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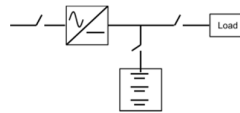


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Sigma Engineering
Industrial Power Solution.



Interface & Operation Manual
Industrial Battery Charger



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Dear customer,

We thank you for choosing our products.

We trust that use of the SIGMATRONIC “Industrial Battery Charger” will give you complete satisfaction.

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1. Safety Rules:

To prevent injury and property damage, follow the safety instructions. After reading this manual, keep it in the place that the user always can contact easily.

1.1. Safety Instructions:

1.1.1. General:

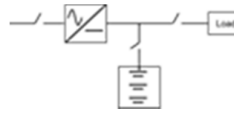
- Move the cabinet in an upright position in its original package to the final destination room. To lift the cabinets, use a forklift or lifting belts with spreader bars.
- Check for sufficient floor and elevator loading capacity.
- Check the integrity of the Charger equipment carefully. If you notice visible damage, do not install or start the Charger. Contact the nearest Service Centre immediately.
- WARNING! RISK OF ELECTRICAL SHOCK: Do not remove covers; there are no user serviceable parts inside.
- After switching off takes 5 minutes for the DC capacitors to discharge because a lethally high voltage remains at the terminals of the electrolytic capacitors.
- All maintenance and service work should be performed by qualified service personnel.
- The field-wiring outlets may be electrically live, even when the Charger is disconnected from the mains.
- Dangerous voltages may be present during battery operation.
- The battery must be disconnected during maintenance or service work.
- This System contains potentially hazardous voltages.
- Be aware that the Rectifier can restart automatically after the mains voltage is restored.
- End user must follow applicable regional occupational safety codes/regulations during installation, operation and equipment maintenance. This may require additional field marking or labeling defining appropriate level of PPE (Personal Protection Equipment) to reduce the risk of Arc-flash related injuries. Contact our Technical Support for product specific information.

1.1.2. Installation:

- This Battery Charger must be installed and connected only by trained personnel.
- Verify accurately during Commissioning and Maintenance of the Charger, for the following: Damaged components, squeezed wires and cables, or not correctly inserted plugs.
- This Battery Charger is intended for use in a controlled indoor environment free of conductive contaminants and protected against animals' intrusion.
- WARNING! HIGH EARTH LEAKAGE CURRENT: Earth connection is essential before connecting power inputs & outputs!
- Switching OFF the unit does not isolate the Charger from the mains.
- Do not install the Charger in an excessively humid environment or near water.
- Avoid spilling liquids on or dropping any foreign object into the Charger.
- The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 45°C
- Optimal battery life is obtained if the ambient temperature does not exceed 25°C
- It is important that air can move freely around and through the unit. Do not block the air vents.
- Avoid locations in direct sunlight or near heat sources.

1.1.3. Storage:

- Store the Charger in a dry location; storage temperature must be within -25°C to +55°C.
- The optimal temperature for Battery storage is 20°C (68°F) to 25°C (77°F) and shall never exceed the range -20°C (-4°F) to 40°C (104°F).
- If the unit is stored for a period exceeding 3 months, the battery must be recharged periodically (time depending on storage temperature).



1.1.4. Battery:

- The battery-voltage is dangerous for person's safety.
- When replacing the battery, use the same number, voltage (V) and capacity (A.H).
- Proper disposal or recycling of the battery is required. Refer to your local codes for disposal requirements.
- Never dispose of battery in a fire: they may explode.
- Do not open or mutilate battery: their contents (electrolyte) may be extremely toxic. If exposed to electrolyte, wash immediately with plenty of water.
- Avoid charging in a sealed container.
- Never short-circuit the batteries.
- When working with batteries, remove watches, rings or other metal objects, and only use insulated tools.

1.2. Safety Symbols and Warnings:

Incorrect operation due to ignoring safety instructions will cause harm or damage. The seriousness of which is indicated by the following symbols.

**DANGER**

This symbol indicates the instant death or serious injury if you don't follow instructions

**WARNING**

This symbol indicates the possibility of death or serious injury

**CAUTION**

This symbol indicates the possibility of injury or damage to property



2. Introduction:

2.1. General description:

SIGMATRONIC IR series is a powerful **Compact Battery Charger** designed for power, water and petroleum plant. **The IR series** provides the fully protection for DC critical industrial systems from unexpected side effects of power obstructions. **The IR** is built ruggedly to work reliably in any environment and is so compact. It is a complete power system for charging a battery system or/and directly powering a load.

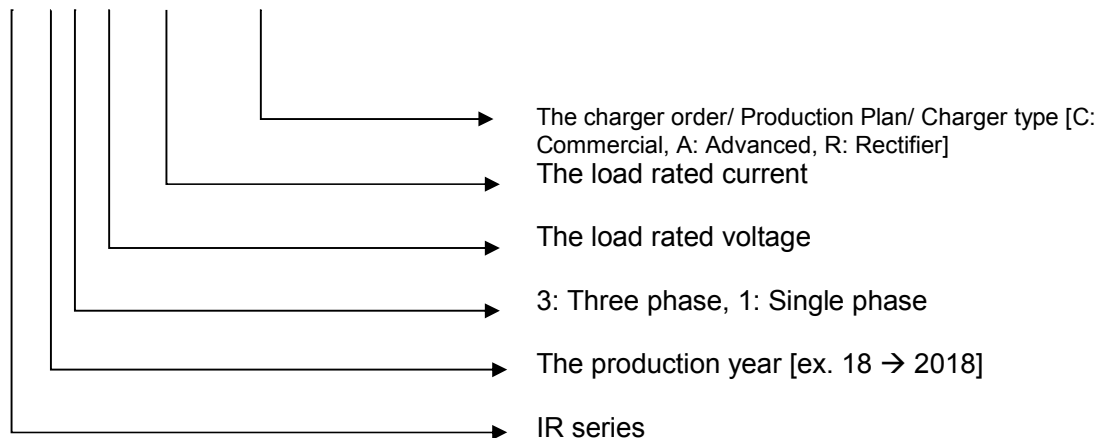
2.2. General specifications:

- Micro Controlled System.
- Input/output RMS measurements.
- Load current, battery current, DC Output Voltage, AC Input Voltage are displayed.
- Wide operation range.
- Programmable nominal DC output Voltage.
- High input voltage protection.
- Low output ripple voltage.

2.3. Nameplate & Model:

To verify the Charger unit is the correct one for the application you need, check its type, output ratings on the nameplate. Here is the detailed description of the nameplate:

IR 193110 060 01 29 A





3. Description:

3.1. System Main Components:

The industrial DC rectifier/battery charger mainly composed from input line MCB (*input protection*), input transformer, Thyristor-controlled Bridge, Battery blocking, Bypass switch, output protection , Control Board, SCR driving Board and Display Board.

3.2. Principle of operation:

The battery charger is based on Isolated Thyristor-controlled bridge technology. It relies on microcontroller control to guarantee the needed flexibility and stability for different applications and loads. By measuring the dc output voltage of rectifier, when AC input voltage or load changes, the control unit will initiate the correction process and it occurs when the dc output voltage is out of range. The control [MCU] changes the firing signal of SCR to regulate the rectifier output in permitted range. There are two techniques of charging [manual, automatic]. In manual charging mode, the required voltage for charging the batteries is adjusted on control user interface easily. In automatic charging mode, the Charger output gives the Hi-Rate charging voltage in Boost Mode. And the charger returns to the floating voltage after Boost time expires.

3.3. General features:

- Adjustable Timer for Boost and Equalize Charging
- Adjustable Boost, Equalize and Float Charge Voltages
- Adjustable output current Limit (Battery side)
- Modular Design
- Electronic Over / Under Voltage, Over Current protections
- Isolated Output by Transformer
- Friendly user interface
- Internal over Temperature protection
- Earth Fault Warning
- Low Battery Level Alarm
- Event log [Real time clock] [optional]
- Secure access to adjust the system parameters
- Soft start or pre-charging process for output filter capacitor
- Circuit Breaker Trip detection [optional]
- Programmable relays [optional]



4. Operation and Control:

4.1. User Interface functions:

The IR series has two types of user interfaces, standard LCD Display interface, and basic seven segment Display interface. According to the preference of the user one of them is installed in the charger.

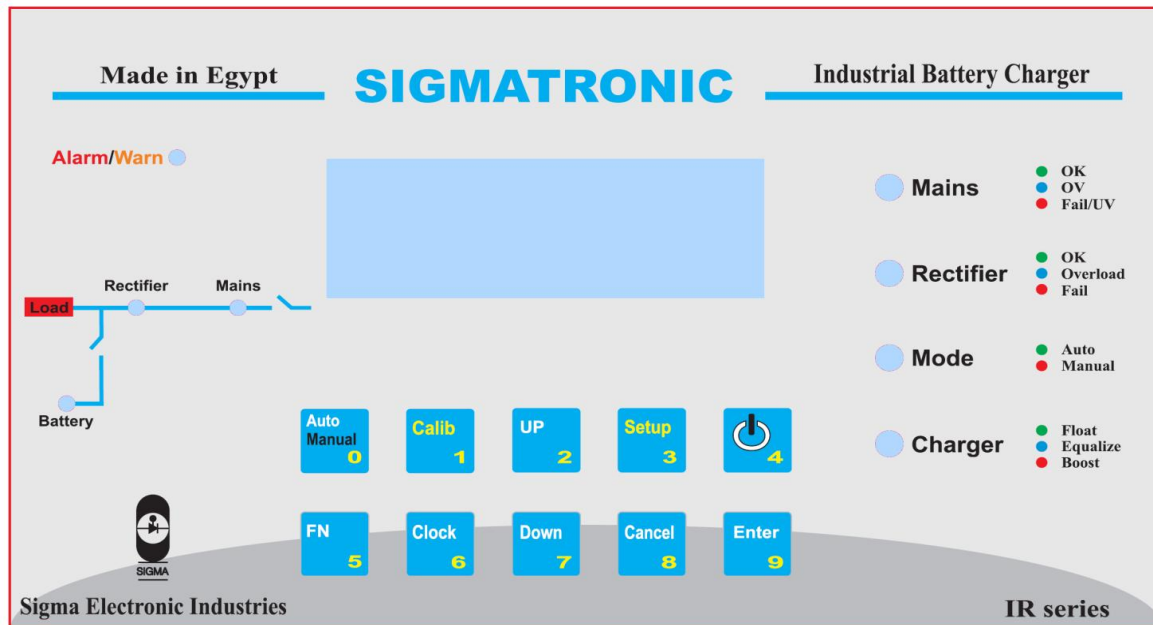



Figure 1: Standard LCD Front panel user interface

The Functions of buttons & indicators

Button	Function*
Power Button 	-To run the battery charger. -To shut down the battery charger.
Cancel Button	-To cancel turn on <u>OR</u> shut down the rectifier. -To go back from submenu to menu in setup mode. -Return to first page in Operational mode. -To get out of Clock Menu
Setup Button	-To enter the Setup Mode in order to adjust the rectifier and battery parameters.
Up Button	-Navigate page up in Operational mode & Event Log. -Navigate up between parameters in Setup menu & clock menu. -To toggle between Auto and Manual modes in Auto/Manual menu.
Down Button	-Navigate page down in Operational mode & Event Log. -Navigate down between parameters in Setup menu & clock menu. -To toggle between Auto and Manual modes in Auto/Manual menu. -To enable clearing Event Logs at last recorded event (In non-Operational mode).



Enter Button	<ul style="list-style-type: none"> -To enter different pages in setup Mode. -To enable voltage editing when selecting manual mode in Auto/Manual mode. -To enter the event log screens in Operational mode. -To confirm edited parameter in setup menu. -To clear the event log history. -To select the parameter required to be edited in Setup and Clock Menu.
Calib Button	-Service reserved function.
Fn Button	-Service reserved function.
Clock Button	-To enter or exit the Clock Menu.
Manual/Auto Button	-To enter or exit the Auto/Manual Menu.

Table 1: Functions of Buttons

*All buttons have corresponding numbers in case of parameter editing as illustrated in the front panel.

RGB led	Function
Main LED	<ul style="list-style-type: none"> -Green: valid input voltage. -Blue: the input voltage above permitted range. -Red: utilities failure or input voltage under permitted range.
Rectifier LED	<ul style="list-style-type: none"> -Green: valid dc output voltage of rectifier. -Blue: overload on rectifier (Current Limit). -Red: rectifier fails.
Mode LED	<ul style="list-style-type: none"> -Green: Automatic Mode. -Red: Manual Mode.
Charging LED	<ul style="list-style-type: none"> -Green: Float Mode. -Blue: Boost Mode. -Red: Equalize Mode.

Table 2: RGB leds indications

-Mimic LEDs

Monitor	Function
Main LED	-illuminated: valid input voltage
Rectifier LED	-illuminated: Rectifier on
Charger LED	-illuminated: the batteries polarity are right and connected.
Alarm/Warn LED	Warnings and Alarms.

Table 3: Mimic leds



Figure 2: basic seven segment Front panel user interface



4.2. Screen modes for Standard LCD display:

4.2.1. Overview:

There are three displaying modes (depending on the state of operation); Stand-by mode, Operational mode, Setup mode as illustrated in Figure :

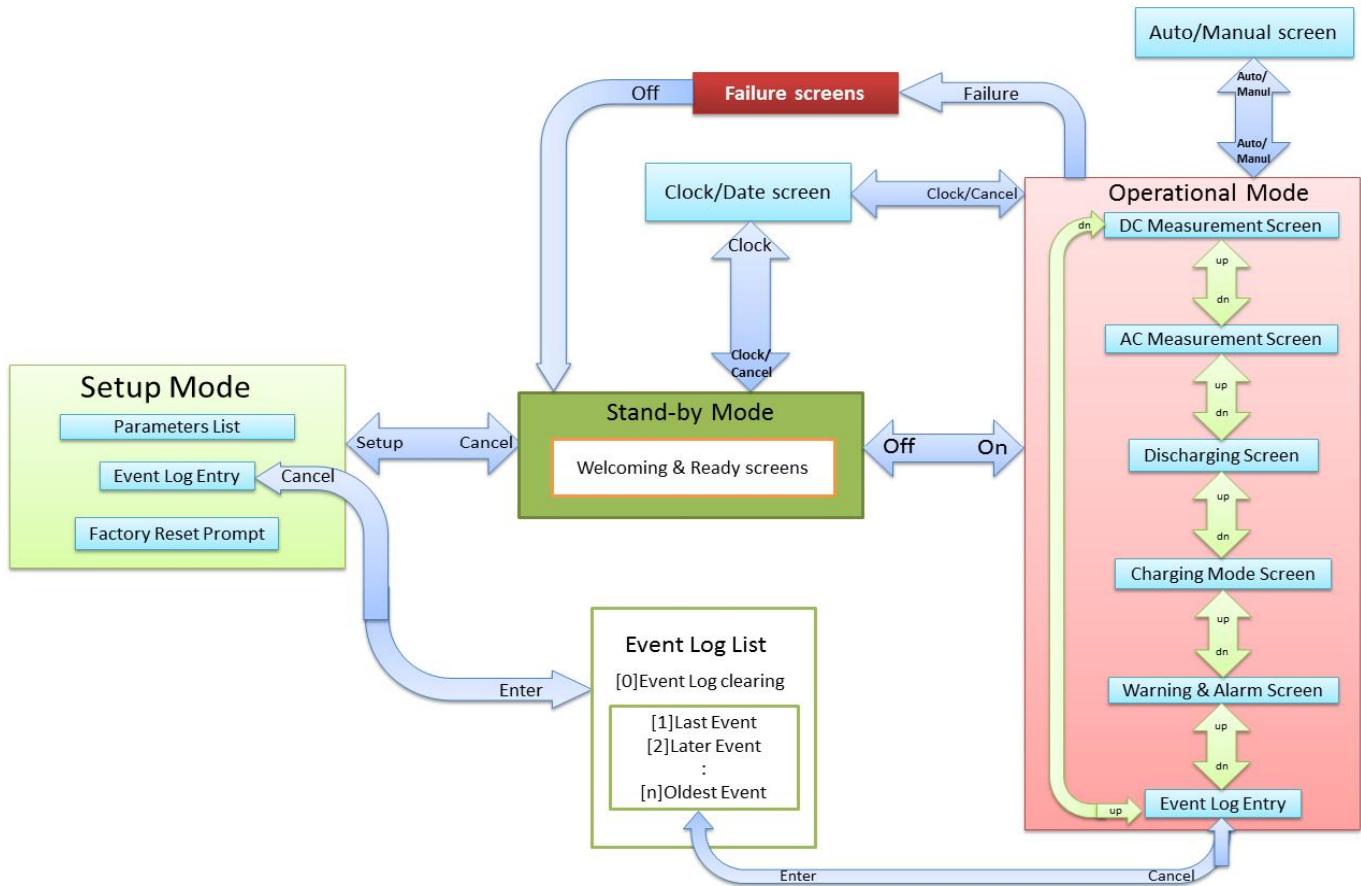


Figure 3: Display modes

In addition to *screen locking mode*; if the screen is left for some time without any user interface the screen will lock, that means the user can only watch system variables during operation but can't change any setup or turn off (during operation) or turn on (if idle) the system from the screen.

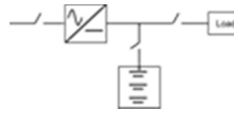
To unlock the screen, the authorized person should enter the screen lock password when demanded, hence the screen will be unlocked and system parameters as well as operation state can be changed. To eliminate screen locking feature the password [0000] should be used; hence the screen will not lock.

There are four actions that can be locked; on/off, setup, clock/date edit, Auto/manual screen. Each of them can be controlled to be locked or not according to corresponding Locking configuration parameter.

4.2.2. Stand-by Mode:

Standby mode is the initial mode at which the rectifier enters when the line switch is on (closed).

Initially these messages (Figure & Figure) will appear on display alternatively. If the screen is unlocked;



To run the rectifier press twice on Power button. To go to Clock menu (Figure) press on Clock button. To edit system parameters press on Setup button. AC measurements (Voltage & frequency) are shown in Ready screen (Figure). If the screen is locked a password message (Figure 1: Password message) will appear -that demands the screen unlock password- when user tries to run the rectifier, edit Clock setup, or edit system parameters each according to their locking configuration.

```
V12=382 Vac    V23= 381 Vac
V31=381 Vac    Frequency = 50.0
Battery charger Sys.
Press[Power]to start
```

Figure 4: Ready message

```
Identification
Dc Rectifier
SWversion :1.0
IR1831048001
```

Figure 5: Welcoming message

```
Date and Time.
Time: 11- 3-50-AM
Date: 11-12-2017
DayOfWeek Monday
```

Figure 6: Clock & Date menu

4.2.3. Clock Menu:

Clock menu (Figure) displays current time and date. These data are used by the event log recording; in order to record system events and their time and date. In order to change hour, minute, second, day, month, year, or day of week; you can parse these parameters by up & down buttons, then press enter to select the chosen parameter. The selected parameter is changed to XX symbol, and then you can enter the number (button functions are changed to numbers from 0 to 9). For AM and Day of week the ranges are [00 ->AM, any other no ->PM] and [1 -> Sunday, 2 ->Monday ...etc.].

4.2.4. Operational Mode:

- After pressing power button twice the system starts to check the AC input voltage and the battery presence and connectivity; displaying checking message (Figure). Note that this message is displayed and disappears in a short time.

```
Check Input Voltage

Battery Connected
```

Figure 7: Checking message



- Normally, the rectifier starts to ramp up output voltage to charge internal filter capacitor. After that the rectifier system is in normal mode the following screens can be browsed by up and down buttons forming a loop as illustrated in Figure :

- [1]DC Measurement screen
- [2]AC Measurement screen
- [3]Discharging state
- [4]Charging Mode
- [5]Current Warning
- [6]Event Log

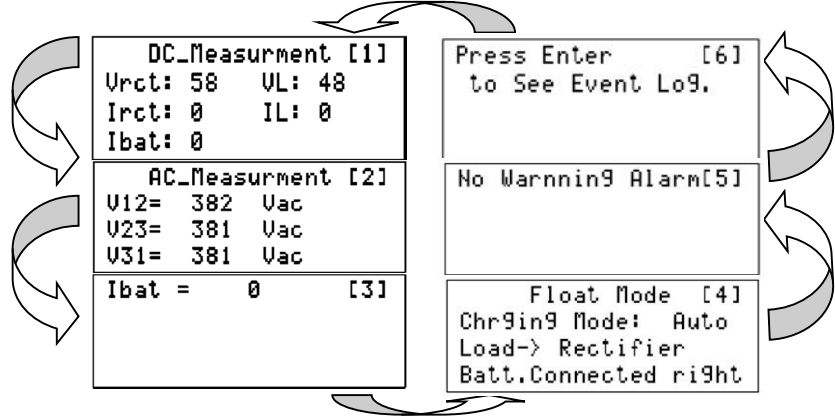


Figure 8:Operational screens

The following table illustrates the main displayed symbols [with in the screens] corresponds to:

Symbol	Meaning	Screen
Vrct	Rectifier output voltage [battery voltage]	[1] DC
VL	Load voltage	[1] DC
Irct	Rectifier current	[1] DC
IL	Load current	[1] DC
Ibat	Charging/ discharging current	[1] DC
V12, V23,V31	Line to Line voltage [three phase]	[2] AC
Ibat	Charging/ discharging current	[3] Discharge
ElapsdTime	Time passed during battery discharging	[3] Discharge
RemainedTime	Estimated time for the system to remain in autonomy time while the battery is in healthy state	[3] Discharge
Chrging Mode	Current charging mode: Manual, float, equalize, boost, discharge.	[4] Charge

Table 4: Display symbols

- To go to Auto/Manual screen press on Manual/Auto Button , Mode can be changed by up & down button while editing the manual charging voltage by pressing Enter Button then enter the required Voltage (hundreds then tens then units) as illustrated in Figure & Figure . Change takes action when leaving Auto/Manual screen; to avoid going to faulty cases. Screen should be unlocked to go to Auto/Manual screen.

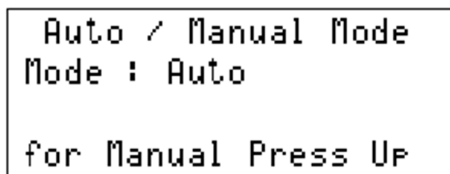


Figure 9: Auto-Manual (Auto selection)

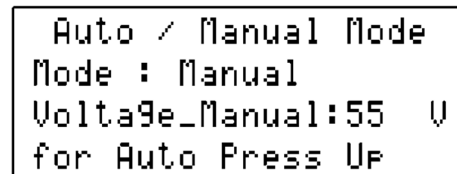


Figure 10: Auto-Manual (Manual detection)



- Clock/Date Menu can be entered also in operational mode by pressing on Clock button and editing can be done as explained in section 4.2.3. Clock Menu: Screen should be unlocked to go to Clock/Date.

4.2.5. Setup Mode:

- To enter setup mode the system must be in stand-by mode, then by pressing Setup button password message (Figure 1) appears if the screen is locked, or the setup mode menu (Figure 2) appears. In screen locking case after entering right password; Setup button shall be pressed again to go to setup mode menu.

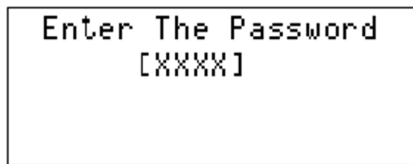


Figure 1: Password message

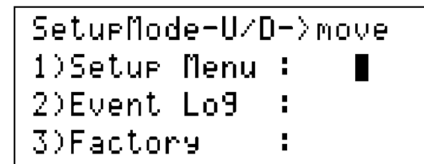


Figure 2: Setup mode menu

- In Setup mode menu by pressing up and down buttons either: Setup menu list, Event log or Factory menu (resetting parameters to Default) can be selected.
- By entering the setup menu the parameter list appears as illustrated in Figure 4, to navigate within the parameters press up or down button until the cursor (█ symbol) reaches the required parameter.
- Press Enter button to enable editing for the selected parameters, the parameter value is transformed to XXX symbol and buttons function is transformed to numbers, the most significant digit is entered first then the lower after (left then right) as illustrated in Figure 3.

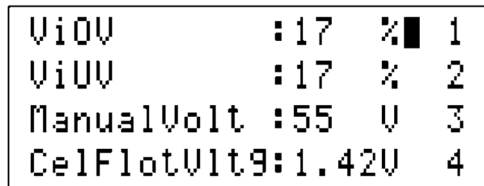


Figure 4: Parameter list

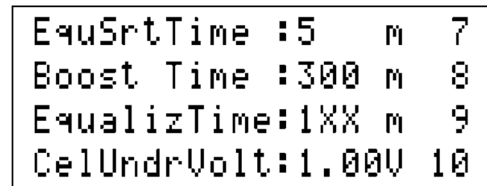


Figure 3: Parameter list (editing)

- After entering all digits a confirmation message appears; value change is confirmed by pressing Enter button to cancel the change press any other button as illustrated in Figure 5.

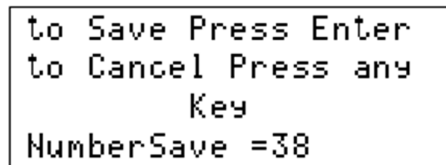
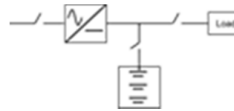


Figure 5: Editing confirmation message

- Parameters List access level & locking configurations are described in sections 5.1. Parameters Access: & 5.2. Interface Locking Configuration:.



- By entering the Event Log menu the last recorded event appears as illustrated in Figure 7, (time & date are included in each event as **Time:Hour:Min.:Sec-Date:Day/Month**) to go to the later events press up button, to clear the event log press down button -at the last recorded event screen- a confirmation screen appears as illustrated in Figure 6.

```
Event1 Float>Stand
C.B Trip

T:12:16:52-D:30/8
```

Figure 7: Last recorded event

```
to Clear EventLogs
Long Press Enter
```

Figure 6: Event log clear confirmation

- Events are divided into critical (Warning event: WE & Error event: EE) and normal event: NE. The access level defines if some or all types of events to be displayed; see section 5.1. Parameters Access:.
- By entering Factory menu a confirmation message for parameters resetting appears as illustrated in Figure .

```
Long Press Enter to
Reset Sys Factory
```

Figure 18: Factory Reset

4.3. System Operational modes:

4.3.1. Float Mode:

Whatever the state of the battery is, in this mode the output voltage at the rectifier side is the float voltage ($=\text{CelFlotVltg} * \text{No Of Cells}$). In this mode the charger is determining automatically the charging voltage to be the float voltage. In this mode output current for both the load and the battery are within limits (BatMaxCurr & TotalCurr).

4.3.2. Hi-Rate Mode:

In this mode the battery is connected right to the rectifier, and the charger is determining automatically the charging voltage to be the equalize voltage ($=\text{CelBstnVltg} * \text{No Of Cells}$). In this mode output currents for both the load and the battery are within limits (BatMaxCurr & TotalCurr). The decision of entering or leaving this mode is decided either by time intervals or by monitoring battery capacity depending on the activation of **AutoEquliz** parameter. The explanation of when to enter or leave the equalize mode is detailed in 5.3. Parameters list: at the **Delta Time**, **BostngTime**, & **MinCurrEqulz** parameters.

4.3.3. Commissioning Mode:



This mode is entered only manually (by activating **Cmismn Mode** parameter) and will be in operation only if the battery is connected right. Also in this mode the load is disconnected, and the charger is determining automatically the charging voltage to be the Commission voltage ($=C_{el}C_{msn}V_{ltg} * \text{No Of cells}$). After the Boost time (**Cmismn Time**) passed, the charger returns to Float mode and will not reenter Boost mode unless the user manually activates the mode again.

4.3.4. Manual Mode:

When User wants to operate on a fixed user defined DC Rectifier Voltage, Manual mode should be used. There are two methods for entering to this mode

- From Setup Menu Parameter [Press Setup Button ,then Press Enter ,Press Up/Down Buttons to reach (**Manual Mode**) Parameter(it should be activated) and (**ManualVolt**) Parameter(edit to the needed voltage)]
- Press Manual Button during rectifier Operation

In this mode output currents for both the load and the battery are within limits (**BatMaxCurr** & **TotalCurr**).

4.3.5. Current Limit state:

When (the Load current + Battery Charging Current) > system max current Limit (**TotalCurr** parameter), Rectifier will reduce DC Rectifier Voltage until its total output Current = **TotalCurr** or less.

4.3.6. Battery Overload:

When the battery charging current > **BatMaxCurr** , Rectifier will reduce DC Rectifier Voltage until Battery Current = **BatMaxCurr** or less.

4.3.7. Bypass Battery state:

If AC Mains fail and Battery Voltage < {230V (in 220v system) or 115V (in 110v system) or 51V (in 48v system)}, the Battery is directly connected to the Load.

4.3.8. Mains Fail:

If Mains fail (Phase Loss, Under, Over Voltage) and Battery is not connected or is wrong connected, The System will be Off (Rectifier and Bypass Switch are off).



5. Setting Parameters using standard LCD display:

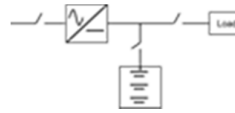
5.1. Parameters Access:

AccessLvl parameter controls the type of parameters displayed in the parameter list. There are three access levels Basic, Standard, and Advanced. Also, the access level determines the types of events shown in event log; Basic level shows error events only, Standard level shows error & warning events (critical events), while Advanced level shows all events (Error, Warning, and normal events).

5.2. Interface Locking Configuration:

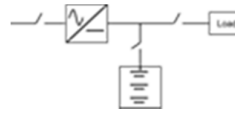
Four actions can be selected to be locked:

Rectifier operation (turn on/off), settings monitor & edit (parameters change), change Auto/Manual settings during operation, Clock/Date change. Each of these has a Locking configuration parameter as in Parameters list.



5.3. Parameters list:

No.	Symbol	Access level	Parameter Name	Description	Range	Unit	Default value
Basic Level							
1	AcessLvl	0	Access level	Determines which parameters are user accessible; 0: basic level, 1:Standard level, 2:Advanced level	0-2	-	1
2	Manual Mode	0	Manual Mode	Manual mode selection	Y/N	-	No
3	ManualVolt	0	Manual Mode Charging Voltage	DC Rectifier Voltage in Manual Mode	(No Of Cells* CelUndrVltg) - (No Of Cells* CelBostVltg)	Volt	127
4	No Of Cells	0	Number of Cells	Number of Cells in the batteries string	36- 122	-	92
Standard Level							
5	CelCmsnVltg	1	Cell Commission Voltage	Commission charging voltage per cell in Boost charging mode	CelBstnVltg - 2.9	Volt	1.65
6	CelBstnVltg	1	Cell Hi-Rate Voltage	Hi-Rate charging voltage per cell in Automatic charging	CelFlotVltg - CelCmsnVltg	Volt	1.47
7	CelFlotVltg	1	Cell Float Voltage	Float charging voltage per cell in Automatic charging mode	CelUndrVltg - CelBstnVltg	Volt	1.38
8	CelUndrVltg	1	Cell Under Voltage	The minimum permitted voltage per cell	0.9- CelFlotVltg	Volt	1
9	BatMaxCurr	1	Battery Max Charging Current	The maximum allowed charging current	1- 85	Amp.	10
10	ViOV	1	Mains Overvoltage Percent	Maximum AC Voltage Level = $380 * (1 + \text{ViOV} \%)$	4-30	%	17
11	ViUV	1	Mains Under Voltage Percent	Minimum AC Voltage Level = $380 * (1 - \text{ViUV} \%)$	4-30	%	17
12	ScrnPsWrd	1	Screen locking Password	Password which unlocks the screen if locked.	0 - 9999		1234
Advanced Level							
13	AutoEquilz		Hi-Rate Mode entering/leaving method	In the Automatic charging mode; <ul style="list-style-type: none"> When the mains returns after an interrupt; the system shall decide either to enter the equalize mode or the float mode. AutoEquilz determines the way used by the system to take the decision. If AutoEquilz is activated the decision will be based on the battery capacity .if it is less than MinPercentg ,the system will enter the equalize mode. Else the decision is based on Delta Time . <ul style="list-style-type: none"> When the system is in Equalize mode; the system shall decide when to enter the float mode. 	Y/N	-	No



				Also AutoEquliz determines the way used by the system to take the decision. If AutoEquliz is activated the decision will be based on MinCurrEqlz . Else the decision will be based on EqualizTime .		
14	BostngTime	2	Hi-Rate Charging Time	Time of Equalize Mode After this time, Sys. Goes back to Float Mode. [this is true in case of both AutoEquliz and Manual Mode are deactivated]	1-999	Min.
15	Delta Time	2	Difference time	If The Load discharged the Battery for time > Delta Time , The Charger would go back to Equalize Mode when AC Input Voltages return [this is true in case of both AutoEquliz and Manual Mode are deactivated]	1-999	Min.
16	MinPercentg	2	Minimum Percentage Capacity	If Percent Capacity < MinPercentg Sys. Will work in Equalize Mode [this is true in case of AutoEquliz is activated and Manual Mode is deactivated]	10-99	%
17	MinCurrEqlz	2	Minimum Current in Hi-Rate mode	The charger returns to Float voltage when charging current decreased to less than MinCurrEqlz [this is true in case of AutoEquliz is activated and Manual Mode is deactivated]	1-10	Amp.
18	Cmismn Mode	2	Commission Mode	Commission mode activation selection	Y/N	-
19	Cmismn Time	2	Commission Charging Time	Time of Commission Mode	1-999	Min.
20	PerCapacity	2	Percent Capacity	This represents how much the battery is charged (current percentage capacity)	1-99	%
21	Reserved	2	-----	-----	-----	---
22	Reserved	2	-----	-----	-----	---
23	Reserved	2	-----	-----	-----	---
24	Reserved	2	-----	-----	-----	---
25	Reserved	2	-----	-----	-----	---
26	TotalCurr	2	Rectifier Total Current	The maximum charger current at which the control limits	1-120	Amp.
27	DCVltRatng	2	System Rated Voltage	The system DC voltage rating	48-110-220	Volt
28	Reserved	2	-----	-----	-----	---
29	ColdStartON	2	Cold Start ON Mode	If ColdStartON is activated and the	Y/N	-



Table 5:
Parameter list

				rectifier fails, the system can operate on the battery.		
30	EthFultShDn	2	Earth Fault Shut Down Mode	If EthFultShDn is activated the system will turn off if earth fault occurs	Y/N	-
31	RLY1stat	2	Programmable relay1 setup (<i>optional</i>)	Setup for Prog. Relay1 to switch on which Alarm or Warning	0: UtltyFail 1: ViUndrLmt 2: ViOverLmt 3: RctfrFail 4: Buck Fail 5: ShrtrCrit 6: OverLd BK 7: LowBattry 8: LowCapcty 9: ErthFault 10: OvrTempBk 11: OvrTRctfr 12: Over Load 13: OvrLodBat 14: C.B. trip 15: Comm. fault	-
32	RLY2stat	2	Programmable relay2 setup (<i>optional</i>)	Setup for Prog. Relay2 to switch on which Alarm or Warning		
33	RLY3stat	2	Programmable relay3 setup (<i>optional</i>)	Setup for Prog. Relay3 to switch on which Alarm or Warning		
34	RLY4stat	2	Programmable relay4 setup (<i>optional</i>)	Setup for Prog. Relay4 to switch on which Alarm or Warning		
35	RLY5stat	2	Programmable relay5 setup (<i>optional</i>)	Setup for Prog. Relay5 to switch on which Alarm or Warning		
36	RLY6stat	2	Programmable relay6 setup (<i>optional</i>)	Setup for Prog. Relay6 to switch on which Alarm or Warning		
37	RLY7stat	2	Programmable relay7 setup (<i>optional</i>)	Setup for Prog. Relay7 to switch on which Alarm or Warning		
38	RLY8stat	2	Programmable relay8 setup (<i>optional</i>)	Setup for Prog. Relay8 to switch on which Alarm or Warning		
39	RLY9stat	2	Programmable relay9 setup (<i>optional</i>)	Setup for Prog. Relay9 to switch on which Alarm or Warning		
40	RLY10stat	2	Programmable relay10 setup (<i>optional</i>)	Setup for Prog. Relay10 to switch on which Alarm or Warning		
41	ScrnLkTim	2	Screen locking Time	Time after which editing features locks	1-120	Min.
42	OnOffLck	2	On/Off Locking	Selecting weather to Lock rectifier operation (turn on or off) or not	Y/N	-
43	SetupLck	2	Setup Locking	Selecting weather to Lock setup menu or not	Y/N	-
44	AtoMnulLck	2	Auto/Manual Locking	Selecting weather to Lock Auto/Manual editing (during operation) or not	Y/N	-
45	ClckDatLck	2	Clock/Date Locking	Selecting weather to Lock Clock/Date editing or not	Y/N	-
46	ParSett_Send	2	Parameters setting sending	Sending Parameters setting from the control to the display	-	-
47	ParSett_Resv	2	Parameters setting receiving	Sending Parameters setting from the display to the control	-	-



6. TROUBLESHOOTING & MAINTENANCE:

6.1. Alarms:

On Alarm situations, the battery charger undergoes a protective action (such as disconnecting the loads for protection from faults and abnormal conditions), following these alarms issued by the battery charger:

Symbol	Name	Description
UtilyFail	AC Utility Failure	Total or partial AC input phase loss occurs
Under Vin	AC input Voltage Under Limit	AC line voltage(s) decreases below the Limit defined by viUV
Over Vin	AC input Voltage Over Limit	AC line voltage(s) increases above the Limit defined by viOV
Mains Fail	Power Sources Failure	AC line voltage(s) is out of range defined by(viOV & viUV) and the battery is either empty or reverse connected or disconnected
Rect Fail	Rectifier Failure	AC line voltage(s) is within defined limits but the AC/DC converter has zero output voltage
Over Temp	Over Temperature Limit	The rectifier heat sink temperature exceeds its limit
ShortCirt	Converter Overload	DC output voltage is under Short circuit level 1 for more than 3 seconds
	Short Circuit	DC output voltage is under Short circuit level 2(normally less than level 1)
LowBatery	Empty Battery	Battery string voltage decreased to less than empty battery level (empty battery level = CelUndrVolt * No Of Cells)
EarthFult	Earth Fault	A leakage current passes between the earth and either the positive or negative terminal. This fault can be Warning if EthFultShDn is deactivated.

Table 6: Alarms

6.2. Warnings:

On Warnings situation, the battery charger continues operating with a buzzer and Warning LED flashing, following these warnings issued by the battery charger:

symbol	Name	Description
Over Load	Rectifier overload	The rectifier current exceeded TotalCurrt , and the system enters a current limit mode.
OverLdBat	Battery overload	The battery charging current exceeded BatMaxCurrt , and the system enters a current limit mode.
EarthFult	Earth Fault	A leakage current passes between the earth and either the positive or negative terminal. This fault can be Alarm if EthFultShDn is activated.
C.B. trip	Circuit Breaker Trip	When the control detects any of the AC input or DC outputs circuit breakers are opened (optional)

Table 7: Warnings



7. Maintenance:

The IR series is an industrial electronic product with advanced semiconductor elements. However, temperature, humidity, vibration and aging parts may still affect it. To avoid this, it is recommended to perform routine inspections.



WARNING

Please only experience maintenance technicians are allowed to follow these steps



CAUTION

**Be sure to remove the input power (AC & DC) input while performing maintenance.
Be sure to perform maintenance only after checking that the DC bus has discharged. The bus capacitors can still be charged even after the power is turned off.**

A Battery Charger like other electrical equipment, need to periodic maintenance as following:

- 1) Release AC input circuit breaker.
- 2) Release battery and load circuit breakers.
- 3) Open the covers of the battery charger and clean the dust carefully with air compressor.
- 4) Check the cooling fans.
- 5) Check the electronic Control PCB connections and tighten the connectors.
- 6) Check the SCR Bridge and block diode.
- 7) Check the SCR driver board and its cables.
- 8) Check the buck converter board and its connection.
- 9) Remain charger OFF, if some parts need maintenance by manufacturer. This state is considered as emergency case.