
Delay to initiate Negative Ground fault alarm (time)	S	46H	70	1	R/W	note(3)
Delay to initiate Positive ground fault alarm (time)	S	46L	70	1	R/W	note(3)
Delay to initiate AC fail alarm (time)	S	47H	71	1	R/W	note(3)
Delay to initiate Rectifier alarm (time)	S	47L	71	1	R/W	note(3)
Delay to initiate Control board & inside high temperature alarm (time)	S	48H	72	1	R/W	note(3)
Delay to initiate Battery high temperature alarm (time)	S	48L	72	1	R/W	note(3)
Delay to initiate Battery low temperature alarm (time)	S	49H	73	1	R/W	note(3)
Delay to initiate AC high volts alarm (time)	S	49L	73	1	R/W	note(3)
Delay to initiate AC low volts alarm (time)	S	4AH	74	1	R/W	note(3)
Delay to initiate High DC current alarm (time)	S	4AL	74	1	R/W	note(3)

Delay to initiate Low DC current alarm (time)	S	4BH	75	1	R/W	note(3)
Delay to initiate High ripple alarm alarm (time)	S	4BL	75	1	R/W	note(3)
Reserved						
Delay to initiate Cell failure alarm alarm (time)	S	4CL	76	1	R/W	note(3)
Rectifier high volts alarm relay/ Battery high volts alarm relay		4DH	77	1	R/W	note(5)
Rectifier low volts relay/ Battery low volts alarm relay		4DL	77	1	R/W	note(5)
High volts shutdown relay/ End of Discharge relay		4EH	78	1	R/W	note(5)
Negative Ground fault alarm relay/ Positive ground fault relay		4EL	78	1	R/W	note(5)
AC fail alarm relay/ Rectifier alarm relay		4FH	79	1	R/W	note(5)
Control board & inside high temperature relay/ Battery high temperature relay		4FL	79	1	R/W	note(5)
Battery low temperature relay		50H	80	1	R/W	note(3)
AC high volts alarm relay/ AC low volts alarm relay		50L	80	1	R/W	note(5)
High DC current relay/ Low DC current relay		51H	81	1	R/W	note(5)
High ripple alarm relay		51L	81	1	R/W	note(3)
Equalize alarm relay		52H	82	1	R/W	note(3)
Cell failure alarm relay		52L	82	1	R/W	note(3)
Year		53H	83	1	R/W	note(0)
Month		53L	83	1	R/W	note(0)
Day		54H	84	1	R/W	note(0)
Hour		54L	84	1	R/W	note(0)
Minute		55H	85	1	R/W	note(0)
Second		55L	85	1	R/W	note(0)
Input contact state		56H	86	1	R/W	note(3)
Input contact preset function 1/2		56L	86	1	R/W	note(5)
Input contact preset function 3/4		57H	87	1	R/W	note(5)
Input contact message assignment # 1/2		57L	87	1	R/W	note(5)
Input contact message assignment # 3/4		58H	88	1	R/W	note(5)
Input contact relay assignment # 1/2		58L	88	1	R/W	note(5)
Input contact relay assignment # 3/4		59H	89	1	R/W	note(5)
Battery test fail alarm relay / Battery test relay		59L	89	1	R/W	note(5)
Battery test mode		5AH	90	1	R/W	note(3)
Alarms Reset		5AL	90	1		note(3)
Reference current (battery test)	A	5B	91	2	R/W	note(1)
Reference voltage (battery test)	V	5C	92	2	R/W	note(1)
Reference time (battery test)	mn	5D	93	2	R/W	note(4)
Reserved		5E	94	2		
Reserved		5F	95	2		
Message10		60	96	2	R/W	note(4)
Message11		61	97	2	R/W	note(4)
Message12		62	98	2	R/W	note(4)
Message13		63	99	2	R/W	note(4)
Message14		64	100	2	R/W	note(4)
Message15		65	101	2	R/W	note(4)
Message16		66	102	2	R/W	note(4)
Message17		67	103	2	R/W	note(4)
Message20		68	104	2	R/W	note(4)
Message21		69	105	2	R/W	note(4)
Message22		6A	106	2	R/W	note(4)
Message23		6B	107	2	R/W	note(4)

Message24		6C	108	2	R/W	note(4)
Message25		6D	109	2	R/W	note(4)
Message26		6E	110	2	R/W	note(4)
Message27		6F	111	2	R/W	note(4)
Message30		70	112	2	R/W	note(4)
Message31		71	113	2	R/W	note(4)
Message32		72	114	2	R/W	note(4)
Message33		73	115	2	R/W	note(4)
Message34		74	116	2	R/W	note(4)
Message35		75	117	2	R/W	note(4)
Message36		76	118	2	R/W	note(4)
Message37		77	119	2	R/W	note(4)
Message40		78	120	2	R/W	note(4)
Message41		79	121	2	R/W	note(4)
Message42		7A	122	2	R/W	note(4)
Message43		7B	123	2	R/W	note(4)
Message44		7C	124	2	R/W	note(4)
Message45		7D	125	2	R/W	note(4)
Message46		7E	126	2	R/W	note(4)
Message47		7F	127	2	R/W	note(4)

Table 4: RAM map

2.2 CHARGER COMMON PARAMETERS SET UP

2.2.1 General

Writing into the RAM leads to modify the charger operating parameters.
In this paragraph, we present the most common charger settings. For more information, please contact the factory.
RAM registers are coded in 16 bits.
In order to write into the Ram: send the password to the address (27 hex; call technical support for password).
When the password is accepted, each register with state (W) can be modified.
WARNING:
Only qualified and trained personnel can access this mapping.
Parameters modification with wrong information may lead to major defects and failures if wrong data is used.

2.2.2 Voltage or current settings

In order to modify the float voltage, write the required value in register (0E hex) (Refer to **Note 1**, for the byte format to send). For equalize voltage, the address (0F hex) is to be used.
In order to modify the float limit current, write the required value in register (10 hex). For equalize limit current, the address (11 hex) is to be used.

2.3 OPERATION MODE MODIFICATION

To switch from float, to equalize, send (0001 in binary) to bit 3, 2, 1 and 0 respectively into the register (26 hex), (Refer to **Note 21**).

To switch from equalize, to float, send (00010 in binary) to bit 3, 2, 1 and 0 respectively into the register (26 hex), (Refer to **Note 21**).

2.3.2 Formation mode

To start a formation mode send (0100 in binary) to bit 3, 2, 1 and 0 respectively into the register (26 hex), (Refer to **Note 21**).

2.3.3 Battery test

To start a battery test send (1000 in binary) to bit 3, 2, 1 and 0 respectively into the register (26 hex), (Refer to **Note 21**).

2.3.4 Alarm reset

To reset all alarms, send (1 in binary) into the register (5AL hex), (Refer to **Note 3**).

2.3.5 Messages

The charge LCD can display 4 different customer defined messages. These messages are stored into the RAM, starting the address (60 hex).
Each message is coded with 16 bytes in ASCII.
Each message is associated to a logic signal coming from the customer provided contact
Addresses **(**57L hex), (58H hex) are used to associate the message to the logic (0-1) signal

Example

Message # 2 "Next On Off Exit" is to be associated with logic signal # 3

2.3.5.1 Message coding

Message	ASCII Code in hexadecimal
N	4E
E	65
X	78
t	74
	20
O	4F
n	6E
	20
O	4F
f	66
f	66
	20
E	45
x	78
i	69
t	74

Table 5: ASCII message

2.3.5.2 RAM message

RAM Coded message

Address hexadecimal	Value in hexadecimal
68	4E65
69	7874
6A	204F
6B	6E20
6C	4F66
6D	6620
6E	4578
6F	6974

Table 6: ASCII message

2.3.5.3 Signal and message association

To link message #2 to signal #3, send (0010 in binary) to bit 7,6,5 and 4 respectively into the register (58H hex), (Refer to **Note 5**).

2.4 OTHER SETTINGS

Please contact the manufacturer for further instructions.

3. DNP V3.00

3.1 INTRODUCTION

The purpose of this section is to describe the specific implementation of the DNP3 within PCOM communications interface. This document, in conjunction with the DNP3 Basic 4 Document Set, and the DNP Subset Definitions Document, provides complete information on how to communicate with **PCOM Communications Interface** via the DNP3 protocol. This implementation of DNP3 is fully compliant with DNP3 Subset Definition Level 2, contains many Subset Level 3 features.
The address of PCOM card is configurable on board as a multiple of 10, from 10 to 2550, and selected with SW3 switch (see Table 7). The default address is "10".

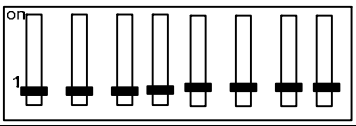
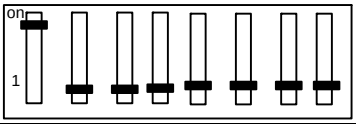
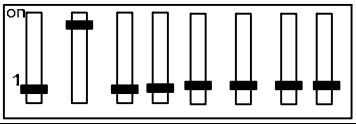
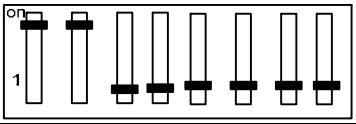
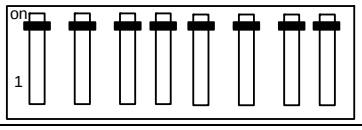
Position of SW3	Slave address
	0
	10
	20
	30
.	.
.	.
	2560

Table7: address of communication according to the position of the SW3 switch

3.2 DEVICE PROFILE

The following table provides a "Device Profile Document" in the standard format defined in the DNP3 Subset Definitions Document. While it is referred to in the DNP3 Subset
Definitions as a "Document," it is only a component of a total interoperability guide. This table, in combination with the following should provide a complete interoperability/ configuration guide for the **PCOM Communications Interface**:

DNP V3.00
DEVICE PROFILE DOCUMENT
Vendor Name: Primax Technologies Inc. 133 Guthrie, Dorval (Quebec) Canada H9P2P1

Highest DNP Level Supported:
For Requests: Level 2
For Responses: Level 2

Device Function:
☐ Master
☒ Slave

Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table):

Maximum Data Link Frame Size (octets):
Transmitted: 292
Received: 292

Maximum Application Fragment Size (octets):
Transmitted: 249
Received: 249

Maximum Data Link Re-tries:
☒ None
☐ Fixed at 3
☐ Configurable range 0 to 255

Maximum Application Layer Re-tries:
☒ None
☐ Configurable

Requires Data Link Layer Confirmation:
☒ Never
☐ Always
☐ Sometimes
☐ Configurable

Requires Application Layer Confirmation:
☒ Never
☐ Always
☐ When reporting Event Data
☐ When sending multi-fragment responses
☐ Sometimes
☐ Configurable

Timeouts while waiting for:

Data Link Confirm:	☒None	☐Fixed at____	☐Variable	☐Configurable
Complete Appl. Fragment:	☒None	☐Fixed at____	☐Variable	☐Configurable
Application Confirm:	☒None	☐Fixed at____	☐Variable	☐Configurable
Complete Appl. Response:	☒None	☐Fixed at____	☐Variable	☐Configurable

Sends/Executes Control Operations:

WRITE Binary Outputs	☒Never	☐Always	☐Sometimes	☐Configurable
SELECT/OPERATE:	☐Never	☒Always	☐Sometimes	☐Configurable
DIRECT OPERATE:	☐Never	☒Always	☐Sometimes	☐Configurable
DIRECT OPERATE – NO ACK	☐Never	☒Always	☐Sometimes	☐Configurable
Cont>1	☒Never	☐Always	☐Sometimes	☐Configurable
Pulse On	☒Never	☐Always	☐Sometimes	☐Configurable
Pulse Off	☒Never	☐Always	☐Sometimes	☐Configurable
Latch On	☒Never	☐Always	☐Sometimes	☐Configurable
Latch Off	☒Never	☐Always	☐Sometimes	☐Configurable
Queue	☒Never	☐Always	☐Sometimes	☐Configurable
Clear Queue	☒Never	☐Always	☐Sometimes	☐Configurable

Sends Unsolicited Responses:
☒Never
☐Configurable, See hardware configuration section
☐Only certain objects
☐Sometimes (attach explanation)
☐ENABLE/DISABLE UNSOLICITED

Sends Static Data in Unsolicited Responses:
☒Never
☐ When Device Restarts
☐When Status Flags Change

No other options are permitted.

Function codes supported

Default Counter Object/Variation:
☒No Counters Reported
☐Configurable
☐Default Object: 20 and 21

Default Variation:
☐Point-by-point list attached

Counters Roll Over at:
☒No Counters Reported
☐Configurable (attach explanation)
☐16 Bits
☐32 Bits
☐Other Value: _____
☐Point-by-point list attached

Sends Multi-Fragment Responses:
☒Yes
☐ No

Sequential File Transfer Support:

Append File Mode	☐Yes	☒ No
Custom Status Code Strings	☐ Yes	☒ No
Permissions Field	☐ Yes	☒ No
File Events Assigned to Class	☐ Yes	☒ No
File Events Poll Specifically	☐ Yes	☒ No
File Events Send Immediately	☐ Yes	☒ No
Multiple Blocks in a Fragment	☐ Yes	☒ No

Max Number of Files Open 0

3.3 IMPLEMENTATION TABLE

The following table identifies the variations, function codes, and qualifiers supported by the **PCOM** Communications Module in both request messages and in response messages.

OBJECT			**REQUEST** (Library will parse)		**RESPONSE**(Library will respond with)	
Object Number	**Variation Number**	**Description**	**Function Codes (dec)**	**Qualifier Codes (hex)**	**Function Codes (dec)**	**Qualifier Codes (hex)**
1	0	Binary Input (Variation 0 is used to request default variation)	1 (read)	00, 01 06		
1	1 (default)	Binary Input	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
1	2	Binary Input with Status	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
10	0	Binary Output Status (Variation 0 is used to request default variation)	1 (read)	00, 01 06		
10	1 (default)	Binary Output without Status	1 (read)	00, 01 06	129(response)	00, 01 (start-stop)
10	2	Binary Output Status	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
20	0	Binary Counter (Variation 0 is used to request default variation)	1 (read)	00, 01 06		
20	1	32-Bit Binary Counter with status	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
20	2	16-Bit Binary Counter with status	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
20	3	32-Bit Delta Counter				
20	4	16-Bit Delta Counter				
20	5	32-Bit Binary Counter without Flag	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
20	6 (default)	16-Bit Binary Counter without Flag	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
20	7	32-Bit Delta Counter without Flag				
20	8	16-Bit Delta Counter without Flag				
30	0	Analog Input (Variation 0 is used to	1 (read)	00, 01 06		

		request default variation)				
30	1	32-Bit Analog Input with status	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
30	2	16-Bit Analog Input with status	1 (read)	00, 01 06	129 (response	00, 01 (start-stop)
30	3	32-Bit Analog Input without Flag	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
30	4 (default)	16-Bit Analog Input without Flag	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
40	0	Analog Output Status (Variation 0 is used to request default variation)	1 (read)	00, 01 06		
40	1	32-Bit Analog Output Status	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
40	2 (default)	16-Bit Analog Output Status	1 (read)	00, 01 06	129 (response)	00, 01 (start-stop)
41	1	32-Bit Analog Output Block	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, no acknowledge)	17	129 (response)	echo of request
41	2	16-Bit Analog Output Block	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, no acknowledge)	17	129 (response)	echo of request

3.4 POINT LIST

The tables in the following sections identify all the individual data points provided by this implementation of DNP3.

3.4.1 SERVICE FUNCTION

1	Reset of remote link
2	Reset of User Process
3	Confirm User Data
4	Unconfirmed user data

Object 01 variation 0 (Binary input all variation)
Default: Object 01 variation 01 (Binary input)

Request (slave must parse)		Response (master must parse)	
Codes function	Codes Qual (hex)	Codes function	Codes Qual (hex)
1 read	00,01,06	129-read	00,01

Point	Signification	Status	
		0	1
0	Unused		
1	High volt battery alarm	Non active	Active
2	High volt rectifier alarm	Non active	Active
3	High volt shut down alarm	Non active	Active
4	Low volt battery alarm	Non active	Active
5	Low volt rectifier alarm	Non active	Active
6	End of Discharge alarm	Non active	Active
7	Ground fault negative alarm	Non active	Active
8	Ground fault positive alarm	Non active	Active
9	Rectifier fail alarm	Non active	Active
10	high Control board & inside high temperature alarm	Non active	Active
11	Low control board & inside high temperature alarm	Non active	Active
12	Battery high temperature alarm	Non active	Active
13	Battery low temperature alarm	Non active	Active
14	AC high volts alarm	Non active	Active
15	AC low volts alarm	Non active	Active
16	Unused		
17	Cell failure alarm	Non active	Active
18	AC fail alarm	Non active	Active
19	High ripple alarm	Non active	Active
20	High DC current rectifier alarm	Non active	Active
21	Low DC current rectifier alarm	Non active	Active
22	Equalize alarm	Non active	Active
23	Frequency fault alarm	Non active	Active
24	Battery test failure alarm	Non active	Active
25	High DC current battery alarm	Non active	Active
26	Low DC current battery alarm	Non active	Active
27	High capacity battery alarm	Non active	Active
28	Low capacity battery alarm	Non active	Active
29	Probe Alarm	Non active	Active
30	Unused		
31	Common alarm	Non active	Active
32	Unused	Non active	Active
33	Mode float	Non active	Active
34	Mode equalize	Non active	Active
35	Mode current limit	Non active	Active
36	Mode test battery	Non active	Active
37	Mode formation voltage	Non active	Active
38	Mode formation current	Non active	Active
39	Switch1	Non active	Active
40	Switch2	Non active	Active
41	Switch3	Non active	Active
42	Switch4	Non active	Active

Object 10 variation 00 (Binary output all variation)
Default: Object 10 variation 01 (Binary output without status)

Request (slave must parse)		Response (master must parse)	
Codes function	Codes Qual (hex)	Codes function	Codes Qual (hex)
1 read	00,01,**06**	129-read	00,01

Point	Signification	Status		
			0	1
0	Unused			
1	high volt battery alarm	Authorization (ON/OFF)	OFF	ON
2	high volt battery alarm	Relays latch authorization	OFF	ON
3	high volt battery alarm	Message latch authorization	OFF	ON
4	high volt battery alarm	Common alarm authorization	OFF	ON
5	Reserved			
6	high volt rectifier alarm	Authorization (ON/OFF)	OFF	ON
7	high volt rectifier alarm	Relays latch authorization	OFF	ON
8	high volt rectifier alarm	Message latch authorization	OFF	ON
9	high volt rectifier alarm	Common alarm authorization	OFF	ON
10	Reserved			
11	High volt shut down alarm	Authorization (ON/OFF)	OFF	ON
12	High volt shut down alarm	Relays latch authorization	OFF	ON
13	High volt shut down alarm	Message latch authorization	OFF	ON
14	High volt shut down alarm	Common alarm authorization	OFF	ON
15	Reserved			
16	Low volt battery alarm	Authorization (ON/OFF)	OFF	ON
17	Low volt battery alarm	Relays latch authorization	OFF	ON
18	Low volt battery alarm	Message latch authorization	OFF	ON
19	Low volt battery alarm	Common alarm authorization	OFF	ON
20	Reserved			
21	Low volt rectifier alarm	Authorization (ON/OFF)	OFF	ON
22	Low volt rectifier alarm	Relays latch authorization	OFF	ON
23	Low volt rectifier alarm	Message latch authorization	OFF	ON
24	Low volt rectifier alarm	Common alarm authorization	OFF	ON
25	Reserved			
26	End of Discharge alarm	Authorization (ON/OFF)	OFF	ON
27	End of Discharge alarm	Relays latch authorization	OFF	ON
28	End of Discharge alarm	Message latch authorization	OFF	ON
29	End of Discharge alarm	Common alarm authorization	OFF	ON
30	Reserved			
31	Ground fault negative alarm	Authorization (ON/OFF)	OFF	ON
32	Ground fault negative alarm	Relays latch authorization	OFF	ON
33	Ground fault negative alarm	Message latch authorization	OFF	ON
34	Ground fault negative alarm	Common alarm authorization	OFF	ON
35	Reserved			
36	Ground fault positive alarm	Authorization (ON/OFF)	OFF	ON
37	Ground fault positive alarm	Relays latch authorization	OFF	ON
38	Ground fault positive alarm	Message latch authorization	OFF	ON
39	Ground fault positive alarm	Common alarm authorization	OFF	ON
40	Reserved			
41	Rectifier fail alarm	Authorization (ON/OFF)	OFF	ON
42	Rectifier fail alarm	Relays latch authorization	OFF	ON
43	Rectifier fail alarm	Message latch authorization	OFF	ON
44	Rectifier fail alarm	Common alarm authorization	OFF	ON
45	Reserved			
46	High Control board & inside high temperature alarm	Authorization (ON/OFF)	OFF	ON
47	High Control board & inside high temperature alarm	Relays latch authorization	OFF	ON

48	High Control board & inside high temperature alarm	Message latch authorization	OFF	ON
49	High Control board & inside high temperature alarm	Common alarm authorization	OFF	ON
50	Reserved			
51	Low control board & inside high temperature alarm	Authorization (ON/OFF)	OFF	ON
52	Low control board & inside high temperature alarm	Relays latch authorization	OFF	ON
53	Low control board & inside high temperature alarm	Message latch authorization	OFF	ON
54	Low control board & inside high temperature alarm	Common alarm authorization	OFF	ON
55	Reserved			
56	High battery temperature alarm	Authorization (ON/OFF)	OFF	ON
57	High battery temperature alarm	Relays latch authorization	OFF	ON
58	High battery temperature alarm	Message latch authorization	OFF	ON
59	High battery temperature alarm	Common alarm authorization	OFF	ON
60	High battery temperature alarm	Shut Down authorization	OFF	ON
61	Low battery temperature alarm	Authorization (ON/OFF)	OFF	ON
62	Low battery temperature alarm	Relays latch authorization	OFF	ON
63	Low battery temperature alarm	Message latch authorization	OFF	ON
64	Low battery temperature alarm	Common alarm authorization	OFF	ON
65	Reserved			
66	AC high volts alarm	Authorization (ON/OFF)	OFF	ON
67	AC high volts alarm	Relays latch authorization	OFF	ON
68	AC high volts alarm	Message latch authorization	OFF	ON
69	AC high volts alarm	Common alarm authorization	OFF	ON
70	Reserved			
71	AC low volts alarm	Authorization (ON/OFF)	OFF	ON
72	AC low volts alarm	Relays latch authorization	OFF	ON
73	AC low volts alarm	Message latch authorization	OFF	ON
74	AC low volts alarm	Common alarm authorization	OFF	ON
75	Reserved			
76	Cell failure alarm	Authorization (ON/OFF)	OFF	ON
77	Cell failure alarm	Relays latch authorization	OFF	ON
78	Cell failure alarm	Message latch authorization	OFF	ON
79	Cell failure alarm	Common alarm authorization	OFF	ON
80	Reserved			
81	AC fail alarm	Authorization (ON/OFF)	OFF	ON
82	AC fail alarm	Relays latch authorization	OFF	ON
83	AC fail alarm	Message latch authorization	OFF	ON
84	AC fail alarm	Common alarm authorization	OFF	ON
85	Reserved			
86	High ripple alarm	Authorization (ON/OFF)	OFF	ON
87	High ripple alarm	Relays latch authorization	OFF	ON
88	High ripple alarm	Message latch authorization	OFF	ON
89	High ripple alarm	Common alarm authorization	OFF	ON
90	Reserved			
91	High DC current rectifier alarm	Authorization (ON/OFF)	OFF	ON
92	High DC current rectifier alarm	Relays latch authorization	OFF	ON
93	High DC current rectifier alarm	Message latch authorization	OFF	ON
94	High DC current rectifier alarm	Common alarm authorization	OFF	ON
95	Reserved			
96	Low DC current rectifier alarm	Authorization (ON/OFF)	OFF	ON
97	Low DC current rectifier alarm	Relays latch authorization	OFF	ON
98	Low DC current rectifier alarm	Message latch authorization	OFF	ON
99	Low DC current rectifier alarm	Common alarm authorization	OFF	ON
100	Reserved			
101	Equalize alarm	Authorization (ON/OFF)	OFF	ON
102	Equalize alarm	Relays latch authorization	OFF	ON
103	Equalize alarm	Message latch authorization	OFF	ON
104	Equalize alarm	Common alarm authorization	OFF	ON
105	Reserved			
106	Frequency fault alarm	Authorization (ON/OFF)	OFF	ON

107	Frequency fault alarm	Relays latch authorization	OFF	ON
108	Frequency fault alarm	Message latch authorization	OFF	ON
109	Frequency fault alarm	Common alarm authorization	OFF	ON
110	Frequency fault alarm	Shut Down authorization	OFF	ON
111	Reserved			
112	Reserved			
113	Reserved			
114	Battery test failure alarm	Common alarm authorization	OFF	ON
115	Reserved			
116	High DC current battery alarm	Authorization (ON/OFF)	OFF	ON
117	High DC current battery alarm	Relays latch authorization	OFF	ON
118	High DC current battery alarm	Message latch authorization	OFF	ON
119	High DC current battery alarm	Common alarm authorization	OFF	ON
120	Reserved			
121	Low DC current battery alarm	Authorization (ON/OFF)	OFF	ON
122	Low DC current battery alarm	Relays latch authorization	OFF	ON
123	Low DC current battery alarm	Message latch authorization	OFF	ON
124	Low DC current battery alarm	Common alarm authorization	OFF	ON
125	Reserved			
126	High capacity battery alarm	Authorization (ON/OFF)	OFF	ON
127	High capacity battery alarm	Relays latch authorization	OFF	ON
128	High capacity battery alarm	Message latch authorization	OFF	ON
129	High capacity battery alarm	Common alarm authorization	OFF	ON
130	Reserved			
131	Low capacity battery alarm	Authorization (ON/OFF)	OFF	ON
132	Low capacity battery alarm	Relays latch authorization	OFF	ON
133	Low capacity battery alarm	Message latch authorization	OFF	ON
134	Low capacity battery alarm	Common alarm authorization	OFF	ON
135	Reserved			
136	Status common alarm	Relays latch authorization	OFF	ON
137	Reserved			
138	Equalize mode start	Equalize authorization	OFF	ON
139	Equalize mode start	Manual authorization	OFF	ON
140	Equalize mode start	Periodical authorization	OFF	ON
141	Equalize mode start	Low DC voltage authorization	OFF	ON
142	Equalize mode start	AC fail authorization	OFF	ON
143	Equalize mode start	Refresh authorization	OFF	ON
144	Equalize mode start	Remote authorization	OFF	ON
145	Equalize mode start	Current limit authorization	OFF	ON
146	Equalize mode start	Charger start authorization	OFF	ON

Object 30 variation 00 (Analog input all variation)
Default: Object 30 variation 04 (16-Bit analog input without status)

Request (slave must parse)		**Response (master must parse)**	
Codes function	Codes Qual (hex)	Codes function	Codes Qual (hex)
1 read	00,01,06	129-read	00,01

Point	**Signification**	**Unit**	**Note**
0	Unused		
1	Rectifier voltage	Volt	note(1)
2	Rectifier current	Ampere	note(1)
3	Battery current	Ampere	note(2)
4	AC volt phase 1	Volt	**note(**1)
5	AC volt phase 2	Volt	**note(**1)
6	AC volt phase 3	Volt	**note(**1)
7	AC current phase 1	Ampere	**note(**1)
8	AC current phase 2	Ampere	**note(**1)
9	AC current phase 3	Ampere	**note(**1)
10	Battery temperature	°C	**note(**22)
11	Control board & inside temperature	°C	**note(**22)
12	AC frequency	Hertz	**note(**1)

Object 40 variation 0 (Analog output all variation)
Default: Object 40 variation 02 (16-Bit analog output with status)

Request (slave must parse)		Response (master must parse)	
Codes function	Codes Qual (hex)	Codes function	Codes Qual (hex)
1 read	00,01,06	129-read	00,01

Point	Signification	Unit	Note
0	Unused		
1	Float voltage	Volt	note(1)
2	Equalize voltage	Volt	note(1)
3	Float Current limit	Ampere	note(1)
4	Equalize Current limit	Ampere	note(1)
5	Unused		
6	Nominal output voltage	Volt	note(1)
7	Nominal output current (Shunt1)	Ampere	note(1)
8	Formation voltage	Volt	note(1)
9	Formation current	Ampere	note(1)
10	Formation time	Hours	note(22)
11	Formation relay		note(22)
12	Unused		
13	Manual equalize time out	Hours	note(22)
14	Periodical equalize time out	Hours	note(22)
15	Periodical equalize period (delay)	Days	note(22)
16	DC Low volts equalize time out	Hours	note(22)
17	DC Low volts equalize	Volt	note(1)
18	AC fail equalize time out	Hours	note(22)
19	AC fail equalize delay	Seconds	note(22)
20	Refresh equalize time out	Minutes	note(22)
21	Refresh equalize period (delay)	Hours	note(22)
22	Remote equalize time out	Hours	note(22)
23	Current limit equalize time out	Hours	note(22)
24	Current limit equalize delay	Seconds	note(22)
25	Post Charge Voltage delay	Minutes	note(22)
26	Post Charge current delay	Minutes	note(22)
27	Post charge current Percentage	%	note(22)
28	Equalize safety time (Eq T security)	Hours	note(22)
29	Unused		
30	Rectifier high volts alarm level	Volt	note(1)
31	Battery high volts alarm level	Volt	note(1)
32	Rectifier low volts level	Volt	note(1)
33	Battery low volts level	Volt	note(1)
34	High volts shutdown level	Volt	note(1)
35	End of Discharge level	Volt	note(1)
36	Negative Ground fault alarm level	Mili Ampere	note(1)
37	Positive ground fault level	Mili Ampere	note(1)
38	Control board & inside high temperature level	°C	note(22)
39	Battery high temperature level	°C	note(22)
40	Battery low temperature level	°C	note(22)
41	AC high volts alarm level	Volt	note(1)
42	AC low volts alarm level	Volt	note(1)
43	High DC current rectifier level	Ampere	note(1)
44	Low DC current rectifier level	Ampere	note(1)
45	High ripple alarm level	%	note(1)
46	Cell failure alarm level	Volt	note(1)
47	High DC current battery level	Ampere	note(1)
48	Low DC current battery level	Ampere	note(1)

49	Delay to initiate Rectifier high volts alarm (time)	Seconds	note(22)
50	Delay to initiate Battery high volts alarm (time)	Seconds	note(22)
51	Delay to initiate Rectifier low volts alarm (time)	Seconds	note(22)
52	Delay to initiate Battery low volts alarm (time)	Seconds	note(22)
53	Delay to initiate High volts shutdown alarm (time)	Seconds	note(22)
54	Delay to initiate End of Discharge alarm (time)	Seconds	note(22)
55	Delay to initiate Negative Ground fault alarm (time)	Seconds	note(22)
56	Delay to initiate Positive ground fault alarm (time)	Seconds	note(22)
57	Delay to initiate AC fail alarm (time)	Seconds	note(22)
58	Delay to initiate Rectifier alarm (time)	Seconds	note(22)
59	Delay to initiate Control board & inside high temperature alarm (time)	Seconds	note(22)
60	Delay to initiate Battery high temperature alarm (time)	Seconds	note(22)
61	Delay to initiate Battery low temperature alarm (time)	Seconds	note(22)
62	Delay to initiate AC high volts alarm (time)	Seconds	note(22)
63	Delay to initiate AC low volts alarm (time)	Seconds	note(22)
64	Delay to initiate High DC current alarm (time)	Seconds	note(22)
65	Delay to initiate Low DC current alarm (time)	Seconds	note(22)
66	Delay to initiate High ripple alarm (time)	Seconds	note(22)
67	Unused		
68	Delay to initiate High DC current battery alarm (time)	Seconds	note(22)
69	Delay to initiate Low DC current battery alarm (time)	Seconds	note(22)
70	Delay to initiate Cell failure alarm alarm (time)	Seconds	note(22)
71	Rectifier high volts alarm relay		note(22)
72	Battery high volts alarm relay		note(22)
73	Rectifier low volts relay		note(22)
74	Battery low volts alarm relay		note(22)
75	High volts shutdown relay		note(22)
76	End of Discharge relay		note(22)
77	Negative Ground fault alarm relay		note(22)
78	Positive ground fault relay		note(22)
79	AC fail alarm relay		note(22)
80	Rectifier alarm relay		note(22)
81	Control board & inside high temperature relay		note(22)
82	Battery high temperature relay		note(22)
83	Battery low temperature relay		note(22)
84	AC high volts alarm relay		note(22)
85	AC low volts alarm relay		note(22)
86	High DC current relay		note(22)
87	Low DC current relay		note(22)
88	High ripple alarm relay		note(22)
89	Equalize alarm relay		note(22)
90	Cell failure alarm relay		note(22)
91	High DC current battery relay		note(22)
92	Low DC current battery relay		note(22)
93	Unused		
94	DC output voltage temperature compensation	mV	note(1)
95	DC output current temperature compensation(TCompAmp)	%	note(22)
96	Temperature threshold (Tref)	°C	note(22)
97	Unused		
98	Battery test mode		note(22)
99	Battery test fail alarm relay		note(22)
100	Battery test relay		note(22)
101	Reference current (battery test)	Ampere	note(1)
102	Reference voltage (battery test)	Volt	note(1)
103	Reference time (battery test)	Minutes	note(22)

Object 20 variation 00 (Binary counter all variation)
Default: Object 20 variation 06 (16-Bit binary counter without status)

Request (slave must parse)		Response (master must parse)	
Codes function	Codes Qual (hex)	Codes function	Codes Qual (hex)
1 read	00,01,06	129-read	00,01

Point		Unit	Note
0	Unused		
1	Equalize remaining time	minutes	note(22)
2	Equalize elapsed time	minutes	**note(**22)
3	Formation remaining time	hours	**note(**22)

Object 41 variation 01 (32-Bit analog OUTPUT BLOCK)
Object 41 variation 02 (16-Bit analog OUTPUT BLOCK)
Select (function 3)
Operate (function 4)
Direct operation (function 5)
Direct operation no acknowledge (function 6)

Request (slave must parse)		Response (master must parse)	
Codes function	Codes Qual (hexa)	Codes function	Codes Qual (hexa)
5 Direct operate	17	129-read	echo of request

Point	Address (hex)	Variable	Unit	Byte	Note
1	0E	Float voltage	V	2	note(1)
2	0F	Equalize voltage	V	2	note(1)
3	10	Float Current limit	A	2	note(1)
4	11	Equalize Current limit	A	2	note(1)
5	12	Formation voltage	V	2	note(1)
6	13	Formation current	A	2	note(1)
7	14H	Formation relay		1	note(3)
8	15H	Formation time	H	1	note(3)
9	16	Charger configuration		2	Refer to paragraph (3.5.3)
10	17	Equalize mode start		2	note(9)
11	1AH	Manual equalize time	H	1	note(3)
12	1AL	Periodical equalize time	H	1	note(3)
13	1BH	Periodical equalize period (delay)	D	1	note(3)
14	1BL	DC Low volts equalize time out	H	1	note(3)
15	1C	DC Low volts equalize level	V	2	note(1)
16		Reserved			
17	1DH	AC fail equalize time out	H	1	note(3)
18	1DL	AC fail equalize delay	S	1	note(3)
19	1EH	Refresh equalize time out	mn	1	note(3)
20	1EL	Refresh equalize period (delay)	H	1	note(3)

21	1F H	Remote equalize time out	H	1	note(3)
22	1FL	Current limit equalize time out	H	1	note(3)
23	20H	Current limit equalize delay	S	1	note(3)
24	20L	Equalize termination (On/Off)		1	note(10)
25	21	Post Charge Voltage Delay	mn	2	note(4)
26		Reserved			
27	22	Post charge current Delay	mn	2	note(4)
28		Reserved			
29	23H	Post charge current Percentage	%	1	note(3)
30	23L	Equalize safety time (Eq T security)	H	1	note(3)
31	24	DC output voltage temperature compensation	mV	2	note(6)
32		Reserved			
33	25H	DC output current temperature compensation (TCompAmp)	%	1	note(3)
34	25L	Current temperature threshold (Tref)		1	note(3)
35	26	Charger mode enabling		2	note(21)
36	27	password		2	note(4)
37	2A	Alarms authorization (ON/OFF)		2	note(13)
38	2B	Alarm authorization (ON/OFF)		2	note(14)
39	2C	Alarms Relays latch authorization		2	note(15)
40	2D	Alarms Relays latch authorization		2	note(16)
41	2E	Alarm messages latch authorization		2	note(17)
42	2F	Alarm messages latch authorization		2	note(18)
43	30	Alarm failsafe		2	note(19)
44	31	Alarms failsafe		2	note(20)
45	32	Rectifier high volts alarm level	V	2	note(1)
46	33	Battery high volts alarm level	V	2	note(1)
47	34	Rectifier low volts level	V	2	note(1)
48	35	Battery low volts level	V	2	note(1)
49	36	High volts shutdown level	V	2	note(1)
50	37	Low volts disconnect level	V	2	note(1)
51	38	Negative Ground fault alarm level	mA	2	note(1)
52	39	Positive ground fault level	mA	2	note(1)
53	3A	Control board & inside high temperature level	°C	2	note(4)
54	3B	Battery high temperature level	°C	2	note(4)
55	3C	Battery low temperature level	°C	2	note(4)
56	3D	AC high volts alarm level	V	2	note(1)
57	3E	AC low volts alarm level	V	2	note(1)
58	3F	High DC current alarm level	A	2	note(1)
59	40	Low DC current alarm level	A	2	note(1)
60	41	High ripple alarm level	V	2	note(1)
61	42	Cell failure alarm level	V	2	note(1)
62		Reserved			
63	43H	Delay to initiate Rectifier high volts alarm (time)	S	1	note(3)
64	43L	Delay to initiate Battery high volts alarm (time)	S	1	note(3)
65	44H	Delay to initiate Rectifier low volts alarm (time)	S	1	note(3)
66	44L	Delay to initiate Battery low volts alarm (time)	S	1	note(3)
67	45H	Delay to initiate High volts shutdown alarm (time)	S	1	note(3)
68	45L	Delay to initiate End of Discharge alarm (time)	S	1	note(3)
69	46H	Delay to initiate Negative Ground fault alarm (time)	S	1	note(3)
70	46L	Delay to initiate Positive ground fault alarm (time)	S	1	note(3)
71	47H	Delay to initiate AC fail alarm (time)	S	1	note(3)
72	47L	Delay to initiate Rectifier alarm (time)	S	1	note(3)

73	48H	Delay to initiate Control board & inside high temperature alarm (time)	S	1	note(3)
74	48L	Delay to initiate Battery high temperature alarm (time)	S	1	note(3)
75	49H	Delay to initiate Battery low temperature alarm (time)	S	1	note(3)
76	49L	Delay to initiate AC high volts alarm (time)	S	1	note(3)
77	4AH	Delay to initiate AC low volts alarm (time)	S	1	note(3)
78	4AL	Delay to initiate High DC current alarm (time)	S	1	note(3)
79	4BH	Delay to initiate Low DC current alarm (time)	S	1	note(3)
80	4BL	Delay to initiate High ripple alarm (time)	S	1	note(3)
81		Reserved			
82	4CL	Delay to initiate Cell failure alarm (time)	S	1	note(3)
83	4DH	Rectifier high volts alarm relay/ Battery high volts alarm relay		1	note(5)
84	4DL	Rectifier low volts relay/ Battery low volts alarm relay		1	note(5)
85	4EH	High volts shutdown relay/ End of Discharge relay		1	note(5)
86	4EL	Negative Ground fault alarm relay/ Positive ground fault relay		1	note(5)
87	4FH	AC fail alarm relay/ Rectifier alarm relay		1	note(5)
88	4FL	Control board & inside high temperature relay/ Battery high temperature relay		1	note(5)
89	50H	Battery low temperature relay		1	note(3)
90	50L	AC high volts alarm relay/ AC low volts alarm relay		1	note(5)
91	51H	High DC current relay/ Low DC current relay		1	note(5)
92	51L	High ripple alarm relay		1	note(3)
93	52H	Equalize alarm relay		1	note(3)
94	52L	Cell failure alarm relay		1	note(3)
95	53H	Year		1	note(0)
96	53L	Month		1	note(0)
97	54H	Day		1	note(0)
98	54L	Hour		1	note(0)
99	55H	Minute		1	note(0)
100		Reserved			
101		Reserved			
102	56L	Input contact preset function 1/2		1	note(5)
103	57H	Input contact preset function 3/4		1	note(5)
104	57L	Input contact message assignment # 1/2		1	note(5)
105	58H	Input contact message assignment # 3/4		1	note(5)
106	58L	Input contact relay assignment # 1/2		1	note(5)
107	59H	Input contact relay assignment # 3/4		1	note(5)
108	59L	Battery test fail alarm relay / Battery test relay		1	note(5)
109	5AH	Battery test mode		1	note(3)
110	5AL	Alarms Reset		1	Refer to paragraph (3.5.4)
111	5B	Reference current (battery test)	A	2	note(1)
112	5C	Reference voltage (battery test)	V	2	note(1)
113	5D	Reference time (battery test)	mn	2	note(4)
114	60	Message10		2	note(4)
115	61	Message11		2	note(4)
116	62	Message12		2	note(4)
117	63	Message13		2	note(4)
118	64	Message14		2	note(4)
119	65	Message15		2	note(4)
120	66	Message16		2	note(4)

121	67	Message17		2	note(4)
122	68	Message20		2	note(4)
123	69	Message21		2	note(4)
124	6A	Message22		2	note(4)
125	6B	Message23		2	note(4)
126	6C	Message24		2	note(4)
127	6D	Message25		2	note(4)
128	6E	Message26		2	note(4)
129	6F	Message27		2	note(4)
130	70	Message30		2	note(4)
131	71	Message31		2	note(4)
132	72	Message32		2	note(4)
133	73	Message33		2	note(4)
134	74	Message34		2	note(4)
135	75	Message35		2	note(4)
136	76	Message36		2	note(4)
137	77	Message37		2	note(4)
138	78	Message40		2	note(4)
139	79	Message41		2	note(4)
140	7A	Message42		2	note(4)
141	7B	Message43		2	note(4)
142	7C	Message44		2	note(4)
143	7D	Message45		2	note(4)
144	7E	Message46		2	note(4)
145	7F	Message47		2	note(4)

3.5 CHARGER COMMON PARAMETERS SET UP

3.5.1 GENERAL

Select (function 3), Operate (function 4), Direct operation (function 5), Direct operation no acknowledge, with Object 41 variation 01 or 02, allows to modify the charger operating parameters.
In this paragraph, we present the most common charger settings. For more information, please contact the factory.
All points are coded in 16 bits.
Only qualified and trained personnel can access this mapping.
Parameters modification with wrong information may lead to major defects and failures if wrong data is used.

3.5.2 VOLTAGE OR CURRENT SETTINGS

In order to modify the float voltage, write the required value in point 1 (Refer to **Note1**, for the byte format to send).
For equalize voltage, the point 2 is to be used.
In order to modify the float current limit, write the required value in point 3 (Refer to **Note1**, for the byte format to send).
For equalize current limit, the point 4 is to be used.

3.5.3 CHARGER CONFIGURATION

Please do not modify this register without consulting the factory. To modify the charger configuration, write the required value in point 5, the byte format to send is the following:

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: ON/OFF display
1: Load sharing
2: Temperature compensation
3: AC current display
4: AC voltage display
5: LCD sleep mode
6: Language
7: Battery current display
8 Formation
9: Battery test
10: x
11: x
12: x
13: x
14: x
15: x

3.5.4 ALARM RESET

To reset all alarms, send (01 in binary) into the point 90L.

4. COMMON NOTES FOR MODBUS AND DNP3

Note 0

Variable is coded in 1 byte. As requested by the user, the decoding is in hexadecimal or BCD code.

Note 1

Variable is coded in 2 bytes including the decimal part

Example:
O/P voltage **= 651.3V corresponds to** 6513 in decimal.
In hexadecimal the corresponding value will be 1971 hex; (19 MSB, 71 LSB)
(*MSB : most significant byte, LSB : least significant byte)*

Note 2

Variable is coded in 2 bytes. It can be positive or negative the most significant bit is associated to the sign

Example 1:
Battery current **=135.2A**
In decimal, the value will be coded: 1352
In binary the value will be: 0000 0101 0100 1000
In hexadecimal the value will be: 0548 hex; (05 MSB, 48 LSB)

Example 2:
Battery current **=-135.2A**
In decimal, the value will be coded: 34120
In binary the value will be: **1**000 0101 0100 1000
In hexadecimal the value will be: 8548 hex; (85 MSB, 48 LSB)

Note 3

Variables are coded in one byte.

Note 4

Variables are coded in 2 bytes.

Note 5

Variables are coded in one byte split in two 1/2 bytes

Example: If value is (45 hex), the 2 variables are in the format X/Y,
X=4, and Y=5.

Note 6

The variable is coded into 2 bytes with the consideration of the decimal part
Example: 0.123 will be coded 123 in decimal, and 7B in hexadecimal.

Note 7

Charger configuration: Address: (16 hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: ON/OFF display
1: Load sharing

2: Temperature compensation
3: AC current display
4: AC voltage display
5: LCD sleep mode
6: Language
7: Battery current display
8 Formation
9: Battery test
10: x
11: x
12: x
13: x
14: x
15: x

Please do not modify this register without consulting the factory.

Note 8

Charger state – address: (15L hex)

7	6	5	4	3	2	1	0

0: Current limit
1: Equalize
2: Float
3: Battery test
4: Formation voltage
5: Formation current
6: Continuity Test Mode
7: Continuity Test passed. (if '1', Continuity Test failed)

This register is to indicate the charger operation mode: The charger can operate in 5 different modes: Current limited, float, equalize, battery test and formation.

Note 9

Equalize mode start: address: (17 hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

The equalize mode will kick in if one of the conditions is authorized

0: Eq
1: Manual
2: Periodical
3: Low DC volts
4: AC fail
5: Refresh
6: Remote (via contact)
7: Current limit
8: Charger start
9: x
10: x
11: x
12: x
13: x
14: x
15: x

This register is used for the charger equalize mode configuration.

Note 10

Equalize termination– address: (20L hex)

7	6	5	4	3	2	1	0

0: x
1: post equalize 1
2: post equalize 2
3: x
4: x
5: x
6: x
7: x

Note 11

Alarm state- address: (28 hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery high volts
1: Rectifier high volts
2: High volts shutdown
3: Battery low volts
4: Rectifier low volts
5: Low volts disconnect
6: Negative ground fault
7: Positive ground fault
8: Rectifier fail
9: Internal high temperature
10: Internal low temperature
11: Battery high temperature
12: Battery low temperature
13: AC high volt
14: AC low volt
15: x

This register indicates the charger alarm status:
The alarm is active when the bit =1

Note 12

Alarm state- address: (29 hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery cell failure
1: AC fail
2: High ripple
3: High DC current
4: Low DC current
5: Equalize alarm
6: Mains frequency failure
7: Battery test failure
8: High current battery
9: Low current battery
10: High capacity
11: Low capacity

12: x
13: x
14: Common alarm
15: x

This register indicates the charger alarm status:
The alarm is active when the bit =1

Note 13

Alarm authorization (ON/OFF) - address: (2A hex).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery high volts
1: Rectifier high volts
2: High volts shutdown
3: Battery low volts
4: Rectifier low volts
5: Low volts disconnect
6: Negative ground fault
7: Positive ground fault
8: Rectifier fail
9: Internal high temperature
10: Internal low temperature
11: Battery high temperature
12: Battery low temperature
13: AC high volt
14: AC low volt
15: x

This register will enable or disable the above alarms.

Note 14

Alarms authorization (ON/OFF)- address: (2B hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery cell failure
1: AC fail
2: High ripple
3: High DC current
4: Low DC current
5: Equalize alarm
6: Mains frequency failure
7: Battery test failure
8: High current battery
9: Low current battery
10: High capacity
11: Low capacity
12: x
13: x
14: x
15: x

This register will enable or disable the above alarms.

Note 15

Alarm latch relay authorization address: (2C hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery high volts
1: Rectifier high volts
2: High volts shutdown
3: Battery low volts
4: Rectifier low volts
5: Low volts disconnect
6: Negative ground fault
7: Positive ground fault
8: Rectifier fail
9: Internal high temperature
10: Internal low temperature
11: Battery high temperature
12: Battery low temperature
13: AC high volt
14: AC low volt
15: x

This register is used to enable or disable any of the above alarms.

Note 16

Alarm latch relay authorization address: (2D hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery cell failure
1: AC fail
2: High ripple
3: High DC current
4: Low DC current
5: Equalize alarm
6: Mains frequency failure
7: Battery test failure
8: High current battery
9: Low current battery
10: High capacity
11: Low capacity
12: x
13: x
14: Common alarm
15: x

This register is used to enable and disable the above alarm relay latching.

Note 17

Alarm latch message authorization address: (2E hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery high volts
1: Rectifier high volts
2: High volts shutdown
3: Battery low volts

4: Rectifier low volts
5: Low volts disconnect
6: Negative ground fault
7: Positive ground fault
8: Rectifier fail
9: Internal high temperature
10: Internal low temperature
11: Battery high temperature
12: Battery low temperature
13: AC high volt
14: AC low volt
15: x

This register is used to enable and disable the above alarm message latching.

Note 18

Alarm latch message authorization address: (2F hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery cell failure
1: AC fail
2: High ripple
3: High DC current
4: Low DC current
5: Equalize alarm
6: Mains frequency failure
7: Battery test failure
8: High current battery
9: Low current battery
10: High capacity
11: Low capacity
12: x
13: x
14: Common alarm
15: x

This register is used to enable and disable the above alarm message latching.

Note 19

Fail-safe or non-fail safe alarm relays operation address: (30 hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery high volts
1: Rectifier high volts
2: High volts shutdown
3: Battery low volts
4: Rectifier low volts
5: Low volts disconnect
6: Negative ground fault
7: Positive ground fault
8: Rectifier fail
9: Internal high temperature
10: Internal low temperature
11: Battery high temperature
12: Battery low temperature
13: AC high volt

14: AC low volt
15: x

This register is used to configure the alarm relay in fail-safe (de-energized when alarm occurs) or non fail-safe (energized when alarm occurs)

Note 20

Fail-safe or non-fail safe alarm relays operation address: (31 hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Battery cell failure
1: AC fail
2: High ripple
3: High DC current
4: Low DC current
5: Equalize alarm
6: Mains frequency failure
7: Battery cell failure
8: High current battery
9: Low current battery
10: High capacity
11: Low capacity
12: x
13: x
14: Common alarm
15: x

This register is used to configure the alarm relay in fail-safe (de-energized when alarm occurs) or non fail-safe (energized when alarm occurs)

Note 21

Charger mode enabling- address: (26 hex)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0: Remote equalize
1: Remote float
2: Formation
3: Battery test
4: x
5: x
6: x
7: x
8: x
9: x
10: x
11: x
12: x
13: x
14: x
15: x

This register is used to force the charger in one of the above operation modes.

Note 22

Variables are coded in 2 bytes.

5. THE 40-20MA OUTPUT

The **PCOM** board has two 4-20mA outputs, which are the images of voltage and current output rectifier. Figure 10, provides the wiring connection for the two outputs.

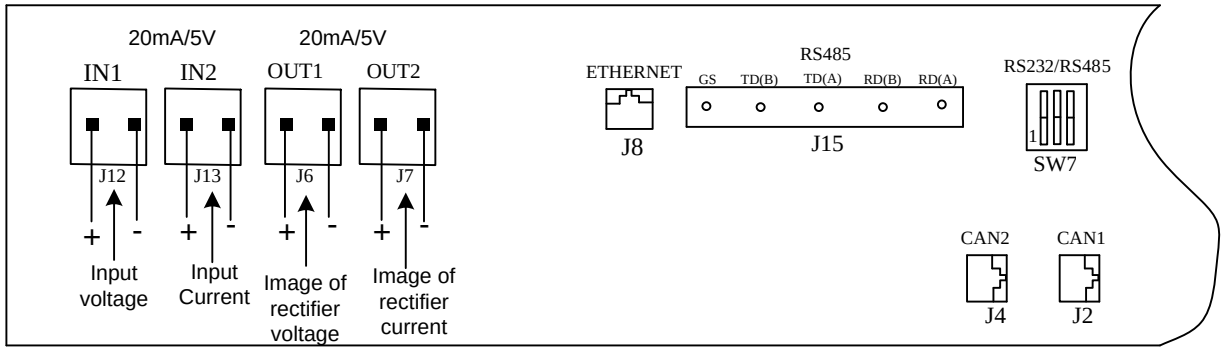


Figure 10. PRIMAX communication card PCOM. Layout