iTECHWORLD
THE POWER EXPERT

12/24V 40Amp MPPT Solar Charge Controller

USER GUIDE

Contents

1. Saftey Precautions

For safe operation and ideal performance, the iTechworld 40A MPPT Solar Charge Controller must be correctly installed and operated correctly. Please carefully read, understand, and follow all instructions and guidelines in this User Guide. iTechworld recommends that all wiring and installation be done by a certified technician to ensure all applicable electrical wiring regulations and installation codes are met.

Failure to follow these instructions may result in damage to the unit and could also result in death or serious injury.

Disclaimer:
While iTechworld has taken every precaution to ensure the accuracy of the contents of this user guide, iTechworld assumes no responsibility for any errors or omissions.
Furthermore, all specifications and functionality may change at any time without notice.

Important:

Please read and understand the entirety of this user guide before using your iTechworld solar charge controller. Any misuse may result in damage to the unit and/or cause harm or serious injury to the user.

SAFETY PRECAUTIONS

1. **WARNING:** People with physical disabilities, visual, sensory, or mental impairments (including children) should not use this device. Children should be supervised to ensure they do not play with battery chargers.

2. **DANGER:** Do not disassemble or modify the solar charge controller, doing so may result in a risk of electrical shock, fire, death, or serious injury.

3. **DANGER EXPLOSION HAZARD:** Do not use this solar charge controller in an environment where flammable fumes or gases are present(such as gas bottles, petrol engines or lead acid battery compartments)

4. **DANGER:** This solar charge controller is only suitable for battery types listed in the manual. **Do not use it for other purposes.**

5. **WARNING:** Please select the correct battery charging profile applicable to the battery being charged. If the incorrect battery charging profile is selected, it may cause damage to your battery or result in fire. If you are unsure of the correct battery charging profile to use, please consult your battery's manufacturer.

6. **WARNING:** External solar and battery disconnects/fuses are required, otherwise, it may result in damage to the charger, risk of electrical shock, fire, death, or serious injury.

7. **WARNING:** Ensure that the selected battery charging profile's charge voltage does not exceed the battery's recommended maximum charging voltage. If you are unsure of the maximum charging voltage of your battery, please consult your battery's manufacturer.

8. **WARNING:** Ensure that the continuous output current of the solar charge controller does not exceed the battery's recommended maximum charging current. If you are unsure of the maximum charging current of your battery, please consult your battery's manufacturer.

9. **Warning:** When using the solar charge controller to charge a lithium battery, ensure that the battery contains an inbuilt battery management system (BMS) that features under and over voltage protection with cell balancing. Failure to do so may result in fire, death, or serious injury.

10. **DANGER:** Never smoke or allow a spark or flame in vicinity of battery or engine. This may cause the battery to explode

11. **LIMITATIONS OF USE:** Do not use in connection with life support systems or other medical equipment or devices.

2. Product Overview

2.1. Introduction:

The iTechworld 40 Amp MPPT Solar Charge Controller is designed to enhance any solar and battery combination, it works especially well with the iTECH120X lithium battery and iTechworld solar panels. This controller and its charging algorithm are patented by iTechworld. Thanks to the innovative technology in the iTechworld 40 Amp MPPT Solar Charge Controller, you can access the maximum power of your solar panel(s) which will significantly improve your system. The iTechworld 40 Amp MPPT Solar Charge Controller has a Liquid-Crystal Display (LCD) which is used to dynamically display the operation data and working status of the solar charge controller. **Suitable for indoor use only.**

2.2 Key Features:

- Advanced Maximum Power Tracking (MPPT) technology, with efficiency of 99.5%
- Maximum conversion efficiency of 97%
- Rapid maximum power point tracking.
- Automatic voltage identification (12V or 24V)
- Suitable for charging most common types of automotive or recreational 12-Volt lead acid batteries, such as Gel, Sealed Lead Acid, Flooded Lead Acid, $LiFePO_4$(Lithium Iron/Ferro Phosphate, such as the iTECH120X) and Li $(NiMnCo)O_2$(Li-po/NMC) Chemistry 12-Volt Lithium batteries containing a BMS.
- 40A MPPT Solar Regulator
- Constant and reliable maximum input power of the solar panel to ensure safety when charging.
- Wide solar panel operating voltage up to 100VDC.
- An intelligent control point for your solar panel system. With an intuitive LCD, you are in control of your solar panel system.
- Power statistics recording functionality, the controller will log the power put into the battery.
- Using the buttons, you can program the controller to your preferences and monitor your solar system in real time.
- Easy to read display icons and indicators will tell you the operating status of your solar panels.
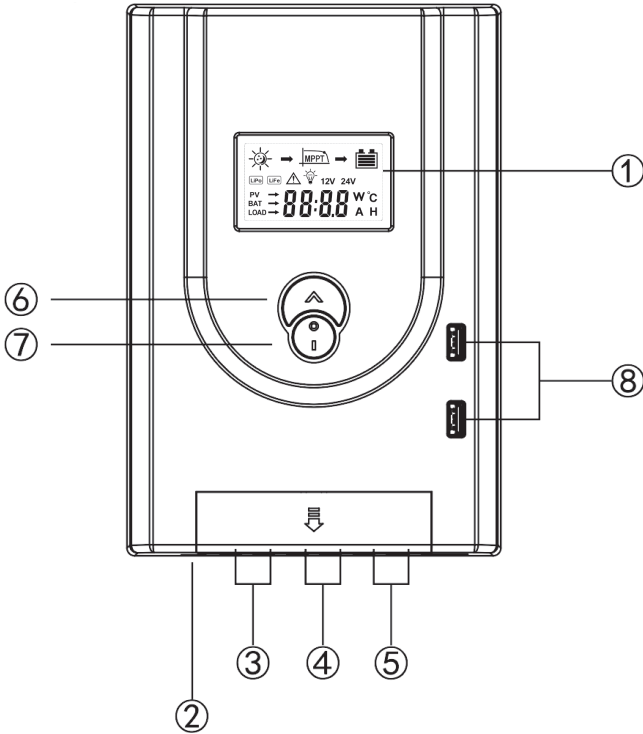
2.3 Product Appearance

Figure 1 Solar Controller Features

1	LCD Screen
2	External Temperature Probe
3	Solar Input Terminals
4	Battery Connection Terminals
5	Load Output Terminals
6	Button A
7	Button B
8	USB Output

3. Installation

The iTechworld 40 Amp MPPT Solar Charge Controller should be installed as close as possible to the battery being charged, this allows for more efficient charging of your battery. The solar charge controller is best mounted vertically with 4 screws (Not included) there are cut outs on the heatsink of the charger where the screws are hooked on. Below is the screw template, the maximum screw head diameter is 5mm.

The solar charge controller should be installed in a dry location, please ensure no liquids (such as water) can enter the solar charge controller. For proper air flow to cool the solar controller, please allow at least 15cm of space above and below the controller and 5cm at the sides.
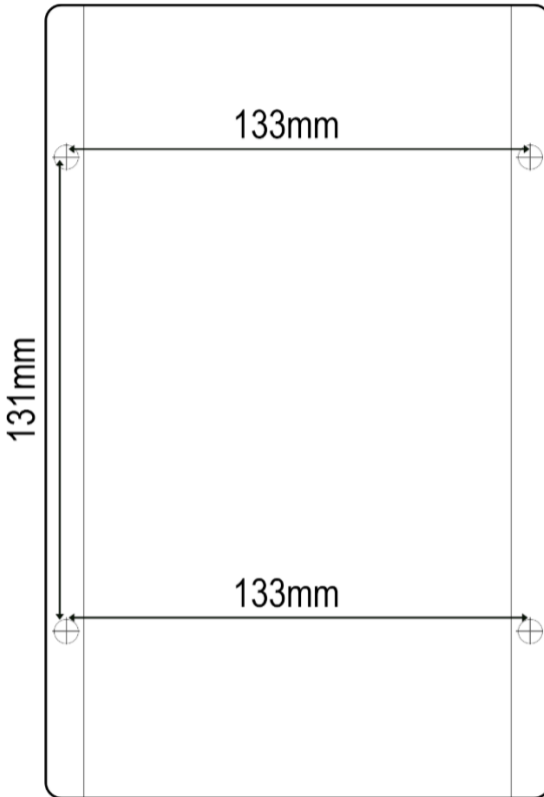
Figure 2 Mounting Diagram
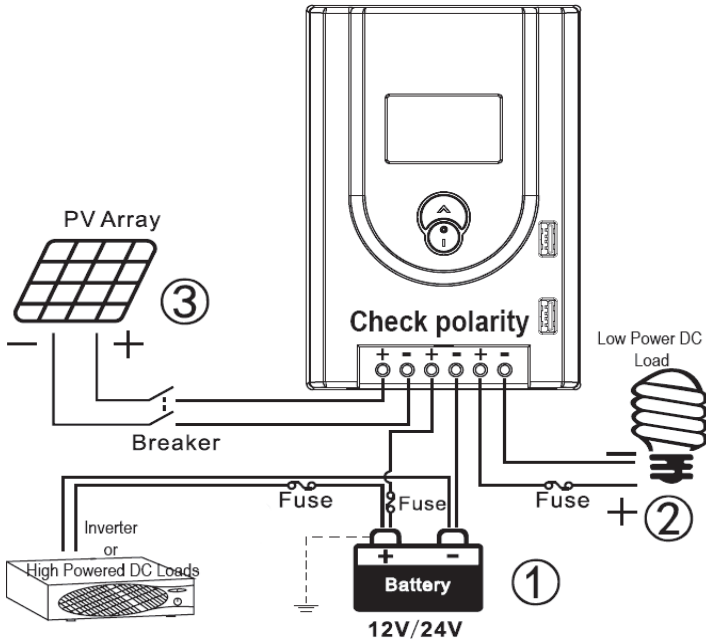
3.1 Wiring the solar charge controller

Figure 3 Connection Diagram

When wiring the solar charge controller, please use flexible, multi-stranded copper wire, with a current rating of at least 50Amps.

1. Connect your components to the solar charge controller in the sequence as shown in figure 3(1,2,3) and make sure the polarity is correctly connected. Do not insert fuses or turn on the breaker during the installation. When disconnecting, the order will be reversed (3,2,1)

2. A battery fuse must be used, the battery fuse should be installed as close to the battery as possible. The suggested distance is within 15cm of the battery. Please refer to fuse specifications.

3. Always connect the battery first, as this allows the solar charge controller to recognise the system voltage.

4. Power up the controller by installing the battery fuse first, then switching on/connecting the solar array.

Warning: If using the load output on the solar charge controller, do not exceed 40Amps, large loads such as inverters should only be connected to the battery directly.
Warning: This solar charge controller is a common positive controller. Directly connect the solar panel + & - connections to the solar charge controller only.

3.2 Fuse Specifications

All recommended fuses should be connected in series in circuit, and as close as possible to power sources. Bolt down fuses is preferred as they ensure a low resistance connection. Blade type fuses are not recommended as they can result in
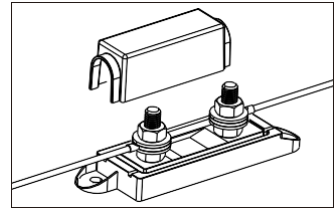

Figure 4 Bolt Down Fuse Holder

a high resistance connection which can cause excess heat generation and may damage the fuse holder and/or the wiring. Self-resetting circuit breakers are not recommended as they may prematurely trip due to the heat generated by the large current flowing through thewires.

Please refer to the table below for the recommended fuses.
(PLEASE NOTE FUSES ARE NOT SUPPLIED)

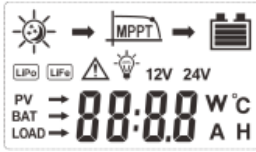|	Minimum Fuse Rating	Maximum Fuse Rating
Battery to solar charge controller	45A	50A
Solar input to solar charge controller	45A	50A
Solar Charge Controller to Load	20A	40A

4. Unit Operation

Figure 5 Display Icons

Solar Controller Status

Item	Icon		Status	
PV Array	☀	☽	Day	Night
	☀ → MPPT → 🔋		Charging	
Battery	🔋		Battery State of Charge	
	LiPo	LiFe	Lithium Battery Type	
Load	💡	💡	On	Off

Boot Sequence

Initial Boot Screen → Battery System Voltage → Controller Rated Charge Current → Software Revision
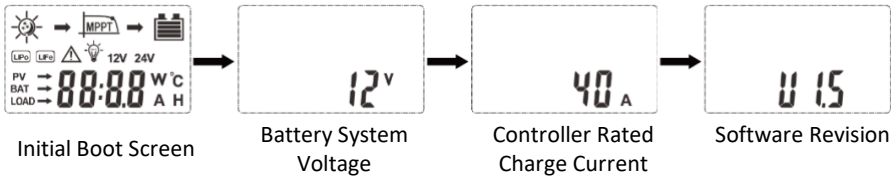
Figure 6 Boot Sequence

4.1 Menu Navigation

Home Screen — Ambient Temperature — Charge Current — Discharge Current — Accumulated Charging AH

Solar Charge Controller Internal Temperature

Accumulated Discharging AH
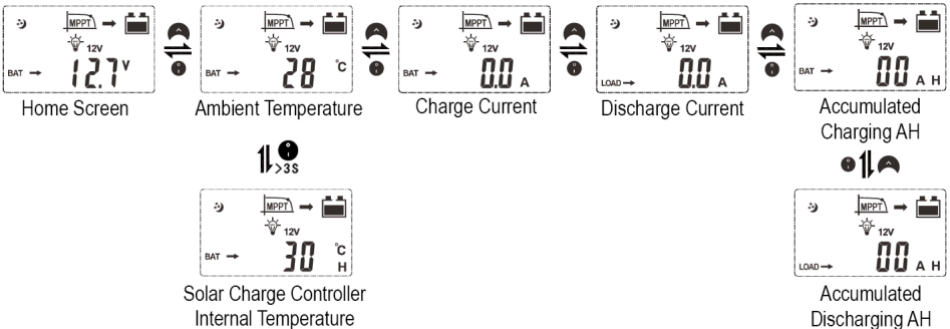
Figure 7 Main Navigation Flow Chart

After the controller is powered on, the display will enter the main navigation flow chart. At this time, short press button A or B to navigate between the parameters.

When on the Ambient Temperature screen, you can switch between the ambient temperature and the solar charge controller's internal temperature (denoted by the letter H under the °C) by pressing and hold button B for longer than 3 seconds.
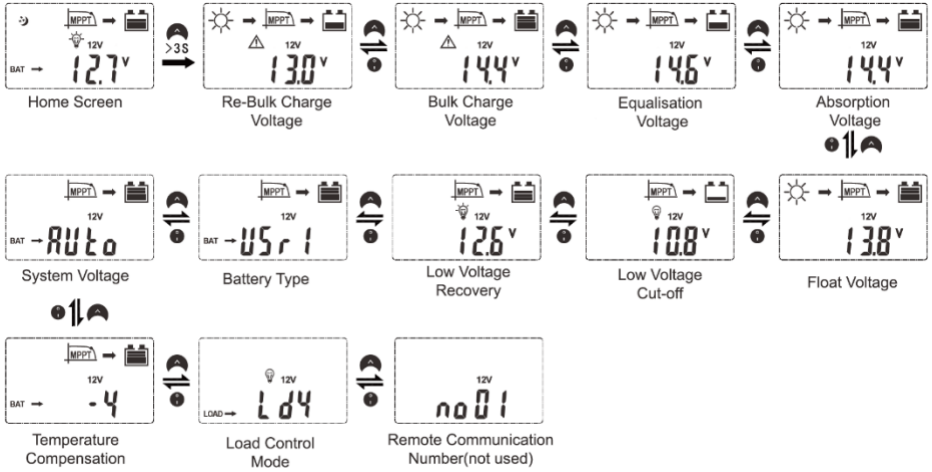
4.2 Settings Menu

Figure 8 Settings Flow Chart

To enter the settings menu of the solar charge controller, on the Home Screen, press and hold button A for more than 3 seconds then using buttons, A or B to scroll thorough the values. To alter the parameter, refer to "Changing Parameters"

4.3 Changing Parameters:
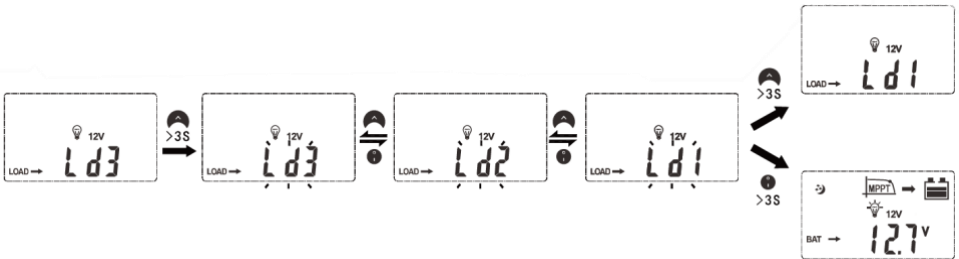

Figure 9 Changing Parameters

To change user changeable parameters, press and hold button A until the parameter value starts to flash, then short pressing button A or B will alter the parameter, once the desired value is reached, press, and hold button A for more than 3 seconds to save the data. Otherwise, press and hold button B to not save the change and return to the Home Screen.
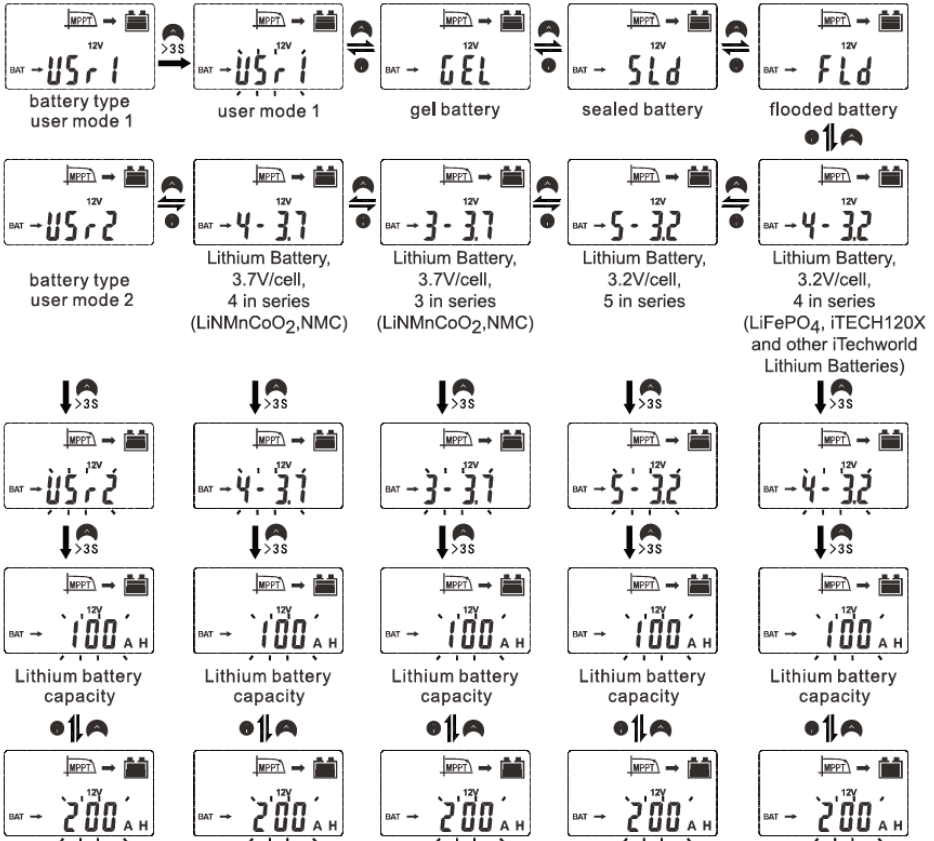
4.4 Battery Selection Menu:

Figure 10 Battery Selection Flow Chart

To change the battery charging profile, on the home screen, press and hold button A for more than 3 seconds to access the settings Menu, then short press button B until you are on the Battery Type (refer to Settings Men u), once on the Battery Type menu, press and hold button A for more than 3 seconds to access the Battery Selection Menu.

Then short pressing buttons A or B to toggle through each of the different battery charging profiles (Usr1, Gel, Sld, Fld and lithium batteries.)
When the desired charge profile is on the display flashing, press and hold button A for more than 3 seconds to save the selection.

4.4.1 Lithium Battery Profiles (4-3.2, 5-3.2, 3-3.7, 4-3.7, Usr2)

When a lithium profile is selected, the display will prompt for the total capacity of your lithium battery, use buttons A or B to set the value to the closest number as it is adjusted in increments of 5AH. Once the correct battery capacity is flashing on the display, press and hold button A for more than 3 seconds to save the selection.

NOTE: When using any of iTechworld's lithium batteries, such as the iTECH120X, please ensure ONLY the 4-3.2 (Lithium Battery, 3.2V/Cell, 4 in series) lithium profile is selected.
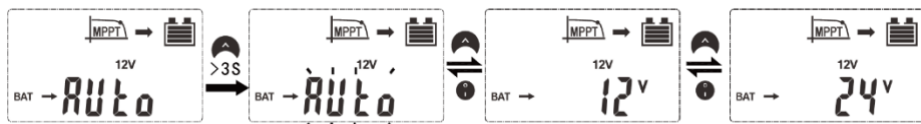
4.5 System Voltage Setting:

Figure 11 System Voltage Setting

The solar charge controller system voltage is set to auto sensing by default, although if required you can set it manually to be either 12 Volts or 24 Volts.

To change the system voltage, enter the Settings Menu(refer to Settings Menu) and scroll to the System Voltage screen , then press and hold button A until the parameter value starts to flash, then short pressing button A or B will alter the parameter, once the desired value is reached, press, and hold button A for more than 3 seconds to save the data, once the system voltage is saved, the solar controller will automatically restart after a few seconds.
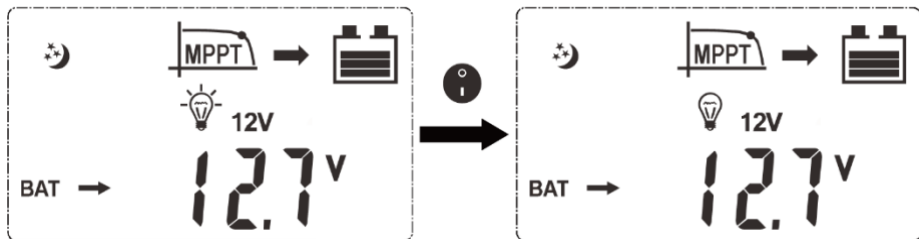
4.6 Load Control:

Figure 12 Load Control

4.6.1 Manually Controlling the load

On the Home Screen, short pressing button B will turn on or off the load as denoted by the light bulb symbol with rays coming out or off.

4.6.2 Load Control Modes

Mode	Function Description
Ld1(LD1)	Manual load control
Ld2(LD2)	Light control mode
Ld3(LD3)	Dual Time Mode
Ld4(LD4)	Inverted light control mode

LD1 Manual Load Control: The controller will not automatically turn on or off the load based on solar input (See above (manually controlling the load)

LD2 Light/Load Control Mode: The controller will automatically turn off the load when there is solar input detected(day) and turns on the load when there is no solar input detected(night). (Detection time of day and night is about 30 seconds)
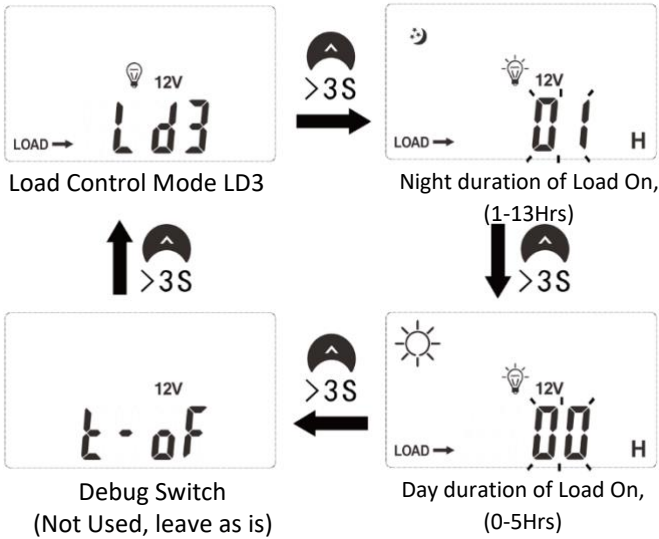
Dual Time Mode

Load Control Mode LD3

Night duration of Load On, (1-13Hrs)

Debug Switch (Not Used, leave as is)

Day duration of Load On, (0-5Hrs)

Figure 13 Dual Time Mode Flow Chart

LD3 Dual Time Control Mode: The controller will turn on the load automatically for the set amount of time during night and day, it will then turn the load off after the elapsed time. When LD3 is selected the above additional settings will be prompted for input, the parameter will be flashing, use buttons A and B to increase or decrease the desired runtime.

LD4 Inverted Light/Load Control Mode: The controller will automatically turn on the load when there is solar input detected(day) and turns off the load when no solar input is detected(night). (Detection time of day and night is about 30 seconds)
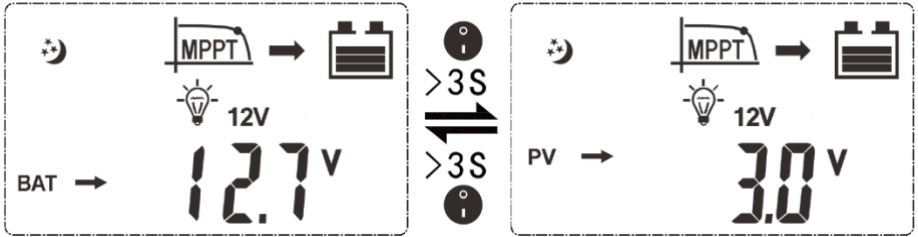
4.7 Solar Input Voltage

Figure 14 Solar Input Voltage

To toggle between the Solar Input Voltage and Battery Voltage, on the Home Screen, press and hold Button B for more than 3 seconds.

4.8 Setting equalisation charging voltage and duration
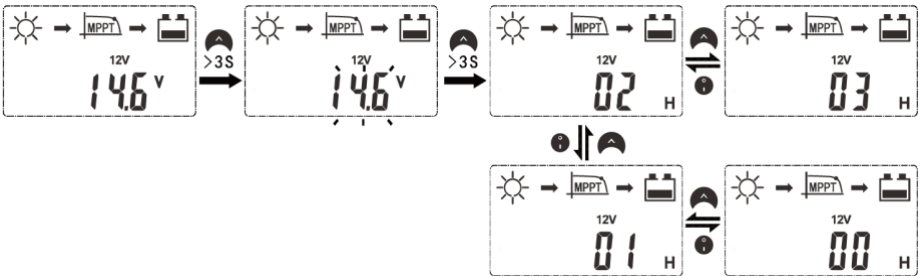(Only adjustable on the Usr 1 battery charging profile)

Figure 15 Equalisation Voltage Settings

Navigate to the Equalisation Voltage screen (refer to Figure 8), then press and hold Button A for more than 3 seconds until the value starts to flash, then using buttons A or B to increase or decrease the Equalisation Voltage, once the desired voltage is set, press, and hold Button A for more than 3 seconds to advance to the duration setting, once again use Buttons A or B to adjust. Finally press and hold Button A for more than 3 seconds to save all changes.
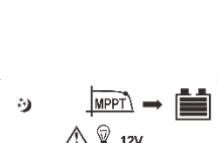
4.9 Setting Absorption Charging Voltage and Duration

(Only adjustable on Usr1 battery charging profile)
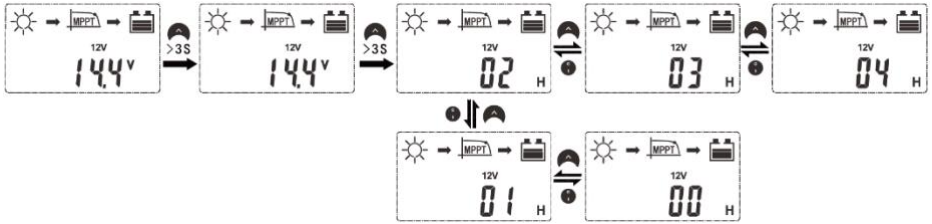
Navigate to the Absorption Voltage screen (refer to figure 8), then press and hold Button A for more than 3 seconds until the value starts to flash, then using buttons A or B to increase or decrease the Absorption Voltage, once the desired voltage is set, press, and hold Button A for more than 3 seconds to advance to the duration setting, once again use Buttons A or B to adjust. Finally press and hold Button A for more than 3 seconds to save all changes.
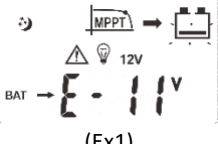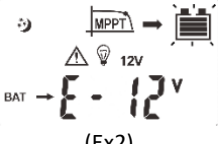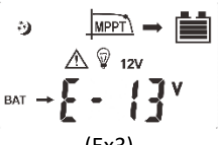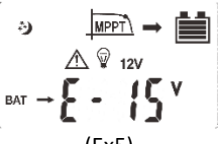
5. Troubleshooting

Fault Code/Symptom	Cause	Correction
Solar Charge controller is not charging battery when there is enough sunlight	1. Solar input is disconnected 2. Solar input voltage is lower than the battery voltage	1. Check that all solar input connections and fuses/breakers are correct. 2. The voltage of the solar panel should be more than the battery voltage.
Nothing is displaying on the LCD	Battery voltage is less than 8 Volts. Or incorrect connections.	Check battery voltage, connections, and fuses. The controller will only turn on if the battery is above 8 Volts.
(Ex1)	Battery is over discharged; low voltage protection has been triggered	The load output is turned off automatically and will recover when the battery voltage rises above the Low voltage recovery voltage.
(Ex2)	Battery is over charged. Over voltage detected.	Check that the selected battery profile is correct for the battery connected.
(Ex3)	Overload detected	Reduce the load on the load output of the solar charge controller.
(Ex5)	Solar charge controller over temperature.	Make sure the solar charge controller has adequate ventilation, and none of the heat sink fins are blocked. Allow the regulator to cool down, once it has cooled down it will restart charging automatically.
(Ex6)	Input voltage of solar panels is too high	Check voltage of the solar input and reduce the number of panels connected in series.

6. Specifications

6.1 Operating Parameters

Input		
System Rated Voltage	12/24VDC Auto sensing	
Max Open Voltage of Solar Panel	100VDC (at the lowest temperature) 92VDC (at standard temp of 25°C)	
Max Solar Input Power	12VDC System	520W
	24VDC System	1040W
Battery Voltage Range	8V DC – 32VDC	
Output		
Rated Charge Current	40A	
Battery Types	Sealed Lead Acid, Flooded Lead Acid, Gel, $LiFePO_4$(i.e. iTECH120X), $LiNiMnCoO_2$(LiPO)	
Static Loss	≤50mA	
Temperature Compensation Coefficient	-4mV/°2V(25°C)	
LCD Temperature	-20°C~+70°C	
Operating Temperature	-20°C~+55°C	
Storage Temperature	-30°C~+80°C	
Working Humidity	≤90% non-condensing	
Grounding	Common Positive	
Dimensions H x W x D	215mm x 145mm x 75mm	
Wire Terminal Size	$16mm^2$/6AWG	
Weight	1.30KG	

6.2 Protections

Protection		
Battery Over Voltage	Battery has reached or exceeded the over-voltage point	Controller will automatically stop charging and discharging
Battery Over Discharge	Battery voltage has dropped below the Low voltage disconnect point	Controller will turn off the load and only recover once the battery has charged above the low voltage reconnect voltage.
Overload	The connected load exceeds the rated current	The load will automatically be turned off

6.3 Charging Profiles

	Re-Bulk	Bulk	Eq	Abs	Flt	LVD	LVR
Usr1	13.0	14.4	14.6**(E)**	14.4**(E)**	13.8**(E)**	10.8**(E)**	12.6**(E)**
Gel	13.6	14.4	14.2	14.2	13.8	10.8	12.6
Sld	13.6	14.4	14.6	14.4	13.8	10.8	12.6
Fld	13.6	14.4	14.8	14.6	13.8	10.8	12.6
LiFePO4 (4-3.2)	13.0	14.40	14.2	14.4	13.8	11.2	12.8
LiFePO4 (5-3.2)	16.2	18.0	14.2	14.4	13.8	14.0	16.0
LiPo (3-3.7)	12.0	12.6	14.4	14.4	13.8	9.9	11.1
LiPo (4-3.7)	16.0	16.8	14.4	14.4	13.8	13.2	14.8
Usr2	13.6**(E)**	14.4**(E)**	14.2	14.2	13.8	10.8	12.6

NOTE: Values with (E) next to them indicates user adjustable values. For iTechworld Lithium Batteries, please use LiFePO4(4-3.2) only, please refer to section 4.4.1.

7. Maintenance and Warranty

Maintenance

Make sure that the solar charge controller is turned off while performing any maintenance.

To keep your solar charge controller operating properly, there is very little maintenance required.

You should clean the exterior periodically with a dry cloth to prevent the build-up of dust and dirt.

Also check and tighten the fasteners on the DC input terminals.

Warranty

iTechworld guarantees this product against defects in materials and workmanship for a period of 12 months from the date of purchase. This warranty will be considered void if the unit has been misused, altered, or accidentally damaged. iTechworld will not be liable for any amount of damage in excess of the retail purchase price of the unit under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty.

This solar charge controller is not intended for commercial use. This warranty does not apply to damage to units from misuse or incorrect **installation**/connection. Misuse includes wiring or connecting to improper polarity sources.

Return/Repair Policy:

In the unlikely event that technical problem arises, please contact iTechworld customer service on **1300 483 249** or email **service@itechworld.com.au** before returning the solar charge controller back to the store.

If such a unit is returned within the warranty period, iTechworld will repair the unit or, at its discretion, replace it, free of charge. If the unit is repaired, new or reconditioned replacement parts may be used, at the manufacturer's discretion. A unit may be replaced with a new or reconditioned unit of the same or comparable design. The repaired or replaced unit will then be warranted under these terms for the remainder of the warranty period. The customer is responsible for the shipping charges on all returned items back to iTechworld.

Limitations:

This warranty does not cover accessories, such as adapters and batteries, defects or damage resulting from normal wear and tear (including but not limited to chips, scratches, abrasions, discoloration or fading due to usage or exposure to sun or environmental elements), accidents, damage during shipping to iTechworld's service facility, alterations unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire, and flood.

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