



IMPAQTM

BATTERY CHARGER



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1. Features

- 1.1. Microprocessor-controlled
- 1.2. Able to auto identify battery's capacity
- 1.3. Able to adapt to State of Charge (SoC)
- 1.4. Compatible with battery voltages of:

1ph	3ph
12V	
24V	24/36/48V
36/48V	72/80V
	96V
	120V

- 1.5. Unique profile for charging Thin Plate Pure Lead (TPPL)
- 1.6. Unique profiles for NexSys® battery charge applications: NXBLOC; NXSTND.
- 1.7. Fully programmable to unique fleet requirements.
- 1.8. Battery chemistry agnostic - TPPL, Flooded and Gel Lead Acid.

2. Technical Information

2.1. Name plate labels

  EnerSys Sp. z o.o. ul. Leszczyńska 73 43-300 Bielsko-Biala, Poland 
TC3 IMP
3 Modules 24V/26V/48V 210A/195A/180A Pmax=11150W
360VAC-440VAC 50/60Hz

2.1.1. Name plate label definitions

Item	Description
Serial Number	Provides date code.
Hertz	Input voltage frequency. Under no conditions operate the charger at a different frequency or from a generator with unstable frequency.
Phase	TCX. When "1" indicates a Single Phase Charger and "3" indicates a Three Phase Charger.
AC Volts	Nominal voltage for which this charger is rated to operate.
DC Volts	Nominal DC output voltage of the charger
Modules	Actual number of power modules installed in the charger cabinet.
DC Amps	DC current that this charger will deliver to a discharged battery with the number of power modules installed and based on the Nominal Voltage

2.1.2. Output power letter codes

Output Power (kW)	Number Modules	Module Power (kW)
1.0	1	1.0
2.0	2	1.0
3.0	3	1.0
3.5	1	3.5
7.0	2	3.5
10.5	3	3.5
14.0	4	3.5
17.5	5	3.5
21.0	6	3.5
24.5	7	3.5
28.0	8	3.5

2.1.3. Cabinet size (number of modules available) and DC cable size

Phases	Module Positions	Standard Cable Gauge	Comments
1ph	Max 1	6 mm ²	stand alone cabinet
1ph	Max 3	25 mm ²	Three slot, 3 kW cabinet
3ph	Max 2	35 mm ²	Two slot, 7 kW cabinet
3ph	Max 4	70 mm ²	Four slot, 3.5 to 14 kW cabinet
3ph	Max 6	95 mm ²	Six slot, max 21 kW cabinet
3ph	Max 8	70 mm ² or 1 x 95 mm ²	Eight slot, max 28 kW cabinet. Dual cable for 24/36/48Vdc single cable for 72/80Vdc

2.1.4. Charge profile codes

Profile Code	Charger Profile	Description
P22	HDUTY	Heavy Duty wet cell Pulse Profile. The charge profile diagnoses the battery status throughout the recharge phase and adjusts its parameters to optimize the charge of flooded battery technology. Max 0.25 C5. Auto battery capacity matching with continuous current loops.
P21	STDWL	Standard (Waterless) wet cell profile. IUI profile Max 0.13 to 0.20 C5. Auto battery capacity matching with Ph1 loops. Can manually set battery capacity if required. Weekly Equal is needed.
P02	GEL	IUI profile. Max 0.17 to 0.22 C5. Auto battery capacity with Ph1 loops. Can manually set battery capacity if required. Weekly Equal is needed.
P06	AGM	IUI profile. Max 0.20 C5. Auto battery capacity with Ph1 loops. Finish time limitation. Can manually set battery capacity if required. Weekly Equal is needed.
P07	OPP (*)	Opportunity charge PzQ cells. IU (main) & IUI pulse (daily) profile @0.25 C5. Finish current 5%. Must set Daily Full charge. Weekly Equal is needed.
P04	AIRMIX	Pneumatic / Airmix profile. Must have Air kit fitted to use this profile. IUI profile Max 0.13 to 0.25 C5. Auto battery capacity with Ph1 loops. Can manually set battery capacity if required. Weekly Equal is needed.
P25	LOWCHG	Low rate charge profile. IUI profile 0.09 to 0.13 C5. Manually set battery capacity if required. Weekly Equal is needed.
P31	NXBLOC (*)	For NexSys® core Bloc battery under normal charge. Charge rate 0.192 to 0.70 C5. Must set Battery Capacity, Temperature & Equalize values (NexSys® BLOC battery). Weekly Equal is needed.
P29	NXSTND (*)	For NexSys® core 2V battery under normal charge. Charge rate 0.192 to 0.25 C5. Must set Battery Capacity, Temperature & Equalize values (NexSys® 2V battery). Weekly Equal is needed.

2.2. (*) Opportunity profile options

2.2.1. Operation: In Opportunity charging mode, the user can charge the battery during breaks, lunch, or any available time during the work schedule. The Opportunity charge profile allows the battery to be safely charged while it is kept in a partial state of charge between 20% and 80% of C6 throughout the work week. Sufficient time should be scheduled after the weekly equalize charge to allow battery cooling and to perform periodical electrolyte level checks.

2.2.2. Daily Charge: This option can be set to add additional daily charging time, if the work schedule allows. It should be considered only when the daily work demand requires additional capacity.

2.3. Equalization charging

2.3.1. Equalization charging for traditional flooded lead acid batteries, performed after normal charging, balances the electrolyte densities in the battery's cells.

2.3.2. NOTE: The factory default is Daily Charge DISABLE, 6-8 hours Equalize, Sunday at 00 hour for flooded, 2-hour week / maintenance charge for NexSys® battery charge profiles.

2.4. Block out time

2.4.1. This function inhibits the charger from charging the battery during the block out time window. If a charge cycle has started before the block out window it is inhibited during the block out window and will automatically restart the charge cycle at the end of the block out window.

2.5. Refresh charging

2.5.1. Refresh or maintenance charging enables the charger to maintain the battery at maximum state of charge as long as it is attached to the charger.

2.6. Charger option list

Suffix	Description
LMEB	Late Make Early Break
Airmix	Electrolyte Circulation System

3. Safety Precautions

- Warning:** The shipping pallet must be removed for proper and safe operations.
- This manual contains important safety and operating instructions. Before using the battery charger, read all instructions, **cautions** and **warnings** on the battery charger, the battery and the product using the battery.
- Read and understand all setup and operating instructions before using the battery charger to prevent damage to the battery and to the charger.

- Do not** touch non-insulated parts of the output connector or the battery terminals to prevent electrical shock. Never open the equipment: High voltage could be still present even turning off the charger. Any adjustment, maintenance or repairs to the equipment while it is open must only be carried out by an appropriately skilled person who is aware of the risks involved.
- During charge, lead acid batteries produce hydrogen gas which can explode if ignited. Never smoke, use an open flame or create sparks in the vicinity of the battery. Take all necessary precautions when the equipment will be used in areas where there is the possible risk of an accident occurring. Ensure appropriate ventilation according to standard EN 62485-3 to allow any gases released to escape. Never disconnect the battery while it is being charged.
- Unless charger is equipment with LMEB (Late Make Early Break) feature **Do not** connect or disconnect the battery plug while the charger is on. Doing so will cause arcing and burning of the connector resulting in charger damage or battery explosion.
- Lead acid batteries contain sulfuric acid which causes burns. **Do not** get in eyes, on skin or on clothing. In cases of contact with eyes, flush immediately with clean water at least for 15 minutes. Seek medical attention immediately.
- Only factory-qualified personnel should install, set up and service this equipment. De-energize all AC and DC power connections before servicing the charger.
- Must be used in conformance with its indicated level of protection and never come into contact with water.
- Must not be installed on surfaces subject to vibration (near to compressors, engines, motors).**
- Must be installed so that the gases from the battery being charged, do not get sucked into the charger by its fans.
- The charger is **not** for outdoor use, only indoor use.
- Do not** expose the charger to moisture. Operating conditions should be 32°F (0°C) to 113°F (45°C); 0 to 70% relative humidity.
- Do not** operate the charger if it has been dropped, received a sharp impact, or otherwise damaged in any way.
- For continued protection and to reduce the risk of fire, install chargers on a non-combustible surface.
- For NexSys® iON batteries, use only EnerSys® battery packs that include the battery management system and all necessary protection for the battery pack integral to the pack.
- The DC cables of the charger emit low power magnetic fields in their surroundings (<5cm). People with medical implant devices should avoid being near charger while charging.
- Contact one of the company's trained technicians if any problem is encountered when putting the charger into operation. It is only designed to recharge Industrial Motive Power lead acid and EnerSys® NexSys® batteries on industrial premises. When the equipment becomes obsolete, the casings and the other internal components can be disposed of by specialist companies. Local legislation takes precedence over any instructions in this document and must be scrupulously observed (WEEE 2002/96 EC).

4. Installation

4.1. Location

- For safe operation, choose a location which is free of excess moisture, dust, combustible material, and corrosive fumes. Also, **avoid high temperature (above 113°F (45°C))** or potential liquid spill on the charger.
- Do not** obstruct the openings in the charger for air ventilation.
- Follow charger warning label when mounting on or over a combustible surface.
- It is recommended to mount the charger **at least 72 cm radial distance** away from the closest top edge of the battery.

4.2. Cabinet mounting

- The charger must be mounted on a wall, stand, shelf or floor in a vertical position. The minimum distance between two chargers must be 31 cm. If wall mounted, make sure that the surface is free of vibrations and the charger is mounted in a vertical position; if floor mounted, make sure that the surfaces are free of vibration, water, humidity. You must avoid areas where the chargers may be splashed with water.
- The charger must be held by 2 or 4 fixings suitable for the type of support. The drilling pattern varies according to the model of charger (please refer to the technical data sheet).

4.3. Electrical connections

- To prevent failure of the charger, make sure it is connected to the correct line voltage. Follow your local and local country standards and laws in making these connections.
- WARNING: Make sure the power source is OFF and the battery is**

4. Installation (cont.)

disconnected before connecting the input power to the terminals of the charger.

4.3.3. To the mains supply: You may only connect to the 1-phase 230Vac or 3-phase 400Vac mains supply (depending on the type of the charger) by means of a standard socket and an appropriate circuit breaker (not supplied). The current consumption is shown on the charger's information plate.

4.3.4. Connection to battery: The charger must be connected to the battery by the cables supplied:

- The RED cable: to the battery's POSITIVE terminal.
- The BLACK cable: to the battery's NEGATIVE terminal.

4.4. AC circuit protection

4.4.1. The user must provide suitable branch circuit protection and a disconnect method from the AC power supply to the charger to allow for safe servicing

4.4.2. CAUTION: Risk of Fire/Electrick shock. Use only on circuits provided with branch circuit protection in accordance with laws and standards.

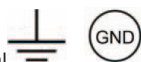
4.4.3. The prevailing safety regulations must be observed. The system protection installed on the power supply to the charger must conform to the charger's electrical characteristics. The installation of a suitable circuit breaker is recommended. It is imperative to ensure that when fuses are being replaced only fuses of the specified type and of the correct are used.

4.4.4. This equipment conforms to Class 1 safety standards, which means that the appliance must be earthed and requires to be powered from an earthed supply.

4.5. Grounding the charger

4.5.1. Grounding the charger

4.5.2. Connect ground wire to the proper terminal usually marked with either of the two symbols to the right.



4.5.3. DANGER: FAILURE TO GROUND THE CHARGER COULD LEAD TO FATAL ELECTRIC SHOCK. Follow National Electric Code for ground wire sizing.

4.6. DC connector polarity

4.6.1. DC plug polarity

4.6.2. The charging cables are connected to the DC output of the charger: the red charging cable (POS) is connected to the positive busbar of the charger, and the black charging cable (NEG) is connected to the negative busbar of the charger. The output polarity of the charger must be observed when connecting to the battery. Improper connection will open the DC fuses in the power modules.

4.7. EU Declaration

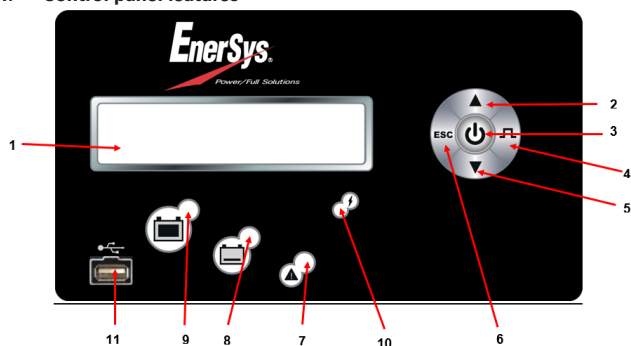
EnerSys® hereby declares that the chargers in the IMPAQ™ charger ranges are in conformity with the following UK and European regulations:

- **Electrical Equipment (Safety) Regulations 2016 (S.I. 2016/1101)**
- **European Directive 2014/35/EU**
Safety
BS EN IEC 62368-1 : 2020 + A11 :2020
- **EMC Regulations 2016 (S.I. 2016/1091)**
- **Directive 2014/30/EU:**
Electromagnetic Compatibility
BS EN IEC 61000-6-2: 2019
BS EN IEC 61000-6-4: 2019
- **Directive 2011/65/EU**
RoHS
- **Control of Electromagnetic Fields Regulations (S.I. 2016/588)**
- **Directive 2013/35/EU:**
Electromagnetic fields
BS EN IEC 62311: 2020

Note: DC cables of the charger emit low power magnetic fields in their surroundings (<5cm). Even if emissions are below the standard limits, people bearing medical implants should avoid operating close to the charger during recharge.

5. Operating Instructions

5.1. Control panel features



5.1. Control panel features (cont.)

Reference	Function	Description
1	LCD Display	Display charger operation info/menus
2	Navigate UP button	Navigate menus / Change values
3	ENTER/STOP and START button	Select menu items / Enter values / Stop and restart battery charge
4	Navigate RIGHT/EQUALIZE button	Scroll right / Start equalize or desulfation
5	Navigate DOWN button	Navigate menus / Change values
6	Navigate LEFT/ ESC button	Enter main menu / Scroll left / Exit menus
7	RED fault indicator	OFF = no fault FLASHING = ongoing fault detected ON = fault
8	YELLOW charging indicator	OFF = charger off or battery not available ON = charging in progress
9	GREEN charge complete indicator	OFF = charger off or battery not available FLASHING = cooling phase ON = battery ready and available
10	BLUE AC supply indicator	OFF = AC missing ON = AC present
11	USB port	Download memos / Upload software

5.2. Menu access

When the charger is idle, press and hold <ESC>, the Main Menu is then displayed. The main menu is automatically exited after 60 seconds of inactivity or can be exited voluntarily by pressing the <ESC> button.

5.2.1. Main Menu

All menus are accessed from Main Menu; a detailed description of each menu is included in the next sections of this manual. The menus that require a password are not displayed until the correct password has been entered.

The menus provide access to the following functions:

- View last 200 charging cycles (Memo menu).
- View of faults, alarms, etc. (Status menu).
- USB functions (USB menu).
- Setting of date, language and others (Parameters menu).
- Management of password (Password menu)

5.3. MEMORIZATIONS

5.3.1. Memorizations Display Screen

The charger can display the details of the last 200 charge cycles.

The display below shows one charge stored in memory. MEMO 1 is the latest charge memorized. After memorizing the two-hundredth charge, the oldest record is deleted and replaced by the next oldest.



5.3.2. Displaying a Charge Cycle

Proceed as follows:

1. Select a record (MEMO x) using the ▲/▼ buttons.
2. Display the first History screen by pressing Enter.
3. Display the second History screen by pressing ▼.
4. Return to the Main Menu by pressing Esc.

The charge history is displayed; use the ▲/▼ to scroll through the parameters.

5.3.3. Memorization Data

Memo	Description
Profile	Selected profile
Capacity	Rated battery capacity (AH)
U batt	Rated battery voltage (V)
Temp	Battery temperature at start of charge (F)
% init	Battery voltage at start of charge (%)
U start	Battery voltage at start of charge (Vpc)
U end	Battery voltage at end of charge (Vpc)
I end	Current at end of charge

Memo	Description
Chg Time	Time of the change cycle (minutes)
AH	Amp-hours returned during charge cycle
SoC	Start of charge date and time
DBa	Battery disconnect date and time
Status	Partial or complete
Fault	Fault Codes
CFC	Termination code (for service tech)

5. Operating Instructions (cont.)

5.4. STATUS

This menu displays the status of the charger's internal counters (number of normal and partial charges, faults by type, etc.).

5.4.1. Status Screen



Status	Description
Charge	Total of number of charges - corresponds to the total of normally terminated charges and charges terminated with or by faults
	Number of charges normally terminated
	Number of charges abnormally terminated
DF1 etc.	Number of faults recorded by the charger (see Fault Codes)
TH	Number of charger temperature faults

5.5. USB

This menu provides access to the USB function to update software.

5.5.1. Update Software

Updates charger's internal software. The software is provided by EnerSys®.

5.6. PARAMETERS

5.6.1. Date/Hour

Sets date and time of the charger. The clock has a battery backup which will preserve the time when power to the charger is off.

5.6.2. Language

Selects the language displayed in the menus.

5.6.3. Region

Selects the format for date, metric (EU) or imperial (US) units for temperature, length and cable gauge.

5.6.4. Display

Set screen saver function.

Contrast

Modifies the display contrast level (20 to 29).

5.6.5. Screen Saver

Enable or Disable the screen saver function.

5.6.6. Delay

Set the time the screen stays illuminated. The delay time is adjustable in minutes up to one hour and 59 minutes.

5.6.7. Daylight Savings

Enables or disables automatic clock adjustment for daylight savings time. When enabled, time will move ahead one hour at 02:00 on the second Sunday in March and will move back one hour at 02:00 on the first Sunday of November. The charger must be powered up at the time of the change for it to take effect.

5.7. PASSWORD

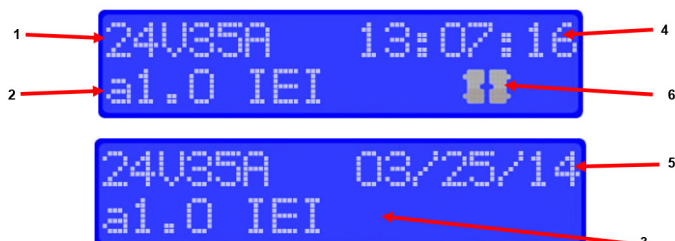
This is where the password is entered to gain access to service level menus by authorized EnerSys® service personnel.

5.8. CHARGING THE BATTERY

At this point, the charger should have been set up by a qualified service person. Charging can only begin when a battery of the proper type, capacity and voltage is connected to the charger.

With the charger in wait mode (no battery connected) and without pressing the Stop/Start button, the display will show the following information:

5.8.1. Charger Idle Display



5.8. Charger Idle Display (cont.)

Ref.	Description
1	Charge DC voltage/Charge current
2	Firmware version
3	Selected charge profile
4	System time
5	System date
6	Connect battery

5.8.2. Starting a Charge Cycle

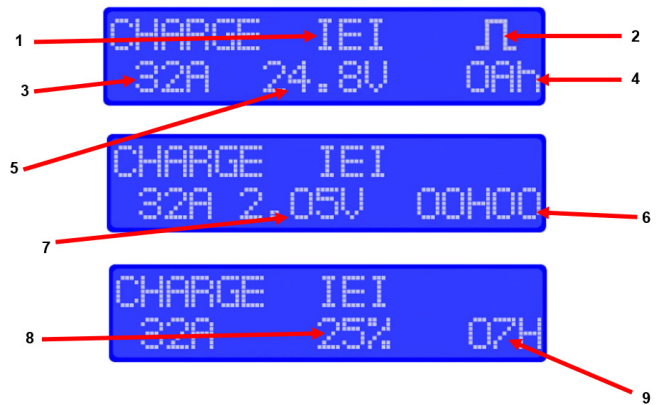
The charger will start automatically when a battery is connected or if the Stop/Start button is pushed if the battery is already connected.

5.8.3. Delayed Start

If the charger was programmed for delayed start, charging will begin following that delay. When the battery is plugged in to the charger, the display shows the time remaining before the programmed charging starts.

5.8.4. Effective Charge

A few moments into the effective charge, the display will begin alternating between the following charging information:



Ref.	Description
1	Charge profile
2	Pending equalize symbol (if selected)
3	Charge current
4	Charge AH
5	Charge voltage (total V)
6	Charge time
7	Charge voltage (V/c)
8	Percent of charge
9	Estimated remaining charge time

5.8.5. End of Charge without Equalization

The green complete LED comes on after proper end of charge. The green complete LED is on and the display shows AVAIL. The display alternates between:

- Total charging time
- Amp/hrs restored to the battery

Any other lit LED indicates a problem during charging. Please refer to paragraph Control Panel for more information.

If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge.

The battery is now ready for use. Push the ON/OFF button before unplugging the battery.

5.8.6. End of Charge with Equalization

An Equalize charge can be started manually or automatically.

5.8.7. Manual Equalization Start

1. At the end of charge (green LED on or flashing), press on the <EQUALIZE> button. The equalize button can also be pressed any time during the charge and an equalize charge will be started after charging is complete.

NOTE: When an Equalize is manually started, the output current will be set to the value saved in the charger configuration.

2. The start of the equalization charge is indicated by the message EQUAL. During the equalization charge, the charger displays the output current and alternates: the battery voltage, voltage per cell and remaining time.

5. Operating Instructions (cont.)

5.8.7. Manual Equalization Start

3. The battery will be available when the green LED comes back on and the display shows AVAIL

4. The battery is now ready for use. If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge. Push the ON/OFF button before unplugging the battery.

5.8.8. Automatic Equalization Start

If an equalization day has been programmed in Charger configurations the equalization charge will start automatically on the programmed day of the week after charging is complete.

NOTE: The factory default IEI Equalize, 6 hour Equalize, Sunday at 00 hour.

The battery will be available when the green LED comes back on and the display shows AVAIL. The battery is now ready for use. If the battery remains plugged in and refresh charge has been enabled, refreshes will occur to maintain an optimal charge. Push the ON/OFF button before unplugging the battery.

6. Fault codes

In case of a fault, one of the corresponding fault codes listed below will appear on the display. If it is a critical fault, charging will stop and the red Fault LED will be illuminated.

6.1. Fault Display



7. Service and Troubleshooting

7.1. Fault Display

Error	Cause	Solution
DF-CUR	Current fault before DF1 (can be low mains, phase missing or faulty module)	Call for Service
DF1	Critical current fault, all modules are on DF1 fault (check the mains and phase missing)	Call for Service
DF2	Output fuse fault, battery reverse polarity	Check the correct connection of the battery (reversed polarity cables) and the output fuse.
DF3	Incorrect Battery voltage for charger setting	Too high or too low battery voltage. Battery voltage must be between 1.6V and 2.4V per cell for Lead Acid technology. Use proper charger for battery.
DF4	Overdischarge	Charge continues.
DF5	Battery or charger setting inspection (Ah security, charge timeout, negative voltage Dv/Dt)	DF5 appears when the charging profile has been achieved with a fault condition, that can be a current increase in regulation phase demonstrating a battery heating or a badly programmed regulation voltage, or the charging time is too long and has exceeded the safety limit. Check charging parameters: profile, temperature, capacity, cables. Check the battery (defective cells, high temperature, water level).
DF7	Air pressure pump fault. Current Di-Dt, thermal run away.	Call for Service
TH	Charger Thermal fault, all modules are on thermal fault (check air flow, and ambient temperature).	Verify the proper operation of the fans and/or absence of too high ambient temperature, or there is poor natural ventilation to the charger.

7.1. Fault Display (cont.)

Error	Cause	Solution
TH-Amb	Ambient temperature too high	Move the charger in a place with lower ambient temperature. Follow instructions on installation and safety
DFMOD	Module faulty (refer to Module Menu to know the fault type)	Call for Service
MOD DEF	Module is unplugged or not answer	Clean the module or the backplane connection. If not working Call for Service
MOD DFC	Module Converter faulty, the module can't output the maximum current (check the AC phases, and AC fuse)	Check power supply.
MOD TH	Module thermal fault (check the air flow, ambient, refer to Module Status Description to check the internal temperature sensor)	Check that the fan(s) is (are) working correctly and/or that the ambient temperature is not too high or whether there is poor natural ventilation to the charger. If all modules are in thermal fault, a TH fault will follow.
MOD FUS	Module output fuse damaged	Call for Service
MOD Err	Module internal error	Call for Service (check the Module status description)
MOD VBAT	Battery voltage is corrupted vs Fuse voltage and VLMFB vs Modules	Call for Service (check the voltage reading on the Module Status Description)
TH-LOCK	Module is locked because of repetitive thermal events	Check the Exx,CDV file to make action before to reset the locking or Call for Service
POWER MODULE OFF	No CANBUS communication between display and module	Check ribbon cable, AC mains, Module plugged, idle = off or Call for Service
DF-VREG	Modules don't follow the regulation voltage setting	Call for Service (replace the faulty module)
DF-ID	Menu setting does not match the module type (ie: Cell setting = 12V, Module type 40 cells)	Use correct module.
CANBUSERROR	CAN bus error	Call for Service
DEFEEP	Memory access denied	Call for Service
DEFRTC	clock access denied	Call For Service

7.2. Maintenance and service

7.2.1. WARNING: THERE ARE DANGEROUS VOLTAGES WITHIN THE BATTERY CHARGER CABINET. ONLY A QUALIFIED PERSON SHOULD ATTEMPT TO ADJUST OR SERVICE THIS BATTERY CHARGER.

7.2.2. The charger requires minimal maintenance. Connections and terminals should be kept clean and tight. The unit (especially the heatsink) should be periodically cleaned with a low pressure air to prevent any excessive dirt build up on components. Care should be taken not to bump or move any adjustments during cleaning. Make sure that both the AC lines and the battery are disconnected before cleaning. The frequency of this type of maintenance depends on the environment in which this unit is installed.

7.2.3. Any data, descriptions or specifications set forth herein are subject to change without notice. Before using the product(s), the user is advised and cautioned to make its own determination and assessment of the suitability of the product(s) for the specific use in question and is further advised against relying on the information contained herein as it may relate to any general use or indistinct application. It is the ultimate responsibility of the user to ensure that the product is suited, and the information is applicable to the user's specific application. The product(s) featured herein will be used under conditions beyond the manufacturer's control and therefore all warranties, either express or implied, concerning the fitness or suitability of such product(s) for any particular use or in any specific application, are disclaimed. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself.

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